

BEML - TATRA 815

26RR36 22 255 6x6.1R/50T, 51T

Workshop manual

Part 7 – AXLES

Publication numer: 03-0254-ENG/00





7 AXLES

7.1 Description and Main Technical Specifications

DESCRIPTION:

A) FRONT AXLE

The vehicles BEML - TATRA T 815 - 26RR36 22 255 6x6.1R/50T and BEML - TATRA T 815 - 26RR36 22 255 6x6.1R/51T feature the swinging, driving and steering front axle. The wheel units are equipped with planetary reduction gears.

The axle is attached to the front backbone tube of the vehicle central member frame and constitutes the front carrying and driving part of the vehicle. It has single wheels.

The axle consists of three main components:

- axle final drive housing (See Fig. 7.1), in which the two-sided axle bevel gear transmission is situated
- two swinging half-axles with independent suspension
- two wheel units (See Fig. 7.2)

The axle final drive housings are attached by bolted connections in the extended central member frame of the vehicle.

Ahead of the final drive of the driving axle there is built an axle spur gear locked differential.

Axle final drive housings and wheel hubs are filled with oil; gears and bearings are fitted with the oil splash lube system.

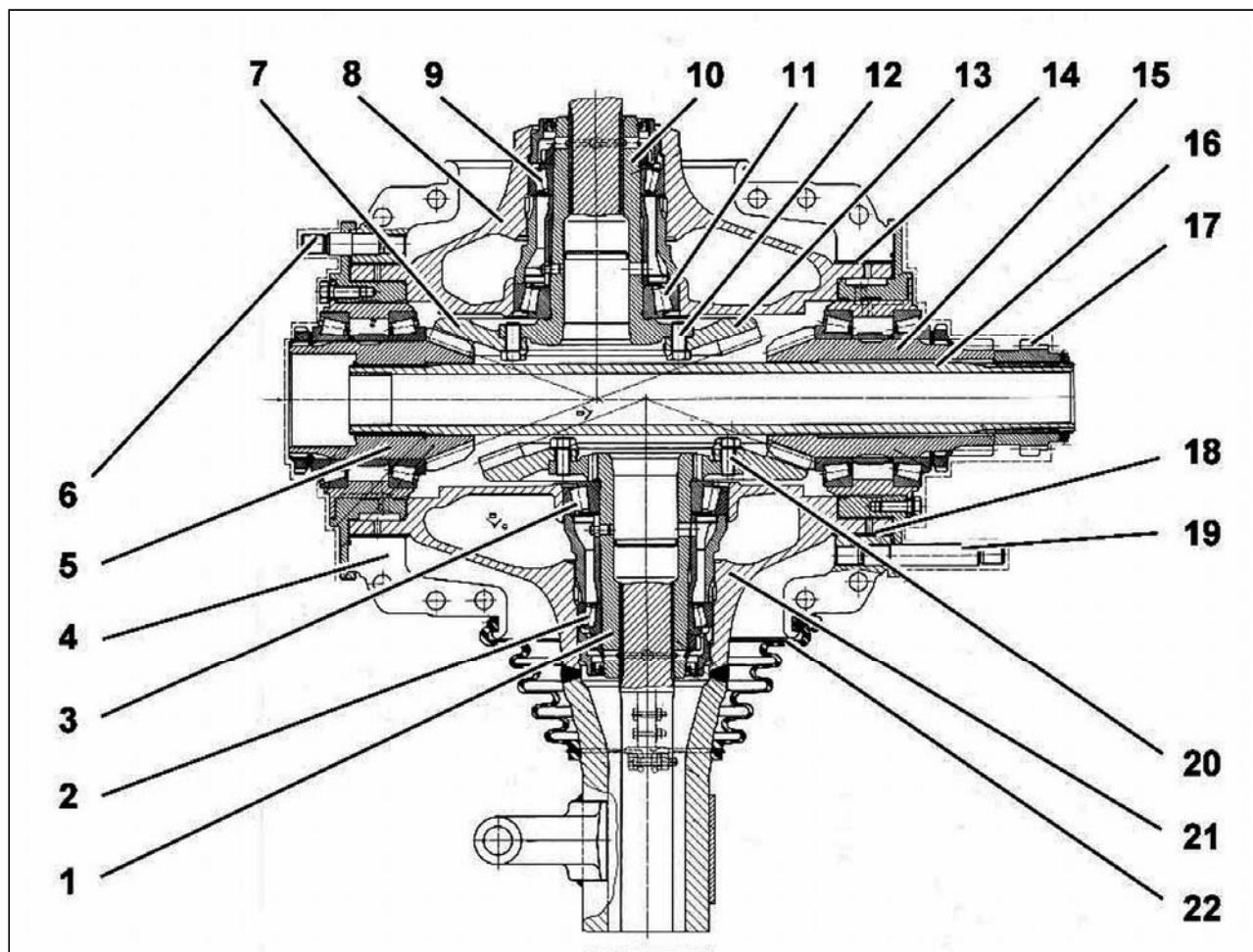
The first part of the axle final drive includes two bevel gear drives (pinion, crown gear) for the left-hand and right-hand half-axes. The half-axes are overset towards each other what has no influence upon the driving properties.

Pinions complete with bearings 5 and 15 of bevel gear drives are placed in the axle final drive housing 4.

The pinion 5 fits on grooves of the propeller shaft 16, which is coupled through shaft grooves with central gear 18 of the axle differential. A part of the pinion 15 is the gearing, which fulfils a function of the other central gear 17 of the axle differential.

Crown gears 7 and 13 are connected by bolts 12 and 20 to wheel hubs 1 and 10, which are mounted in axle shafts 8 and 21 on two tapered roller bearings 2, 3 and 9, 11. The wheel driving shafts are inserted into hubs grooves. The half-axle swinging is allowed due to a swing mounting of axle shafts in the axle final drive housing in friction large-size bearings, which are formed by sheet-iron strips 14 and 18. During the half-axle swinging the crown gears are rolling over pinions. To protect the axle final drive housing from pollution, the axle shafts are fitted with protective bags 22. The axle final drive housings are incorporated into the central member frame and are attached using bolts 6 and 19.

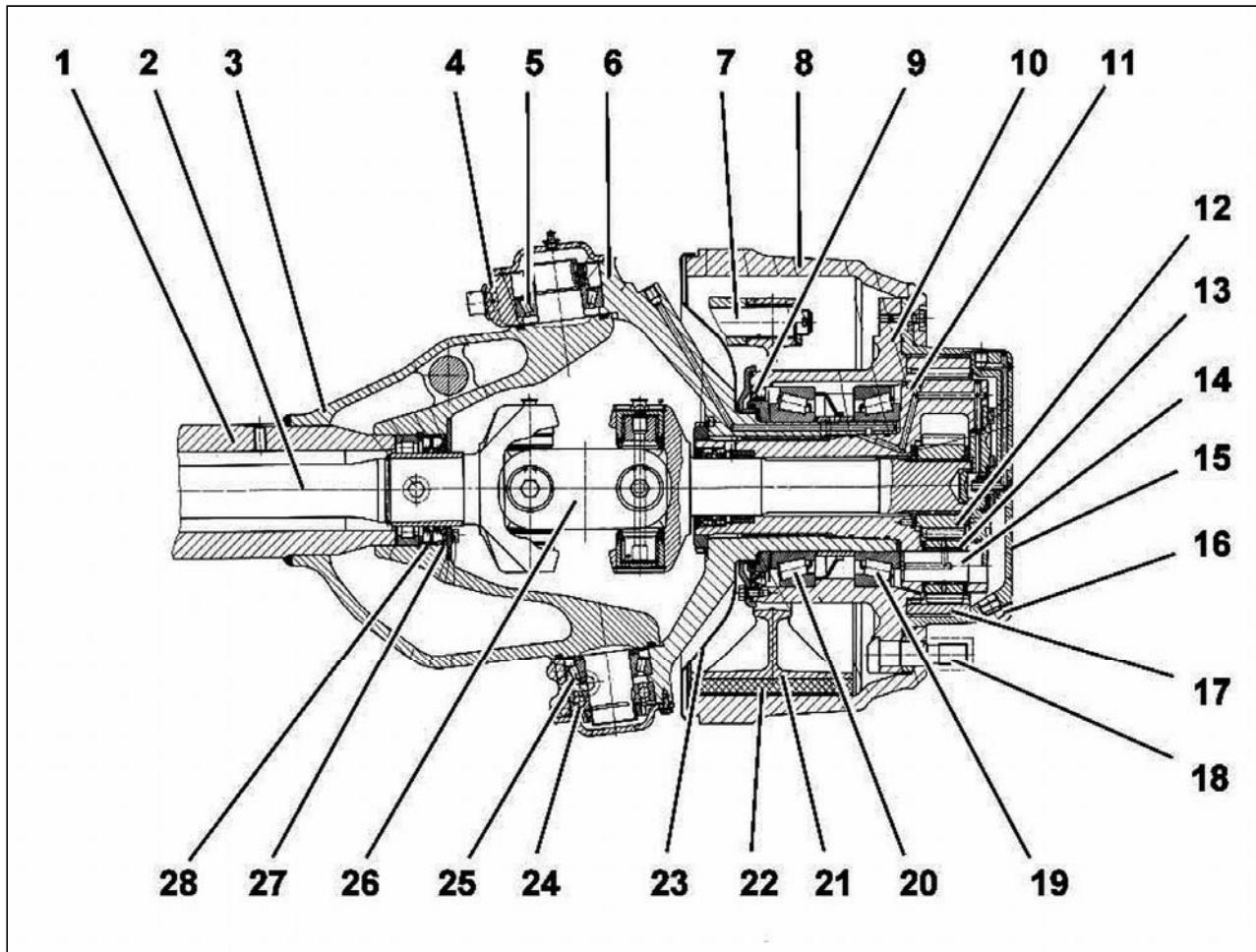
The axle final drive housing is filled with oil and the oil splash system provides the lubrication.



Legend: 1, 10 - crown gear hub; 2, 3, 9, 11 - tapered roller bearing; 4 - axle final drive housing; 5, 15 - complete pinion c/w bearings; 6, 19 - bolts; 7, 13 - crown gear; 8, 21 - half-axle; 12, 20 - crown gear bolts; 14, 18 - sheet-iron strip (friction bearing); 16 - propeller shaft; 17 - axle differential central gear; 22 - protective bag;

Fig. 7.1 Axle final drive housing of the front axle - description

Another part of the axle final drive is a planetary wheel reduction gear, which is placed in the wheel unit.



Legend: 1 - axle shaft; 2 - wheel driving shaft; 3 - swivel pin axle shaft yoke; 4 - steering arm; 5, 25 - steering knuckle tapered roller bearings; 6 - steering knuckle; 7 - brake shoes pins; 8 - brake drum; 9 - shaft seal; 10 - wheel hub; 11 - planet wheels housing; 12 - sun gear; 13 - planet wheel; 14 - planet wheels pin; 15 - wheel reduction gear cover; 16 - drain plug; 17 - crown gear; 18 - wheel bolts; 19, 20 - tapered roller bearings; 21 - brake shoe; 22 - brake lining; 23 - cover sheet, 24 - ball bearing; 27, 28 - shaft seal;

Fig. 7.2 Wheel unit of the front axle - description

At the end of the half-axle 1 there is a yoke 3 welded, which forms a kingpin. The steering knuckle 6 is supported on the yoke 3 of the axle shaft 1 on tapered roller bearings 5, 25 and ball bearing 24. A part of the steering knuckle is the steering arm 4.

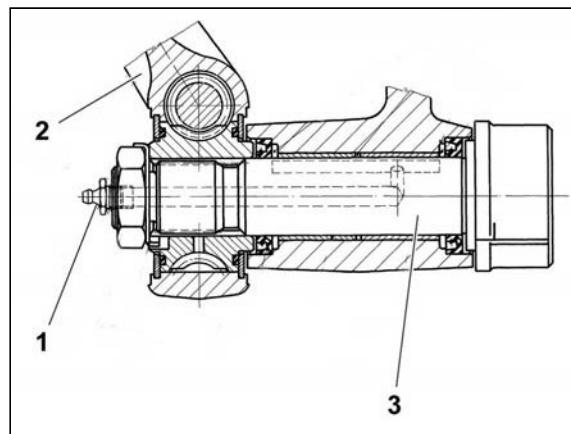
The torque is transmitted from the axle drive (axle final drive housing) through the driving shaft 2 with constant velocity joint 26. The shaft is sealed with shaft seals 27 and 28 on the outlet from the axle shaft 1. A part of the steering knuckle 6 is the cover sheet 23 and brake shoes pins 7. On brake shoes pins 7 the brake shoes 21 c/w lining 22 are mounted. The wheel hub 10 c/w **brake drum** 8 and wheel bolts 18 fit on the steering knuckle 6 on two tapered roller bearings 19 and 20, which are sealed with the shaft seal 9. The planet wheel reduction gear, which is mounted in the wheel reduction gear cover 15, consists of the sun gear 12, which is driving, and crown gear 17, which is driven. The braked element is the planet wheels housing 11 with planet wheels 13, which are supported on pins 14.

Such arrangement of the planetary gear system means a step-down gear what means that a bigger driving force on vehicle wheels is generated.

The wheel hub is filled with oil and the lubrication is secured by the oil splash system. The oil is drained after removal of the drain plug 16.



The brake cam **3** with lubricating nipple **1** and complete brake cam lever **2** are mounted in the steering knuckle.



Legend: 1 - lubricating nipple; 2 - complete front brake cam lever; 3 - brake cam

Fig. 7.3 Brake cam mounting

B) REAR AXLE

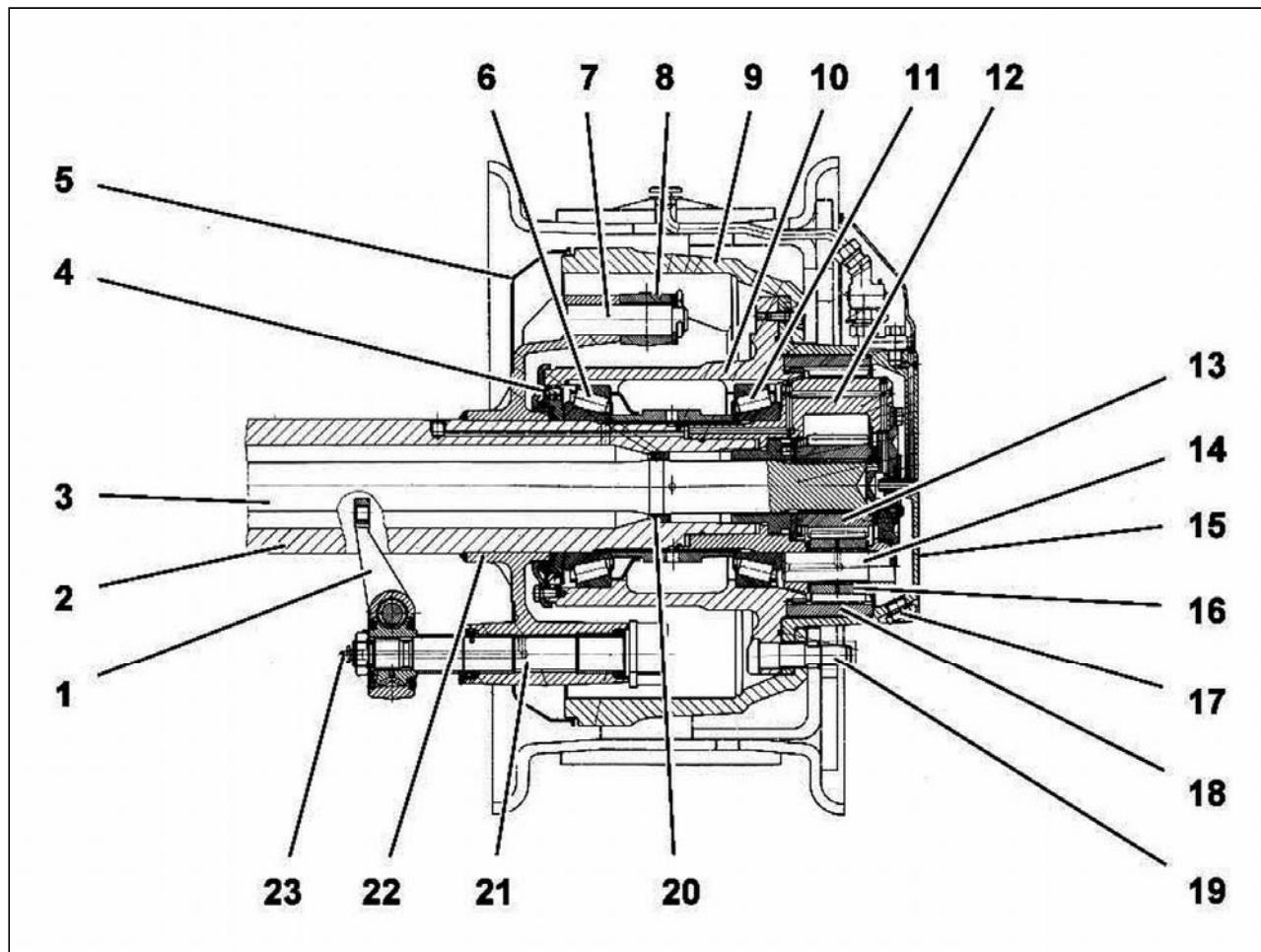
The vehicles BEML - TATRA **T 815 - 26RR36 22 255 6x6.1R/50T** and BEML - TATRA **T 815 - 26RR36 22 255 6x6.1R/51T** have two swinging and driving rear axles with planetary wheel reduction gears.

The axles are fixed to the vehicle central member frame and constitute the rear carrying and driving part of the vehicle. They are fitted with single wheels.

The axle consists of three main components:

- axle final drive housing, in which the two-sided axle bevel gear transmission is situated
- two swinging half-axles with independent suspension
- two wheel units (See Fig. 7.4)

The axle final drives of rear axles are similar in design with the front axle final drives. However, they are turned through 180° round the transversal axis because of the opposite position towards axle differentials.



Legend: 1 - complete brake cam; 2 - axle shaft; 3 - wheel driving shaft; 4, 20 - shaft seal; 5 - cover sheet; 6, 11 - tapered roller bearings; 7 - brake shoes pins; 8 - brake shoes; 9 - brake drum; 10 - wheel hub; 12 - planet wheels housing; 13 - sun gear; 14 - planet wheels pin; 15 - wheel reduction gear cover; 16 - planet wheel; 17 - drain plug; 18 - crown gear; 19 - wheel bolts; 21 - brake cam; 22 - brake girder; 23 - lubricating nipple

Fig. 7.4 Wheel unit of the rear axle - description

The half-axle 2 is terminated by the welded brake girder 22, to which pins of brake shoes 7 and rear cover sheet 5 are welded. On pins of brake shoes 7 the brake shoes 8 c/w lining are mounted. In the brake girder 22 the brake cam 21 c/w lubricating nipple 23 and complete brake cam lever 1 are installed.

The torque from the final drive (axle final drive housing) is transmitted by means of the driving shaft 3. The shaft is sealed with the shaft seal 20 on the outlet from the axle shaft 2.

The wheel hub 10 is supported on two tapered roller bearings 6 and 11, the bearing 6 is mounted on the axle shaft 2, and the bearing 11 is placed on the planet wheels housing 12. To the wheel hub 10 the brake drum 9 is bolted. In the wheel hub 10 the wheel bolts 19 are pressed and secured with weld.

The planetary wheel reduction gears, which are situated in the wheel reduction gear cover 15, is formed by the planet wheels housing 12, sun gear 13, which is driving, and the crown gear 18, which is driven. The braked element is the planet wheels housing with planet wheels 16, which are mounted on rollers and pins 14.

Such arrangement of the planetary gear system means a step-down gear and it means that a bigger driving force on wheels is generated. The wheel reduction gear housing is filled with oil and the lubrication is of the splash-type.

The space o the wheel reduction gear is oil-sealed by the shaft seal 4.



The oil is drained after removal of the plug 17.

The principal technical and assembly data of axles are mentioned in the table below (See Tab. 7.1).

Tab. 7.1 Main technical and assembly data of axles

	Data for the front axle	Data for the rear axle
Kind of axle	Swinging, steering, driving with half-axles and independent wheels suspension	Swinging, steering, driving with half-axles and independent wheels suspension
Suspension	Torsion bars with fluid double-acting telescopic shock absorbers	Leaf springs with 14 leaves
Half-axle oversetting	51 mm	51 mm
Axle drive ratio	2,714 x 2,333	2,714 x 2,333
Kind of axle drive gearing	Oerlikon bevel gearing in the axle final drive and straight-tooth spur gearing in the planetary wheel reduction	Oerlikon bevel gearing in the axle final drive and straight-tooth spur gearing in the planetary wheel reduction
Axle differentials and inter-axle differential	Symmetrical with six planet wheels, with spur gearing, with locks controlled by pneumatic working cylinders and pneumatic cocks	Symmetrical with six planet wheels, with spur gearing, with locks controlled by pneumatic working cylinders and pneumatic cocks
Axle weight	930 kg	820 kg



7.2 Faults Causes, Symptoms and Troubleshooting

Fault	Cause	Remedy	It can be found in:
The wheel unit of the front axle is too noisy	A big clearance in wheel hub bearings	Adjust the clearance	(See Subchapter 7.5.9)
	Worn wheel hub bearings	Replace bearings	(See Subchapter 7.5.9)
	Damaged wheel hub reduction gearing	Remove and replace the damaged parts	(See Subchapter 7.5.9)
	Damaged or worn driving shaft joint	Replace the driving articulated shaft	(See Subchapter 7.5.9)
The wheel unit of the rear axle is too noisy	A big clearance in wheel hub bearings	Adjust the clearance	(See Subchapter 7.5.10)
	Worn wheel hub bearings	Replace bearings	(See Subchapter 7.5.10)
	Damaged wheel hub reduction gearing	Remove and replace the damaged parts	(See Subchapter 7.5.10)
Backlash in the vehicle steering (the vehicle is "wandering") caused due to clearances in steering joints	A big clearance in wheel hub bearings	Check the clearance and/or adjust it	(See Subchapter 7.5.9)
	Worn wheel hub bearings	Replace bearings	(See Subchapter 7.5.9)
	Possible clearance in steering knuckle bearing	Adjust the clearance	(See Subchapter 7.5.7)
The oil leaks round the wheel reduction gear cover	Damaged shaped ring	Remove the cover and replace the ring	(See Subchapter 7.5.4), (See Subchapter 7.5.5)
The oil leaks from the front axle wheel hub	Damaged shaft seals in steering knuckle	Remove shaft seals and replace them	(See Subchapter 7.5.4)
	Damaged shaft seal in hub	Remove shaft seals and replace them	(See Subchapter 7.5.9.)
The grease leakage from the front half-axle round the driving shaft	Damaged shaft seal in the half-axle	Remove the shaft seal and replace it	(See Subchapter 7.5.7)
Rear axle wheel hub leakage	Damaged shaft seals in hub or the shaped ring in spacer ring	Replace shaft seals and ring	(See Subchapter 7.5.10)
Central member frame flanges screw connections leakage	Damaged shaped sealing rings	Remove respective components of the central member frame and replace the rings	(See Subchapter 7.5.11), (See Subchapter 7.5.13), (See Subchapter 7.5.14)
The axle final drive of some axle is noisy	Worn or damaged bearings or gearing systems in the gearbox	Remove the axle final drive and repair it	(See Subchapter 7.5.11), (See Subchapter 7.5.13), (See Subchapter 7.5.14)



7.3 List of Special Tools

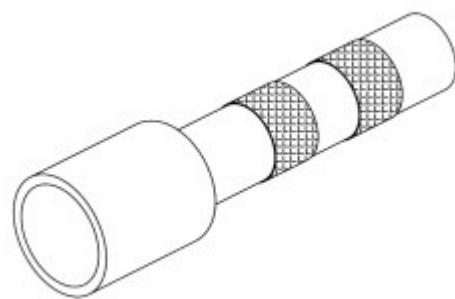
Tab. 7.2 *Special tools for the axles repair*

<p>Name: Driver of articulated shaft cross-pin bearings</p> <p>Tool number: PRL 0766</p>	
<p>Name: Driver of shaft seal 55x72x12 and centering ring into half axle</p> <p>Tool number: PRL 0842</p>	



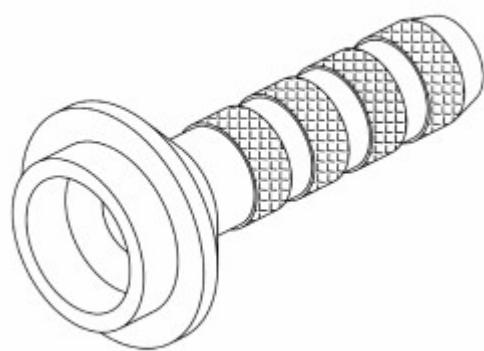
Name: Driver of bearings 32209, 6209

Tool number: PRL 0843



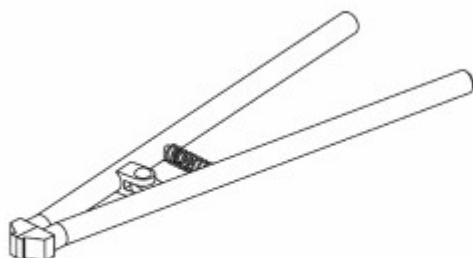
Name: Driver of shaft seals 58x80x13, 55x80x13

Tool number: PRM 0411



Name: Snap ring pliers

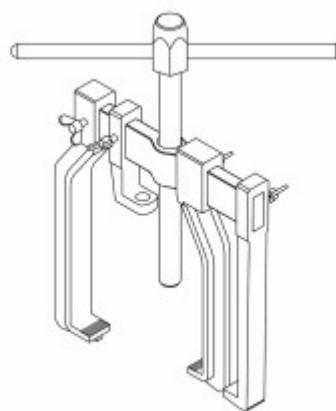
Tool number: PRM 0470





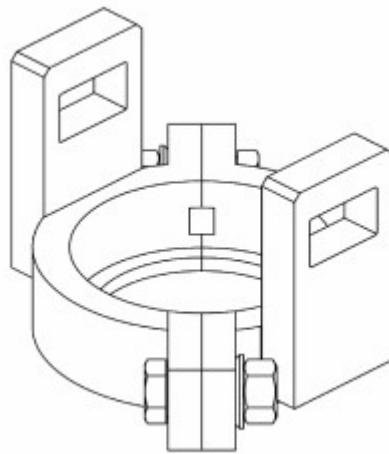
Name: Universal puller

Tool number: PRM 0777



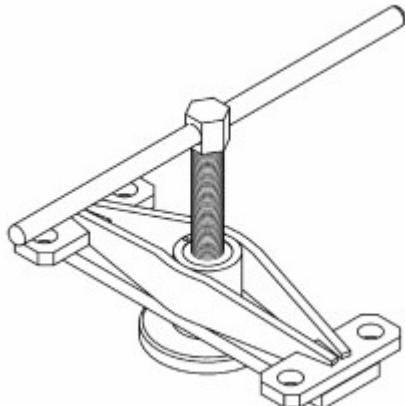
Name: Puller of inner race of bearing 32209

Tool number: PRM 2773



Name: Front wheel hub puller

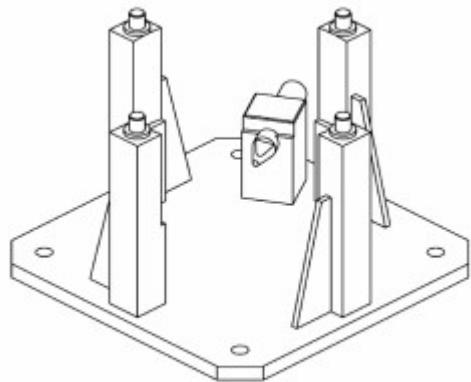
Tool number: PRM 2880





Name: Assembly stand of pinion

Tool number: PRM 3072.1



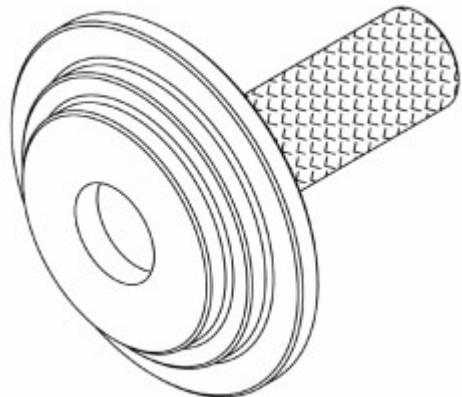
Name: Driver of inner race of bearing 32026

Tool number: PRM 3073.1



Name: Tool to pull-out inner races of bearings from pinion

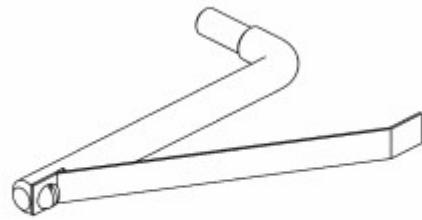
Tool number: PRM 3114





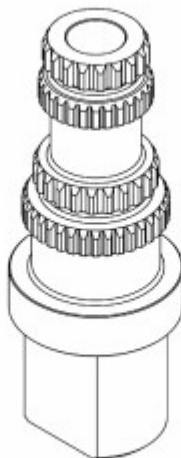
Name: Tool to remove crown wheel hub assembly

Tool number: PRM 3121.1



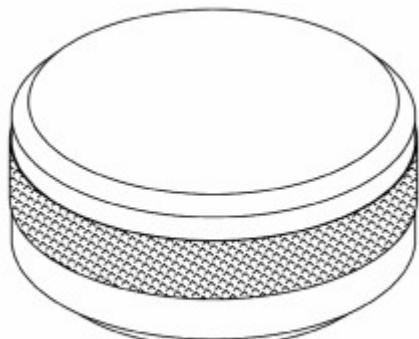
Name: Assembly stand of crown wheel hub

Tool number: PRM 3123.1



Name: Driver for mounting satelite housing into wheel hub

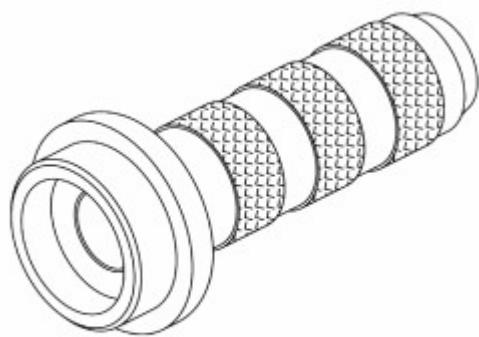
Tool number: PRM 3131





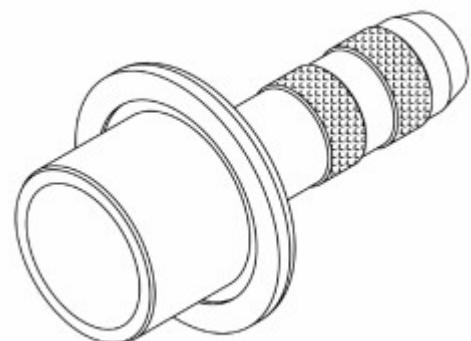
Name: Driver of bearing RNU 4910

Tool number: PRM 3132



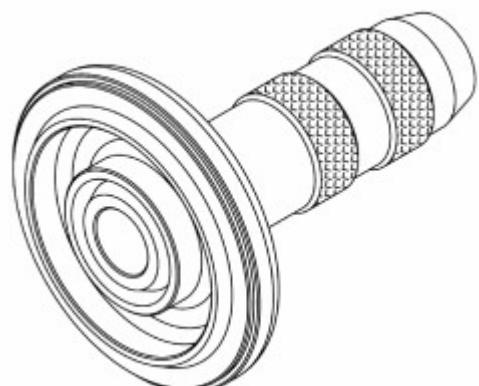
Name: Driver of shaft seals 73,5x110x10, 73,5x110x13,
73,5x110x21/22 and bearing RNU 212

Tool number: PRM 3141.1



Name: Driver of shaft seal 85x110x12

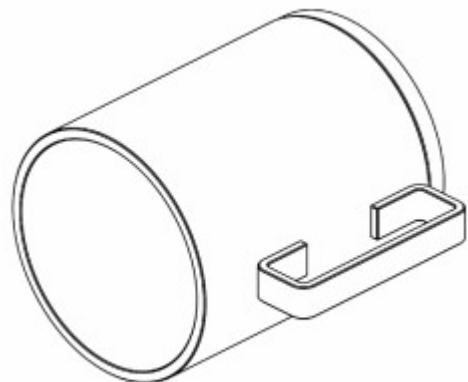
Tool number: PRM 3142





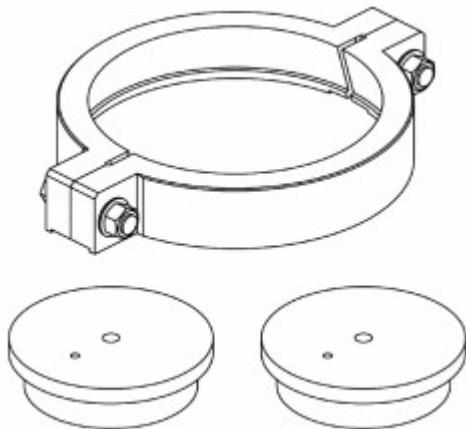
Name: Driver of inner races of bearing onto the pinion and driver of spacer ring and inner race of bearing 32024 onto the axle wheel hub

Tool number: PRM 3144



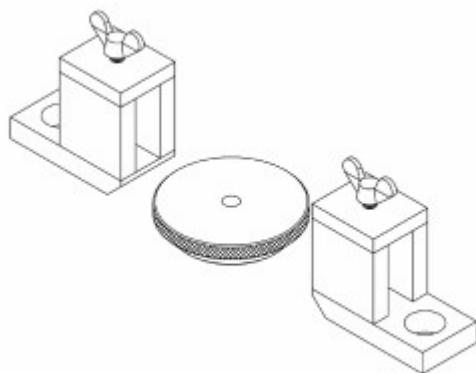
Name: Puller of inner ring of bearing 32026

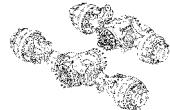
Tool number: PRM 3146



Name: Puller of wheel hub

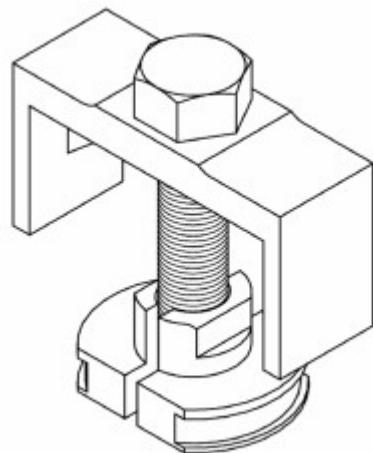
Tool number: PRM 3151





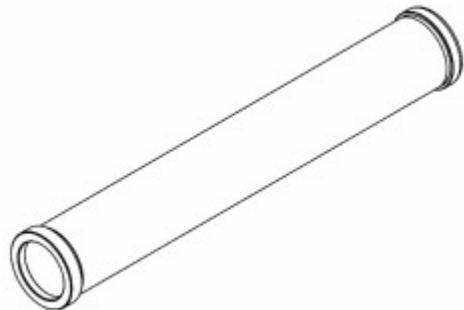
Name: Puller of bearing RNU 212

Tool number: PRM 3152



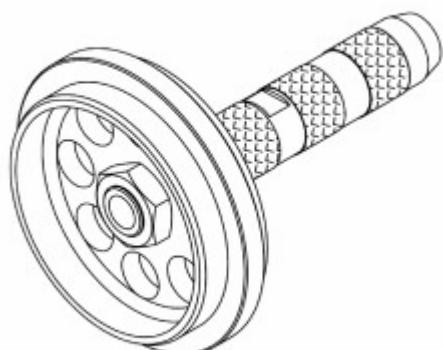
Name: driver to press bearing bushing onto the articulated shaft

Tool number: PRM 3153



Name: Driver of shaft seal 170x200x15 and outer race of bearing 32026

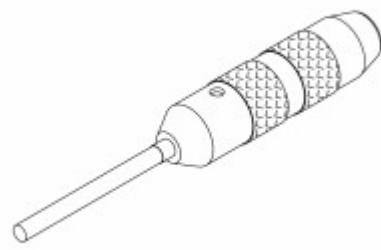
Tool number: PRM 3180





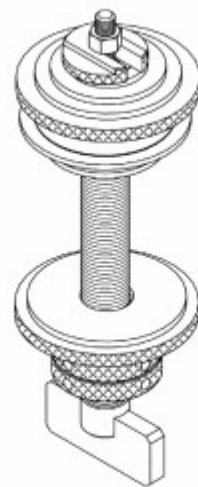
Name: Extractor of crown wheel hub bearings and front wheel hub bearings - extractor of flywheel seal ring

Tool number: PRM 3184



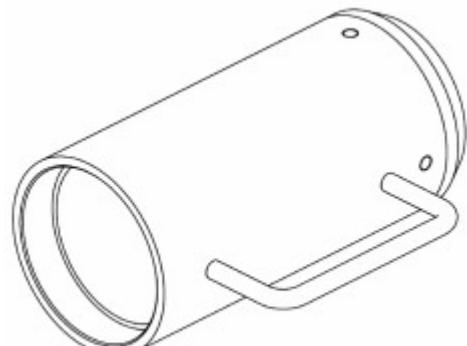
Name: Universal tool to measure clearance of tapered roller bearings

Tool number: PRM 3206



Name: Driver of inner race of bearing 30219

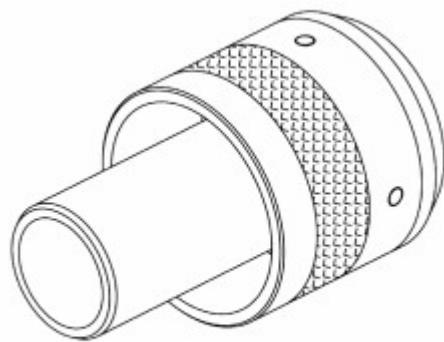
Tool number: PRM 3279





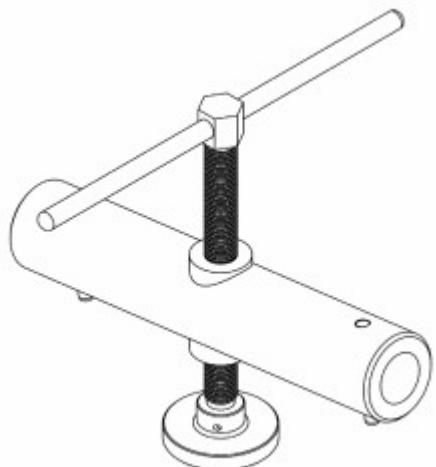
Name: Driver of inner race of crown wheel hub bearing
32018

Tool number: PRM 3280



Name: Tool to remove front axle satellite housing

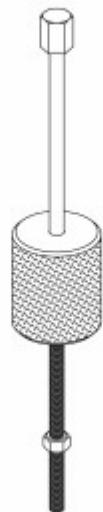
Tool number: PRM 3300





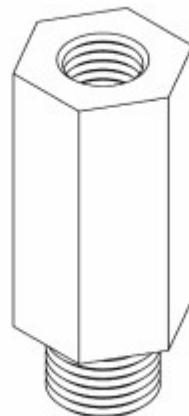
Name: Universal extractor

Tool number: PRM 3322



Name: Extractor of articulated shaft cross pin bearings

Tool number: PRM 3339



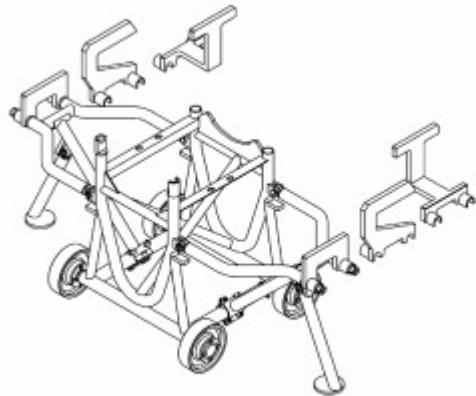


07 Axles



Name: Assembly trolley of axles - axles with reduction gear

Tool number: PRM 3338.1



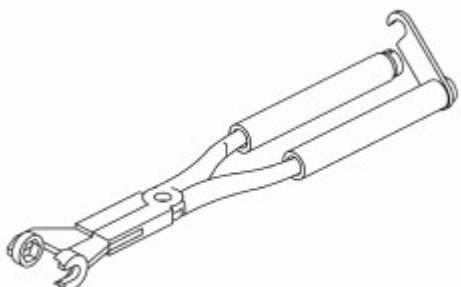
Name: Turning tool of pinions (checking of bevel gearing adjusting)

Tool number: PRM 3838



Name: Pliers to tighten up protective bags wires (M8)

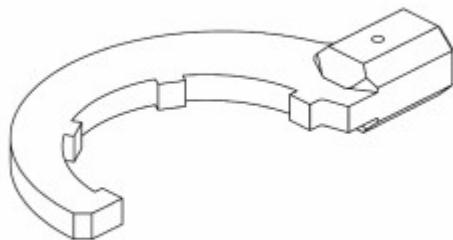
Tool number: PRM 3861





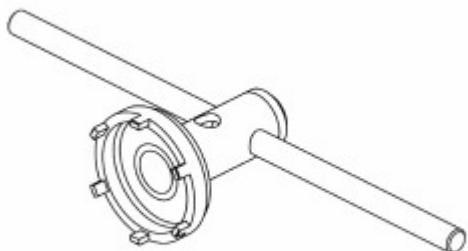
Name: Wrench for nuts 442 0 5257 085 4 and 442 0 5257 162 4

Tool number: URK 0199



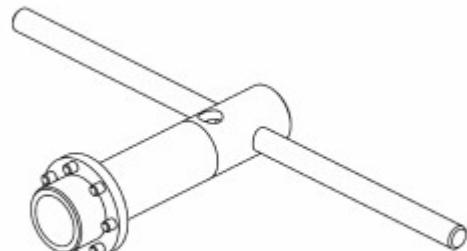
Name: Wrench for satelite housing nut

Tool number: URN 0182



Name: Wrench for locking nut

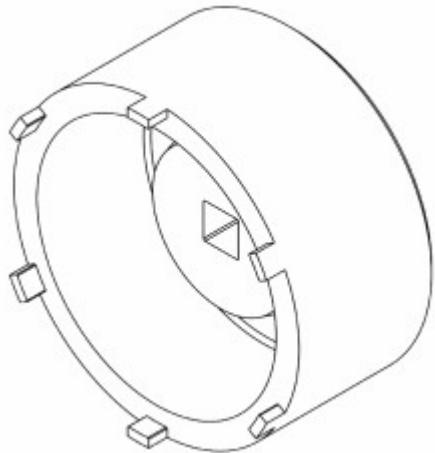
Tool number: URN 0183





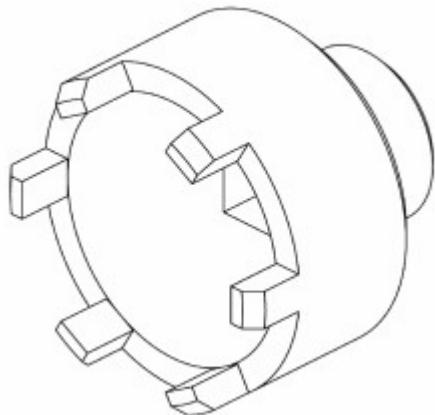
Name: Wrench for nut 442 0 2087 016 4

Tool number: URN 0202



Name: Wrench for nuts 442 0 5257 022 4, 442 0 5257 012 4

Tool number: URN 1339





7.4 Survey of Torque Specifications

Tab. 7.3 Survey of torque specifications of axle screw connections

Data	Unit	Value
Front axle brake drum bolts		15 ± 1,5
Slotted nuts on the upper swivel pin - to be tightened		200 - 300
Wheel reduction gear oil drain plug		120 ± 12
Check plug on the axle final drive housing		200 ± 20
Drain plugs		80 ± 8
Bolts on shield of steering knuckle lower yoke		150 ± 15
Steering arm screws		370 ± 40
Slotted nuts on the lower swivel pin - to be tightened		200 - 300
Nuts of technological distance pieces		250 - 300
Rear axle brake drum bolts		15 ± 1,5
Planet wheels housing nuts	Nm	900 ± 90
Front axle wheel reduction gear cover		22 ± 2
Rear axle wheel reduction gear cover		12 ± 1
Central member frame flange screw connections		420 ± 10 %
Bolts fixing the frame to cross girders		400 ± 40
Rear axle locking bolt		800 + 50
Crown gear fastening bolts		135 ± 15
Crown gear hub locking nut		500 ± 50
Pinion adjusting nut		900 ± 90
Axle final drive housing connecting bolts		200 ± 20
Pinion bushes fastening bolts		75 ± 8



7.5 Working Procedures

7.5.1 Oil Change in the Wheel Unit Reduction Gear Housing

a) Reasons for Oil Change

1. Regular oil change in accordance with a lubrication schedule (see the "Operation and Maintenance Manual") after three years of operation at the latest.
2. Water penetration into the oil filling.

b) Technical Conditions

1. Secure the vehicle with wheel chocks to protect it from motion during the oil change.
2. After the oil change, no oil leakage below the drain plug is allowed.

c) Oil Change Procedure

Note:

The procedure describes the oil change with a wheel removed from the vehicle. However, it is possible to change the oil when the wheel remains to be on the wheel unit - in this case be sure to protect the wheel and the tire from being stained with oil.

1. Remove the vehicle wheel according to the procedure in (See Part 11).
2. Unscrew the oil drain plug **1** from the wheel unit and drain the oil into a pan prepared.

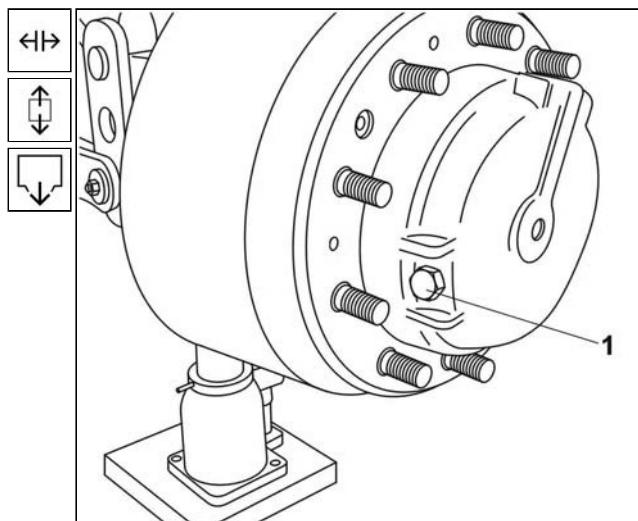


Fig. 7.5 Wheel reduction gear housing oil drain plug – removal



07 Axles



3. Turn the wheel unit so that the marks on the wheel reduction gear housing cover indicating the oil level would be positioned horizontally.
4. Fill the wheel unit with oil to the lower edge of the drain hole.
5. Clean contact surfaces of the drain plug and wheel reduction gear housing cover.
6. Screw on the plug with sealing ring and tighten to the torque of **120 ± 12 Nm**.
7. Install the vehicle wheel according to the procedure in (See Part 11).

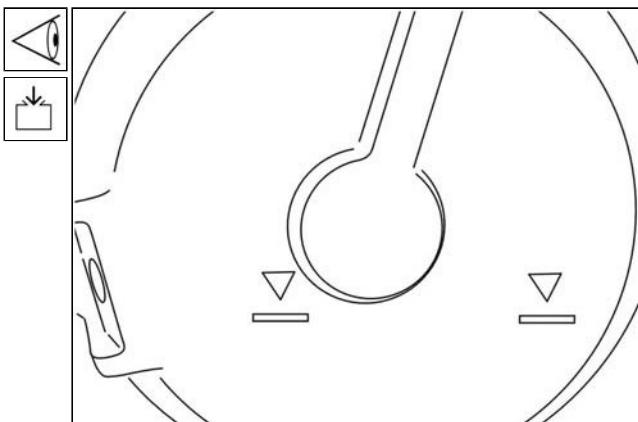


Fig. 7.6 Oil level check marks



7.5.2 Oil Change in the Axle Final Drive Housing

a) Reasons for Oil Change

1. Regular oil changes in accordance with a lubrication schedule – see the "Operation and Maintenance Manual" - after three years of operation at the latest.
2. A reason for the oil change may be a water penetration into the oil filling.

b) Technical Conditions

1. After the oil has been changed, no oil leakage below drain plugs is allowed.

c) Oil Change Procedure

1. Unscrew plugs **1** and **3**.

Note:

The figure is illustrative only. The inspection plug **3** is situated on the side of the final drive housing. It may be located to the right or to the left, the individual axles dependent.

2. Drain the oil into a pan prepared.
3. After draining the oil from the axle final drive housing, unscrew the plug **2** and drain oil from a space of the axle differential into a pan prepared.

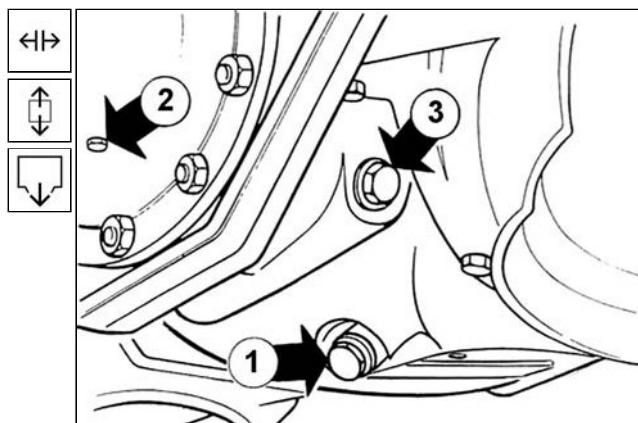


Fig. 7.7 Filler, inspection and drain holes of the axle final drive and axle differential oil filling – removal

4. Having drained the oil also from a space of the axle differential, reinstall plugs **1** and **2** and tighten to the torque of **80 ± 8 Nm**.
5. Fill the specified amount of oil through the inspection hole below the plug **3** to the lower edge.
6. After the oil filling, install plug **3** to cover the inspection hole and tighten to the torque of **200 ± 20 Nm**.
7. After the oil change in the axle final drive housing and covering about 50 km, be sure to check the oil level and top up the oil to reach the lower edge of the inspection hole.

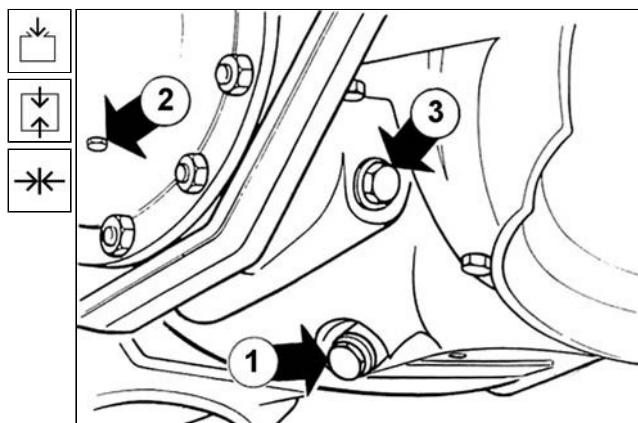


Fig. 7.8 Filler, inspection and drain holes of the axle final drive and axle differential oil filling – installation



7.5.3 Replacement of the Half-axle Protective Bag

a) Reasons for Replacement

1. The protective bag needs to be replaced when the visible rubber ageing resulting in surface cracks appears on the surface or when it has been damaged (torn) due to the vehicle operation under rough conditions.

b) Technical Conditions

1. Secure the vehicle with wheel chocks to prevent it from motion during repair.
2. Use new screws and nuts for connections of the protective bag during installation.
3. If need be, replace the wire-tightening rings too.
4. Thoroughly apply the sealant to the flange connection of the protective bag and to its connection to the axle final drive housing and to the half-axle.

c) Removal Procedure

1. Partially raise the half-axle and support it with a suitable stand.
2. Unscrew nuts **1** (bolts **2** on the front axle) and remove (shim **3** on the front axle) and protective basket **4** of the protective bag **11**.
3. Clean the protective bag **11**.
4. Dismount screws **5** c/w washers **6** and nuts **10** of the partition connection of the protective bag **11**.
5. Remove both wire-tightening rings **9** and **12** of the protective bag **11** using the tool **PRM 3861**.
6. Remove the protective bag **11** from the half-axle.

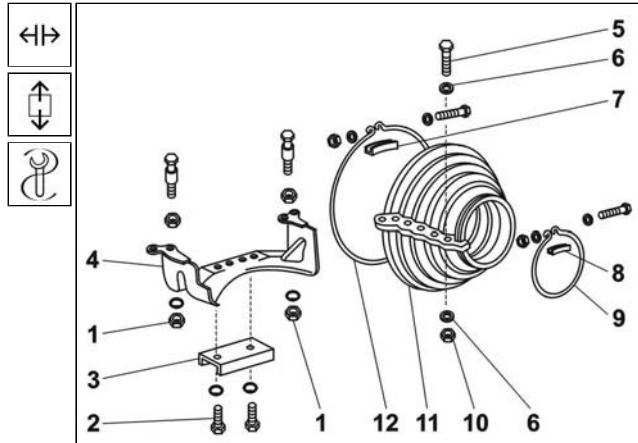


Fig. 7.9 Protective bag of the half-axle - removal

**d) Installation Procedure**

1. Apply the sealant to the flange connection of the protective bag **11** on the threaded connection and to the half-axle and the axle final drive housing contact surfaces beneath both wire-tightening rings **9** and **12** before installation.
2. Install the protective bag **11** on the clean half-axle so that it would be positioned forwards in the driving direction in the vehicle longitudinal centreline with its partition connection.
3. Mount and tighten screws **5** c/w washers **6** and nuts **10** of the partition connection.
4. Use the tool **PRM 3861** to fit and tighten both wire-tightening rings **9** and **12** with shims **7** and **8**.
5. Install the protective basket **4** on the protective bag **11** and fix it using nuts **1**.
6. On the front axle, install the shim **3** using bolts **2**.
7. Lower the half-axle.

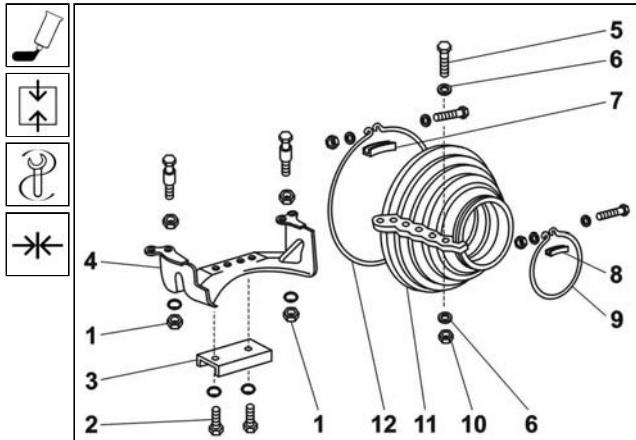


Fig. 7.10 Protective bag of the half-axle - installation



7.5.4 Removal and Installation of the Steering Axle Driving Shaft

a) Reasons for Removal

1. The driving shaft has been damaged.
2. Shaft seals in the steering knuckle are leaky.
3. Shaft seals in the axle shaft are leaky.

b) Technical Conditions

1. Secure the vehicle with wheel chocks against motion during repair.
2. Replace all sealing elements used in the procedure with new ones.

c) Removal Procedure

1. Dismount the complete steering knuckle (See Subchapter 7.5.7).
2. Remove the driving shaft **1** from the axle shaft **2**.

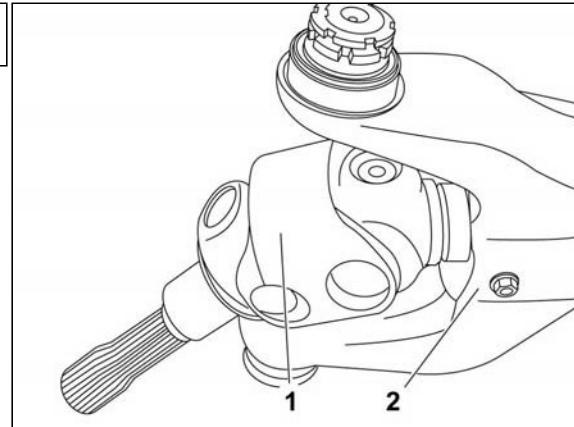


Fig. 7.11 Driving shaft - removal

3. Remove the circlip **1** and withdraw bushes **2** from both ends of the propeller shaft.

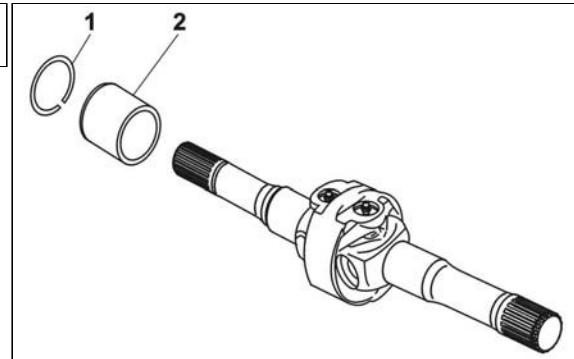
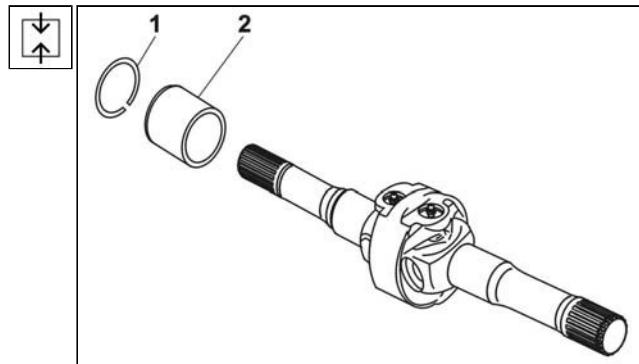


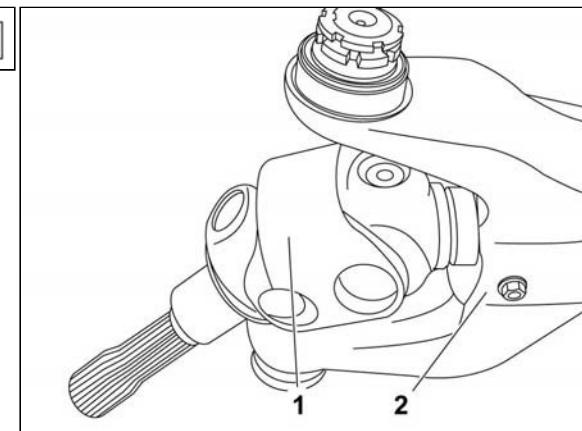
Fig. 7.12 Shaft bearings bushes - removal

**d) Installation Procedure**

1. Heat the bushes **2** and press them on both ends of the propeller shaft by means of the tool **PRM 3153**. Fit circlips **1**.

*Fig. 7.13 Shaft bearings bushes - installation*

1. Gently apply the grease **Servo grease 'MP'** o grooves of the driving shaft **1** on side of the axle final drive housing and slide into the axle shaft **2**.
2. Install the complete steering knuckle (See Subchapter **7.5.7**).

*Fig. 7.14 Driving shaft - installation*



7.5.5 Removal and Installation of the Unsteered Axle Driving Shaft

a) Reasons for Removal

1. The driving shaft has been damaged.

b) Technical Conditions

1. Secure the vehicle with wheel chocks to prevent it from motion during repair.
2. Replace all sealing elements used in the procedure with new ones.

c) Removal Procedure

1. Dismount the vehicle wheel in accordance with a procedure (See Part 11).
2. Turn the wheel unit so that the oil drain plug **3** of the wheel unit is situated in the lowermost position, and unscrew the plug **3** and drain the oil into a prepared pan.
3. Dismount 2 pcs of screws **1**, which attach the brake drum **2** to the wheel hub.
4. Use screws M 12 to withdraw the brake drum from location and withdraw it from the wheel hub

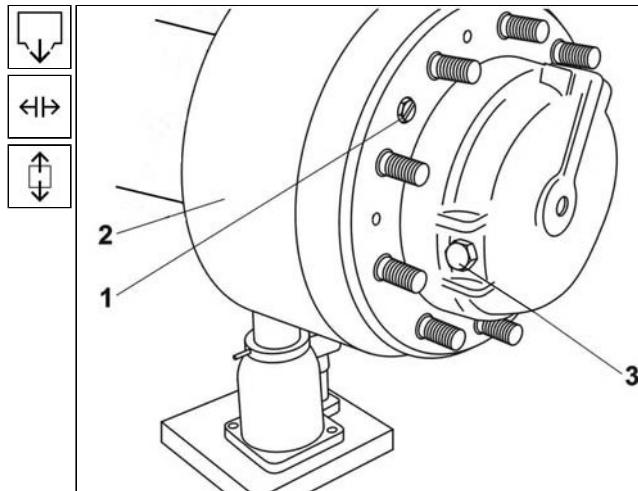


Fig. 7.15 Rear axle brake drum - removal

5. Unscrew screws **2** from the wheel reduction gear cover.
6. Use screws M8 to force off the wheel reduction gear cover **1**.

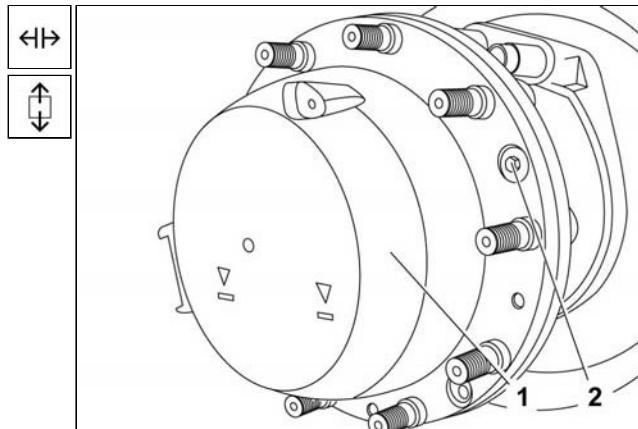


Fig. 7.16 Rear wheel reduction gear cover - removal



07 Axles



7. Remove the sealing shaped ring **2** from the wheel reduction gear cover **1**.

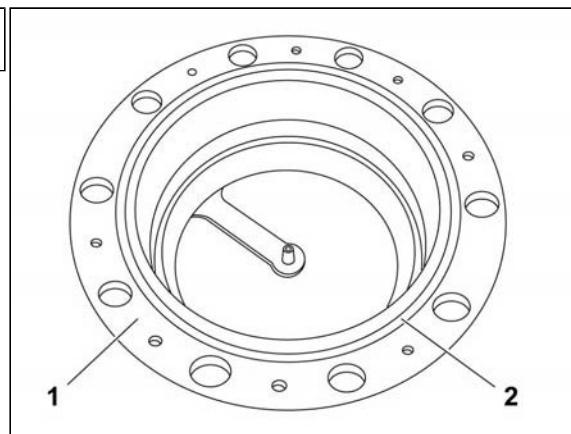


Fig. 7.17 Sealing ring - removal

8. Unscrew screws **2** from the satellite housing cover **1** and withdraw the satellite housing cover **1**.

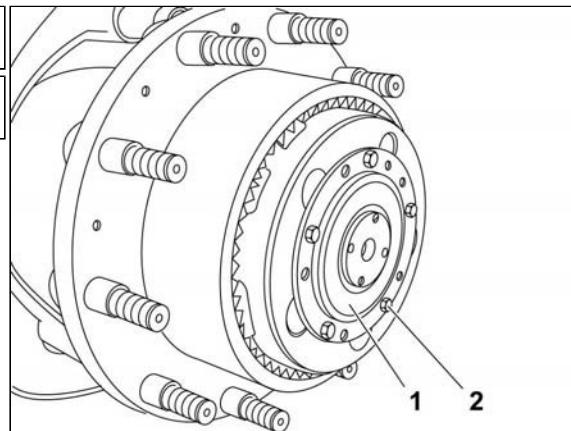
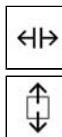


Fig. 7.18 Satellite housing cover - removal

9. Remove the shim **1** from end of the driving shaft

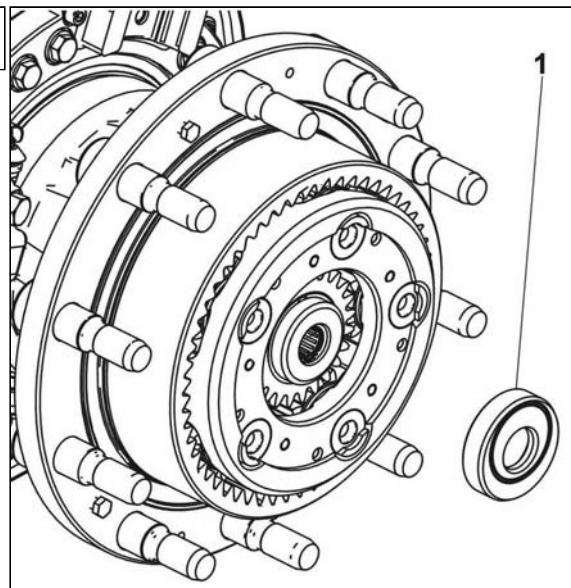


Fig. 7.19 Shim - removal



10. Withdraw the wheel reduction crown gear **1**, if it remained in the wheel reduction gear cover.
11. Use the Seeger pliers **PRM 0470** to remove the lock ring **3** and reduction central gear **2**.
12. Move the driving shaft **4** away from the axle shaft.

Note:

Take care not to damage the shaft seal inside the axle shaft.

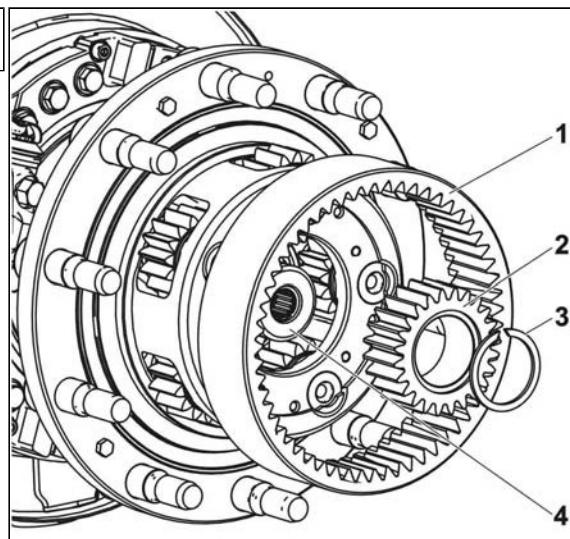
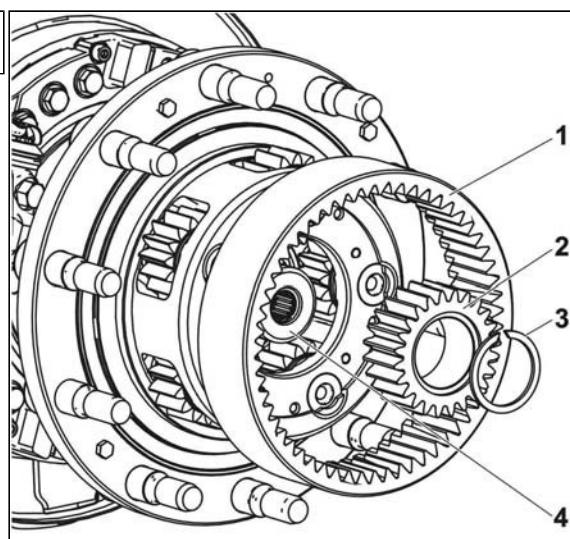


Fig. 7.20 Driving shaft - removal

d) Installation Procedure

1. Gently smear the splines of the driving shaft on the side of axle final drive housing with the plastic lubricant **Servo grease 'MP'**.
2. Apply the transmission oil to edge of the sealing ring in the axle shaft.
3. Slide the driving shaft **4** into half-axle.



Note:

Take an extreme care when sliding the end of the driving shaft into the half-axle with regard to possibility of damaging the sealing ring in the axle shaft.

4. Fit the central gear of the wheel reduction gear **2** on end of the driving shaft.
5. Use Seeger pliers **PRM 0470** to fit the lock ring **3** of the wheel reduction central gear.
6. Fit the wheel reduction crown gear **1**.

Fig. 7.21 Driving shaft - installation



07 Axles



7. Mount the shim **1** so that the lubricating groove is directed towards the wheel reduction gear cover.

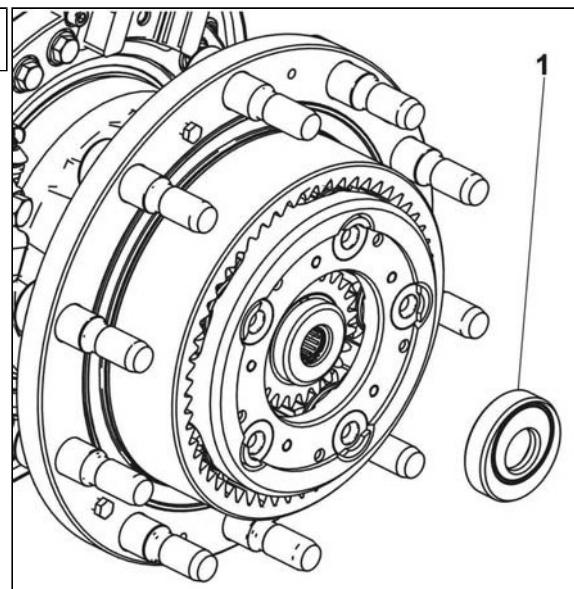


Fig. 7.22 Shim - installation

8. Fit the satellite housing cover **2** on the satellite housing **1**.

Note:

A hole in the satellite housing **1** must be aligned with a hole in the satellite housing cover **2** (see the arrows).

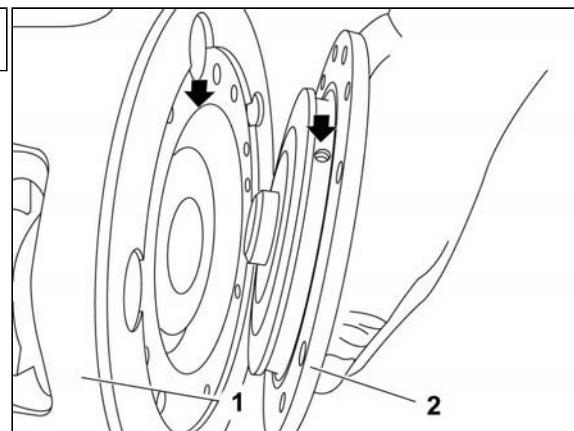


Fig. 7.23 Installation of satellite housing cover

9. Use screws **2** to attach the satellite housing cover **1** to the satellite housing.

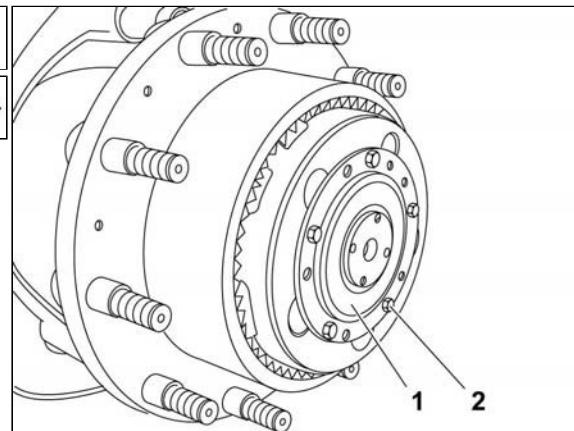


Fig. 7.24 Satellite housing cover - installation



10. Fit a new shaped sealing ring **2** smeared with transmission oil into recess in the wheel reduction gear cover **1**.

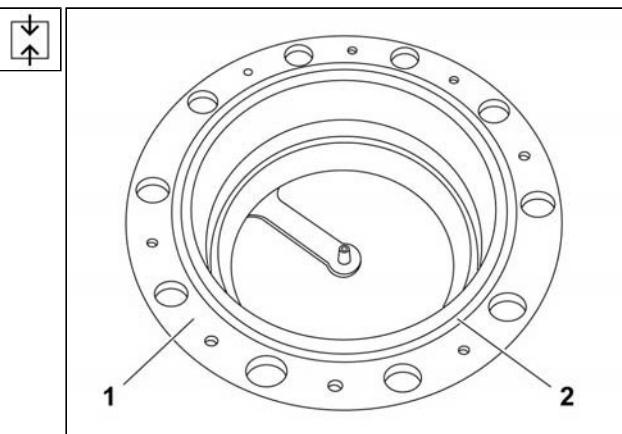


Fig. 7.25 Sealing ring - installation

11. Fit the wheel reduction gear cover **1**.
12. Mount screws **2** to attach the wheel reduction gear cover.

Note:

Tighten the screws uniformly to achieve a correct pressing of cover to the wheel hub with the tightening torque of 12 ± 1 Nm .

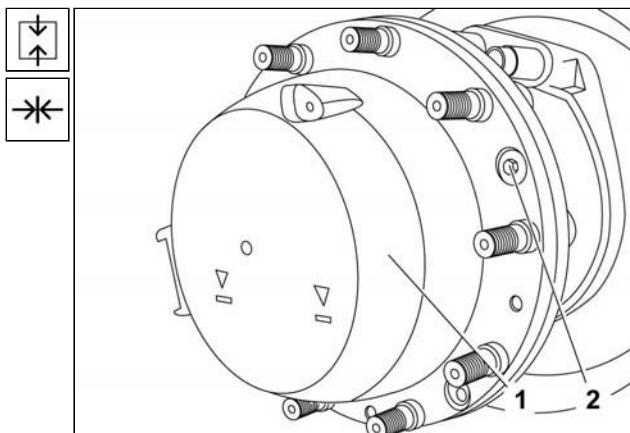


Fig. 7.26 Wheel reduction gear cover of the rear axle - installation

13. Fill the wheel unit with oil through the drain hole **3** in the wheel reduction gear cover (Viz).
14. Install the brake drum **2**.
15. Apply the paste LOCTITE ANTI SEIZE to screw threads on the brake drum.
16. Mount screws **1** of the brake drum.

Note:

Tighten the screws uniformly to achieve a correct pressing of drum to the wheel reduction gear cover with the tightening torque of 15 ± 1.5 Nm .

17. Install the vehicle wheel according to a procedure (See Part 11).
18. Check the brake system for a correct function.

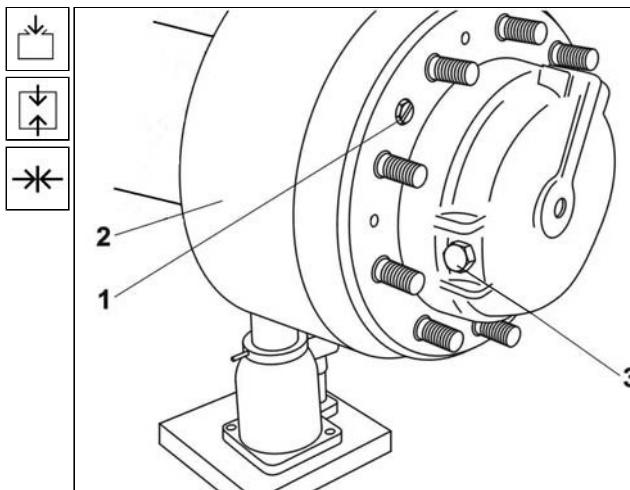


Fig. 7.27 Rear brake drum - installation



7.5.6 Removal and Installation of the Driving Articulated Shaft Bearing in the Half-axle

a) Reasons for Removal and Installation

1. The bearing has been damaged.
2. Replacement of the bearing during regular repair of vehicle components.

b) Technical Conditions

1. While replacing the bearing in the half-axle, replace also the bushing on the articulated shaft (See Subchapter 7.5.4).

c) Removal Procedure

1. Remove the driving articulated shaft in accordance with the procedure (See Subchapter 7.5.4).
2. Dismount four bolts **3** c/w spring washers from the axle shaft **5**, pry out the shim **4** and remove shaft seals **1** and **2**.

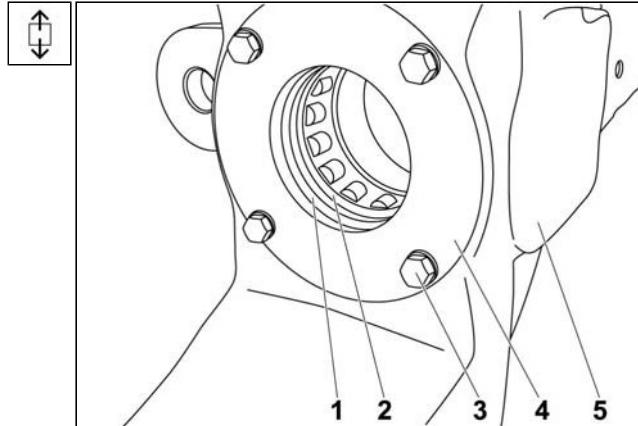


Fig. 7.28 Removal of the lid and shaft seal



3. Remove the lock ring 1.

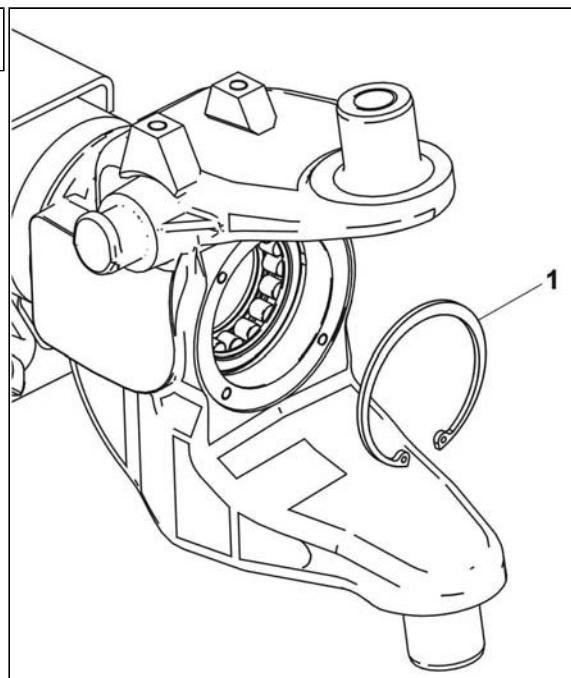


Fig. 7.29 Lock ring in the half-axle - removal

4. Use the puller **PRM 3152** to pull the bearing 2 (RNU 212) out of the half-axle 3.
5. Remove the spacer washer 1.

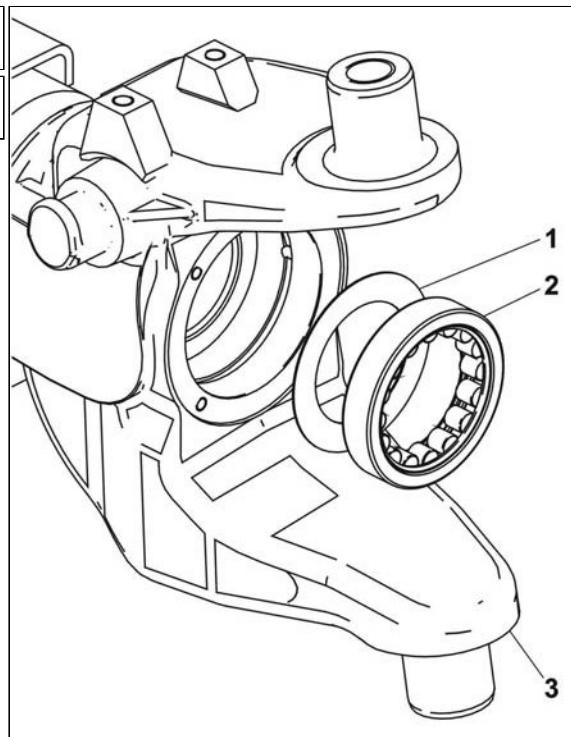
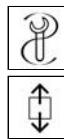


Fig. 7.30 Removal of the bearing from half-axle

**d) Installation Procedure**

1. Apply the oil to location of the bearing in the axle shaft 3 and fit the washer 1.
2. Use the driver PRM 3141.1 to press the roller bearing 2.

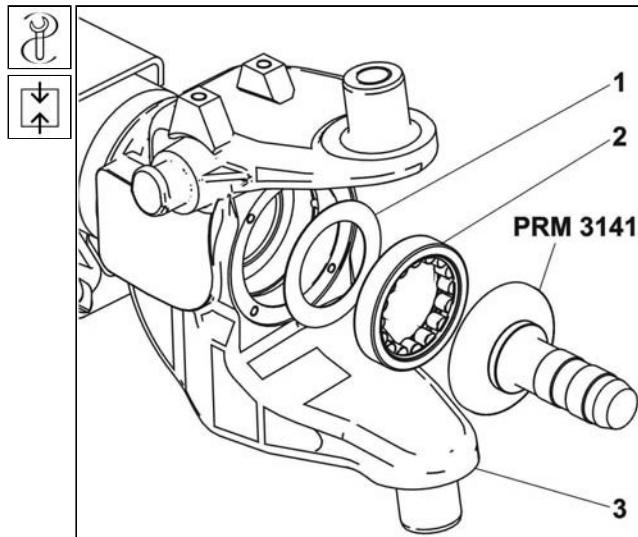


Fig. 7.31 Installation of the bearing into half-axle

3. Install the inner retaining ring 1 into a recess in the hole.

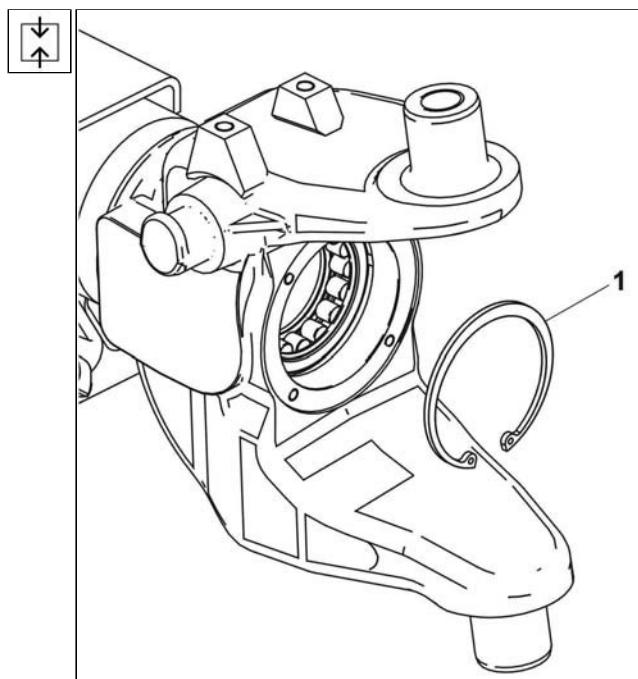


Fig. 7.32 Lock ring in the half-axle - installation



4. Use the driver **PRM 3141.1** to press shaft seals (first smear them with oil) in order GP 73,5x110x13 SM.40-235 **2** and G 73,5x110x10NITRIL **1** into the axle shaft **5**.
5. Fill the 50% shaft seals and bearing volume space with the plastic lubricant LA-2.
6. Fit shim **4** and use four bolts **3** to attach it and tighten to **17 + 4 Nm**. Apply the sealant **LOCTITE 270** to bolt threads.
7. Install the driving articulated shaft in accordance with the procedure (See Subchapter **7.5.4**).

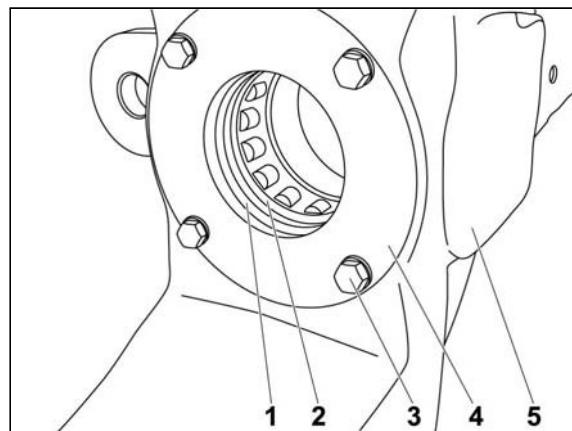


Fig. 7.33 Installation of the lid and shaft seal



7.5.7 Removal and Installation of the Steering Knuckle

a) Reasons for Removal and Installation

1. Mechanical damage to the steering knuckle.
2. Excessive clearance of the steering knuckle.
3. Driving shaft replacement.
4. Damage to the driving shaft bearing (and/or leakage) in the axle shaft.
5. Wheel hub leakage.

b) Technical Conditions

1. Secure the vehicle with wheel chocks against motion during repair.
2. Replace all sealing elements involved in the procedure with new ones.

c) Removal Procedure

1. Dismount the vehicle wheel in accordance with the procedure (See Part 11).
2. Disconnect the joint connection between the steering rod and steering arm on the steering knuckle (See Part 10).
3. Detach pneumatic manifolds **1** and **2**.
4. Dismount the brake cylinder **3** c/w bracket (See Part 9).

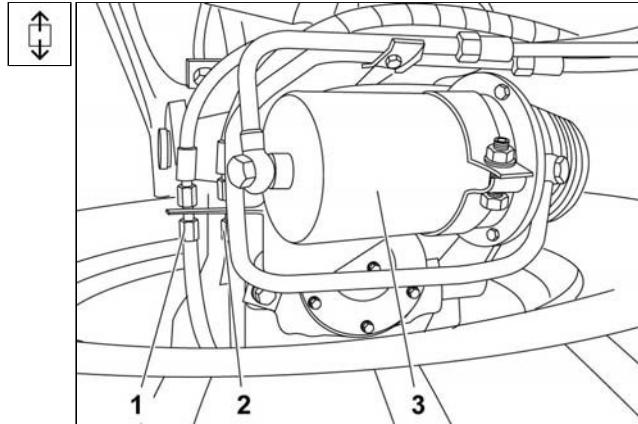


Fig. 7.34 Pneumatic manifolds - removal

5. Dismount bolts **3** from the brake drum **2**.
6. Withdraw the brake drum **2** from location.
7. Dismount brake shoes **13** ((See Part 9), wheel reduction gear cover **9** and withdraw the crown gear **10**.
8. Use two force-off bolts to remove the covering lid **8** of planet wheels and remove the shim **7**.
9. Slide the propeller shaft **1** away towards the axle final drive to make the lock ring **6** better accessible, remove lock ring **6**, and withdraw sun gear **5**, thrust shim **4** and locking pin **11** from the planet wheels housing **12**.

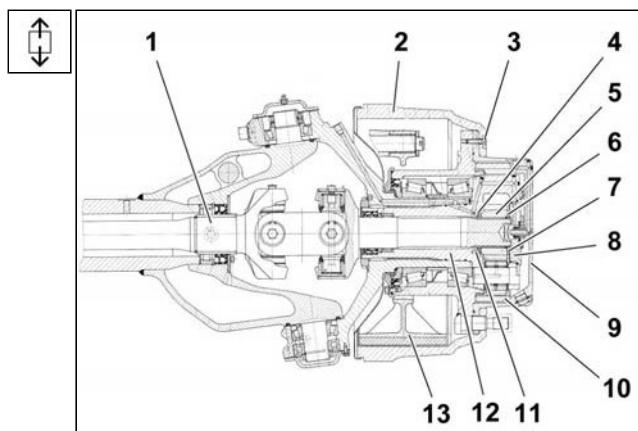


Fig. 7.35 Steering knuckle - removal



10. Support the steering knuckle in a suitable manner (hang it on the commercial textile lifting band) and remove covering lids 7 and 6 from the lower and upper knuckles.
11. On the upper knuckle use the wrench URN 1339 to dismount the slotted nut 5, remove the lock sheet 4 and use the wrench URN 1339 to loosen the slotted nut 3.
12. On the lower knuckle use the wrench URN 1339 to loosen the slotted nut 8.
13. Remove the binding wire 2 locking the bolts 1 of the steering arm.

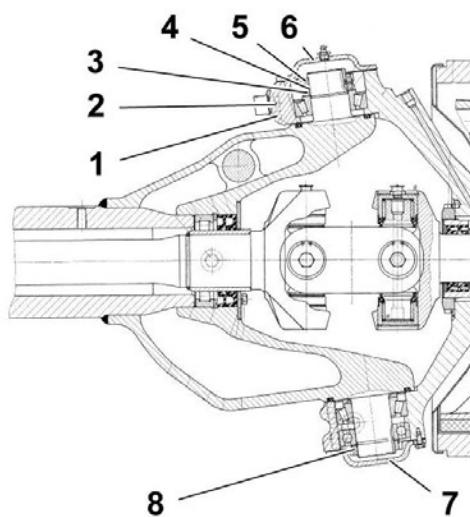
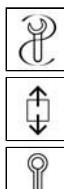


Fig. 7.36 Steering knuckle - removal 1

14. On the lower knuckle unscrew four bolts 2 c/w lock washers of the bearing yoke 1, on the upper knuckle unscrew two fastening bolts 1 (See Fig. 7.36) of the steering arm.
15. Withdraw the steering knuckle with the planet wheels housing and wheel hub with a shorter part of propeller shaft and place it aside.

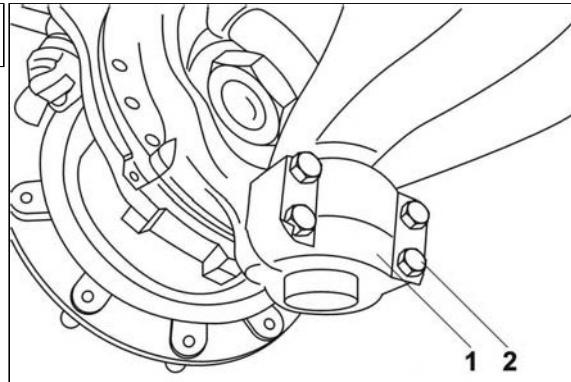


Fig. 7.37 Lower part of steering knuckle - removal

Installation Procedure

Note:

When fitting the propeller shaft, pay attention to rollers of needle bearing in the planet wheels housing. Smear the grooves of propeller shaft with grease. Proceed with care when sliding the end of propeller shaft into the steering knuckle with regard to possibility of causing damage to sealing rings in the steering knuckle and take care not to damage the sealing rings at swivel pins when installing the shield.



1. Hang the steering knuckle on the commercial textile band.
2. Fit the steering knuckle shield **4** on the propeller shaft so that the bearings **1**, **2** and **3** fit into location.

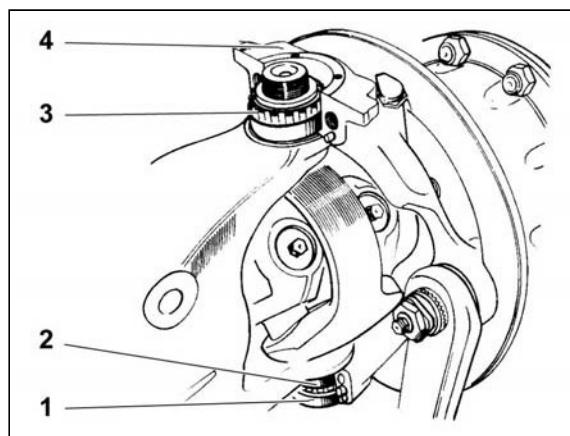


Fig. 7.38 Steering knuckle - installation

3. Fit the yoke **1** of lower knuckle, screw fastening bolts **2** c/w lock washers and check whether bearings are mounted properly. If need be, knock the ball bearing in position.
4. Tighten the fastening bolts **2** to **150 ± 15 Nm** and secure them.

Note:

To improve the possibility of locking, the bolts **2** may be tightened by **30°** as a maximum.

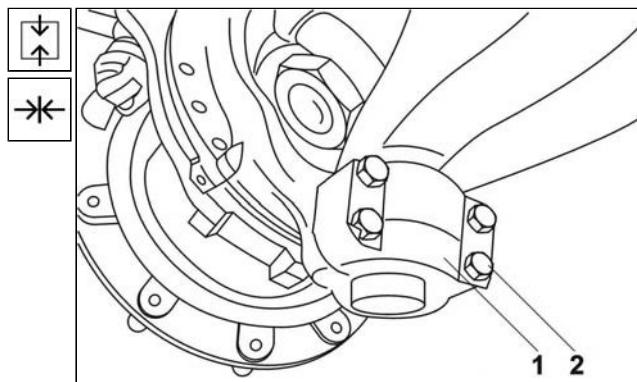


Fig. 7.39 Lower part of steering knuckle - removal

5. Use two bolts **1** to mount the steering arm to the upper swivel pin in the specified position.
6. Tighten the fastening bolts **1** to **370 ± 40 Nm** and secure with locking wire **2**.
7. Use the wrench **URN 1339** to tighten the slotted nut **8** to **200 - 300 Nm** on the lower swivel pin.
8. Use the wrench **URN 1339** to tighten the slotted nut **3** to **200 - 300 Nm** on the upper swivel pin. When tightening the nut, check the steering knuckle for a correct function.
9. Fit the lock sheet **4**, screw and use the wrench **URN 1339** to tighten the other slotted nut **5** to **200 - 300 Nm**. Secure the nuts with lock sheet **4**.
10. Fill the space of bearings with grease **A 00**.
11. Mount the upper lid **6** and lower lid **7**. Apply the sealant to contact surfaces.

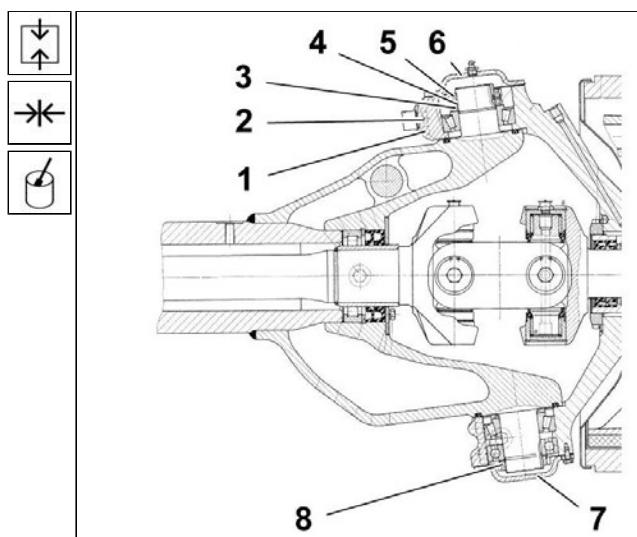


Fig. 7.40 Steering knuckle - installation



12. Slide the locking pin **11** and shim **4** into the planet wheels housing **12**.
13. Install the sun gear **5** on grooves of the propeller shaft **1** and between planet wheels. Secure the gear with lock ring **6** and fit the shim **7**.
14. Install the assembled covering lid **8** of the planet wheels housing onto the planet wheels housing **12**.
15. Fit the crown gear **10** on planet wheels and hub gearing.
16. Use four bolts **3** to attach the wheel reduction gear cover **9** c/w sealing ring to the wheel hub.
17. Install brake shoes **13** c/w lining (See Part **A9**). Mount the brake drum **2** and tighten the bolts to **15 ± 1.5 Nm**.
18. Install the brake cylinder **3** c/w bracket (See Part **9**).
19. Attach pneumatic manifolds **1** and **2**.
20. Connect the joint connecting the steering rod to steering arm on the steering knuckle (See Part **10**).
21. Mount the vehicle wheel in accordance with the procedure (See Part **11**).

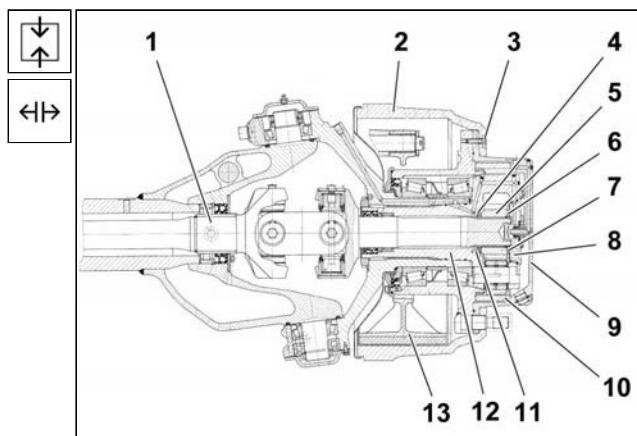


Fig. 7.41 Steering knuckle - installation 1

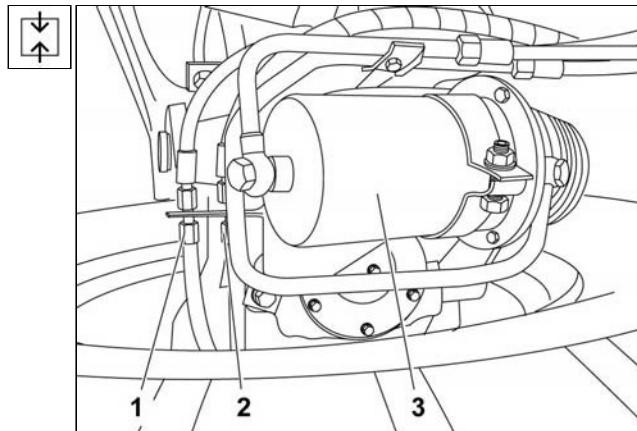


Fig. 7.42 Pneumatic manifold - installation



7.5.8 Removal and Installation of Bearings on Pins of the Axle Shaft Yoke

a) Reasons for Removal and Installation

1. Damaged steering knuckle location.
2. Damaged swivel pins bearings.

b) Technical Conditions

1. Secure the vehicle with wheel chocks against motion during repair.
2. Replace all sealing elements involved in the procedure with new ones.

c) Removal Procedure

1. Dismount the steering knuckle (See Subchapter 7.5.7).
2. Unscrew the nut **1** and withdraw the lock sheet **2** (if not removed during removal of steering knuckle) at the upper swivel pin of the axle shaft yoke **6**.
3. Unscrew the nut **3**.
4. Use the tool **PRM 2773** and universal puller **PRM 0777** to withdraw the tapered roller bearing **4**.
5. Remove the sealing ring **5** from the circular groove.
6. Unscrew the nut **11** (if not removed during removal of steering knuckle) at the lower swivel pin of the axle shaft yoke **6**.
7. Use the tool **PRM 2773** and universal puller **PRM 0777** to withdraw the tapered roller bearing **9** c/w ball bearing **10**.
8. Withdraw the shim **8** and remove the shaped ring **7** from the circular groove.

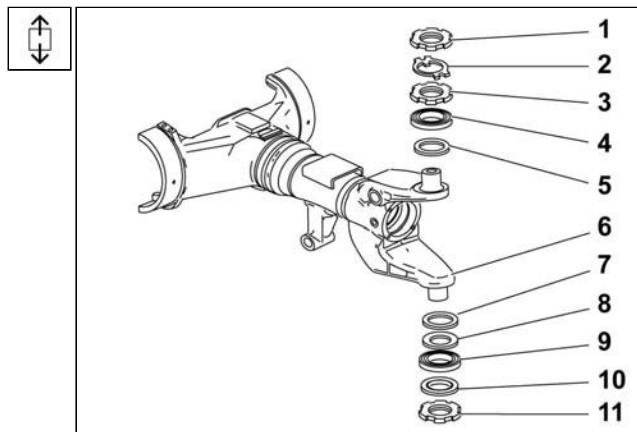


Fig. 7.43 Bearings of axle shaft yoke swivel pin - removal



d) Installation Procedure

1. Stick the shaped ring **7** into the circular groove at the lower swivel pin of the axle shaft yoke **6** with grease.
2. Fit the shim **6** on the axle shaft yoke swivel pin and use the driver **PRL 0843** to press the tapered roller bearing **9**.
3. Drive the ball bearing **10** so that there is a gap by 2 mm bigger than the inner distance shoulder of bearing support in fastening yoke of bearings.
4. Mount the nut **11** (do not tighten it).
5. Stick the sealing ring **5** into the circular groove at the upper swivel pin of the axle shaft yoke **6** with grease.
6. Use the driver **PRL 0843** to drive the tapered roller bearing **4** on the swivel pin of the axle shaft yoke **6** about 7 mm from the machined surface of the yoke.
7. Mount the nut **3** (do not tighten it).

Note:

Nuts **11, 3, 1** will be tightened and locked with the lock sheet **2** during installation of the steering knuckle.

8. Install the steering knuckle (See Subchapter **7.5.7**).

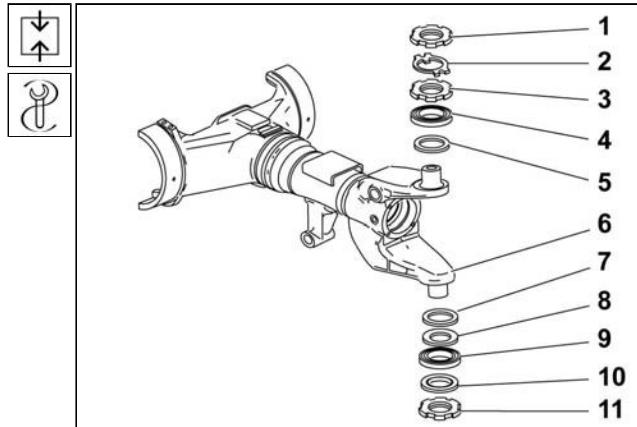


Fig. 7.44 Bearings of axle shaft yoke swivel pin - installation



7.5.9 Removal and Installation of the Front Axle Wheel Hub and Planet Wheels Housing

a) Reasons for Removal and Installation

1. Replacement of steering axle bearings due to excessive wear.
2. Replacement of damaged wheel hub.
3. Replacement of damaged planet wheels or planet wheels housing.

b) Technical Conditions

1. Replace all sealing elements involved in the procedure with new ones.
2. Use needles of one classification group for location of planet wheels on pins for one wheel reduction gear.
3. Use planet wheels of one classification group during installation.

c) Removal Procedure

1. Dismount the steering knuckle (See Subchapter 7.5.7).
2. Clamp the steering knuckle into a suitable clamping device **1**.
3. Use the wrench **URN 0182** to unlock and unscrew the nut of planet wheels housing from the rear side of steering knuckle **2**.

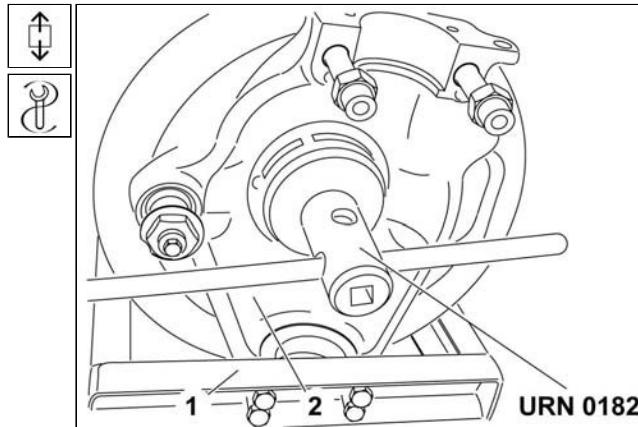


Fig. 7.45 Planet wheels housing nut - unscrewing

4. Use the tool **PRM 3300** to press the planet wheels housing **2** out of shield of steering knuckle **1**.

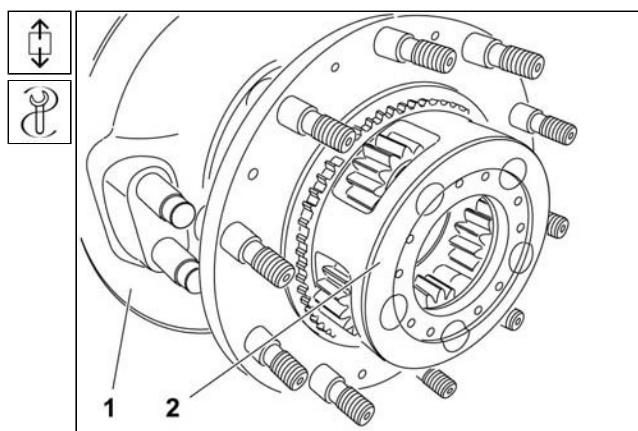


Fig. 7.46 Pressing out the planet wheels housing



5. Use the puller **PRM 2880** to withdraw the wheel hub **1** from steering knuckle **2**.

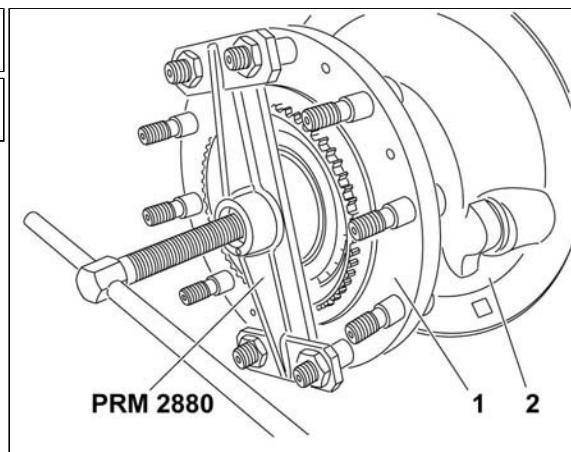


Fig. 7.47 Removal of wheel hub

6. Remove tapered roller bearing, spacer washers and spacer ring.
7. Turn the wheel hub upside down. Unscrew bolts **2**, withdraw clamping lid **1**, and remove spacer ring, felt ring, shaft seal and sealing ring from the wheel hub **3**.
8. Dismount outer rings of tapered roller bearings from the wheel hub **3**, remove cover sheet (if necessary - the sheet is pressed into the wheel hub).

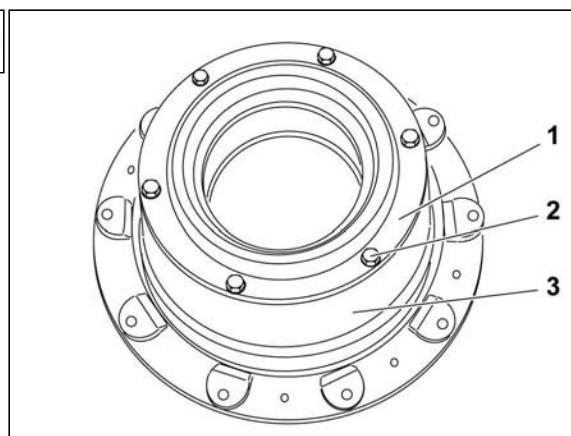


Fig. 7.48 Wheel hub - dismantling

9. Remove sealing rings **6** and **7** from circumferential grooves of the planet wheels housing.
10. Unlock and remove lid **1**, withdraw shaft seals **2** and **3**.
11. Remove lock ring **4** and needle bearing **5**.

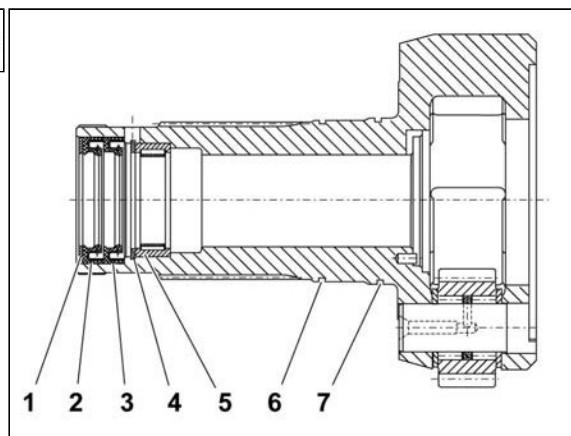


Fig. 7.49 Planet wheels housing - dismantling
1



12. Press out planet wheels pins **1** from the planet wheels housing **2** and remove planet wheels **3**.

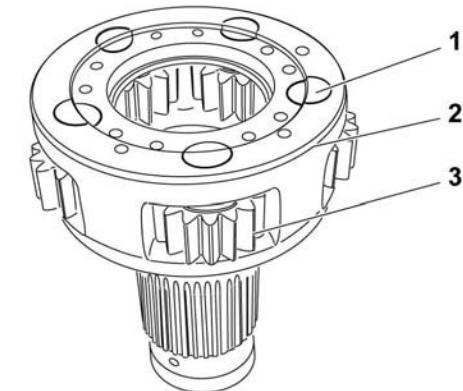


Fig. 7.50 Planet wheels housing - dismantling
2

13. Withdraw shims **1** and **5** from planet wheels **4**, take out needle rollers **3** and spacer ring **2** from hole in planet wheels.

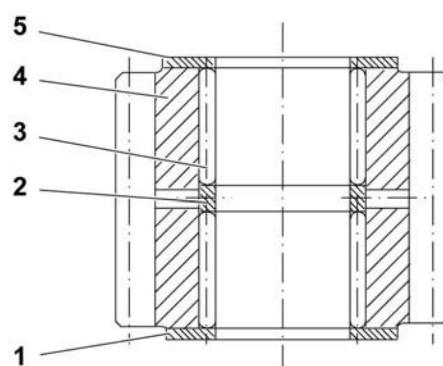
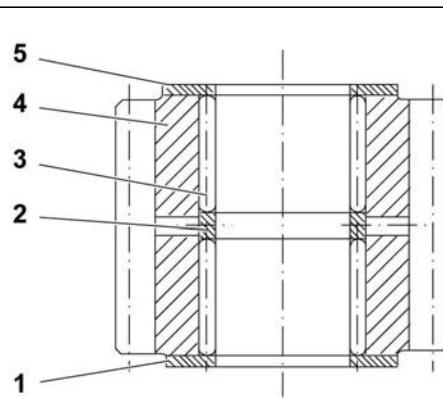


Fig. 7.51 Planet wheel dismantling

d) Installation Procedure

1. Smear the hole (for pin) in the planet wheel **4** with lubricating grease and fit inside needle rollers **3** in two rows.
2. Install spacer ring **2** in the middle of the planet wheel, between rows of needles.
3. Fit shims **1** and **5** from the side of contact surfaces.



Note:

There are 68 pcs of needle rollers in one planet wheel (34 pcs in one row).

Fig. 7.52 Assembling the planet wheel



4. Fit planet wheels **3** and planet wheels pins **1** into planet wheels housing **2**. Use the tool to press the pins into the housing **2**.

Note:

The diameter of the tool and diameter of the covering lid must be identical. The tool must fit into slot in the pins. Thus the pins will be fitted in the correct position, which is necessary for the assembly of the lid.

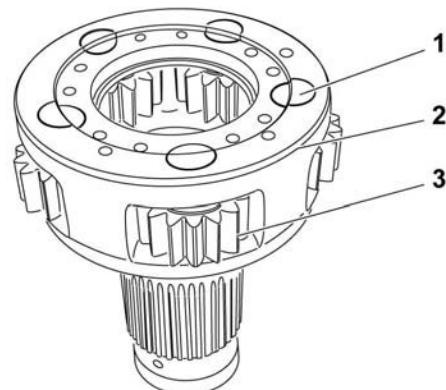


Fig. 7.53 Planet wheels housing - assembly

5. Use the driver of needle bearings **PRM 3132** to press the needle roller bearing **5** from the other side of the planet wheels housing.

Note:

Secure the needles in place with spacer sheet ring. The sheet ring will push off the shaft of spider joint from the bearing (when fitting shield of steering knuckle).



6. Lock the bearing with circlip **4**.
7. Use the driver of shaft seals **PRM 0411** to press two shaft seals **2** and **3**.
8. Tap protective sheet washer **1** (cover) and lock it with a punch.
9. Fit sealing shaped rings **6** and **7** into circumferential grooves of the planet wheels housing.

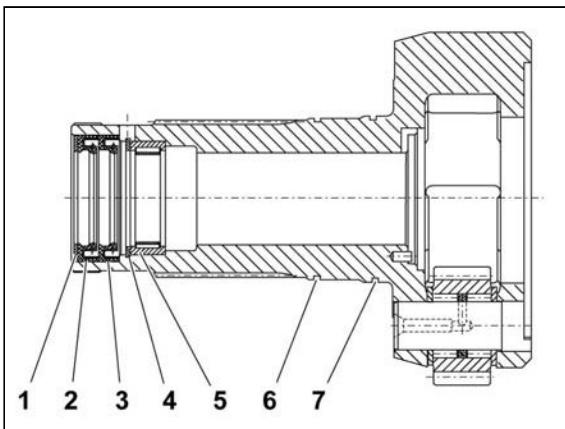


Fig. 7.54 Planet wheels housing - assembly 1

**Note:**

When adjusting the axial clearance of wheel hub bearings, do not smear the tapered roller bearings with oil.

10. Use the driver **PRM 3180** to press the outer ring of tapered roller bearing into the wheel hub **1**, (install the cover sheet if it was removed) and press the second outer ring of tapered roller bearing from the other side using the driver **PRM 3180**.

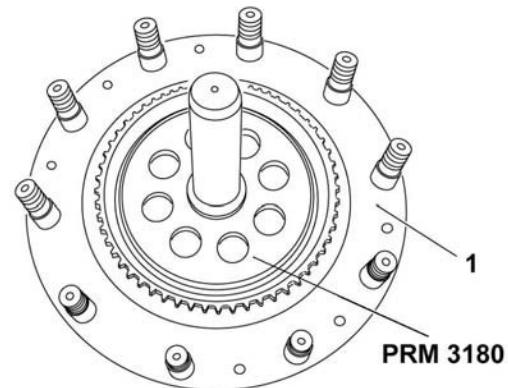


Fig. 7.55 Outer rings of the tapered rollers - pressing into the wheel hub

11. Fit the lower tapered roller bearing **6** on the tool **PRM 3206**, install wheel hub **1**, spacer washers **4**, spacer **3** and the second tapered roller bearing **5**.
12. Mount and tighten nut **2** of the tool **PRM 3206**.
13. Use the dial indicator to measure the axial clearance, which should amount to **0.05 - 0.12 mm**.
14. To adjust the clearance, add or remove spacer washers **4** of suitable thickness. If the clearance is set correctly, the wheel hub should turn without dragging.
15. Remove the wheel hub from the tool **PRM 3206** and attach spacer washers **4** to the spacer ring (to allow further fitting of assembled wheel hub onto steering knuckle).

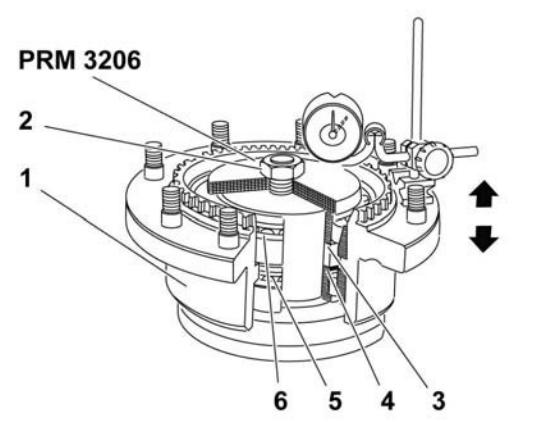


Fig. 7.56 Setting the axial clearance of bearings

16. Smear the inner tapered roller bearing 32206 with oil and fit into the wheel hub **3**.
17. Install the felt ring into a groove in the spacer ring; remember first to dip it for 20 minutes into the transmission oil heated to about 50° C.
18. Fit the spacer ring to the bearing.
19. Press the shaft seal with dust seal (170x200x15) using the tool **PRM 3180**.
20. Fit the shaped ring into circumferential groove on the face surface of the wheel hub.
21. Use screws **2** to mount the clamping lid **1**.

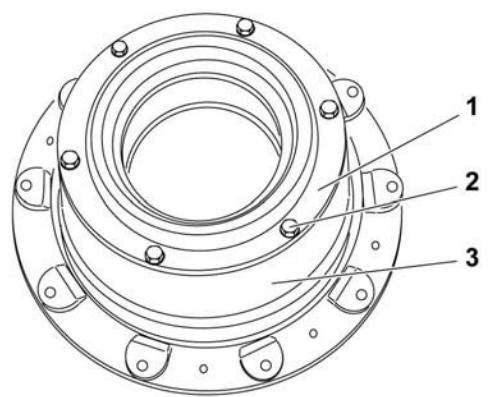


Fig. 7.57 Wheel hub - assembly



22. Fit the wheel hub on steering knuckle, install spacer and spacer washers, fit the second tapered roller bearing (first smear it with oil) and use the tool **PRM 3073.1** to press it on the steering knuckle.

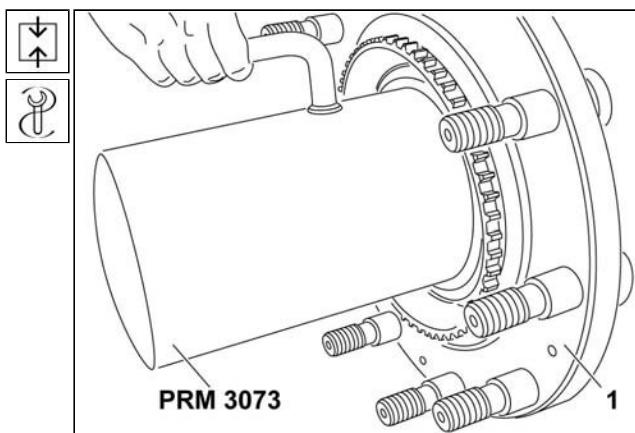


Fig. 7.58 Wheel hub - pressing on steering knuckle

23. Slide the assembled planet wheels housing **2** into splining of steering knuckle **3** so that the holes for inflation are aligned.
24. Use the tool **PRM 3131** to tap the planet wheels housing so that it comes to bear against the outer tapered roller bearing of wheel hub **1**.

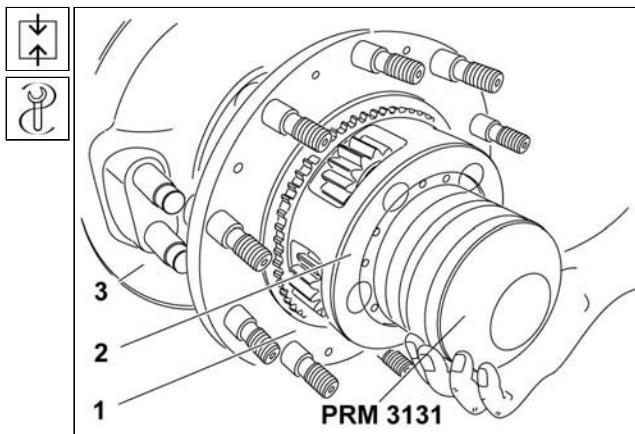


Fig. 7.59 Planet wheels housing - pressing-in

25. From the other side of steering knuckle **2**, use the wrench **URN 0182** to mount the nut of planet wheels housing. Tighten the nut to **900 ± 90 Nm** and lock it with a punch.
26. Remove steering knuckle from the fixing tool **1**.
27. Install the steering knuckle (See Subchapter 7.5.7).

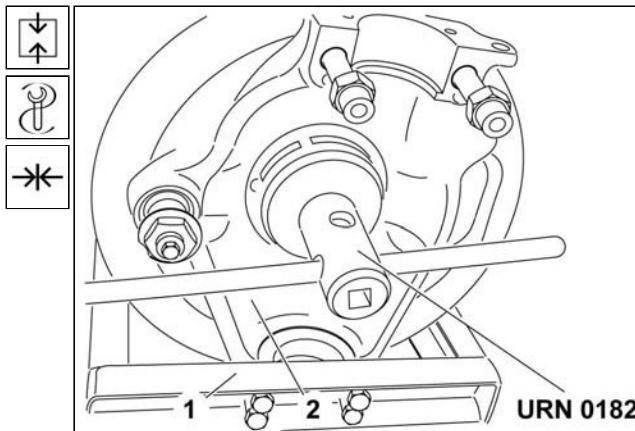


Fig. 7.60 Nut of planet wheels housing - screwing-on



7.5.10 Removal and Installation of the Rear Axle Wheel Hub and Planet Wheels Housing

a) Reasons for Removal and Installation

1. Replacement of rear axle bearings due to excessive wear.
2. Replacement of damaged wheel hub.

b) Technical Conditions

1. Replace all sealing elements involved in the procedure with new ones.
2. Use needles of one classification group for location of planet wheels on pins for one wheel reduction gear.
3. Use planet wheels of one classification group during installation.

c) Removal Procedure

1. Dismount the driving shaft in accordance with the procedure (See Subchapter 7.5.5).
2. Remove the wire ring 1.

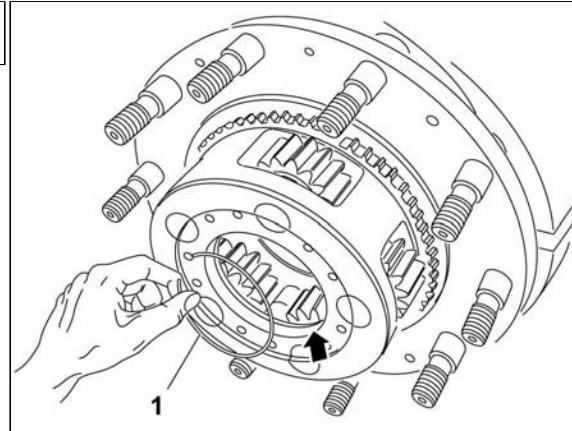


Fig. 7.61 Removal of wire ring

3. Remove thrust shim 1 and locking pin 2.

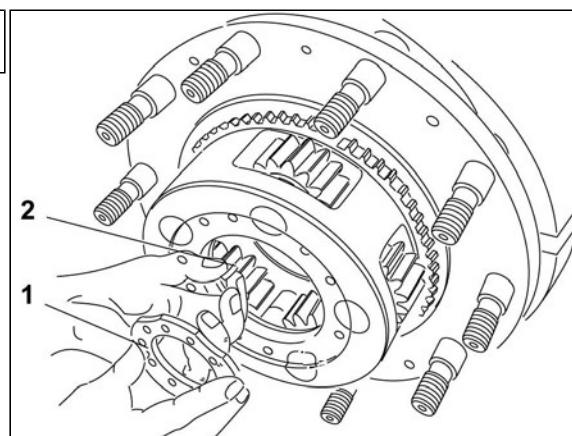


Fig. 7.62 Removal of thrust shim



4. Use the wrench **URN 0183** to unscrew the locking bolt from thread in the axle shaft (locking bolt will remain ahead of planet wheels in the planet wheels housing), knock off the planet wheels housing from the wheel hub.

Note:

The tapered roller bearing will remain on the planet wheels housing. Keep spacer washers in a safe place.

5. Dismount the brake shoes (See Part 9).

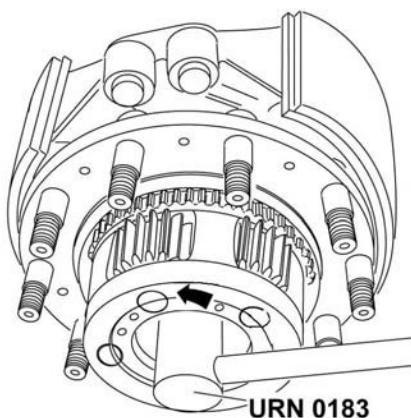


Fig. 7.63 Unscrewing the locking bolt

6. Remove the bearings spacer and wheel hub using puller **PRM 3151** and universal puller **PRM 0777** from the axle shaft.

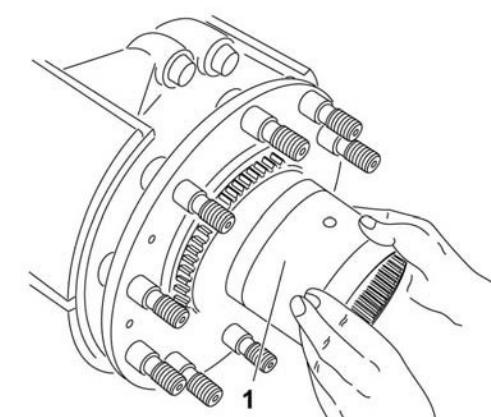


Fig. 7.64 Removal of bearings spacer

7. Remove tapered roller bearing, spacer washers and spacer.
8. Turn the wheel hub upside down. Unscrew bolts **2**, withdraw clamping lid **1**, remove spacer ring, felt ring, shaft seal and sealing ring from the wheel hub **3**.
9. Press out outer rings of tapered roller bearings from the wheel hub **3**, remove the cover sheet.

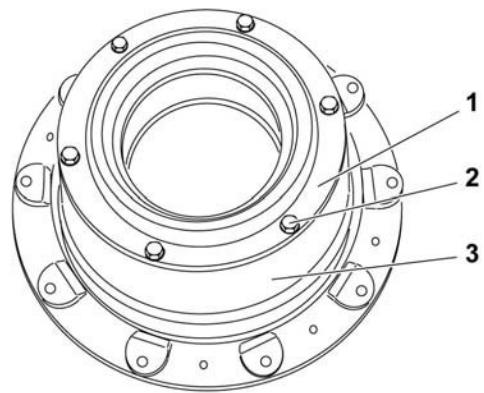
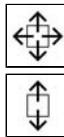


Fig. 7.65 Dismantling the wheel hub



10. Withdraw the tapered roller bearing **2** from the planet wheels housing using the puller for inner ring of bearing **PRM 3146** and universal puller **PRM 0777**.
11. Press out pins of planet wheels, and remove planet wheels **1** and locking bolt.

Note:

Keep the needles, which you remove from planet wheels, together with shims and spacer rings.

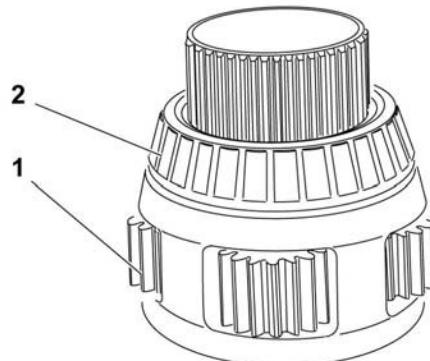


Fig. 7.66 Planet wheels housing - dismantling

12. Press out the shaft seal **1** and centering ring **2** from the planet wheels housing **3**.

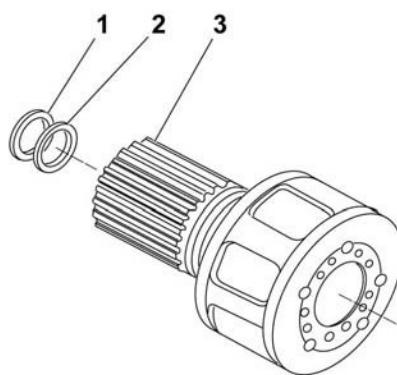


Fig. 7.67 Planet wheels housing - dismantling
1

13. Withdraw shims **1** and **5** from planet wheels **4**, and remove needle rollers **3** and spacer ring **2** from hole in planet wheels.

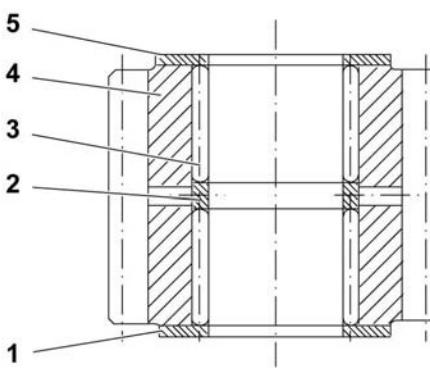


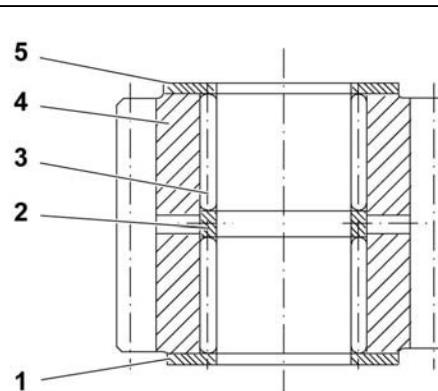
Fig. 7.68 Dismantling the planet wheel

**d) Installation Procedure**

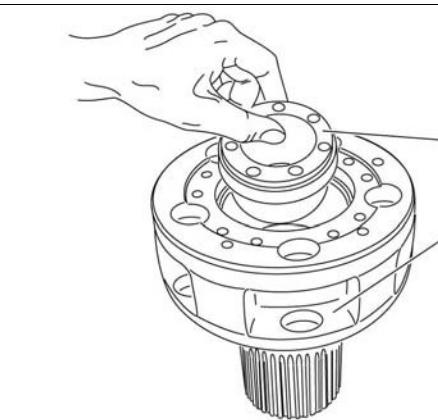
1. Smear the hole (for pin) in planet wheel **4** with lubricating grease and fit inside needle rollers **3** in two rows.
2. Fit spacer ring **2** in the middle of planet wheel, between rows of needle rollers.
3. Fit shims **1** and **5** from the side of contact surfaces.

Note:

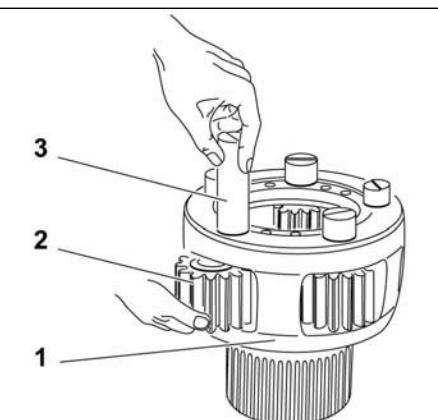
There are 68 pcs of needle rollers in one planet wheel (34 pcs in one row).

*Fig. 7.69 Assembly of planet wheel*

4. Fit the locking bolt **1** into the planet wheels housing **2** - screw it into thread in the axle shaft during assembly of the planet wheels housing.

*Fig. 7.70 Planet wheels housing - assembly*

5. Fit planet wheels **2** and planet wheels pins **3** into the planet wheels housing **1**.

*Fig. 7.71 Planet wheels housing - assembly 1*



6. Use a suitable tool **3** to press pins of planet wheels **2** into planet wheels housing **1**.

Note:

The diameter of the tool and diameter of the covering lid must be identical. The tool must fit into slot in the pins during pressing. Thus the pins will be fitted in the correct position, which is necessary for the further assembly of the lid.

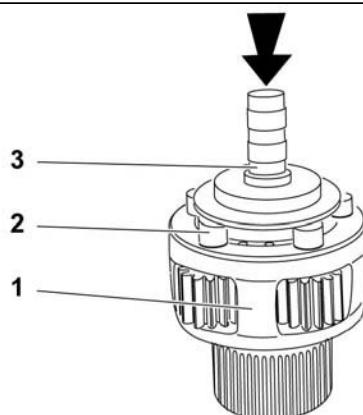


Fig. 7.72 Planet wheels housing - assembly 2

7. Use the tool **PRL 0842** to mount the centering ring **2** into planet wheels housing **3**.
8. Use the tool **PRL 0842** to mount the shaft seal **1** into planet wheels housing **3**.

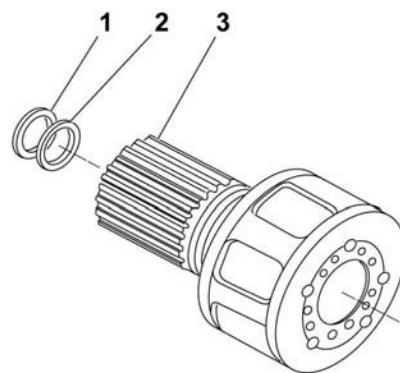


Fig. 7.73 Planet wheels housing - assembly 3

Note:

When adjusting the axial clearance of wheel hub bearings, do not smear the tapered roller bearings with oil.

9. Use the driver **PRM 3180** to press the outer ring of tapered roller bearing into the wheel hub **1**, install the cover sheet and press the second outer ring of tapered roller bearing from the other side.

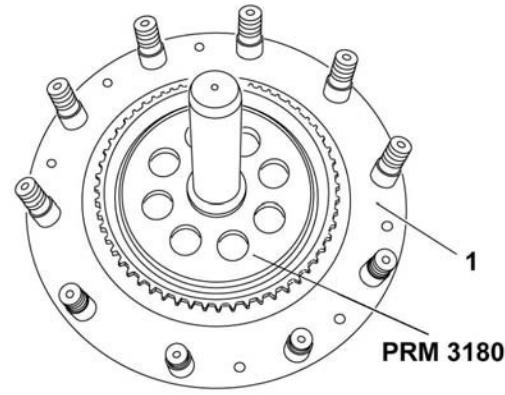


Fig. 7.74 Pressing in outer rings of bearings



10. Fit the lower tapered roller bearing **6** on the tool **PRM 3206**, install wheel hub **1**, spacer washers **4**, spacer **3** and the second tapered roller bearing **5**.
11. Mount and tighten nut **2** of the tool **PRM 3206**.
12. Use the dial indicator to measure the axial clearance, which should amount to **0.05 ÷ 0.12 mm**.
13. To adjust the clearance, add or remove spacer washers **4** of suitable thickness. If the clearance is set correctly, the wheel hub should turn without dragging.
14. Remove the wheel hub from the tool **PRM 3206** and attach spacer washers **4** to the spacer ring (to allow further fitting of assembled wheel hub onto steering knuckle).

Note:

Assemble the wheel hub after adjustment of axial clearance of tapered roller bearings.

15. Smear the inner tapered roller bearing with oil and fit it in position.
16. Fit the felt ring into slot in the spacer ring.
17. Fit the spacer ring to the bearing.
18. Press the shaft seal 170x200x15 using the tool **PRM 3180**.

Note:

Remember first to dip the felt ring for 20 minutes into the transmission oil heated to about 50°C before installation.

19. Fit the shaped ring into circumferential groove on the face surface of the wheel hub.
20. Mount the clamping lid **1**.
21. Slide three shaped rings **1**, **2** and **3** on the axle shaft.

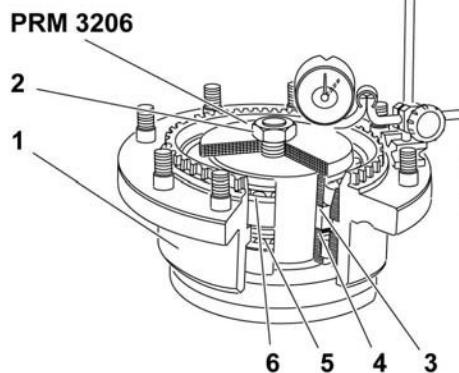


Fig. 7.75 Setting the axial clearance of bearings

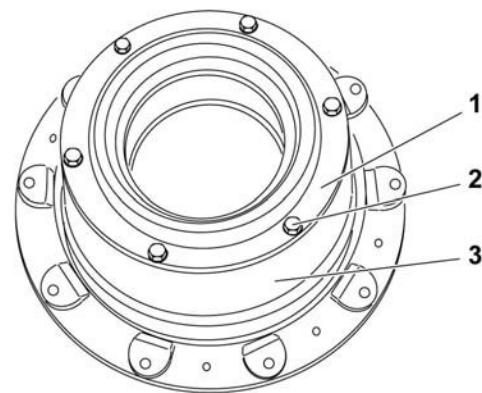


Fig. 7.76 Assembly of wheel hub

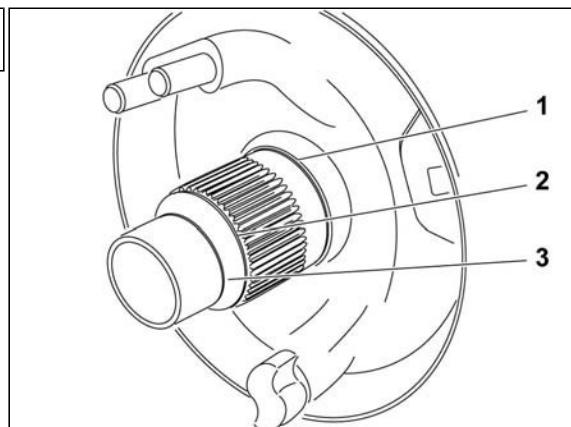


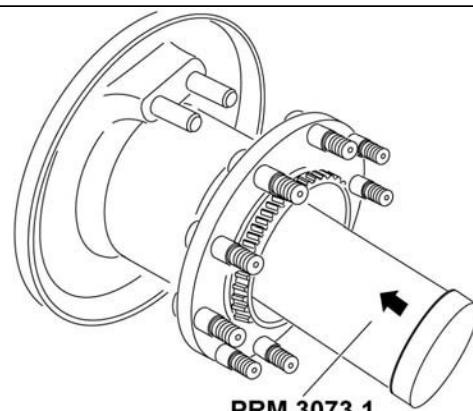
Fig. 7.77 Installation of shaped rings



22. Use the driver **PRM 3073.1** to drive the wheel hub on the axle shaft.

**Note:**

The driver must bear against the inner ring of tapered roller bearing during forcing in.



PRM 3073.1

Fig. 7.78 Installation of wheel hub

23. Mount the brake shoes (See Part 9).
24. Slide the bearings spacer **1** - with hole facing down.

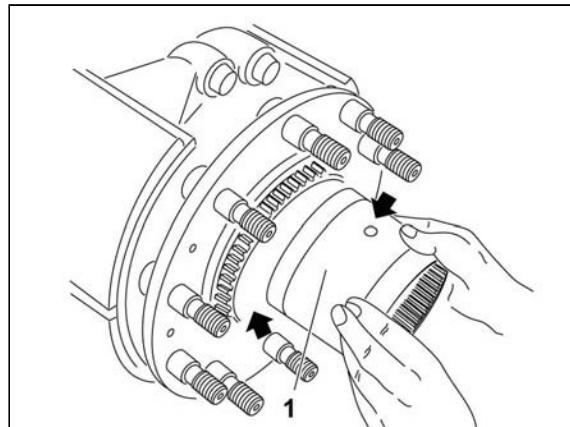


Fig. 7.79 Installation of bearings spacer

25. Use the driver **PRM 3073.1** to press the outer tapered roller bearing **1** (from wheel hub) on the planet wheels housing.
26. Fit spacer washers **2** (see point 12 - adjustment of tapered roller bearings).

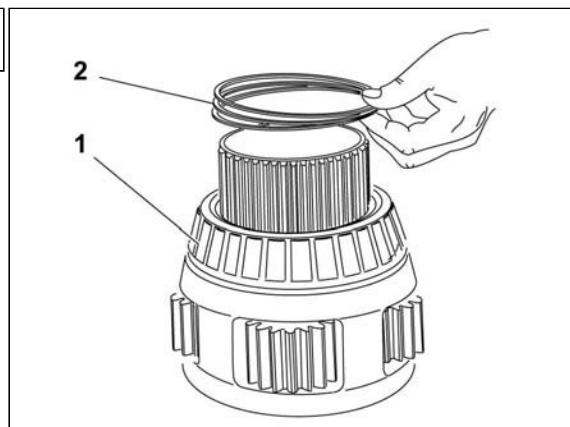


Fig. 7.80 Pressing in the outer tapered roller bearing



07 Axles



27. Slide the planet wheels housing **1** with splining into splining of the bearings spacer and tap it to the wheel hub as far as it goes.

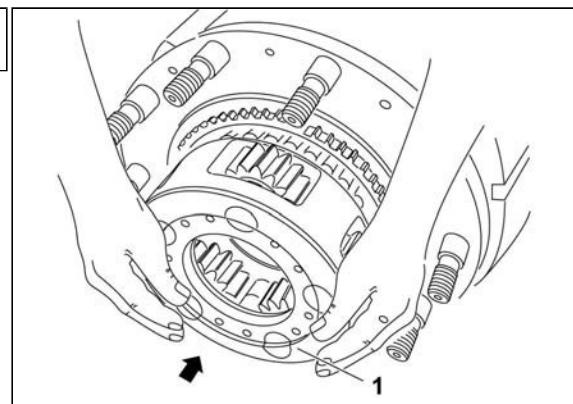


Fig. 7.81 Installation of planet wheels housing

28. Screw the locking bolt (which was slided ahead of planet wheels during assembly of planet wheels housing - see point 4.) into thread in the axle shaft. Use the wrench **URN 0183** to tighten the locking bolt to **850 ± 5 Nm**.

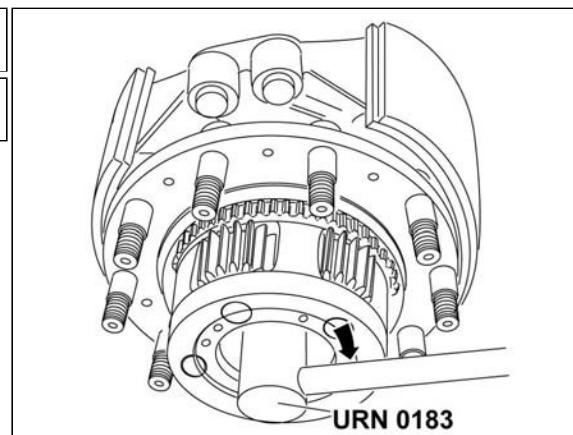


Fig. 7.82 Screwing on the locking bolt

29. Fit the thrust shim **1** to the locking bolt (two holes for locking pin must be aligned).
30. Knock the locking pin **2** into position.

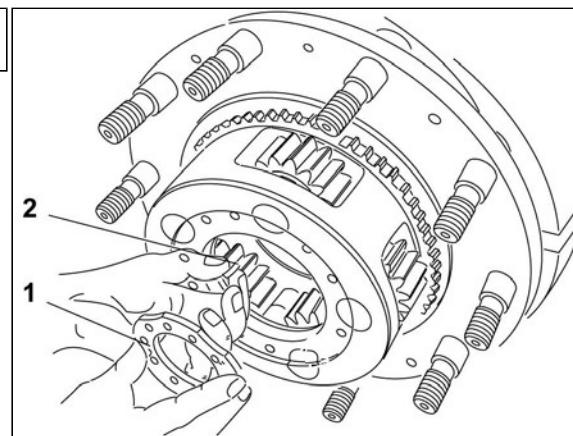


Fig. 7.83 Installation of thrust shim



07 Axles



31. Secure the thrust shim with wire ring **1**.
32. Mount the driving shaft in accordance with the procedure (See Subchapter **7.5.5**).

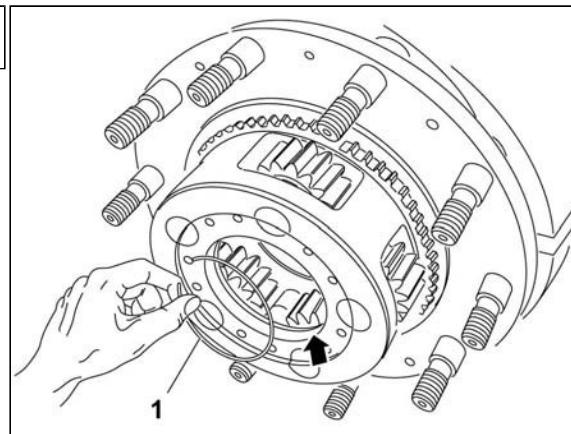


Fig. 7.84 Installation of wire ring



7.5.11 Removal and Installation of the Front Axle

a) Reasons for Removal

1. The axle has been damaged.
2. The axle is too noisy (damaged bearings or gears teeth).

b) Technical Conditions

1. Set the parking brake.
2. Place chocks behind rear wheels to secure the vehicle against motion.
3. Keep the safety precautions valid for work with a hanging load.
4. Replace all shaped rings with new ones.
5. Replace all split pins with new ones.
6. Top up oil fillings in accordance with the lubrication chart after installation.
7. Check pneumatic lines for leaks after installation.
8. Check the front axle geometry after installation.

c) Removal Procedure

1. Drain the oil from the front axle final drive housing and from the front backbone tube (See Subchapter **7.5.2**), release the air from the pneumatic system.
2. Raise the front axle and place a support stand under the front backbone tube.
3. Dismount the vehicle wheels from front axle in accordance with the procedure (See Part **11**).
4. Lower the front axle so that the front backbone tube fits on the support stand.
5. Remove front axle shock absorbers in accordance with the procedure mentioned in the section (See Part **8**).
6. Dismount the front strut (See Part **12**).
7. Dismount ball joints of steering rods from steering arms (See Part **10**).
8. Dismount ball joint of steering booster from the front cross girder (See Part **10**).

9. Detach hoses **1**, **2** and **3** from the threaded connections on frame.
10. Detach the bleeding hose from the upper cover of axle final drive.

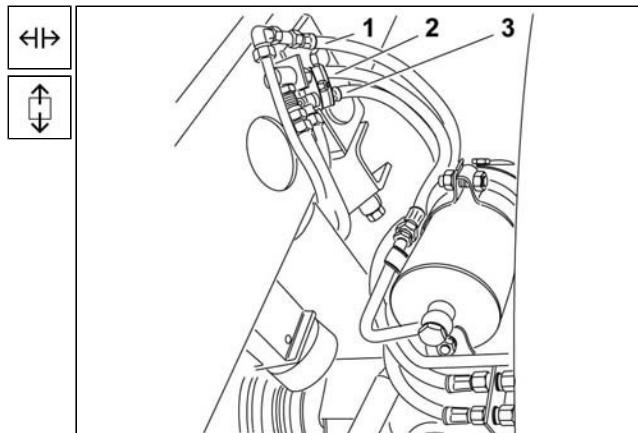


Fig. 7.85 Detachment of air manifolds



11. Dismount the hinge pin from arm of torsion bar (See Part 8).

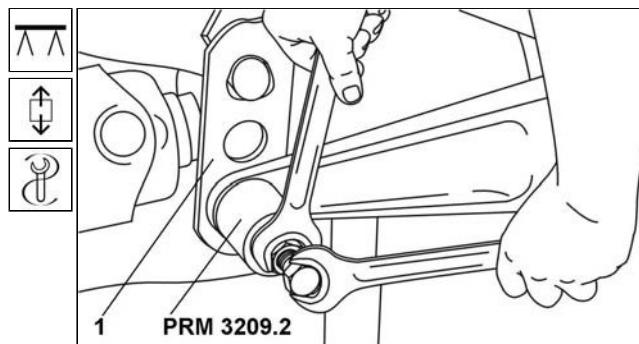


Fig. 7.86 Removal of torsion bar pin

12. Unscrew nuts from screws 4 and remove spring washers.
 13. Remove bolts 4 c/w washers from frame.
 14. Remove rubber plugs 3.
 15. Unscrew locking nuts and fastening nuts c/w washers from bolts 1.
 16. Remove bolts 1 and spacer washers 2.

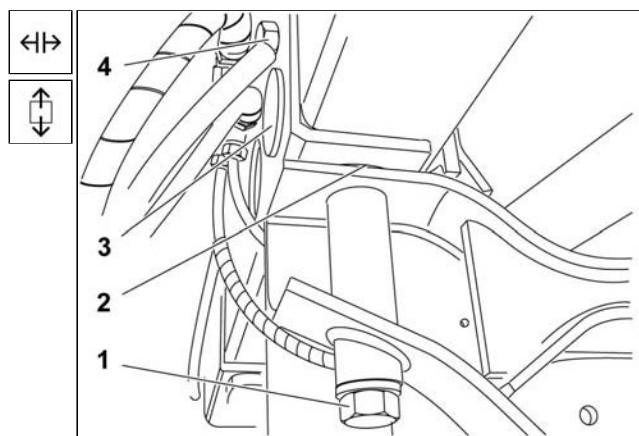


Fig. 7.87 Mounting of ladder-type frame to the front cross girder - removal

17. Prior to dismount the front axle, secure the position of the cross girder behind the front axle by connecting the cross girder 3 with the front backbone tube 2 so that you screw the bolts M14 x 35 into three holes 1. Tighten the bolts as far as it goes.

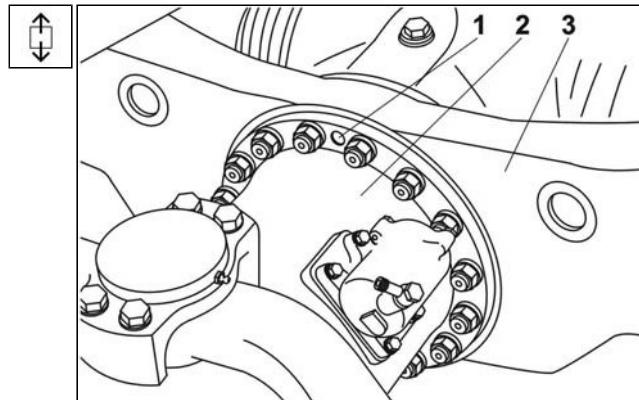


Fig. 7.88 Securing the position of the frame cross girder



18. Support the front axle with a height-adjustable assembly truck.

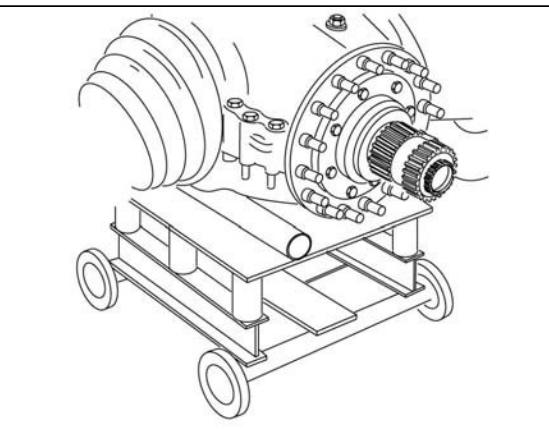


Fig. 7.89 Location of axle on assembly truck

19. Unscrew nuts **1** fixing the front cross girder and front cover to the flange of axle final drive. Withdraw the front cover **2** c/w shaped ring **3** and front cross girder **4** from bolts.

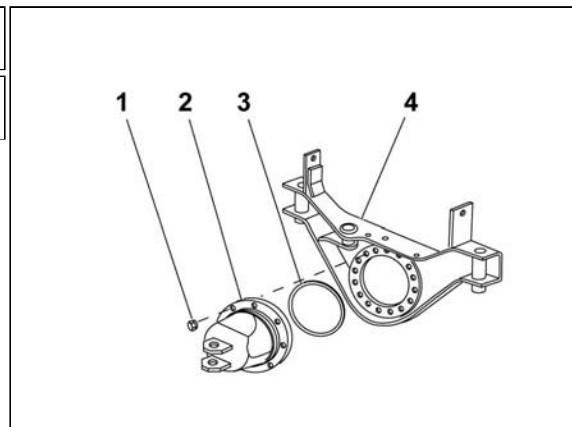
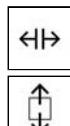


Fig. 7.90 Front cross girder c/w cover - removal

20. Unscrew nuts **2** of bolts connecting the axle final drive, cross girder **3** and front backbone tube.
21. Move the front axle being placed safely on the assembly truck forwards ahead of the vehicle.
22. Remove the shaped ring from the rear bush of axle final drive.

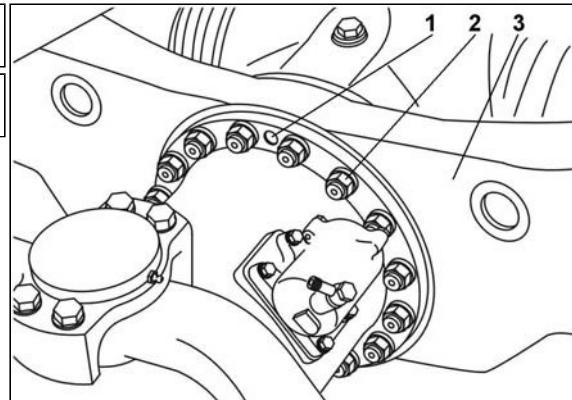
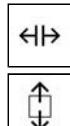


Fig. 7.91 Nuts connecting the front backbone tube to the axle final drive housing - removal



d) Installation Procedure

1. Clean the rear bush of axle final drive housing and fit the shaped ring on. Stick the ring with sealant.
2. Carefully slide the front axle being placed on the assembly truck beneath the front part of vehicle in direction of vehicle longitudinal centerline.
3. Install the front axle so that teeth of central and free pinions would mesh into teeth of planet wheels of the axle differential in the front backbone tube and the axle final drive housing would fit on the cross-girder.

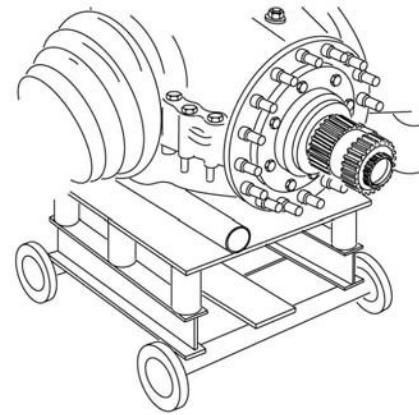


Fig. 7.92 Location of axle on the assembly truck

4. Mount nuts **2** on stud bolts of axle final drive housing and tighten them evenly to torque of **420 ± 10 % Nm**. Loosen locking bolts (M14x35) from three holes **1**.

CAUTION:

The contact surface for nuts **2** of the flange connection Ø 32 must be free of paint during installation.

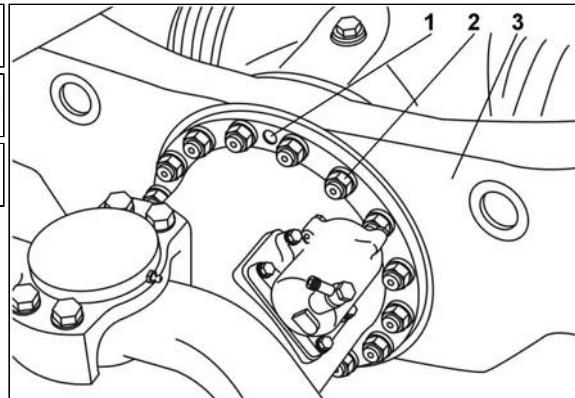
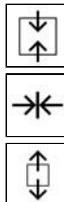


Fig. 7.93 Nuts connecting the front backbone tube to the axle final drive housing - installation



5. Slide front cross girder **4**, shaped ring **3** (stick it with sealant) and front cover **2** on centering stud bolts of axle final drive housing. Mount nuts **1** and tighten evenly to $420 \pm 10\% \text{ Nm}$.

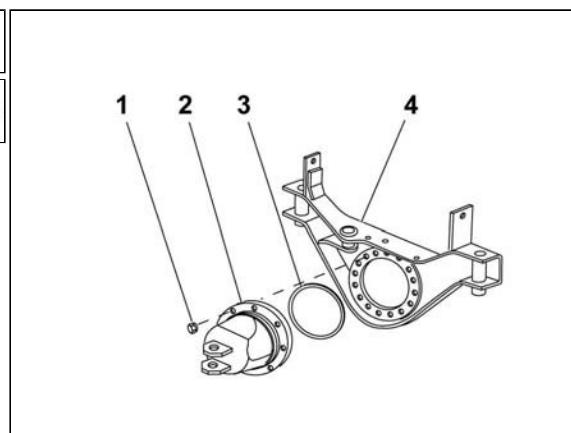
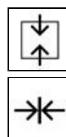


Fig. 7.94 Front cross girder c/w cover - installation

6. If need be, install spacer washers **2** between front cross girder and frame.
 7. Use bolts **1**, washers, fastening nuts and locking nuts to attach the lower part of frame to the front cross girder.
 8. Tighten fastening nuts and locking nuts of bolts **1** to $300 \pm 40 \text{ Nm}$.
 9. Fit rubber plugs **3**.
 10. Use bolts **4** c/w washers, spring washers and nuts to fix the side parts of frame to the front cross girder.
 11. Tighten nuts of bolts **4** to $400 \pm 40 \text{ Nm}$.
12. Install the hinge pin **1** in accordance with the procedure mentioned in (See Part 8).

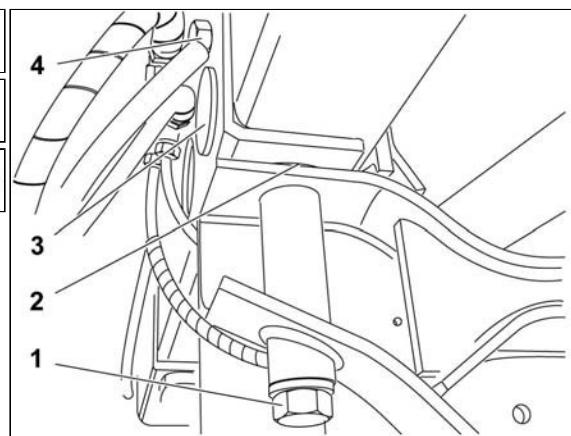
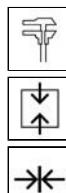


Fig. 7.95 Attachment of ladder-type frame to front cross girder - installation

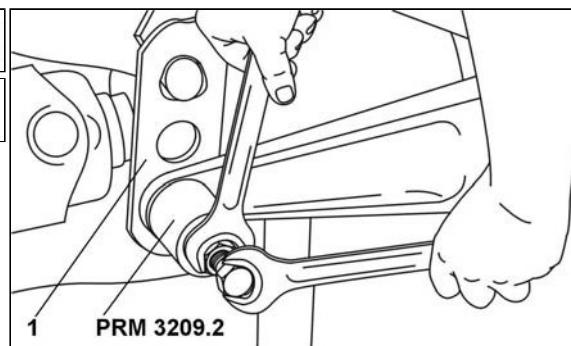
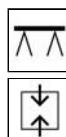


Fig. 7.96 Installation of torsion bar pin



07 Axles



13. Attach hoses **1**, **2** and **3** to threaded connections on frame.
14. Screw the bleeding manifold to the upper cover of axle final drive housing.

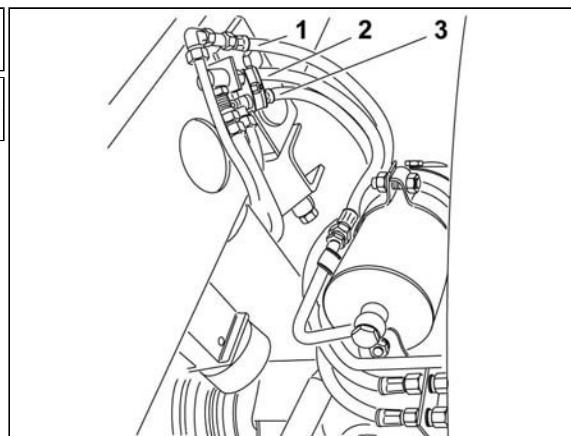


Fig. 7.97 Attachment of air hoses

15. Install the front strut (See Part **12**).
16. Install ball joints of steering rods on steering arms (See Part **10**).
17. Mount the ball joint of steering booster on the front cross girder (See Part **10**).
18. Mount front axle telescopic shock absorbers in accordance with the procedure (See Part **8**).
19. Mount vehicle wheels according to the procedure (See Part **11**).
20. Raise the front part of vehicle and remove the support stand from beneath the front backbone tube and remove the assembly truck.
21. Lower the vehicle on wheels.
22. Fit the front axle final drive housing with oil in accordance with the procedure (See Subchapter **7.5.2**).
23. Start the engine and pressurize the pneumatic system to the specified pressure.
24. Check connections of the pneumatic system for leaks.
25. Check the geometry of front axle.
26. Road test the vehicle by 5-km drive, check the steering ability and efficiency of brakes.
27. Check oil levels after a road test.



7.5.12 Removal and Installation of the Couple of Rear Axles

a) Reasons for Removal

1. Because of the first rear axle removal.
2. Because of removal of other assembly groups and sub-assemblies (auxiliary gearbox, backbone tubes, differentials).

b) Technical Conditions

1. Keep the safety precautions valid for work with a hanging load.
2. Replace all shaped rings with new ones.
3. Check pneumatic lines for leaks after installation.
4. Check flange connections for leaks after a road test.

c) Removal Procedure

1. Dismount the cargo truck platform.
2. Dismount mud-guards behind 2nd rear axle.
3. Release air from the brake system.
4. Drain oil from axle final drives of rear axles, rear connecting part and rear backbone tube (See Subchapter 7.5.2).
5. Secure the front part of vehicle against overturning, support the front axle final drive housing, auxiliary gearbox and front backbone tube with support stands in a safe manner.
6. Secure front vehicle wheels with chocks against motion.
7. Remove the rear strut (See Part 12).
8. Dismount the winch drive from coupling plate on the auxiliary gearbox (See Part 4) - **it applies to trucks fitted with a winch.**
9. Dismount the hinge pin from arm of torsion bar (See Part 8).

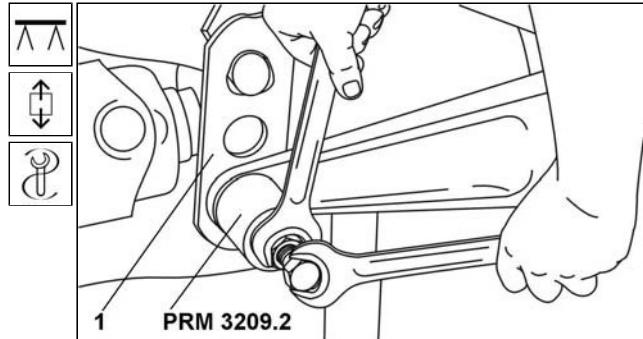


Fig. 7.98 Removal of torsion bar pin



07 Axles



10. Unscrew cover plugs from bottom of brake cylinders on both rear axles and mount instead releasing screws (M14x1.5 – 90 mm long) from the vehicle outfit as far as it goes.

Note:

Use copper sealing rings under hexagon heads of releasing screws. Keep plugs in a safe place.

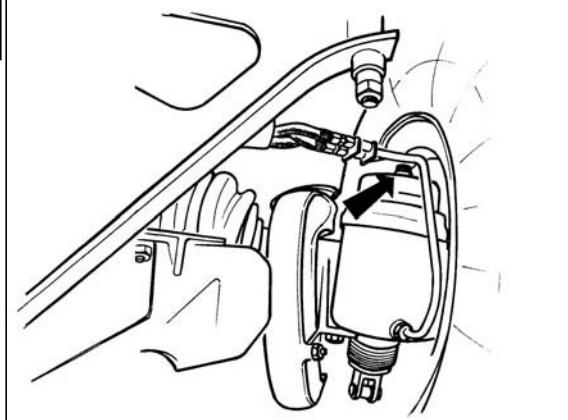


Fig. 7.99 Releasing spring-loaded cylinders

11. Disconnect threaded connections of air manifolds **1**, **2**, **3** and **4** on both rear axles.

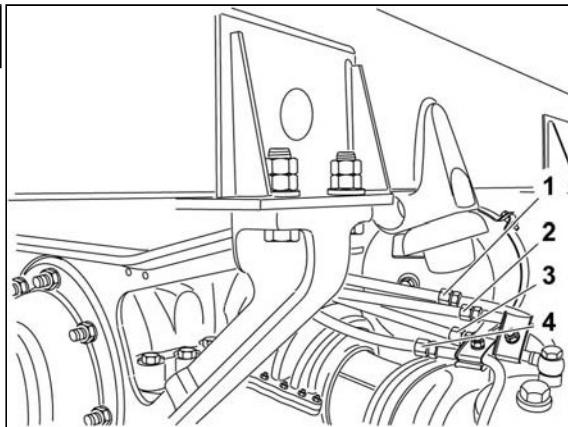


Fig. 7.100 Disconnection of air manifolds

12. Unscrew bolts **1** and **3** fixing the air pipes to the 1st and 2nd rear axle.
13. Detach the bleeding manifold **2** from axle final drives of rear axles.

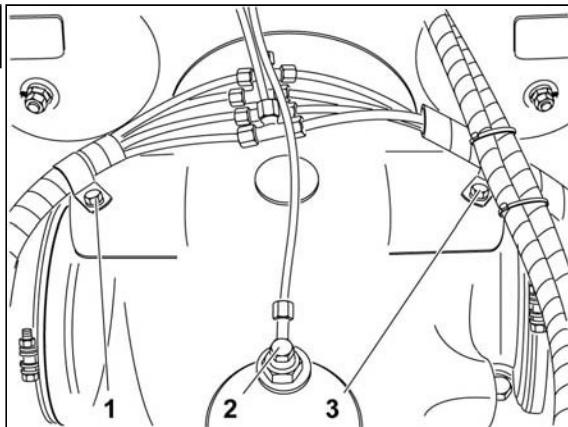


Fig. 7.101 Removal of bleeding manifold and attachment of air pipes



07 Axles



14. Detach the air manifold **1** and disconnect electric cable **2** from shift cylinder **3** of 2nd rear axle differential lock.

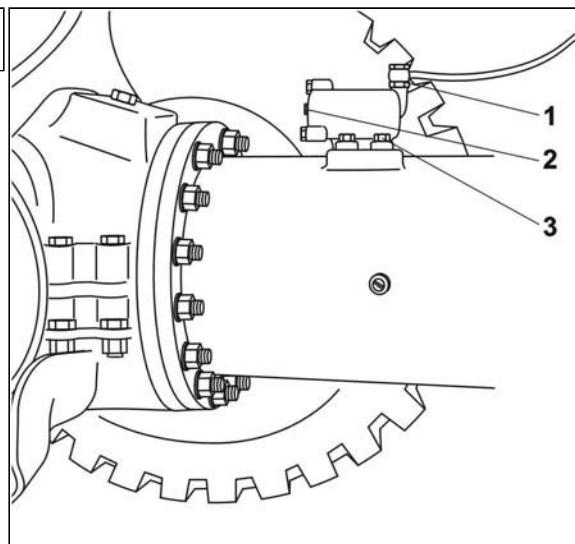


Fig. 7.102 Shift cylinder of 2nd rear axle differential lock - removal

15. Detach the air manifold and respective electric cables from shift cylinders of axle and inter-axle differentials locks **1** from the rear backbone tube.
16. Dismount the air reservoir from the rear backbone tube in accordance with the procedure (See Part 9).
17. Loosen clamps and disconnect air manifolds being fixed on cross girders of the rear connecting part.

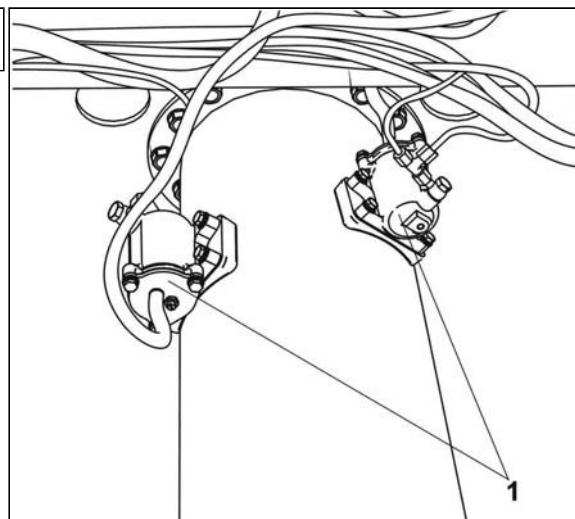


Fig. 7.103 Shift cylinders of differential locks - removal

18. Loosen two screwed connections connecting the front cross girder **1** of the central member frame with the ladder-type frame and leave bolts with released nuts (by approx. 20 mm) in the front cross girder. Disconnect screwed connections **2**, **3**, **4** and **5** fixing the other cross girders with the ladder-type frame and remove bolts from cross girders.

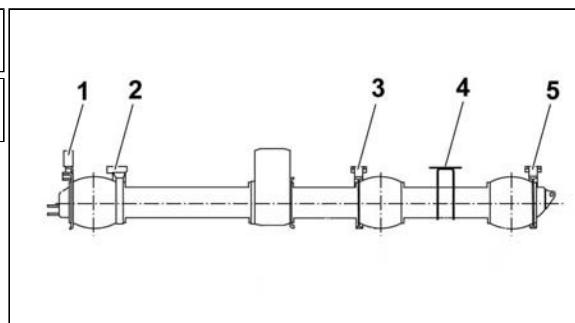
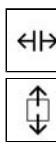


Fig. 7.104 Ladder-type frame - removal



19. Support the rear backbone tube with a height-adjustable assembly truck.
20. Unscrew nuts **2** fixing the rear backbone tube **3** to the auxiliary gearbox **1**.

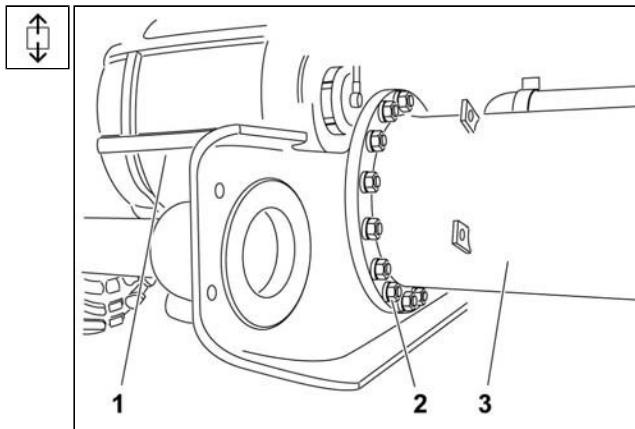


Fig. 7.105 Removal of the rear couple of axles

21. Partially lift the rear part of the ladder-type frame so that the double rear axle and rear backbone tube can be slid out rearwards behind the vehicle in a safe manner.

CAUTION:

When lifting the rear part of the ladder-type frame, check points of collision along the whole length of the frame not to damage hoses, pipes and electric cables. If need be, release pipes, hoses and electric cables from clamps.

22. Move the rear double axle and rear backbone tube rearwards in direction of vehicle longitudinal centerline so that the propeller shaft will slide out of inter-axle differential housing and/or coupling sleeve of propeller shaft will slide out of splining of lower shaft of auxiliary gearbox.
23. Lower the ladder-type frame on cross girders of central member frame and support it with support stands in the rear part.
24. Remove the shaped ring **2** (250x3) from cross-girder **1** of auxiliary gearbox.

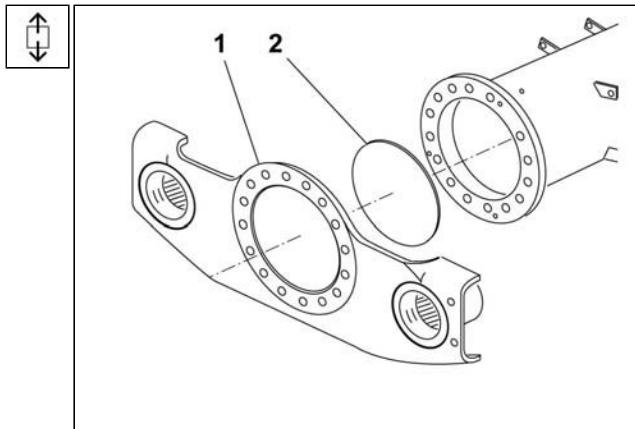
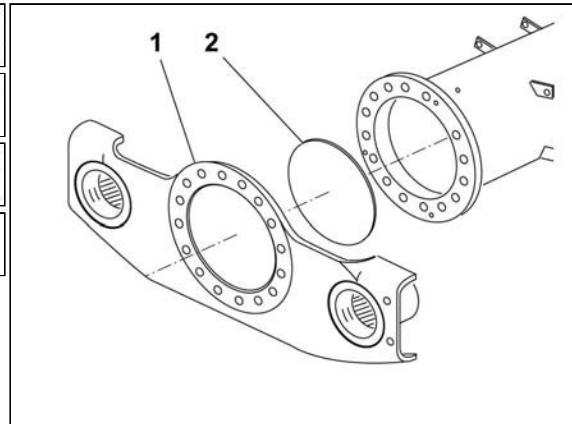
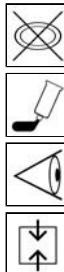


Fig. 7.106 Shaped ring 250x3 - removal

**d) Installation Procedure**

1. Install a new shaped ring **2** into a groove in the cross girder flange **1** of auxiliary gearbox. Stick the ring with sealant.

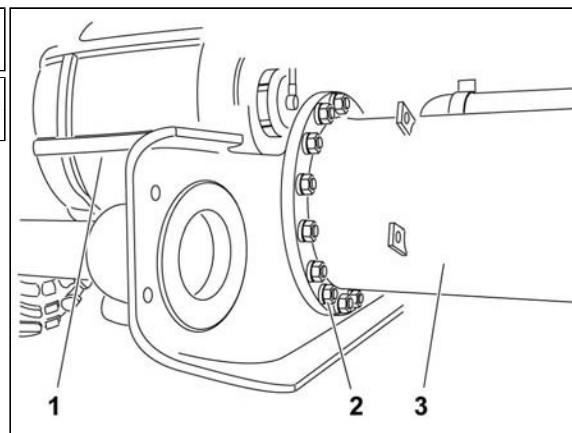
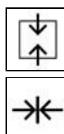
*Fig. 7.107 Shaped ring 250x3 - installation*

2. Smear the inner splining of propeller shaft and inner splining of coupling sleeve of propeller shaft with plastic lubricant **Servo grease 'MP'** and slide the shaft into splining in the inter-axle differential housing.
3. Partially raise the rear part of the vehicle ladder-type frame and move the rear double axle and rear backbone tube being placed on a height-adjustable assembly truck under the ladder-type frame forwards in the vehicle longitudinal centerline in a safe manner.
4. Move the rear double axle and rear backbone tube precisely in the vehicle longitudinal centerline towards the auxiliary gearbox so that the coupling sleeve of propeller shaft will slide onto lower shaft of auxiliary gearbox. Simultaneously the centering stud bolts must slide through holes on flange of the rear backbone tube.

CAUTION:

The contact surface for nuts of \varnothing 32 flange connection must be free of paint during installation.

5. After the rear backbone tube **3** and auxiliary gearbox **1** are slided together and flanges bear on each other, mount fastening nuts **2** on stud bolts of auxiliary gearbox **1** and tighten them evenly to $420 \pm 10\% \text{ Nm}$.

*Fig. 7.108 Installation of couple of rear axles*



6. Carefully lower the rear part of the ladder-type frame on cross girders **1, 2, 3, 4** and **5** of the central member frame so that the frame comes to bear against lens in the cross girder **4** of the rear connecting part.

CAUTION:

When lowering the rear part of the ladder-type frame, check points of collision along the whole length of the frame not to damage hoses, pipes and electric cables.

7. Screw the ladder-type frame to cross girders **1, 2, 3, 4** and **5** according to the procedure (See Part **12**).
8. Attach the bleeding manifold **2** to axle final drives of rear axles.
9. Mount bolts **1** and **3** fixing the air pipes to 1st and 2nd rear axle.

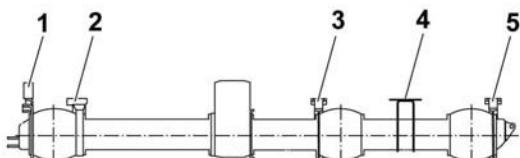


Fig. 7.109 Ladder-type frame - installation

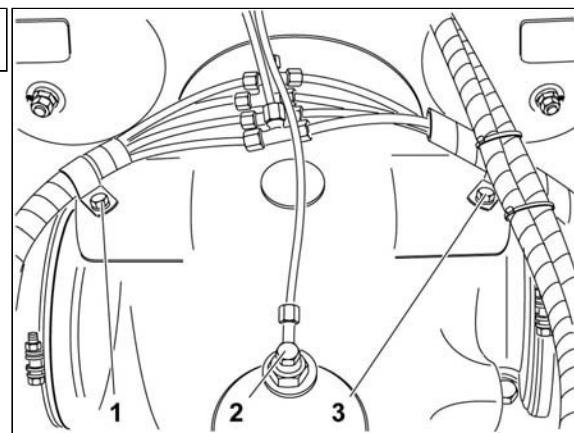


Fig. 7.110 Installation of bleeding manifold and attachment of air pipes

10. Attach air manifolds on the rear backbone tube and connect respective electric cables to shift cylinders of axle and inter-axle differential locks **1**.
11. Install the air reservoir on the rear backbone tube according to the procedure (See Part **9**).
12. Attach clamps and connect air manifolds on cross girders of the rear connecting part.

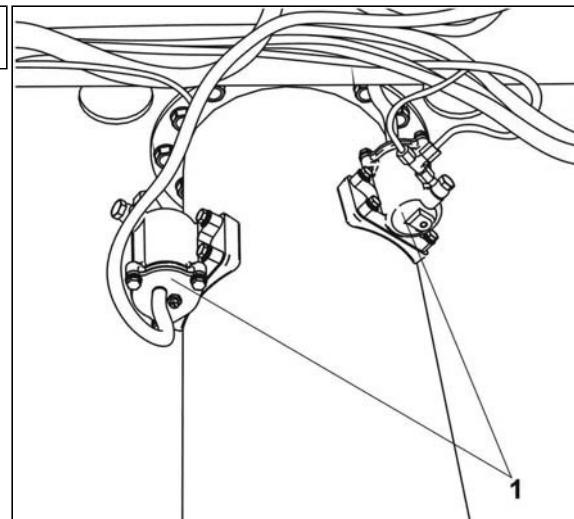


Fig. 7.111 Shift cylinders of differential locks - installation



07 Axles



13. Attach air manifold **1** and connect electric cable **2** to shift cylinder **3** of 2nd rear axle differential lock.

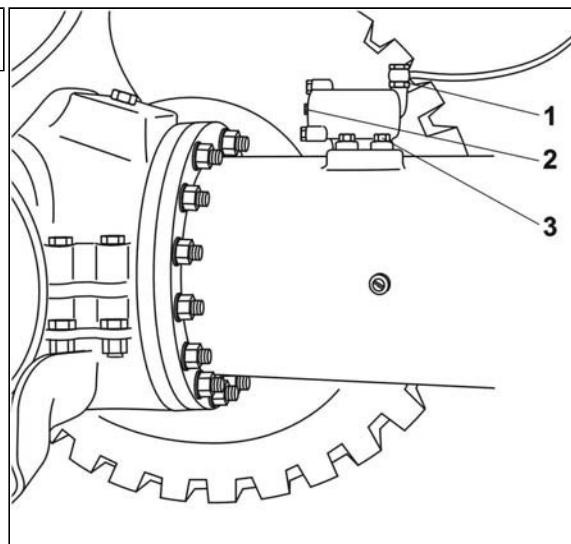


Fig. 7.112 Shift cylinder of 2nd rear axle differential lock - installation

14. Mount screwed connections of air manifolds **1**, **2**, **3** and **4** on both rear axles.

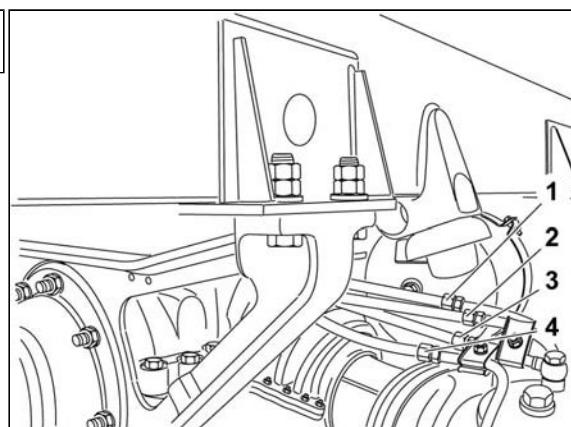


Fig. 7.113 Connection of air manifolds

15. Unscrew releasing screws (M14x1.5 – 90 mm long) from bottom of brake cylinders on both rear axles and mount instead cover plugs c/w copper sealing rings.

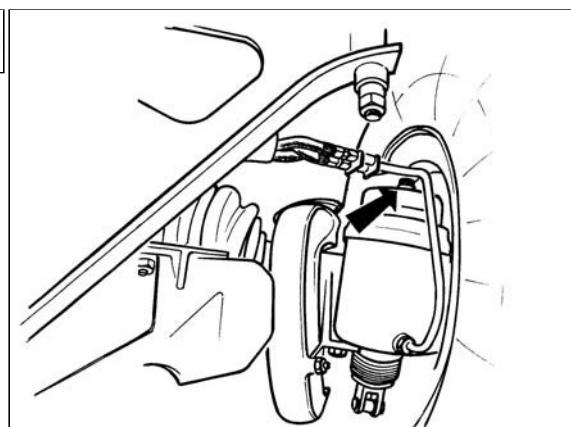


Fig. 7.114 Releasing screws of brake cylinder - removal



07 Axles



16. Install the hinge pin 1 according to the procedure (See Part 8).

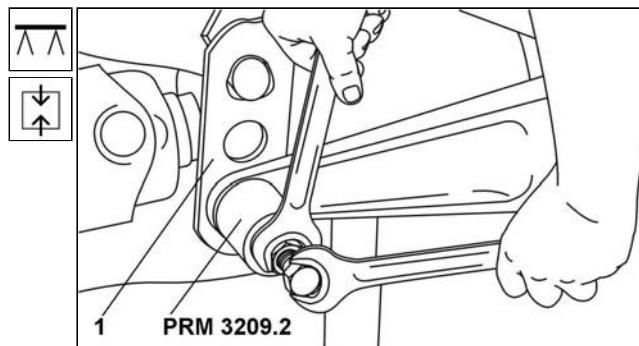


Fig. 7.115 Installation of torsion bar pin

17. Mount the rear strut (See Part 12).
18. Install the winch drive to coupling plate on the auxiliary gearbox (See Part 4) - **it applies to trucks fitted with a winch.**
19. Top up oil into final drives of rear axles, rear connecting part and rear backbone tube (See Subchapter 7.5.2).
20. Remove support stands located under auxiliary gearbox and front backbone tube.
21. Install clamps, holders and fastening clips of hoses, pipes and electric cables.
22. Mount mudguards behind the 2nd rear axle.
23. Mount the cargo truck platform.
24. Check the oil level in the auxiliary gearbox.
25. Start the engine and pressurize the pneumatic system to the specified pressure.
26. Check connections of pneumatic system for leaks.
27. Carry out a road test of the vehicle to check both rear axles and brake system for function.
28. Check oil levels after a road test.



7.5.13 Removal and Installation of 1st Rear Axle

a) Reasons for Removal

1. The axle has been damaged and it must be dismounted to carry out a repair.
2. Excessive axle noise.

b) Technical Conditions

1. Keep safety precautions valid for work with a hanging load.
2. Replace all shaped rings with new ones.

c) Removal Procedure

1. Dismount the couple of rear axles c/w rear backbone tube in accordance with the procedure (See Subchapter 7.5.12).
2. Dismount the rear backbone tube and cross girder in accordance with the procedure (See Part 6).
3. Place support stands beneath the rear connecting part on both sides of the cross girder under leaf springs clamps and under axle final drives of both axles.
4. Dismount leaf spring shackles of 1st rear axle in accordance with the procedure (See Part 6).
5. Dismount vehicle wheels of 1st rear axle in accordance with the procedure (See Part 11).
6. Unscrew nuts **1** fixing the 1st rear axle final drive housing with the rear connecting part.
7. Hang the axle on a suitable lifting device, slide it out of the rear connecting part and place it on a pallet.

CAUTION:

Keep safety precautions valid for work with a hanging load.

8. Remove the shaped ring from the rear bush of axle final drive housing.

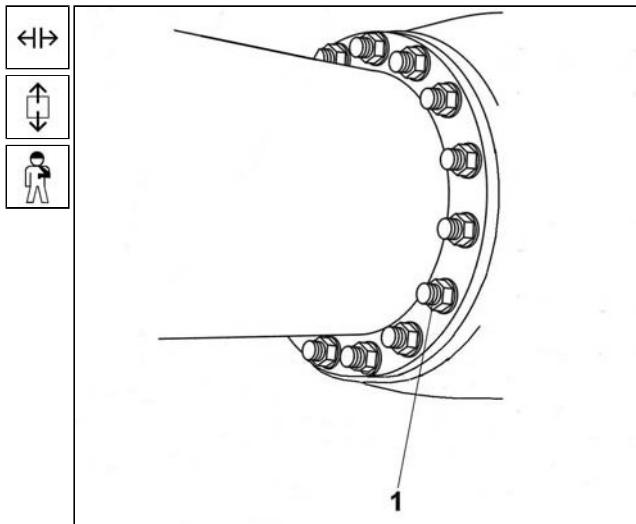


Fig. 7.116 Removal of 1st rear axle



d) Installation Procedure

1. Clean the rear bush of axle final drive housing and fit the shaped ring on.
2. Hang the axle on a suitable lifting device and slide it on the cleaned flange of the rear connecting part.

CAUTION:

Keep safety precautions valid for work with a hanging load.

3. Mount nuts **1** on stud bolts of the axle final drive and tighten them evenly to **420 ± 10 % Nm**.

CAUTION:

The contact surface for nuts of Ø 32 flange connection must be free of paint during installation.

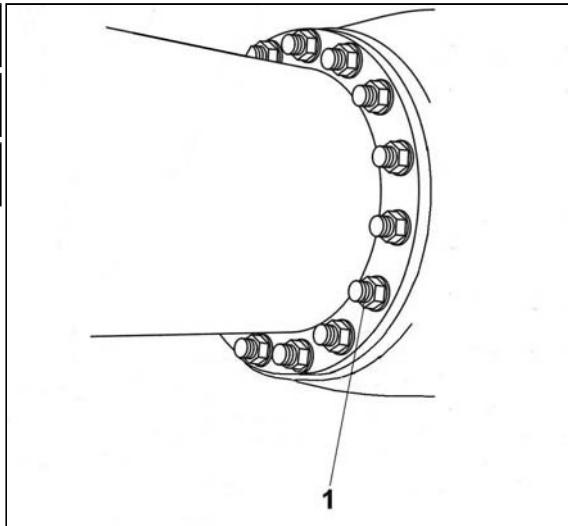
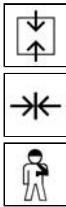


Fig. 7.117 Installation of 1st rear axle

4. Pad the 1st rear axle final drive housing with a support stand.
5. Mount vehicle wheels of 1st rear axle in accordance with the procedure (See Part 11).
6. Mount shackles of leaf springs of 1st rear axle in accordance with the procedure (See Part 5).
7. Remove support stands from the rear connecting part and axle final drive housings.
8. Install the cross girder and rear backbone tube in accordance with the procedure (See Part 6).
9. Install the couple of rear axles c/w rear backbone tube into vehicle in accordance with the procedure (See Subchapter 7.5.12).



7.5.14 Removal and Installation of 2nd Rear Axle

a) Reasons for Removal and Installation

1. The axle has been damaged and it must be dismounted to carry out a repair.
2. Excessive axle noise.

b) Technical Conditions

1. Keep safety precautions valid for work with a hanging load.
2. Replace all shaped rings with new ones.
3. Top up oil fillings after installation.
4. Check pneumatic manifolds for leaks after installation.

c) Removal Procedure

1. Secure the vehicle with wheel chocks against motion.
2. Dismount mud-guards behind 2nd rear axle.
3. Release air from the brake system.
4. Drain oil from 2nd rear axle final drive and rear connecting part (See Subchapter 7.5.2).
5. Remove the rear strut (See Part 12).
6. Lift the rear part of vehicle, and pad the 1st rear axle final drive and the rear connecting part on both sides of the cross girder beneath leaf spring shackles with support stands and place the height-adjustable assembly truck under 2nd rear axle final drive housing.
7. Lower the vehicle.
8. Remove leaf springs shackles of 2nd rear axle (See Part 8).
9. Dismount vehicle wheels from 2nd rear axle (See Part 11).
10. Disconnect screwed connections of air manifolds **1**, **2**, **3** and **4** on 2nd rear axle.

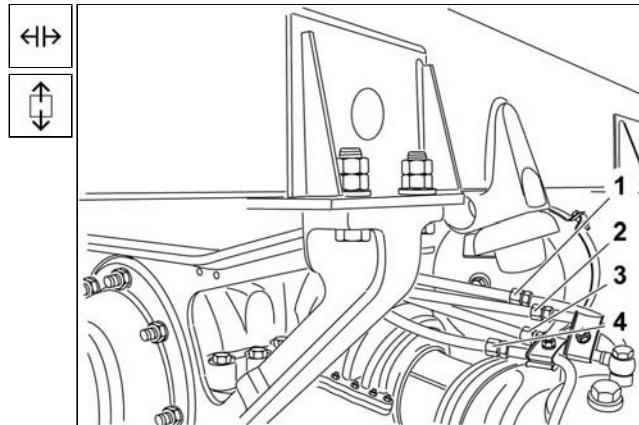


Fig. 7.118 Disconnection of air manifolds



11. Unscrew bolts **1** and **3** fixing air pipes on 2nd rear axle.
12. Detach the bleeding manifold **2** from 2nd rear axle final drive housing.

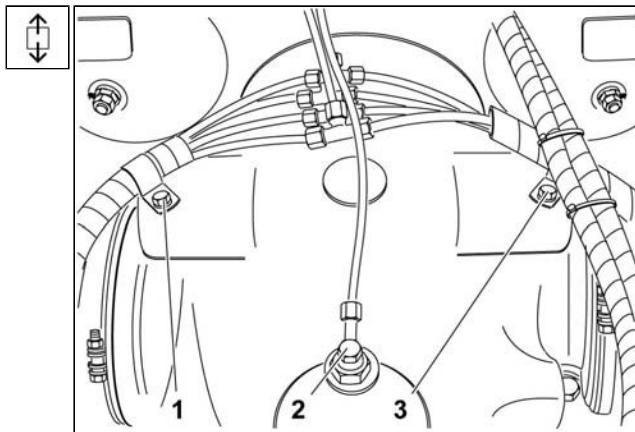


Fig. 7.119 Removal of bleeding manifold and attachment of air pipes

13. Unscrew locking nuts **4** and fastening nuts **3** c/w washers **2** fixing the auxiliary frame to the rear cross girder.
14. Remove bolts **5** and withdraw washers **2**.
15. Remove spacer washers **1**.

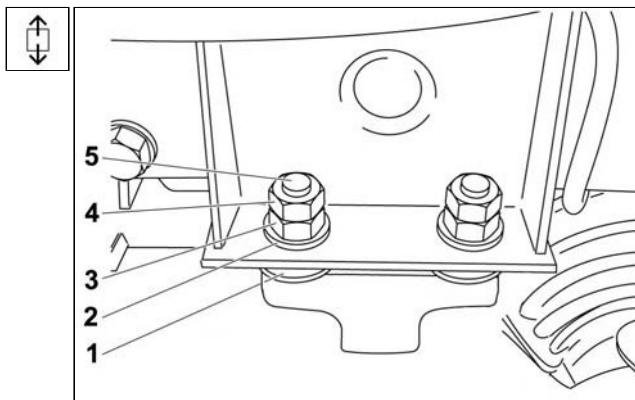


Fig. 7.120 Frame attachment to rear cross girder

16. Unscrew nuts **3**. Withdraw cover **2** together with shaped ring and rear cross girder **1** from stud bolts.

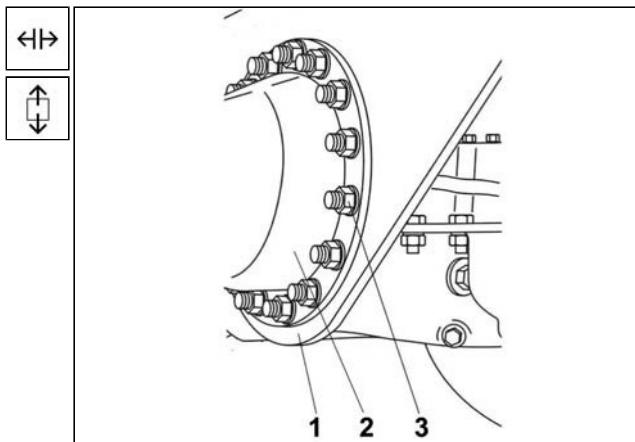


Fig. 7.121 Rear cross girder - removal



17. Unscrew fastening nuts **1** fixing the 2nd rear axle final drive housing to the rear connecting part and move the axle being placed on the height-adjustable assembly truck rearwards behind the vehicle.
18. Remove the shaped ring between flanges of axle final drive housing and connecting part.

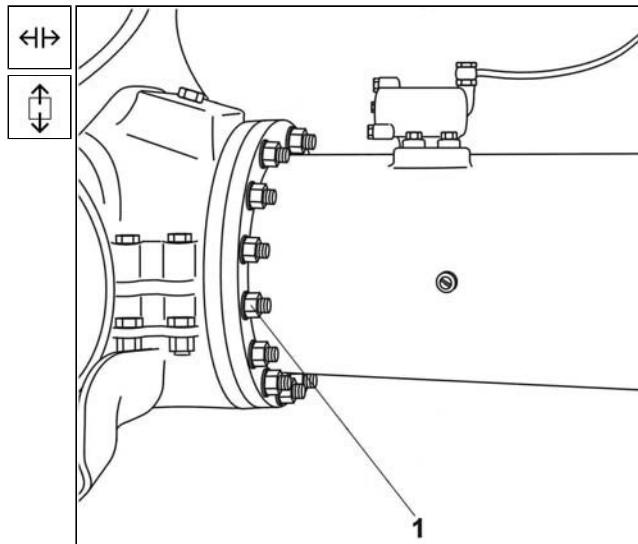


Fig. 7.122 Connection of 2nd rear axle with connecting part - removal

d) Installation Procedure

1. Move the axle being placed on the height-adjustable assembly truck from rearwards under the vehicle precisely in the vehicle longitudinal centerline so that the flange of axle final drive housing would face against the flange of connecting part.
2. Fit a new shaped ring on flange of the axle final drive housing.
3. Mount the front axle so that teeth of central and free pinions would mesh into teeth of planet wheels of the axle differential in the connecting part and the axle final drive housing would fit on flange of the connecting part. Screw the nuts **1** fixing the axle to connecting part and tighten nuts evenly to $420 \pm 10\% \text{ Nm}$.

CAUTION:

The contact surface for nuts **2** of the flange connection Ø 32 must be free of paint during installation.

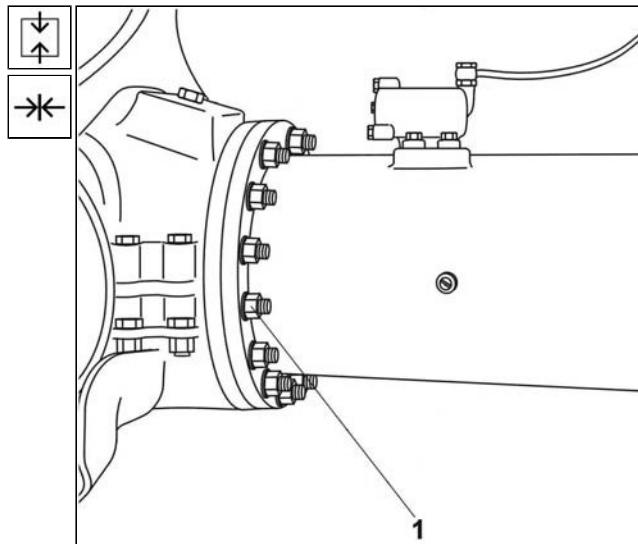


Fig. 7.123 Connection of 2nd rear axle and connecting part - installation



4. Slide (knock) the rear cross girder **1** on stud bolts of the axle final drive housing. Apply sealant to sealing shaped ring.

Note:

Mount the cross girder with a chamfered edge for the shaped ring facing the rear cover.

5. Slide the rear cover **2** on stud bolts, mount nuts **3** and tighten evenly to $420 \pm 10\% \text{ Nm}$.

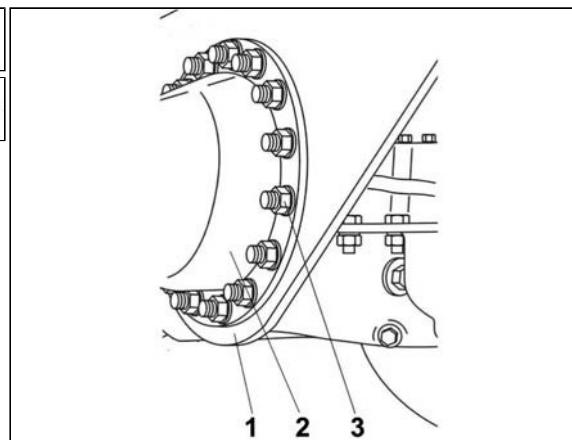


Fig. 7.124 Rear cover - installation

6. If need be, place spacer washers **1** between the rear cross girder and auxiliary frame.
7. Use bolts **5**, washers **2**, fastening nuts **3** and locking nuts **4** to attach the frame to cross girders.
8. Tighten nuts and locking nuts to $400 \pm 40 \text{ Nm}$.

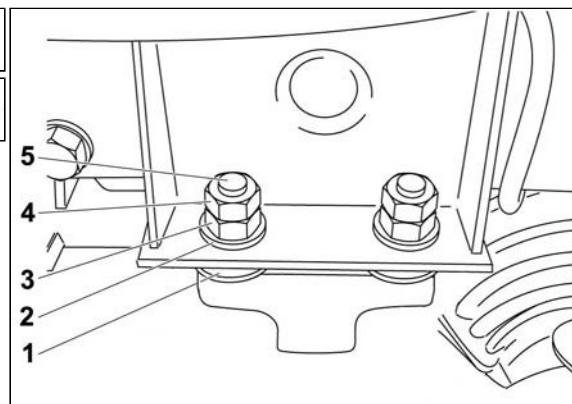


Fig. 7.125 Attachment of frame to the rear cross girder

9. Attach the bleeding manifold **2** to the 2nd rear axle final drive housing.
10. Mount bolts **1** and **3** fixing the air pipes on 2nd rear axle.

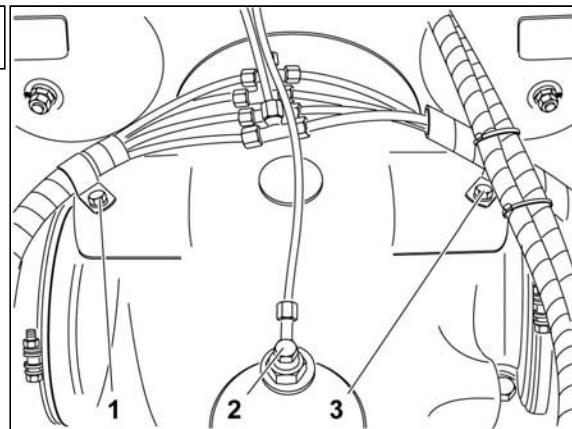


Fig. 7.126 Mounting of bleeding manifold and attachment of air pipes



11. Mount screwed connections of air manifolds **1, 2, 3** and **4** on 2nd rear axle.

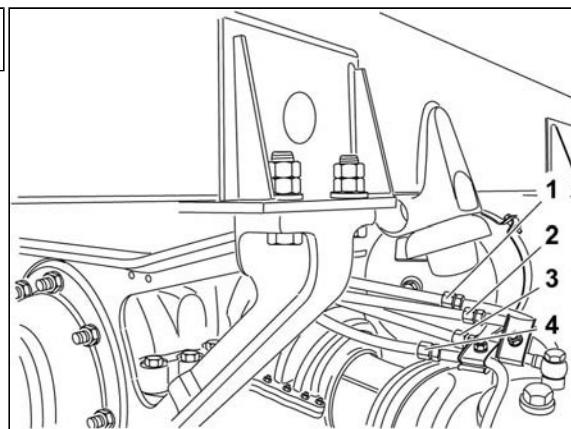


Fig. 7.127 Attachment of air manifolds

12. Mount vehicle wheels of 2nd rear axle (See Part 11).
13. Install leaf spring shackles of 2nd rear axle (See Part 8).
14. Remove support stands from 1st rear axle final drive housing and rear connecting part; remove the assembly truck.
15. Install the rear strut (See Part 12).
16. Fill the 2nd rear axle final drive housing with oil (See Subchapter 7.5.2).
17. Mount mud-guards of 2nd rear axle vehicle wheels.
18. Start the engine and pressurize the pneumatic system to the specified pressure.
19. Check connections of pneumatic system for leaks.
20. Road test the vehicle to check both rear axles and brake system for function.
21. After a road test, check oil levels.



7.5.15 Disassembly and Assembly of the Final Drive Housing

a) Reasons for Disassembly and Assembly

1. Some inner parts of the axle final drive housing have been damaged.
2. The axle final drive housing is too noisy (damaged bearings or gears).

b) Technical Conditions

1. Replace all sealing rings, shaft seals and damaged bearings.
2. In case that the pinion or the crown gear needs to be replaced, install always "a new pair" (the crown gear and pinion have been run-in together in the manufacturing plant and have a serial number and a manufacturing deviation stamped on, which are necessary during the axle assembly).
3. Check crown gears, pinions and the central gear to make sure that they are in a good condition. Replace them, if the following faults have been found:
 - "pitting" - in the middle of the tooth (on the pitch circle) the porosity occurs,
 - cemented zone of the tooth has been broken,
 - seized tooth – it manifests in the form of transversal scratches on the whole working area of the tooth,
 - crumbled or broken tooth.
4. On termination of the assembly, it is necessary to check the adjustment of the bevel gearing mesh in accordance with a procedure mentioned in (See Subchapter 7.5.16) and the running-in according to a separate technological procedure.

c) Removal Procedure

1. Remove the pertaining axle from the vehicle in accordance with procedures (See Subchapter 7.5.11), (See Subchapter 7.5.13), (See Subchapter 7.5.14). Bed the axle in the assembly trolley PRM 3338.1.
2. On the front axle, remove steering knuckles in accordance with a procedure (See Subchapter 7.5.7), on the 1st or 2nd rear axle, remove driving shafts in accordance with a procedure (See Subchapter 7.5.5).
3. Remove protective rubber bags from half-axles in accordance with a procedure (See Subchapter 7.5.5).



4. Remove the lock ring **1** from a groove on the propeller shaft (on the side of the fixed pinion).

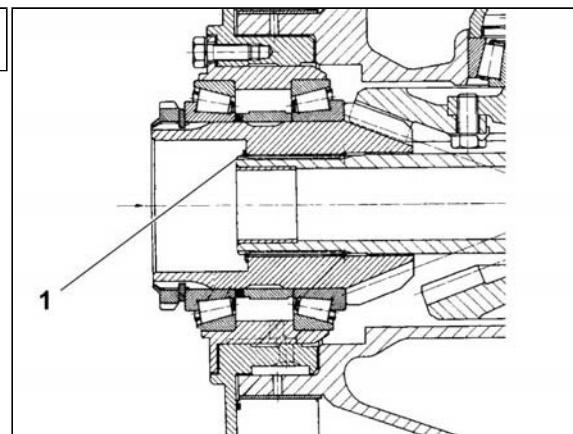


Fig. 7.128 Propeller shaft lock ring - removal

5. Remove the lock ring **3** from a groove on the propeller shaft (from the side of a rotary pinion) and remove the differential central gear **1** c/w spacer ring **2** and spacer washers, which are placed between the spacer ring **2** and the central gear **1**.
6. Remove the propeller shaft from the axle final drive housing.

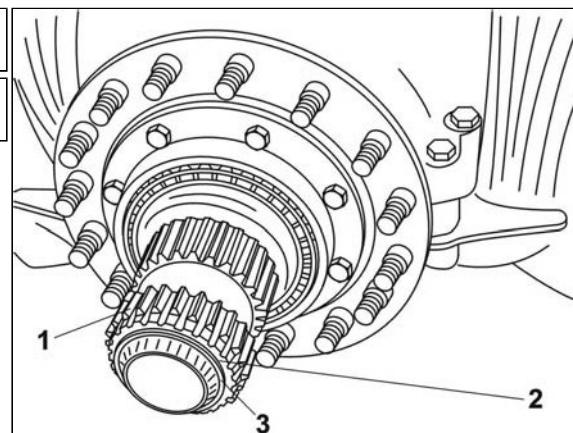


Fig. 7.129 Differential central gear - removal



07 Axles



7. Dismount bolts 1 from bearing units of both pinions (on both sides of the axle final drive housing). Save the distance washers.

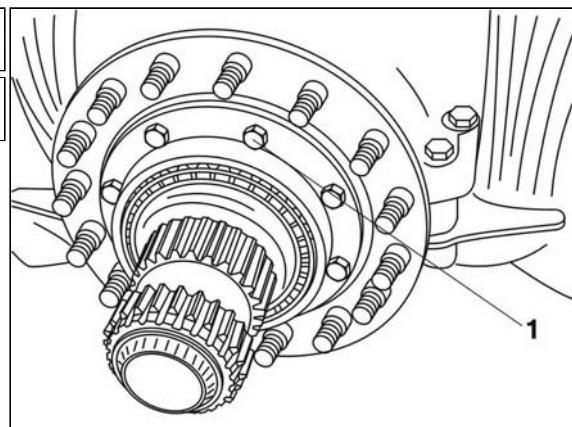


Fig. 7.130 Bolts of pinion bearing units - removal

8. Knock off and remove pinion bushings.

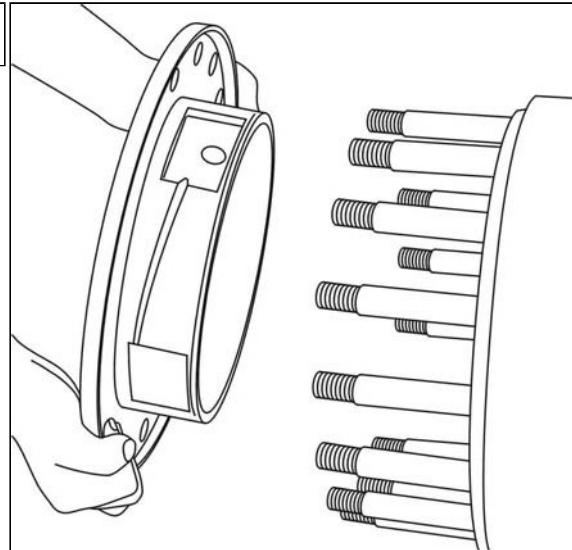


Fig. 7.131 Pinion bushings - removal



07 Axles



10. Unscrew nuts **1** and remove connecting bolts from both parts of the axle final drive housing and remove the upper part of the housing.

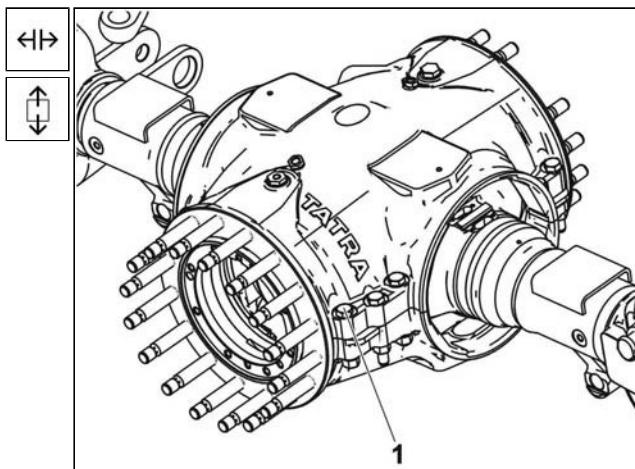


Fig. 7.132 Removal of the axle final drive housing bolts

10. Remove outer sheet-iron plates **1**.
11. Move the half-axles out of the lower part of the axle final drive housing.

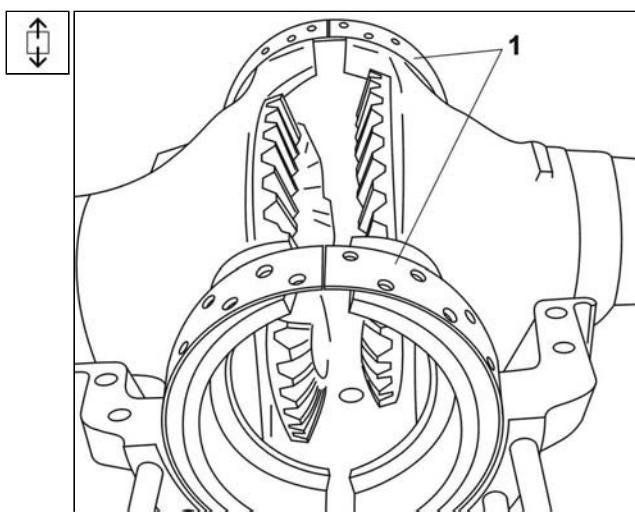


Fig. 7.133 Removal of half-axes from the lower part of the housing



12. Unscrew bolts 1 c/w lock pins and lock iron plates of the adjusting nut and adjusting bushing from the swinging half-axle.

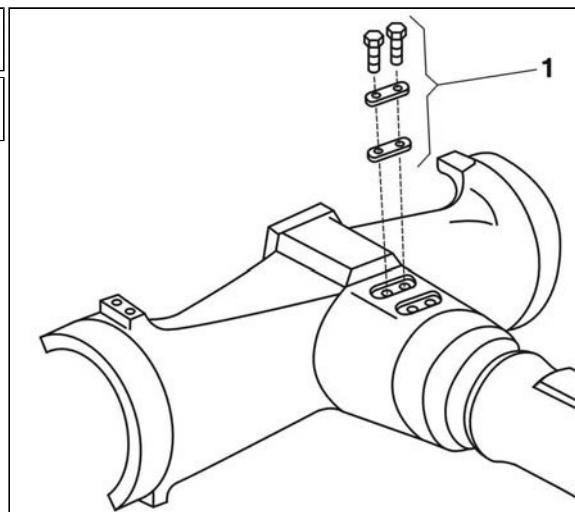
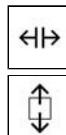


Fig. 7.134 Lock elements of adjusting bushing and nut - removal

13. Loosen the adjusting nut.

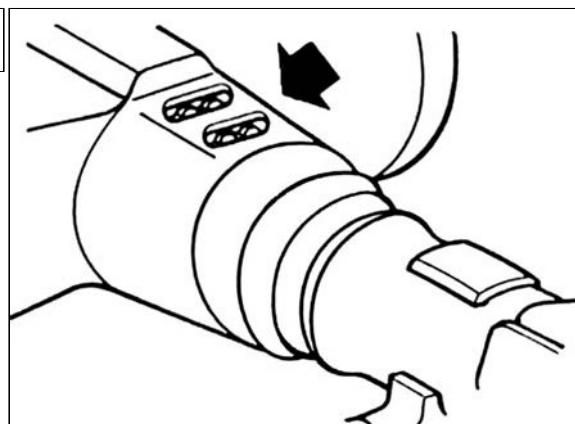


Fig. 7.135 Crown gear adjusting bushing and nut

14. Use the tool **PRM 3121.1** to unscrew the crown gear hub from the half-axle (during removal use the tool to hold the adjusting bushing through a hole in the crown gear cavity).

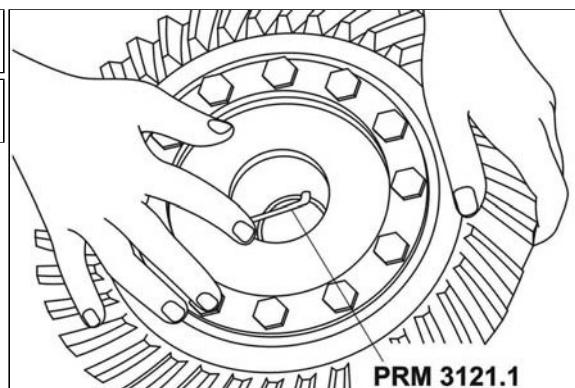
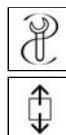


Fig. 7.136 Use of the tool PRM 3121.1 - removal



15. After unscrewing, remove the hub with crown gear **1** and adjusting bushing **2** from the half-axle **3**.

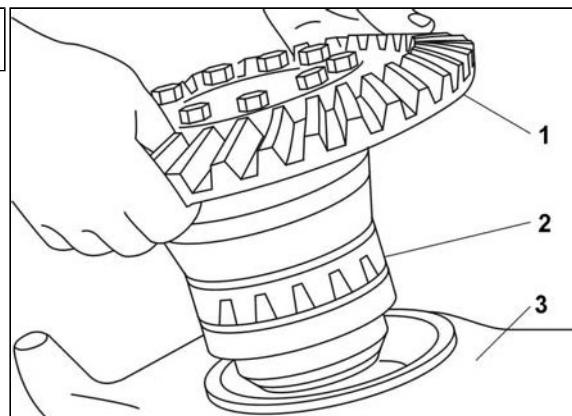


Fig. 7.137 Crown gear hub - removal

16. Dismount the adjusting nut **1** c/w shaft seal **2** from the half axle **3**. Remove the shaft seal.

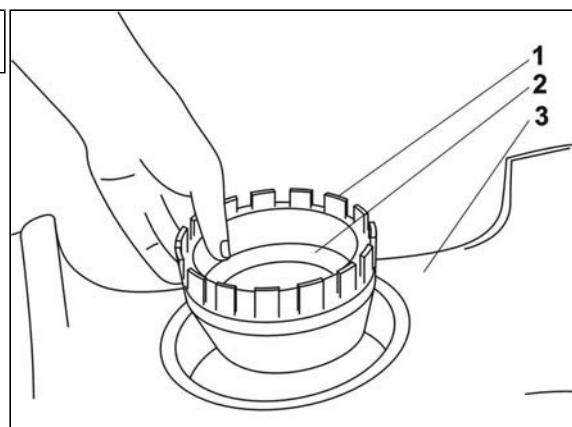


Fig. 7.138 Adjusting nut - removal

17. Slide the crown gear hub on a stand **PRM 3123.1**, unlock and unscrew fastening bolts **3** fixing the crown gear **1** to the hub. Remove the tab washers and the crown gear **1**.

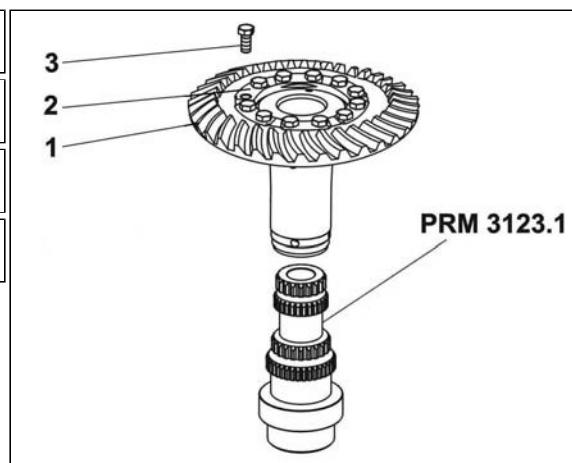
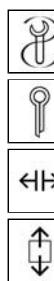


Fig. 7.139 Crown gear removal



07 Axles



18. Unscrew two bolts c/w lock iron plate and remove the scraping dish **1** from the half-axle.

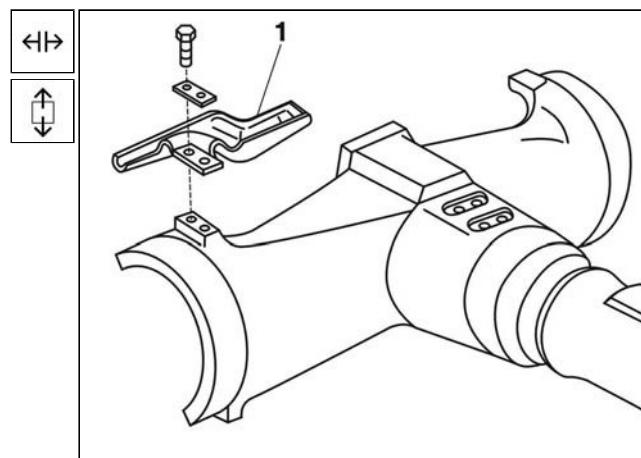
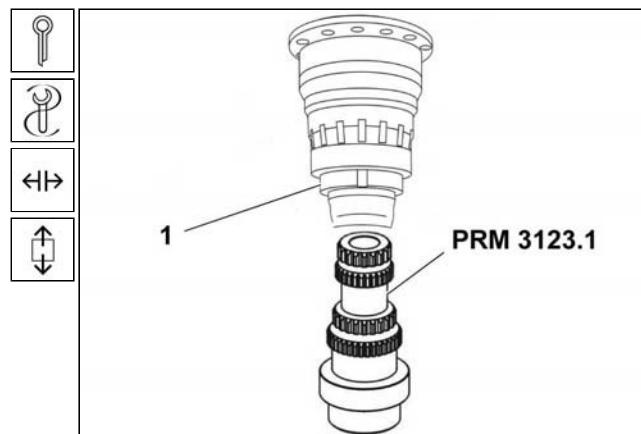


Fig. 7.140 Scraping dish removal

19. Slide the crown gear hub on a stand **PRM 3123.1**. Use the tool **URK 0199** to unlock and unscrew the lock slotted nut **1** from the crown gear hub.





07 Axles



20. Withdraw the tapered roller bearing **1** (32018 AX).

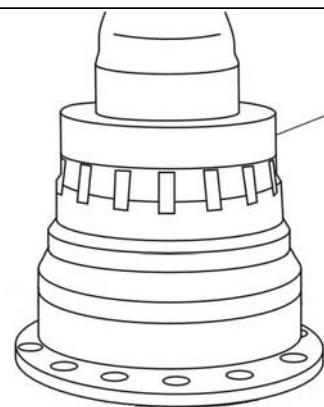


Fig. 7.142 Rear bearing of the crown gear hub - removal

21. Remove the adjusting bushing **1** and spacer bushing **2** c/w pin **4** and spacer washers **3** (keep the washers in a safe place for a later assembly).

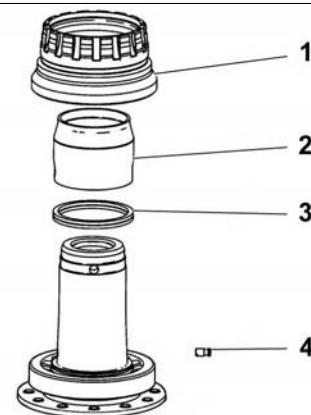


Fig. 7.143 Removal of crown gear hub components



22. Use the puller **PRM 3184** to press the inner race **1** of the tapered roller bearing 30219 A out of holes in the hub.

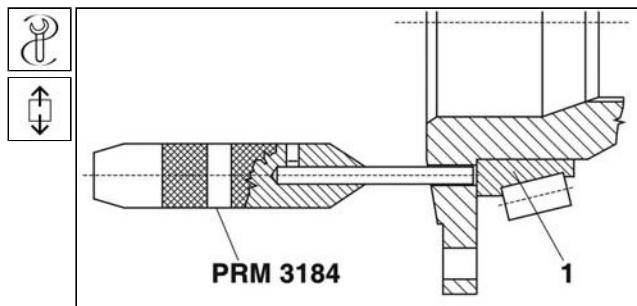


Fig. 7.144 Removal of the front bearing inner race of the crown gear hub

23. Fit the complete pinion c/w bearing unit into a tool **PRM 3072.1** and unlock the slotted nut.
24. Use the wrench **URN 0202** to loosen and unscrew the lock slotted nut **1**.

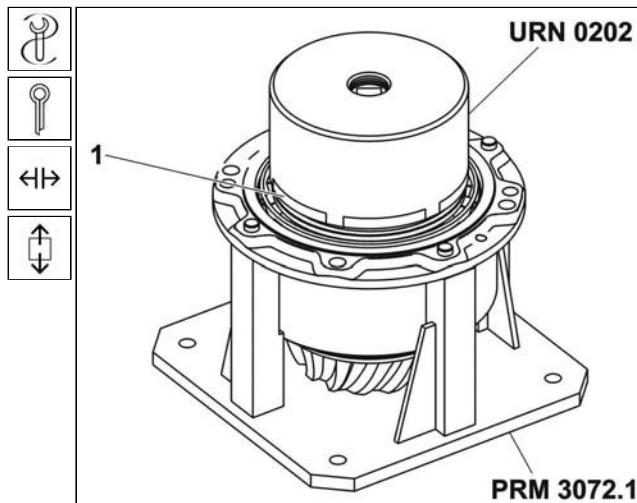


Fig. 7.145 Removal of the bearing unit lock nut

25. Remove the lock washer **1**.
26. Remove the pinion c/w bearing unit from the tool **PRM 3072.1**.

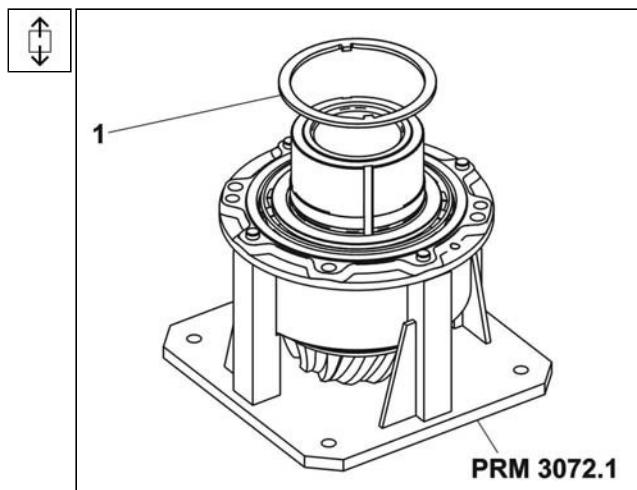


Fig. 7.146 Lock washer - removal



27. Use the tool **PRM 3114** to press the pinion out of the bearing unit.

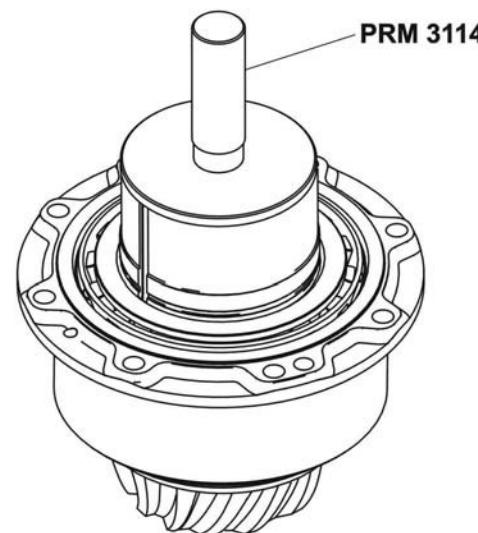
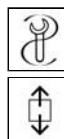


Fig. 7.147 Pressing the pinion out of the bearing unit

d) Installation Procedure

1. Check contact surfaces of adjusting and spacer bushings, adjusting nut, bearings and lock slotted nut.
2. Fit the crown gear hub on a stand **PRM 3123.1**) and set and press the crown gear **1** on the hub flange.
3. Set the lock sheet **2** and cross-tighten fastening bolts **3** of the crown gear **1** to **135 ± 15 Nm**.
4. Knock the lock sheet **2** over bolt **3** heads to secure the bolts in position
5. Withdraw the hub from the tool **PRM 3123.1**.

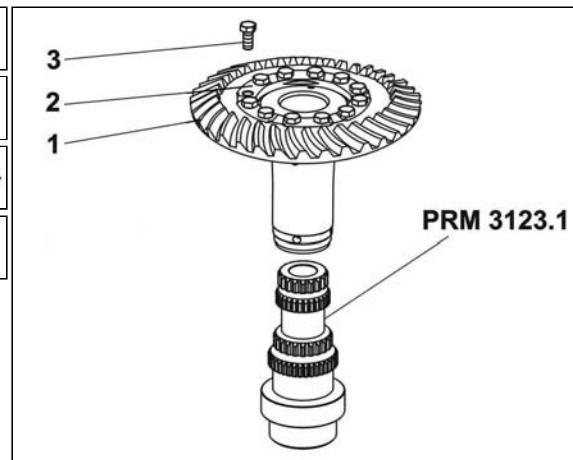


Fig. 7.148 Installation of the crown gear



6. Heat the tapered roller bearing **1** 30219 A to about **80°C**.
7. Use the puller **PRM 3279** to press the tapered roller bearing 30219 A **1** onto hub **2** of the crown gear.

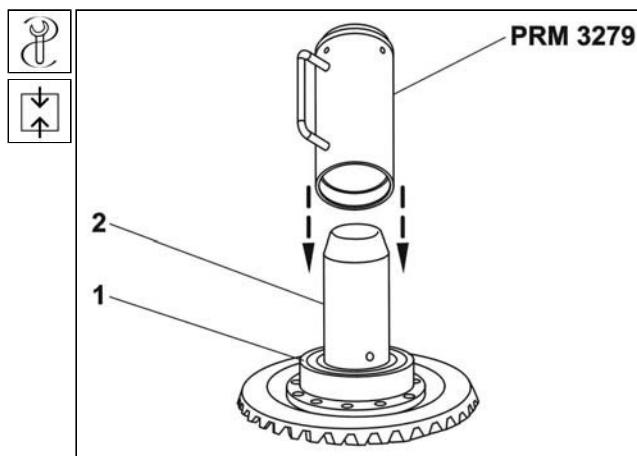


Fig. 7.149 Installation of the front bearing of the crown gear hub

8. Fit the adjusting sleeve on a hub on the outer bearing race and use the depth gauge to measure the height **A** of the adjusting sleeve from the bearing inner race to the upper edge of the adjusting sleeve.

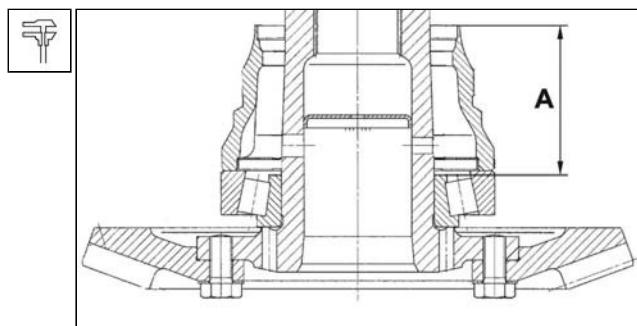


Fig. 7.150 Height of the upper edge of the adjusting sleeve

9. Use the slide gauge to measure the length **B** of the adjusting sleeve.
10. Select spacer washers of the total thickness **X = A - B + 0.3 mm** and fit them onto hub to the bearing.
11. Place the space washers on the bearing **1** (See Fig. 7.149).

Note:

Max. number pieces of washers is two.

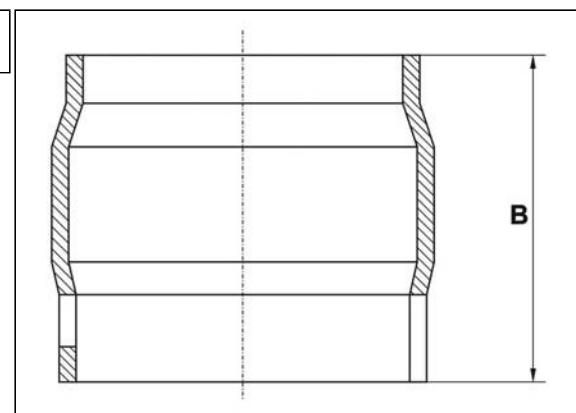


Fig. 7.151 Length of the adjusting sleeve



12. Slide the pin **2** into a hole in the crown gear hub and install the spacer bushing **1** with cutout on a groove on the pin circumference.

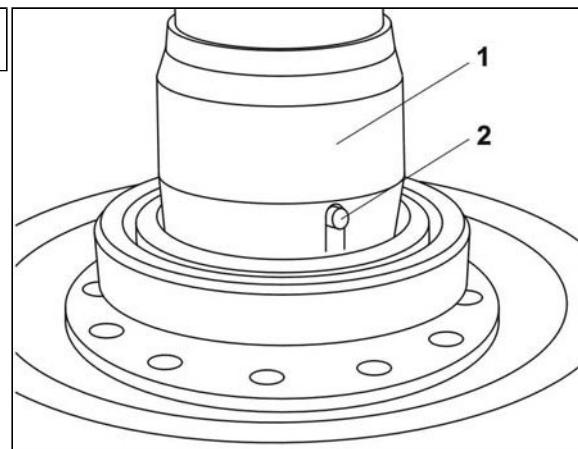


Fig. 7.152 Installation of the crown gear hub

13. Fit the adjusting sleeve **2** onto a crown gear hub **1** and use the puller **PRM 3280** to press the warmed tapered roller bearing **3** (32018 AX). Having cooled down, smear the bearing with the transmission oil.

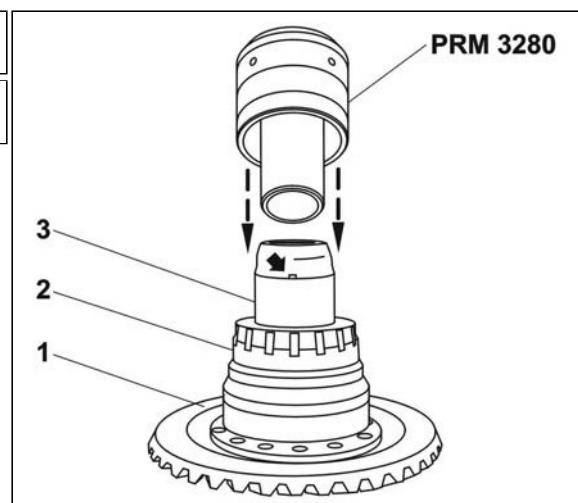
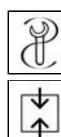


Fig. 7.153 Installation of the rear bearing of the crown gear hub



14. Install the lock nut 1 and insert the complet in holders **PRM 3123.1**. Use the tool **URK 0199** to tighten the nut to the torque of **500 ± 50 Nm**.
15. After tightening the nut, the adjusting sleeve can move – while tapping it with a rubber mallet - with a slight resistance (bearing pre-stressing **0.00** to **0.06 mm**).

CAUTION:

If the adjusting sleeve cannot be moved or if it is loose, readjust it according to the above-mentioned procedure (add or remove spacer washers if need be).

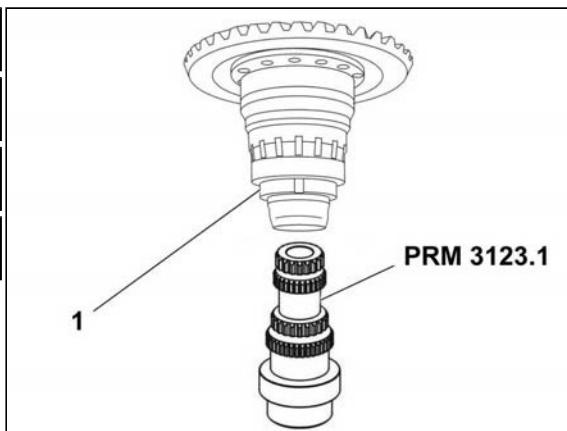
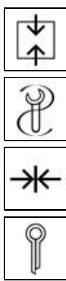


Fig. 7.154 Lock nut - installation

16. Knock the lock nut in two points into a hole in the crown gear hub to secure the lock nut in position.
17. Use the driver **PRM 3142** to press the shaft seal 85x110x12 2 to the adjusting nut 1.

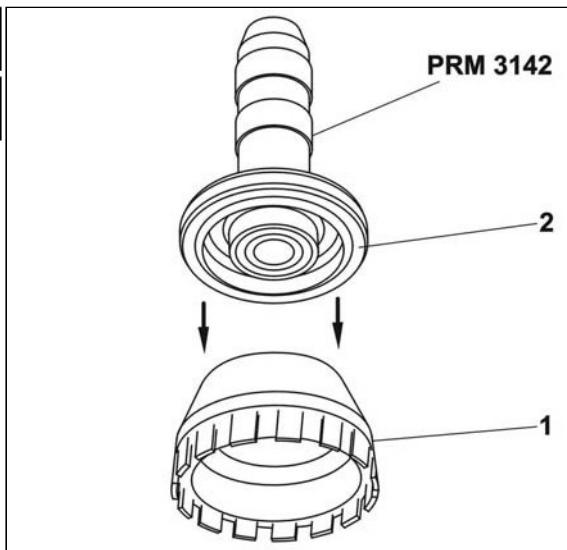
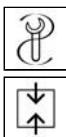


Fig. 7.155 Installation of the shaft seal into adjusting nut



18. Screw the adjusting nut **1** to a half-axle **2** fully to the stop.

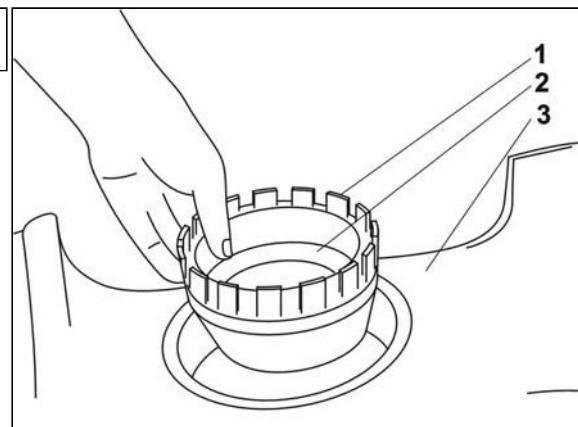


Fig. 7.156 Adjusting nut - installation

18. Fit the assembled hub c/w the adjusting bushing **2** into half-axle **3** according to a lead of the crown gear helix **1** and a common number with a respective pinion on the shaft of bevel gears.

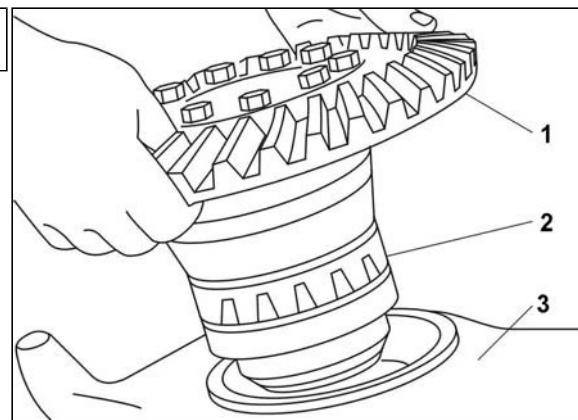


Fig. 7.157 Crown gear hub - installation

20. Screw the hub into a thread in the half-axle fully to the stop. Use the tool **PRM 3121.1** to hold the adjusting sleeve through a hole in the crown gear cavity while mounting the hub.

CAUTION:

During assembly the thread of the adjusting sleeve must be aligned with outer diameters of tapered roller bearings.

During assembly of pinions take care that the pinion would be in mesh with the same crown gear as before the axle removal. If a new pinion is installed, it is necessary to mount a new crown gear simultaneously (they are marked with the same serial numbers having the same manufacturing deviation).

**Differentiation of front axle pinions:**

- the rotary pinion with a right-hand lead of helix is longer and it has spur teeth, which mesh between planet wheels of the axle differential during assembly of axle to the backbone tube,
- the fixed pinion with a left-hand lead of helix is shorter without spur teeth.

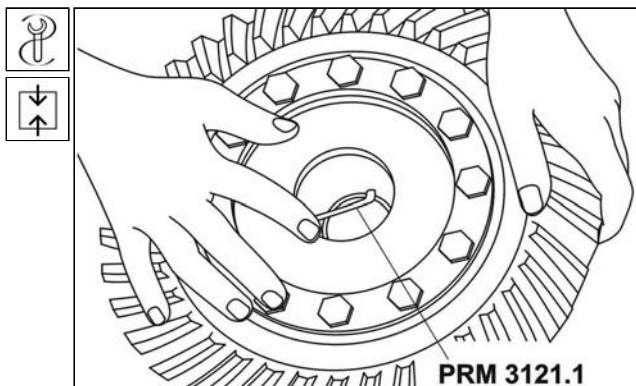
On rear axles, it is conversely.

Fig. 7.158 Use of the tool PRM 3121.1 - installation

21. Heat the inner race of the bearing **4**, apply the transmission oil to contact surfaces and use the tool to press it on the pinion **1**.
22. Press the outer rings of both tapered bearings into bearings bushing **6** and measure its distance " **a** ".
23. Measure the width " **b** " of the distance bushing **3**. The distance bushing **3** put on the pinion **1**.
24. Put on the distance washers " **c** " for the overrun of bearings setting.

Note:

The necessary thickness of the distance washers is determined as follows:

$$c = a - b$$

Add the value **0.00 - 0.06** mm to value 'c'.
The thickness 'x' of the distance washers then:

$$x = c + (0.00 - 0.06)$$

Example:

$$a = 35.80 \text{ mm}$$

$$b = 27.45 \text{ mm}$$

$$c = 35.80 - 27.45 = 835 \text{ mm}$$

$$x = 8.35 + (0.00 - 0.06) = 8.35 - 8.29 \text{ mm}$$

25. Put on the bearings bushing **6** and press the other tapered bearing **7** (32024X).
26. Put on the lock plate **2**, screw on the nut **8**.

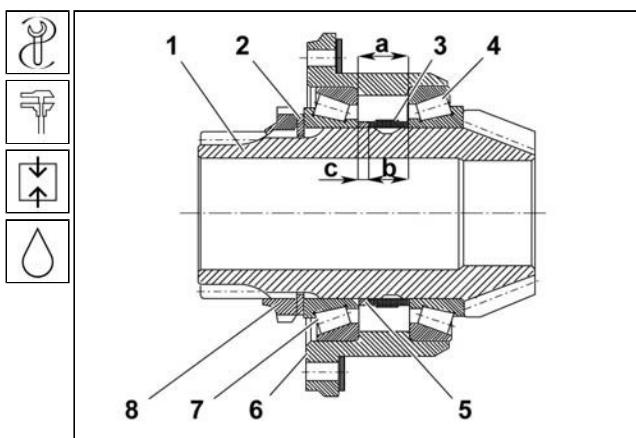


Fig. 7.159 Pinion bearings - installation



07 Axles



27. The complete pinion place in the tool **PRM 3072.1**.
28. Tighten the nut **1** (using the wrench **URN 0202**) with torque **900 ± 90 Nm**.
29. Turning the bearings bushing freely must be possible.

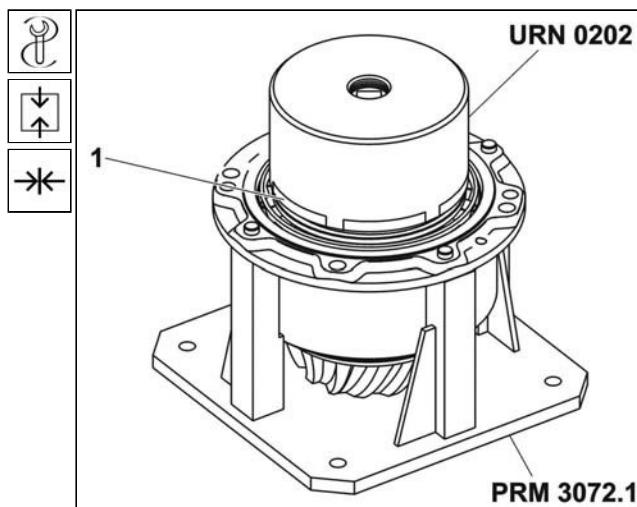


Fig. 7.160 Lock nut tightening

29. After tightening, lock the nut with a punch in two grooves or teeth gaps (according to a pinion shape).

Note:

On the assembled pinion, the friction moment of tapered roller bearings must be **0.6 - 3 Nm** as a maximum and the complete unit must have no clearance.

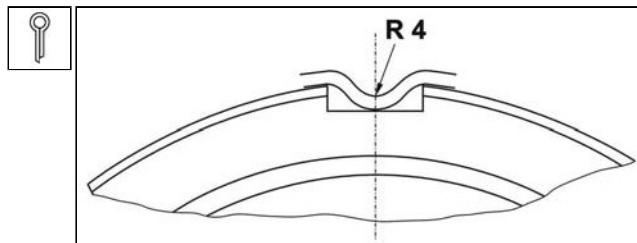


Fig. 7.161 Locking the nut

30. Apply the transmission oil to outer iron plates **1** and slide between forks and the lower part of the housing (the end of iron plates must point up).

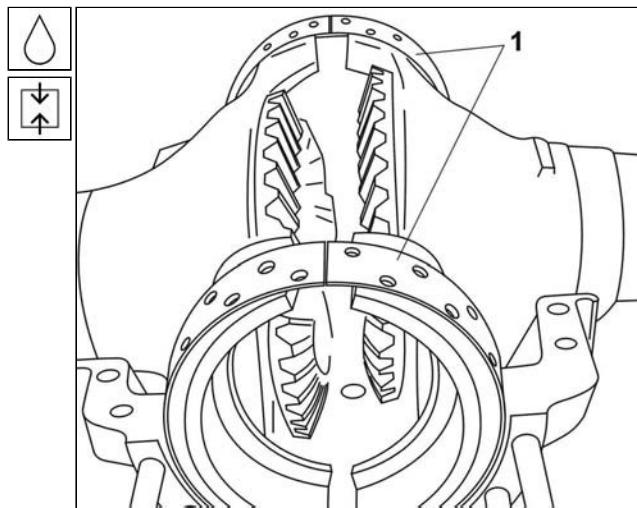


Fig. 7.162 Half-axles placing in the lower part of the housing



31. Install scraping metal sheet plates **1** and bend off the lock metal sheet plates to secure their fastening bolts in position.
32. The lower surfaces of scraping metal sheet plates must be positioned **max. 0,5 mm** above the crown gear (The friction of their edges along a part of the crown gear circumference does not matter).
33. Apply the sealant to contact surfaces of the lower part of the housing, fit the housing upper part, press the calibrated bolts and gently tighten the nuts.

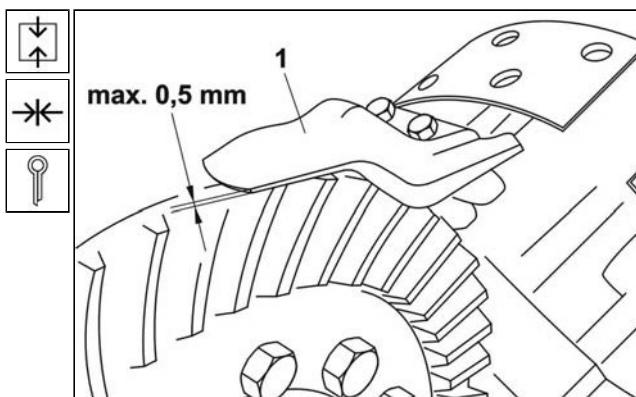


Fig. 7.163 Installation of scraping metal sheet plates

34. Stick sealing rings into a groove in the contact surface of the housing for pinion bushings (on both housing sides).

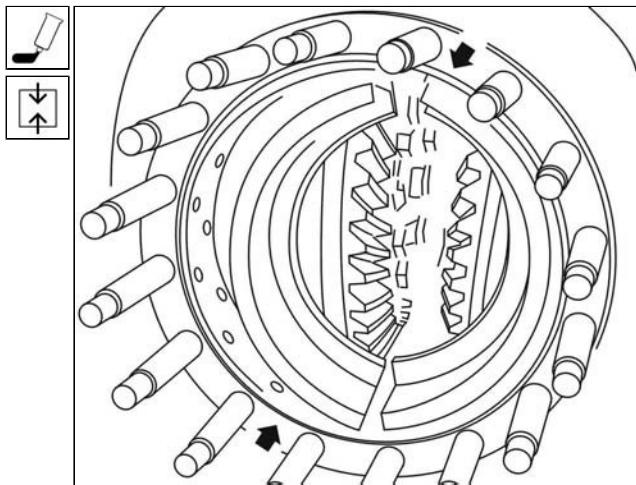


Fig. 7.164 Installation of sealing rings

35. Apply the transmission oil to the bushing cylindrical surfaces for the pinion location, fit the bushing with a grease nipple up onto bolts of the axle final drive housing and press into housing (bushing are the same for both pinions).
36. Tighten all nuts of axle final drive housing halves connecting bolts to the torque of **200 ± 20 Nm**.

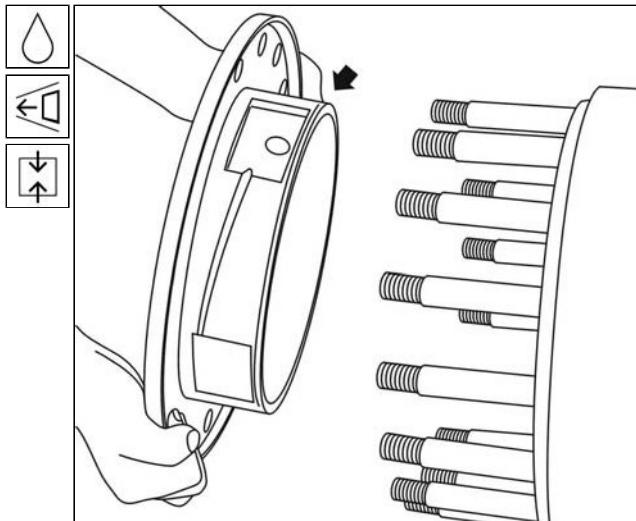


Fig. 7.165 Installation of the bushing for the pinion mounting



37. Use four technological spacers and nuts **1** to attach both pinion bushings to the axle final drive housing (on each side). Tighten nuts to the torque of **250 to 300 Nm**.
38. Install complete pinions, the shorter pinion (fixed pinion) from ahead of the front axle, on rear axles from behind (in the driving direction) with spacer washers. Install the pinion c/w bearing unit so that the bushing is in the position with a grease nipple up.

Note:

While pressing the bearing unit bushings with pinions, rotate the pertaining crown gear and on spacer washers, take care to a correct position of the oil flow with regard to holes in the pinion bushing.

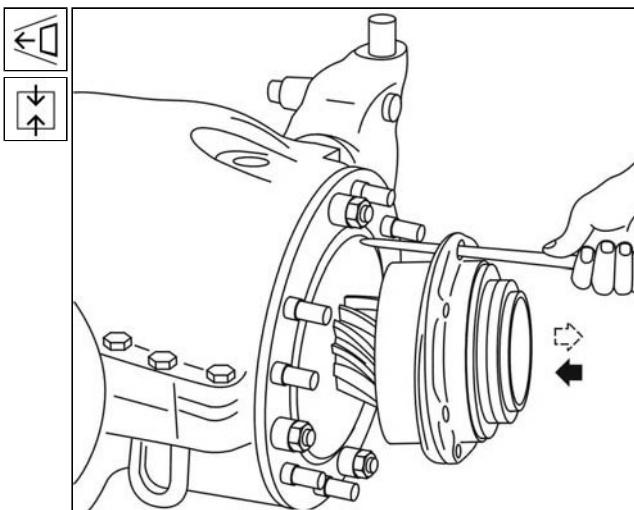


Fig. 7.166 Installation of the pinion bushing

39. Cross-tighten fastening bolts **1** on both pinions to the torque of **75 ± 8 Nm**.
40. Dismount four technological nuts c/w spacers.

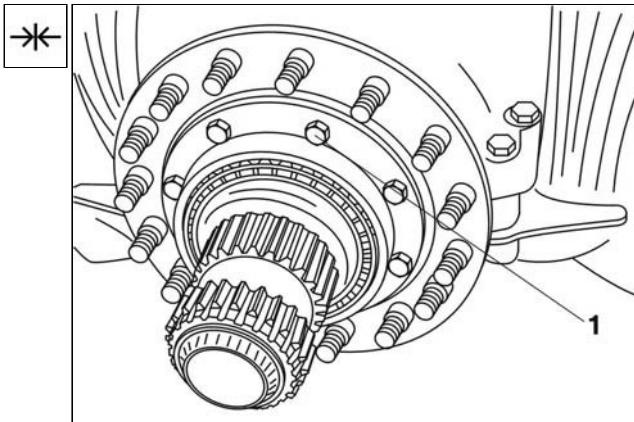


Fig. 7.167 Bolts of pinion bearing units - installation

41. Slide the propeller shaft **1** c/w wire lock ring **2** into the axle final drive housing through a long (rotary) pinion.

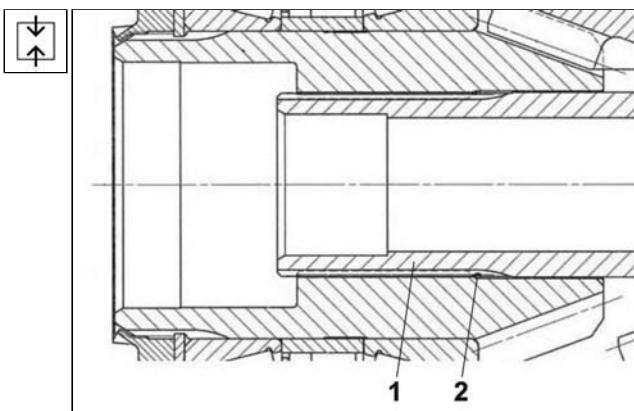


Fig. 7.168 Installation of the propeller shaft into axle final drive housing



42. Use the lock ring 1 to secure the propeller shaft in position.

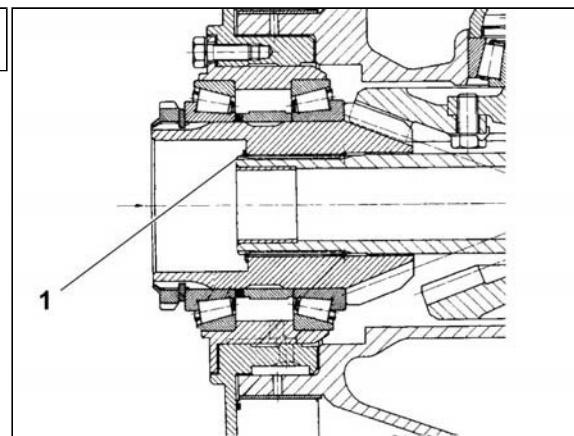


Fig. 7.169 Propeller shaft lock ring - installation

43. Fit the central gear 1, washer 2 and lock ring 3.
44. Adjust the clearance between the pinion and the central gear to a value of **0.3 - 0.5 mm** (insert spacer washers between the central gear 1 and washer 2, which should be then locked with a lock ring 3).
45. Adjust the bevel gearing mesh in accordance with a procedure (See Subchapter 7.5.16).
46. Install protective rubber bags of half-axles in accordance with a procedure (See Subchapter 7.5.3).
47. On the front axle, install steering knuckles in accordance with a procedure (See Subchapter 7.5.7), on the 1st and the 2nd rear axle install the driving shafts in accordance with a procedure (See Subchapter 7.5.1). (
48. Install the axle into a vehicle in accordance with procedures (See Subchapter 7.5.11), (See Subchapter 7.5.13), (See Subchapter 7.5.14).

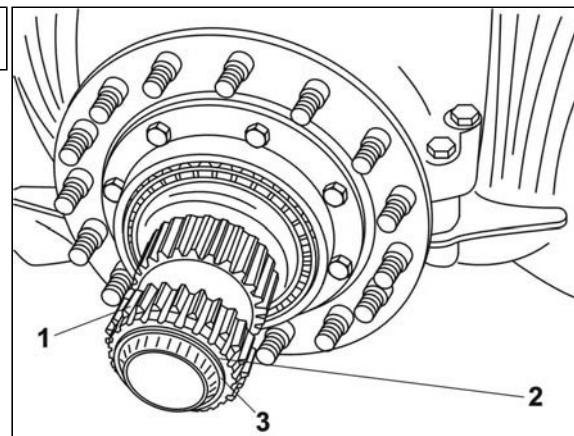


Fig. 7.170 Differential central gear – installation



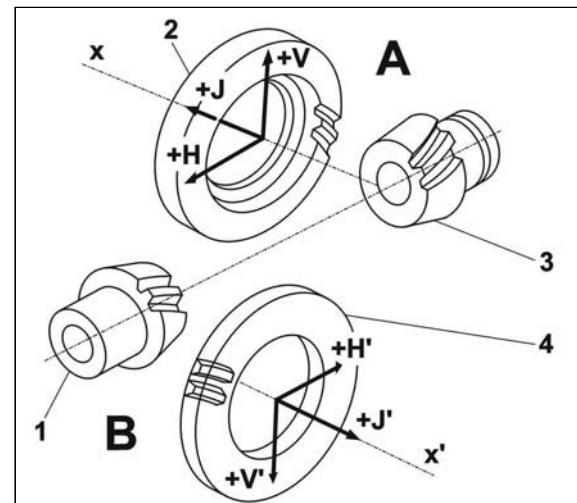
7.5.16 Adjustment of the Bevel Gearing Mesh

a) Reason for Adjustment

1. Secure a correct mesh in the axle final drive bevel gearing.

b) Technical Conditions

1. The bevel gearing OERLIKON, type XN1, is used on axles. Before starting with adjustment of the bevel gearing mesh, you should read through the following instructions in order to get acquainted with the differentiation of the RH and the LH gearing, with the differentiation of helices of crown gears and pinions and to understand the meaning of values (H , J , V , H' , J' , V'), which are necessary for adjustment of a correct mesh.
2. The senses of shifts H , J , V for the RH gearing and H' , J' , V' for the LH gearing mean the following:
 - H , H' - horizontal adjustment (it corresponds to a change in the adjustment of the assembling measure of both pinions);
 - J , J' - side adjustment (it corresponds to a change of the backlash adjustment by shifting of the pertaining crown gear);
 - V , V' - vertical adjustment (non-parallelity of axes of pinions and crown gears in the manufacturing process – it cannot be adjusted).



Legend: **A** – right-hand gearing, **B** – left-hand gearing, **1** - pinion, **2** – crown gear (items 1 and 2 – RH helix), **3** - pinion, **4** – crown gear (items 3 and 4 – LH helix), **P** – direction of view to orientate the half-axles, **S'** - driving direction, **x** – axis of the RH half-axle, **x'** - axis of the LH half-axle

Fig. 7.171 Adjustment of bevel gearing



3. The decisive factor in the adjustment of a correct meshing zone is a displacement of pinions in direction H, H'. The direction of displacement of pinions in mesh (+H, +H') or out of mesh (-H, -H') by the corresponding value can be evaluated and carried out according to tables for the RH and LH gearing (Fig. 7.175). To adjust the required backlash (**0.3 ± 0.5 mm**), move crown gears in direction J, J', while the displacement $J = J' 0.8 \text{ mm}$ has no essential influence upon the position of the meshing zone.
4. Marking on crown gear teeth for the adjustment of a correct mesh:
 - **1** – tooth working side,
 - **2** – tooth rear face,
 - **0** – correct adjustment of the mesh with side backlash 0.28 mm,
 - **-H (-H')** – displacement of the pinion in direction -H (out of mesh) by a value,
 - **+H (+H')** – displacement of the pinion in direction +H (in mesh) by a value,
 - **arrow** – direction towards the centre of the crown gear. The LH side (Fig. 7.175) is valid for the RH gearing (gearing of the rotary pinion). The RH side is valid for the LH gearing (gearing of the fixed pinion).

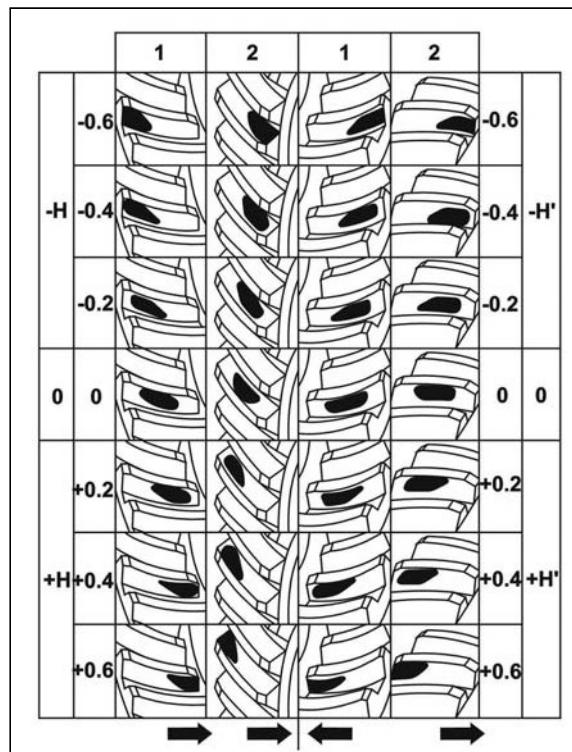


Fig. 7.172 Marking on the crown gear



c) Adjustment Procedure

1. Tighten both pinion bushes using four technological spacers and nuts to the torque of **250 to 300 Nm** (See Subchapter D7.5.15).
2. Check and/or adjust the backlash in the bevel gearing (between crown gears and pinions), which should be **0.3 ± 0.5 mm** as a minimum in the point of the tightest contact among teeth. Use the indicator and magnetic stand to carry out the measurement. Fix the magnetic stand on the sealing surface of the pinion bushing and lean the indicator tip on the central gear tooth side (fixed pinion – short or rotary pinion - long). Brake up the brake drum of the measured gearing in the point of the tightest contact among teeth and find out the backlash in the gearing by a slight turning (jerking) the measured pinion.
3. Only adding or removing spacer washers between the pinion bushing and the axle final drive bushing can displace the **bevel pinions**.
4. Screwing the spacer sleeve can **move the hub with crown gear** and its position is locked with adjusting nut. Use a suitable lever to turn the adjusting bush and adjusting nut through holes in the half-axle shaft arm.
5. Check meshing of bevel gearing by marking the teeth. Apply the colour lead to teeth of crown gears and pinions via holes in the upper part of the housing and rotate the shaft of bevel gear pinions several times (using tool **PRM 3838**). Light the final drive-housing interior with a suitably screened lamp (via check holes in the upper part of the housing) and check the marking on tooth faces of crown gears.
6. First check the marking on the crown gear of the RH gearing (Fig. 7.172). In case that the mesh is incorrect (evaluate it according to a table) – move the pinion in mesh (+H) or out of mesh (-H) by a respective value by adding or removing the spacer washers under the bearing bushing to obtain a correct mesh. After each adjustment, check the backlash in the whole gearing of the axle final drive (**0.3 ± 0.5 mm**).
7. Dismount nuts with technological spacers from pinion bushings.
8. Install good protective bags. Apply the sealant to bag contact surfaces on the screwed connection and to axle contact surfaces under both wire sleeves (before applying the sealant, clean and degrease the contact surfaces properly).

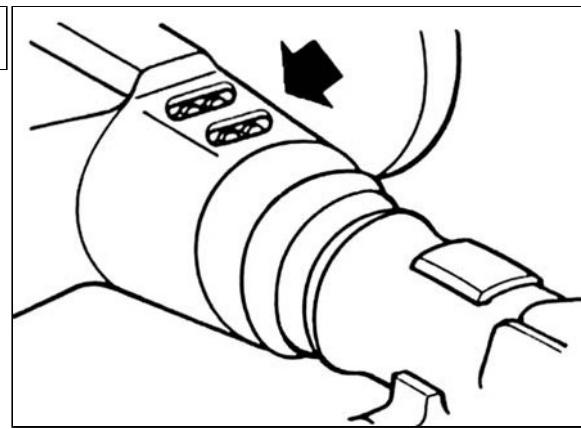


Fig. 7.173 Crown gear adjusting bushing and nut



9. After a correct adjustment of the RH gearing mesh, check the mesh of the **crown gear of the LH gearing** in the same way as in points 4 and 5. If the marking on the crown gear indicates a correct mesh (evaluate it according to (Fig. 7.175) and if the backlash is in the prescribed tolerance, tighten adjusting nuts on both half-axles and lock by turning the safety pins 1. Lock the pin screws with iron plates. Tighten fastening bolts of pinion bushings to the torque of **75 ± 8 Nm**.
10. Fill the final drive housing with oil after adjustment.

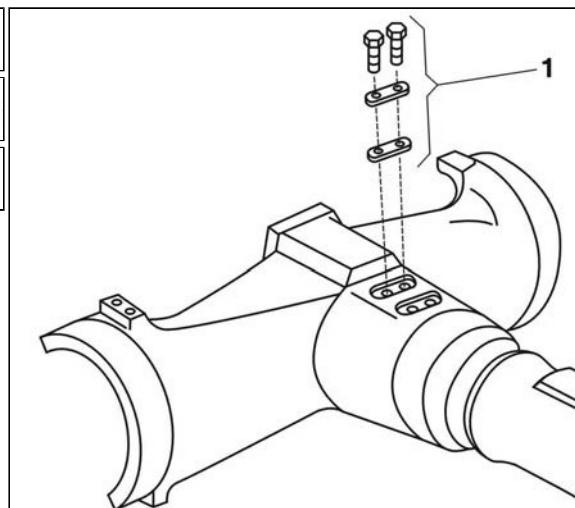
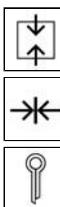


Fig. 7.174 Lock elements of adjusting bushing and nut – installation



7.5.17 Disassembly and Assembly of the Propeller Shaft

a) Reason for Disassembly

1. Damaged propeller shaft

b) Technical Conditions

1. The cardan spiders axial clearance should be **0.1 mm** as a maximum.
2. Fill the space among edges of bush seals with the plastic lubricant **AK2** along the whole circumference before installation.
3. Mount needles of the same classification group.

c) Disassembly Procedure

1. Unscrew the lubricating nipple **3** from bush **5** and plug **17** from bush **15**.
2. Remove inner circlips **9** and **16** from the cardan cross shaft **1**.
3. Mount an extractor **PRM 3339** of cardan spider bearings into bush **15** and use a universal extractor **PRM 3322** to press the bush **15** out of the cardan cross shaft **1**.
4. Force the bush **8** out of the cardan shaft **1**.
5. Withdraw the cardan cross shaft **1** from the spider **2**.
6. Take inner circlips **4** and **13** out of the middle part **10**.
7. Mount an extractor **PRM 3339** of cardan spider bearings into bush **5** and use a universal extractor **PRM 3322** to press the bush **5** out of the middle part **10**.
8. Press the bush **12** out of the middle part **10**.
9. Remove the cardan spider **2** from the middle part **10**.
10. Remove needle rollers **6**, **7**, **11** and **14** from bushes **5**, **8**, **12** and **15**.
11. Proceed in a similar manner on the side of the cardan driven shaft.

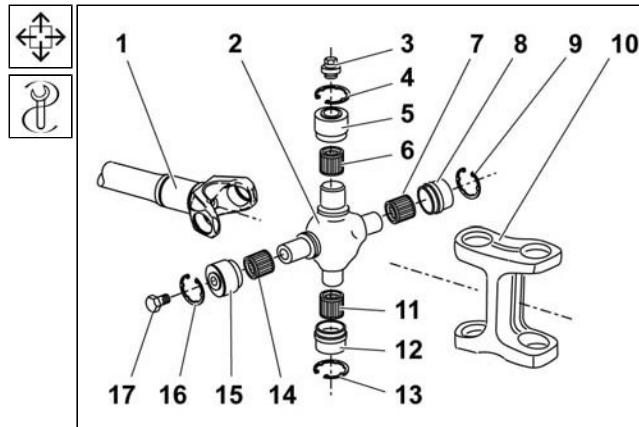


Fig. 7.175 Disassembly of propeller shaft

**d) Assembly Procedure**

1. Measure the distance **X** between outer edges of slots for circlips on the cardan cross shaft, cardan driven shaft and middle part.

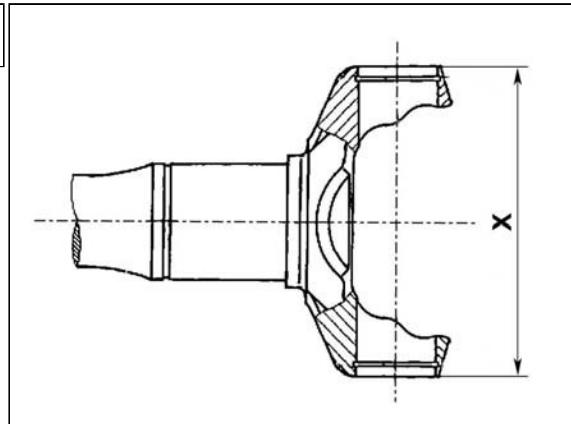


Fig. 7.176 Measurement of the distance X

2. Fit per 36 pcs of needle rollers **2** of the same classification group into bushes **1** smeared inside with the plastic lubricant **AK2**.

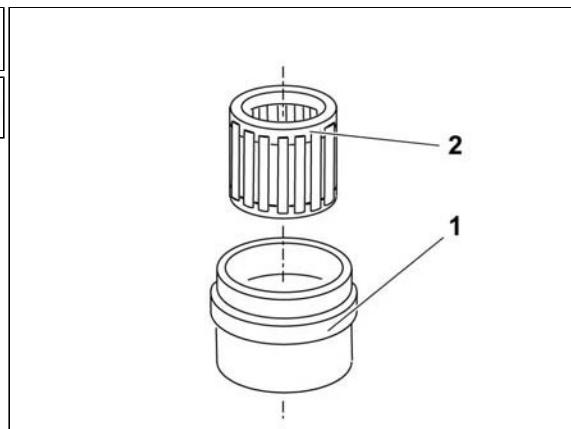
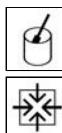


Fig. 7.177 Complete bush

3. Fit assembled bushes **1** onto cardan spider **2**.
4. Press the bushes applying a force of **400 N** from each side and measure the distance of **Y**.
5. Calculate the thickness of circlips out of the difference of values **X - Y** so that the axial clearance of spiders should be max. **0.1 mm**.

Note:

The circlips as SP are supplied in the following thicknesses: **1.75 mm ; 1.7 mm; 1.65 mm; 1.6 mm; 1.55 mm; 1.5 mm**.

6. Remove bushes **1** c/w needle rollers from the cardan spider **2** (be sure not to confuse them during reassembly).

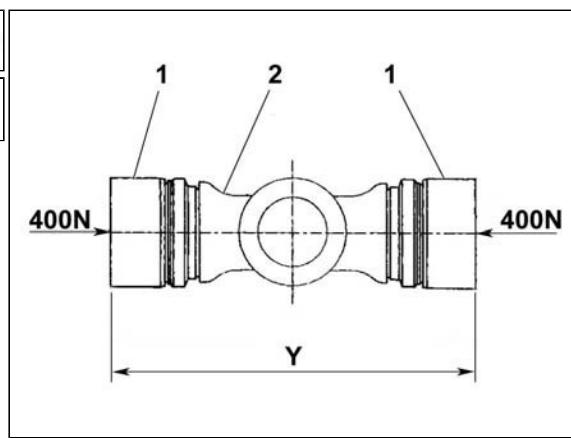


Fig. 7.178 Measurement of the distance Y



07 Axles



7. Fit the cardan spider **2** into holes of the middle part **8**.
8. Use a driver of cardan spider bearings **PRL 0766** to press the bushes **5**, **9** and secure them with inner circlips **4** and **10** of the necessary thickness.
9. Slide the cardan spider **2** into holes of the cardan cross shaft **1**.
10. Use an extractor of cardan spider bearings **PRL 0766** to press the bushes **6**, **11** and secure them with inner circlips **7** and **12** of the necessary thickness.
11. Install lubricating nipple **3** into bush **5** and plug **13** into bush **11**.
12. Proceed in a similar manner on the side of the cardan driven shaft.
13. Grease the propeller shaft via lubricating nipples **3** using the plastic lubricant **AK2** until the lubricant starts to escape beneath seal edges of bushes **5**, **6**, **9** and **11**.

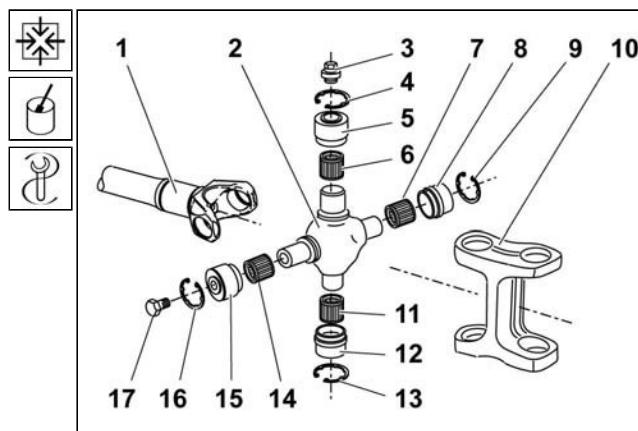


Fig. 7.179 Assembly of propeller shaft