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1. STEERING GEAR, GENERAL

1.1 GENERAL

Steering box

Maximum system pressure

175 + 5 bar,
see steering box type plate

Maximum system pressure for vehicles equipped with a 150N air-sprung front axle and a wheel base in excess of 5300 mm

150 + 10 bar
see steering box type plate

Circulation pressure

Maximum admissible circulation pressure of the steering mechanism at a steering oil temperature of 50°C

- Steering box THP 80 and THP 90
- Steering box THP 91
- Steering box THP 92

5 bar
10 bar
20 bar

Final limiting pressure

Final limiting pressure at a steering oil temperature of 50°C and an engine speed of 1200 - 1400 rpm

maximum 90 bar

Internal leakage in steering box

Maximum permissible internal leakage in the steering box

- steering box without slave cylinder
- steering box with slave cylinder

3.8 l/min.
5.7 l/min.

Internal play in steering box

Maximum admissible internal play of the steering box with a blocked pitman arm

4.5° on the input shaft

Dual-circuit steering system

Second circuit activation if main steering pump output

< 6 l/min.

Output indicator cut-in pressure, circuit 1

< 6 l/min.

Output indicator cut-in pressure, circuit 2

< 2-3 l/min.

Steering pump

CF65 vehicle series

ZF 7685

FAN vehicle version

LUK LF77

FAX vehicle version

LUK VT72A

Steering gear with slave cylinder

LUK VT77

Other

LUK VT77

0**Steering pump output**

Steering pump output at a steering oil temperature of 50°C, a pressure of 50 bar and an engine speed of 1200 - 1400 rpm

Steering pump ZF 7685	17.0 - 22.8 l/min.
Steering pump LUK LF77	22.5 - 30 l/min.
Steering pump LUK VT72A	12.6 - 16.8 l/min.
Steering pump LUK VT77 (steering gear with slave cylinder)	25.2 - 33.6 l/min.
Steering pump LUK VT77	17.0 - 22.8 l/min.

2. STEERING BOX

2.1 GENERAL

0

Steering box

Type	right-angled transmission automatic bleeding system, automatically adjustable wheel deflection limiting valves and pressure-limiting valve.
Type:	
THP 80	single circuit steering box. Application: front axle 150N/ 152N/156N.
THP 90	single circuit steering box. Application: front axle 182 and 186N.
THP 91	dual-circuit steering box without slave cylinder. Application: vehicles requiring emergency steering gear.
THP 92	dual-circuit steering box with slave cylinder. Application: vehicles requiring emergency steering gear and fitted with a slave cylinder.

The gear ratio depends on the vehicle type.

Wheel deflection limiting valve

Final limiting pressure at a steering oil
temperature of 50°C and an engine speed of
1200 - 1400 rpm

maximum 90 bar

Internal steering box resistance

Internal resistance outside the pressure point
(slip moment)

maximum 270 Ncm

Internal resistance increase in the pressure point

80 -120 Ncm

Pipe connections

Single-circuit steering box THP 90:

- Connection P
- Connection R
- Steering box connection, top
- Steering box connection, rear

delivery pipe
return pipe
slave cylinder, front⁽¹⁾
slave cylinder, rear⁽¹⁾

0

Dual-circuit steering box TAS 91 and TAS 92:

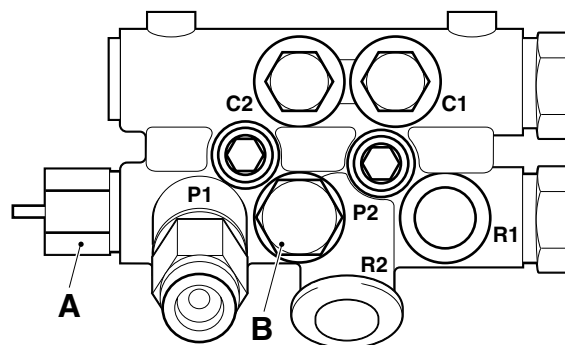
- Connection P1
- Connection P2
- Connection R1
- Connection R2
- Connection C1
- Connection C2

main steering pump delivery pipe
 emergency steering pump delivery pipe
 return pipe, circuit 1
 return pipe, circuit 2
 slave cylinder, front⁽¹⁾
 slave cylinder, rear⁽¹⁾

(1) Viewed as if in driving direction

Output indicators

- A Output indicator circuit 1
- B Output indicator circuit 2

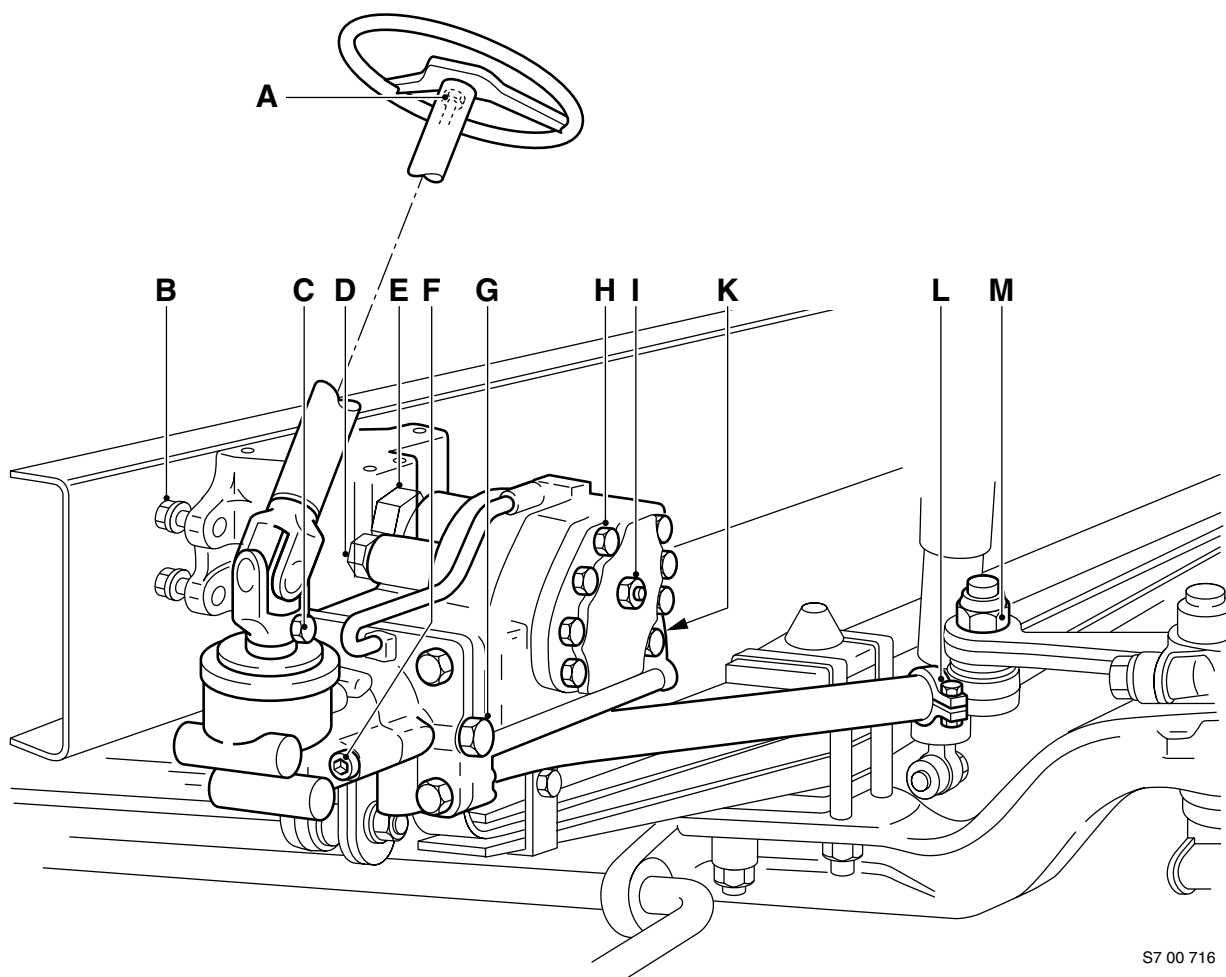


S7 00 409

2.2 TIGHTENING TORQUES

The tightening torques stated in this section are different from the standard tightening torques stated in the overview of the standard tightening torques. The other threaded connections not specified must therefore be tightened to the torque stated in the overview of standard tightening torques.

When attachment bolts and nuts are replaced, it is important that - unless stated otherwise - these bolts and nuts are of exactly the same length and property class as those removed.

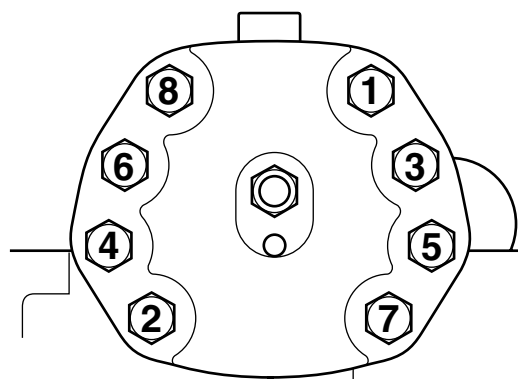


S7 00 716

A.	Steering wheel attachment nut	65 Nm
B.	Bolts for attaching the steering bracket to the chassis	260 Nm + 60° angular displacement
C.	Bolt, steering column universal joint	56 Nm ⁽¹⁾
D.	Bolts for attaching the steering box to the steering bracket	520 Nm + 90° angular displacement ⁽²⁾
E.	Pitman arm attachment nut	900 Nm
F.	Right-angle transmission bolts	65 Nm
G.	Pressure-limiting valve plug	41 Nm

0

- H. Steering box side cover attachment bolts 240 Nm
Tightening sequence of attachment bolts on the steering box side cover. See illustration.



S7 00 043

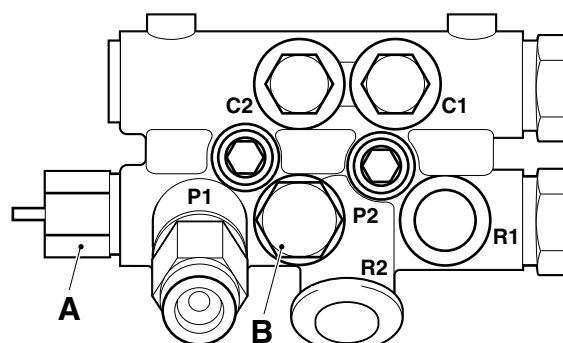
- I. Lock nut for pressure point adjusting bolt 70 Nm
K. Lock nut of wheel deflection limiting valve adjusting bolt 55 Nm
L. Attachment bolt, steering rod clamping bracket
- if M10 47 Nm⁽³⁾
- if M12 80 Nm⁽³⁾
M. Steering rod nut
- if M20 castle nut 225 Nm⁽⁴⁾
- if M24 castle nut 285 Nm⁽⁴⁾
- if self-locking M20 nut 225 Nm⁽⁵⁾
- if self-locking M24 nut 285 Nm⁽⁵⁾

- (1) Fit new original locating bolt and self-locking nut.
(2) Only fit new attachment bolts.
(3) Fit new self-locking nut.
(4) Tighten until the split pin fits (max. 60°). It is not allowed to fit a self-locking nut instead of a castle nut.
(5) Check the ball end thread for damage before fitting a new self-locking nut.
To do so, hand-tighten a non-self-locking nut on the ball joint to be checked.
If the new nut cannot be fully hand-screwed onto the entire thread, the ball end must be replaced.
Fit new self-locking nut. Apply Loctite 243 to the nut.



Fitting a new self-locking nut to a ball end with a damaged thread may lead to dangerous situations.

- A. Output indicator circuit 1 50 Nm
B. Output indicator circuit 2 (banjo bolt) 50 Nm



S7 00 409

3. STEERING PUMP

3.1 GENERAL

0

Main steering pump

Type	vane pump
Maximum pressure (Pump is not equipped with pressure limiting valve.)	see steering box type plate
Type:	
VT72A	85 series, FAX model
VT77	75 and 85 series
LF77	75 and 85 series FAN model
ZF 7685	65 series

Emergency steering pump

Type	radial plunger pump
Type	ZF 8604
Maximum pressure	see steering box type plate
Setting of peak pressure limiting valve	200 bar
Output of emergency steering pump at a steering oil temperature of 50°C and a pressure of 50 bar	16 l/min.

3.2 TIGHTENING TORQUES

The tightening torques stated in this section are different from the standard tightening torques stated in the overview of the standard tightening torques. The other threaded connections not specified must therefore be tightened to the torque stated in the overview of standard tightening torques.

When attachment bolts and nuts are replaced, it is important that - unless stated otherwise - these bolts and nuts are of exactly the same length and property class as those removed.

Steering pump LUK VT72A

Pipe connection in the pump, delivery side	50 Nm
Pipe connection in the pump, intake side	100 Nm
Flow control valve plug	80 Nm
Attachment bolts, steering pump	60 Nm

Steering pump LUK VT77 and LF77

Drive sprocket attachment nut	80 Nm ⁽¹⁾
Pipe connection in the pump, delivery side	40 Nm
Pipe connection in the pump, intake side	90 Nm
Flow control valve plug	80 Nm
Attachment bolts, steering pump	60 Nm

(1) Apply Loctite 243 to the nut.

Steering pump ZF 7685

Pipe connection in the pump, delivery side	50 Nm
Pipe connection in the pump, intake side	75 Nm
Flow control valve plug	65 Nm
Attachment bolts, steering pump	60 Nm

Emergency steering pump

Emergency steering pump attachment bolts	80 Nm ⁽¹⁾
Drive sprocket attachment nut	60 Nm ⁽¹⁾

(1) Apply Loctite 243 to the nut.

4. PIPES/RESERVOIR AND SLAVE CYLINDER

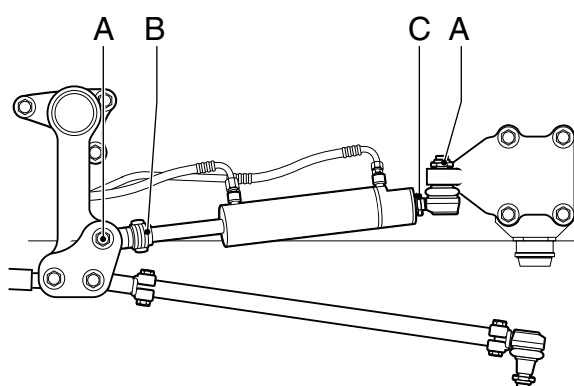
4.1 TIGHTENING TORQUES

The tightening torques stated in this section are different from the standard tightening torques stated in the overview of the standard tightening torques. The other threaded connections not specified must therefore be tightened to the torque stated in the overview of standard tightening torques.

When attachment bolts and nuts are replaced, it is important that - unless stated otherwise - these bolts and nuts are of exactly the same length and property class as those removed.

- | | | |
|----|----------------------------------|-----------------------|
| A. | Ball end nut | |
| - | if M24 castle nut | 285 Nm ⁽¹⁾ |
| - | if self-locking M24 nut | 285 Nm ⁽²⁾ |
| B. | Attachment bolt clamping bracket | |
| - | if M10 | 47 Nm ⁽³⁾ |
| - | if M12 | 80 Nm ⁽³⁾ |
| C. | Cylinder lock nut | 225 Nm |

- (1) Tighten until the split pin fits (max. 60°). It is not allowed to fit a self-locking nut instead of a castle nut.
- (2) Check the ball end thread for damage before fitting a new self-locking nut.
To do so, hand-tighten a non-self-locking nut on the ball joint to be checked.
If the new nut cannot be fully hand-screwed onto the entire thread, the ball end must be replaced.
Fit new self-locking nut. Apply Loctite 243 to the nut.
- (3) Fit new self-locking nut.



S7 00 719



Fitting a new self-locking nut to a ball end with a damaged thread may lead to dangerous situations.

5. FRONT AXLE AND LEADING REAR AXLE

5.1 GENERAL

Front axles

Type:

- 150N load capacity 7500 kg
- 152N load capacity 7500 kg
- 156N load capacity 7500 kg
- 182N load capacity 9000 kg
- 186N load capacity 9000 kg

Wheel speed sensor

Anti-corrosion agent

Molykote P37

Steering rod arm

Abutting surface of steering rod arm to swivel axle treated with

Loctite 2701

Wheel hub unit

Axle journal for installing the wheel hub unit treated with

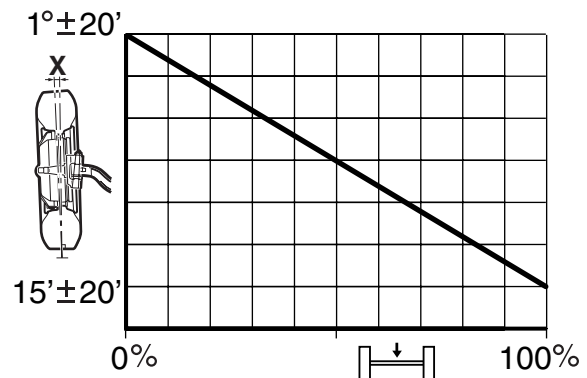
Gleitmo 805 anti-corrosion agent

Camber angle

Camber angle (X) depends on the axle load.

0% axle load is the situation in which the axle is not fitted underneath the vehicle.

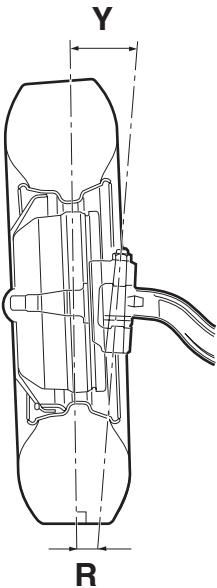
100% axle load is the situation in which the maximum allowable load capacity of the axle is reached.



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King-pin inclination



S700933

The value stated for the king-pin inclination (Y) belongs to the situation in which the axle is not fitted underneath the vehicle.

7°30'

Maximum inner wheel deflection

FRONT AXLE TYPE: 150N		
Vehicle type	Tyre size	Inner wheel deflection
FT, FA, FAN, FAS/R	All	49°

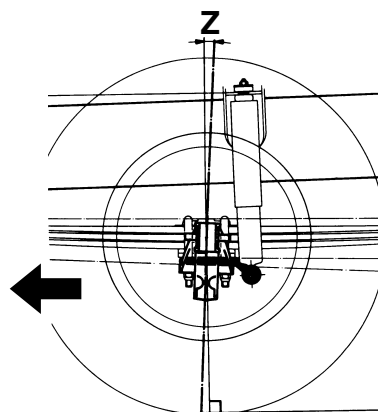
FRONT AXLE TYPE: 152N/156N		
Vehicle type	Tyre size	Inner wheel deflection
FT, FA, FAN, FAS/R, FTP, FTT, FAT	12.00 R24	43°
	Other	49°
FTG, FAG	All	43°
FAC, FAD, FAX, FAL	12.00 R24	38°
	385/65 R22.5	41°
	Other	43°

FRONT AXLE TYPE: 182N/186N		
Vehicle type	Tyre size	Inner wheel deflection
FT, FA, FAN, FAS/R, FTT, FAT	12.00 R24	43°
	Other	49°
FTG, FAG	All	43°

FRONT AXLE TYPE: 182N/186N		
Vehicle type	Tyre size	Inner wheel deflection
FAC, FAD, FAX, FAL	12.00 R24	38°
	Other	43°

Caster

Z = caster



S7 00 423

Vehicle type/version

FAG/FTG

FAD/FAC/FAX/FAL

FAN

Other

Air-sprung front axle

first axle

2° or 3.5°⁽¹⁾

3.5°

2° or 3.5°⁽¹⁾2° or 3.5°⁽¹⁾

3 - 4°

second axle

0°

3.5°

2°

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(1) 3.5° from production date >2002-41

Toe

The toe is shown in a graph. For the 152N and 186N there is one more subdivision made on the basis of axle configuration. For the other axles, no differentiation in axle configuration is made. In the case of these axles, the axle configuration does not influence the toe.

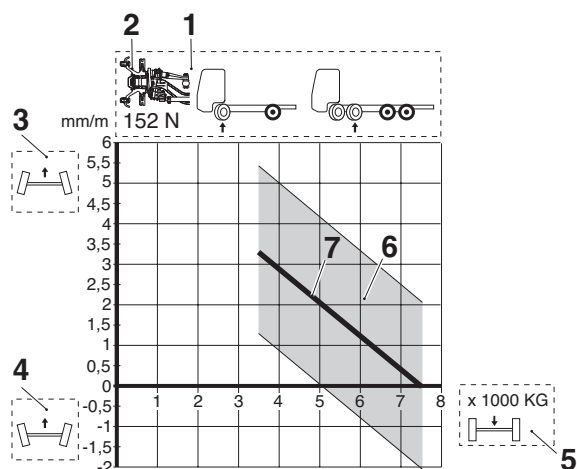
Note:

The graphs are constructed so that at 75% of the permissible loading weight, the toe has a value of 0.5 ± 1 mm/m toe-in. The axle load is made up of the unladen axle weight + loading weight.

0

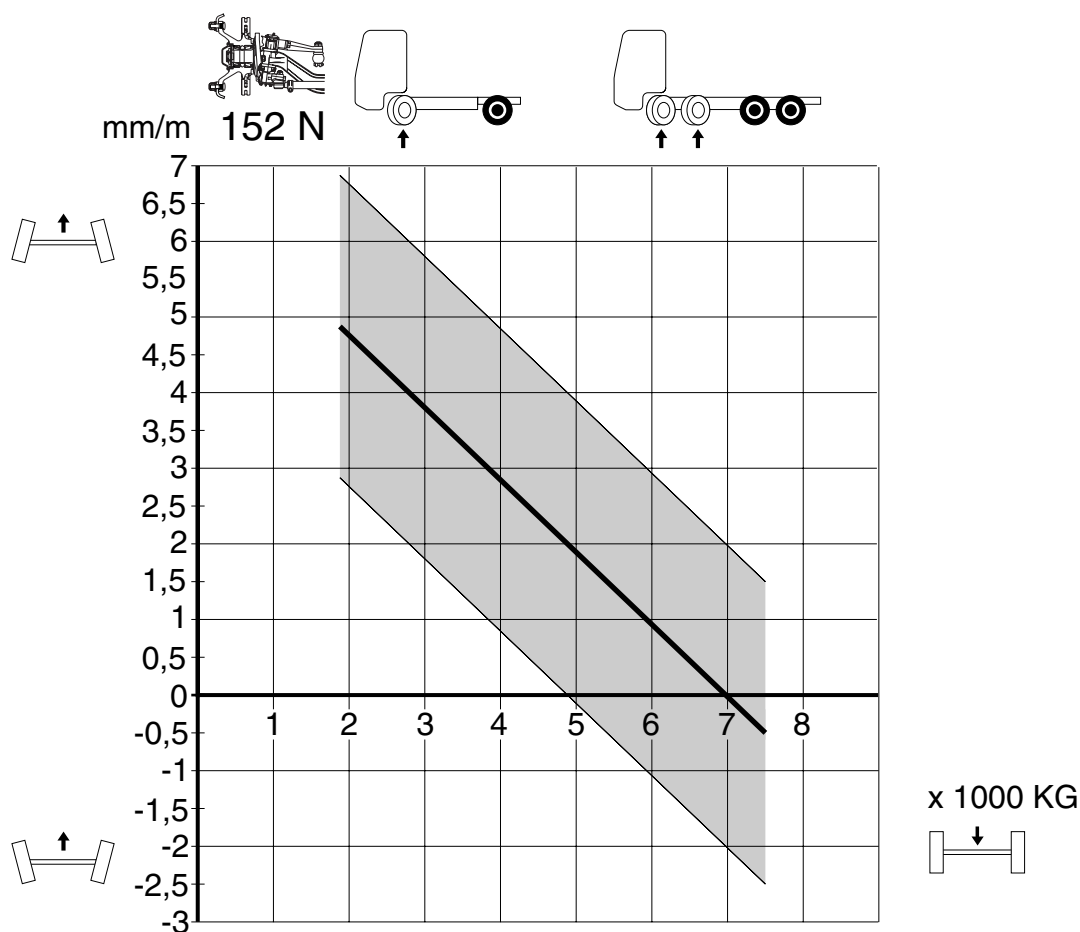
Graph explanation

1. At the top of the graph, the axle type is shown with axle configuration (1).
2. With some axles, a distinction is made between the disc brake version and the drum brake version. To this end there is an illustration (2) of a disc brake or a drum brake at the top of the graph.
3. On the left-hand side of the graph, the toe is shown in mm/m. The values above the 0 line show toe-in values, indicated by symbol (3). The values under the 0 line show toe-out values, indicated by symbol (4). The toe-out values are indicated by negative values.
4. At the bottom of the graph, the axle load (5) is shown.
5. The permitted toe at any axle load can be read from the shaded area (6) in the graph.
6. If the value measured lies outside the shaded area, the toe must be adjusted to the value indicated by the uninterrupted line (7).



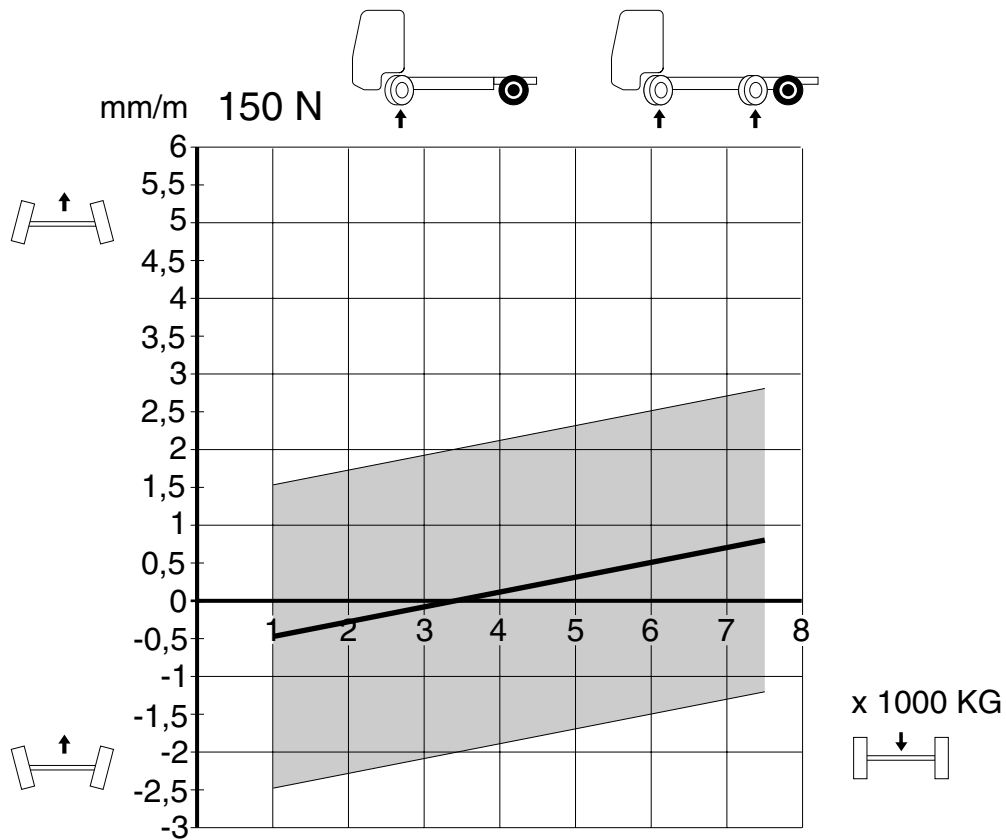
S700912

152N front axle toe, disc brake version



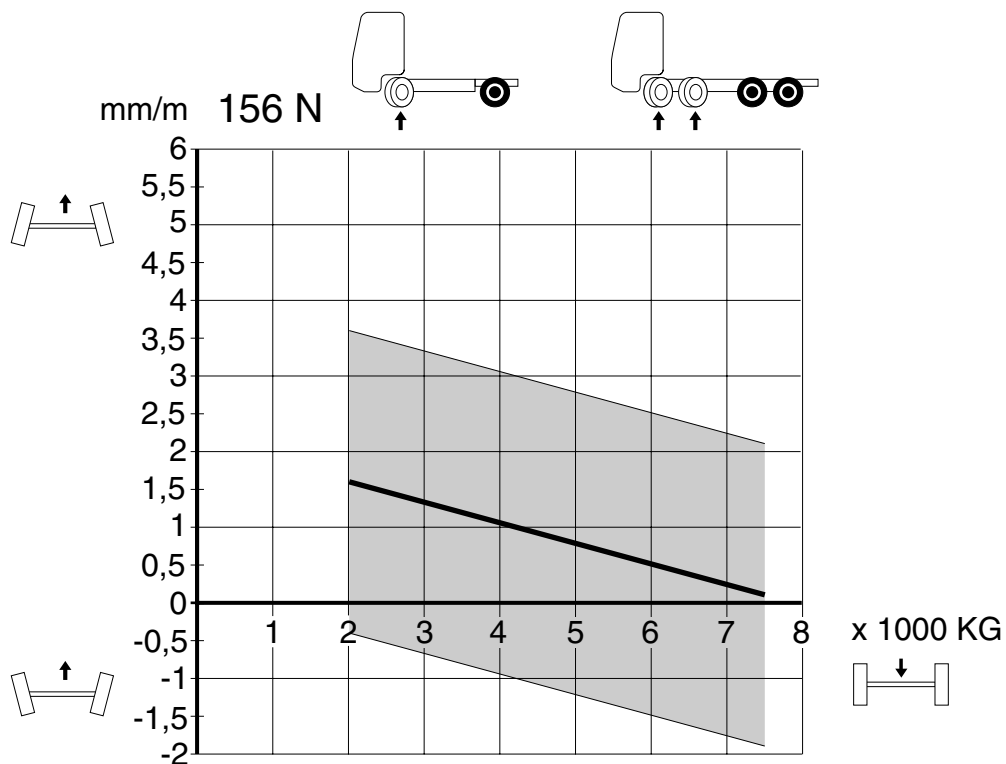
S7 00 905

150N front axle toe



S7 00 899

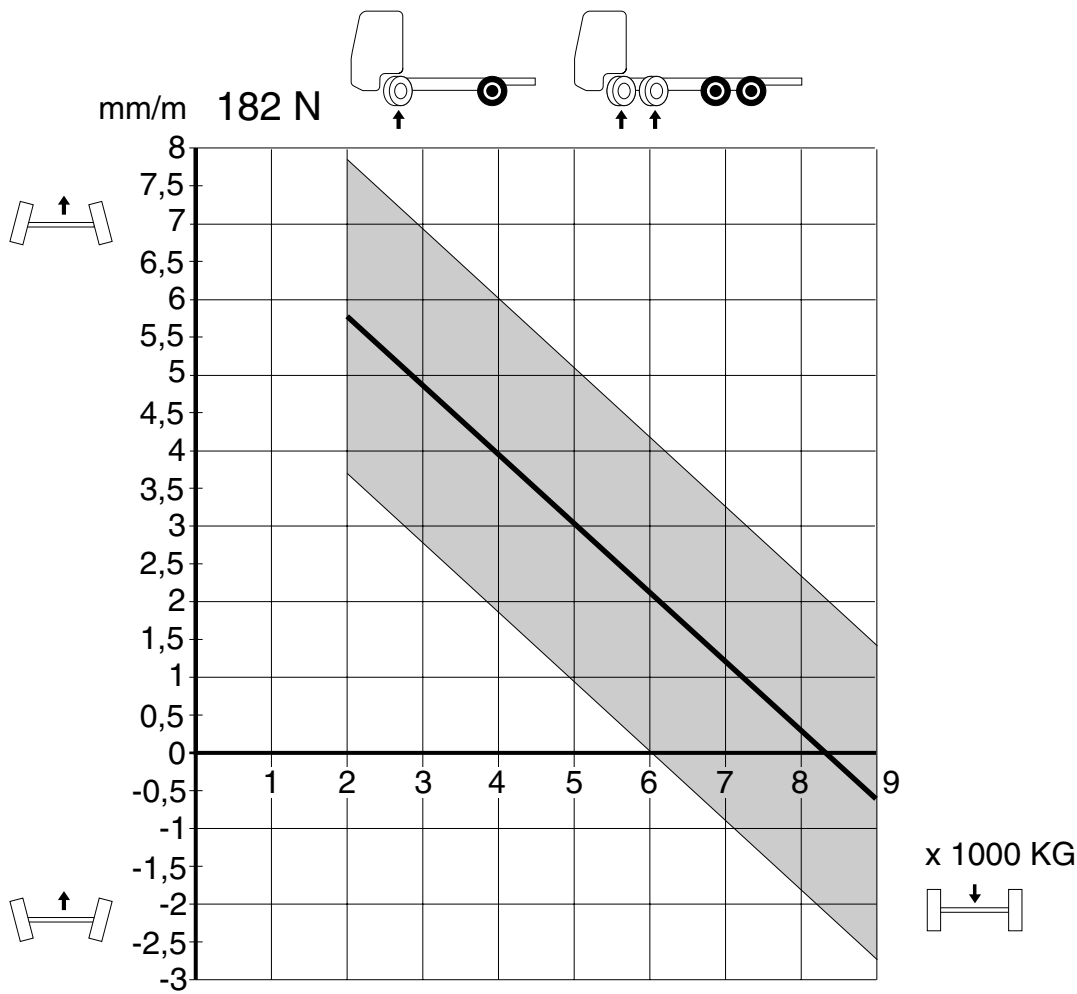
156N front axle toe



S7 00 900

0

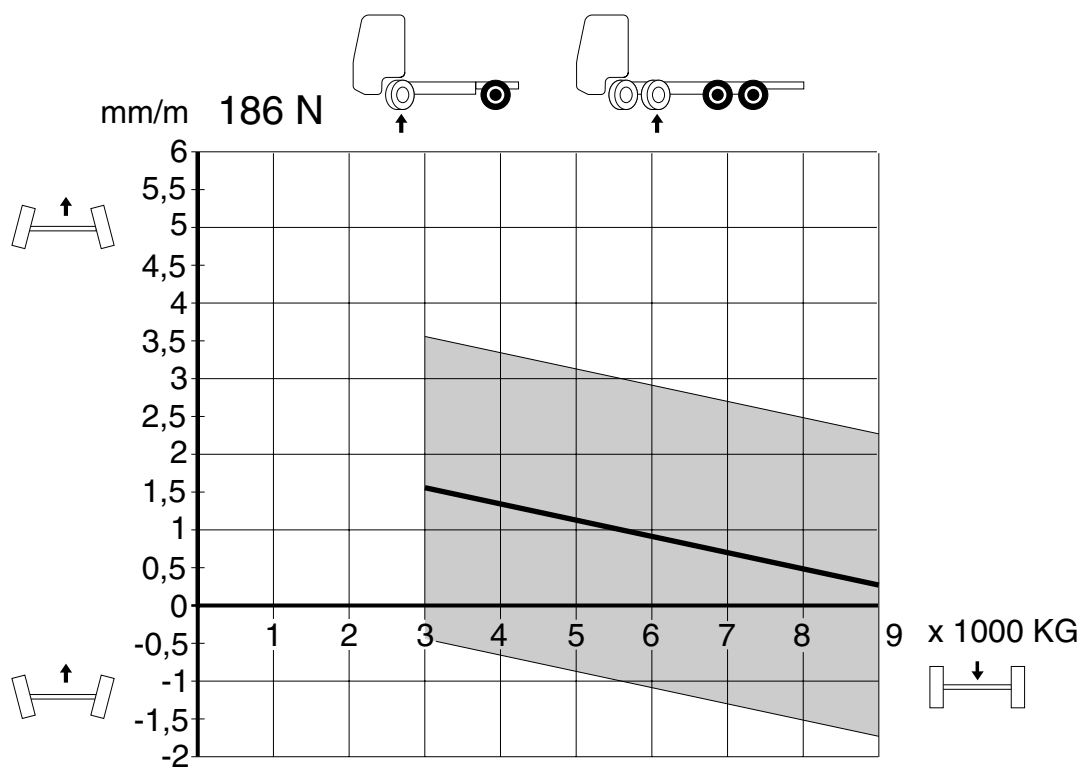
182N front axle toe



S7 00 901

186N front axle toe, configured as a single front axle or second front axle in the case of two steered front axles

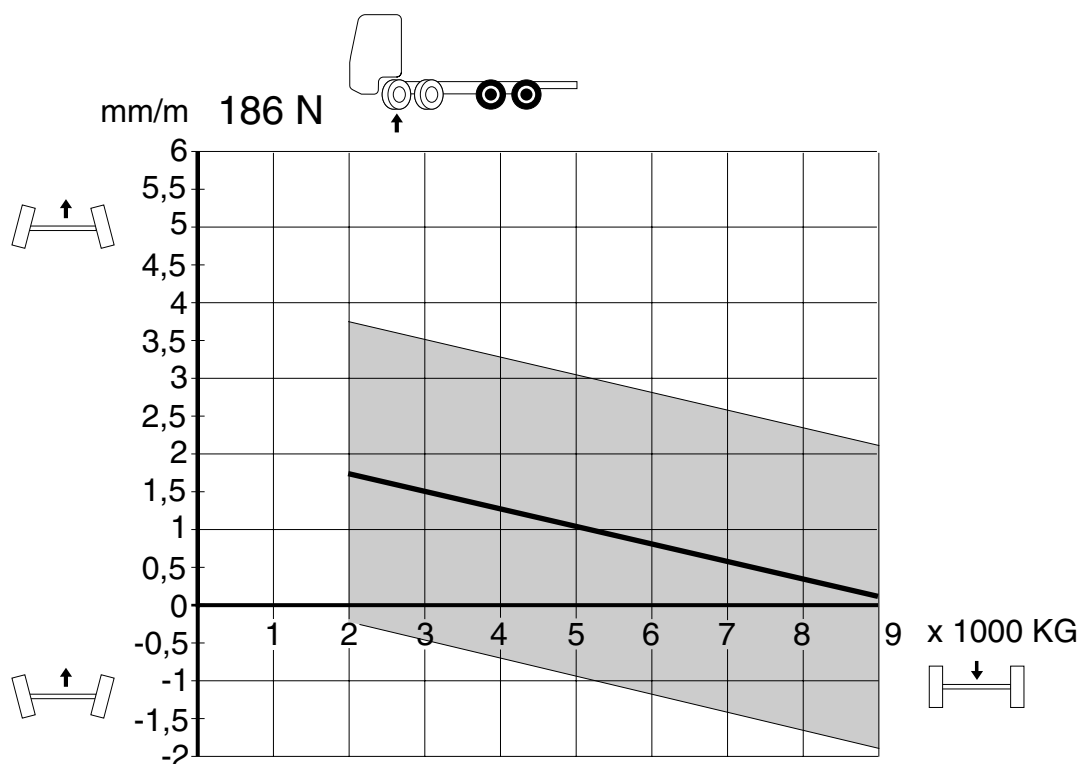
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S7 00 902

0

186N front axle toe, configured as a first front axle
in the case of two steered front axles



S7 00 903

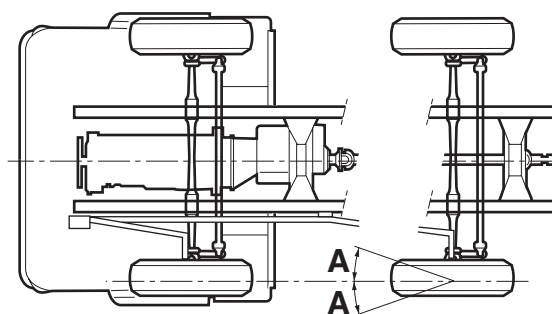
Alignment of steerable axles

Deviation in driving direction of the wheel of the second front axle or leading rear axle in relation to the front axle wheel:

- check value ± 3 mm/m (angles A)
- setting value ± 1 mm/m (angles A)

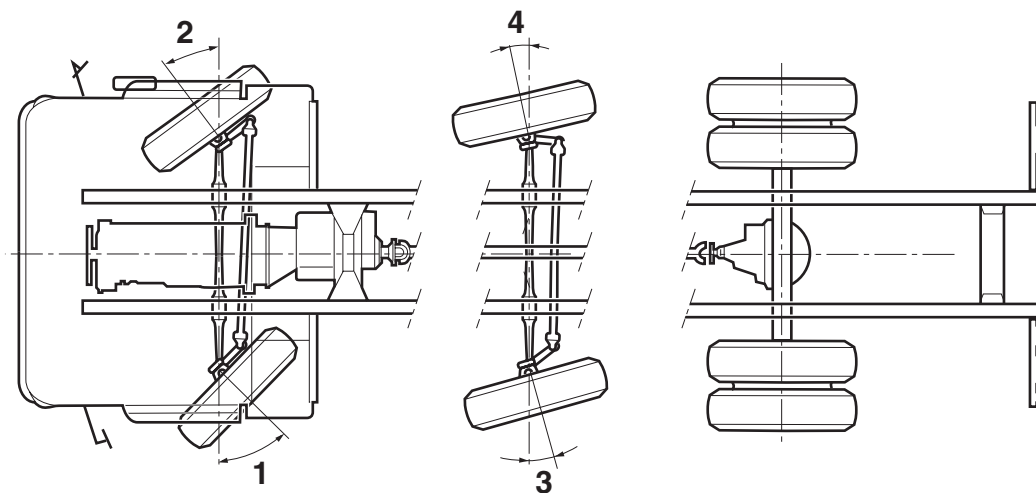
Measured on the left-hand wheels on an LHD vehicle.

Measured on the right-hand wheels on an RHD vehicle.



S700138

Check values for toe-out



S7 00 124

Single front axle:

Front axle	Wheel base	Wheel 1	Wheel 2
150N	≤ 4.40 m	30°	25°
150N	> 4.40 m	30°	25°
152N	≤ 4.40 m	30°	25°
152N	> 4.40 m	30°	26°
156N	≤ 4.40 m	30°	25°
156N	> 4.40 m	30°	26°
182N	≤ 4.50 m	30°	25°
182N	> 4.50 m	30°	26°
186N	≤ 4.50 m	30°	25°
186N	> 4.50 m	30°	26°

A 1° tolerance applies to the distortion of wheel 2

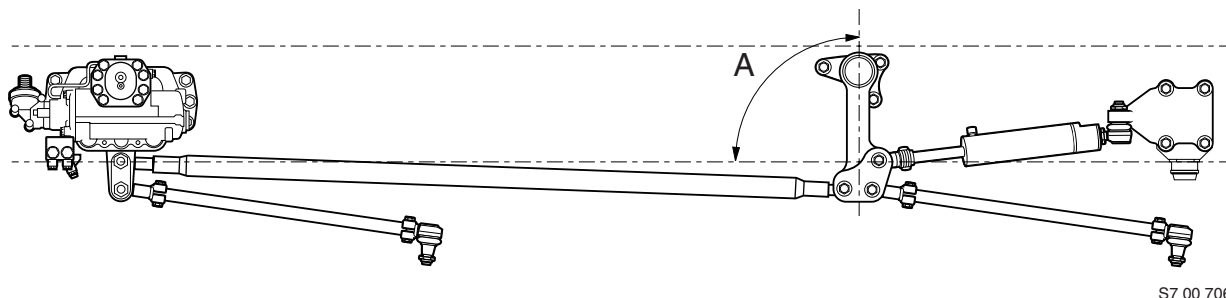
Dual front axle/leading rear axle:

Type	Wheel base	Wheel 1	Wheel 2	Wheel 3	Wheel 4
FTG	3.82 m	30°	25°	12°	9°
FAG	4.10 m	30°	25°	12°	9°
FAG	4.60 m	30°	26°	10°	8°
FAG	5.20 m	30°	26°	8°	7°
FAG	5.75 m	30°	26°	8°	7°
FAG	6.50 m	30°	26°	7°	6°
FAD/FAC/FAL	4.30 m	30°	26°	21°	19°
FAX	4.60 m	30°	26°	21°	19°
FAD/FAC/FAX/FAL	5.00 m	30°	26°	21°	19°
FAD/FAC/FAX/FAL	5.70 m	30°	26°	22°	20°
FAD/FAC/FAX/FAL	6.40 m	30°	26°	24°	21°
FAD/FAC/FAL	7.10 m	30°	26°	24°	21°

A 1° tolerance applies to the distortion of wheels 2, 3 and 4.

0

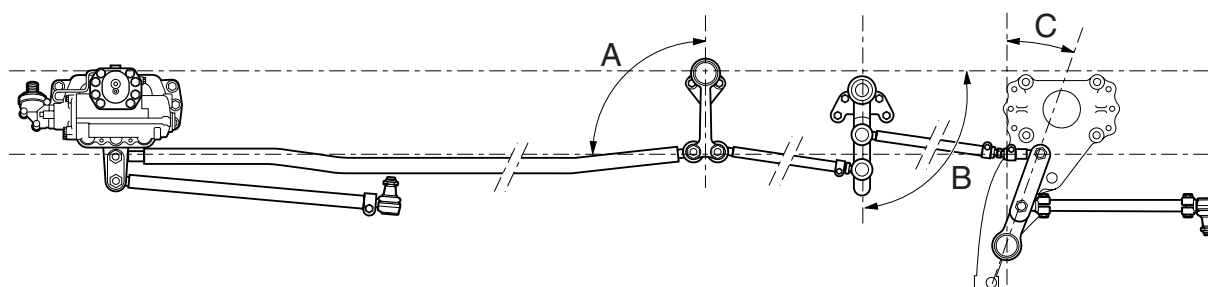
Angle of idler arm FAC/FAD/FAX/FAL



S7 00 706

Angle A: 90°

Angle of idler arms FAG/FTG

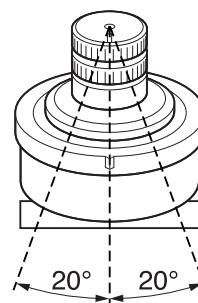


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Angle A: 90°
Angle B: 90°
Angle C: 20° ± 1.5°

Permitted tolerance, steering box input shaft

Test with steering gear in the central position.
Permitted tolerance of the input shaft of the steering box relative to the marking: 20°.



S7 00 860

Steering ball joints

Axial play maximum 1.5 mm

Swivel axle

Axial play 0.05 - 0.3 mm

Overview of shim thickness for adjustment of swivel axle pay

1.50 mm
1.75 mm
1.88 mm
2.00 mm
2.13 mm
2.25 mm
2.38 mm

CF65/75/85 series**Front axle and leading rear axle**

Front axle needle bearing pressing-in depth

150N, 152N and 156N

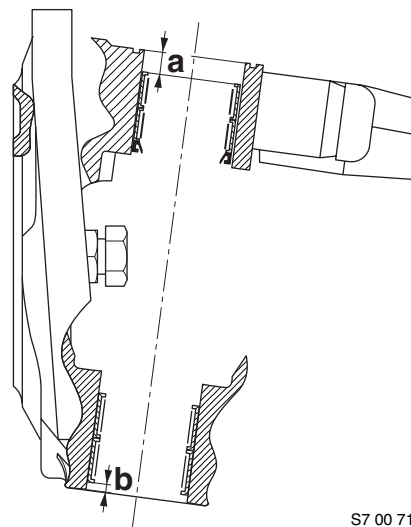
dimension a: 12 - 13 mm

dimension b: 3 - 4 mm

182N and 186N

dimension a: 15 - 16 mm

dimension b: 6 - 7 mm

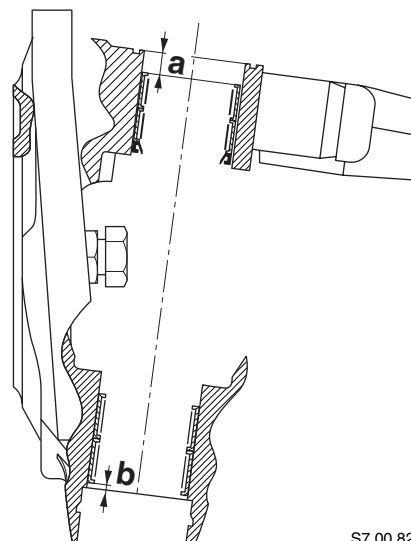


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Leading rear axle needle bearing pressing-in depth

dimension a: 12 - 13 mm

dimension b: 3 - 4 mm



S7 00 822

Wheel speed sensor ring

Lateral run-out

maximum 0.25 mm

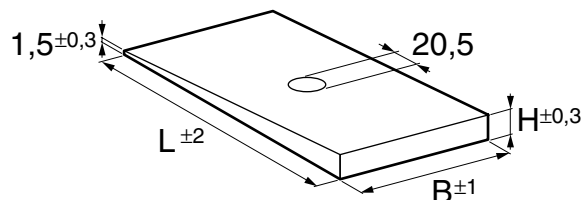
Idler arm

Axial bearing play

0 - 0.05 mm

Overview of available keys

Key angle	B ⁽¹⁾	L	H
0.5°	78	155	2.85
1°	78	155	4.20
1.5°	78	155	5.55
2°	78	155	6.91
2.5°	78	155	8.26
3°	78	155	9.62



S7 00 107

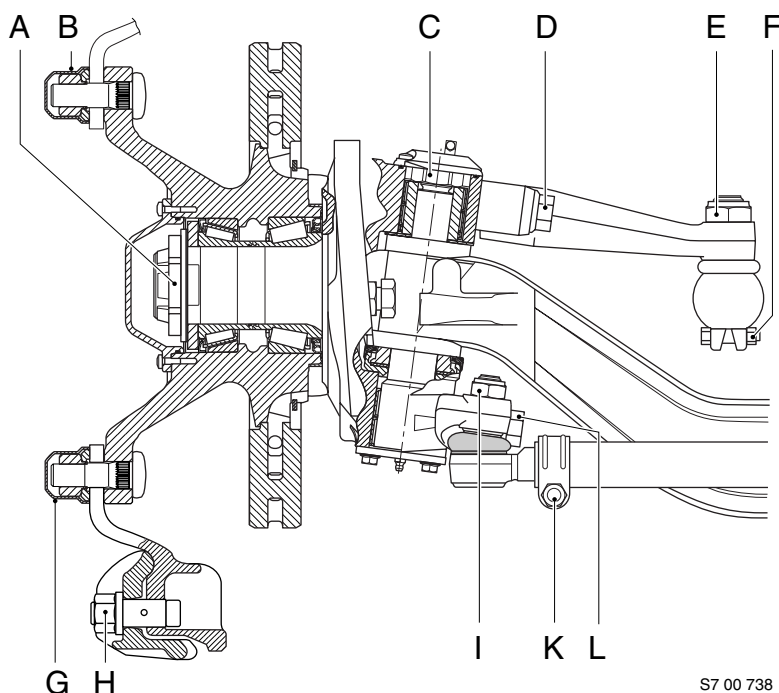
(1) Spring-blade width

0

5.2 TIGHTENING TORQUES

The tightening torques stated in this section are different from the standard tightening torques stated in the overview of the standard tightening torques. The other threaded connections not specified must therefore be tightened to the torque stated in the overview of standard tightening torques.

When attachment bolts and nuts are replaced, it is important that - unless stated otherwise - these bolts and nuts are of exactly the same length and property class as those removed.



S7 00 738

- | | | |
|----|--|--|
| A. | Wheel hub unit lock nut | |
| - | 1 st phase | 400 Nm ⁽¹⁾ |
| - | 2 nd phase | turn the hub through 10 rotations ⁽²⁾ |
| - | 3 rd phase | 450 Nm |
| - | 4 th phase | turn the hub through 10 rotations ⁽²⁾ |
| - | 5 th phase, for 150N, 152N and 156N | 950 Nm |
| - | 5 th phase, for 182N and 186N | 1000 Nm |
| B. | Wheel nut | 700 Nm ⁽³⁾ |
| C. | King pin nut | |
| - | if M27 (150N/152N/156N) | 595 Nm ⁽⁴⁾ |
| - | if M33 (182N/186N) | 660 Nm ⁽⁴⁾ |
| D. | Steering rod arm bolt | 500 Nm + 90° angular displacement ⁽⁵⁾ |
| E. | Steering rod attachment nut | |
| - | if M20 castle nut | 225 Nm ⁽⁶⁾ |
| - | if M24 castle nut | 285 Nm ⁽⁶⁾ |
| - | if self-locking M20 nut | 225 Nm ⁽⁷⁾ |
| - | if self-locking M24 nut | 285 Nm ⁽⁷⁾ |

F.	Bolt, steering rod clamping bracket	
-	if M10	47 Nm ⁽⁸⁾
-	if M12	80 Nm ⁽⁸⁾
G.	Nut, Trilex assembly ring	700 Nm ⁽³⁾
H.	M20 nut (Trilex/Tublex wheel)	335 Nm ⁽³⁾
I.	Track rod attachment nut M20	225 Nm ⁽⁷⁾
K.	Bolt, track rod clamping bracket	
-	if M12	80 Nm ⁽⁸⁾
-	if M14	170 Nm ⁽⁸⁾
L.	Track rod arm bolt	500 Nm + 90° angular displacement ⁽⁵⁾

(1) Fit new hub nut.

(2) Rotate the hub at a rotational speed of approx. 40 rpm.

(3) Retorque after 100 km; if new wheel studs have been fitted, the wheels need additional retorquing after 500 km.

(4) Apply Loctite 243 to the nut.

(5) Fit new bolt. Apply Loctite 243 to the bolt.

(6) Tighten until the split pin fits (max. 60°). It is not allowed to fit a self-locking nut instead of a castle nut.

(7) Check the ball end thread for damage before fitting a new self-locking nut.

To do so, hand-tighten a non-self-locking nut on the ball joint to be checked.

If the new nut cannot be fully hand-screwed onto the entire thread, the ball end must be replaced.

Fit new self-locking nut. Apply Loctite 243 to the nut.

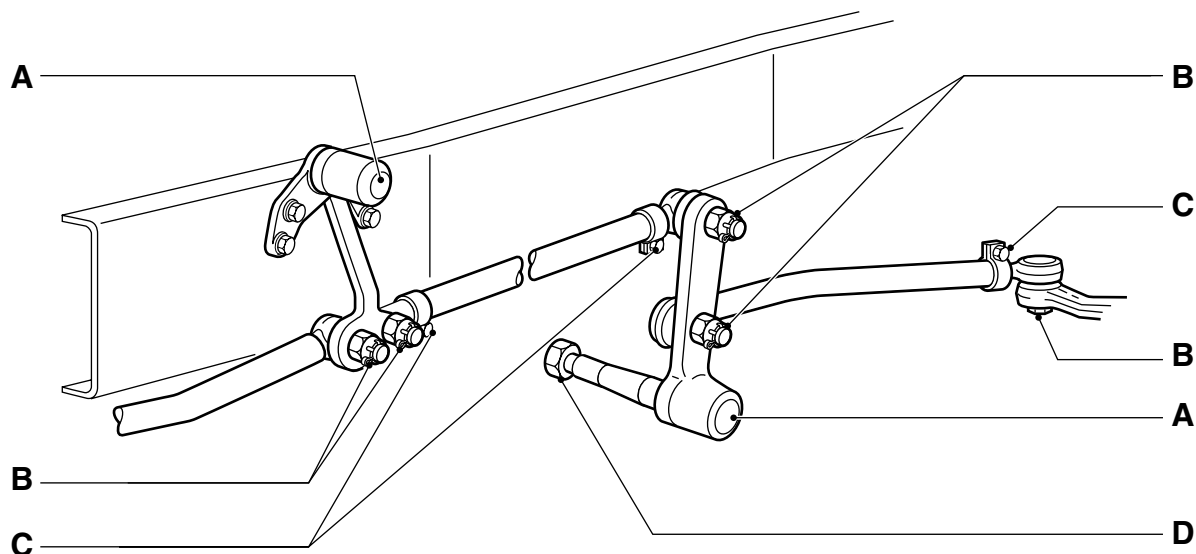
(8) Fit new self-locking nut.



Fitting a new self-locking nut to a ball end with a damaged thread may lead to dangerous situations.

0

Steering rods FAG/FTG



S7 00 154

- | | | |
|----|-------------------------------------|-----------------------|
| A. | Idler arm lock nut | 185 Nm |
| B. | Steering rod attachment nut | |
| | - if M20 castle nut | 225 Nm ⁽¹⁾ |
| | - if M24 castle nut | 285 Nm ⁽¹⁾ |
| | - if self-locking M20 nut | 225 Nm ⁽²⁾ |
| | - if self-locking M24 nut | 285 Nm ⁽²⁾ |
| C. | Bolt, steering rod clamping bracket | |
| | - if M10 | 47 Nm ⁽³⁾ |
| | - if M12 | 80 Nm ⁽³⁾ |
| D. | Nut, idler arm attachment | 750 Nm |

(1) Tighten until the split pin fits (max. 60°). It is not allowed to fit a self-locking nut instead of a castle nut.

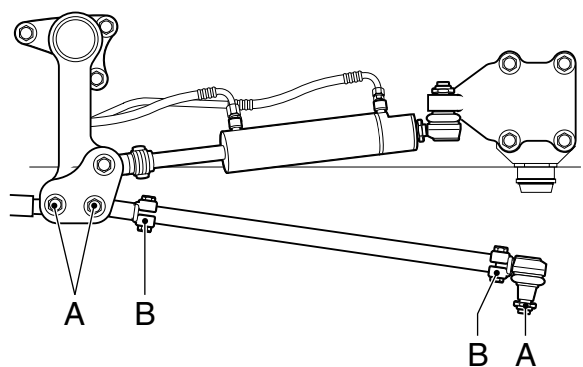
(2) Check the ball end thread for damage before fitting a new self-locking nut.
To do so, hand-tighten a non-self-locking nut on the ball joint to be checked.
If the new nut cannot be fully hand-screwed onto the entire thread, the ball end must be replaced.
Fit new self-locking nut. Apply Loctite 243 to the nut.

(3) Fit new self-locking nut.



Fitting a new self-locking nut to a ball end with a damaged thread may lead to dangerous situations.

Steering rods FAD/FAC/FAX/FAL



- | | | |
|----|-------------------------------------|-----------------------|
| A. | Steering rod attachment nut | |
| - | if M20 castle nut | 225 Nm ⁽¹⁾ |
| - | if M24 castle nut | 285 Nm ⁽¹⁾ |
| - | if self-locking M20 nut | 225 Nm ⁽²⁾ |
| - | if self-locking M24 nut | 285 Nm ⁽²⁾ |
| B. | Bolt, steering rod clamping bracket | |
| - | if M10 | 47 Nm ⁽³⁾ |
| - | if M12 | 80 Nm ⁽³⁾ |

(1) Tighten until the split pin fits (max. 60°). It is not allowed to fit a self-locking nut instead of a castle nut.

(2) Check the ball end thread for damage before fitting a new self-locking nut.

To do so, hand-tighten a non-self-locking nut on the ball joint to be checked.

If the new nut cannot be fully hand-screwed onto the entire thread, the ball end must be replaced.

Fit new self-locking nut. Apply Loctite 243 to the nut.

(3) Fit new self-locking nut.



Fitting a new self-locking nut to a ball end with a damaged thread may lead to dangerous situations.

6. STEERED TRAILING SWIVEL AXLE

6.1 GENERAL

Type

- 09G075 load capacity 7500 kg

Cylinder attachment arm

Abutting surface of cylinder attachment arm to swivel axle treated with

Loctite 2701

Wheel hub unit

Axle journal for installing the wheel hub unit treated with

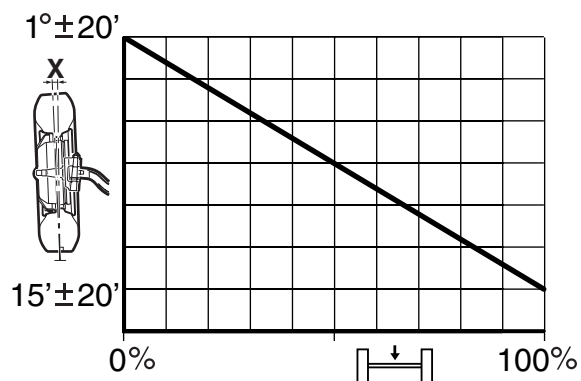
Gleitmo 805 anti-corrosion agent

Camber angle

Camber angle (X) depends on the axle load.

0% axle load when the axle is not fitted underneath the vehicle.

100% axle load with the maximum allowable loading capacity of the axle.

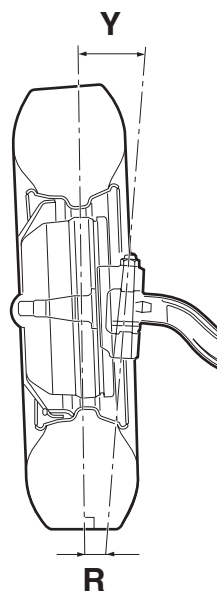


S700934

King-pin inclination

King-pin inclination (Y)

8°



S700933

0

Caster

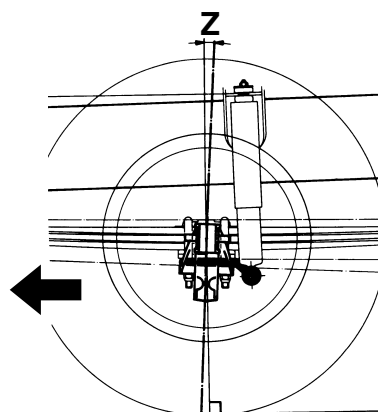
Caster (Z) 2.5°

Toe

The toe is shown in a graph.

Note:

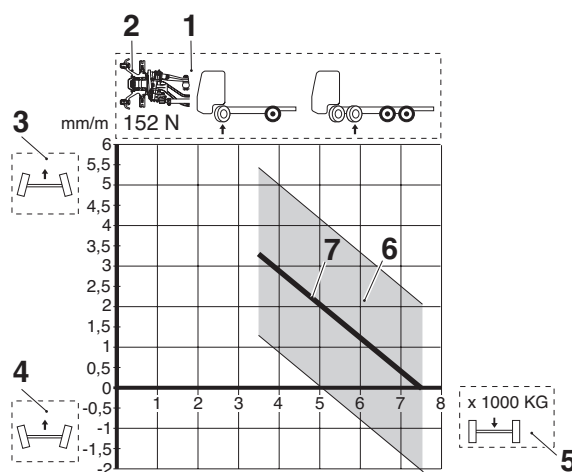
The graphs are constructed so that at 75% of the permissible loading weight, the toe has a value of 0.5 ± 1 mm/m toe-in. The axle load is made up of the unladen axle weight + loading weight.



S7 00 423

Graph explanation

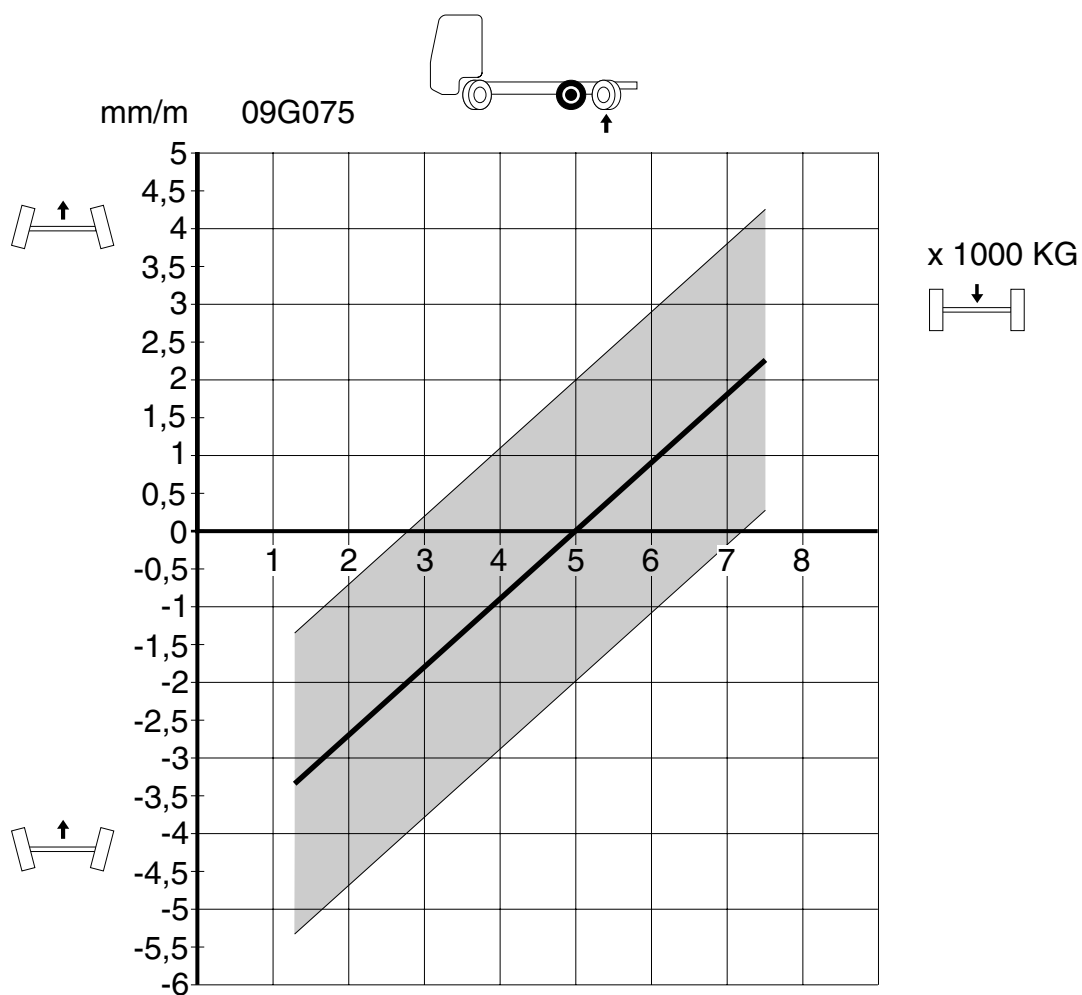
1. At the top of the graph, the axle type is shown with axle configuration (1).
2. With some axles, a distinction is made between the disc brake version and the drum brake version. To this end there is an illustration (2) of a disc brake or a drum brake at the top of the graph.
3. On the left-hand side of the graph, the toe is shown in mm/m. The values above the 0 line show toe-in values, indicated by symbol (3). The values under the 0 line show toe-out values, indicated by symbol (4). The toe-out values are indicated by negative values.
4. At the bottom of the graph, the axle load (5) is shown.
5. The permitted toe at any axle load can be read from the shaded area (6) in the graph.
6. If the value measured lies outside the shaded area, the toe must be adjusted to the value indicated by the uninterrupted line (7).



S700912

09G075-axle toe

0

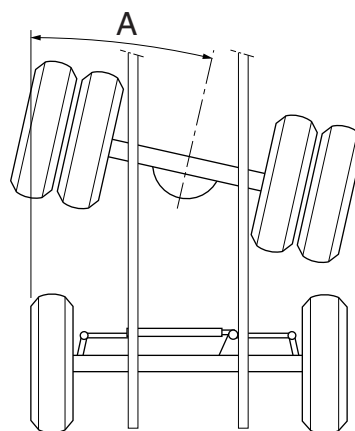


S7 00 896

Alignment

Permissible deviation on a trailing axle blocked in central position.

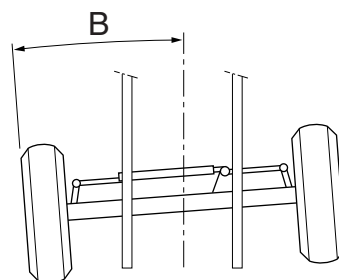
In relation to the driven axle:
2 mm/m maximum (angle A)



S7 00 725

0

In relation to the centre line of the vehicle:
4 mm/m maximum (angle B)



S7 00 727

Steering ball joints

axial play

maximum 1.5 mm

Swivel axle

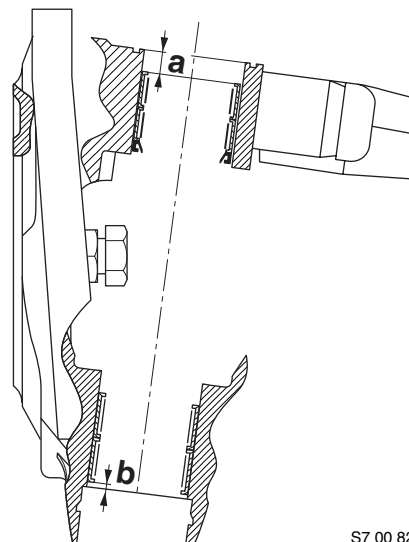
Axial play

0.05 - 0.3 mm

Overview of shim thickness for adjustment of
swivel axle pay

1.50 mm
1.75 mm
1.88 mm
2.00 mm
2.13 mm
2.25 mm
2.38 mm

Needle bearing pressing-in depth
dimension a: 12 - 13 mm
dimension b: 3 - 4 mm

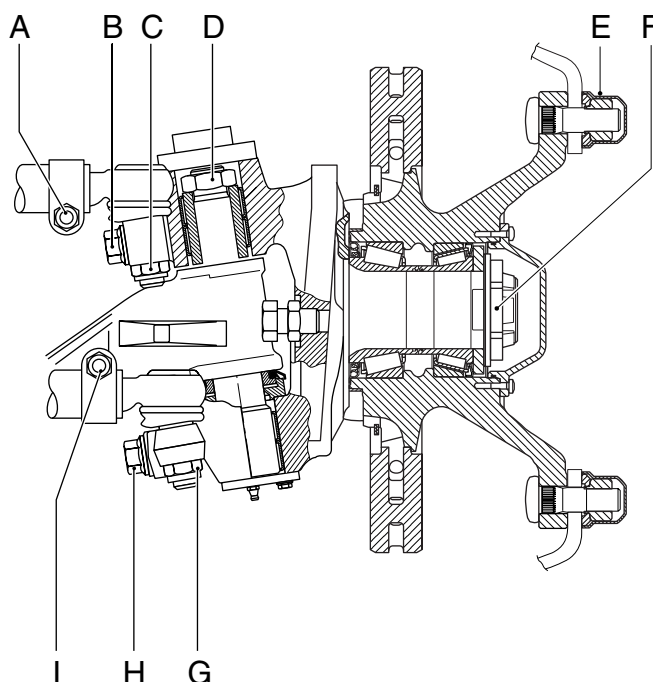


S7 00 822

6.2 TIGHTENING TORQUES

The tightening torques stated in this section are different from the standard tightening torques stated in the overview of the standard tightening torques. The other threaded connections not specified must therefore be tightened to the torque stated in the overview of standard tightening torques.

When attachment bolts and nuts are replaced, it is important that - unless stated otherwise - these bolts and nuts are of exactly the same length and property class as those removed.



S7 00 736

A.	Bolt M10, cylinder clamping bracket	47 Nm ⁽¹⁾
B.	Bolt for cylinder attachment arm	500 Nm + 90° angular displacement ⁽²⁾
C.	Cylinder attachment nut	
	Self-locking M24 nut	285 Nm ⁽³⁾
D.	King-pin nut	595 Nm ⁽⁴⁾
E.	Wheel nut	700 Nm ⁽⁵⁾

0

- | | | |
|----|--------------------------------------|--|
| F. | Wheel hub unit lock nut | |
| - | 1 st phase | 400 Nm ⁽⁶⁾ |
| - | 2 nd phase | turn the hub through 10 rotations ⁽⁷⁾ |
| - | 3 rd phase | 450 Nm |
| - | 4 th phase | turn the hub through 10 rotations ⁽⁷⁾ |
| - | 5 th phase | 950 Nm |
| G. | Track rod attachment nut M20 | 225 Nm ⁽³⁾ |
| H. | Track rod arm bolt | 500 Nm + 90° angular displacement ⁽²⁾ |
| I. | Bolt M12, track rod clamping bracket | 80 Nm ⁽¹⁾ |

(1) Fit new self-locking nut.

(2) Fit new bolt. Apply Loctite 243 to the bolt.

(3) Check the ball end thread for damage before fitting a new self-locking nut.

To do so, hand-tighten a non-self-locking nut on the ball joint to be checked.

If the new nut cannot be fully hand-screwed onto the entire thread, the ball end must be replaced.

Fit new self-locking nut. Apply Loctite 243 to the nut.

(4) Apply Loctite 243 to the nut.

(5) Retorque after 100 km; if new wheel studs have been fitted, the wheels need additional retorquing after 500 km.

(6) Apply new hub nut.

(7) Rotate the hub at a rotational speed of approx. 40 rpm.



Fitting a new self-locking nut to a ball end with a damaged thread may lead to dangerous situations.

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1. STEERING GEAR, GENERAL

1.1 FAULT-FINDING TABLE

SYMPTOM: HEAVY STEERING, TO BOTH SIDES	
Possible cause	Remedy
Tyre pressure of steerable wheels too low	Check the tyre pressure. Increase tyre pressure to the specified value.
Fifth-wheel coupling damaged or insufficiently lubricated.	Inspect/lubricate fifth-wheel coupling.
Axle load of steerable axle(s) too high	Check axle load. Adjust the load.
Steering oil level too low	Check steering oil level. Top up oil and bleed system. Check system for leaks.
Air in the system	Bleed the system. Check steering oil for foaming.
Filter is extremely filthy	Check filter. If necessary, replace the O-ring.
Steering oil line kinked or pinched off	Check routing of the steering oil lines.
The supply opening in the reservoir is (partially) blocked.	Check supply opening in the reservoir.
Tight steering shaft bearings or universal joint(s) of steering column	Jack up steerable axle(s) and check the steering column tightening torque.
Tight swivel axle bearing	Check steerable axle(s).
Excessive caster	Check caster. Reduce if necessary.
System pressure too low	Check maximum system pressure. Replace pressure-limiting valve or steering pump.
Steering pump output too low	Check pump output. Check whether the flow control valve is jammed. If necessary, replace steering pump.
Excessive internal leakage of steering box or slave cylinder (if fitted)	Check internal leakage of steering box/slave cylinder.

SYMPTOM: HEAVY STEERING, TO ONE SIDE

Possible cause	Remedy
Tyre pressure of steerable wheels too low	Check the tyre pressure. Increase tyre pressure to the specified value.
Fifth-wheel coupling damaged or insufficiently lubricated.	Inspect/lubricate fifth-wheel coupling.
Steering oil level too low	Check steering oil level. Top up oil and bleed system. Check system for leaks.
Air in the system	Bleed the system. Check steering oil for foaming.
Wheel deflection limiting valves incorrectly adjusted.	Check setting of the wheel deflection limiting valves.
Tight swivel axle bearing	Check steerable axle(s).
Misalignment of the universal joints of the steering column	Check/adjust position of the universal joints in relation to each other.
Excessive internal leakage of steering box or slave cylinder (if present) on one side	Check internal leakage of steering box/slave cylinder.

SYMPTOM: HEAVY STEERING, OCCASIONALLY

Possible cause	Remedy
Fifth-wheel coupling damaged or insufficiently lubricated	Inspect/lubricate fifth-wheel coupling.
Steering oil level too low	Check steering oil level. Top up oil and bleed system. Check system for leaks.
Air in the system	Bleed the system. Check steering oil for foaming.
The steering oil line is temporarily kinked or pinched off	Check routing of the steering oil lines.
Supply opening in the reservoir temporarily blocked	Check reservoir for impurities.
Steering pump output too low because flow control valve is jammed	Check the flow control valve for smooth operation.
Low steering pump output in "cold condition" and at low engine speed because the partitions jam in the rotor	Check pump output when steering pump is "cold". Replace steering pump.
Excessive internal steering box leakage at lower pressures	Check internal steering box leakage at a preset pressure of 15 - 30 bar.

SYMPTOM: WHEEL DEFLECTION TOO SMALL	
Possible cause	Remedy
The vehicle is being steered when at a standstill	Steer while the vehicle is moving.
Incorrect setting of maximum wheel deflection at the axle	Check maximum wheel deflection and - if incorrectly set - correct it.
Wheel deflection limiting valves incorrectly adjusted	Check setting of the wheel deflection limiting valves.
Axle load of steerable axle(s) too high	Check axle load(s). Adjust the load.
System pressure too low	Check maximum system pressure. Replace pressure-limiting valve or steering pump.
Steering rod incorrectly set	Check steering rod setting.
Pitman arm installed in the wrong position on steering box output shaft	Check whether position of pitman arm on the sector shaft is correct, using the markings.
Wrong pitman arm installed on steering box	Check the pitman arm part number.
Sector shaft is installed in the wrong position in the steering box	Put steering box in the central position and check whether the sector shaft is correctly installed, using the markings on the input shaft and on the sector shaft.

SYMPTOM: VEHICLE PULLS TO ONE SIDE	
Possible cause	Remedy
Unequal weight distribution causing the vehicle to tilt	Adjust the weight distribution.
Fifth-wheel coupling insufficiently lubricated	Lubricate fifth-wheel coupling.
Driving over cambered roads.	When driving over cambered roads, bear in mind that the vehicle might pull to one side.
Difference in tyre pressure between the wheels on the steerable axle(s)	Check the tyre pressure. Pump both tyres to the specified value.
Different tyre types or difference in tread depth between tyres of the steerable axle(s)	Always fit tyres of the same type and tread depth on the axle.
Different wheel rims installed on the steerable axle(s)	Always install wheel rims of the same type on the axle.
Fault in one of the tyres	Replace the tyre on the side the vehicle pulls to.
Incorrectly adjusted brakes or a brake of the steerable axle(s) which is "dragging".	Check brakes. If necessary repair and re-adjust.
Misalignment of the universal joints of the steering column	Check/adjust position of the universal joints in relation to each other.
Poorly adjusted wheel bearing play	Check wheel bearing adjustment. Adjust the wheel bearing play until correct.
Incorrect caster	Check caster. Adjust caster until correct.
Incorrect camber angle	Check camber angle. Check axle housing.

SYMPTOM: VEHICLE PULLS TO ONE SIDE

Possible cause	Remedy
Incorrect alignment of steerable axles	Check alignment of the steerable axles. Adjust steering rods until correct.
Incorrect alignment of rear axle(s) or of trailer/semi-trailer	Check alignment of the rear axle(s) or of trailer/semi-trailer. Align axles.
Front axle/rear axle suspension play	Check suspension. Replace worn parts.
Difference in spring opening between the leaf springs of one axle	Measure the spring opening of the springs. Replace springs.
Poorly adjusted air suspension. This will cause the vehicle to tilt.	Check height adjustment. Adjust the height until correct.
Steering pump output too high.	Check pump output. Check the flow control valve for smooth operation.
Incorrect hydraulic central position of the steering box	Check the hydraulic central position of the steering box. The hydraulic centre position cannot be set. Replace the steering box.

SYMPTOM: VEHICLE IS SEARCHING, TRACKING INSTABILITY

Possible cause	Remedy
Tyre pressure of steerable wheels too low	Check the tyre pressure. Increase tyre pressure to the specified value.
Fifth-wheel coupling insufficiently lubricated or damaged	Inspect/lubricate fifth-wheel coupling.
Incorrect steering box pressure point setting; play at the pressure point or pressure point set too tight	Check pressure point setting. Adjust pressure point until correct.
Axle load of front axle too low	Check axle load and adjust the load.
Incorrect toe-in	Check toe-in. Adjust toe-in until correct.
Incorrect caster	Check caster. Adjust caster until correct.
Incorrect alignment of 2nd steerable axle	Check alignment of 2nd steerable axle. Adjust alignment until correct.
Play in a universal joint or in the steering column slide joint. Tight universal joint	Check universal joints and the steering column slide joint. Replace worn parts.
Misalignment of the universal joints in the steering column	Check/adjust position of the universal joints in relation to each other.
Play in the steering rod ball joints	Check ball joints. Replace ball joint.
Loose steering box, steering bracket or steering rod attachment	Check attachments, retighten bolts/nuts.
Worn or tight swivel axle bearing	Check swivel axle bearing. Replace worn parts.

SYMPTOM: VEHICLE IS SEARCHING, TRACKING INSTABILITY	
Possible cause	Remedy
Steering rod set incorrectly; when the wheels are in the "straight ahead" position, the steering box is not in its mechanical central position (pressure point)	Check steering rod setting. Adjust steering rod until correct.
Front axle/rear axle suspension play	Check axle suspension. Replace worn parts.
Steering pump output too high	Check steering pump output. Check the flow control valve for smooth operation. If necessary, replace steering pump.
Excessive internal steering box resistance.	Check internal steering box resistance. Replace steering box.
Internal defect in the steering box	Replace steering box.

SYMPTOM: STEERING WHEEL DOES NOT RETURN TO THE "STRAIGHT AHEAD" POSITION (OR ONLY VERY SLOWLY)	
Possible cause	Remedy
Tyre pressure of steerable wheels too low	Check the tyre pressure. Increase tyre pressure to the specified value.
Fifth-wheel coupling insufficiently lubricated or damaged	Inspect/lubricate fifth-wheel coupling.
Misalignment of the universal joints of the steering column	Check/adjust position of the universal joints in relation to each other.
Axle load of front axle too low	Check axle load and adjust the load.
Incorrect caster	Check caster. Adjust caster until correct.
Tight universal joint or steering column bearing	Check universal joints and steering column bearing. Replace worn parts.
Friction between mechanical parts of the steering gear (pitman arm, steering rod/steering arm or track rod/track rod arm)	Check mechanical parts of the steering gear.
Loose steering box or steering bracket	Check attachments, retighten bolts.
Tight swivel axle bearing	Check swivel axle bearing.
Steering pump output too high	Check pump output. Check the flow control valve for smooth operation. Replace pump.
Pressure point set too tight	Check pressure point setting. Adjust pressure point until correct.
Excessive internal steering box resistance	Check internal steering box resistance. Replace steering box.
Internal defect in the steering box	Replace steering box.

1

SYMPTOM: CIRCUIT 1 WARNING SYMBOL REMAINS ACTIVATED	
Possible cause	Remedy
Defective output indicator	Remove cover of circuit 1 reservoir and, with the engine at idling speed, check if oil has returned. If in doubt, check main steering pump output. Replace output indicator.
Circuit 1 oil level too low	Check the oil level. Top up oil and bleed system.
There is air in the system.	Bleed the system.
Steering oil lines of circuit 1 kinked or pinched off	Check/re-adjust routing of the steering oil lines.
Main steering pump output too low	Check main steering pump output. Replace main steering pump.
Fault in warning system	Check/repair warning system.

SYMPTOM: CIRCUIT 2 WARNING SYMBOL REMAINS ACTIVATED	
Possible cause	Remedy
Defective output indicator	Carry out function test for the emergency steering gear. Replace output indicator.
Circuit 2 oil level too low	Check the oil level. Top up oil and bleed system.
There is air in the system.	Bleed the system.
Steering oil lines of circuit 2 kinked or pinched off	Check/re-adjust routing of the steering oil lines.
Emergency steering pump output too low	Check emergency steering pump output. Replace emergency steering pump.
Fault in warning system	Check/repair warning system.

SYMPTOM: JOLTING OF THE STEERING WHEEL	
Possible cause	Remedy
Air in the system	Check steering oil level and bleed system.
Worn or loose shock absorbers on the steerable axle(s)	Tighten attachment. Replace shock absorbers.
Steering pump output too low	Check steering pump output.
Loose steering rod, track rod, steering bracket or steering box	Check/tighten attachment of these components.
Excessive internal steering box play	Check the input shaft play. Check the steering box pressure point. Replace the steering box.

SYMPTOM: VIBRATIONS IN THE STEERING WHEEL	
Possible cause	Remedy
Dirt between wheel rim and hub	Remove wheel and clean wheel rim and hub. Install wheel as specified.
Wheel nuts have not been tightened evenly	Loosen all nuts and tighten these as specified.
Wheel imbalance	Balance wheel statically and dynamically.

SYMPTOM: AIR IN THE STEERING OIL	
Possible cause	Remedy
Reservoir oil level too low	Check the oil level. Top up oil. Check for leakage.
Poor sealing of the supply line connections.	Check connections. Replace the hose with the clamps.
Porous supply line	Replace the hose with the clamps.
Poor internal sealing of the steering pump	Replace steering pump.

SYMPTOM: STEERING OIL LEAKAGE	
Possible cause	Remedy
Leaking delivery or return line. Leaking delivery or return line connection. Leaking reservoir connection pipe	Check the lines and line connections. Tighten the lines securely. Replace the line.
Leaking reservoir	Replace reservoir.
Leaking steering pump	Check sealing of the pump housing at the main steering pump and sealing of the plug at the rear of the steering pump. Check sealing of the pump housing at the emergency steering pump, the sealing of the plugs at the pump housing and the sealing of the plug at the rear of the pump. Replace the O-ring concerned.

SYMPTOM: STEERING OIL LEAKAGE

Possible cause	Remedy
Leaking steering box	On the steering box, check the following seals: - input shaft oil seal - sector shaft oil seal in side cover (plastic plug) - side cover gasket - valve housing/cylinder - sector shaft on pitman arm side - various plugs - adjusting bolt of wheel deflection limiting valves Depending on the leak, replace the input shaft oil seal, the sector shaft oil seals, the side cover gasket, and the sealing rings of the various plugs and the adjusting bolt. Replace the steering box in the case of leaks other than described above.
The melting point of the grease found behind the dust seal of the sector shaft or the input shaft is too low. It seems like the steering box is leaking, but in fact the grease has melted.	Replace the grease with grease of the specified type (melting point >130°C).

SOUND**Note:**

The steering gear always produces sounds.

Normal sounds:

- a hissing sound in the steering box while steering. The sound level depends on the system pressure.
- an increasing sound level when opening the wheel deflection limiting valve.
- a maximum sound level when opening the pressure-limiting valve.
- the emergency steering pump (plunger pump) produces a considerably higher sound level than the main steering pump (vane pump).

SYMPTOM: STEERING PUMP PRODUCES A SQUEALING SOUND WHILE STEERING

Possible cause	Remedy
Oil level too low, causing the pump to draw air.	Check the oil level. Top up oil and check for leaks.
Air in the steering oil	Check oil for the presence of air (foaming). Bleed system and find the cause.
Supply line kinked or pinched off.	Check the supply line.
The supply opening in the reservoir is (partially) blocked.	Check supply opening in the reservoir.

**SYMPTOM: THE STEERING PUMP PRODUCES A DIFFERENT SOUND WHEN AT IDLING SPEED.
THE SOUND LEVEL INCREASES WHEN THE ENGINE SPEED INCREASES**

Possible cause	Remedy
Worn steering pump	Replace steering pump. Replace steering oil. Clean the reservoir and lines. Replace filter.

SYMPTOM: WHEN STEERING THE SOUND OF METAL SCRAPING AGAINST METAL IS HEARD

Possible cause	Remedy
Loose steering box, steering bracket or pitman arm	Check attachment of components. Tighten bolts to the specified tightening torque.
Play in a steering rod or track rod ball joint.	Check ball joints. Replace ball joint.
There is friction between the steering gear components.	Turn steering gear carefully from one stop to the other and check the mechanical part of the steering gear for friction.
Play of the steering column slide joint	Check slide joint for wear. Replace slide joint.

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1. SAFETY INSTRUCTIONS

1.1 SAFETY INSTRUCTIONS

The steering gear is one of the most important systems for the safety of the vehicle. That is why the steering gear should be treated accordingly during maintenance and repair activities. Always work in a very clean environment; even the slightest contamination in the system can cause faults.

Repair and maintenance work on the steering gear must only be carried out by experienced mechanics with sufficient training.

On re-use, thoroughly check the thread of attachment bolts and nuts.

Tighten all connections to the specified tightening torques.

Always check line connections for leaks after tightening.

If the vehicle has been involved in a collision in which the steering box or other components of the steering gear have (possibly) been damaged, the steering box should always be sent to DAF for inspection or be replaced. This instruction even applies if no external damage is visible. In the collision, the steering box may have sustained internal damage, causing it to be unreliable.

The other (possibly) damaged components of the steering gear such as the steering and track rods, steering and track arms, steering bracket, pitman arm and the attachments of these components should always be checked for distortions, cracks, fractures, etc.

If possible, all components should be magnaflux tested.

Damaged components must always be replaced, even if in doubt about their condition.

2

Components must only be replaced by DAF components.

Do not take any chances, and replace components if in doubt.

Welding of steering gear components is prohibited.

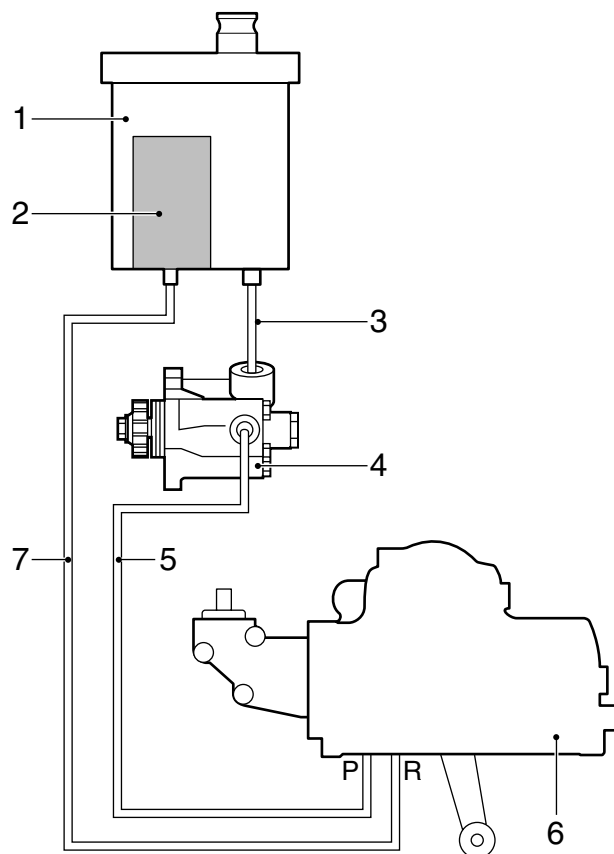
Straightening of steering gear components is prohibited.

An incorrect pressure point setting will affect the vehicle's steering characteristics.

Always take a test drive after completing maintenance or repair work on the steering gear. During this test drive, be aware that the steering gear might not function properly.

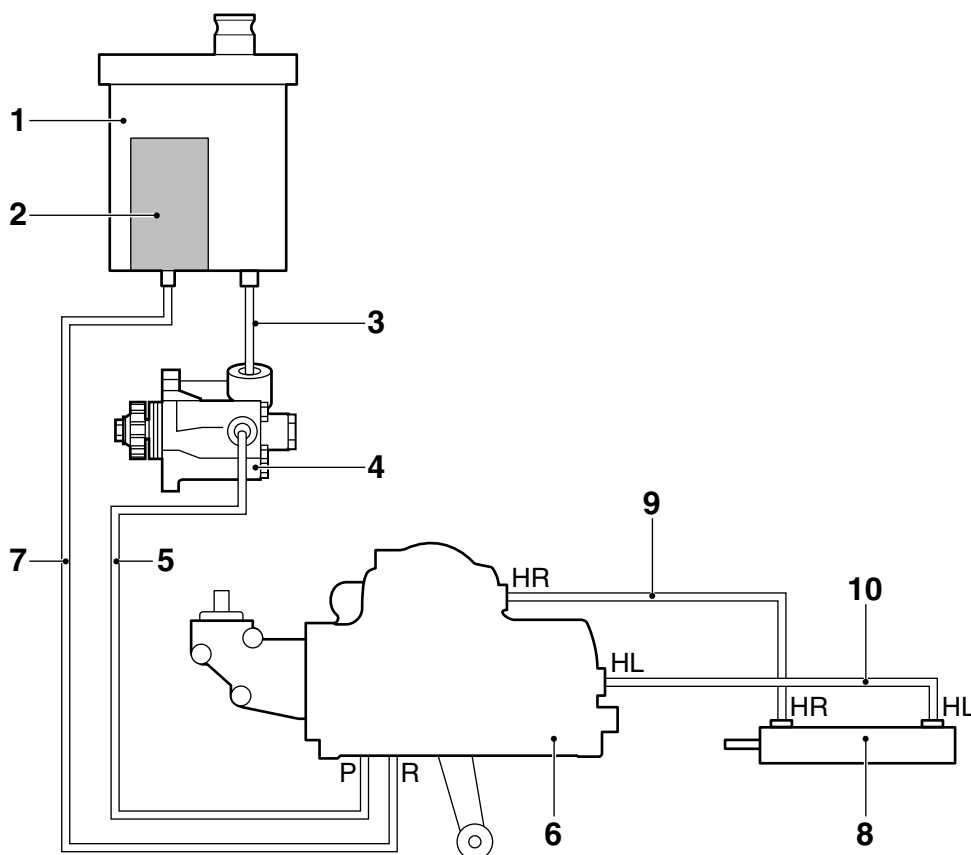
2. GENERAL

2.1 OVERVIEW DRAWING, SINGLE CIRCUIT SYSTEM



S700925

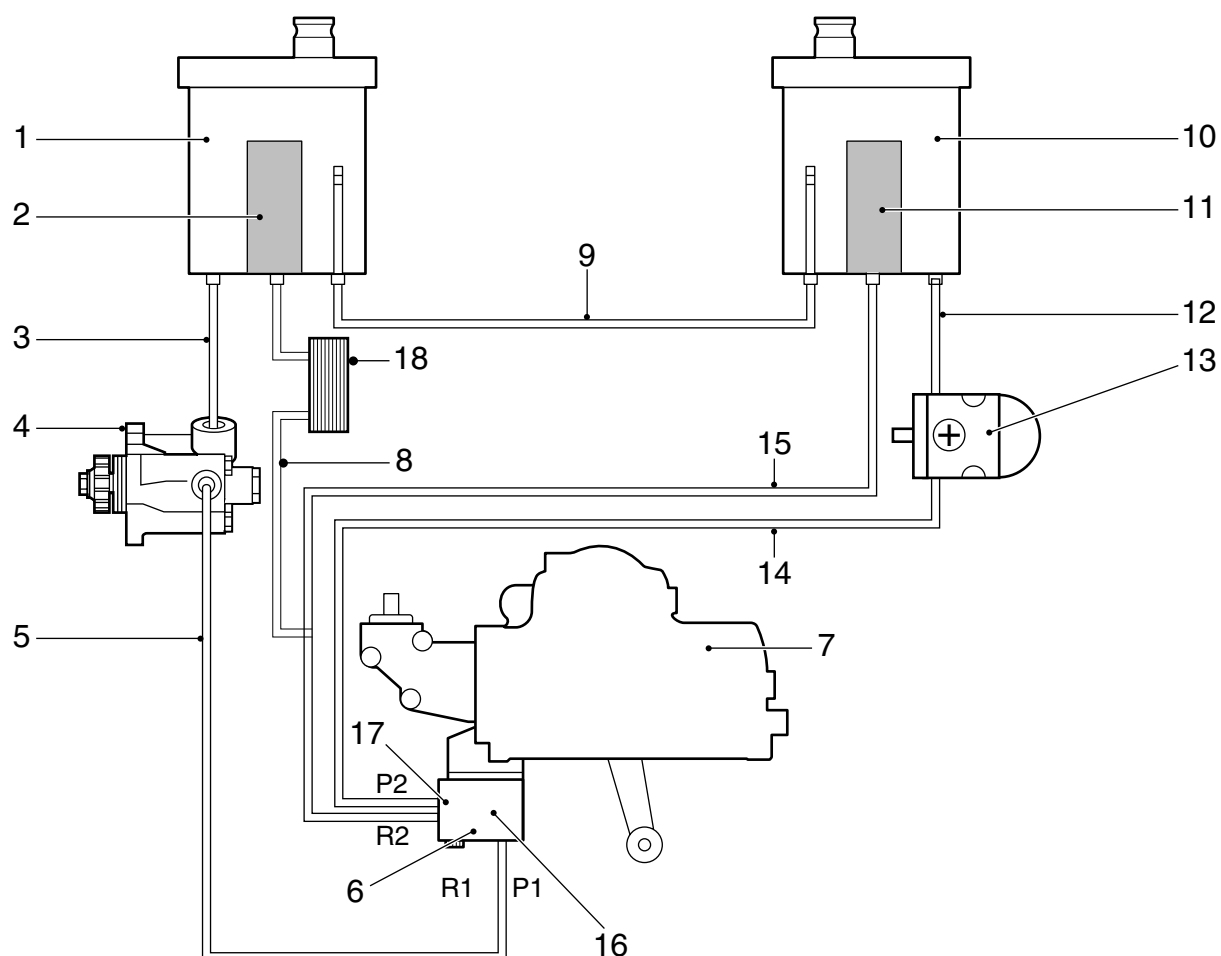
2.2 OVERVIEW DRAWING, SINGLE-CIRCUIT SYSTEM WITH SLAVE CYLINDER



S7 00 018

1. Reservoir
2. Filter
3. Supply pipe
4. Steering pump
5. Delivery pipe
6. Steering box
7. Return pipe
8. Slave cylinder
9. Slave cylinder pipe
10. Slave cylinder pipe

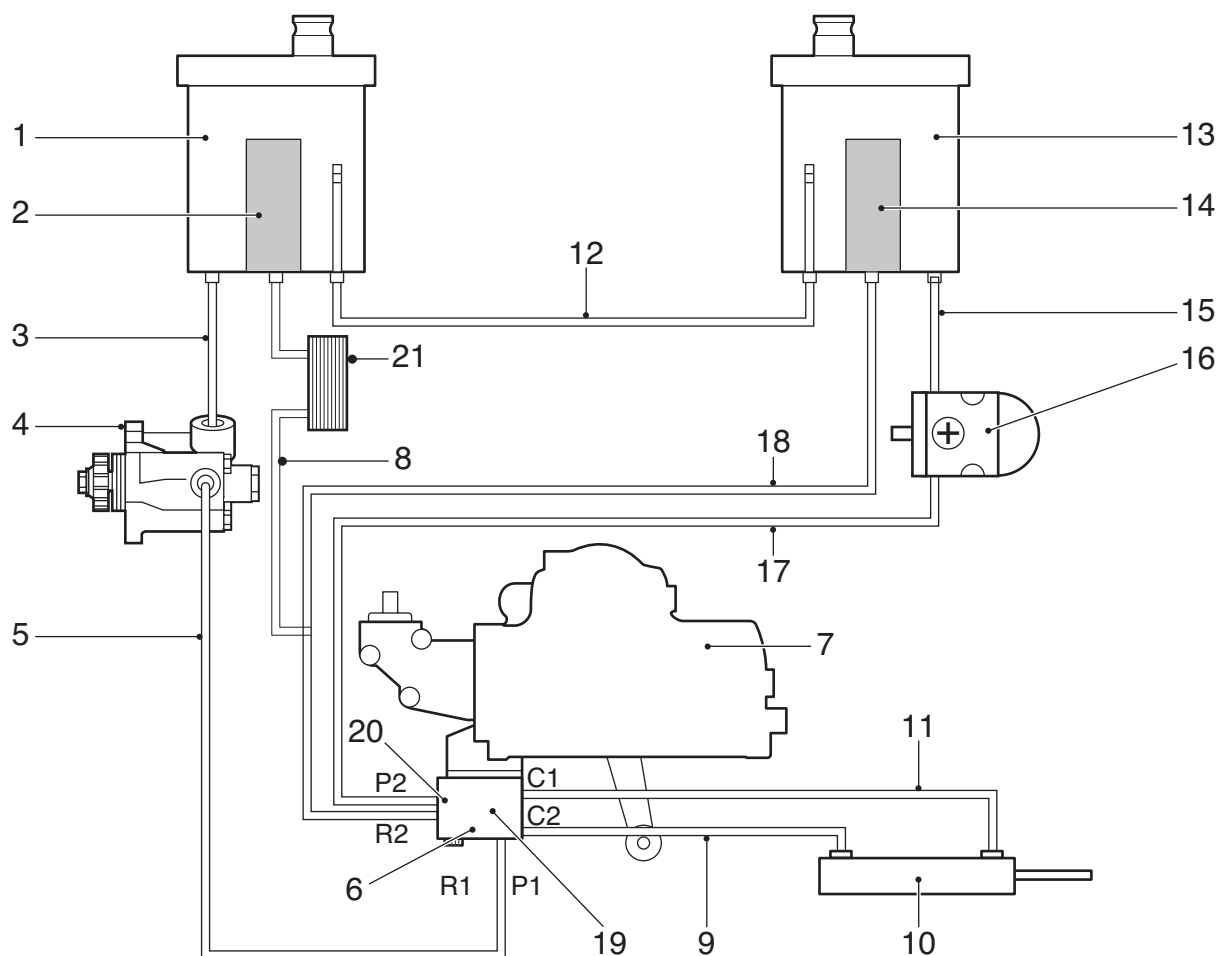
2.3 OVERVIEW DRAWING, DUAL-CIRCUIT SYSTEM



1. Main steering pump reservoir
2. Filter
3. Main steering pump supply pipe
4. Main steering pump
5. Main steering pump delivery pipe
6. Valve housing
7. Steering box
8. Main steering pump return pipe
9. Connection pipe reservoirs
10. Emergency steering pump reservoir
11. Filter
12. Emergency steering pump supply pipe
13. Emergency steering pump
14. Emergency steering pump delivery pipe
15. Emergency steering pump return pipe
16. Main steering pump output indicator
17. Emergency steering pump output indicator

S700926

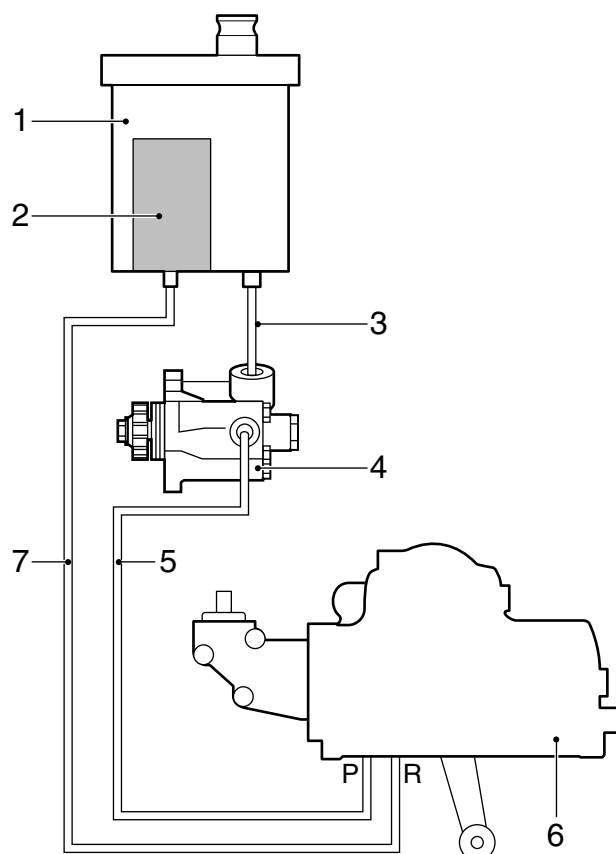
2.4 OVERVIEW DRAWING, DUAL-CIRCUIT SYSTEM WITH SLAVE CYLINDER



S700913

1. Main steering pump reservoir
2. Filter
3. Main steering pump supply pipe
4. Main steering pump
5. Main steering pump delivery pipe
6. Valve housing
7. Steering box
8. Main steering pump return pipe
9. Slave cylinder pipe
10. Slave cylinder
11. Slave cylinder pipe
12. Connection pipe reservoirs
13. Emergency steering pump reservoir
14. Filter
15. Emergency steering pump supply pipe
16. Emergency steering pump
17. Emergency steering pump delivery pipe
18. Emergency steering pump return pipe
19. Main steering pump output indicator
20. Emergency steering pump output indicator
21. Oil cooler

2.5 SYSTEM DESCRIPTION, SINGLE-CIRCUIT SYSTEM



S700925

From the reservoir (1) mounted over the steering pump (4), the oil flows through the supply pipe (3) to the steering pump (4).

The steering pump is a non-regenerative vane pump. When the pump is supplying output, the steering pump (4) does become regenerative, thus causing a negative pressure in the supply pipe (3).

The steering pump (4) pumps the oil through the delivery pipe (5) to the steering box (6).

From the steering box (6), the oil is returned to the reservoir (1) through the return pipe (7) via the filter (2). The return pipe (7) always has a low pressure.

The pressure in the delivery pipe (5) varies and depends on the steering force. If there is no steering action, the delivery pipe is at circulation pressure.

If a steering action takes place, the pressure in the delivery pipe can increase to the preset value of the pressure relief valve.

2

This maximum pressure can occur when the vehicle is steered while at a standstill on a skid-resistant road surface or when the vehicle is parked against a curb and the steering wheel is turned.

When at maximum pressure a major transmission of energy will take place, resulting in the release of much heat. If this situation lasts too long, the steering pump can be damaged by the heat development.

The steering pump can develop very high pressure within a short period of time. This very high pressure can cause certain steering gear components to become overloaded or even to break off.

A pressure-limiting valve is intended to protect the steering gear against excessive pressure. The system pressure may not be increased.

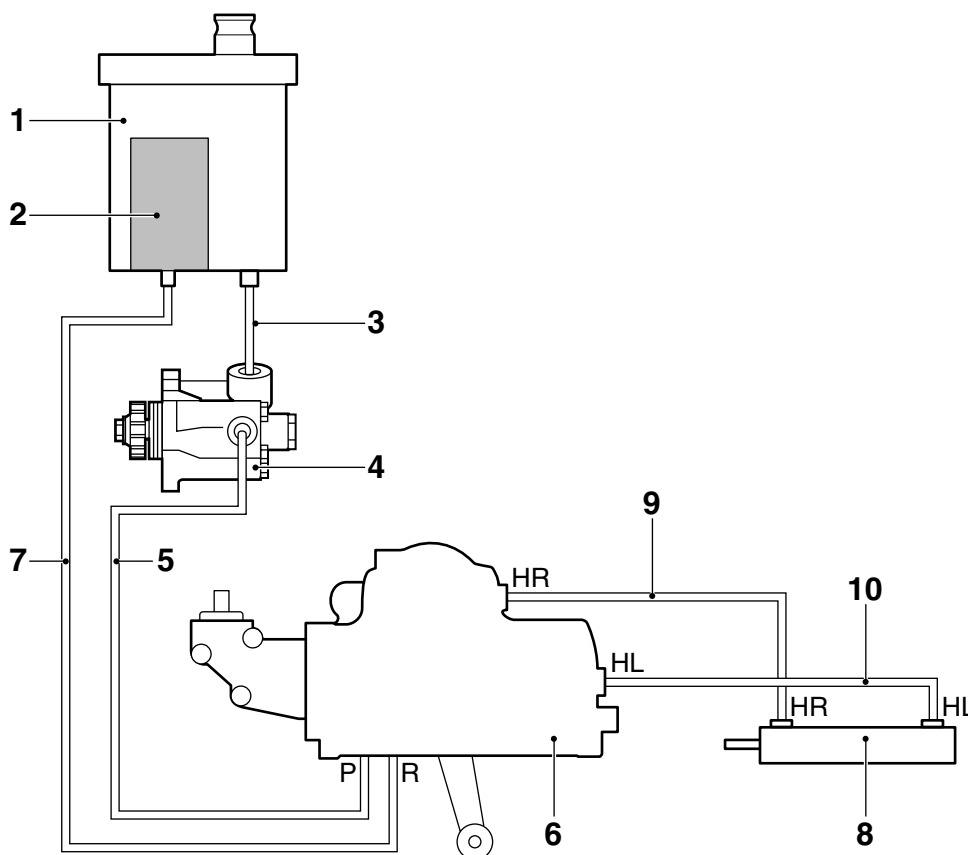
The pressure-limiting valve is located in the steering box. This can be checked using the type plate on the steering box.

If a pressure value is mentioned on the type plate, the component concerned contains a pressure-limiting valve.



It can be very dangerous to replace the steering box or the steering pump with a different type without DAF's express permission. Such replacements are therefore prohibited. If the original type is no longer available, DAF will supply another approved type.

2.6 SYSTEM DESCRIPTION, SINGLE-CIRCUIT SYSTEM WITH SLAVE CYLINDER

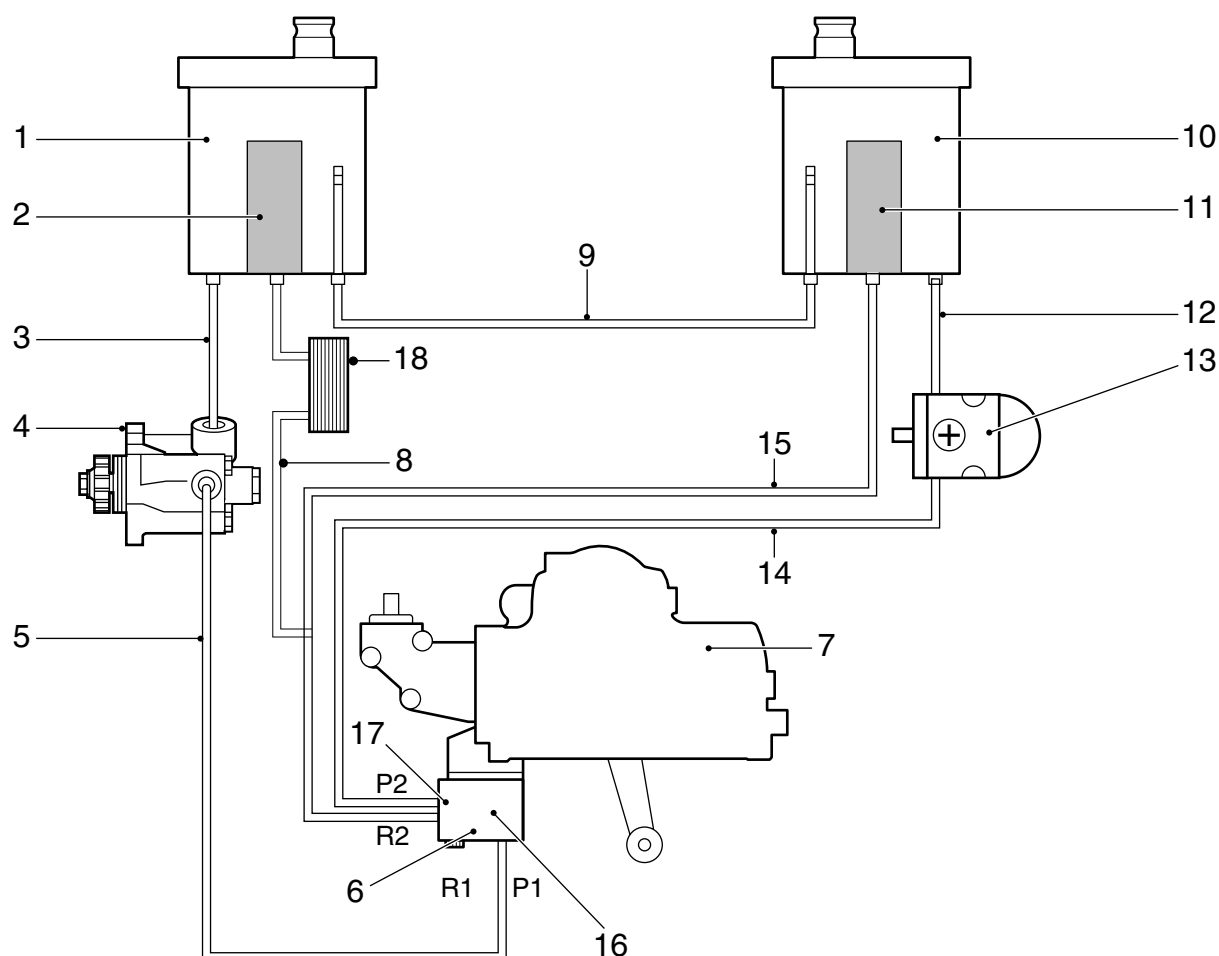


S7 00 018

The steering gear can contain a slave cylinder (8) for additional steering power. This slave cylinder is located parallel to the steering box cylinder and is supplied with oil through the steering box.

System operation is identical to that of the single-circuit system.

2



S700926

The emergency steering pump (16) is attached to the gearbox and is driven by the gearbox output shaft. At a vehicle road speed exceeding approx. 10 km per hour, the emergency fuel pump supplies sufficient oil. During normal operation, the oil from the emergency steering pump is returned to the emergency steering pump reservoir (13) via the dual-circuit valve (6).

Reservoirs (1) and (10) are interconnected by an overflow pipe (9). This pipe is connected in such a way that if one of the circuits leaks the other circuit remains functional.

If the oil output of the main steering pump (4) becomes too low, the dual-circuit valve (6) adds the output of the emergency steering pump (13) to the remaining output of the main steering pump (4). The return pipe (8) of the main steering pump is also cut off.

The output of both pumps is returned to the emergency steering pump reservoir (10). If more oil is supplied to the emergency steering pump reservoir than is drawn in by the emergency steering pump, the excess oil is discharged to the main steering pump reservoir (1) through the overflow pipe (9).

Dual-circuit valve

In the dual-circuit valve (6) an output indicator (16) is fitted to signal that the oil output from the main steering pump (4) is too low. The output indicator (16) activates the circuit 1 warning indicator when the emergency steering pump (13) is activated.

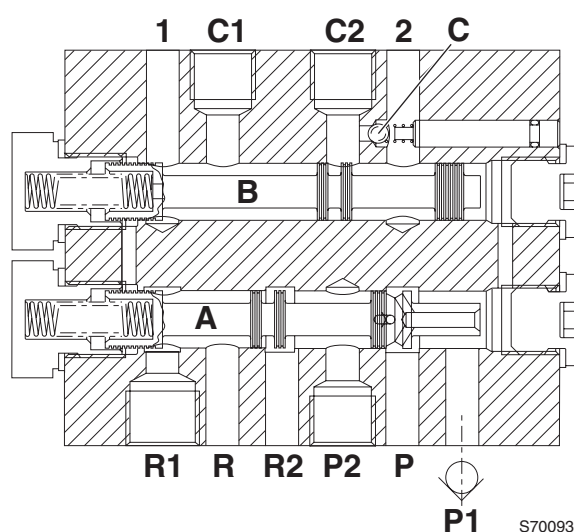
The output indicator for circuit 2 is fitted in pipe connection (P2) (emergency steering pump (13) delivery pipe connection on the dual-circuit valve).

When the output from the emergency steering pump (13) is too low, the output indicator activates the circuit 2 warning indicator.

The emergency steering pump (13) is fitted with a pressure limiting valve with a higher opening pressure than the pressure limiting valve in the steering box. The function of this valve is to serve peak demands, which can occur when switching circuit 2 on and off. When the valve opens, the delivery pipe (14) is connected to the supply pipe (12).

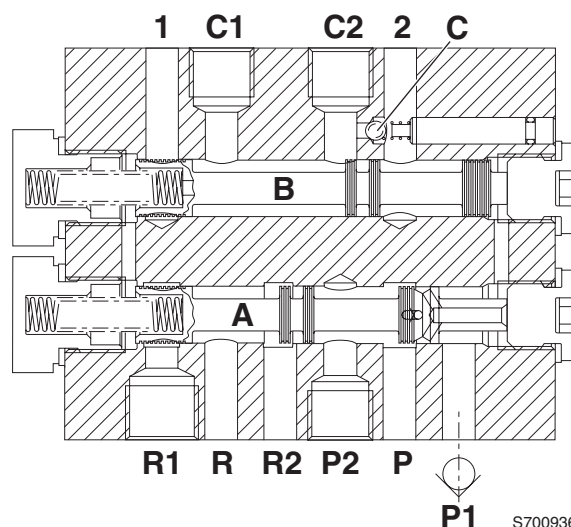
Operation of dual-circuit valve

When the engine is running, the pressure from the main steering pump (P1) will cause control slide A to move to the left against the spring pressure. The supply from the main steering pump goes to the steering box via exit (P). The return from the steering box (R) is connected to the main steering pump reservoir via exit (R1). At the same time the connection of the emergency steering pump (P2) and the steering box is broken. The oil supplied by the emergency steering pump while the vehicle is being driven goes to the emergency steering pump reservoir via entrance (P2) and exit (R2). Control slide B is only used with vehicles equipped with a slave cylinder.

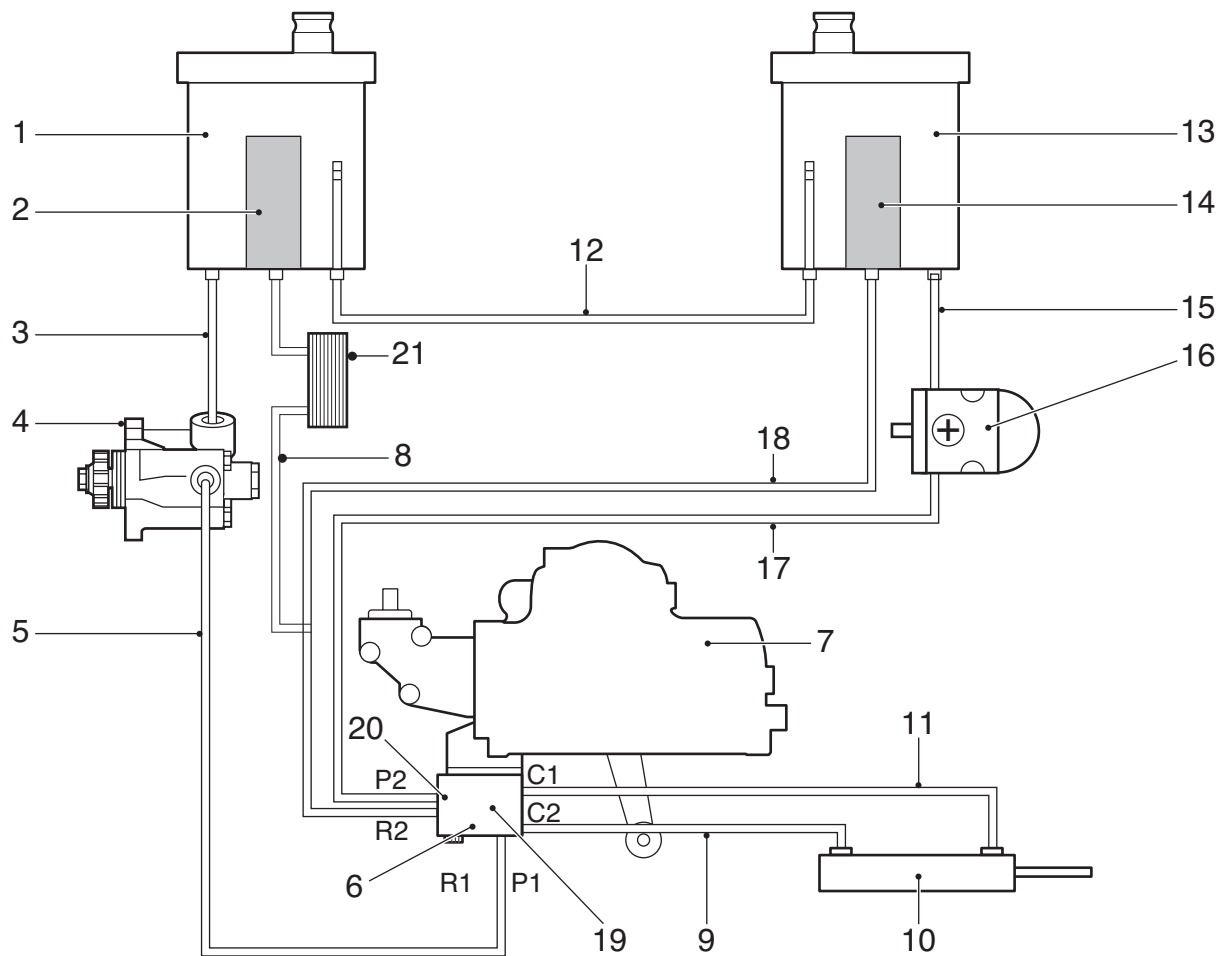


S700935

If a main steering pump failure causes the pressure (P1) drop to zero while the vehicle is being driven, the spring will move control slide A to the right. As a result, the emergency steering pump (P2) is connected to the steering box (P). The steering power is now produced by the emergency steering pump. To ensure that the oil of the main steering pump does not leak away in case of leakage, the return (R) of the steering box is led to the emergency steering pump reservoir (R2).



2.8 SYSTEM DESCRIPTION, DUAL-CIRCUIT SYSTEM WITH SLAVE CYLINDER



The steering gear can contain a slave cylinder (10) for additional steering power. This slave cylinder is located parallel to the steering box cylinder and is supplied with oil through the dual-circuit valve.

System operation is identical to that of the dual-circuit system.

Dual-circuit valve

The steering box is provided with an extra valve, which cuts off the oil supply to the slave cylinder (10) and connects both pipes (9) and (11) of the slave cylinder when the output of the main steering pump is too low. Just like the dual-circuit pump is too low. Just like the dual-circuit valve this valve is operated by the emergency steering pump pressure.

In the dual-circuit valve (6) an output indicator (19) is fitted to signal that the oil output from the main steering pump (4) is too low. The output indicator (19) activates the circuit 1 warning indicator when the emergency steering pump (16) is activated.

S700913

The output indicator (20) for circuit 2 is fitted in pipe connection (P2) (emergency steering pump (16) delivery pipe connection on the dual-circuit valve).

When the output from the emergency steering pump (16) is too low, the output indicator (20) activates the circuit 2 warning indicator.

The emergency steering pump (16) is fitted with a pressure limiting valve with a higher opening pressure than the pressure limiting valve in the steering box. The function of this valve is to serve peak demands, which can occur when switching circuit 2 on and off. When the valve opens, the delivery pipe (17) is connected to the supply pipe (15).

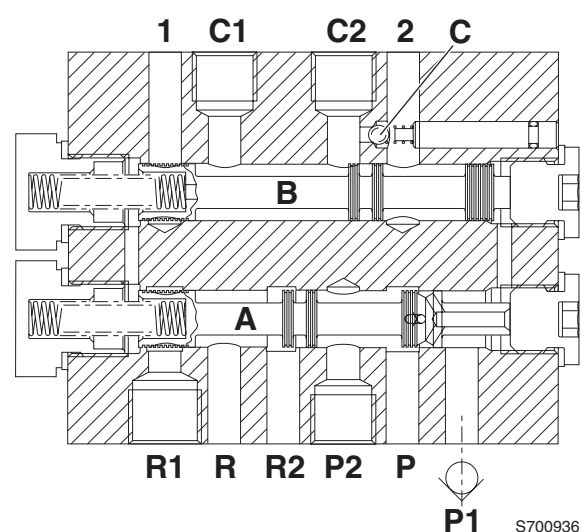
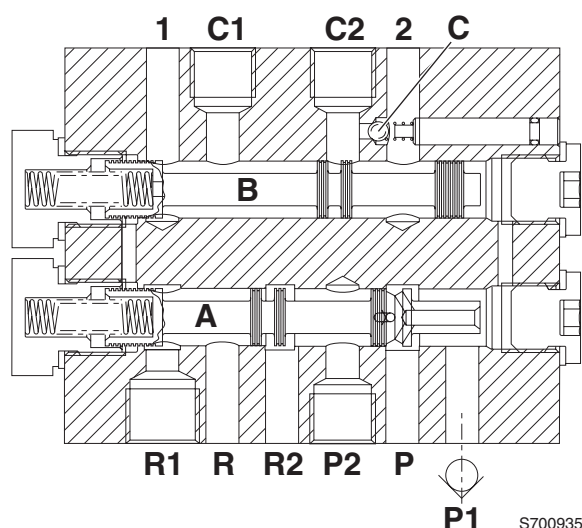
Operation of dual-circuit valve

When the engine is running, the pressure from the main steering pump (P1) will cause control slide A to move to the left against the spring pressure. The supply from the main steering pump goes to the steering box via exit (P). The return from the steering box (R) is connected to the main steering pump reservoir via exit (R1). At the same time the connection of the emergency steering pump (P2) and the steering box is broken. The oil supplied by the emergency steering pump while the vehicle is being driven goes to the emergency steering pump reservoir via entrance (P2) and exit (R2).

When the main steering pump is active, control slide B moves to the left against the spring pressure. Connections (C1) and (C2) of the slave cylinder are connected to the connections on the left (1) and right (2) of the steering box.

If a main steering pump failure causes the pressure (P1) drop to zero while the vehicle is being driven, the spring will move control slide A to the right. As a result, the emergency steering pump (P2) is connected to the steering box (P). The steering power is now produced by the emergency steering pump. To ensure that the oil of the main steering pump does not leak away in case of leakage, the return (R) of the steering box is led to the emergency steering pump reservoir (R2).

If the pressure of the main steering pump drops to zero, the spring pressure will cause control slide B to move to the right. The connections (C1) and (C2) between the slave cylinder (1) and the steering box (2) are closed off. At the same time the slave cylinder connections (C1) and (C2) are interconnected. While pressure is being built up in the slave cylinder due to the different capacities of the two chambers in the cylinder, valve C will open.



3. INSPECTION AND ADJUSTMENT

3.1 INSPECTION OF THE STEERING GEAR USING A PRESSURE GAUGE

Note:

A quick check of the steering gear can be carried out using a pressure gauge. To this end, the same pressure gauge can be used as for the adjustment of the wheel deflection limiting valves.

A pressure gauge allows you to carry out only a limited number of measurements. To test the steering pump (output in l/min. at a certain pressure) and the steering box condition (internal sealing, plays) you will need a test equipment case.

If the cause of the problem cannot be found using the pressure gauge, the steering gear should be diagnosed using the test case.



After having turned the steering wheel with a torque wrench with a dial, always check the tightening torque of the steering wheel nut.

Items requiring special attention when connecting the pressure gauge

1. Clean the delivery line connection that is going to be disconnected.
2. Check the steering box attachment.
3. Check the hydraulic central position.
4. Place proper turning plates under the vehicle's steerable wheels.



Block the vehicle so that it cannot slide off the jack or the turning plates.

Connecting the pressure gauge



Only use couplings and lines which are suited to the maximum system pressure.

1. Connect the pressure gauge, using special tool (DAF no. 0535653) to the T-piece in the delivery line. Make sure that as little steering oil as possible runs off and clear away spilt oil.
2. Check the steering oil level in the reservoir and top up if necessary.
3. Bleed the steering gear, see chapter 'Draining, filling and bleeding'.

Bringing the steering oil up to the test temperature

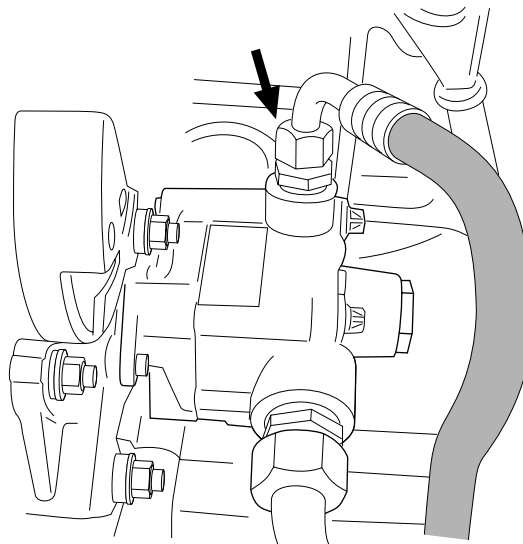
1. Set the engine speed to 1200 - 1400 rpm.
2. Activate the steering gear for 5 seconds at its maximum, making sure that the pressure does not exceed 50 bar. Do not touch the steering wheel for 5 seconds.
3. Repeat this action until the lines are at least hand warm.

Measuring the circulation pressure

1. Run the engine at idling speed.
2. Check the circulation pressure. Compare the reading with the specified value, see 'Technical data'.

Inspection of front axle bearings

1. Run the engine at idling speed.
2. Turn the steering gear carefully from the central position to both maximum wheel deflections.
3. Check whether the control pressure rises evenly.



S7 00 585

Testing the maximum system pressure

1. Run the engine at idling speed.
2. Activate the steering gear and fit a 15-mm filler piece, special tool (DAF no. 0535996), between the adjusting bolt or the axle stop on the swivel axle and the axle housing stop.



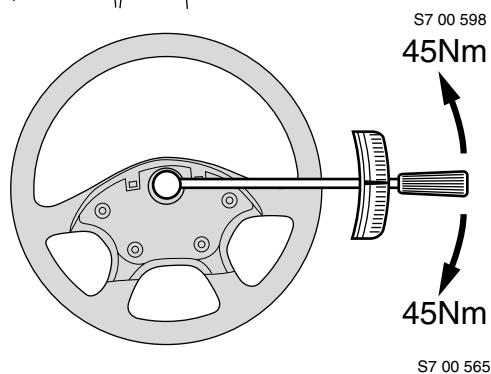
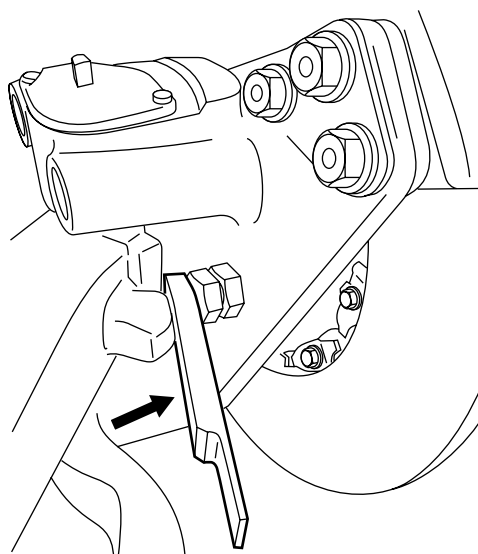
Be careful when fitting the 15-mm filler piece between the adjusting bolt and the axle stop, because there is a danger of limbs getting trapped.

3. Fit a torque wrench with a dial to the steering wheel attachment bolt. Tighten the nut to a tightening torque of 45 Nm on the torque wrench.
4. Take the maximum pressure reading on the pressure gauge (the maximum pressure should not be continued for more than 5 seconds). Compare the reading with the specified value, see 'Technical data'.

Note:

If the measured value deviates more than 10% from the specified value, the cause should be identified using the test case.

5. Repeat the measurement using the 15-mm filler piece at the other side of the front axle.
6. Retighten the steering wheel attachment bolt to the specified tightening torque. See 'Technical data'.
7. Remove the pressure gauge and the T-piece.
8. Check the steering oil level in the reservoir and top up if necessary.
9. Bleed the steering gear, see chapter 'Draining, filling and bleeding'.



3.2 INSPECTION OF STEERING GEAR USING THE TEST CASE

Note:

The test case makes it possible to:

- inspect the condition of the entire steering gear on a regular basis.
- make a reliable diagnosis if the steering gear does not function properly.

An inspection using a pressure gauge will only provide information on system pressures, which in some cases might be insufficient to find a defect. However, it provides no information on the condition of the steering pump (output) and the steering box (internal leakage). As a result, in practice steering pumps and steering boxes are often replaced unnecessarily.

Electronic test case 'Servotest 550'

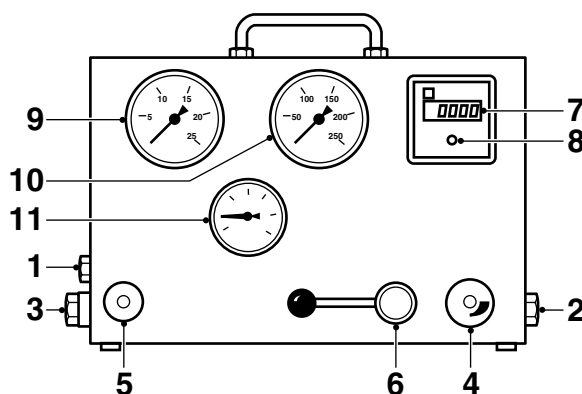
The inspection referred to below is carried out using the 'Servotest 550' test case. It is also possible to inspect the steering gear using similar equipment able to perform the same measurements as the 'Servotest 550'.

The test case is connected to the delivery line, which runs from the steering pump to the steering box.

The line connection "Eingang" is fitted with a filter which, depending on the degree of impurity of the oil, should be regularly cleaned.

The 'Servotest 550' test case consists of the following parts:

1. Connection "Eingang" (input)
2. Connection "Ausgang" (output)
3. Connection "Tank"
4. Cock
5. Non-return valve (throttle)
6. Pressure-limiting valve 120/150 bar (switch over)
7. Output meter 0.01 - 100 l/min
8. Switch for output meter
9. Low-pressure gauge 0-25 bar
10. High-pressure gauge 0-250 bar
11. Temperature gauge 0-120°C



S7 00 020

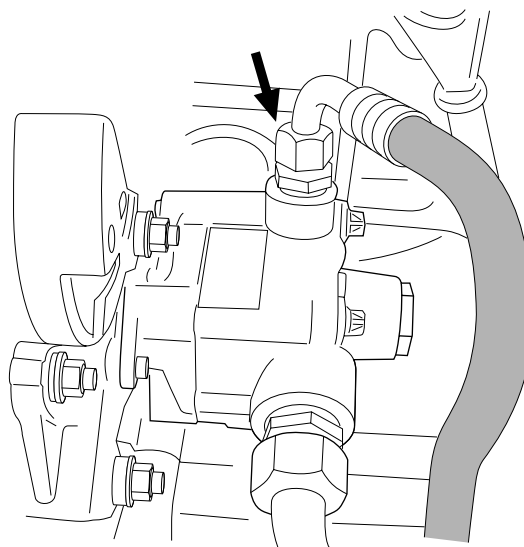
Items requiring special attention when connecting the test case

1. Clean the delivery line connection that is going to be disconnected.
2. Check the steering box attachment.
3. Check the hydraulic central position.
4. Place proper turning plates under the vehicle's steerable wheels.



Block the vehicle so that it cannot slide off the jack or the turning plates.

5. With an EMAS-controlled trailing axle remove the fuses from the EMAS system.



S7 00 585

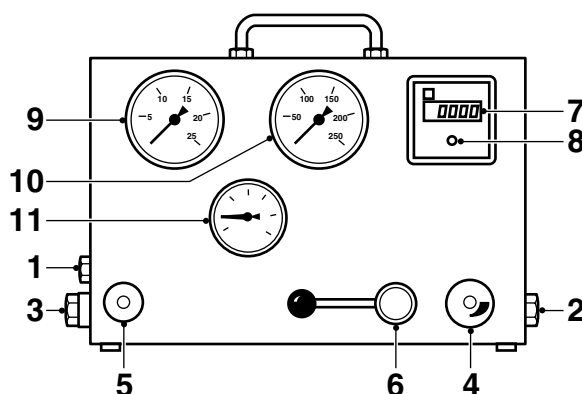
2

Connecting the test case

1. Check whether the non-return valve (5) of the 'Servotest 550' is completely closed, the cock (4) has been fully opened and the pressure adjusting device (6) of the pressure-limiting valve is set in accordance with the maximum system pressure.



Only use couplings and lines which are suited to the maximum system pressure.



S7 00 020

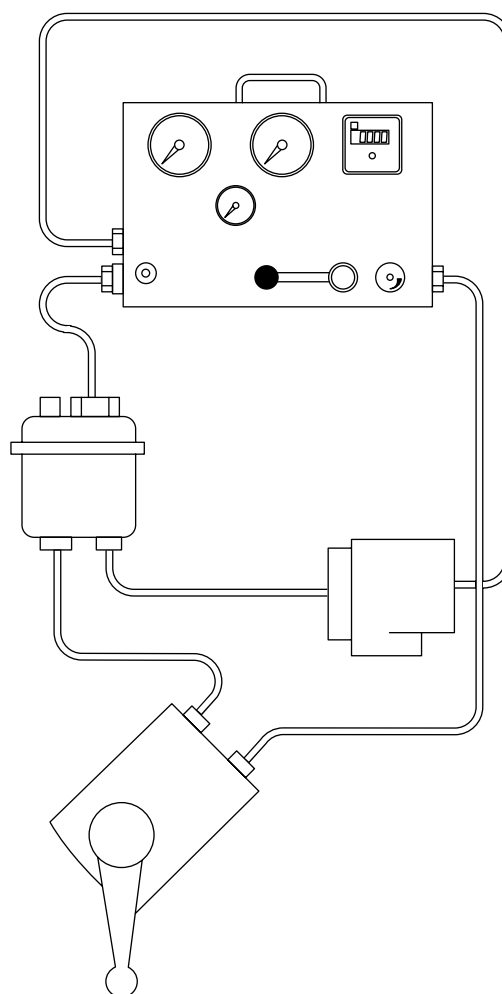
2

- Connect the test case to the delivery line. Make sure that as little steering oil as possible runs off. Collect the steering oil leaking out of the system. Connect the hose from the "Eingang" connection of the test case to the part of the line coming from the main steering pump. Connect the hose from the "Ausgang" connection of the test case to the part of the line going to the steering box.

Note:

If internal leakage needs to be measured in the steering box on an EMAS-controlled trailing axle, the test case should be connected between the EMAS fluid flow control valve and the steering box.

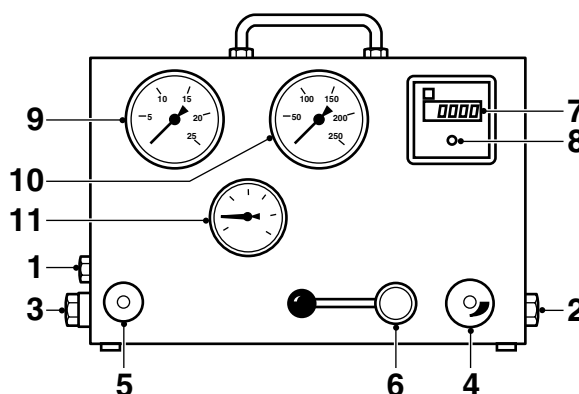
- Place the hose coming from the "Tank" connection into the reservoir. Attach this line to the reservoir and make sure that the end of the line stays below the oil surface (to prevent the forming of foam).
- Check the steering oil level and top up as necessary.
- Start the engine and keep an eye on the steering oil level.



S7 00 174

Bringing the steering oil up to the test temperature

- Bleed the system by running the engine at idling speed for 2 minutes. Check the steering oil level at regular intervals, and top up as necessary. Do not touch the steering wheel during these 2 minutes.
- Run the engine at idling speed.
- Slowly close the cock (4), until the pressure gauge (10) reads a pressure of 50 bar.
- Wait until the thermometer (11) reads a value of 50°C.
- Now open the cock (4) completely.



S7 00 020

Inspection of steering gear using the test case

Note:

- During the measurements, the steering oil temperature should be checked regularly and, if required, the oil should be warmed as specified.
- If during the measurements a deviating value is found, the cause of this deviation should be traced and rectified first, before continuing with the next measurement.

Measuring the circulation pressure

1. Run the engine at idling speed.
2. Open the cock (4) completely.
3. The circulation pressure is indicated by the pressure gauge (9). Compare the reading with the maximum value allowed. See 'Technical data'.

Inspection of front axle bearings

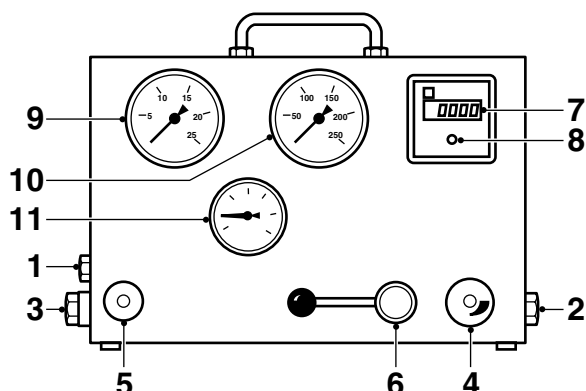
1. Run the engine at idling speed.
2. Check whether the cock (4) is fully opened.
3. Turn the steering gear carefully from the central position to both maximum wheel deflections.
4. Check whether the necessary pressure rises evenly.

Testing the maximum system pressure

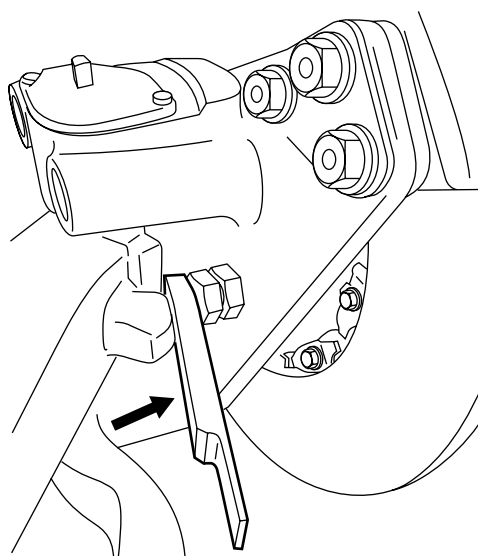
1. Run the engine at idling speed.
2. Activate the steering gear and fit a 15-mm filler piece, special tool (DAF no. 0535996), between the adjusting bolt and the axle stop.



Be careful when fitting the 15-mm filler piece between the adjusting bolt and the axle stop, because there is a danger of limbs getting trapped.



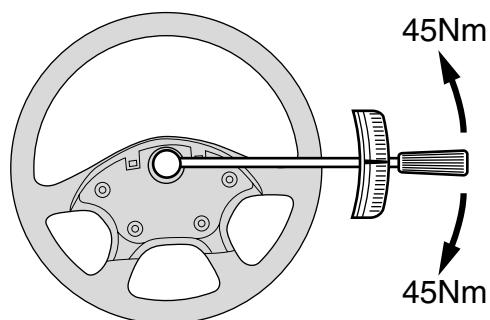
S7 00 020



S7 00 598

2

- Fit a torque wrench with a dial to the steering wheel nut and tighten the nut to a tightening torque of 45 Nm on the torque wrench.

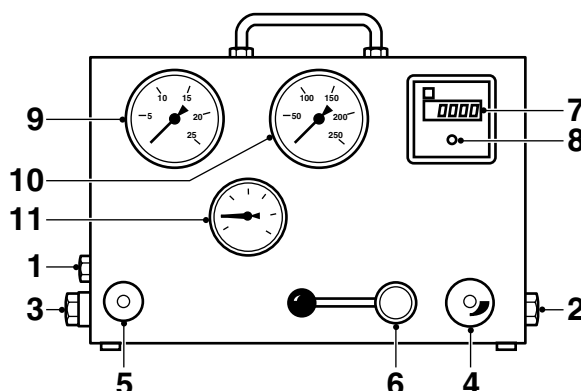


S7 00 565

- Read the pressure given by the gauge (10) (hold maximum pressure for no longer than 5 seconds) and compare the measured value with the value specified, see 'Technical data'.
- Repeat the measurement using the 15-mm filler piece at the other side of the front axle.

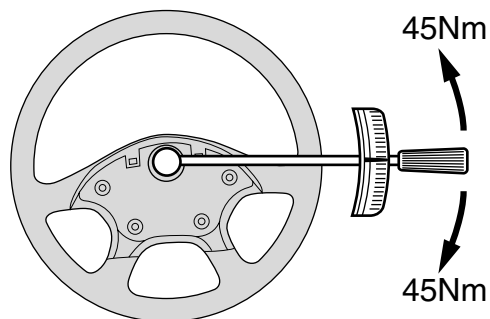
Testing the final limiting pressure

- Turn the steering gear to maximum lock.
- Set the engine speed to 1200 - 1400 rpm.



S7 00 020

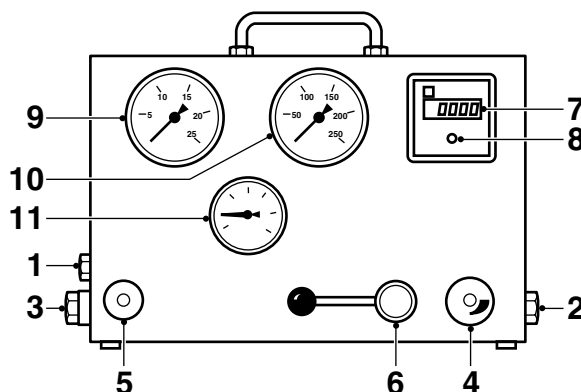
- Fit a torque wrench with a dial to the steering wheel nut and tighten the nut to a tightening torque of 45 Nm on the torque wrench.
- The pressure gauge (10) will indicate the final limiting pressure.
- Compare the reading with the specified value, see 'Technical data'.
- Carry out the measurement at the other side of the axle as well.



S7 00 565

Testing the maximum pump pressure

- Check whether the pressure-limiting valve (6) is set at the correct pressure.
- While the engine is at idling speed, slowly close the cock (4) until the maximum pressure is achieved at gauge (10). This maximum pressure should be maintained for 5 seconds at the most. Otherwise the internal pump components will become too hot. This would result in premature wearing of the pump.
If the pressure-limiting valve (6) is set lower than the system pressure, the maximum system pressure will not be reached.



S7 00 020

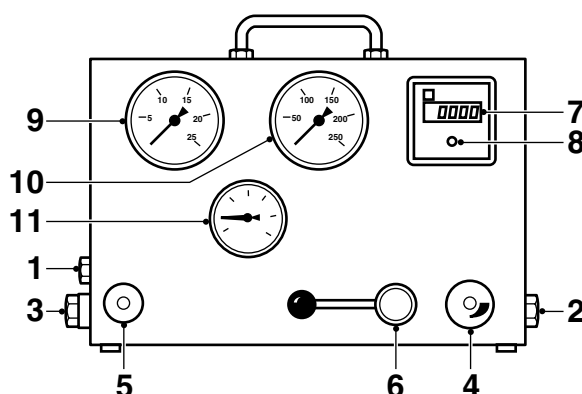
Note:

When the cock (4) is closed, the steering wheel should never be turned. The peak pressures involved could damage the pump or the test case.

3. Open the cock (4).
4. Compare the reading with the specified value, see 'Technical data'.

Testing the pump output

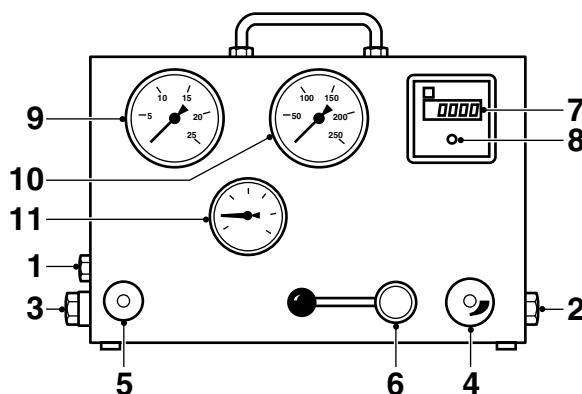
1. Activate the output meter (7) using the switch (8).
2. Set the engine speed to 1200 - 1400 rpm.
3. Close the cock (4) until the pressure gauge (10) indicates the specified pump output pressure. See 'Technical data'.
4. Take the pump output reading at the output meter (7) and compare this value with the specified value. See 'Technical data'.



S7 00 020

Testing the steering pump flow control valve

1. Activate the output meter (7) using the switch (8).
2. Slowly increase the engine speed, until the output meter (7) reading no longer rises. Check whether the output is stable and compare the measured reading with the specified reading, see 'Technical data'.
3. Increase and decrease the engine speed and check whether the output increases evenly and then remains stable.
4. Slowly close the cock (4) until the pressure at the pressure gauge (10) has increased to approx. 50 bar. While closing the cock, check whether the pressure gauge (10) needle starts to fluctuate.



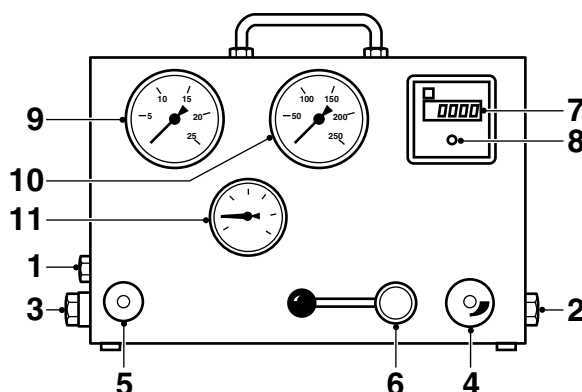
S7 00 020

Testing the internal steering box leakage

1. Check whether the connection between the "Tank" connection and the steering oil reservoir has been established. The connection to the reservoir should continue to the bottom of the reservoir, to prevent foaming.

2

2. Open the non-return valve (5).
3. Close the cock (4) completely.
4. Adjust the pressure to 30 bar under the maximum system pressure using the non-return valve (5).
5. Open the cock (4) completely.
6. Activate the output meter (7) using the switch (8).

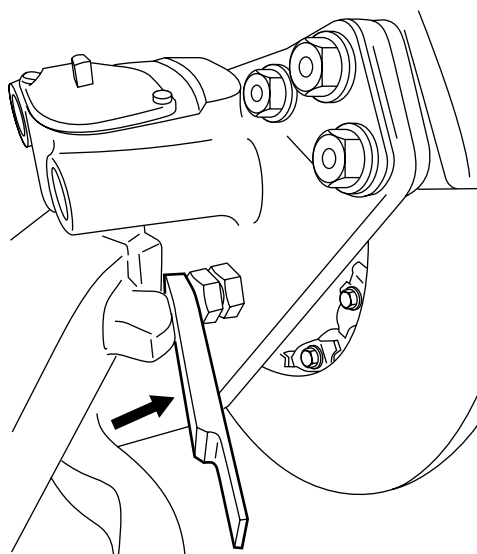


S7 00 020

7. Activate the steering gear and fit a 15-mm filler piece, special tool (DAF no. 0535996), between the adjusting bolt and the axle stop.

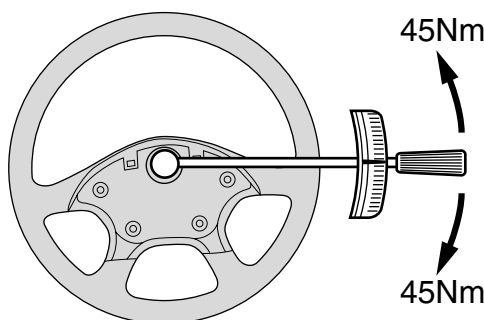


Be careful when fitting the 15-mm filler piece between the adjusting bolt and the axle stop, because there is a danger of limbs getting trapped.



S7 00 598

8. Fit a torque wrench with a dial to the steering wheel nut and tighten the nut to a tightening torque of 45 Nm on the torque wrench.
9. Read off the leak-off oil quantity and compare this quantity with the maximum admissible leak-off oil quantity. See 'Technical data'.
10. Carry out the measurement for the other wheel deflection.



S7 00 565

11. If an excessive internal leakage is measured for a vehicle equipped with a slave cylinder (see 'Technical data'), the measurement should be repeated with the slave cylinder disconnected.

- Mark the slave-cylinder lines and remove these from the steering box.
- Fit suitable plugs into the slave cylinder line connections to plug the steering box.
- Place the lines from the slave cylinder in a reservoir, as the slave cylinder will force the oil from the lines while steering.

Note:

Never connect the slave cylinder lines to each other. The volumes of the left- and right-hand cylinder halves are not equal, resulting in a pressure build-up in the slave cylinder while steering.

- After the slave cylinder has been disconnected, measuring should be repeated and the reading compared with the maximum admissible value. See 'Technical data'.

12. If the steering gear "jams", the test should be repeated with a set pressure of 15 - 30 bar.

Testing the steering-wheel nut attachment

As the steering wheel nut might be slackened by the torque wrench, the steering wheel nut should be re-tightened to the specified tightening torque. See 'Technical data'.

Removing the test case

1. Remove the hoses and connect the delivery line.
2. Reconnect the slave cylinder lines, if these have been removed.
3. Check the steering oil level and top up as necessary.
4. Bleed the system.
5. Inspect the line connections for leaks.
6. Remove the jack.
7. With an EMAS-controlled trailing axle install the fuses for the EMAS system.

3.3 INSPECTION OF SECOND CIRCUIT OF THE DUAL-CIRCUIT SYSTEM



Test the operation of the second circuit in an open yard, devoid of traffic. This test may not be performed on the public road.

1. Drive at a speed of 30 km/h.
2. Put the gear lever in neutral position and switch off the engine with the contact key.



Make sure that the key is only turned back one position. If, by accident, the key is turned back too far, it could be removed, thus activating the steering wheel lock and blocking the steering gear.

3. After switching off the engine, check whether warning indicator 1 of circuit 1 lights up.
4. Carry out the test at a vehicle road speed of 30 to 15 km/h.
Turn the steering wheel a $\frac{1}{4}$ to $\frac{1}{2}$ turn to the left and to the right.
5. If the steering gear is not equipped with a slave cylinder, the required steering force should not exceed the force required when the engine is running.
If the steering gear is equipped with a slave cylinder, the required steering force may exceed the force required when the engine is running, because the slave cylinder is switched off.



At a vehicle road speed of less than 10 km/h, the vehicle will steer very heavily.

3.4 INSPECTION OF STEERING BOX ATTACHMENT.

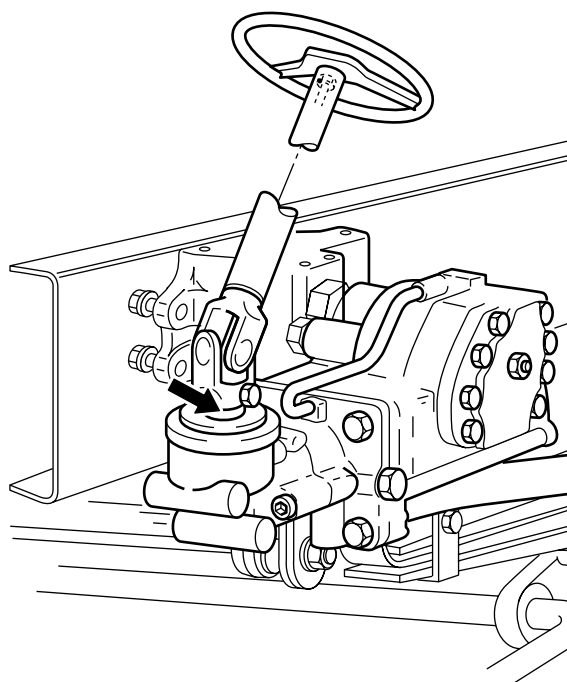
1. Engine should be at idling speed.
2. Pull the steering wheel with quick jerks.
3. The steering box should not move.

3.5 INSPECTION OF HYDRAULIC CENTRE POSITION

1. Jack up the front axle(s).
2. Place the pitman arm in the central position.
3. Engine speed 1200 - 1400 rpm.
4. The pitman arm should not move by itself.

3.6 CHECKING FASTENING OF UNIVERSAL JOINT TO STEERING BOX INPUT SHAFT

1. Check the universal joint for perceptible play. If perceptible play is detected, the affected part must be replaced.
2. Check whether there is any perceptible play between the spline connection of the universal joint and the steering box input shaft. If perceptible play is detected, the splines on the universal joint and those on the input shaft must be checked for wear. If wear is detected, the affected part must be replaced.
3. If there is noticeable play but the parts are not worn, the attachment bolt and nut must be replaced. Tighten the new locating bolt with the new self-locking nut to the specified tightening torque, see 'Technical data'.



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4. DRAINING AND FILLING

4.1 DRAINING AND FILLING/BLEEDING THE SINGLE CIRCUIT STEERING SYSTEM

The steering oil should be drained in case of:

- damage to the main steering pump or emergency steering pump
- contamination of the steering oil
- water in the steering oil
- serious foaming of the steering oil due to drawing in of air.

Draining of a single-circuit steering system

1. Clean the line connections of the steering box, reservoir and, if present, the slave cylinder.
2. Jack up the steerable axle(s).
3. Place receptacles under the steering box and, if present, the slave cylinder. Remove the return line from the steering box and, if present, the slave cylinder lines.
4. Remove the filter from the reservoir.
5. With the engine at a standstill turn the steering wheel slowly from one end stop to the other until the oil stops coming out of the line connection(s).
6. Reconnect the disconnected line(s).
7. Fit a new filter into the reservoir.



Drained steering oil must not be re-used. Store this hydraulic oil separately from the other drained oils and have the oil collected by a waste-removal company authorised to do so.

Make sure that during filling and bleeding the reservoir always remains filled with oil so as to prevent the pump from drawing in air which would cause foaming in the oil.

Air in the hydraulic system may cause serious damage to the steering pump. Air in the hydraulic system could cause occasional "jamming" of the steering gear.

If the hydraulic system contains air, a squealing sound will be heard when the steering wheel is turned.

In the case of serious foaming, the steering oil should be completely drained. Trace and repair the leak, after which the system can be filled again and bled.

Filling/bleeding of a single-circuit steering system

1. The steering gear bleeds automatically. This bleeding system will only function if there is circulation pressure in the system.
2. Fill the reservoir to the brim with clean oil which complies with the specifications. Wait a little while and then fill the reservoir to the brim again.
3. Crank the engine for approx. 2 seconds using the starter motor. Make sure that the reservoir remains filled. Stop cranking immediately if the oil level threatens to become too low. Top up the steering oil.
4. Crank the engine for approx. 10 seconds using the starter motor. Make sure that the reservoir remains filled. Stop cranking immediately if the oil level threatens to become too low.
5. Top up the steering oil to the upper mark on the dipstick.
6. Repeat the actions described in points 4 and 5 until the steering oil level no longer decreases.

7. Jack up the steerable axle(s) until the wheels are clear of the floor.

Note:

If the wheel deflection limiting valves are incorrectly set, e.g. because the maximum wheel deflection is increased, these valves should be set correct first.

8. Start the engine and, with the engine running, slowly turn the steering wheel (approx. a ½ turn of the steering wheel per second) to the left and to the right, until the maximum wheel deflection is reached. Continue this until the oil level no longer decreases.
Watch the steering oil level, especially if the vehicle is equipped with a slave cylinder.
9. Run the engine at idling speed for another 2 minutes. Do not touch the steering wheel during these 2 minutes.
10. Check the steering oil level when the engine is not running.
11. Clean the dipstick and its immediate surroundings so that no dirt can get into the reservoir.
12. Check the fluid level in the reservoir using the dipstick.
13. The fluid level should be between the marks when the steering oil is "cold".

Note:

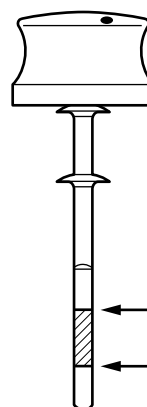
When the steering oil is at operating temperature, the level may be above the top mark on the dipstick.

Note:

If the vehicle is equipped with a slave cylinder, it may be necessary in some cases to bleed the slave cylinder separately.

To do so, slightly loosen the union nuts of both connections while the engine is running, and no steering action is taking place. Any air can now escape.

14. Put the filler cap on the reservoir again and lower the axle(s).
15. Inspect the line connections for leaks.
16. Make a test drive. Now check the steering oil level and check the line connections for leaks.



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4.2 DRAINING AND FILLING/BLEEDING THE DUAL-CIRCUIT SYSTEM

The steering oil should be drained in case of:

- damage to the main steering pump or emergency steering pump
- contamination of the steering oil
- water in the steering oil
- serious foaming of the steering oil due to drawing in of air.

2**Draining a dual-circuit steering system**

1. Clean the line connections of the steering box, the reservoirs, the emergency steering pump and, if present, the slave cylinder.
2. Jack up the steerable axle(s).
3. Place receptacles under the reservoirs, the steering box, the emergency steering pump and, if present, the slave cylinder. Remove the lines (for the reservoirs only the connection line).
4. Remove the filters from the reservoirs.
5. With the engine at a standstill turn the steering wheel slowly from one end stop to the other until the oil stops coming out of the line connections of the steering box and the slave cylinder.
6. Reinstall the lines which were disconnected.
7. Fit new filters into the reservoirs.



Drained steering oil must not be re-used. Store this hydraulic oil separately from the other drained oils and have the oil collected by a waste removal company authorised to do so.

Make sure that during filling and bleeding the reservoir always remains filled with oil so as to prevent the pump from drawing in air which would cause foaming in the oil.

Air in the hydraulic system may cause serious damage to the steering pump. Air in the hydraulic system could cause occasional "jamming" of the steering gear.

If the hydraulic system contains air, a squealing sound will be heard when the steering wheel is turned.

In the case of serious foaming, the steering oil should be completely drained. Trace and repair the leak, after which the system can be filled again and bled.

Filling/bleeding the dual-circuit steering system

1. The steering boxes are equipped with an automatic bleeding system. This bleeding system will only function if there is circulation pressure in the system.
2. Disconnect the propeller shaft from the gearbox.



Hang the propeller shaft properly to one side so that it cannot come into contact with the gearbox flange.

If the bolts cannot be removed from the gearbox flange, these should be provided with spacer sleeves and nuts. Tighten the nuts carefully, so that the bolts can no longer come into contact with the gearbox housing.

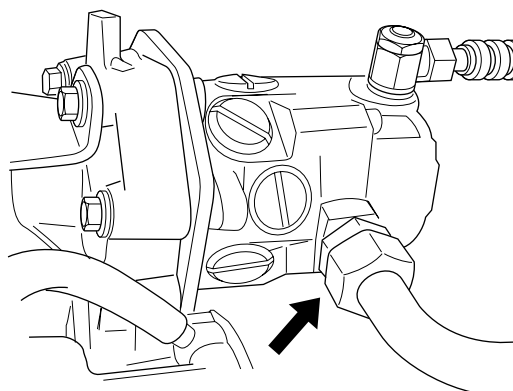
3. Fill both reservoirs to the rim with clean oil which complies with the specifications. Wait a little while and then fill the reservoirs to the brim again.

4. Loosen the line connection of the supply line on the emergency steering pump. Bleed the supply pipe.
Tighten the line connection.
5. Top up the reservoirs again.
6. Crank the engine for approx. 2 seconds using the starter motor. Make sure that the reservoir remains filled. Stop cranking immediately if the oil level threatens to become too low. Top up the steering oil.
7. Crank the engine for approx. 10 seconds using the starter motor. Make sure that the reservoir remains filled. Stop cranking immediately if the oil level threatens to become too low.
8. Top up the steering oil to the upper mark on the dipstick.
9. Repeat the actions described in points 6 and 7 until the steering oil level no longer decreases.
10. Jack up the steerable axle(s) until the wheels are clear of the floor.

Note:

If the wheel deflection limiting valves are incorrectly set, e.g. because the maximum wheel deflection is increased, these valves should be set correct first.

11. Start the engine and, with the engine running, slowly turn the steering wheel (approx. a ½ turn of the steering wheel per second) to the left and to the right, until the maximum wheel deflection is reached. Continue this until the oil level no longer decreases.
Watch the steering oil level, especially if the vehicle is equipped with a slave cylinder.
12. Check the steering oil level when the engine is running and, if necessary, top up to the upper mark on the dipstick.
13. Change into a low gear and slowly release the clutch pedal while the engine is at idling speed. Watch the steering oil level in the reservoir of circuit 2. Top up if the level becomes too low.
14. Change into a higher gear and increase the engine speed if the steering oil level no longer decreases.
The warning indicator of circuit 2 should now go off.



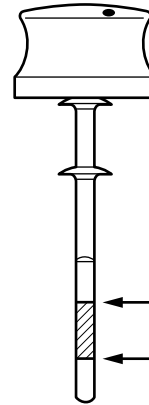
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15. Run the engine at idling speed for another 2 minutes. Do not touch the steering wheel during these 2 minutes.
16. Check the steering oil level when the engine is not running.
17. Clean the dipstick and its immediate surroundings so that no dirt can get into the reservoir.
18. Check the fluid level in the reservoir using the dipstick.
19. The fluid level should be between the marks when the steering oil is "cold".

Note:

When the steering oil is at operating temperature, the level may be above the top mark on the dipstick.

20. Put the filler cap on the reservoir again and lower the axle(s).
21. Inspect the line connections for leaks.
22. Attach the propeller shaft.
23. Make a test drive. Now check the steering oil level and check the line connections for leaks.



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4.3 DRAINING AND FILLING/BLEEDING THE STEERING SYSTEM WITH EMAS-CONTROLLED TRAILING AXLE

The steering oil should be drained in case of:

- damage to the main steering pump or emergency steering pump
- contamination of the steering oil
- water in the steering oil
- serious foaming of the steering oil due to drawing in of air.

Draining the steering system with EMAS-controlled trailing axle

1. Clean the line connections of the steering box, reservoir and, if present, the slave cylinder.
2. Jack up the front axle.
3. Place receptacles under the steering box. Remove the return line from the steering box.
4. Remove the filter from the reservoir.
5. With the engine at a standstill turn the steering wheel slowly from one end stop to the other until the oil stops coming out of the line connection.
6. Reinstall the line which was disconnected.
7. Drain the EMAS system.
8. Fit a new filter into the reservoir.
9. Replace the pressure filter in the fluid flow control valve.



Drained steering oil must not be re-used. Store this hydraulic oil separately from the other drained oils and have the oil collected by a waste removal company authorised to do so.

Make sure that during filling and bleeding the reservoir always remains filled with oil so as to prevent the pump from drawing in air which would cause foaming in the oil.

Air in the hydraulic system may cause serious damage to the steering pump. Air in the hydraulic system could cause occasional "jamming" of the steering gear. If the hydraulic system contains air, a squealing sound will be heard when the steering wheel is turned. Air in the fluid flow control valve is continually audible.

In the case of serious foaming, the steering oil should be completely drained. Trace and repair the leak, after which the system can be filled again and bled.

Filling/bleeding the steering system with EMAS-controlled trailing axle

1. Remove the fuses of the EMAS system.
2. The steering gear bleeds automatically. This bleeding system will only function if there is circulation pressure in the system.
3. Fill the reservoir to the brim with clean oil which complies with the specifications. Wait a little while and then fill the reservoir to the brim again.
4. Crank the engine for approx. 2 seconds using the starter motor. Make sure that the reservoir remains filled. Stop cranking immediately if the oil level threatens to become too low. Top up the steering oil.
5. Crank the engine for approx. 10 seconds using the starter motor. Make sure that the reservoir remains filled. Stop cranking immediately if the oil level threatens to become too low.
6. Top up the steering oil to the upper mark on the dipstick.

7. Repeat the actions described in points 4 and 5 until the steering oil level no longer decreases.
8. Jack up the front axle until the wheels are clear of the floor.

Note:

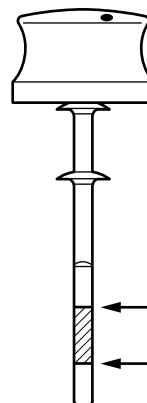
If the wheel deflection limiting valves are incorrectly set, e.g. because the maximum wheel deflection is increased, these valves should be set correct first.

9. Start the engine and, with the engine running, slowly turn the steering wheel (approx. a ½ turn of the steering wheel per second) to the left and to the right, until the maximum wheel deflection is reached. Continue this until the oil level no longer decreases. Watch the steering oil level, especially if the vehicle is equipped with a slave cylinder.
10. Run the engine at idling speed for another 2 minutes. Do not touch the steering wheel during these 2 minutes.
11. Check the steering oil level when the engine is not running.
12. Clean the dipstick and its immediate surroundings so that no dirt can get into the reservoir.
13. Check the fluid level in the reservoir using the dipstick.
14. The fluid level should be between the marks when the steering oil is "cold".

Note:

When the steering oil is at operating temperature, the level may be above the top mark on the dipstick.

15. Fit the fuses to the EMAS system.
16. Fill and bleed the EMAS system as specified.
17. Inspect the line connections for leaks.
18. Make a test drive. Now check the steering oil level and check the line connections for leaks.



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1. SAFETY INSTRUCTIONS

1.1 SAFETY INSTRUCTIONS



Be careful when tilting the cab or when working under the tilted cab if the steering bracket is to be inspected or replaced because of a collision. Vital parts of the cab suspension may have been damaged. Take the necessary precautions.

If the vehicle has been involved in a collision in which the steering box or other components of the steering gear have (possibly) been damaged, the steering box should always be sent to DAF for inspection or be replaced. This instruction even applies if no external damage is visible. In the collision, the steering box may have sustained internal damage, causing it to be unreliable.

If the pitman arm has been subjected to extremely high loads (accident), it should be magnaflux tested, even if no deviations can be found with the naked eye.

If such a test is not possible, the pitman arm should be replaced at all times.

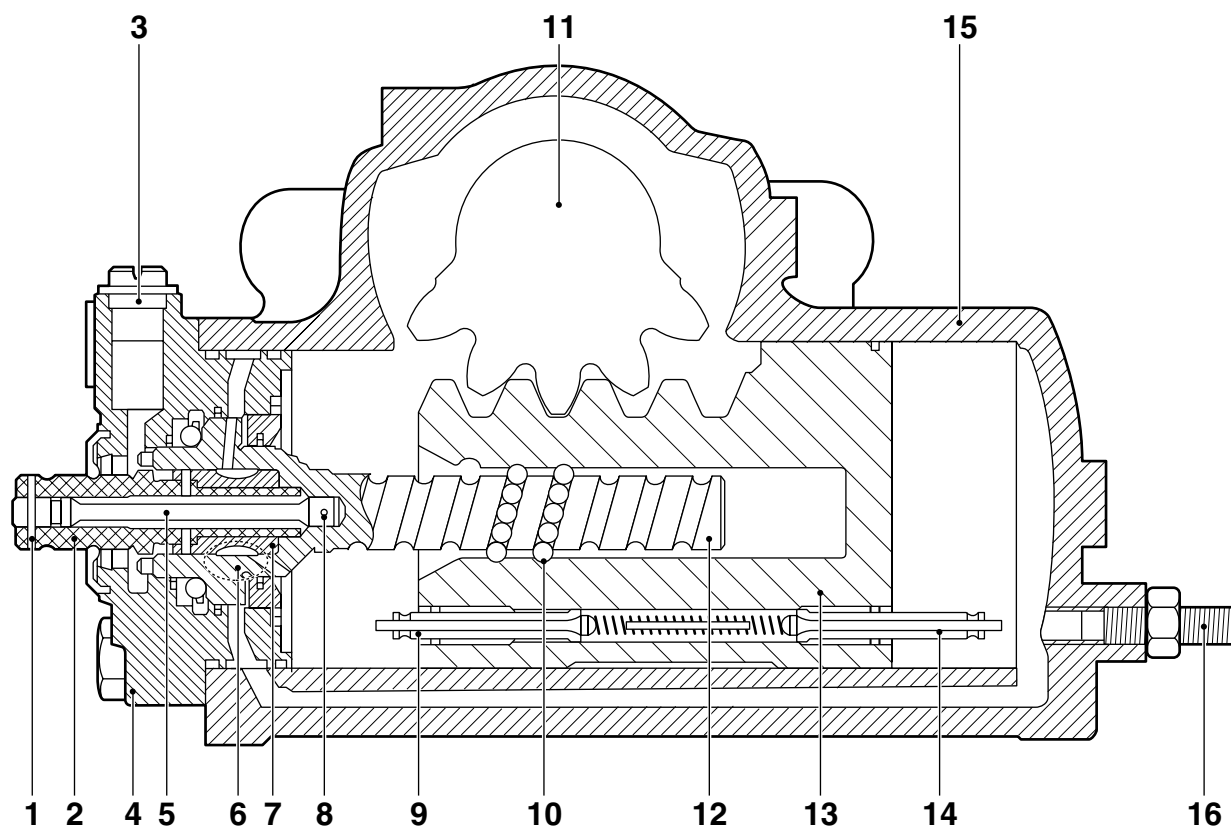
The pitman arm should only be removed using the prescribed special tools.

Under no circumstances should the pitman arm be removed by dislodging it using a hammer or by heating, if the prescribed tools are not available. This would not only result in the pitman arm becoming highly unreliable, it would also permanently damage the sector shaft.

With steering boxes, only the input shaft oil seal, the sector shaft seals, the dirt and water seals and the side cover gasket may be replaced.

2. GENERAL

2.1 OVERVIEW DRAWING, STEERING BOX

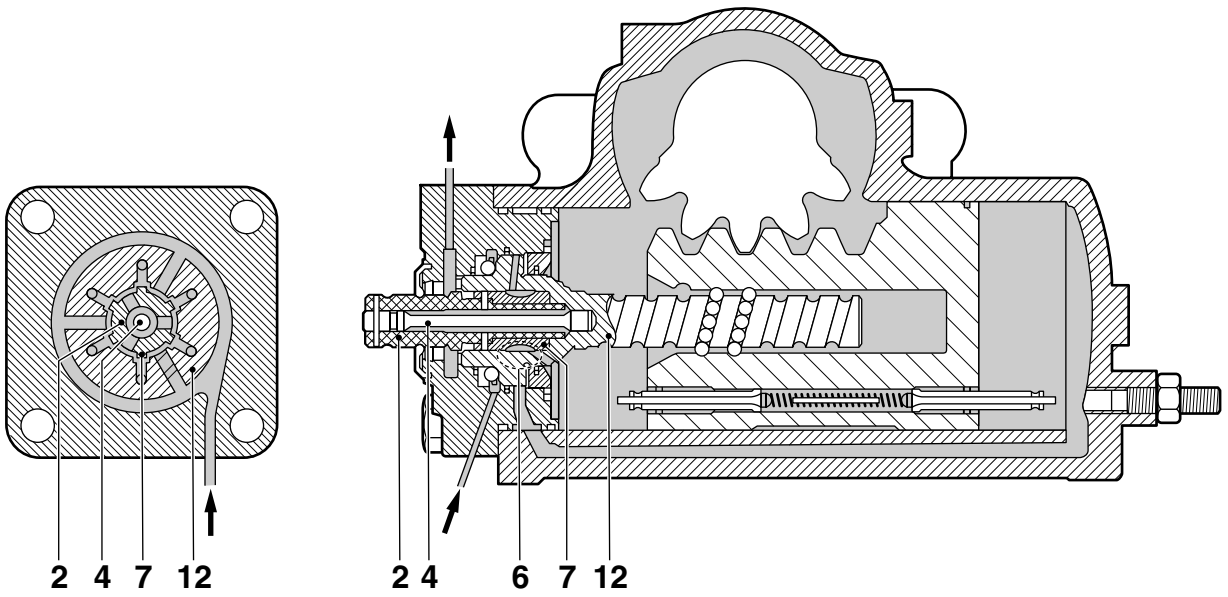


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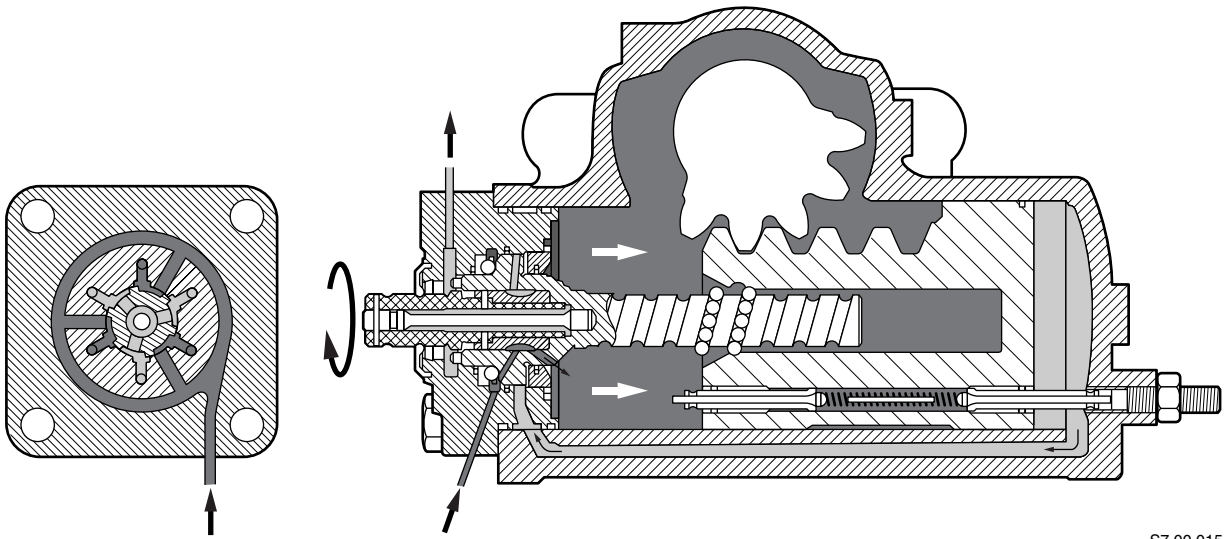
1. Attachment pin, torsion bar
2. Input shaft
3. Pressure-limiting valve
4. Cover
5. Torsion bar
6. Control valve
7. Bushing
8. Attachment pin, torsion bar
9. Wheel deflection limiting valve
10. Ball nut
11. Sector shaft
12. Worm shaft
13. Piston
14. Wheel deflection limiting valve
15. Housing
16. Adjusting bolt, wheel deflection limiting valves

2.2 OPERATION OF THE STEERING BOX

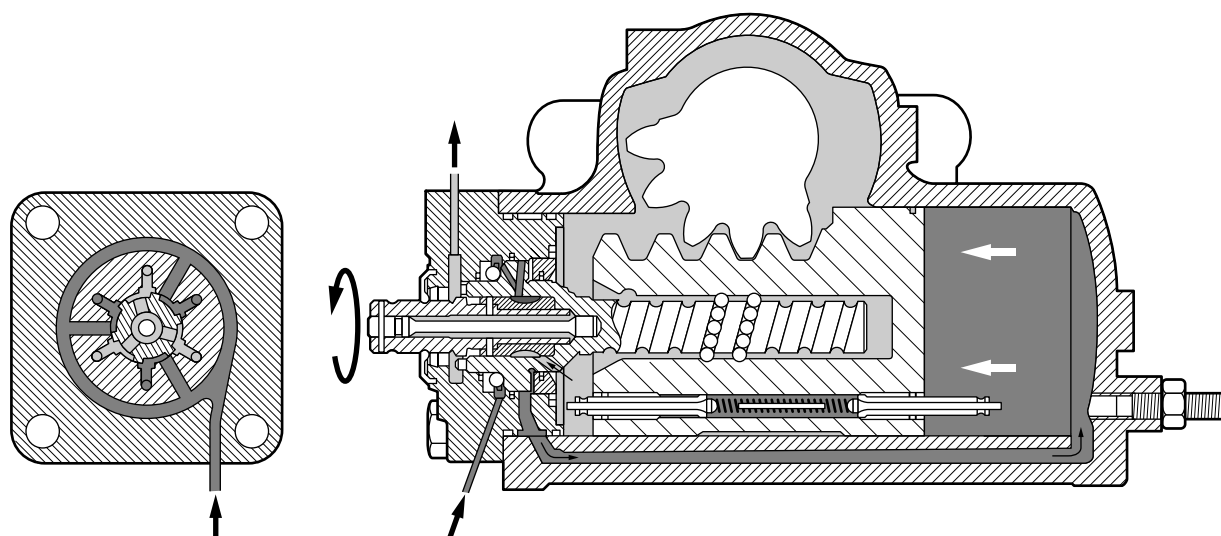
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Hydraulic power steering

The oil flow in the steering box is controlled by the control valve (6).

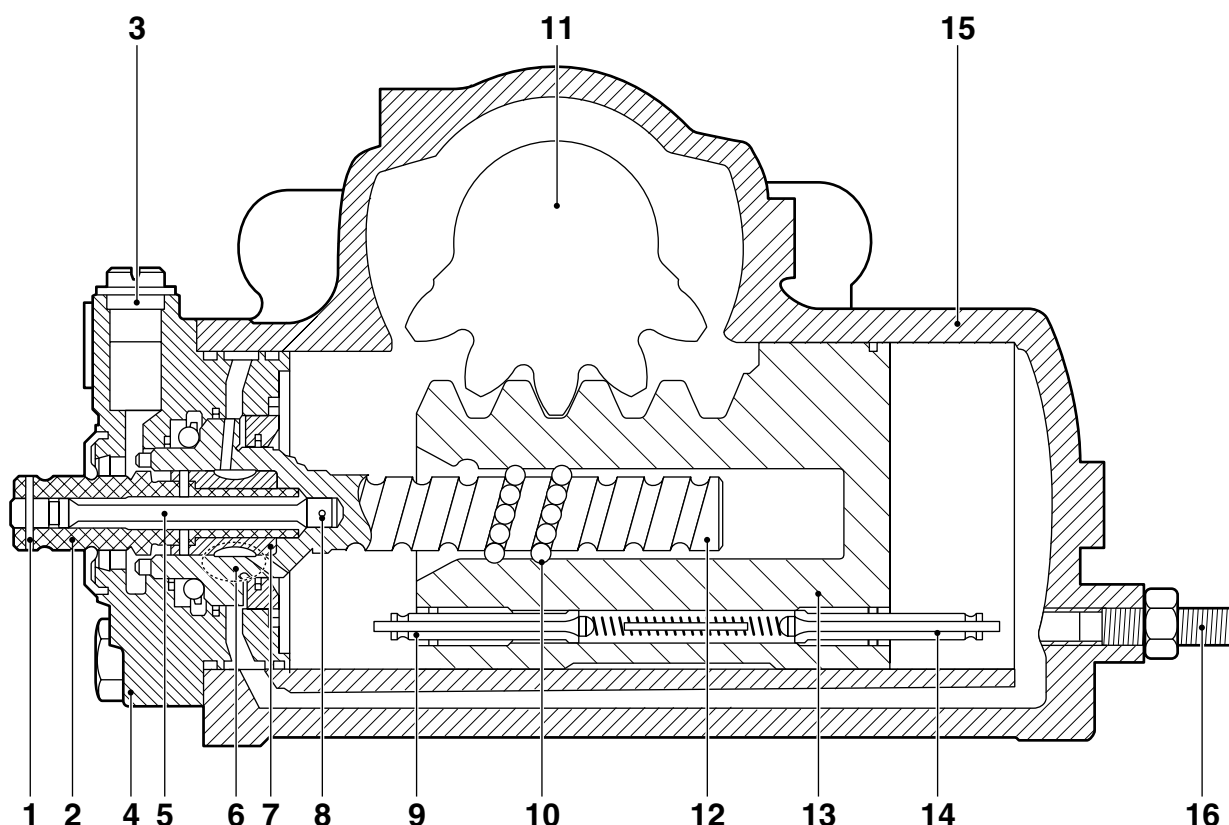
The control valve (6) consists of a bushing (7), which is attached to the input shaft (2) and the space in the worm shaft (12).

On the outside, the bushing (7) has a number of recesses. The delivery line and the return line and the channels leading to the cylinder halves end in the chamber of the worm shaft (12). The delivery line and the return line can be connected to the channels leading to the cylinder halves through the recesses of the bushing (7).

If the bushing (7) is turned in relation to the space in the worm shaft (12), one cylinder half connects to the delivery line and the other to the return line. If the input shaft (2) is turned the other way, the bushing (7) will switch the delivery line and return line connections to the cylinder halves.

Because the control valve (6) increases the oil flow to one side of the piston during steering and connects the other side of the piston to the return line, the oil can no longer circulate through the steering box. As a result, pressure builds up on one side of the piston and the piston moves.

If no steering takes place, the control valve (6) is in its neutral position. In the neutral position the oil flow to the left-hand and the right-hand side of the piston is such that the forces exerted on the piston by the oil are equal. Therefore, the piston will not move. This is called the "hydraulic central position" of the steering box. The oil pressure in this situation is called the circulation pressure. The neutral position of the steering box is factory-set and cannot be changed.



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A torsion bar (5) is fitted between the input shaft (2) and the worm shaft (12) and connected to the input shaft (2) and the worm shaft (12) using pins (1) and (8).

While steering, the input shaft (2) will turn in relation to the worm shaft (12), resulting in a twisting movement of the torsion bar (5). The torsion bar (5) ensures that when no torque is exerted at the input shaft (and steering no longer takes place), the input shaft (2) is returned to its neutral position in relation to the worm shaft (12). As a result, the control valve (6) also returns to the neutral position and the hydraulic power steering is deactivated.

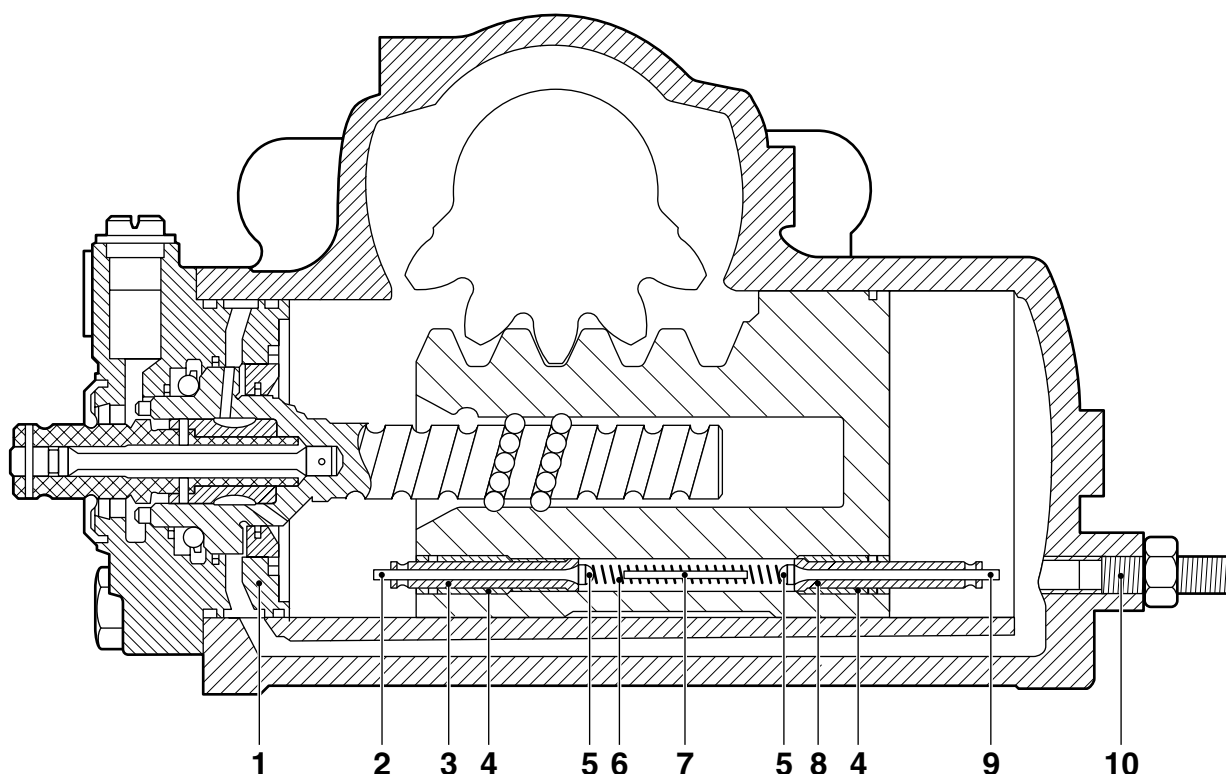
Pressure limiting

The pressure-limiting valve (3) protects the system from excessive system pressures. If the preset valve pressure is reached, the valve opens and connects the delivery line to the return line.

Bleeding

The steering box is auto-bleeding.

At circulation pressure, the steering box auto-bleeds. At a higher system pressure, the bleeding system is closed.



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Wheel deflection limiting

To reduce the system pressure at the maximum wheel deflection, the piston is equipped with two wheel deflection limiting valves (3) and (8).

The pins (2) and (9) of the wheel deflection limiting valves touch their stops before the maximum wheel deflection is reached. The pin opens the valve (5) and both cylinder halves become connected, thus decreasing the system pressure.

The pin (2) of the wheel deflection limiting valve (3) touches the cover (1), and the pin (9) of the wheel deflection limiting valve (8) touches the adjusting bolt (10).

The wheel deflection limiting valves are automatically adjusted when a new steering box is fitted. The wheel deflection limiting valves are fitted into the piston using clamping bushes (4), thus making it possible for the valves to slide within the piston.

If a new steering box is fitted, the wheel deflection limiting valves protrude far enough from the piston so that they will touch the end stops (the cover and the adjusting bolt) well before the maximum wheel deflection is reached.

The first time the steering box is turned to its maximum steering position (both to the left and to the right) - with a front axle which is correctly adjusted for maximum wheel deflection - the

wheel deflection limiting valves will be depressed to the correct depth in the piston, resulting in a correct valve adjustment.

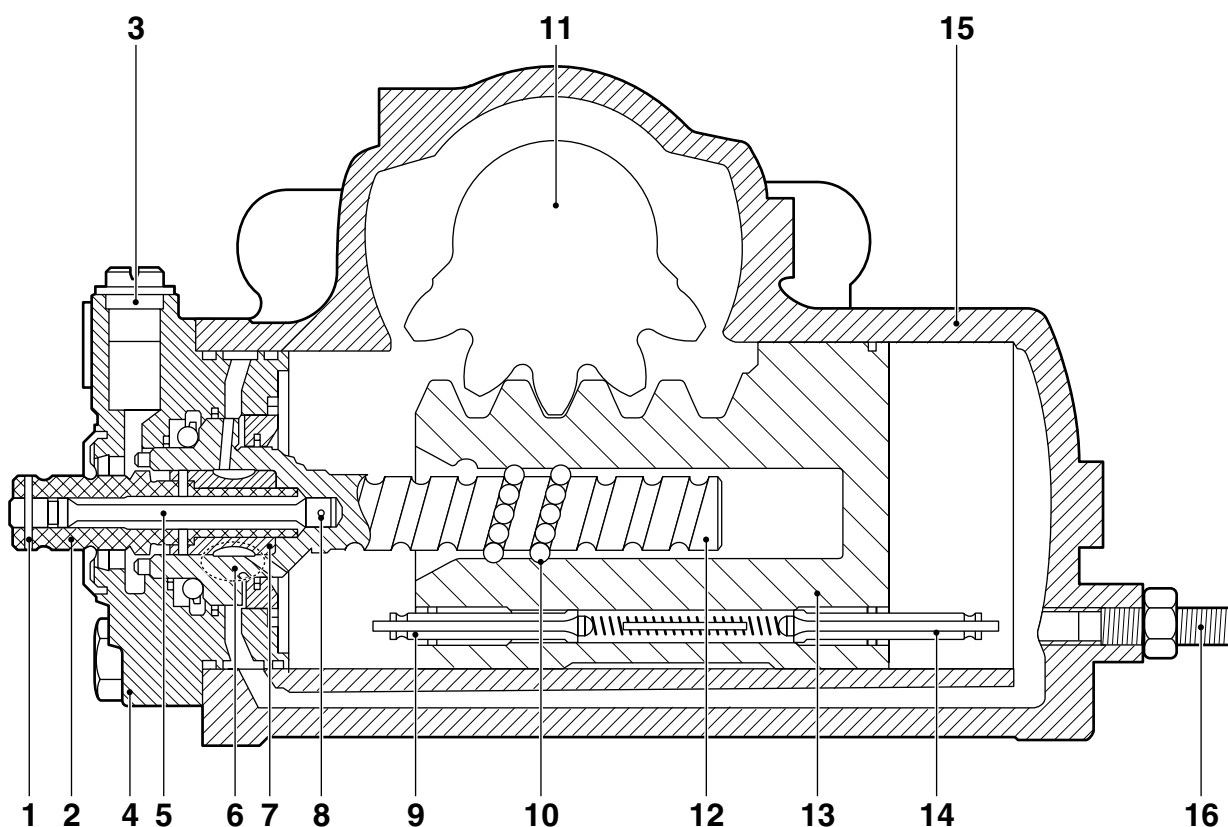
If the wheel deflection is to be reduced (e.g. because wider tyres have been fitted), the adjustment of the wheel deflection limiting valves must be reset. This is done as follows:

Place the steering box in the central position, and screw adjusting bolt (10) further into the steering box.

By moving the piston towards the adjusting bolt (10), the wheel deflection limiting valve (8) will touch the adjusting bolt (10), thus pushing the valve (8) deeper into the piston. A distance pin (7) is fitted between wheel deflection limiting valves (3) and (8). If the valve (8) is pushed deeper into the cylinder, the valve will touch the pin (7), and the pin will subsequently push the valve (3) partially out of the piston.

By moving the piston in the direction of the cover (1) to the maximum wheel deflection, the wheel deflection limiting valve (3) will touch the cover and the valve will be pushed into the piston to the correct depth. This completes correct setting of the valve (3). During this action, the wheel deflection limiting valve (8) is also pushed partially out of the piston.

The correct setting of the wheel deflection limiting valve (8) is finally restored using the adjusting bolt (10).



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Mechanical linkage

If the hydraulic power steering is cut off, the torque on the input shaft (2) is mechanically transferred to the steering rod.

The input shaft (2) and the worm shaft (12) can rotate in relation to each other. This rotation is limited by an end stop.

While steering without the hydraulic power steering, the steering force at the input shaft (2) is transferred to the worm shaft (12) by the end stop.

The ball curve (10) converts the rotating movement of the worm shaft into the linear movement of the piston (13). The teeth of the piston (13) rotate the sector shaft (11) with the pitman arm attached to it.

Gear backlash

Because the gearing of the sector shaft (11) and the piston (13) are constantly engaged when driving straight forward, slight wear may occur.

This wear can cause gear backlash. To eliminate this gear backlash, the sector shaft can be adjusted axially using an adjusting bolt. The adjusting bolt pushes the bevelled teeth of the sector shaft (11) deeper into the teeth of the piston (13), thus eliminating any play.

The sector shaft gearing (11) is such that the tooth engaging the piston teeth when the steering box is in its central position is slightly longer than the other teeth.

After the play in the central position of the steering box has been corrected, the piston should be prevented from jamming in other positions. As a result play is perceptible outside the central position.

3. INSPECTION AND ADJUSTMENT

3.1 INSPECTION AND ADJUSTMENT, WHEEL DEFLECTION LIMITING VALVES

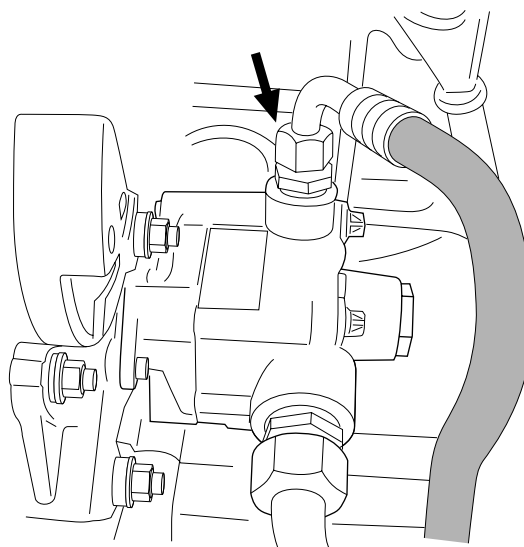
Inspection of wheel deflection limiting valves

1. Connect the pressure gauge (DAF no. 0535653) to the delivery line using a T-piece. Connect the T-piece as quickly as possible to avoid air getting into the system. Check the steering oil level in the reservoir after connecting the T-piece and top up the oil if required.
2. Bleed the steering gear. To do so, run the engine at idling speed for approx. 2 minutes, without steering.
3. Jack up the steerable axle(s).
4. Warm the steering oil as described below, until the lines are hand warm at least.
 - Set the engine speed to 1200 - 1400 rpm.
 - Activate the steering gear for 5 seconds at its maximum, making sure that the pressure does not exceed 50 bar.
 - Do not touch the steering wheel for 5 seconds.
 - Continue this operation until the required temperature is reached.

Note:

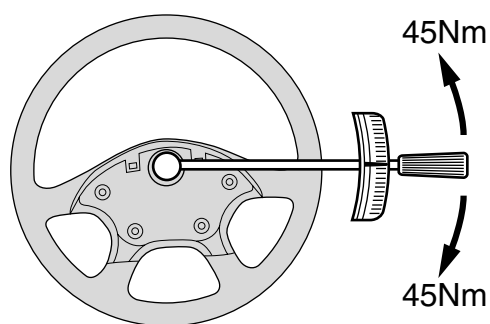
If the steering oil is too cold, considerably higher pressures will be measured.

5. Turn the steering wheel fully left.
6. Set the engine speed to 1200 - 1400 rpm.
7. Fit a torque wrench with a dial to the steering wheel nut and tighten the nut to a tightening torque of 45 Nm on the torque wrench.
8. The pressure gauge will indicate the final limiting pressure. Compare the reading with the maximum permissible value. See 'Technical data'. If the value measured is too high, the wheel deflection limiting valves should be re-adjusted.
9. Carry out the measurement once again, with the steering wheel being turned fully to the right.
10. Remove the jack.
11. Remove the pressure gauge.



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12. Check the steering oil level in the reservoir after removing the pressure gauge and top up the oil if required.
13. Bleed the steering gear. To do so, run the engine at idling speed for approx. 2 minutes, without steering.
14. Retighten the steering wheel nut to the specified tightening torque. See 'Technical data'.

3**Adjusting the wheel deflection limiting valves**

There are three adjusting procedures.

Procedure A, to be applied if:

- a new or revised steering box is installed, and the steering box input shaft has not been rotated more than 1.5 turns before the steering rod was connected to the steering gear.

Procedure B, to be applied if:

- the wheel deflection has been increased, and the wheel deflection limiting valves have not yet been adjusted according to procedure C.

Procedure C, to be applied if:

- the wheel deflection has been reduced.
- the wheel deflection has been increased, and the wheel deflection limiting valves have already been adjusted according to procedure C.
- the steering box input shaft was rotated more than 1.5 turns before the steering box with the steering rod was connected to the steering gear.

Note:

A steering box, whose wheel deflection limiting valves have already been adjusted according to procedure C, can be identified by the fact that the factory-applied paint layer is missing from the protruding thread of the adjusting bolt.

Adjusting according to procedure A

1. Make sure that the steering box and the steering bracket attachment bolts are tightened to the specified tightening torques. See 'Technical data'.
2. Check the wheel deflection of the steerable axle(s) before the steering rod is installed. If necessary, the wheel deflection should be adjusted using the wheel stop bolts on the swivel axles.
3. Install the steering rod.

4. Turn the steering wheel fully to the left and to the right during a test drive.
Both wheel deflection limiting valves have now been pushed to the right position in the steering box piston and have adjusted themselves.

Adjusting according to procedure B

1. Turn the steering wheel fully to the left and to the right during a test drive.
Both wheel deflection limiting valves have now been pushed to the right position in the steering box piston and have adjusted themselves.

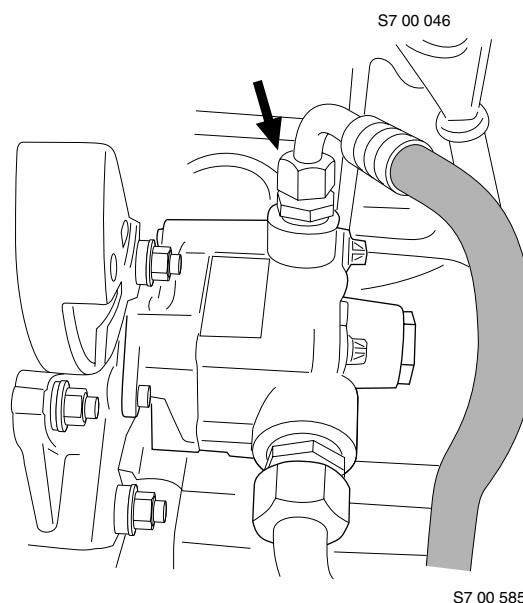
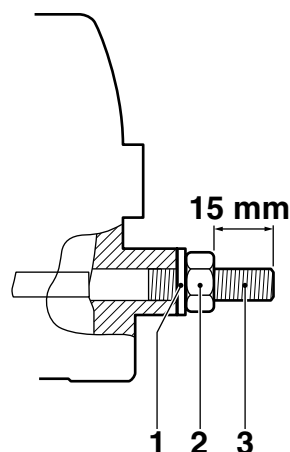
Adjusting according to procedure C

Note:

To adjust the wheel deflection limiting valves the sealing plug should be replaced by an adjusting bolt.

The required adjusting bolt (length 55 mm) can be ordered as (DAF no. 1276448).

1. Remove the sealing plug at the underside of the steering box.
2. Screw the adjusting bolt (3) which is fitted with a lubricant seal (1) into the steering box, until approx. 15 mm of thread protrudes from the lock nut (2). Tighten the lock nut.
3. Jack up the steerable axle(s) until the wheels are clear of the floor.
4. Remove the steering rod from the pitman arm.
5. Connect the pressure gauge (DAF no. 0535653) to the delivery line using a T-piece. Connect the T-piece as quickly as possible to avoid air getting into the system. Check the steering oil level in the reservoir after connecting the T-piece and top up the oil if required.
6. Bleed the steering gear. To do so, run the engine at idling speed for approx. 2 minutes, without steering.
7. Warm the steering oil as described below, until the lines are hand warm at least.
 - Set the engine speed to 1200 - 1400 rpm.
 - Activate the steering gear for 5 seconds at its maximum, making sure that the pressure does not exceed 50 bar.
 - Do not touch the steering wheel for 5 seconds.
 - Continue this operation until the required temperature is reached.



Note:

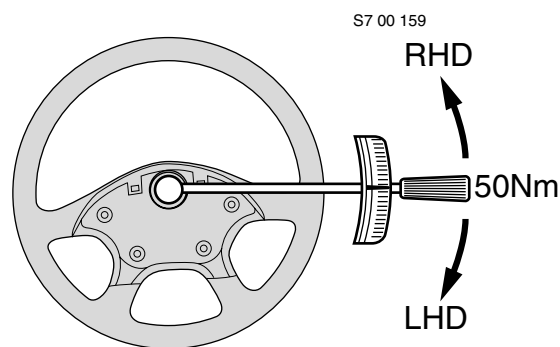
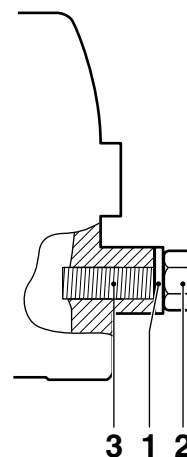
If the steering oil is too cold, considerably higher pressures will be measured.

8. Stop the engine.
9. Screw the adjusting bolt (3) into the steering box until the top of the adjusting bolt is flush with the top of the lock nut (2).

Note:

The following actions can differ for versions with left-hand and right-hand steering (LHD and RHD). If so, the RHD situation is described between brackets.

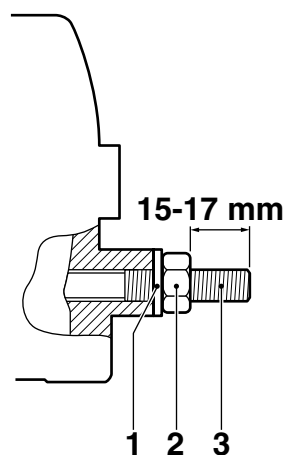
10. With the engine shut off, turn the steering wheel fully to the right (RHD to the left) until resistance is felt. Place a torque wrench on the steering wheel nut and turn the steering gear further until a tightening torque of 50 Nm is achieved. This will press the wheel deflection limiting valves into the "reset" position.
11. Remove the torque wrench and turn the steering gear into the central position.
12. Fit the steering rod into the pitman arm.



S7 00 159

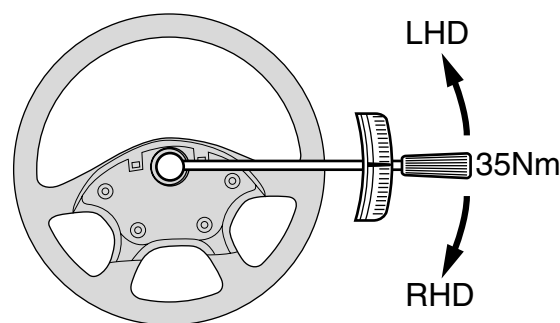
S7 00 564

13. Loosen the lock nut (2) and unscrew the adjusting bolt 15 - 17 mm out of the lock nut.
14. Tighten the lock nut to a tightening torque of 20 - 30 Nm.
15. Start the engine and run it at idling speed.



S7 00 158

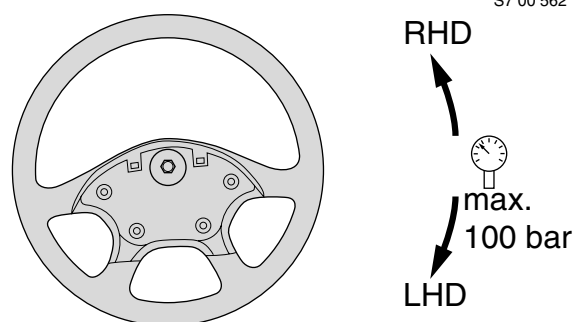
16. Turn the steering wheel fully left (RHD fully right) until the end stop is reached. Fit a torque wrench to the steering wheel nut and pull on the torque wrench with a tightening torque of 35 Nm. The maximum reading on the pressure gauge should be 80 bar. This will correctly re-adjust the wheel deflection limiting valve, which has its end stop at the steering box cover.



S7 00 562

17. Run the engine at idling speed and turn the steering wheel fully right (RHD fully left) until the end stop is reached. The pressure should not exceed approx. 100 bar; this pressure should not be continued for more than 5 seconds.

18. While the steering wheel is at its end stop, loosen the lock nut one turn and screw in the adjusting bolt, while securing the lock nut at the same time. Screw in the adjusting bolt, until the pressure is reduced to a maximum of 80 bar. This will correctly re-adjust the wheel deflection limiting valve, which has its end stop against the adjusting bolt.



S7 00 563

19. Set the engine speed to 1200 - 1400 rpm. The final limiting pressure should not exceed 80 bar. Screw the adjusting bolt in further if the pressure is too high.

Note:

Do not screw in the adjusting bolt further than is strictly required, as the other wheel deflection limiting valve could lose its previous setting in this way, in which case the adjusting procedure must be repeated from the start.

There is also the chance that the wheel deflection limiting valve will open too early, thus reducing the pressure too fast so that maximum wheel deflection is not reached.

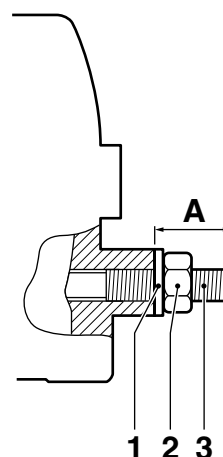
20. Tighten the lock nut to the specified tightening torque. See 'Technical data'.
21. Turn the steering wheel fully left (RHD fully right) until the end stop is reached. Set the engine speed to 1200 - 1400 rpm and check the final limiting pressure.

3

22. Measure the length of the part of the adjusting bolt that protrudes from the steering box (distance A in drawing). The total length (including the nut) should not exceed 26 mm.
If the adjusting bolt protrudes further from the steering box than the above-mentioned length, an adjusting bolt of the wrong length has been used or the wheel deflection limiting valves have been incorrectly set. In that case, the total length of the adjusting bolt should be checked, and the adjusting procedure repeated.



The adjusting bolt should not protrude further from the steering box than is specified, in order to keep a sufficient screw thread length in the housing. A larger dimension could result in loss of the bolt and loss of steering power.



S7 00 045

23. Remove the jack.
24. Remove the T-piece and the pressure gauge.
25. Fit the delivery line.
26. Check the steering oil level in the reservoir after connecting the pressure gauge and top up the oil if required.
27. Bleed the steering gear. To do so, run the engine at idling speed for approx. 2 minutes, without steering.
28. Retighten the steering wheel nut to the specified tightening torque. See 'Technical data'.

3.2 INSPECTION AND ADJUSTMENT, PRESSURE POINT

Inspection of the pressure point

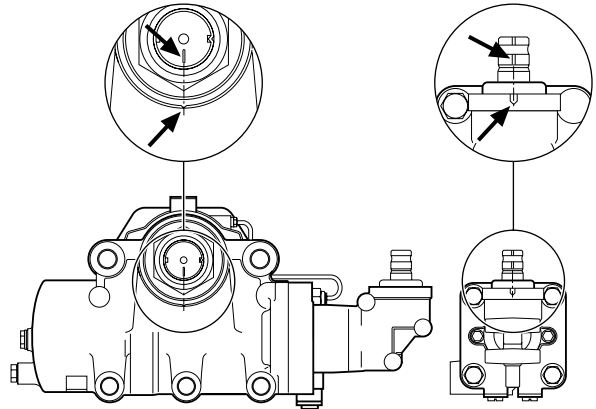
1. Place the sector shaft in the central position, by aligning the markings on the sector shaft and on the steering box.

2. Remove the steering rod from the pitman arm.

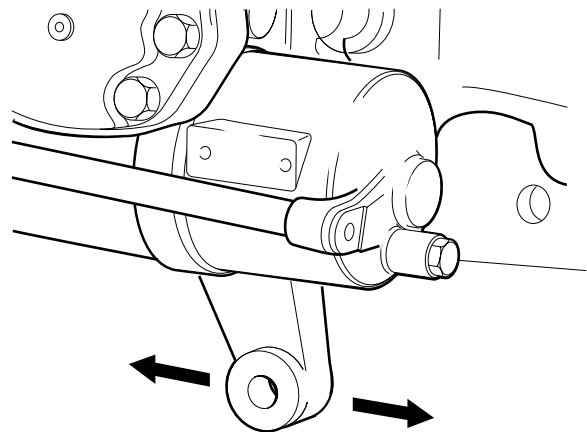
Note:

When a steering rod has been removed, the input shaft must not be rotated more than 1.5 turns (counting from the central position) because otherwise the setting of the wheel-deflection limiting valves will be changed.

3. Check whether the sector shaft is still in the central position, using the markings.
4. Take hold of the pitman arm and carefully move it in its direction of rotation to feel whether there is play. Make sure that the input shaft is not rotated more than 1.5 turns, counting from the central position. There should be no play in the central position of the steering box. Outside the central position of the steering box, play is allowed.

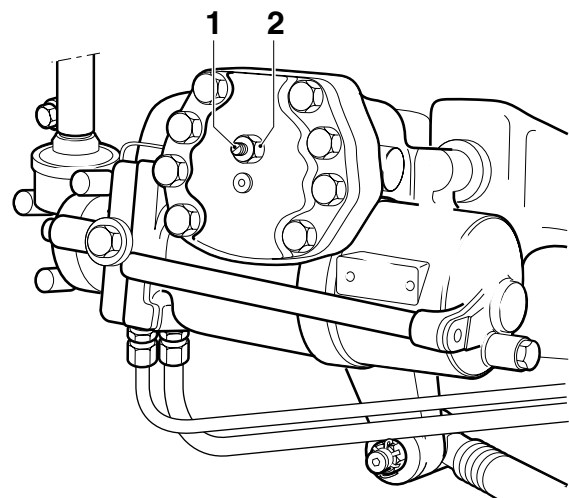


S7 00 024



S7 00 027

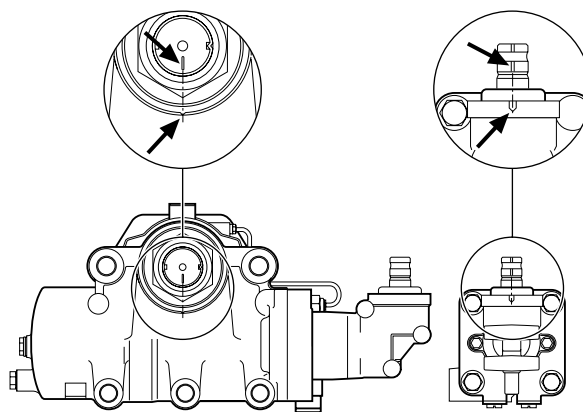
5. If play can be felt, this can be remedied using the adjusting bolt (1).



S7 00 593

Adjusting the pressure point

1. Check whether the sector shaft is still in the central position, using the marks.

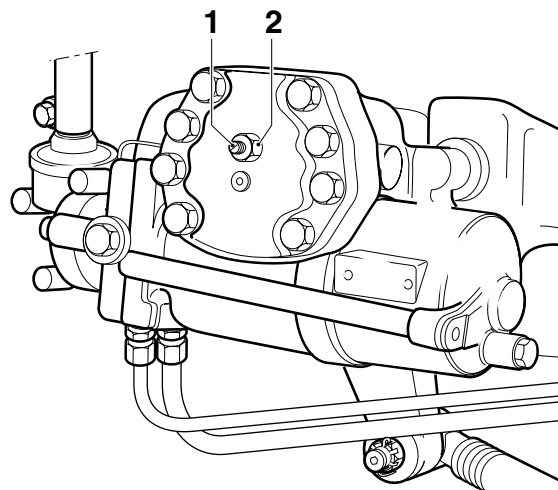


S7 00 024

2. Loosen the lock nut (2) one turn.
3. Loosen the adjusting bolt (1) one turn until noticeable play can be felt.
4. Slowly turn the adjusting bolt (1) to the right, until no play can be felt at the pitman arm. The torque used should not exceed 15 Nm.
5. Turn the adjusting bolt another $\frac{1}{4}$ to $\frac{1}{2}$ turn clockwise.



If the adjusting bolt is turned clockwise too far, the steering wheel will not return to its central position by itself after making a turn. The steering force at the central position will increase and the directional stability characteristics of the vehicle will deteriorate.



S7 00 593

6. Tighten the lock nut (2) to the specified tightening torque. See 'Technical data'. Make sure that the adjusting bolt (1) does not turn too.
7. Check the pitman arm to see whether there is still play. You should not feel any play for a $\frac{1}{4}$ of a turn to the left and right of the central position of the input shaft.
8. If play can still be felt, the adjusting procedure should be repeated.
9. Fit the steering rod on to the pitman arm.
10. Make a test run and check the vehicle's directional stability and check whether the steering wheel returns to the central position after taking a turn.

3.3 INSPECTION, SECTOR SHAFT SEALING RING LEAKS

1. A plastic plug is fitted into the steering box side cover.
2. If there is an oil leak at this plug, the sector shaft oil seal is leaking into the side cover.
3. If the oil seal is leaking, the sector shaft oil seal in the side cover must be replaced.

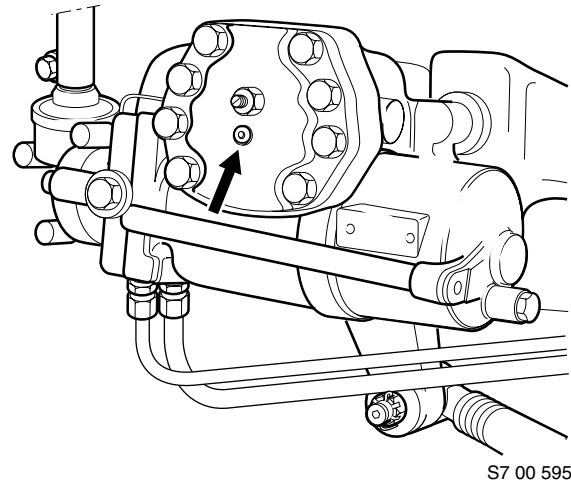


It is not permitted:

- to fit the plastic plug into the side cover using a sealing compound or glue;
- to apply an additional layer of paint over the factory-applied layer;
- to seal the plug hole using means other than the plug itself.

If leak-off oil from the sector shaft oil seal cannot escape through the plug hole, there is a risk that the steering box may fail.

4. Check the sector shaft oil seal on the pitman arm side.
5. In the event of leakage, replace the sector shaft oil seal on the pitman arm side.



S7 00 595

3.4 INSPECTION, INTERNAL STEERING BOX RESISTANCE

1. Place a receptacle under the steering box.
Clean the pipe connections and remove the steering oil pipes from the steering box.
Collect the oil flowing out and plug the pipe openings.
2. Turn the steering wheel from one end stop to the other until the oil stops coming out of the steering box. The pipe connections at the steering box should not be plugged.
3. Remove the steering rod from the pitman arm.
4. Remove the steering column shaft from the steering box input shaft.
5. Place a resistance torque tester on the steering box input shaft and measure the resistance torque to a maximum of 1.5 turns at both sides of the central position.

Note:

When a steering rod has been removed, the input shaft must not be rotated more than 1.5 turns (counting from the central position) because otherwise the setting of the wheel deflection limiting valves will be changed.

6. Compare the reading with the maximum value allowed. See 'Technical data'.
7. If the reading deviates, the pressure point setting must be checked.

Note:

The internal resistance outside the pressure point cannot be adjusted.

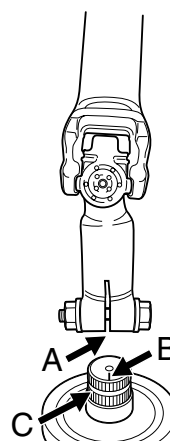
8. Fit the pipes to the steering box.

9. Fit the steering shaft to the steering box input shaft. The groove (A) in the coupling must be aligned with the mark (B) on the input shaft of the steering box.



Check that the steering shaft is correctly fitted to the input shaft, so that the bolt can be fitted in the recess (C).

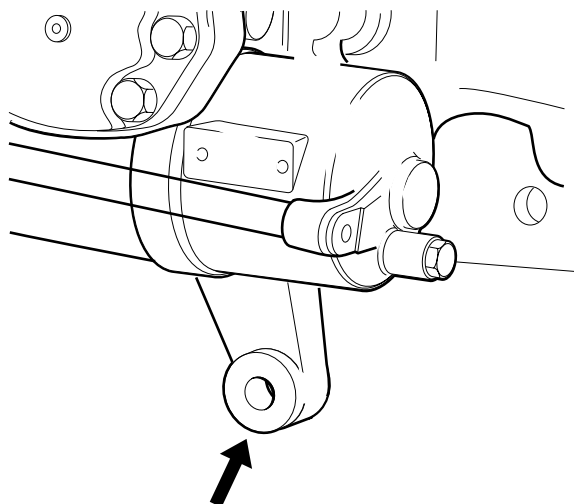
10. Fit the new, original bolt and nut in the universal joint.
Tighten the bolt to the specified torque, see 'Technical data'.
11. Install the steering rod.
12. Fill and bleed the steering gear.
13. If the steering box input shaft may possibly have been rotated more than 1.5 turns (as seen from the central position) with the steering rod removed, the final limiting pressures should be checked.
14. Make a test drive. During the test drive, check the proper functioning of the steering gear. After the test drive, the system should be checked for leaks.



K1 01 353

3.5 INSPECTION, PITMAN ARM PART NUMBER

The part number of the pitman arm is stamped next to the eye for the steering rod attachment. See the arrow in the illustration.



S7 00 447

4. REMOVAL AND INSTALLATION

4.1 REMOVAL AND INSTALLATION, ENTIRE STEERING BOX



If the vehicle has been involved in a collision in which the steering box or other components of the steering gear have (possibly) been damaged, the steering box should always be sent to DAF for inspection or be replaced. This instruction even applies if no external damage is visible. In the collision, the steering box may have sustained internal damage, causing it to be unreliable.

3

Removing the entire steering box

1. Clean the steering box and the surrounding area.
2. Place the steering gear in the central position. This can be checked using the markings on the steering box.
3. With an EMAS-controlled trailing axle, remove the connector from the angle sensor.
4. Remove the steering oil pipes from the steering box. Collect the steering oil flowing out and plug the openings of the pipes and at the steering box, to prevent dirt entering.

Note:

If the pipe connections might accidentally be switched, they should be marked.

5. Remove the steering rod from the pitman arm.

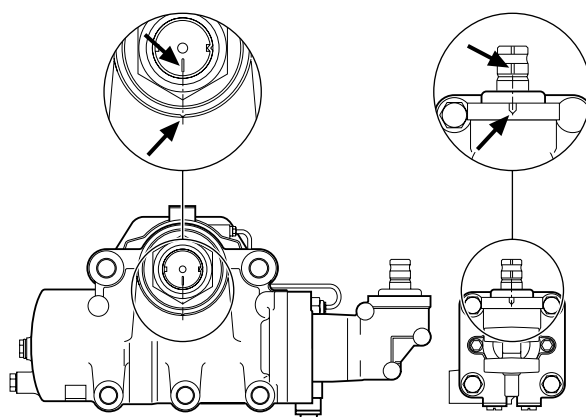
Note:

When a steering rod has been removed, the input shaft must not be rotated more than 1.5 turns (counting from the central position) because otherwise the setting of the wheel deflection limiting valves will be changed.

6. If present, detach the wiring harness and/or other pipes from the steering bracket.
7. Remove the steering shaft from the steering box input shaft.



Note: The steering box weighs approx. 35 kg. The steering box should be supported securely and responsibly, or safely suspended in a hoist.



S7 00 024

8. Remove the attachment bolts from the steering box to the steering bracket and remove the steering box from the vehicle. Keep the removed bolts to check the length of the new bolts.
9. With an EMAS-controlled trailing axle, remove the angle sensor from the steering box, if necessary.

Installing the entire steering box

1. Carefully clean and inspect the threaded holes of the steering box.
2. Remove all paint, dirt, grease, etc. from the contact surfaces of both the steering box and the steering bracket (a thin, factory-applied layer of paint is allowed). The contact surfaces should be absolutely free from dirt and grease.
3. In the case of the new or revised steering box, fit the pipe connections. For the connection points, see 'Technical data'.
4. With an EMAS-controlled trailing axle, fit the angle sensor to the steering box, if necessary.
5. Replace the attachment bolts. Because the yield stress is exceeded while tightening the bolts, they may not be re-used. Check that the new bolts are exactly the same length as the removed bolts. Grease the new bolt sparingly. On no account should you over apply the lubricant. This could result in the connection coming loose.



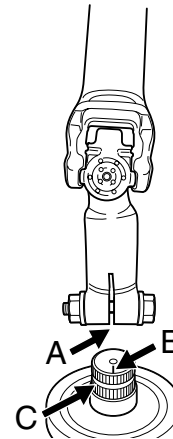
Carefully check the length of the new bolts. If the bolts used to fit the steering box are too long, they can lock in the steering box thus resulting in insufficient pre-load.

6. Fit the steering box equipped with a pitman arm to the steering bracket. Make sure that the locating bolt is fitted into the middle threaded hole under the steering box.
7. Tighten the attachment bolts evenly. Tighten the bolts to the specified tightening torque. See 'Technical data'.
8. Fit the pipes to the steering box.

9. Fit the new, original locating bolt and nut in the universal joint.
Tighten the bolt to the specified torque, see 'Technical data'.
10. Fit the steering shaft to the steering box input shaft. The groove (A) in the coupling must be aligned with the mark (B) on the input shaft of the steering box.



Check that the steering shaft is correctly fitted to the input shaft, so that the bolt can be fitted in the recess (C).



K1 01 353

11. Install the steering rod.
12. Fit the cable harness and/or other pipes back in their original position.
13. With an EMAS-controlled trailing axle, fit the connector to the angle sensor.
14. Fill and bleed the steering gear, see 'Filling and bleeding'.
15. If the steering box input shaft may have been rotated more than 1.5 turns (as seen from the central position) while the steering rod was removed, the final limiting pressures should be checked. See 'Inspection and adjustment'.
16. With an EMAS-controlled trailing axle, calibrate the EMAS system.
17. Make a test drive. During the test drive, the proper functioning of the steering gear should be checked. After the test drive, the system should be checked for leaks.

4.2 REMOVAL AND INSTALLATION, STEERING BRACKET



Be careful when tilting the cab or when working under the tilted cab if the steering bracket is to be inspected or replaced because of a collision. Vital parts of the cab suspension may have been damaged. Take the necessary precautions.

3

Removing the steering bracket

1. Remove the steering box.
2. Support the steering bracket. Remove the attachment bolts and take the steering bracket off the chassis.



After a collision, the steering bracket should be inspected very carefully for deformation and cracks. This is important for vehicle safety. If possible, the steering bracket should be magnaflux tested. If in doubt, always replace the steering bracket.

Re-using attachment bolts

As bolts are tightened to breaking point, every bolt should be inspected before it is re-used.

1. Clean the bolt thread thoroughly.
2. Check the thread for damage. To do so, manually screw a new nut onto the thread to be checked. If the new nut cannot be fully hand-screwed onto the entire thread of the bolt to be checked, it is not allowed to re-use the bolt.

Installing the steering bracket

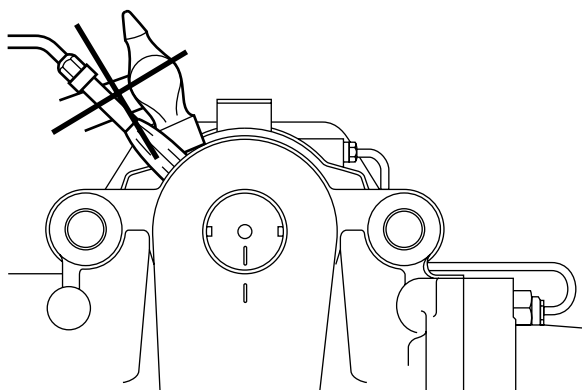
1. Apply one drop of oil to the first turn of the screw thread and to the underside of the bolt head. Do not apply more than a single drop of oil as excess oil would penetrate between the two contact surfaces, which would increase the risk of the connection loosening.
2. Screw the nut on the attachment bolt by hand. If the nut can be screwed by hand easily on to the bolt, the bolt may be re-used. If necessary, the attachment bolts should be renewed.
3. Remove all paint from the contact surfaces of the steering box/steering bracket and steering bracket/chassis (a thin, factory-applied layer of paint is allowed). The contact surfaces should be absolutely free from dirt and grease.
4. Place the steering bracket on the chassis. Tighten the bolts evenly to the specified tightening torque. See 'Technical data'.
5. Install the steering box.

4.3 REMOVAL AND INSTALLATION, PITMAN ARM



If the pitman arm has been subjected to extremely high loads (accident), it should be magnaflux tested, even if no deviations can be found with the naked eye. If such a test is not possible, the pitman arm should be replaced at all times.

The pitman arm should only be removed using the prescribed special tools. Under no circumstances should the pitman arm be removed by dislodging it with a hammer or by heating, if the prescribed tools are not available. This would not only result in the pitman arm becoming highly unreliable, it would also permanently damage the sector shaft.

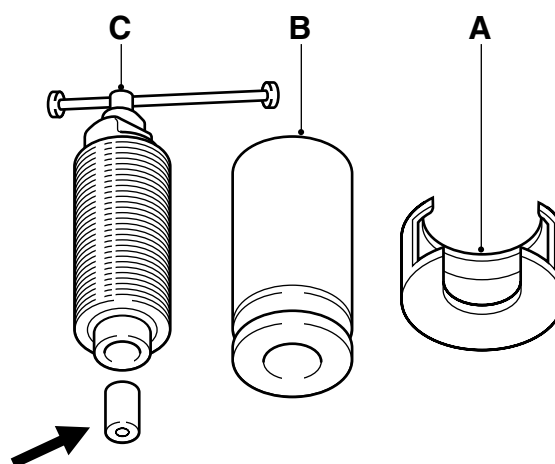


S7 00 031

3

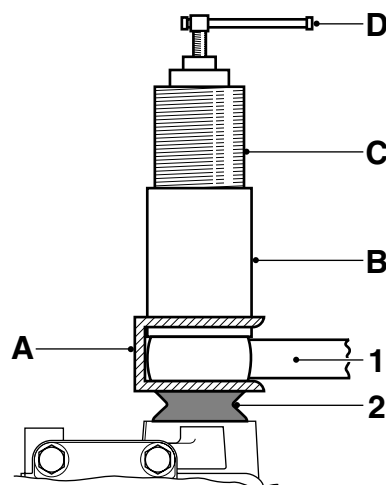
Removing the pitman arm

1. Remove the steering box.
2. Clean the screw thread of the sector shaft protruding from the nut.
3. Tap the locking ring of the nut back into its locking position.
4. Remove the nut from the sector shaft.
5. Place the push rod (see arrow in drawing) in the hydraulic puller (C), special tool (DAF no. 0535891).
6. Screw the adapter (B), special tool (DAF no. 0694786), partly onto the hydraulic puller (C).



S7 00 029

7. Slide the claw (A), special tool (DAF no. 0694916), over the pitman arm (1). If necessary, cut the sector shaft dust seal (2) and remove it.
8. Slide the adapter (B) with the hydraulic puller (C) into the claw (A).
9. Screw out the spindle (D) of the hydraulic puller (C) as far as possible. Subsequently screw the hydraulic puller (C) into adapter (B) as far as possible using an open-end spanner.
10. Screw in the spindle (D) until the pitman arm comes off the sector shaft. If the pitman arm still has not come off after the spindle has been completely screwed in, screw out the spindle and screw the puller into the adapter (B) as far as possible. Then screw in spindle (D) again until the pitman arm comes off.



S7 00 030

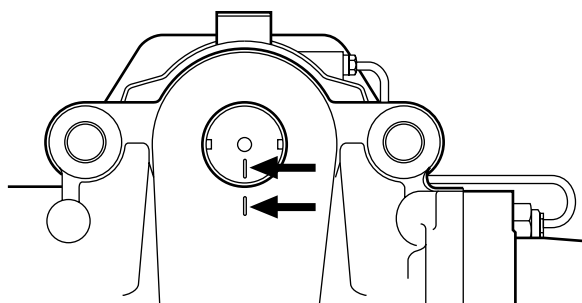
3

Installing the pitman arm

1. Install a new dust seal on the sector shaft.
2. Grease the dust seal surface which is positioned against the steering box using a grease with the specified DAF specification (melting point $>130^{\circ}\text{C}$).
3. Install the pitman arm on the sector shaft so that the marks on the pitman arm and the sector shaft align.

Note:

As the sector shaft is normally secured at the same position, the sector shaft nut can only be secured twice. After that, the nut should be replaced. The nut should not be used for locking at locations where the shaft has already been locked before.

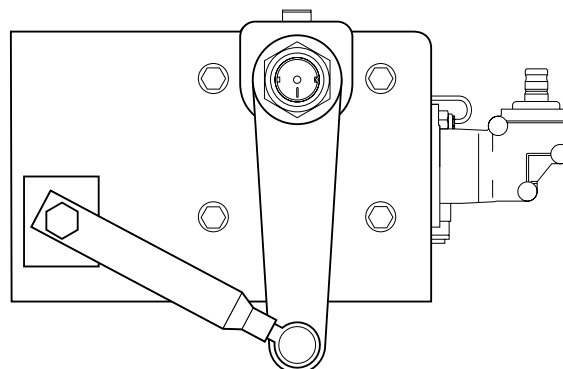


S7 00 032

4. Block the steering box with the pitman arm. Do this, for example by fixing a section of a used steering rod to a clamp and to the pitman arm with the ball joint. If the pitman arm is blocked differently, ensure that the conical section of the pitman arm is not damaged.

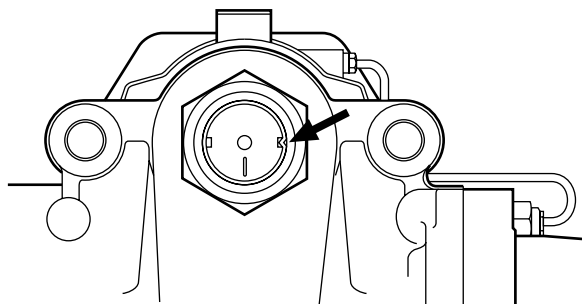
Note:

If the steering box is not blocked, the adjustment of the wheel-deflection limiting valve will be distorted when the steering box is completely rotated in.



S7 00 723

5. Fit the nut on the sector shaft and tighten it to the specified tightening torque. See 'Technical data'.
6. Secure the sector shaft nut by tapping the locking ring of the nut at least 2.5 mm into one of the recesses of the sector shaft. Always use a part of the locking ring which has not been used before.
7. Install the steering box.

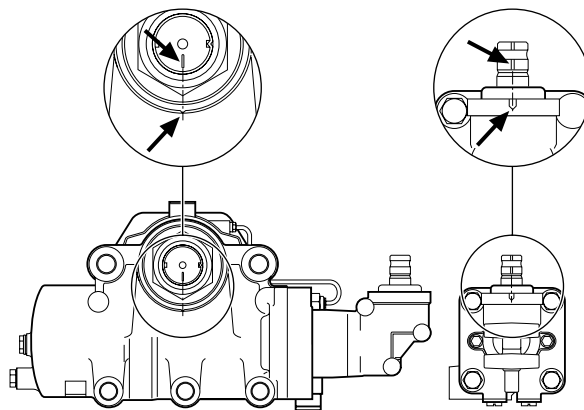


S7 00 033

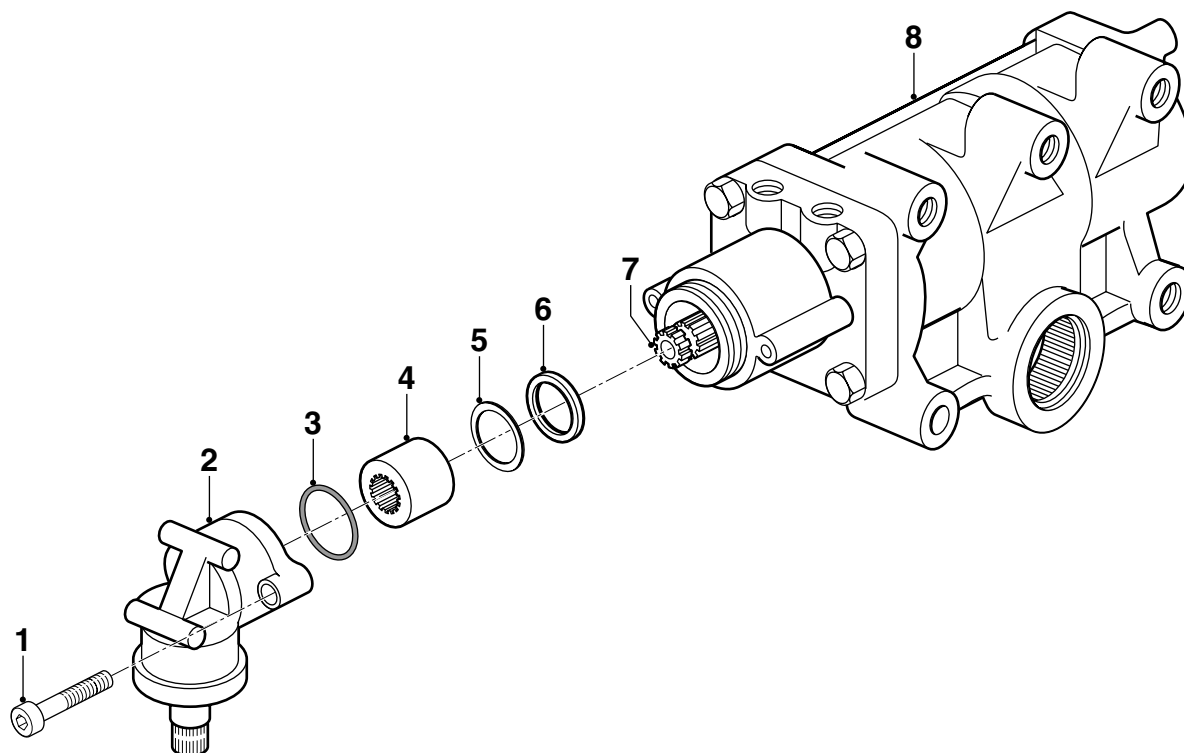
4.4 REMOVAL AND INSTALLATION, INPUT SHAFT SEAL

Removing the input shaft seal

1. Tilt the cab.
2. Place the steering box in the central position using the markings.
3. Remove the front plate.
4. Remove the headlight unit.
5. Remove the steering shaft from the steering box.
6. Remove the pipes from the steering box.



S7 00 024



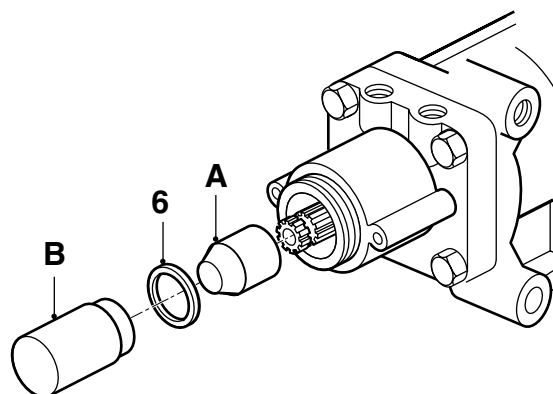
S7 00 035

7. Remove the two attachment bolts (1) from the right-angle transmission (2) and remove the right-angle transmission from the steering box (8). If the right-angle transmission is stuck, it can be tapped off the steering box with a plastic mallet.
8. Remove the coupling sleeve (4).
9. Remove the circlip (5) located above the seal (6).

10. For a one-circuit steering box, the seal (6) should be removed as follows:
 - Close off the delivery-pipe connection (P) using a plug.
 - Connect a hydraulic pump, which can generate a pressure of approx. 150 bar, to the return pipe connection (R).
 - Cover the opening at the steering box input shaft to prevent any oil splashes.
 - Using the hydraulic pump, gradually increase the pressure until the seal (6) is driven from the steering box.
 - Remove the hydraulic pump and the plug.
11. For a dual-circuit steering box, the seal (6) should be removed as follows:
 - Close off the pipe connections P1, P2, R1, C1 and C2 using plugs.
 - Connect a hydraulic pump, which can generate a pressure of approx. 150 bar, to pipe connection R2.
 - Cover the opening at the steering box input shaft to prevent any oil splashes.
 - Using the hydraulic pump, gradually increase the pressure until the seal (6) is driven from the steering box.
 - Remove the hydraulic pump and the plugs.

Installing the input shaft oil seal

1. Check the oil seal chamber (6) for rough edges, grooves and residual seal particles.
2. Place guide sleeve (A), special tool (DAF no. 1240095), on the gearing of the input shaft (7) so as not to damage the new seal (6).
3. Grease the inside of the new seal (6) and install the seal, with its spring side towards the steering box, into the steering box.
4. Tap the seal (6) carefully into the chamber using a plastic mallet and driver (B), special tool (DAF no. 1240095).
Check whether the groove for the circlip (5) is entirely free.
Make sure that the seal (6) is not fitted into the chamber too deeply.
5. Check that no parts of the seal (6) were left behind during its installation. Remove these particles, if any.
6. Install a new circlip (5). Place the lower circlip lip into the groove and turn the circlip anticlockwise while pushing it slightly into the groove.



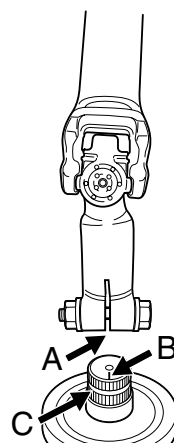
S7 00 054

7. Check whether the steering box is still in the central position, using the markings.
8. Check the coupling sleeve (4) gearing and slide the coupling sleeve onto the input shaft (7).
9. Fit a new O-ring (3) to the right-angle transmission (2).
10. Check that the right-angle transmission is in the centre position using the marks and fit the right-angle transmission (2) onto the steering box (8).
11. Fit the attachment bolts (1) of the right-angle transmission (2) and tighten them to the specified tightening torque. See 'Technical data'.
12. Connect the pipes.
13. Fit the steering shaft to the steering box input shaft. The groove (A) in the coupling must be aligned with the mark (B) on the input shaft of the steering box.



Check that the steering shaft is correctly fitted to the input shaft, so that the bolt can be fitted in the recess (C).

14. Fit the new, original bolt and nut in the universal joint.
Tighten the bolt to the specified torque, see 'Technical data'.
15. Fit the headlight unit.
16. Fit the front plate.
17. Top up steering oil and bleed the system.
18. Now check the steering box and pipe connections for leaks.
19. Make a test drive. After the test drive re-check the steering box and pipe connections for leaks.



K1 01 353

4.5 REMOVAL AND INSTALLATION, SECTOR SHAFT OIL SEAL IN THE SIDE COVER

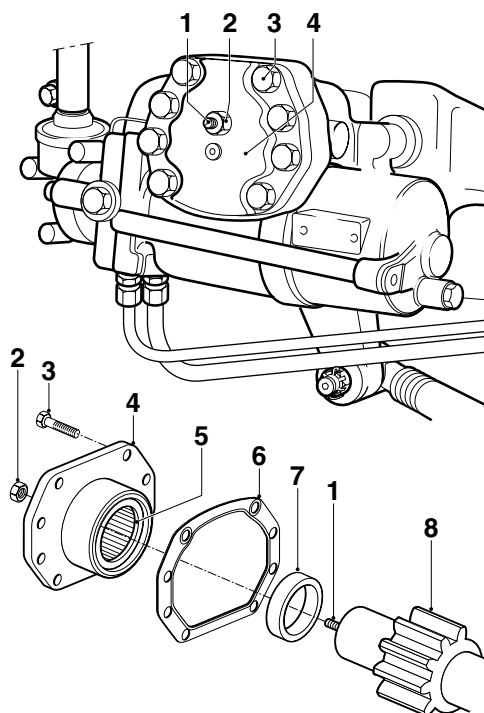
Removing the sector shaft oil seal in the side cover

1. Clean the steering box and the surrounding area.
2. Remove the lock nut (2).
3. Remove the attachment bolts (3) of the side cover (4).
4. Collect the steering oil released from the system.
5. Using a plastic mallet, tap the side cover (4) loose and at the same time, turn the adjusting screw (1) clockwise. The adjusting screw (1) is attached to the sector shaft (8) and must be completely unscrewed from the side cover (4).
6. Remove the gasket (6) from the side cover. This gasket may not be re-used.
- Note:**
Work in a clean environment. Prevent dirt getting into the needle bearing.
7. Remove the sector shaft oil seal (7) from the side cover with a universal internal puller.



Ensure that when removing the sector shaft oil seal, the needle bearing (5) is not damaged.

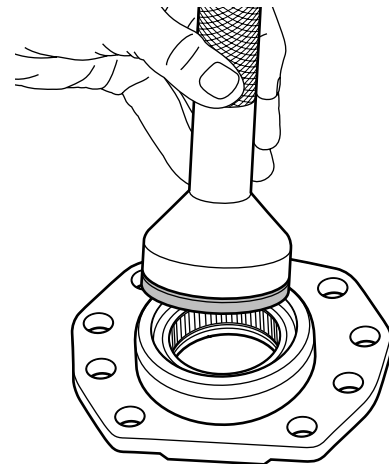
8. Check the needle bearing for freedom of movement and damage after removing the sector shaft oil seal.



S7 00 597

Installing the sector shaft oil seal in the side cover

1. Apply clean grease with the specified DAF specification (melting point $>130^{\circ}\text{C}$) to the needle bearing (5).
2. Fit a new seal into the side cover using special tool (DAF no. 1329453).
3. Fit a new gasket to the side cover. Stick the gasket to the cover using a little clean grease.
4. Fit the side cover (4) to the steering box and at the same time turn the adjusting screw (1) anti-clockwise into the side cover.



S7 00 455

5. Clean the attachment bolts.

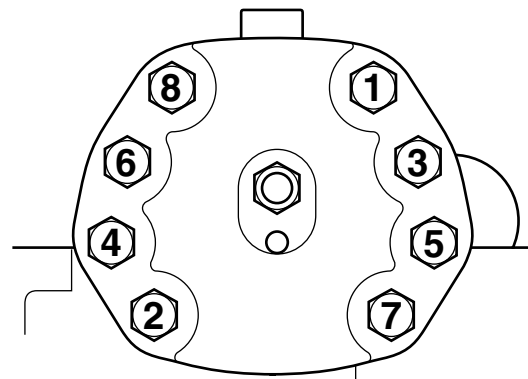
Note:

These are special attachment bolts. If damaged or lost, always fit original attachment bolts.

Apply a drop of steering oil to the bolt head and first windings of the thread.

Fit the bolts.

Tighten the bolts evenly in the sequence shown in the drawing. Then tighten the bolts to the specified tightening torque in the sequence shown. See 'Technical data'.



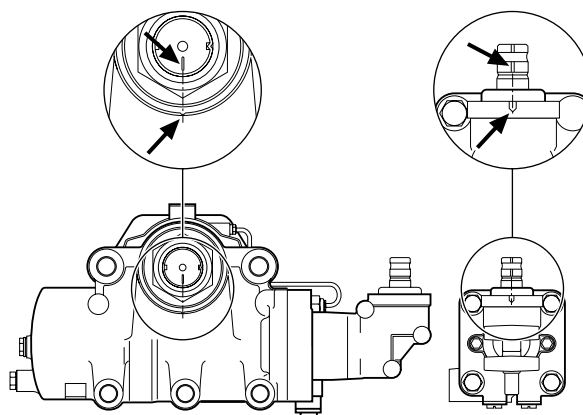
S7 00 043

6. Fit the lock nut and adjust the pressure point once more. See 'Inspection and adjustment'.
7. Fill and bleed the steering gear.
8. Make a test drive. During the test drive the proper functioning of the steering gear should be checked. After the test drive the system should be checked for leaks.

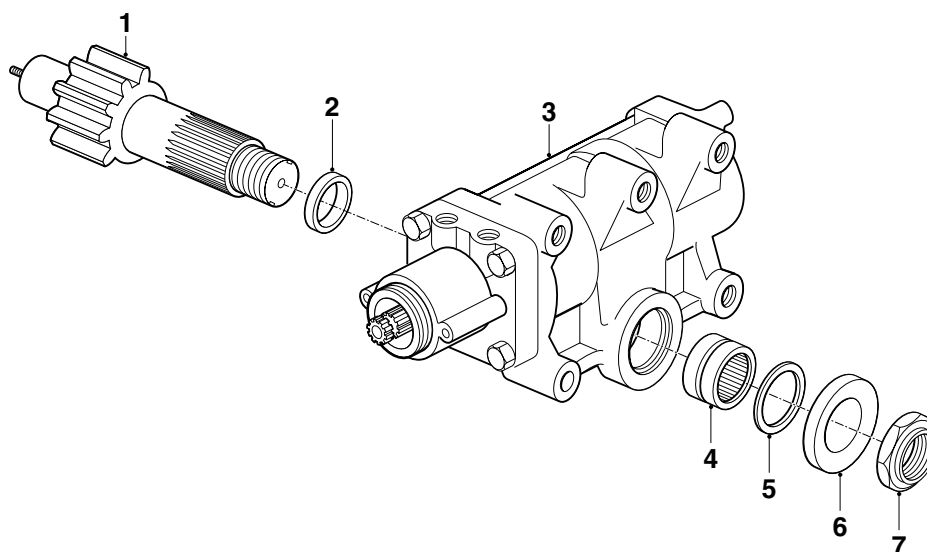
4.6 REMOVAL AND INSTALLATION, SECTOR SHAFT OIL SEAL ON THE PITMAN ARM SIDE

Removing the sector shaft oil seal on the pitman arm side

1. Remove the steering box.
2. Fit clamping plates to bench vice jaws. Clamp the steering box in the bench vice at the attachment points. Do not clamp the steering box in the bench vice at the cylinder. If necessary, make a special bracket. Connect the bracket to the steering box attachment points and place the steering box in the bench vice using the bracket.
3. Place the steering box in the central position using the markings.
4. Remove the pitman arm from the steering box.



S7 00 024



S7 00 599

5. Remove the dust seal (6).
6. Remove dirt and paint or rust, if any, from the sector shaft (1).

Note:

Work in a clean environment. Prevent any dirt from getting into the steering box or parts thereof. When removing parts, note how they were fitted. This is in view of fitting new seals.

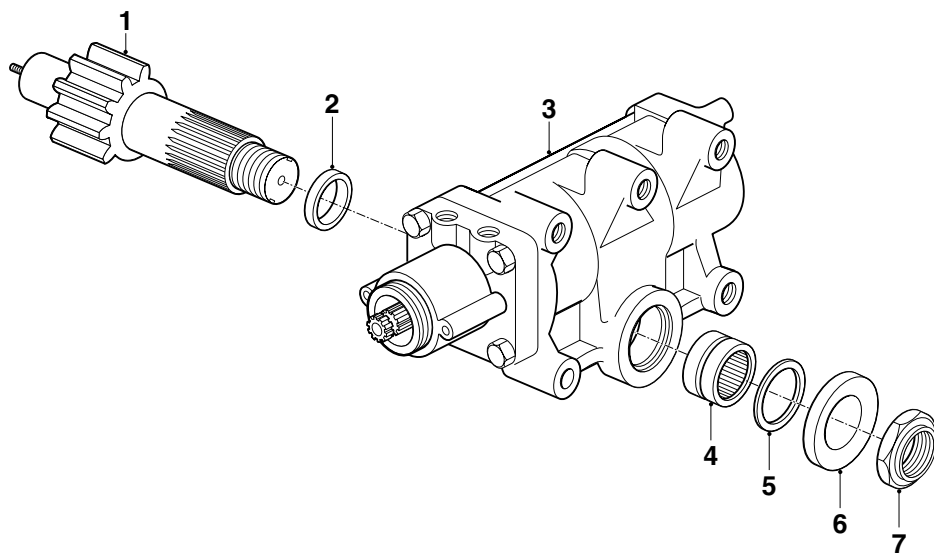
7. Remove the side cover of the steering box.
8. Remove the sector shaft (1).

9. Carefully remove the dirt/water seal (5) from the steering box (3) using a small screw driver.
10. Lay the steering box flat and remove the sector shaft oil seal (2) with a universal internal puller from the steering box.



When removing the sector shaft oil seal, make sure that the needle bearing (4) is not damaged.

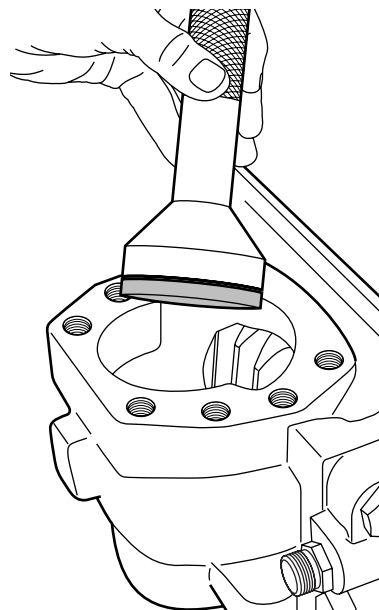
11. Check the needle bearing for freedom of movement and damage after removing the sector shaft oil seal (2).



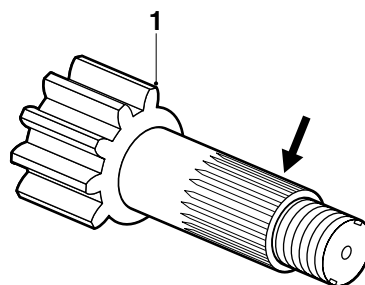
S7 00 599

Installing the sector shaft oil seal on the pitman arm side

1. Fit a new sector shaft oil seal (2) in the steering box (3) using special tool (DAF no. 1329453).
2. Apply clean grease with the specified DAF specification (melting point $>130^{\circ}\text{C}$) to the needle bearing (4).
3. Apply grease with the specified DAF specification (melting point $>130^{\circ}\text{C}$) to the rear side of the new dirt/water seal (5) and fit the dirt/water seal (5) into the steering box..



4. Stick adhesive tape to the sector shaft groove teeth (1) (see arrow in drawing). This tape will prevent damage to the sector shaft oil seal when fitting the sector shaft in the steering box.

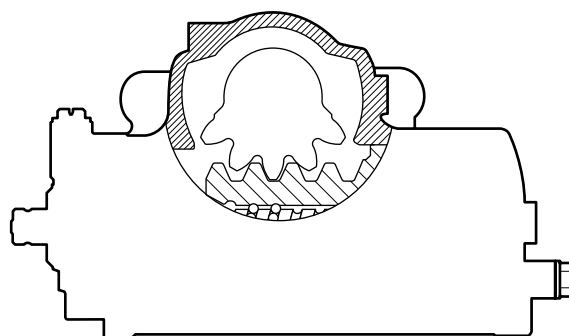


5. Check whether the piston is still in its central position, so that the middle sector shaft tooth engages the correct piston teeth.

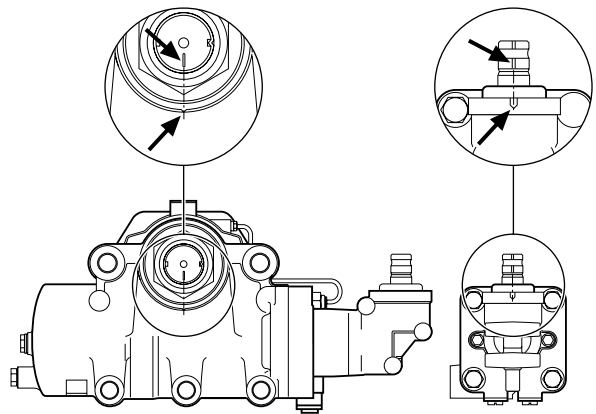


If the piston is not in its central position during the sector shaft assembly, the steering turn to one side will become very small. This may lead to dangerous situations.

6. Install the sector shaft (1) into the steering box (3).



7. Check whether the middle tooth of the sector shaft engages the correct piston teeth, using the markings on the sector shaft and input shaft.
8. Remove the adhesive tape from the groove teeth.
9. Fit a new dust seal (6) and apply grease with the specified DAF specification (melting point $>130^{\circ}\text{C}$) to the dust seal that abuts the steering box.
10. Fit the side cover.
11. Fit the pitman arm.
12. Adjust the pressure point once more. See 'Inspection and adjustment'.
13. Place the steering box on a test bench, if available, and check for leaks.
14. Install the steering box.
15. Fill and bleed the steering gear.
16. Make a test drive. During the test drive the proper functioning of the steering gear should be checked. After the test drive the system should be checked for leaks.

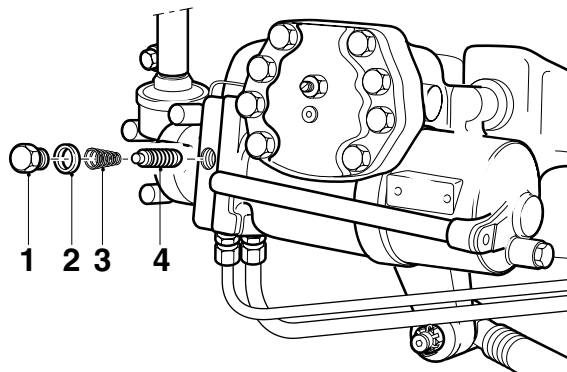


S7 00 024

4.7 REMOVAL AND INSTALLATION, PRESSURE-LIMITING VALVE

Removing the pressure-limiting valve

1. Make sure that no dirt can enter into the system while the pressure-limiting valve is removed.
2. Remove the plug (1) and take the valve (4) with the spring (3) out of the steering box.
3. Check the contact surface of the valve (4) and the contact surface of the valve inside the steering box.



S7 00 596



Do not change the pressure-limiting valve setting.

Installing the pressure-limiting valve

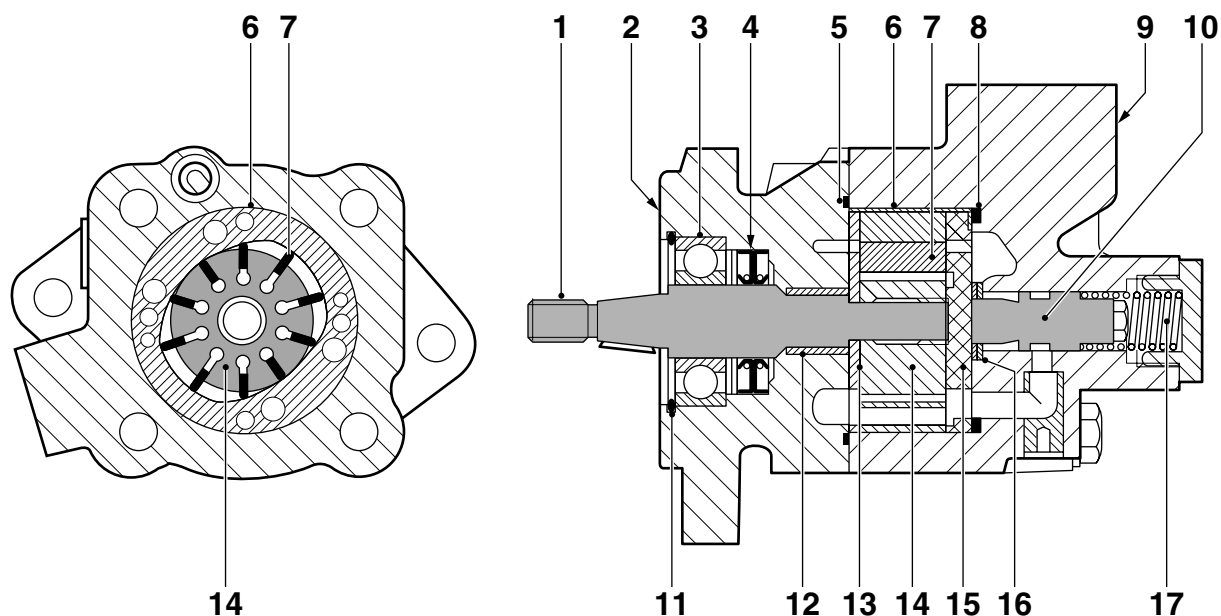
1. Fit a new O-ring (2) on the plug (1).
2. Place the valve (4) with the spring (3) in the steering box. Install the plug (1) and tighten it to the specified torque. See 'Technical data'.
3. Make a test drive. During the test drive the proper functioning of the steering gear should be checked. After the test drive the plug (1) should be checked for leaks.

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1. GENERAL

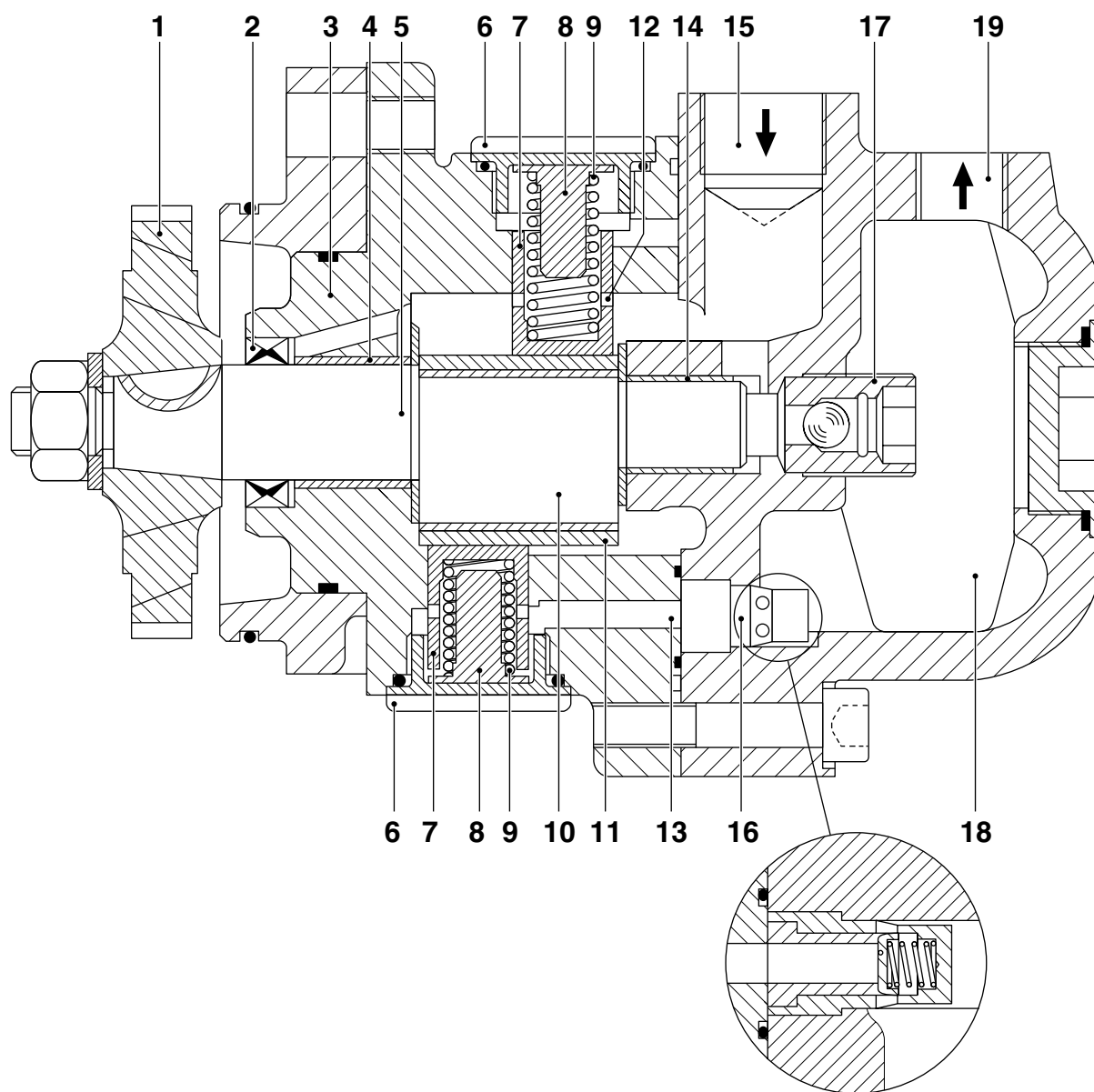
1.1 OVERVIEW DRAWING, STEERING PUMP LUK VT72A, VT77 AND LF77



S7 00 037

1. Prop shaft
2. Housing
3. Ball bearing
4. Double oil seal
5. O-ring
6. Stator
7. Partitions
8. O-ring
9. Cover
10. Flow control valve
11. Circlip
12. Bearing bush
13. Thrust plate
14. Rotor
15. Thrust plate
16. Sealing ring
17. Spring

1.2 OVERVIEW DRAWING, EMERGENCY STEERING PUMP

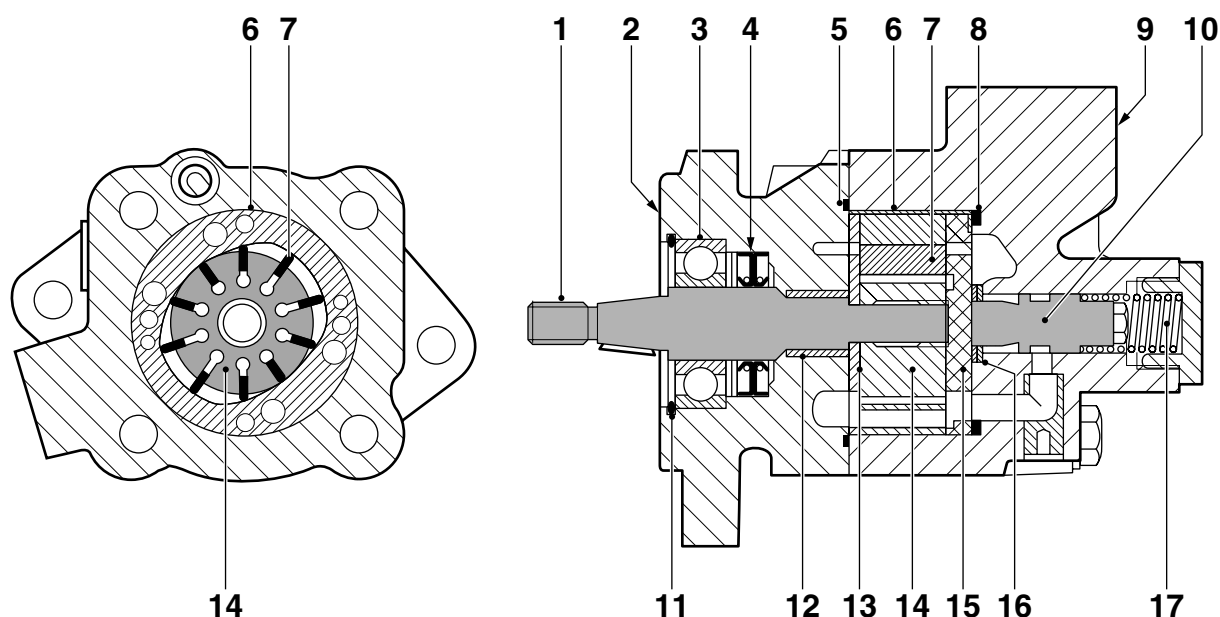


1. Gear wheel
2. Double oil seal
3. Housing
4. Bearing bush
5. Shaft
6. Plug
7. Plunger
8. Spring guide
9. Spring
10. Eccentric

11. Bearing bush
12. Bore
13. Plunger/delivery valve channel
14. Bearing bush
15. Supply line
16. Delivery valve
17. Suction valve
18. Cushioning chamber
19. Delivery line

S7 00 049

1.3 OPERATION OF THE STEERING PUMP



S7 00 037

The below description refers to the LUK VT72A, VT77 and LF77 pumps. Although the ZF 7685 pump differs from the LUK pumps, operation of the ZF 7685 is identical to that of the LUK pumps.

The pump can be divided into a pump and a control part.

The pump part consists of the shaft (1), the rotor (14), the partitions (7) fitted, the stator (6) and the thrust plates (13) and (15).

The control part is located in the pump cover and consists of a calibrated opening in the internal delivery pipe and the flow control valve (10) with spring (17).

The shaft (1) is borne by the ball bearing (3) and the bearing bush (12).

The ball bearing (3) is lubricated with engine oil. The bearing bush (12) is lubricated with steering oil.

The shaft is sealed using a double-sealing oil seal (4).

The stator (6) is locked between the thrust plates (13) and (15).

The O-ring (8) and the seal (16) press the thrust plate (15) against the stator (6) and the rotor (14), thus sealing off these components.

If the pump starts building up pressure, the oil pressure also reaches the back of the thrust plate (15). As a result the thrust plate is pressed even tighter against the stator and the rotor and even better sealing is achieved.

The centrifugal force moves the partitions (7) partially out of the rotor (14) to the outside, pressing them against the stator's (6) running surface.

Two subsequent partitions each form a separate space, sealed off at the sides by the thrust plates (13) and (15). These spaces form the pumping chambers.

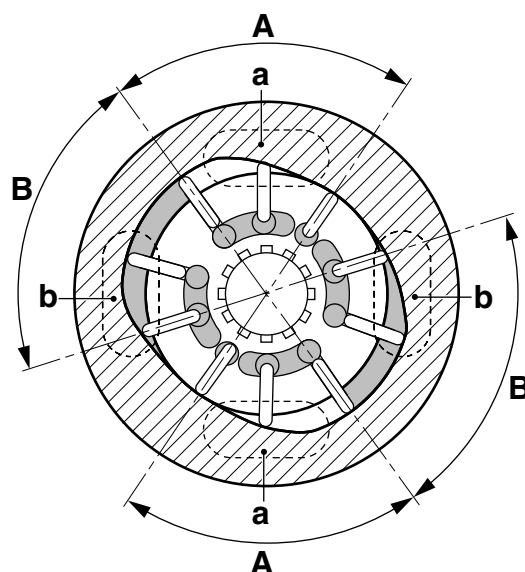
The elliptical shape of the stator's (6) interior results twice per revolution in a volume increase in each pumping chamber, the suction stroke (angular displacement A) and twice per revolution in a volume decrease, the delivery stroke (angular displacement B).

The two spaces in which the volume is increased are connected to the supply pipe (a). The two spaces in which the volume is decreased are connected to the delivery pipe (b).

To achieve adequate sealing between the partitions and the stator, the undersides of the partitions are connected to the pump's internal delivery pipe. This construction presses the partitions against the stator, resulting in optimal sealing.

When starting up the pump this sealing is not yet optimal, and the pump is non-regenerative. That is why the steering oil reservoir must always be positioned higher than the steering pump.

When the pump is pressurised, it does become regenerative, thus causing a negative pressure in the supply pipe.



S7 00 038

Regulated output control

In principle, the pump output depends on the speed.

The steering gear however should be provided with an oil volume which is as constant as possible. To achieve this constant oil volume, the pump is equipped with a regulated output control. The output at the steering box is controlled by a calibrated opening (1) in the internal delivery pipe and the flow control valve (6) with spring (4).

If the pump output has not yet reached the preset output, the flow control valve (6) is pushed at the front against a stop, thus closing the internal circulation channel (5).

The flow control valve (6) is held against the stop by the spring (4) and the oil pressure in the delivery pipe (2) which is exerted through the channel (3) at the back of the flow control valve. The entire pump output flows through the calibrated opening (1) to the delivery pipe connection (2).

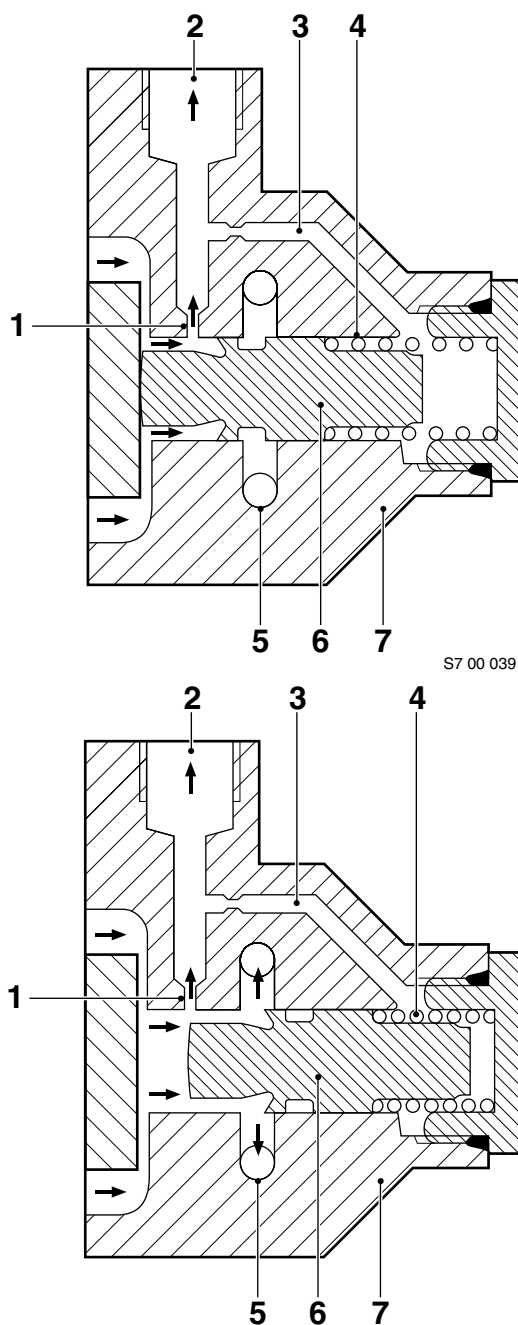
If the pump output exceeds the preset output because the engine speed has increased, pressure builds up at the front of the flow control valve (6) which exceeds the delivery pressure at the back of the valve. The valve moves to the right and the connection to the internal circulation channel (5) is opened. Part of the pump output is returned to the pump inlet channel through the circulation channel.

If the pump output drops because the engine speed has been reduced, the flow control valve will move to the left and the connection to the internal circulation channel (5) will partly close again. A smaller part of the pump output is returned to the pump inlet channel.

This control system supplies a fairly constant oil output to the steering gear, despite the engine speed variations.

Note:

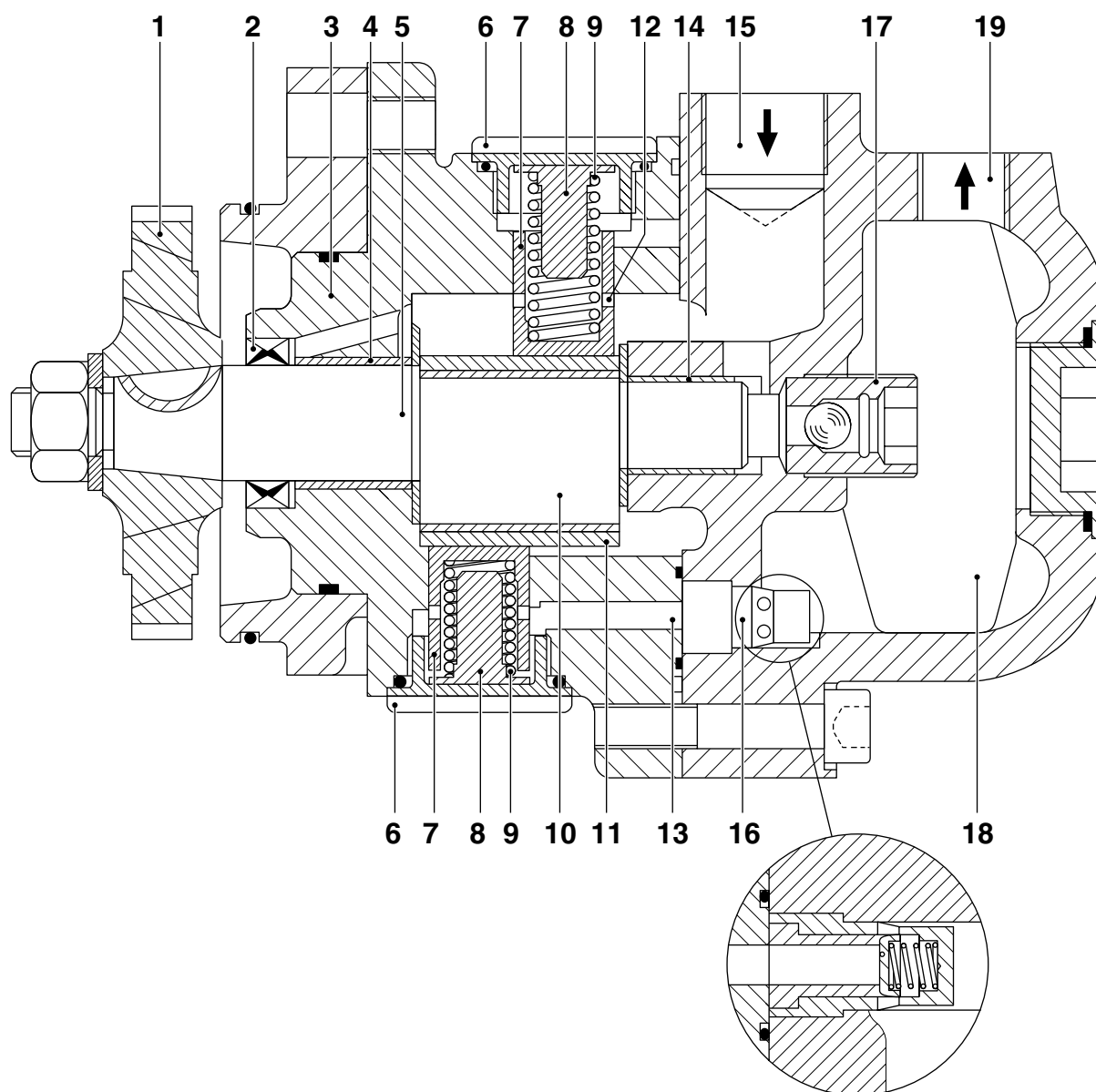
The pressure-limiting valve is fitted into the steering box.



S7 00 039

S7 00 040

1.4 OPERATION OF EMERGENCY STEERING PUMP



S7 00 049

The emergency steering pump is a radial plunger pump. This pump is driven by the gearbox output shaft.

The pump is driven when the vehicle is moving. The direction of rotation is not important for this pump.

The pump is equipped with eight hollow plungers (7), arranged around an eccentric (10). The eccentric takes care of the upward plunger stroke.

The downward stroke is activated by a spring (9) which is fitted in the plunger (7).

At the bottom the plunger is equipped with bores (12). These bores are connected to the supply line (15).

At the end of the downward stroke the plunger is filled with oil. The oil is pressed away during the upward stroke.

The pump output is limited because an increase in engine speed reduces the amount of time during which the steering oil can flow into the hollow plunger, thus decreasing the filling volume of the hollow plungers.

A flow control valve is therefore not necessary.

Every cylinder is equipped with a delivery valve (16). Behind the delivery valves there is a cushioning chamber (18) in which the pulsating action of the plunger on the oil is dampened.

The pump is equipped with a suction valve (17). A suction valve is required in a plunger pump because this pump type cannot draw in oil via the plungers when the pump is at a standstill.

The suction valve (17) is opened when an underpressure exists in the emergency steering pump delivery line (19). Such an underpressure can be caused if steering takes place when the main steering pump is switched off and the vehicle road speed is low. In such a situation, partial mechanical steering takes place. Such steering requires more oil than the emergency steering pump can supply at that moment.

The underpressure will open the suction valve (17), connecting the supply line (15) with the delivery line (19).

If the emergency steering pump output is sufficient, the suction valve is closed due to the pressure difference between the supply line and the delivery line.

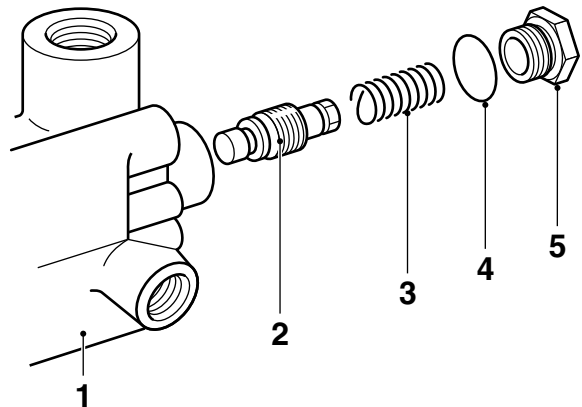
2. INSPECTION AND ADJUSTMENT

2.1 INSPECTION, FLOW CONTROL VALVE LUK VT72A, VT77 AND LF77

Note:

If there is sufficient space behind the steering pump, this inspection can be carried out while the steering pump is still attached to the engine.

1. Clean the steering pump and the surrounding area.
2. Place a receptacle underneath the steering pump.
3. Remove the plug (5) at the back of the steering pump (1).
4. Remove the flow control valve (2) with the spring (3) from the steering pump (1). Mark the position of the valve in the valve bore.
5. Check both the valve and the valve bore for impurities. Clean these parts if necessary.
6. Apply plenty of clean steering oil to the valve and fit the valve in the correct position (hexagon facing outwards) in the bore.
7. Check the valve for smooth operation. The valve should not jam.
8. Fit the spring (3) to the valve (2).
9. Fit the plug (5), equipped with a new sealing ring (4), to the pump. Tighten the plug to the specified tightening torque, see 'Technical data'.
10. Fill and bleed the steering gear hydraulic system.
11. Take a test drive and check the plug for leaks.



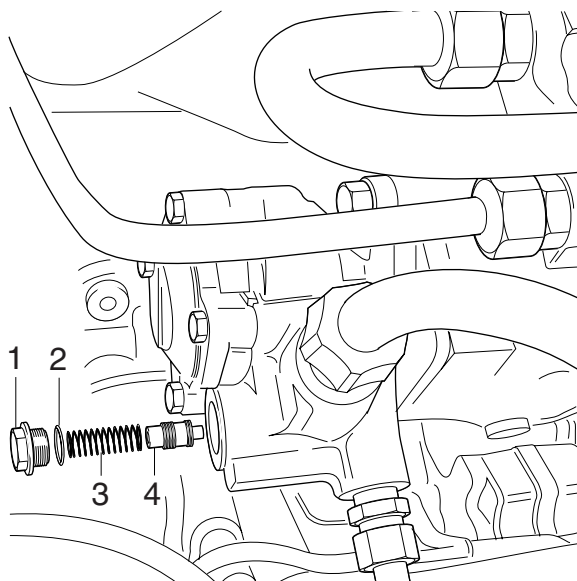
S7 00 052

2.2 INSPECTION, FLOW CONTROL VALVE ZF 7685

Note:

If there is sufficient space behind the steering pump, this inspection can be carried out while the steering pump is still attached to the engine.

1. Clean the steering pump and the surrounding area.
2. Place a receptacle underneath the steering pump.
3. Remove the plug (1) at the back of the steering pump.
4. Remove the flow control valve (4) with the spring (3) from the steering pump. Mark the position of the valve in the valve bore.
5. Check both the valve (4) and the valve bore for impurities. Clean these parts if necessary.
6. Apply plenty of clean steering oil to the valve (4) and fit the valve in the correct position in the bore.
7. Check the valve for smooth operation. The valve should not jam.
8. Fit the spring (3) to the valve (4).
9. Fit the plug (1), equipped with a new O-ring (2), to the pump. Tighten the plug (1) to the specified torque. See 'Technical data'.
10. Fill and bleed the steering gear hydraulic system.
11. Take a test drive and check the plug for leaks.



S7 00 600

3. REMOVAL AND INSTALLATION

3.1 REMOVAL AND INSTALLATION, STEERING PUMP LUK VT77 AND LF77

Removing steering pump LUK VT77 and LF77

Note:

When replacing a worn steering pump, you are advised to drain the steering oil fully, dismantle the steering oil reservoir and clean it thoroughly, and to replace the filter.

In extreme situations, the steering pump may have been worn to such an extent that metal pump parts have entered the steering box. Check the steering box for internal wear using the test case.

1. Clean the line connections.
2. Remove the wiring harness attachments that are behind the pump.
3. Place a receptacle underneath the steering pump.
4. Remove the lines from the steering pump and plug the line and pump openings. The steering oil filter is fitted in the return line, which means that should any dirt enter, it will immediately also enter the steering gear.
5. Remove the attachment bolts and remove the steering pump from the engine timing gear.

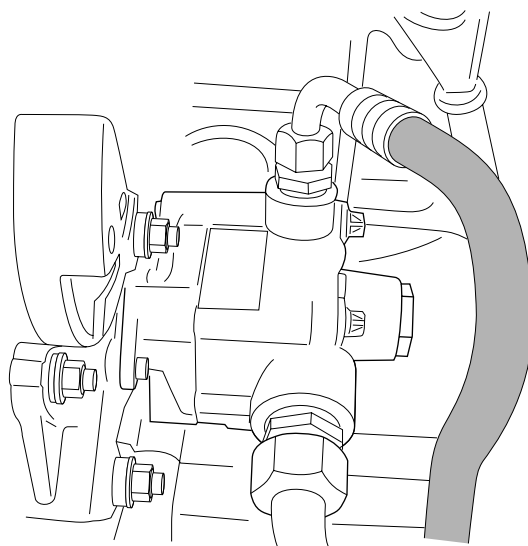
Installation of steering pump LUK VT77 and LF77

1. Transfer the drive sprocket to the steering pump to be fitted, if necessary. Thoroughly remove any preserving grease, especially from the tapered parts. Apply locking compound to the attachment nut and tighten them to the specified torque. See 'Technical data'.
2. If necessary, connect the line couplings to the steering pump to be fitted. Tighten the couplings to the specified torques, see 'Technical data'.



If the specified tightening torques are exceeded, the aluminium pump housing may be damaged.

3. Fit a new O-ring to the steering pump and grease it lightly.



S7 00 567

4. Fit the pump to the engine. Tighten the attachment bolts evenly to the specified tightening torque, see 'Technical data'.
5. Fit the lines.
6. Fill and bleed the steering gear hydraulic system.
7. Re-connect the wiring harness as it was originally connected.
8. Take a test drive and check the line connections for leaks.

3.2 REMOVAL AND INSTALLATION, STEERING PUMP LUK VT72A

Removing the LUK VT72A steering pump

Note:

When replacing a worn steering pump, you are advised to drain the steering oil fully, dismantle the steering oil reservoir and clean it thoroughly, and to replace the filter.

In extreme situations, the steering pump may have been worn to such an extent that metal pump parts have entered the steering box. Check the EMAS system for correct operation.

1. Clean the pipe connections.
2. Place a receptacle underneath the steering pump.
3. Remove the pipes from the steering pump and plug the pipe and pump openings. The steering oil filter is fitted in the return pipe, which means that should any dirt enter, it will immediately also enter the steering gear.
4. Remove the attachment bolts (2) and take the steering pump (1) out of the bearing housing (3).

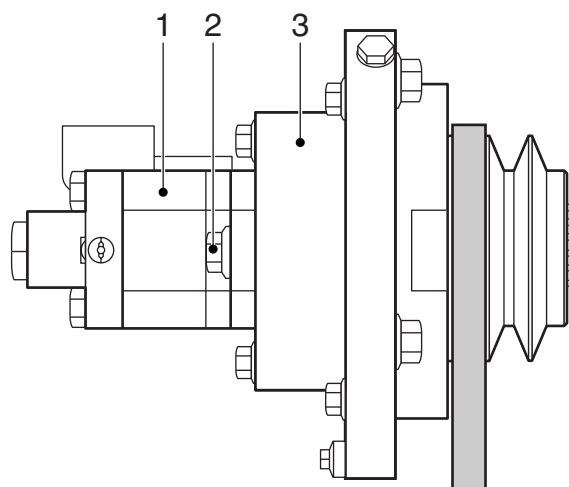
Installing the LUK VT72A steering pump

1. Thoroughly remove any preserving grease, especially from the prop shaft.
2. If necessary, connect the pipe couplings to the steering pump to be fitted. Tighten the couplings to the specified torques, see 'Technical data'.



If the specified tightening torques are exceeded, the aluminium pump housing may be damaged.

3. Check the drive key for damage.
4. Fit the key into the prop shaft.
5. Fit the pump (1) to the bearing housing (3).
6. Insert the attachment bolts (2). Tighten the attachment bolts evenly to the specified tightening torque, see 'Technical data'.
7. Fit the pipes.
8. Fill and bleed the EMAS system.
9. Check the operation of the EMAS system and for leaks of the pipe connections.



S7 00 858

3.3 REMOVAL AND INSTALLATION, STEERING PUMP ZF 7685

Removing the ZF 7685 steering pump

Note:

When replacing a worn steering pump, you are advised to drain the steering oil fully, dismantle the steering oil reservoir and clean it thoroughly, and to replace the filter.

In extreme situations, the steering pump may have been worn to such an extent that metal pump parts have entered the steering box. Check the steering box for internal wear using the test equipment case.

1. Clean the pipe connections.
2. Place a receptacle underneath the steering pump.
3. Remove the pipes from the steering pump and plug the pipe and pump openings. The steering oil filter is fitted in the return pipe, which means that should any dirt enter, it will immediately also enter the steering gear.
4. Remove the attachment bolts. Remove the steering pump (1) and the driver (3) from the compressor.

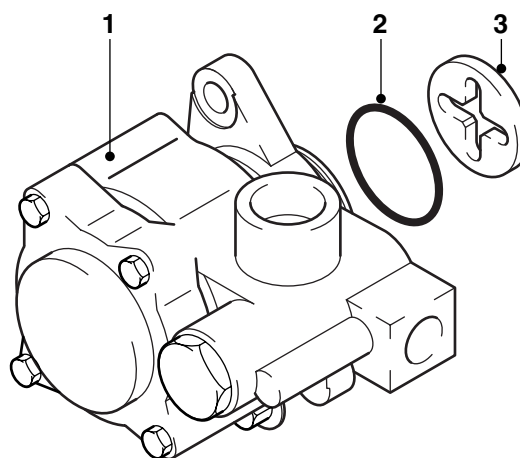
Installing the ZF 7685 steering pump

1. Check the driver (3) for wear.
2. If necessary, connect the pipe couplings to the steering pump to be fitted. Tighten the couplings to the specified torques, see 'Technical data'.



If the specified tightening torques are exceeded, the aluminium pump housing may be damaged.

3. Fit a new O-ring (2) to the steering pump and grease it lightly.
4. Crank the engine until the compressor driver half is horizontal.
5. Grease the driver (3) lightly and fit it to the compressor driver half.
6. Fit the pump (1). Tighten the attachment bolts evenly to the specified tightening torque, see 'Technical data'.
7. Fit the pipes.
8. Fill and bleed the steering gear hydraulic system.
9. Take a test drive and check the pipe connections for leaks.



S7 00 586

3.4 REMOVAL AND INSTALLATION, EMERGENCY STEERING PUMP

Removing the emergency steering pump

Note:

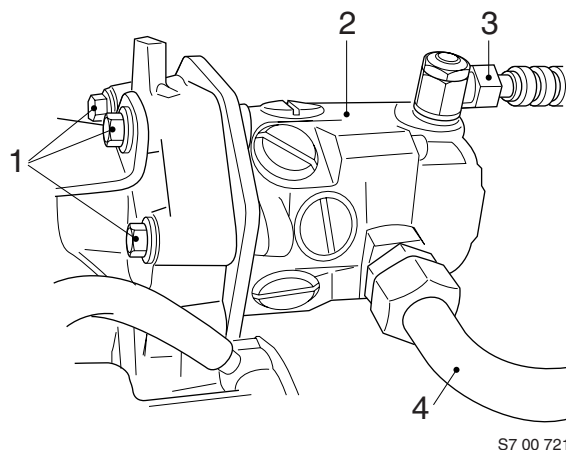
When replacing a worn steering pump you are advised to fully drain the steering oil, disassemble the steering oil reservoirs and clean them thoroughly and to replace the filter.

In extreme situations, the steering pump may have been worn to such an extent that metal pump parts have entered the steering box. Check the steering box for internal wear using the test case.

1. Clean the line connections.
2. Place a receptacle under the pump (2).
3. Remove the lines (3) and (4) from the pump (2). Then plug the line and pump openings.
The steering oil filter is fitted in the return line, which means that should any dirt enter, it will immediately also enter the steering gear.
4. Remove the attachment bolts (1) and remove the pump (2) from the gearbox.

Installation of emergency steering pump

1. Transfer the drive sprocket to the steering pump to be installed, if necessary.
Thoroughly remove any preserving grease, especially from the tapered parts.
Apply locking compound to the attachment nut and tighten them to the specified torque. See 'Technical data'.
2. Replace the O-ring at the drive side of the pump.
3. Fill the pump (2) with clean steering oil through the line connection of the supply line (4) before installing it.
4. Install the pump (2) on the gearbox. Fit the supply line (4) and secure it so that the pump does not empty.



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5. Apply locking compound to the attachment bolts (1) and tighten these bolts (1) to the specified tightening torque, see 'Technical data'.
6. Fit the delivery line (3). Tighten the lines (3) and (4).
7. Fill and bleed the system.
8. Take a test drive and check whether circuit 2 functions properly.
9. After the test drive check the pump and line connections for leaks.
Check the steering oil level in the reservoirs.

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1. GENERAL

1.1 LINES

Supply line

The supply line connects the reservoir to the steering pump and consists partly of a thick, flexible rubber hose and, within the engine enclosure, it is made of a steel pipe.

The hose is attached to the reservoir with a hose clamp.

As the steering pump is of the non-regenerative type, the reservoir should be fitted at a certain height over the steering pump.

The length of the supply line also influences the steering pump operation.

If the reservoir is moved, thus making the supply line longer, the reservoir should also be fitted higher.

Delivery line

The delivery line connects the steering pump to the steering box and consists partly of a rubber hose with an internal, braided, steel casing and partly of a steel pipe. The admissible pressure is marked on the line.

The line is connected to the steering pump and the steering box using a union nut connection.

Return line

The return line connects the steering box to the reservoir and consists partly of a steel pipe and partly of a flexible rubber hose with a textile sheath.

The line is connected to the steering box with a union nut connection and to the reservoir with a hose clamp.

1.2 OPERATION OF THE RESERVOIR

General

The reservoir can be made of plastic or steel. The reservoir is equipped with a filter element, which filters the return oil.

The filter is not fitted into the supply line as this would increase the filter resistance of the filter element and, as a result, the reservoir would have to be very large.

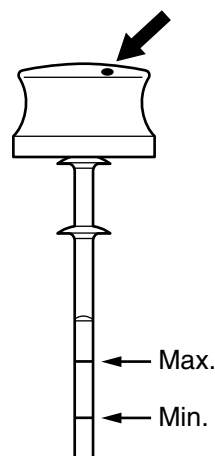


When working on the steering gear, prevent dirt from entering the reservoir or the lines. The steering oil is drawn in unfiltered, allowing impurities to enter into the steering gear.

A by-pass valve is fitted under the filter. If the resistance in the filter is excessive, e.g. because of cold oil or a polluted filter, the by-pass valve opens. Part of the oil will flow into the reservoir without being filtered.

A dipstick is located at the top of the reservoir with a minimum and maximum oil level mark.

A small bleeding hole is fitted in the rubber dipstick cap. This hole should never be blocked, as the return pressure would become too high.



S7 00 051

Plastic reservoir

In single-circuit systems, plastic reservoirs are applied.

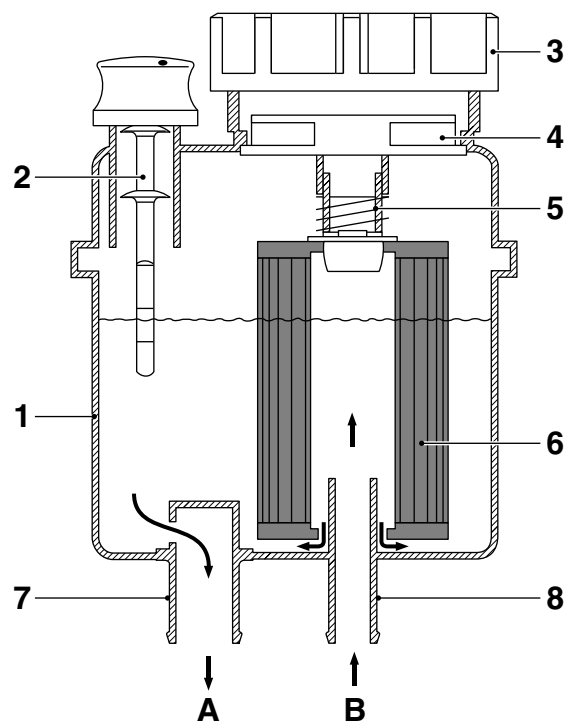
The reservoir (1) is equipped with a screw cap (3) and a dipstick (2).

The supply line is connected to line connection (7).

The return line is connected to line connection (8).

The filter element (6) is kept in place with a plastic clamp (4).

If the resistance in the filter is excessive, e.g. because of cold oil or a polluted filter, the filter element (6) is partly pushed off the seat. This causes part of the steering oil to pass along the underside of the filter element (6) directly into the reservoir. This movement of the filter element (6) is possible, because a spring (5) has been fitted between the filter element (6) and the plastic clamp (4).



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Steel reservoir

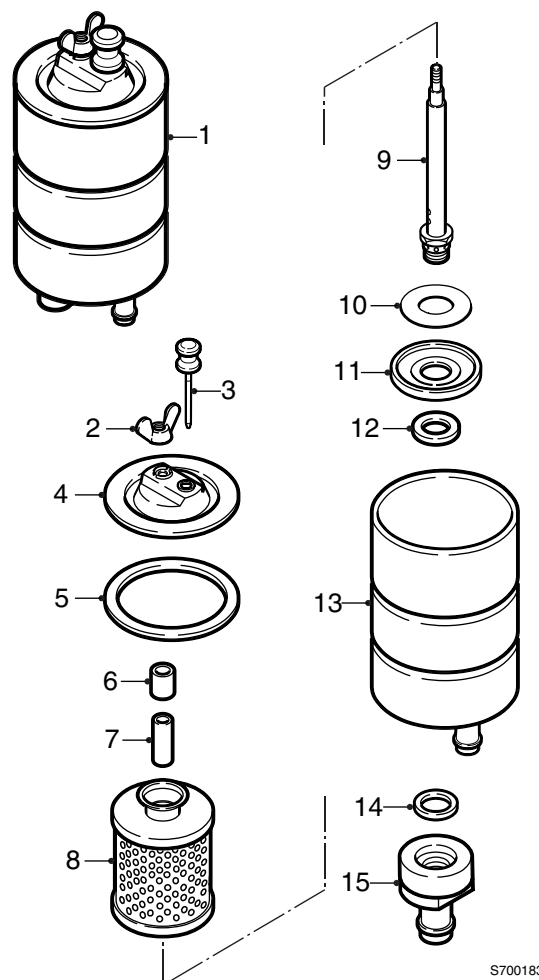
A steel reservoir is used on the dual-circuit system and the EMAS controlled trailing axle. In the dual-circuit system, two interconnected reservoirs are applied.

The reservoir is equipped with a steel lid (4), which is closed using a wing nut (2). The lid (4) is sealed with a rubber ring (5).

The lid (4) is equipped with a dipstick (3).

A rubber bush (6) is fitted between the lid (4) and the filter element (8), which pushes the filter element (8) onto the seat of the filter holder (9).

The by-pass valve consists of a clamping disc (10) placed under the filter element.

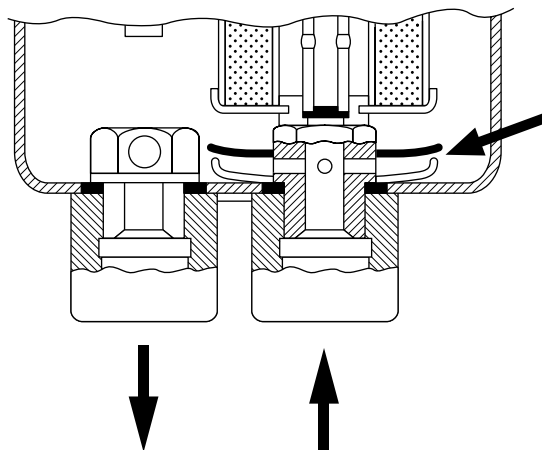


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The force which the return oil exerts on the clamping disc (10) pushes the disc (10) off the seat (11). Part of the steering oil flows directly into the reservoir, see the arrow in the drawing.

The line connection (15) is sealed by the sealing ring (14).

The two reservoirs are interconnected by an overflow line.



S7 00 050

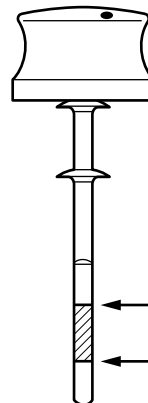
2. INSPECTION AND ADJUSTMENT

2.1 INSPECTION OF STEERING OIL LEVEL

1. Check the steering oil level when the engine is not running.
2. Clean the dipstick and its immediate surroundings to prevent any dirt from entering the reservoir.
3. Check the fluid level in the reservoir using the dipstick.
4. The fluid level should be between the marks when the steering oil is "cold".

Note:

When the steering oil is at operating temperature, the level may be above the top mark on the dipstick.



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2.2 INSPECTION OF LINES

1. Condition of the lines
 - Check all lines for tightness and wear.
Where supply lines are subject to negative pressure, it is particularly likely that porous lines will give rise to problems (air in the system).
 - If in doubt, always replace the line.
2. Line connections
 - Check every line connection for leaks.
3. Line route
 - Lines must not be twisted during assembly. To facilitate checking this, a mark may have been provided on the hose (sometimes in the form of text).
 - Lines should not touch other parts (to prevent chafing).
 - The course lines follow should not include any sharp bends; this applies especially to the flexible suction and return lines.
 - Lines should not be pinched off by other components.

3. REMOVAL AND INSTALLATION

3.1 REMOVAL AND INSTALLATION, PLASTIC RESERVOIR FILTER ELEMENT

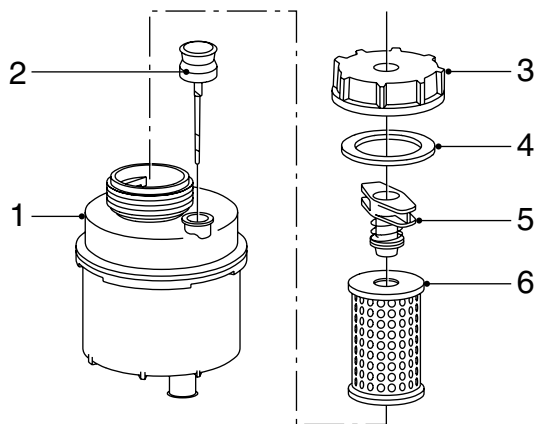
Removing the plastic reservoir filter element

1. Clean the reservoir cover, so that absolutely no dirt can get into the reservoir.
2. Remove the cover (3).
3. Rotate the filter holder (5) a quarter turn. Slowly remove the filter holder (5) together with the filter element (6) from the reservoir (1).

Note:

The filter holder and filter element must be removed from the reservoir (1) with care so that no dirt remains in the reservoir (1).

4. Remove the filter element (6) from the filter holder (5).



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Installation of plastic reservoir filter element

1. Fit a new filter element (6) in the filter holder (5).
2. Fit the filter holder (5) together with the filter element (6) in the reservoir (1) and rotate the filter holder (5) a quarter turn. Make sure that the filter holder (5) engages in its locking element.
3. Check the sealing ring (4) for damage and replace if necessary.
4. Fit the sealing ring (4) and cover (3).
5. Check the fluid level using the dipstick (2).

3.2 REMOVAL AND INSTALLATION, STEEL RESERVOIR FILTER ELEMENT**Removing the steel reservoir filter element**

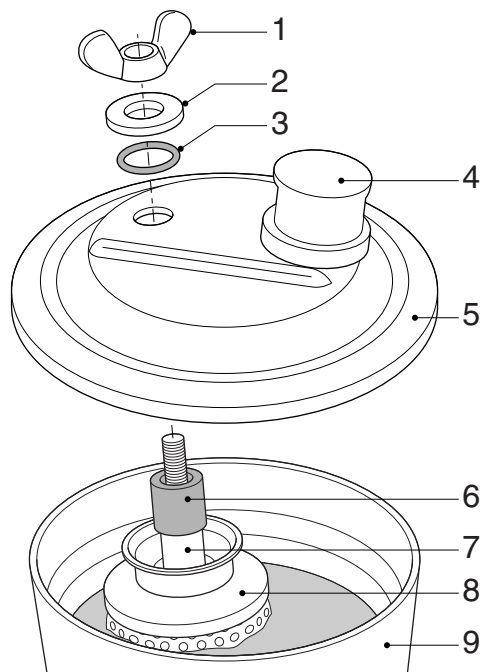
1. Clean the reservoir (9) cover, so that absolutely no dirt can get into the reservoir.
2. Remove the wing nut (1).
3. Remove the steel ring (2) and the sealing ring (3).
4. Remove the cover (5).
5. Remove the rubber bush (6) and steel bush (7).
6. Slowly remove the filter element (8) from the reservoir (9).

Note:

The filter element must be removed from the reservoir with care so that no dirt remains in the reservoir.

Installation of steel reservoir filter element

1. Fit a new filter element (8) into the reservoir (9).
2. Fit the steel bush (7).
3. Check the flexibility of the rubber bush (6) and replace if necessary. Install the rubber bush (6).
4. Check the sealing ring on the cover (5) and replace if necessary. Fit the cover (5).
5. Check the rubber ring (3) and replace if necessary. Install the rubber ring (3) and steel ring (2).
6. Fit the wing nut (1).
7. Check the fluid level using the dipstick (4).



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3.3 REMOVAL AND INSTALLATION, RESERVOIR

Removing the reservoir

1. Clean the reservoir and the surrounding area.
2. Place a receptacle under the reservoir.
3. Disconnect the hoses from the reservoir. Plug the hose connections.
4. Remove the filter element from the reservoir.
5. Loosen the clamping strips and remove the reservoir from the bracket.

Installation of reservoir

1. Thoroughly clean the inside of the reservoir.
2. Fit a new filter element into the reservoir.
3. Place the reservoir on the bracket.
4. Check the condition of the hoses and connect these to the reservoir. If necessary, turn the reservoir so that the hoses can be connected straight to the reservoir.
5. Fix the hoses with new hose clamps. Tighten the hose clamp.
6. Fill and bleed the system.
7. Inspect the hose connections for leaks.

3.4 REMOVAL AND INSTALLATION, LINES**Removing lines**

1. Clean the line connections and the surrounding area.
2. Place a receptacle under the line connection.
3. Remove the line. Plug the openings.

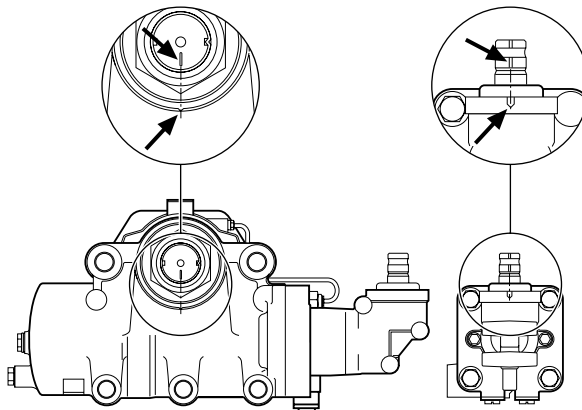
Installation of lines

1. Only install original lines supplied by DAF.
2. Items requiring special attention when connecting lines
 - Replace the O-ring.
 - Prevent the line twisting during tightening of the coupling. To facilitate checking this, a mark may have been provided on the hose (sometimes in the form of text).
 - The line must not touch other parts (this is in view of chafing).
 - The line must not bend sharply; this applies especially to the flexible supply line and return line.
 - The line is not pinched off by other components.
3. If the hose is connected using a hose clamp, the hose clamp should be replaced. Tighten the hose clamp.
Check the tapered parts for damage in the case of a union nut connection.
4. Fill and bleed the system.
5. Inspect the line connections for leaks.

3.5 REMOVAL AND INSTALLATION, SLAVE CYLINDER

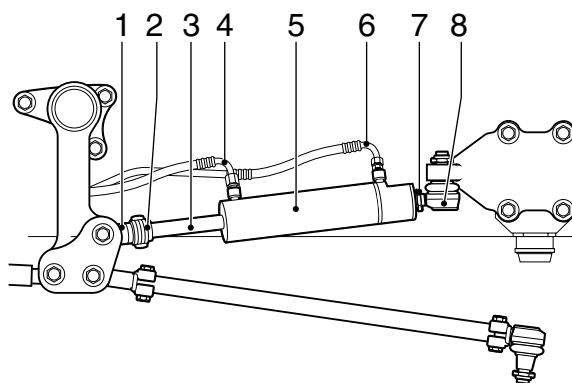
Removing the slave cylinder

1. Clean the pipe connections and the surrounding area.
2. Place the steering gear in the central position. This can be checked using the markings on the steering box.
3. Place a receptacle under the pipe connections.
4. Remove the pipes. Plug the openings.



S7 00 024

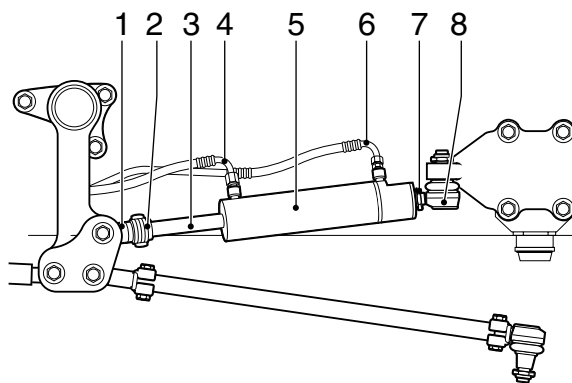
5. Remove the piston rod (3) from the ball end (1). To do so, slacken the bolt of clamping bracket (2) and screw the piston rod (3) from the ball end (1).
6. Unscrew the lock nut (7) and remove the cylinder (5) from the ball end (8).
7. Remove the cylinder (5) from the vehicle and push the piston rod (3) fully into the cylinder (5), to avoid damaging the piston rod.



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Installing the slave cylinder

1. Thoroughly clean and check the clamping bracket bolt (2). If corroded or damaged, replace the bolt. Replace the self-locking nut. Check the ball ends (1) and (8) for damage and play, and replace if necessary.
2. Screw the cylinder (5) as far as possible onto the ball end (8), making sure that the pipe connections (4) and (6) are at the top of the cylinder (5).
3. Tighten the lock nut (7) to the specified tightening torque. See 'Technical data'.
4. Slide the piston rod (3) out of the cylinder (5). Turn the piston rod (3) into the ball end (1) as far as possible.



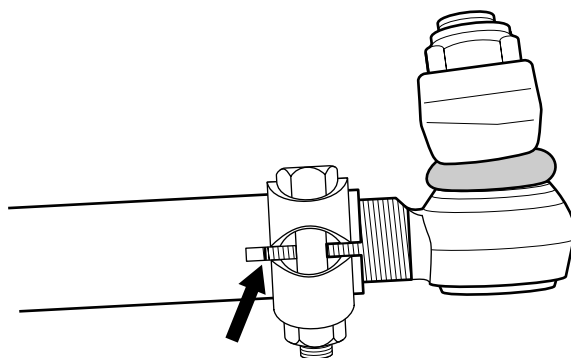
S7 00 717

5. Replace the nut of the clamping bracket (2) and tighten the nut to the specified tightening torque, see 'Technical data'.

Note:

- Position the clamping bracket on the slot so that the open side is above the slot.
- The clamping bracket always fully engages the screw thread, see the drawing.

6. Fit the pipes.
7. Fill and bleed the system.
8. Inspect the pipe connections for leaks.



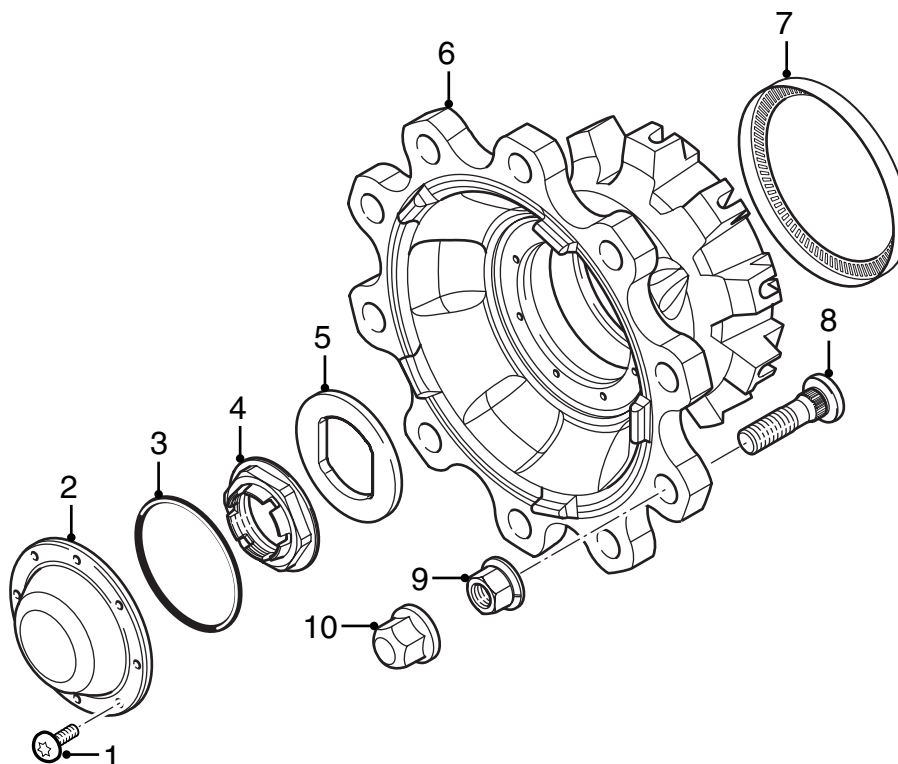
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1. GENERAL

1.1 OVERVIEW DRAWING, WHEEL HUB

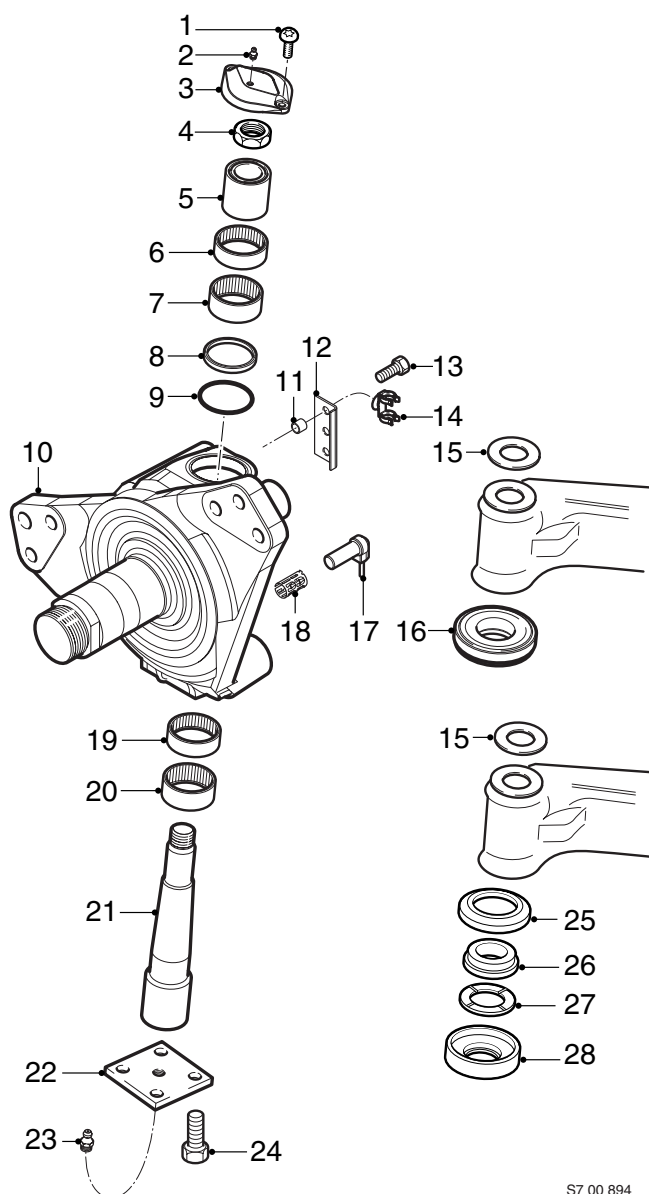


1. Attachment bolt
2. Hub cap
3. O-ring
4. Hub nut
5. Locking plate
6. Wheel hub unit
7. Wheel speed sensor ring
8. Wheel stud
9. Wheel nut
10. Wheel nut cap

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1.2 OVERVIEW DRAWING, FRONT AXLE SWIVEL AXLE

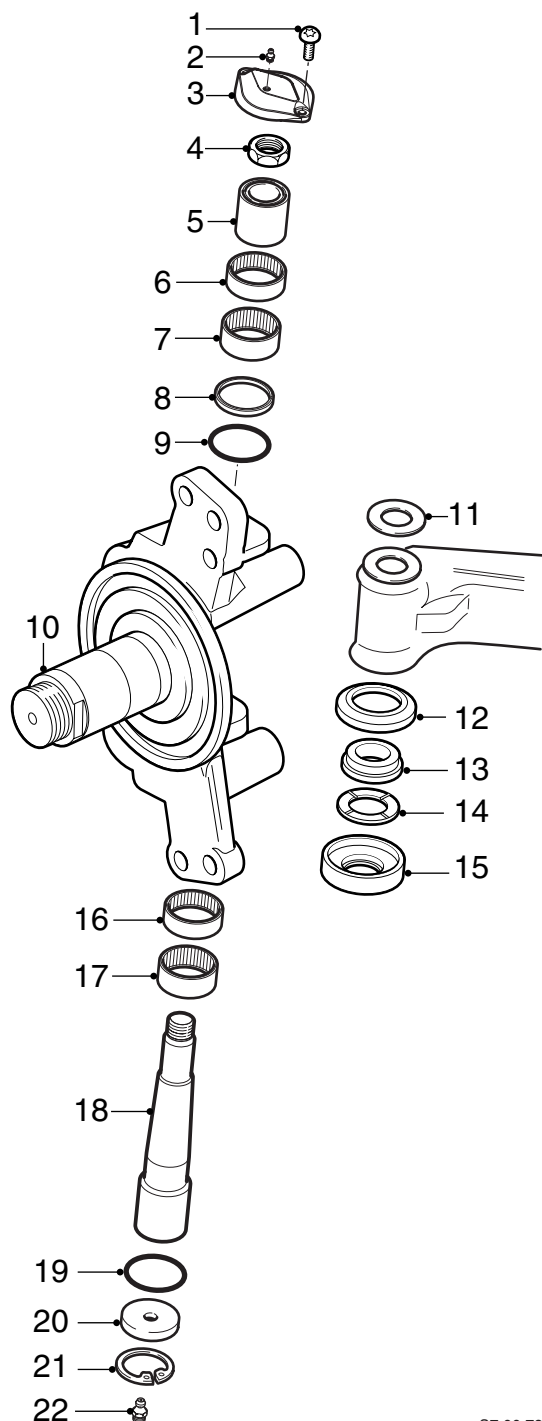
1. Bolt
2. Lubricating nipple
3. Cover
4. Nut
5. Bearing bush
6. Needle bearing
7. Needle bearing
8. Oil seal
9. O-ring
10. Swivel axle
11. Bush
12. Bracket
13. Bolt
14. Bracket
15. Shim
16. Thrust bearing, assembled version
17. Wheel speed sensor
18. Wheel speed sensor holder
19. Needle bearing
20. Needle bearing
21. King pin
22. Sealing plate
23. Lubricating nipple
24. Bolt
25. Sealing ring
26. Thrust washer
27. Bearing ring
28. Shoulder ring



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1.3 OVERVIEW DRAWING, LEADING REAR AXLE SWIVEL AXLE

1. Bolt
2. Lubricating nipple
3. Cover
4. Nut
5. Bearing bush
6. Needle bearing
7. Needle bearing
8. Oil seal
9. O-ring
10. Swivel axle
11. Shim
12. Sealing ring
13. Thrust washer
14. Bearing ring
15. Shoulder ring
16. Needle bearing
17. Needle bearing
18. King pin
19. O-ring
20. Cover
21. Circlip
22. Lubricating nipple



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1.4 DESCRIPTION OF WHEEL HUB UNIT

Wheel hub unit

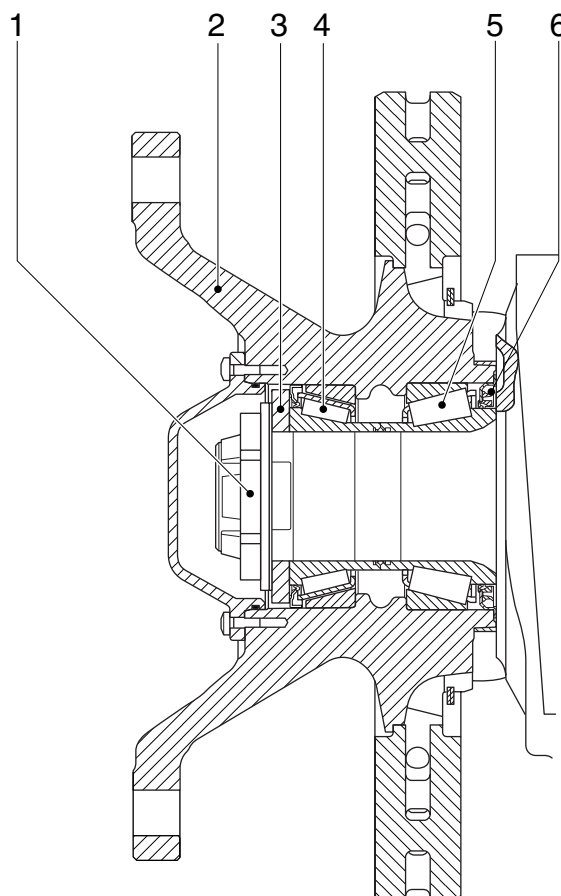
The wheel hub (2), wheel bearings (4) and (5) and oil seal (6) form a whole that is called the wheel hub unit.

The thrust washer (3), on the inner side of two straight surfaces, prevents the hub nut (1) from coming loose if there are any problems with the bearings. The hub nut (1) is of the self-locking type. The nut is locked by bending the lips on the hub nut (1) outward.

The bearings (4) and (5) of the wheel hub unit are greased and are maintenance free.

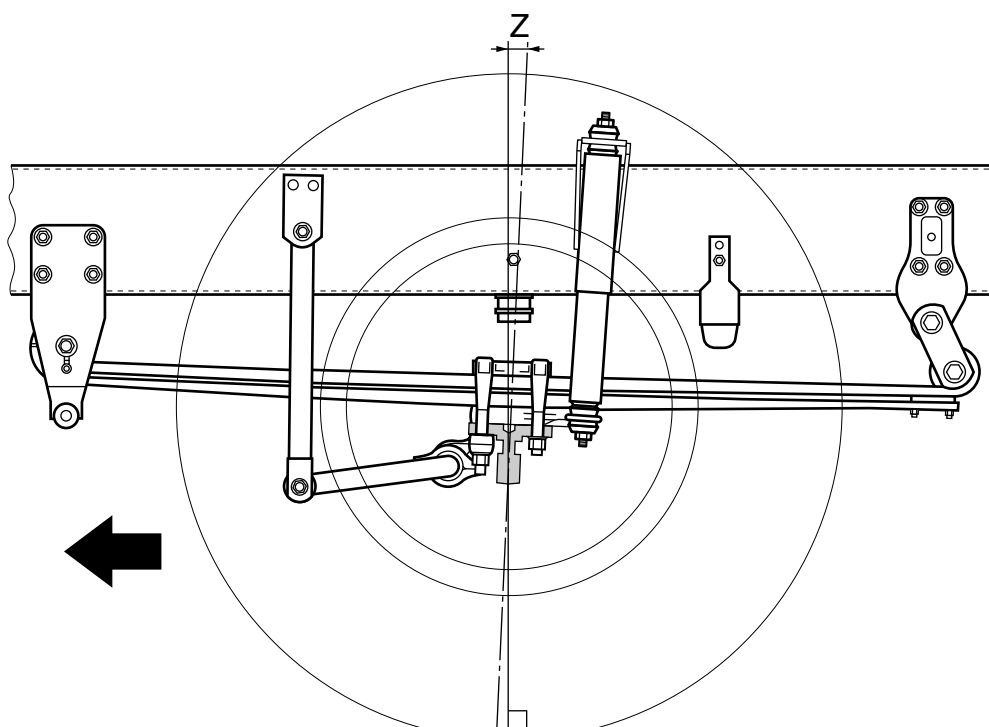
The correct wheel bearing pre-load is achieved by installing the hub nut (1) as specified.

It is not possible to replace wheel bearings (4) and (5) and/or hub oil seal (6).



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1.5 DESCRIPTION OF WHEEL SETTINGS



S7 00 606

Caster

The caster (Z) is the angle of the axle housing to the road surface. The caster is important for the directional stability of the vehicle. Too little caster will lead to "searching" behaviour by the vehicle, while too much caster will result in "heavy" steering.

A deviating caster will not result in tyre wear.

The caster is determined by the relation between the road surface and the chassis, assuming that the chassis is parallel with the road surface.

The caster can be very easily inspected and adjusted and requires no complicated equipment.

If a vehicle has two steerable axles, this inspection should be carried out on both axles.

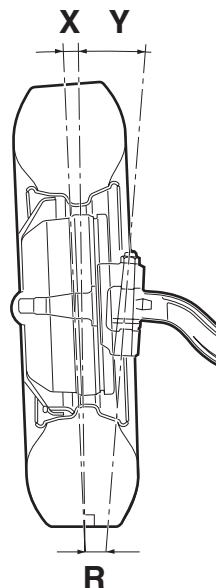
Camber angle and king pin inclination

The camber angle (X) and the king pin inclination (Y) are determined by the construction of the swivel axle and the axle housing. In DAF vehicles, neither setting can be adjusted.

Wheel alignment deviations can only be caused by collisions and/or a bent front axle due to overloading.

If a vehicle has a deviation in one of these wheel alignments, the load of the tyre will be unevenly distributed across the road surface. This will result in irregular tyre wear.

Inspections of vehicles with one steerable axle and vehicles with two steerable axles do not differ. The inspection should be carried out on each individual wheel.



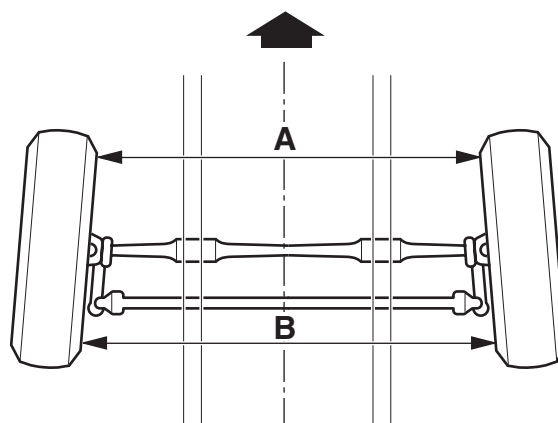
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6

Toe

Toe is the difference between distances A and B. If distance A is smaller than B, this is called toe-in. If, however, distance A exceeds distance B, this is called toe-out.

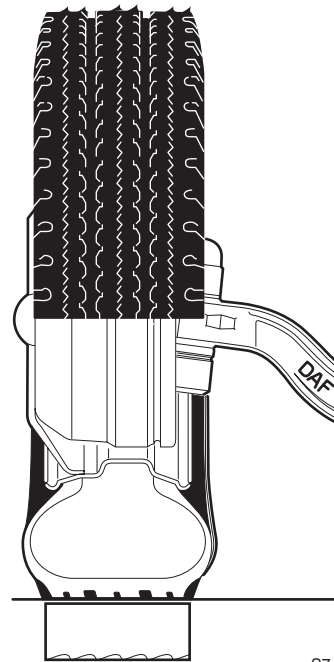
Whether a vehicle should have toe-in or toe-out is determined by the manufacturer of the vehicle. Toe-in or toe-out is required to ensure that the wheels have perfect rolling characteristics while the vehicle is driving straight ahead.



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Toe-in or toe-out deviations will cause "chafing" of the tyres on the road surface. This will result in irregular tyre wear.

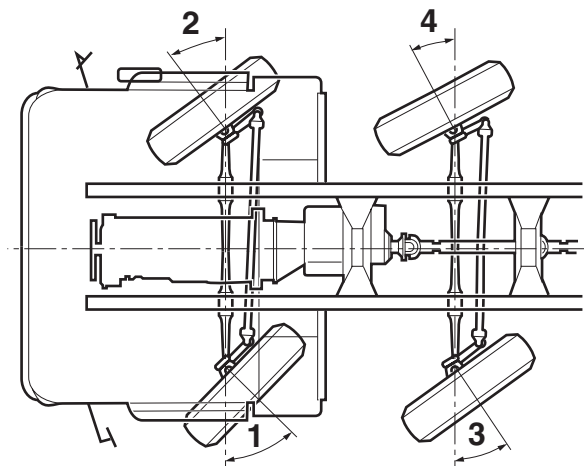
The same irregular tyre wear is found in vehicles with multiple steerable axles if the wheels are "misaligned" while the vehicle is driving straight ahead.



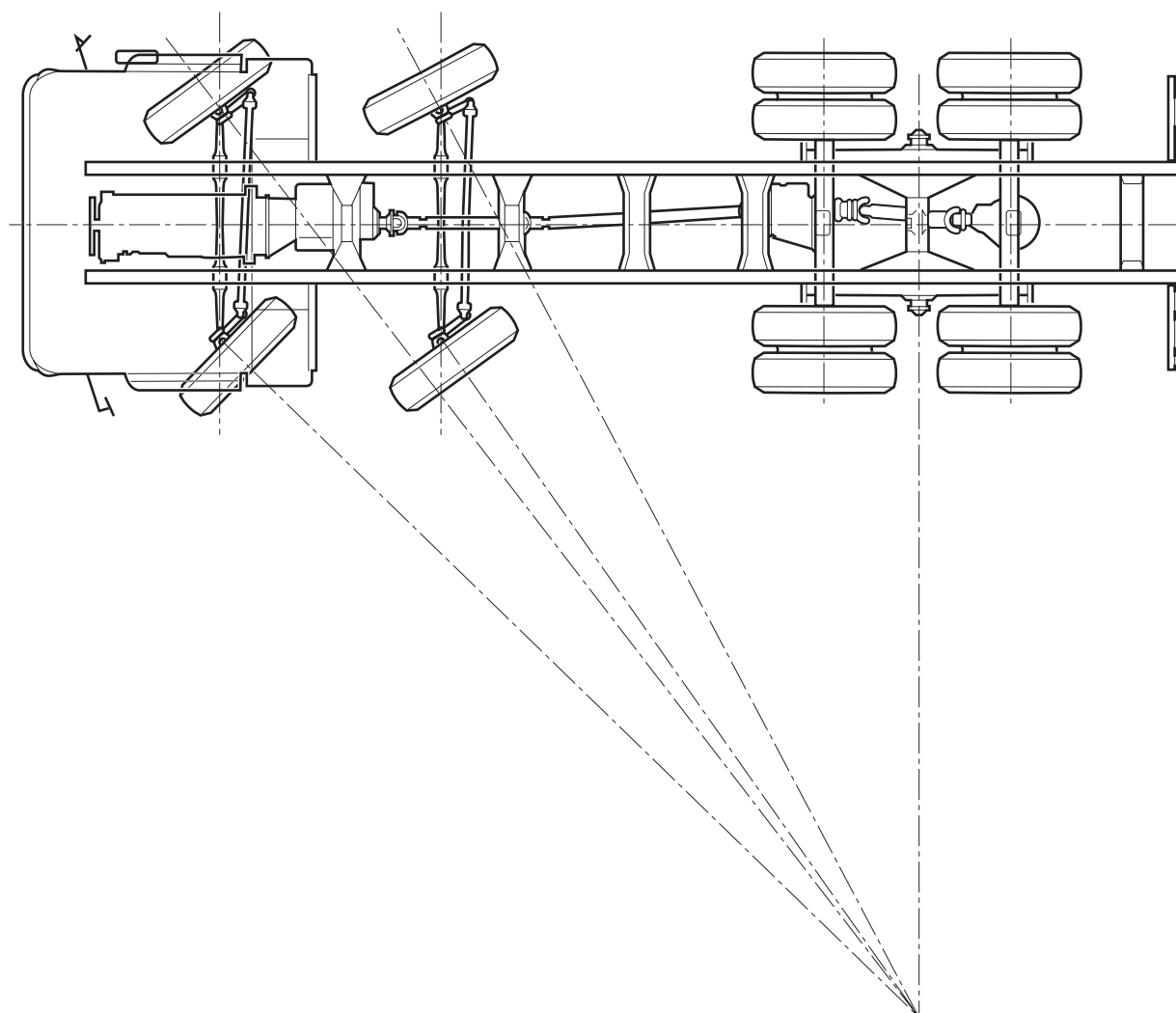
S7 00 126

Toe-out when turning

Toe-out when turning is the difference in the wheel alignment angle between the individual wheels when the vehicle is making a turn.



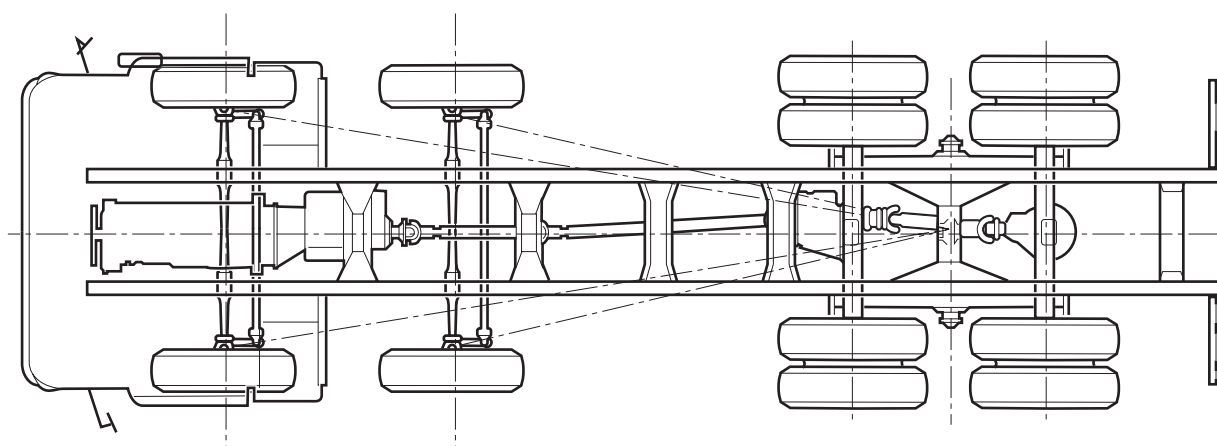
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6

In order to achieve proper rolling of the wheels in the turn, it is necessary that the direction of wheel rotation is at right angles to the turning radius ending in the point the vehicle is turning around.

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To make certain that the toe-out when turning is correct, the construction of the track rod and the track rod arms should comply with a certain principle: the Ackermann principle. According to the Ackermann principle it should be possible to draw an imaginary line from the centre of the king pin right through the centre of the track rod ball joint to the centre of the rear axle(s).

The drawing clearly shows that in vehicles with two steerable axles, both axles should comply with the Ackermann principle. By trying different track rods and track arms, it is possible to comply as closely as possible with the Ackermann principle.

If the wheelbase has been shortened or extended it may be necessary to adjust the track rod and track arms in order to comply with the Ackermann principle.

The toe-out when turning cannot be adjusted. However, it is possible and necessary to check and adjust the maximum wheel deflection of the inside wheel, to prevent the tyres from chafing against certain components.

Once the maximum wheel deflection is set, this will also determine the deflection for the other wheel or wheels, if the vehicle concerned has two steerable axles.

Wheel alignment in vehicles with multiple steerable axles

To prevent premature tyre wear, all wheels should be aligned while the vehicle is driving straight ahead. If the wheels are misaligned, the wheels of vehicles with multiple steerable axles will be particularly prone to abnormal and premature wear. Misalignment of steerable wheels can be caused by various factors. It may happen, however, that the steerable wheels are properly aligned but that other factors have caused abnormal tyre wear.

The main cause of this phenomenon should be sought in the axle suspension, especially suspension of the rear axle(s).

2. INSPECTION AND ADJUSTMENT

2.1 INSPECTION AND ADJUSTMENT, SWIVEL AXLE PLAY

Inspection of swivel axle play

1. The vehicle should have its wheels on the ground.

Note:

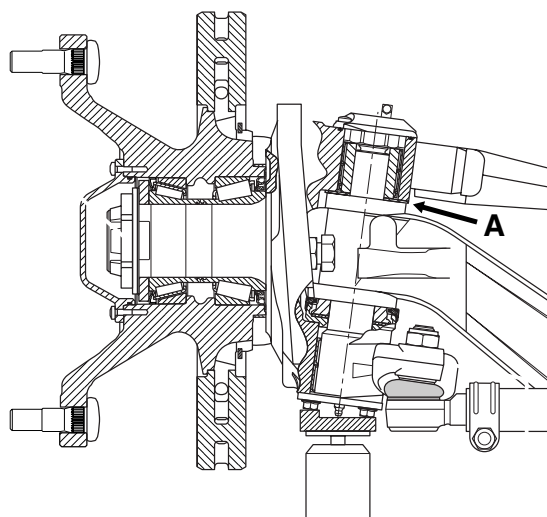
If the wheels have been removed from the front axle, e.g. for overhaul purposes, the swivel axle will hang at the axle end. In that case, the swivel axle should be supported by a jack, pushing the swivel axle against the bottom of the axle end.

2. Using a feeler gauge measure the distance between the shim and the swivel axle at (A). Take measurements in several places. Compare the reading with the admissible play. See 'Technical data'.

Note:

The play should be about equal along the entire circumference of the axle end. If the play is not equal, this is caused by radial play in the needle bearings. If the radial play of one of the values measured along the circumference differs from the specified value, the needle bearings should be replaced, see the chapter 'Removal and installation'.

If an excessive axial play is measured along the entire circumference of the axle end, this is probably caused by a worn swivel axle thrust bearing.

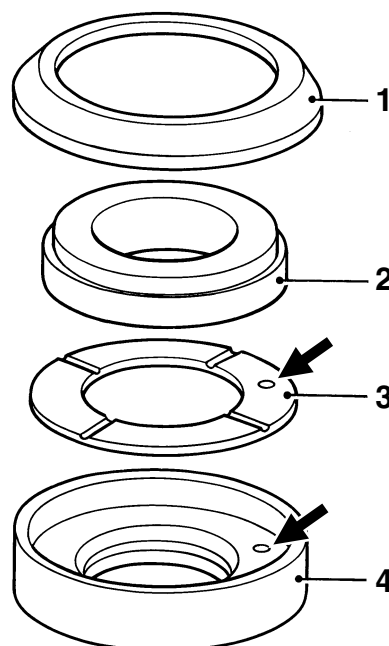


S7 00 579

Adjusting the swivel axle play, thrust bearing, split version

1. Remove the swivel axle from the axle end. See 'Removal and installation'.
2. Degrease and clean the thrust bearing.
3. Check the thrust bearing for wear or damage. If in doubt, replace the thrust bearing.
4. Check the machined surfaces of the axle end and the swivel axle for damage.

5. Remove the dust seal (1) from the thrust washer (2).
6. Assemble the thrust bearing without greasing it and without the dust seal (1). Make sure that the cam at the bottom of the bearing ring (3) falls in the recess of shoulder ring (4). See the arrows in the drawing.
7. Fit the swivel axle with its original shim on the axle end.
8. Fit the king pin. Hand tighten the nut.
9. Place a jack under the swivel axle, pushing the thrust bearing against the axle end.



S7 00 114

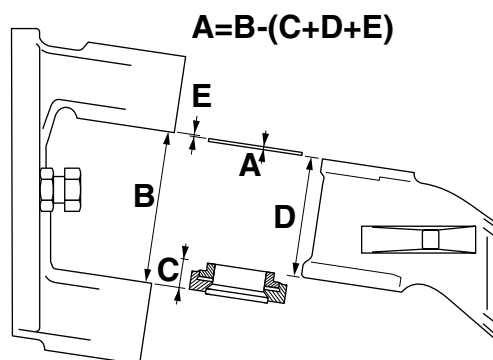
6

- A = shim thickness
 B = distance between the swivel axle contact surfaces
 C = total thickness of the thrust bearing without the dust seal
 D = axle end dimensions
 E = play

10. Using a feeler gauge measure the gap between the shim and the swivel axle. If necessary, use a shim with a different thickness until the specified axial play is achieved. See 'Technical data'.

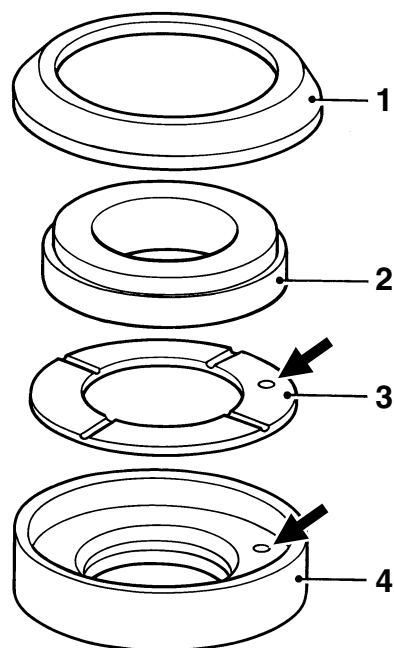
Note:

The shim thickness can also be determined using the formula in the drawing.



S7 00 815

11. Remove the swivel axle from the axle end.
12. Disassemble the thrust bearing and grease the top side of bearing ring (3) (ribbed side with lubricating grooves).
13. Fit a new dust seal (1) to the thrust washer (2).
Make sure that the top of the dust seal is positioned under the top of the thrust washer.
14. Install the swivel axle with the correct shim on the axle end. See 'Removal and installation'.
15. Measure the play again.



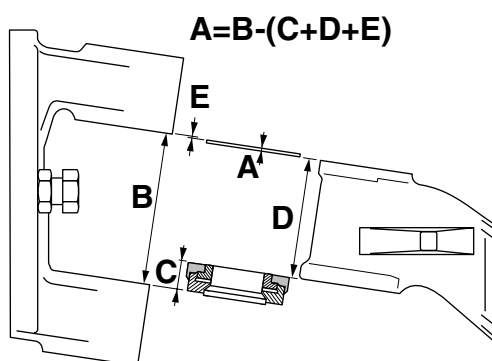
S7 00 114

Adjusting the swivel axle play, thrust bearing, assembled version

1. Remove the swivel axle from the axle end. See 'Removal and installation'.
2. Check the thrust bearing for wear or damage. If in doubt, replace the thrust bearing.
3. Check the machined surfaces of the axle end and the swivel axle for damage.
4. Fit the swivel axle with its original shim on the axle end.
5. Fit the king pin. Hand tighten the nut.
6. Place a jack under the swivel axle, pushing the thrust bearing against the axle end.

- A = shim thickness
 B = distance between the swivel axle contact surfaces
 C = total thickness of the thrust bearing
 D = axle end dimensions
 E = play

7. Using a feeler gauge measure the gap between the shim and the swivel axle. If necessary, use a shim with a different thickness until the specified axial play is achieved. See 'Technical data'.



S7 00 577

Note:

The shim thickness can also be determined using the formula in the drawing.

8. Remove the swivel axle from the axle end.

9. Install the swivel axle with the correct shim on the axle end. See 'Removal and installation'.
10. Check the play once again.

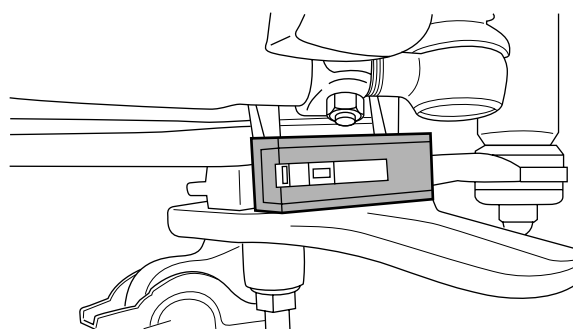
2.2 INSPECTION AND ADJUSTMENT, CASTER

General

- The vehicle should be on a flat and horizontal surface, with the steering gear in the "straight ahead" position.
- The caster can be measured using an angle measuring device or wheel alignment equipment.

Inspection of caster using angle measuring device

1. Clean the spot where the angle measuring device is to be placed on the spring seat.
2. Place the angle measuring device on a chassis side member and check whether the chassis is parallel with the floor. If not, the caster reading should be adjusted to the chassis position.
3. Place the angle measuring device on the spring seat and measure the angle. Compare the reading with the specified value. See 'Technical data'.
4. Carry out the caster measurement on the other axle side too. If different readings are obtained, the front axle suspension should also be inspected for deviations.



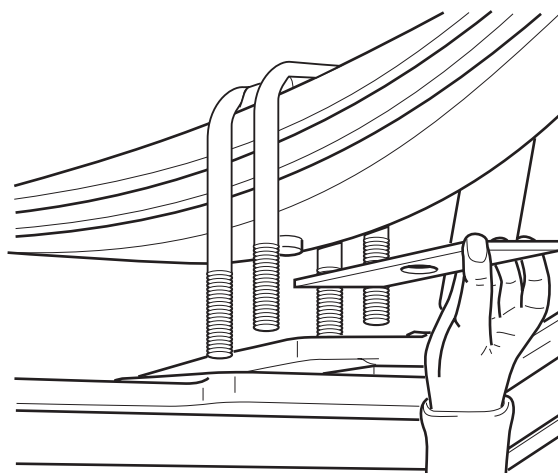
S7 00 560

Inspection of caster using wheel alignment equipment

1. Use high-quality wheel alignment equipment for the inspection. The equipment must be calibrated regularly and preferably be of the type that can be calibrated before every use.
2. Follow the instructions for the wheel alignment equipment carefully.

Adjusting the caster

1. Fit a key of the required thickness between the spring seat and the spring. For the keys available, see 'Technical data'.
2. Repeat the measurement once the key has been fitted.



S7 00 146

2.3 INSPECTION OF CAMBER ANGLE AND KING PIN INCLINATION

Note:

In the following measurement, only the camber angle is measured. If the camber angle is correct, the king pin inclination must also be correct.

General

- The vehicle should be on a flat and horizontal surface, with the steering gear in the "straight ahead" position.
- The tyre pressure should be correct.
- The camber angle can be measured using an angle measuring device or wheel alignment equipment.
- The measurement should be carried out on both wheels.

Inspection of camber angle using angle measuring device

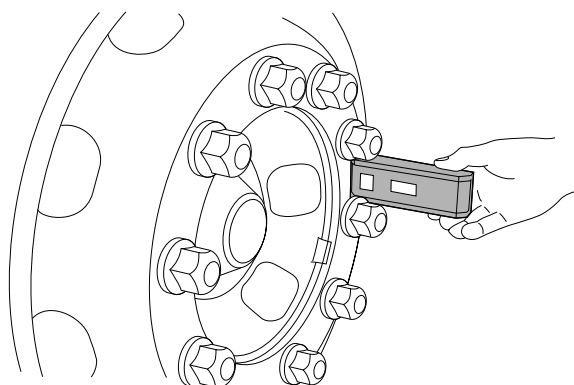
1. Thoroughly clean the side of the wheel rim. Position the angle measuring device against the wheel rim. Keep the angle measuring device in the vertical position.
2. Read off the angle shown. For the permitted angle, see 'Technical data'.

Inspection of camber angle using wheel alignment equipment

1. Use high-quality wheel alignment equipment for the inspection. The equipment must be calibrated regularly and preferably be of the type that can be calibrated before every use.
2. Follow the instructions for the wheel alignment equipment carefully. For the permitted angle, see 'Technical data'.

The following points may cause the reading to deviate:

- excessive swivel axle bearing play
- bent front axle. In this case, the king pin inclination will also deviate from the values specified.



S7 00 566

2.4 INSPECTION AND ADJUSTMENT, TOE

Inspection of toe

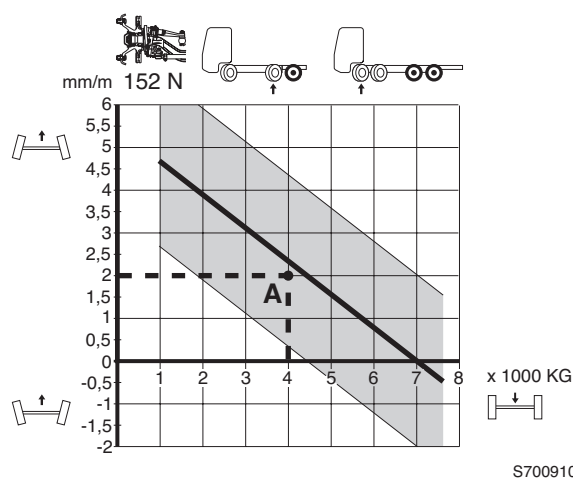
1. Use high-quality wheel alignment equipment for the inspection. The equipment must be calibrated regularly and preferably be of the type that can be calibrated before every use. Follow the instructions for the wheel alignment equipment carefully.
2. Ensure that the steering gear is free of tension. To that end, drive the vehicle, if possible, directly to the place of measurement. If this is not possible, drive forwards and backwards at the place of measurement with the steering gear in the "straight ahead" position. Do not brake excessively because of weight transmission to front axle.
3. Measure the axle load of the axle being inspected.
4. Measure the toe of the axle.
5. Using the graph for the axle concerned, inspect whether the toe is correct or must be corrected (see 'Technical data'). There are two examples explaining how the graphs are to be read in 'Technical data'.

Note:

If a large deviation is measured, the cause should be traced. The deviation could, for example, have been caused by a collision, during which components were bent. If so, the remaining steering gear components should be inspected carefully.

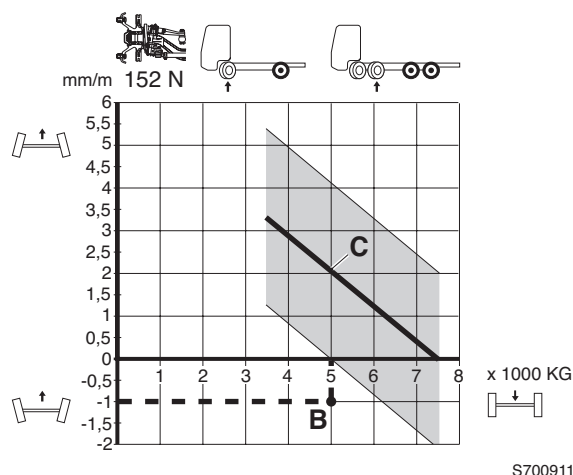
Example 1

Look at the graph for the 152N axle, disc brake version, used as a leading rear axle or first front axle in a vehicle with two steered front axles. The measured axle load is 4,000 kg and the measured toe is 2 mm/m (toe-in). The intersection of the lines (A) occurs in the shaded area. This shows you that the toe is within the permitted tolerance. The toe does not have to be corrected.



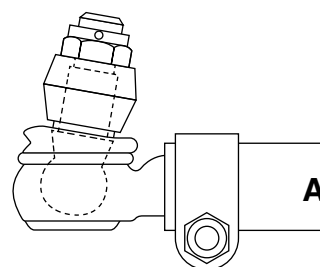
Example 2

Look at the graph for the 152N axle, disc brake version, used as a single front axle or second front axle in a vehicle with two steered front axles. The measured axle load is 5,000 kg and the measured toe is 1-mm/m (toe-out). The intersection of the lines (B) occurs outside the shaded area. This shows you that the toe is outside the permitted tolerance. If the amount measured lies outside the shaded area, the toe must be adjusted to the amount indicated by the intersecting line (C).

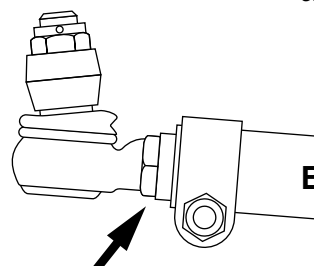


Adjusting the front axle(s)/leading rear axle toe

1. Slacken the bolts of the clamping brackets until the track rod can be rotated.
2. Set the correct length for track rod type A (see 'Technical data') by lengthening or shortening the track rod. Track rod type B can be adjusted using the nuts with internal and external thread. Both bolts should receive an equal number of turns.



S7 00 060

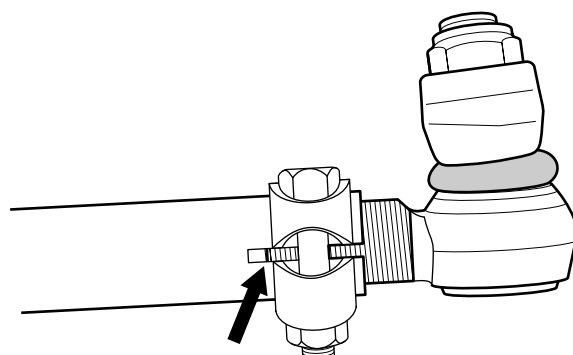


S7 00 061

Note:

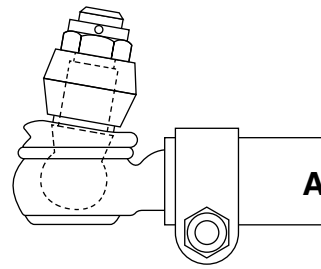
Make sure that the threaded ends of the ball joints are not pushed too far from the track rod. The clamping bracket should always fully engage the ball joint screw thread. See the drawing.

3. Thoroughly clean and check the clamping bracket bolts. A corroded or damaged bolt must be replaced. Replace the self-locking nut.
4. Tighten the locking bolts of the clamping brackets to the specified tightening torque. See 'Technical data'.
5. After this, check the toe once again.



S7 00 539

6. Make sure that the clamping brackets do not come into contact with the axle housing at maximum wheel deflection. Turn the clamping brackets if necessary. The straight steering rod clamping bracket (type A) may have any position.



S7 00 060

2.5 INSPECTION AND ADJUSTMENT, WHEEL DEFLECTION



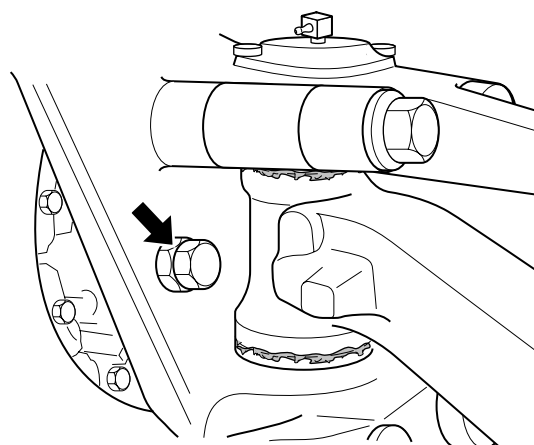
Work safely and block the vehicle so that it cannot slide off the turning plates.

Inspection of wheel deflection

1. Engage the vehicle's parking brake and place chocks in front of and behind the rear wheels.
2. Jack up the steerable axles and place turning plates under the centre of the wheels. Only use turning plates which allow for wheel displacement caused by the wheel offset.
3. Place the wheels in the "straight ahead" position and lower them until they rest on the turning plates. Set the turning plates to zero degrees.
4. Turn the steering wheel fully to the right until the end stop is reached and check the wheel deflection on the right. See 'Technical data'.
5. Turn the steering wheel fully to the left until the end stop is reached and check the wheel deflection on the left. See 'Technical data'.

Adjusting the wheel deflection

1. The wheel deflection is adjusted by changing the length of the stop bolt on the swivel axle. After the adjustment, secure the bolt using the lock nut.
2. After finishing the adjustment, make sure that the tyre does not come into contact with other components.
3. If larger tyres, wheel rims or snow chains have been fitted, first make sure that these do not come into contact with other components. Reduce the wheel deflection if necessary.
4. When the wheel deflection has been changed, re-adjust the wheel deflection limiting valves of the steering box.



S7 00 584

2.6 INSPECTION OF TOE-OUT WHEN TURNING

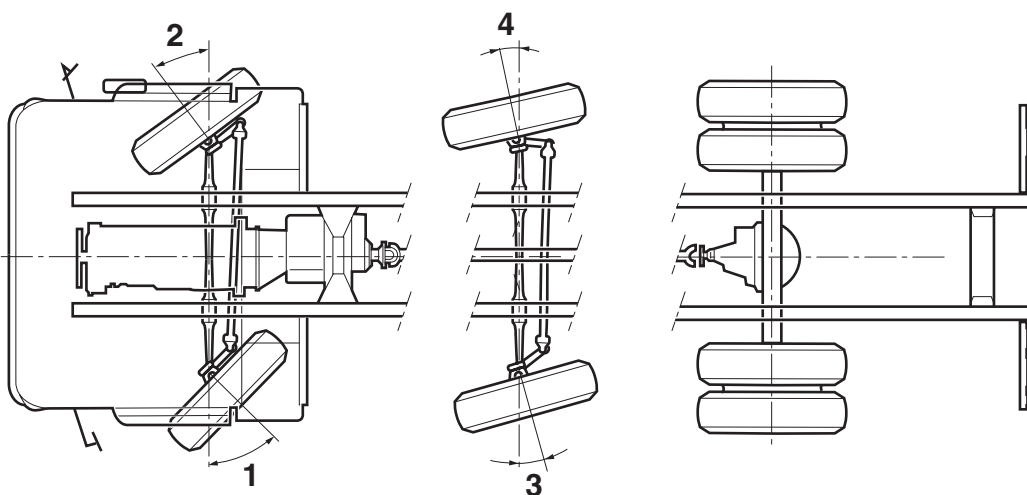
Measuring the toe-out while the vehicle is turning (especially for vehicles with two steerable front axles or a leading rear axle) is a method of inspecting the setting of the steering gear. During this measurement, the inside wheel of the front steerable axle is turned 30° inwards. The wheel deflections of the other steerable wheels are then measured.



Work safely and block the vehicle so that it cannot slide off the turning plates.

Inspection of toe-out when turning

1. Engage the vehicle's parking brake and place chocks in front of and behind the rear wheels.
2. Jack up the steerable axles and place turning plates under the centre of the wheels. Only use turning plates which allow for wheel displacement caused by the wheel offset.
3. Place the wheels in the "straight ahead" position and lower them until they rest on the turning plates. Set the turning plates to zero degrees.



4. Turn the steering wheel until the inside wheel of the front steerable axle (wheel 1 in the drawing) reaches a 30° angle.
5. Fix the steering wheel in this position and note down the wheel deflections of the remaining steerable wheels.
6. Carry out this measurement on both the left and the right side.

S7 00 124

7. For the correct values, see 'Technical data'.
If a large deviation is measured, the cause should be traced. Inspect the wheel deflection using wheel alignment equipment. The deviation may, for example, have been caused by a collision, during which components were bent. If so, the remaining steering gear components should be inspected carefully.

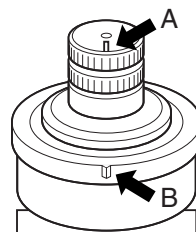
2.7 INSPECTION AND ADJUSTMENT, STEERING ROD



Work safely and block the vehicle so that it cannot slide off the turning plates.

Inspecting the steering rod adjustment

1. Engage the vehicle's parking brake and place chocks in front of and behind the rear wheels.
2. Jack up the steerable axle and place turning plates under the wheels.
Only use turning plates which allow for wheel displacement caused by the wheel offset.
3. Place the wheels in the "straight ahead" position and lower them until they rest on the turning plates.
4. Measure the (mis)alignment of the wheel to which the steering rod is connected. This can be done using wheel alignment equipment or by measuring the distance from the wheel rim to the spring leafs at the front and rear of the wheel. The distances at the front and rear of the wheel should be equal.
5. Check using the markings (A) and (B) on the steering box that the input shaft of the steering box is in the central position. For the permitted deviation, see 'Technical data'.
6. Adjust the steering rod length, if the values deviate too much.
If a large deviation is measured, the cause should be traced.
The deviation may, for example, have been caused by a collision, during which components were bent. If so, the remaining steering gear components should be inspected carefully.



S7 00 861

Adjusting the steering rod

1. Loosen the bolt of the clamping bracket on the steering rod.
2. Remove the steering rod from the steering rod arm. See 'Removal and installation'.

3. Place the steering box in the centre position by aligning the markings.
4. Set the correct length of the steering rod by screwing the ball end in or out.
If the vehicle is unloaded, turn the ball end one additional turn.
Make sure that the threaded end of the ball end is not pushed too far from the steering rod. The clamping bracket should always fully engage the screw thread of the ball end (see drawing).

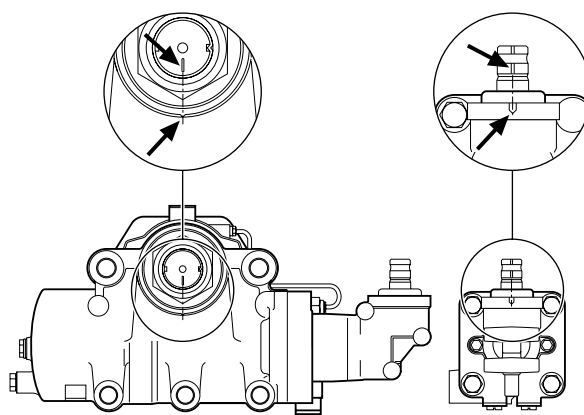
Note:

If the length is not correct because the ball end can only be rotated one full turn, get as close as possible to the correct length. A steering rod that is too long is preferable to a steering rod that is too short.

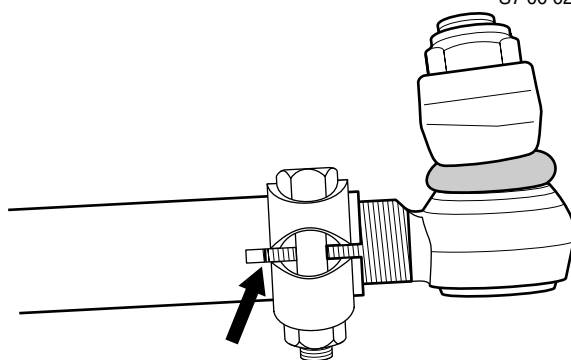
5. Inspect the thread of the ball end for damage.



Fitting a new self-locking nut to a ball end with a damaged thread may lead to dangerous situations.



S7 00 024



S7 00 539

6. Install the steering rod in the steering rod arm. See 'Removal and installation'.
7. Thoroughly clean and check the clamping bracket bolt. A corroded or damaged bolt must be replaced.
Replace the self-locking nut.
8. Tighten the clamping bracket bolt to the specified tightening torque. See 'Technical data'.
9. Check the steering wheel position when it is in the "straight ahead" position. If necessary, adjust the position by changing the position of the steering wheel on the steering shaft.
10. Calibrate the EMAS system in case of a steered trailing swivel axle.

2.8 INSPECTION AND ADJUSTMENT, STEERABLE FRONT AXLES AND LEADING REAR AXLE ALIGNMENT

Inspection of the steerable front axles and leading rear axle alignment

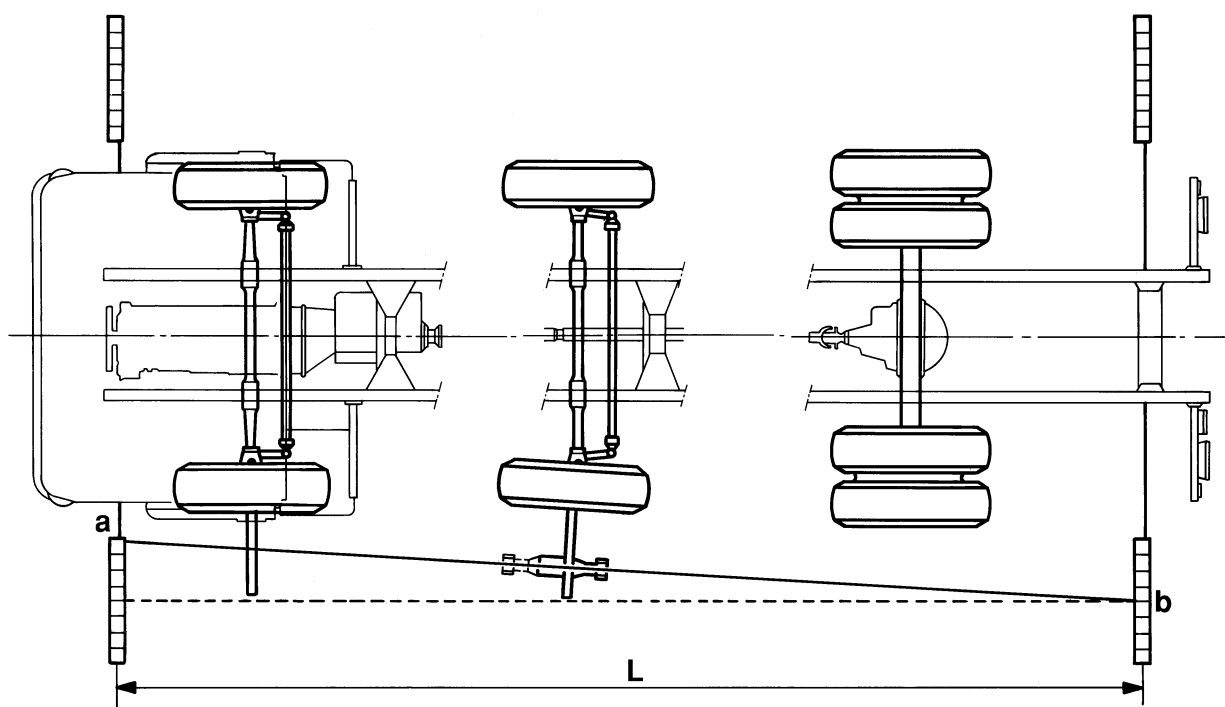
- Use high-quality wheel alignment equipment for the inspection. The equipment must be calibrated regularly and preferably be of the type that can be calibrated before every use.
- The vehicle load must be in accordance with the vehicle's normal load conditions. The load should be at least 40% of the vehicle's admissible load.
- For a vehicle combination (truck with trailer, or tractor with semi-trailer), the alignment of the total vehicle combination must be checked. A misaligned trailer or semi-trailer can cause the combination to become directionally unstable.
- Before measuring, the following points should be checked:
 - the track of the steerable axles
 - the axle position of the non-steerable axles
 - tyre pressure
 - spring opening of the spring
 - play of the steering gear, if any
 - play of the axle suspension.

Note:

If a deviation is found, it should be corrected/ repaired before the measurement is taken.

- The work should be carried out very precisely. The wheel alignment (the angle of the wheel in relation to the central axis of the chassis) should be calculated in millimetres per metre.

This wheel position is calculated by dividing the difference (in millimetres) in the readings on the measuring boards (a - b in the drawing below) by the distance (in metres) between the measuring boards (L in the drawing).



S7 00 093

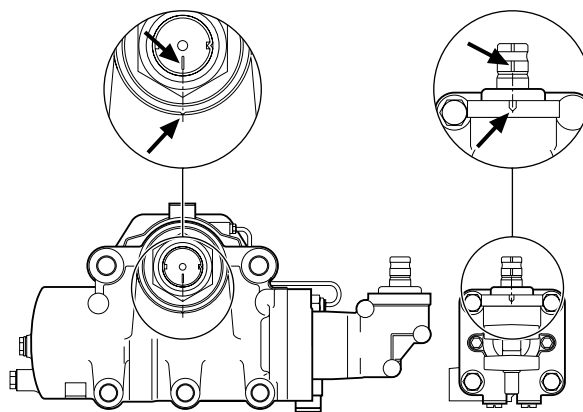
6

1. Drive the vehicle straight to the test location to avoid stresses in the chassis or in the axle suspension system.
2. Place the vehicle on the turning plates. Only use turning plates which allow for wheel displacement caused by the wheel offset.
3. Place chocks before and behind the non-steerable wheels.



Block the vehicle so that it cannot slide off the turning plates.

4. Place the steering gear in the central position using the markings on the steering box.



S7 00 024

5. Measure the angle of the idler arms in relation to the chassis (the angles A, B and C in the drawing). Compare the angles measured with the specified angles. See 'Technical data'. If these deviate, trace the cause and set the angles correctly.

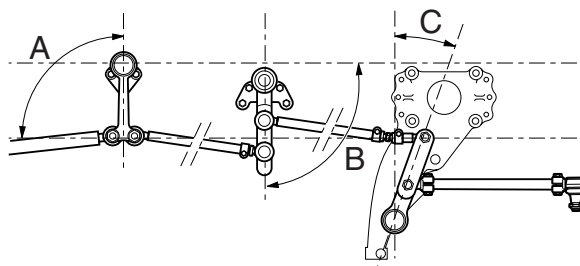
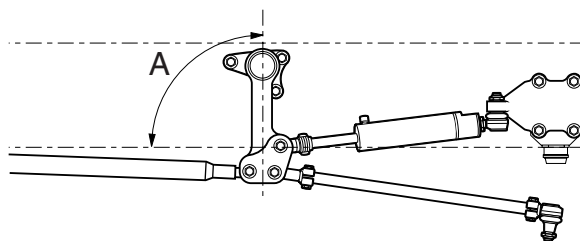
Note:

If a large deviation is measured, the cause should be traced. The deviation could, for example, have been caused by a collision, during which a steering rod and/or idler arm were bent.

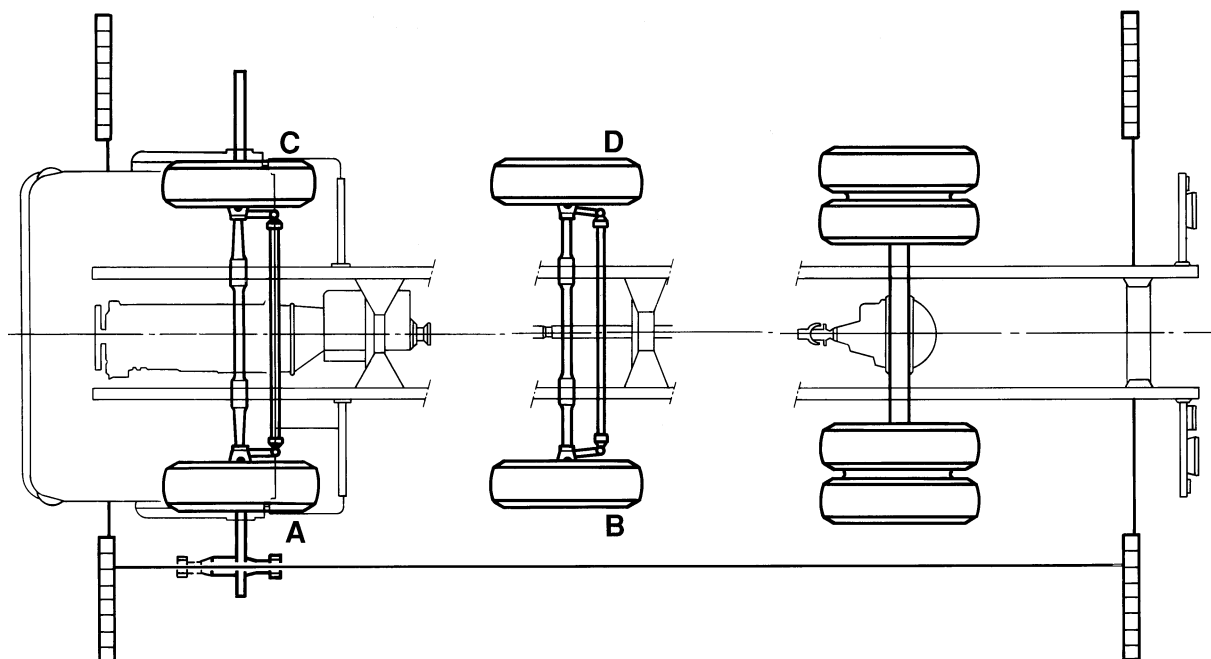
6. Fit alignment equipment to the steerable axles.
7. Calibrate the alignment equipment, if possible.
8. Consult the alignment equipment manual and follow the instructions given there.

Note:

The drawings show the alignment equipment, with a loose projector and measuring boards being hung in the chassis.

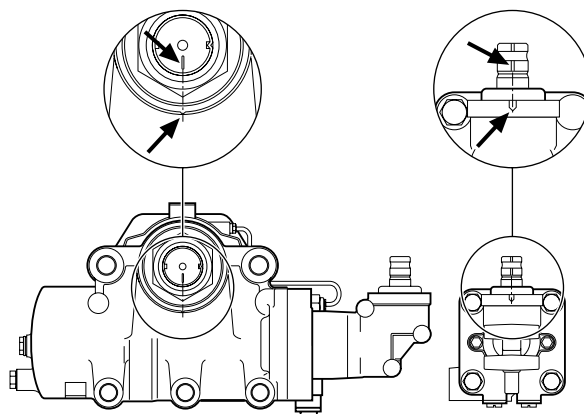


S7 00 712



S7 00 089

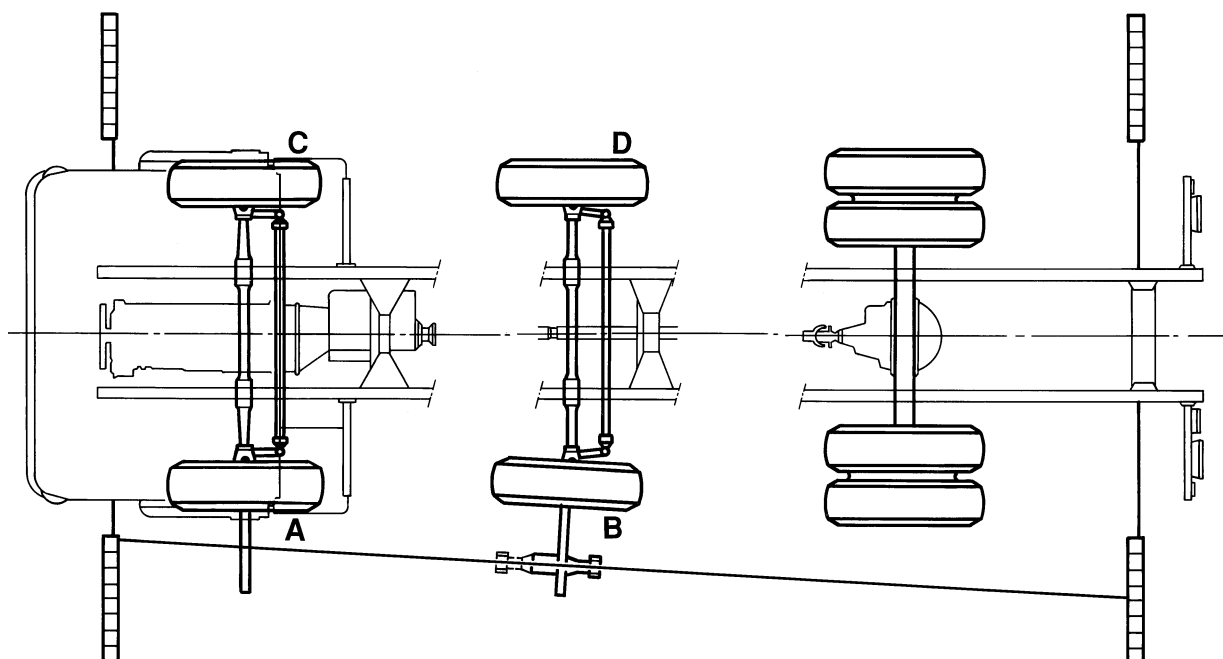
9. Place wheel A (LHD-type vehicle) or wheel C (RHD-type vehicle) in the "straight ahead" position using the alignment equipment.
10. Check whether the steering gear is in the central position using the markings on the steering box.
If the central position deviates, the steering rod from the steering box to the front axle should be adjusted before the rear steerable axle is measured.
11. Check whether the front axle wheel is still in the "straight ahead" position.
Measure the position of wheel B (LHD-type vehicle) or the position of wheel D (RHD-type vehicle)..
Correct the alignment if the position in relation to the front axle wheel is outside the tolerance (see 'Technical data').



S7 00 024

Note:

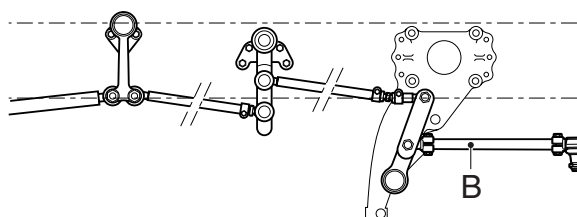
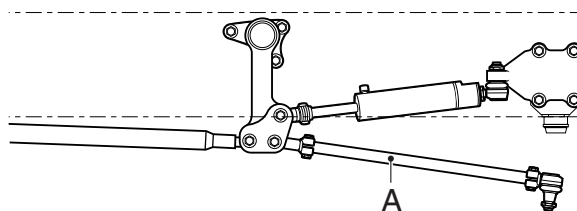
If a large deviation is measured, the cause should be traced. The deviation could, for example, have been caused by a collision, during which components were bent. If so, the remaining steering gear components should be inspected carefully.



S7 00 090

Adjusting the steerable front axles and leading rear axle alignment

1. If the position of the front axle wheel is outside the specified tolerance (see 'Technical data'), this should be corrected by lengthening or shortening the rear steering rod (A on double front axle and B on leading rear axle).
2. After adjusting the steering rod make sure that the clamping brackets of this steering rod do not come into contact with other components. Check this by turning the steering wheels carefully from one end stop to another.
3. Thoroughly clean and check the clamping bracket bolts. Corroded or damaged bolts should be replaced. Replace the self-locking nut.
4. Tighten the locking bolts of the clamping brackets to the specified tightening torque. See 'Technical data'.
5. After tightening the clamping brackets, check the wheel alignment once again.



S7 00 713

2.9 INSPECTION OF THE STEERING BALL JOINT

Inspection of the steering ball joint screw thread with a self-locking nut

1. Check the ball end thread for damage before fitting a new self-locking nut.
2. To do so, hand-tighten a new non-self-locking nut on the ball end.
3. If the new nut cannot be fully hand-screwed onto the entire thread, the ball end must be replaced.



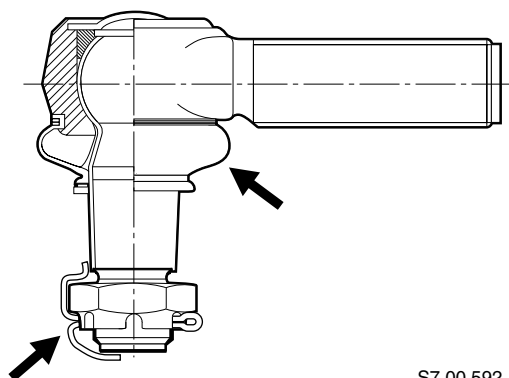
Fitting a new self-locking nut to a ball end with a damaged thread may lead to dangerous situations.

Inspection of locking with castle nut

1. If a castle nut is fitted, check that the locking devices are present and undamaged.

Inspection of dust cover

1. Check that the steering ball joint dust cover or seal is not damaged. Replace the steering ball joint if damaged.



S7 00 592

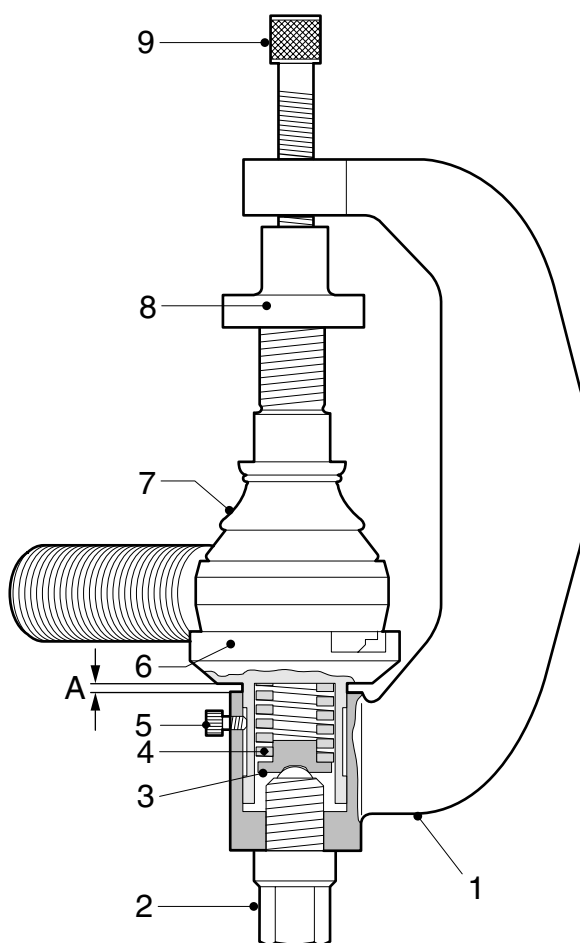
Inspection of axial steering ball joint play

1. Check the axial steering ball joint play using special tool (DAF no. 1329426).
2. First jack up the axle until the wheels come off the ground and put the axle on stands.
3. Make sure that the castle nut split pin (if fitted) at the nut does not come into contact with the head of the threaded end.
4. Screw the thrust washer (8) onto the threaded spindle.
5. Fit the spring retainer (3), spring (4) and pressure sleeve (6) into bracket (1). Fit the locking screw (5). It should be possible to move the pressure sleeve (6) freely.

Note:

Fit the correct pressure sleeve (6).
The pressure sleeve (6) must abut the outer edge of the steering ball joint (7).

6. Loosen thrust bolt (2) until the flange of the pressure sleeve (6) abuts the bracket (A=0 mm).
7. Fit the special tool over the steering ball joint (7) and turn the threaded spindle (9) by hand until the special tool is tight around the steering ball joint (7).
8. Tighten thrust bolt (2) until its head abuts bracket (1).
9. Measure play "A" between the pressure sleeve and the bracket using a feeler gauge. Compare the reading with the maximum permissible steering ball joint play, see 'Technical data'.
If necessary, replace the steering ball joint.



S700426

2.10 INSPECTION OF AXLE HOUSING

General

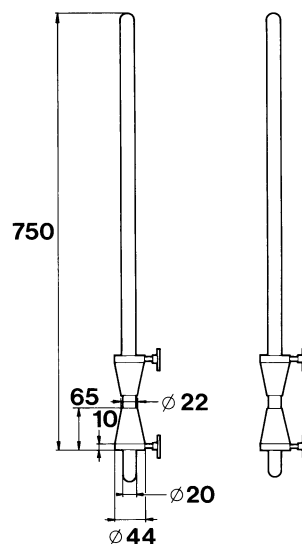
When the vehicle has been involved in a collision or when abnormal deviations are measured during the inspection of the wheel alignment, it may be wise to inspect the axle housing.

A number of the following measurements can also be carried out using alignment equipment. Consult the alignment equipment manual for this.

The special tools required cannot be obtained from DAF and should be manufactured by yourself.

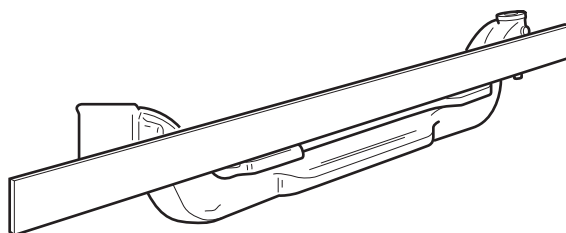
Inspection of axle housing

1. Remove the vehicle's axle and both swivel axles. See 'Removal and installation'.



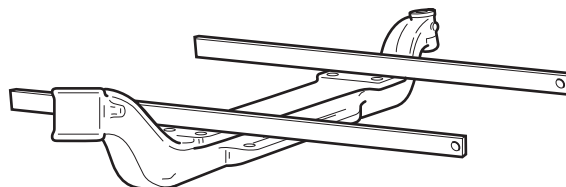
S7 00 119

2. Place a straight edge over the spring seats of the axle housing and check whether they are aligned.



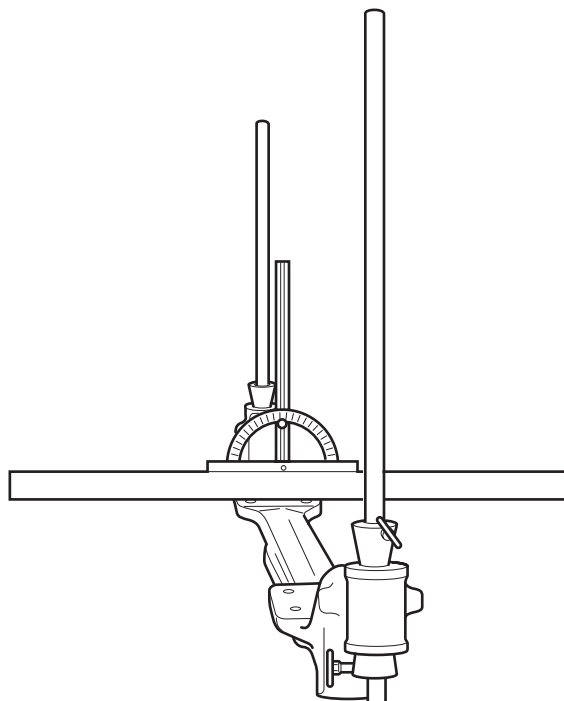
S7 00 151

3. Place a straight edge over both spring seats and check whether they are parallel with each other.



S7 00 152

4. Place the two gauge bars in the swivel axle holes.
Place a straight edge with a protractor on the spring seat. Measure the angle of the gauge bars in relation to the spring seats. The angle measured should be 90° .

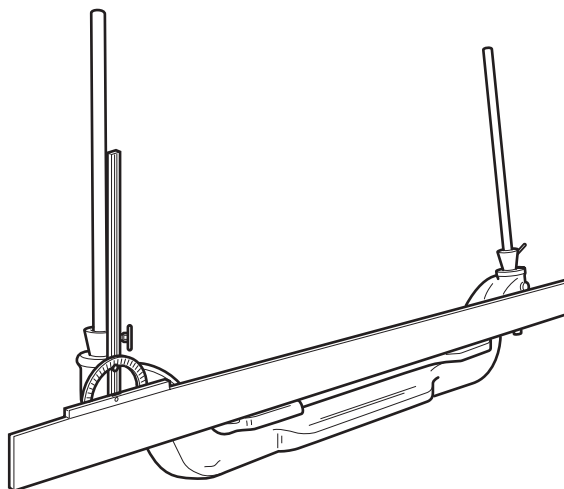


S7 00 149

5. Measure the king pin inclination (KPI) by placing a straight edge with a protractor on the spring seats.
By placing the straight edge of the ruler parallel with the gauge bar, the angle can be read.
6. If a deviation is found during one of the inspections, the axle housing should be replaced.



The axle housing should not be straightened. This could affect the material strength.



S7 00 150

2.11 INSPECTION OF WHEEL RIM

General

1. Inspect the wheel rims for the following points:
 - deformation of the wheel rims, wheel disc and/or Trilex parts. In the case of twin wheels, also inspect the inside wheel.
 - deformation or cracking of the wheel stud holes.
 - corrosion, including at the tyre side of the rim and on the rim ring.
2. Cracked or damaged wheel rims or wheel rims with cracked or deformed wheel stub holes should be replaced.

It is prohibited to weld wheel rims or repair these in some other way. After some time, the weld will crack again due to the dynamic load.

6

When removing such a damaged wheel rim from the vehicle, deflate the tyre (remove the tyre valve) in view of possible tensions in the wheel rim.

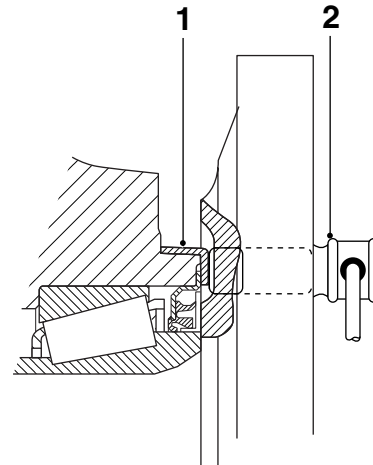
3. To prevent damage to the tyre due to corrosion and/or indirect tension cracks (due to notching), the anti-corrosion treatment of the wheel rim should stay fully intact. For the removal of corrosion and repair of the paint layer, see 'Paint treatment'. Before re-spraying, remove the old paint layer to prevent the total paint layer from becoming too thick. The total paint layer thickness should not exceed 50 microns.



At a total paint layer thickness (wash primer and finishing paint) of more than 50 microns, the pre-tension of the wheel studs might be reduced if this layer were to be crushed. This could result in the wheel nuts coming loose.

2.12 INSPECTION OF WHEEL SPEED SENSOR RING

1. Remove the wheel hub unit. See 'Removal and installation'.
2. Check the sensor ring (1) for deposits. Special attention should be paid to deposits between the sensor ring teeth. Clean the sensor ring if necessary.
3. Check the sensor ring (1) for damage. Even the tiniest damage may cause a failure. Replace the sensor ring if necessary, see chapter 'Removal and installation'.
4. If possible, the sensor ring (1) should be checked for the maximum admissible axial end play. See 'Technical data'.
5. Check the sensor (2) for freedom of movement. If the sensor cannot move freely, remove, clean and refit it. See chapter 'Removal and installation'.



S7 00 543



Never tap the sensor into the swivel axle using a hammer. This may damage both the sensor and the sensor ring.

6. Check the operation of the EBS or ABS system.

3. REMOVAL AND INSTALLATION

3.1 REMOVAL AND INSTALLATION, WHEEL



When removing a wheel with a cracked or damaged wheel rim, always deflate the tyre (remove the tyre valve) in view of possible tensions in the wheel rim.

General

- Only use the original DAF wheel rims specified for the vehicle concerned.
- Make sure that tyres of the same type are fitted on both sides of the axle.
- Insufficient cleaning of the mating surfaces and/or uneven tightening of the wheel nuts may cause vibrations during driving or braking.

Note:

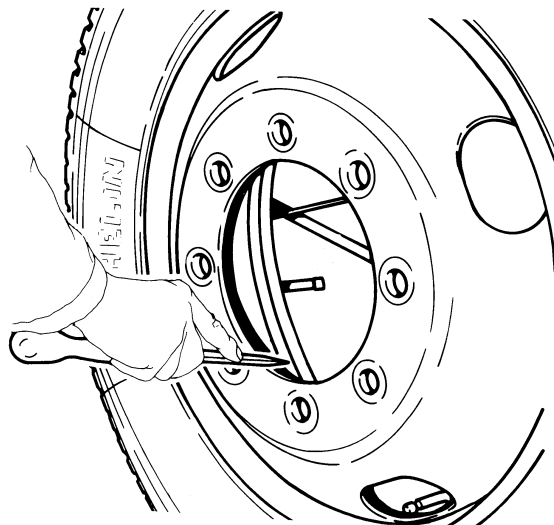
If a wheel stud is renewed, the other wheel studs on the relevant wheel must also be renewed.

Removing the wheels

1. Chock the wheels to prevent the vehicle moving off.
2. Clean the screw thread of the wheel studs using a wire brush.
3. Oil the wheel studs sparingly.
4. Unscrew the wheel nuts.
5. Fit a jack as close as possible to the wheel to be replaced.
6. Jack up the vehicle and, if possible, place a support under the axle.
7. Remove the wheel nuts and take the wheel off the hub.

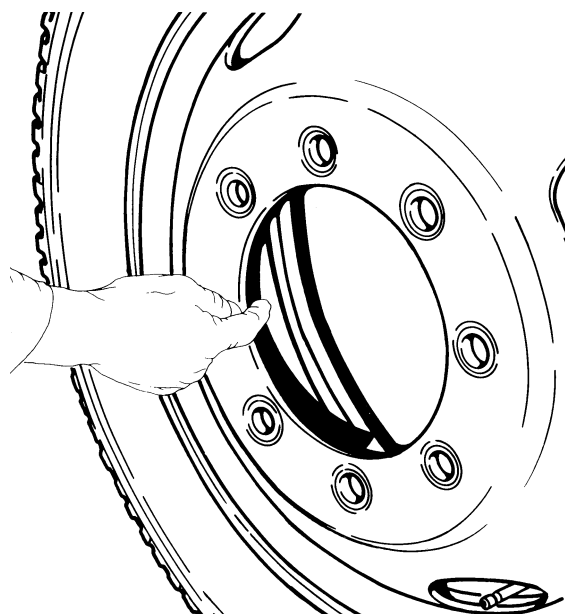
Installation of wheel

1. Clean the fitting edge of the wheel rim by scraping off dirt and corrosion with a scraper.



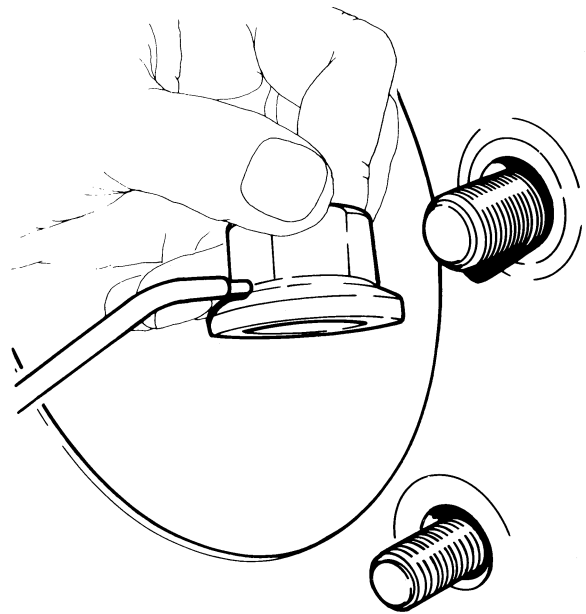
S7 00 096

2. Apply a **thin** layer of grease to the fitting edge of the wheel hub.
3. Also apply a **thin** layer of grease to the fitting edge of the wheel rim. This grease layer should prevent the wheel rim and the wheel hub from becoming "rust-bound".
4. Check whether the contact surfaces of the wheel rim and hub are clean. Clean them if necessary.



S7 00 097

5. Clean the wheel nuts and then apply a drop of oil between the thrust washer and the nut.
6. Also apply a drop of oil to the first turn of the wheel stud screw threads.



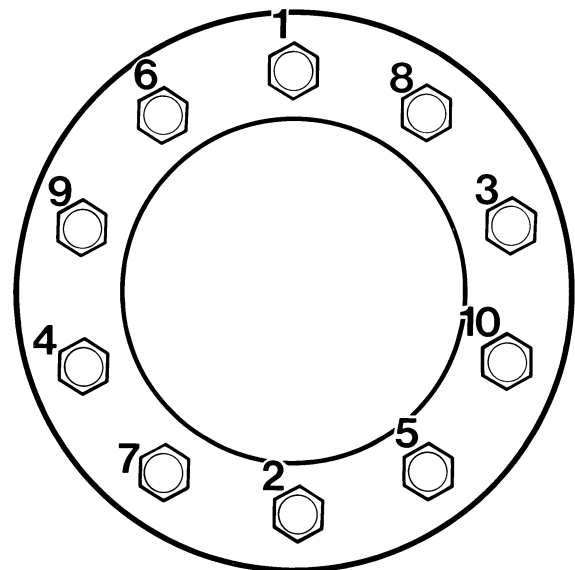
S7 00 098

7. Fit the wheel nuts and tighten them evenly according to the sequence in the illustration. A pneumatic spanner may be used for this purpose, but its tightening torque is not very reliable. It will therefore be necessary to retighten the wheel nuts to the specified tightening torque. For the prescribed tightening torque, see 'Technical data'.

Note:

Wheel nuts should always be tightened and retightened in cold condition. However, tightening wheel studs in extreme cold should be avoided.

8. Check the tyre pressure.

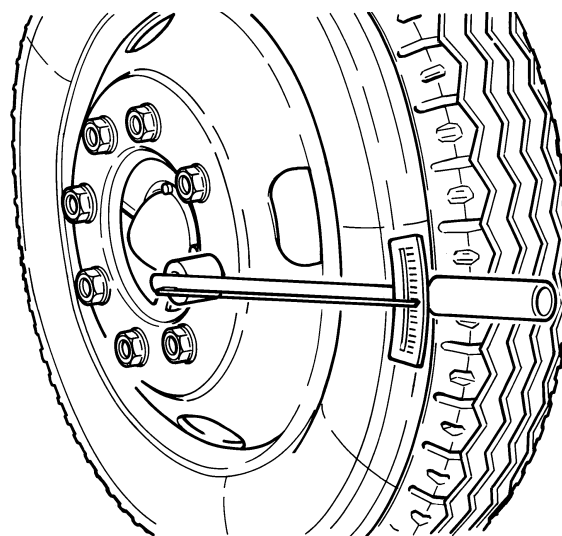


S7 00 095

9. Retorque the wheel nuts with a torque wrench after 100 km. If new wheel studs are fitted, they need additional retorquing after 500 km.

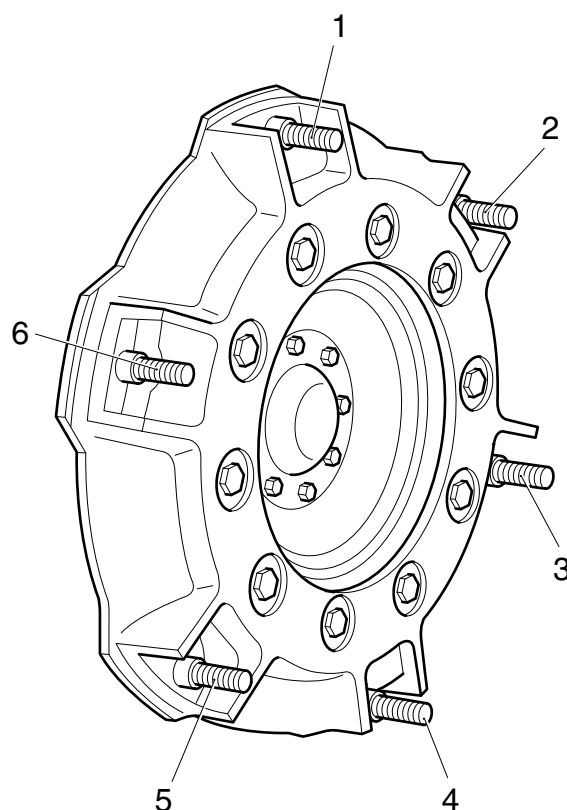
Removal and installation, Trilex wheel

1. If the vehicle is equipped with special adapter rings for the assembly of Trilex rims on the disc wheel hubs, these adapter rings should be installed on the hub in the same way as a disc wheel. This also applies to the tightening torque and the retightening.
2. The same instructions which apply to a standard wheel also apply to the removal and installation of a Trilex rim on a Trilex hub or adapter ring, except for the attachment nut tightening sequence and tightening torque.



S7 00 099

3. Tighten the nuts evenly in the sequence shown in the drawing. A pneumatic spanner may be used for this purpose, but its tightening torque is not very reliable. It will therefore be necessary to retighten the wheel nuts to the specified tightening torque using a torque wrench. For the prescribed tightening torque, see 'Technical data'.
4. Retorque the wheel nuts with a torque wrench after 100 km. If new wheel studs are fitted, the nuts need additional retorquing after 500 km.



S700571

3.2 REMOVAL AND INSTALLATION, STEERING ROD

Removing the steering rod

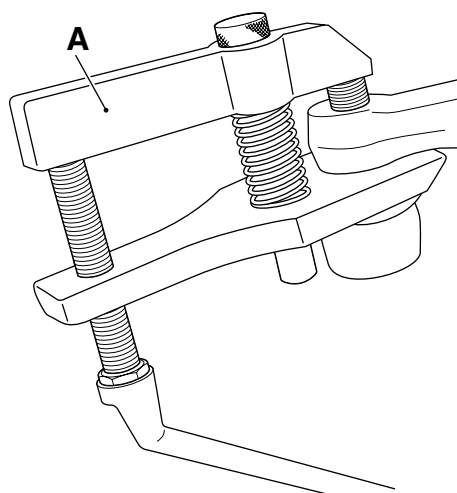
1. Remove the nuts on both sides of the steering rod.
2. Remove the ball ends from the steering rod arm and the pitman arm using a ball-end puller (A).

Installation of steering rod

1. If installing a new steering rod, copy the settings of the steering rod to be replaced.
2. Clean the tapered contact surfaces of both the steering rod balls and the steering rod arm and the pitman arm. The tapered surfaces should be absolutely free from dirt, grease and paint.
3. Check the thread of the ball end. See 'Inspection and adjustment'.

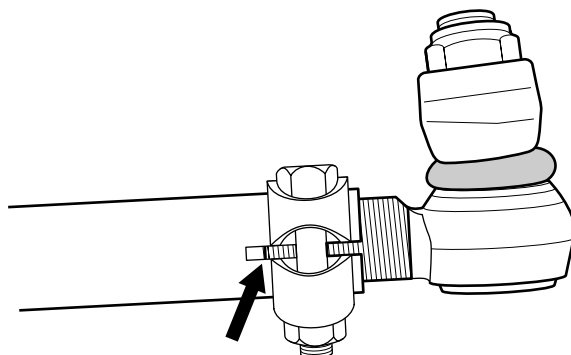


Fitting a new self-locking nut to a ball end with a damaged thread may lead to dangerous situations.



S7 00 555

4. Install the steering rod.
5. Check the steering rod setting and adjust, if necessary. See 'Inspection and adjustment'.
6. Make sure that the threaded end of the ball joint is not screwed too far from the steering rod. The clamping bracket should always fully engage the screw thread of the ball head (see drawing).
7. Check whether the bolt of the clamping bracket is tightened to the specified tightening torque. See 'Technical data'.
8. In the case of self-locking nuts, use new nuts. Apply locking compound to the nut. See 'Technical data'.
9. Tighten the nuts to the specified torque. See 'Technical data'.
10. In the case of castle nuts, use a new lock.



S7 00 539

3.3 REMOVAL AND INSTALLATION, TRACK ROD

Removing the track rod

1. Remove the wheel speed sensor and the connector bracket.

Note:

When the track rod has been removed, the swivel axle can be at such an angle that the wheel speed sensor is damaged, which can damage the wheel speed sensor ring.

2. Remove the attachment nuts. These nuts should not be re-used.
3. Remove the ball ends from the track rod arms using a ball end puller (A).

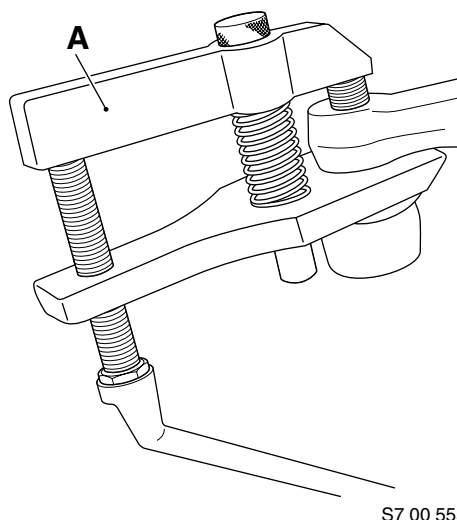
Installation of track rod

1. If installing a new track rod, copy the settings of the track rod to be replaced.
2. Check the ball end thread for damage before fitting a new self-locking nut. See 'Inspection and adjustment'.

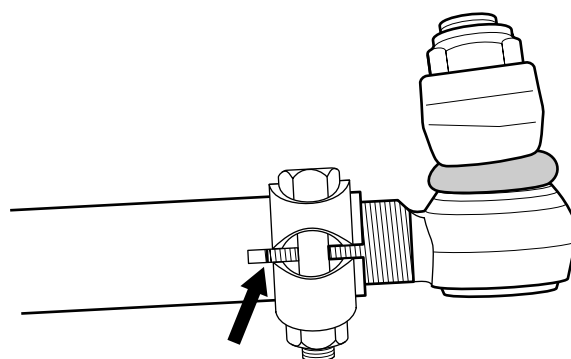


Fitting a new self-locking nut to a ball end with a damaged thread may lead to dangerous situations.

3. Clean the tapered contact surfaces of both the track rod balls and the track rod arms. The tapered surfaces should be absolutely free from dirt, grease and paint.
4. Fit the track rod.
5. Fit a new self-locking nut to the ball end. Apply locking compound to the nut. See 'Technical data'.
6. Tighten the new self-locking nuts to the specified torque. See 'Technical data'.
7. Check the axle toe and adjust, if necessary. See 'Inspection and adjustment'.
8. Check whether the threaded ends of the ball joints are fully engaged by the clamping pieces.
9. Check whether the clamping piece bolts are tightened to the specified tightening torque. See 'Technical data'.
10. Fit the wheel speed sensor and the connector bracket.



S7 00 555



S7 00 539

3.4 REMOVAL AND INSTALLATION, TRACK ROD ARM AND STEERING ROD ARM



These instructions should be followed to the letter. The attachment of the track rod arms and steering rod arm is one of the most critical factors in terms of the safety of the vehicle.

Always use new attachment bolts for the track rod and steering rod arms. Always use original attachment bolts of the prescribed length supplied by DAF.

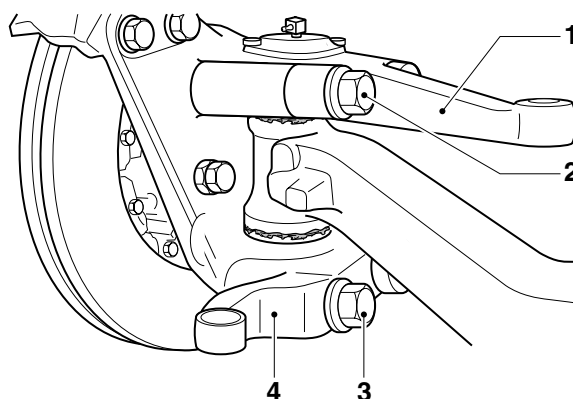
Removing the track rod and steering rod arms

1. Remove the track rod and the steering rod from the track rod and steering rod arms.
2. Remove the attachment bolts (2) and (3).

Note:

These bolts should not be re-used.

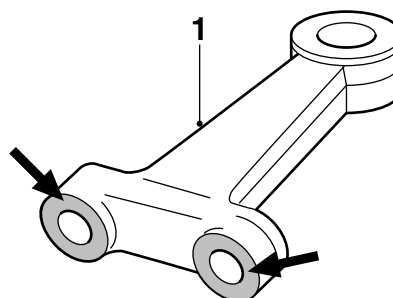
3. Remove the track rod arm (4) and the steering rod arm (1) from the swivel axle. When removing the steering rod arm a plastic mallet may be used, because locking agent has been applied between the arm and the swivel axle.



S7 00 582

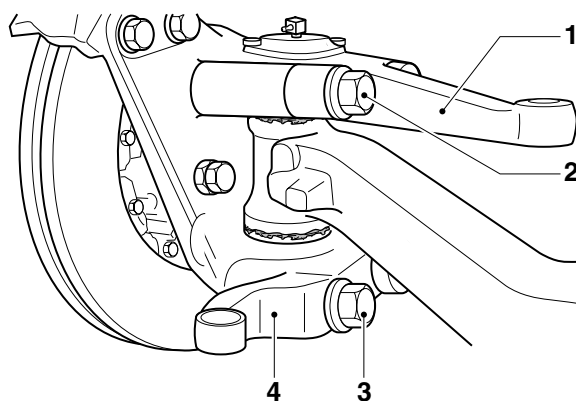
Installation of track rod arm and steering rod arm

1. Thoroughly clean and check the screw thread in the swivel axle. The screw thread should be undamaged.
2. Clean and degrease the contact surfaces of the swivel axle and the arm.
3. Apply locking agent around the steering rod arm bolt holes, see 'Technical data'.



S7 00 583

4. Always use new attachment bolts when installing the track rod arm (4) and the steering rod arm (1). Apply locking compound to the new attachment bolts. See 'Technical data'.
Tighten the attachment bolts (alternately) evenly. Tighten the attachment bolts to the specified torque. See 'Technical data'.
5. Install the track rod and the steering rod.

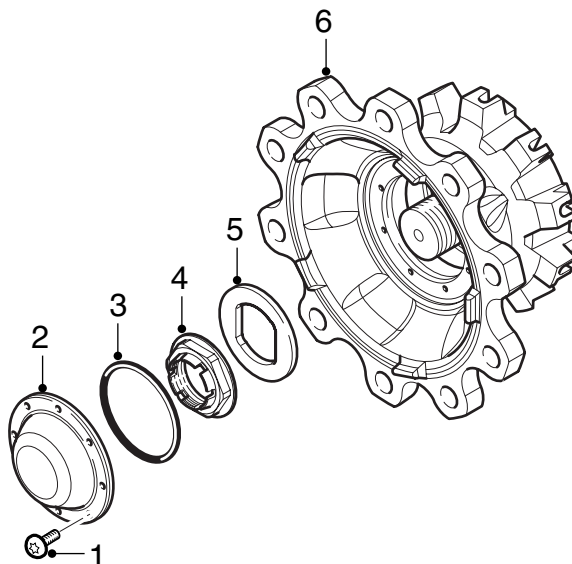


S7 00 582

3.5 REMOVAL AND INSTALLATION, WHEEL HUB UNIT

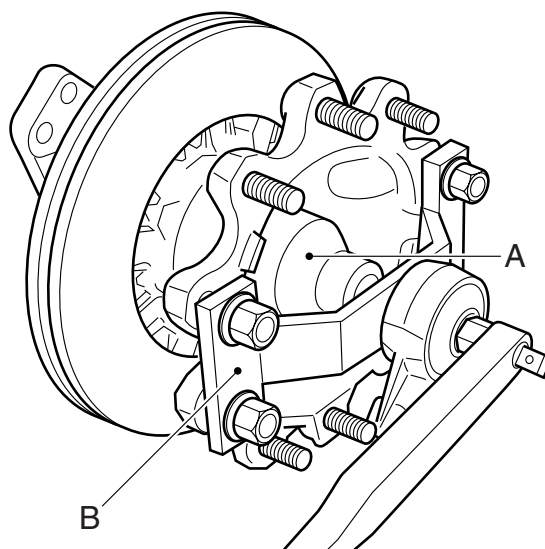
Removing the wheel hub unit

1. Jack up the axle until the wheels are clear from the floor. Place suitable supports under the axle.
2. Remove the wheel.
3. Remove the brake calliper.
4. Remove the hub cap (2).



S7 00 581

5. Remove the hub nut (4) using the special tool set (DAF no. 1329496). Fit the socket wrench (A) to the hub nut. Fit the socket wrench guide (B) to the wheel hub unit using four wheel studs. Loosen the nut using a torque amplifier.
6. Remove the thrust washer (5).



S7 00 641

7. Install the guide sleeve (A), which is part of the special tool set (DAF no. 1329496), on the axle journal.
8. Remove the wheel hub unit (6) using a lifting device. Take care that the wheel hub unit does not rest on the guide bush (A) as the latter is not strong enough to take the weight of the wheel hub unit.

Installation of wheel hub unit

1. Check the wheel hub speed sensor ring, see 'Technical data'.
2. Check the axle journal thread carefully for damage.



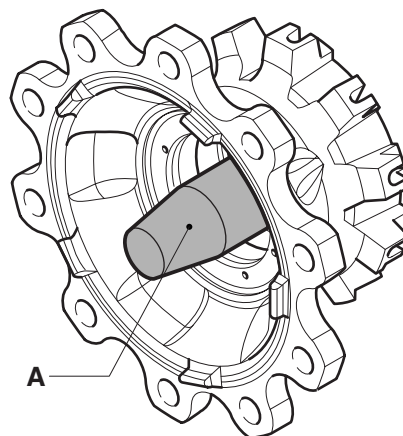
You must never fit a wheel hub unit on an axle journal with a damaged thread.

3. Apply a thin and even layer of the prescribed anti-corrosion agent to the entire circumference of the axle journal, see 'Technical data'.

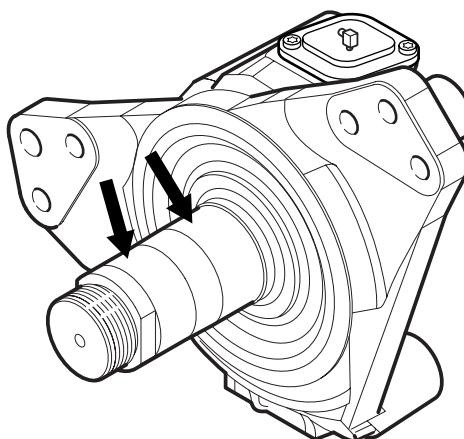
Note:

Do not apply too much anti-corrosion agent to the axle journal. While fitting the wheel hub unit, the excess anti-corrosion agent will collect at the backside of the wheel hub. When the vehicle is used in daily operation, this can leak out so that the seal wrongly appears to be leaking.

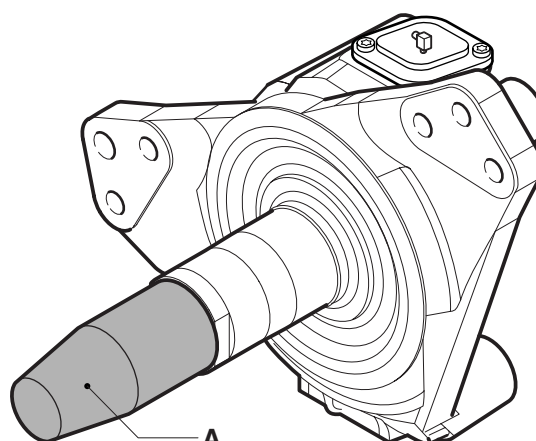
4. Install the guide sleeve (A), which is part of the special tool set (DAF no. 1329496), on the axle journal.



S7 00 580

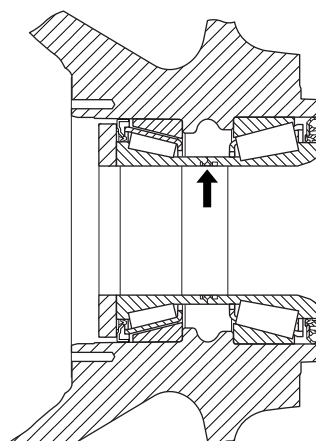


S7 00 547



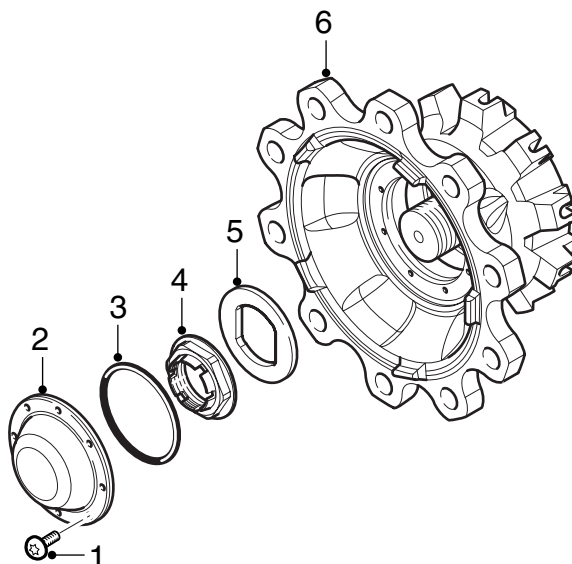
S7 00 561

5. Check that the spring clip, located between the inner bearing races, is positioned correctly.



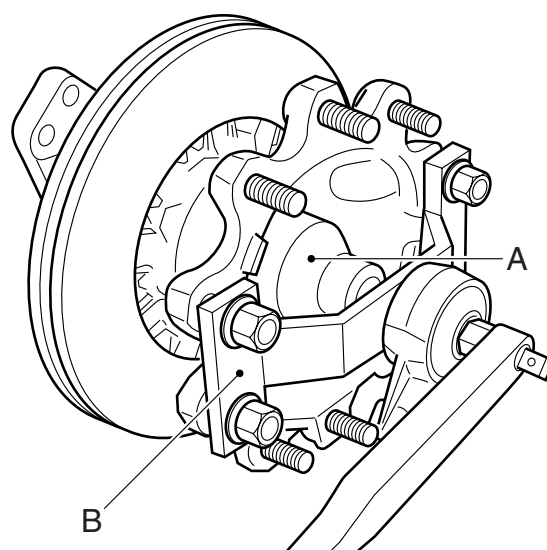
S7 00 747

6. Position the wheel hub unit (6) precisely in front of the axle journal using a lifting device. Slide the wheel hub unit (6) onto the axle journal without twisting it. Take care that the wheel hub unit does not rest on the guide bush as the latter is not strong enough to take the weight of the wheel hub unit.
7. Fit the thrust washer (5).
8. Replace the hub nut (4). Apply a few drops of oil to the abutting surface of the hub nut. Fit the hub nut.



S7 00 581

9. Fit the hub nut (4) using the special tool set (DAF no. 1329496). Fit the socket wrench (A) to the hub nut. Fit the socket wrench guide (B) to the wheel hub unit using four nuts. Tighten the hub nut (4) in the specified manner using a torque amplifier, see 'Technical data'.
10. Fit a new O-ring (3) to the hub cap (2).
11. Fit the brake calliper.
12. Fit the wheel.



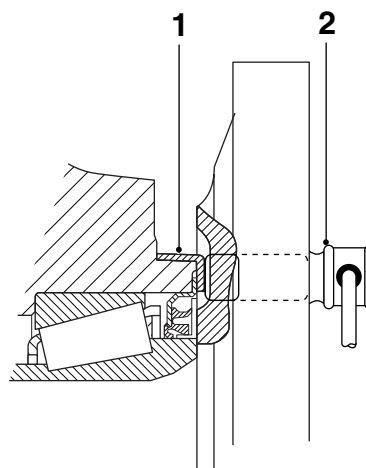
S7 00 641

13. Press the wheel speed sensor (2) against the sensor ring (1) by hand. While the vehicle is being driven, the air gap between the sensor and the sensor ring is adjusted. If the sensor has no freedom of movement, remove, clean and refit it.



Never tap the sensor with a hammer. This may damage both the sensor and the sensor ring.

14. Check the operation of the EBS or ABS system.

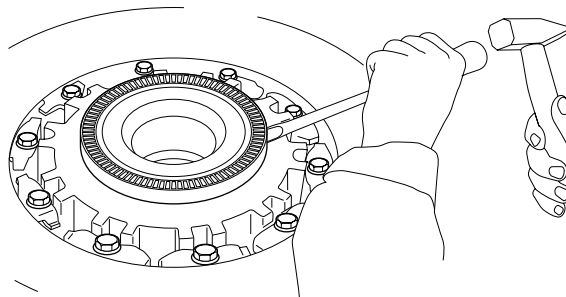


S7 00 543

3.6 REMOVAL AND INSTALLATION, WHEEL SPEED SENSOR RING

Removing the wheel speed sensor ring

1. Remove the wheel speed sensor.
2. Remove the wheel hub unit from the axle journal.
3. Make a notch in the side of the sensor ring, using a hammer and chisel. Make sure that the contact surface of the sensor ring to the wheel hub unit is not damaged in the process.
4. Remove the wheel hub unit sensor ring.



S7 00 554



Once removed, a sensor ring should not be re-installed.

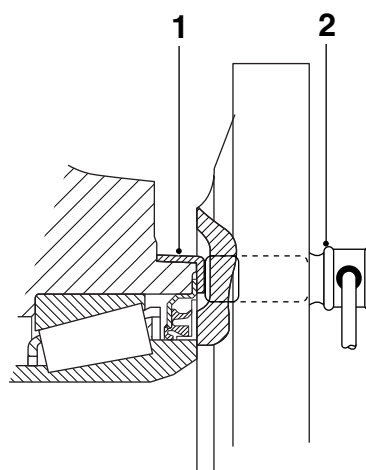
Installation of wheel speed sensor ring

1. Check the contact surface of the sensor ring to the wheel hub unit for damage.
2. Check the new sensor ring carefully for possible damage in transit.
3. Fit a new sensor ring to the wheel hub unit using a press and flat plate.
4. Check that the sensor ring makes good contact around the entire circumference.
5. Install the wheel hub unit on the axle journal.
6. Press the wheel speed sensor (2) against the sensor ring (1) by hand. While the vehicle is being driven, the air gap between the sensor and the sensor ring is adjusted. If the sensor has no freedom of movement, remove, clean and refit it.



Never tap the sensor with a hammer. This may damage both the sensor and the sensor ring.

7. Check the operation of the EBS or ABS system.



S7 00 543

3.7 REMOVAL AND INSTALLATION, WHEEL SPEED SENSOR

Removing the wheel speed sensor

1. Remove the wheel speed sensor (2).

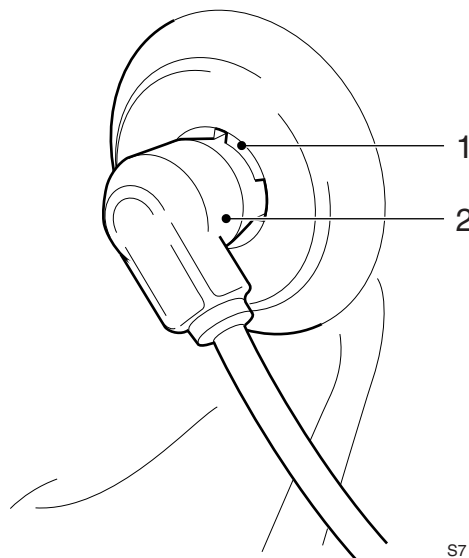
Installation of wheel speed sensor

1. Clean the wheel speed sensor (2) and its holder (1). Replace the holder if necessary.
2. Apply the specified anti-corrosion agent to the circumference of the wheel speed sensor. See 'Technical data'.
3. Fit the wheel speed sensor. Press the wheel speed sensor against the back plate manually.



**Never tap the sensor with a hammer.
This may damage both the sensor
and the sensor ring.**

4. Check the operation of the EBS or ABS system.

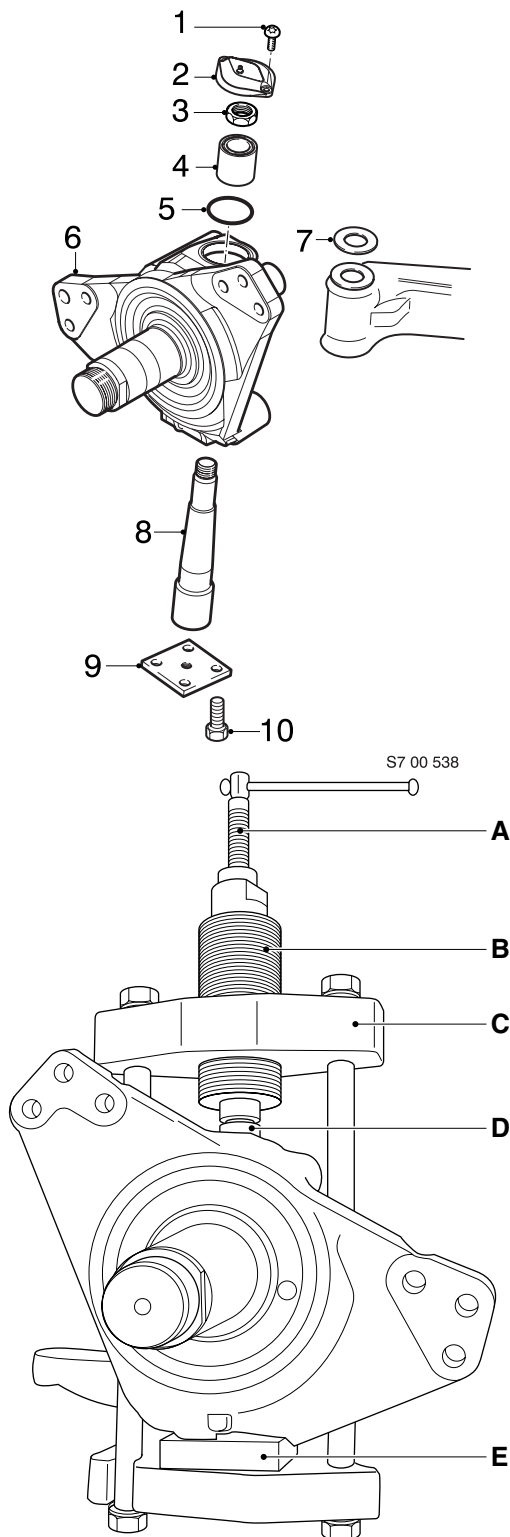


S7 00 796

3.8 REMOVAL AND INSTALLATION, FRONT AXLE SWIVEL AXLE

Removing the front axle swivel axle

1. Remove the wheel hub unit.
2. Remove the track rod and, if necessary, the swivel axle steering rod.
3. Remove the cover (2).
4. Remove the sealing plate (9).
5. Remove the nut (3).
6. Screw the hydraulic puller (B), special tool (DAF no. 0535891), into the king pin puller (C), special tool (DAF no. 0694767) for axles 150N, 152N and 156N or (DAF no. 1453127) for axles 182N and 186N.
7. Install the centring plate (E), special tool (DAF no. 0694823) for axles 150N, 152N and 156N or (DAF no. 1453134) 1453128 for axles 182N and 186N, on the bottom plate of the king pin puller.
8. Position the appropriate pivot (D) for the axle type, special tool (DAF no. 0694919) for 150N, 152N and 156N or (DAF no. 0694920) for the 182N and 186N axles to the king pin.
9. Fit the king pin puller to the king pin.
10. Align the king pin puller at the top of the pivot (D). At the bottom, the centring pins of the centring plate (E) should fall into the swivel axle bolt holes.
11. Screw out the spindle (A) of the hydraulic puller (B) as far as possible.
12. Use a spanner to screw the hydraulic puller (B) into the king pin puller (C) as far as possible.

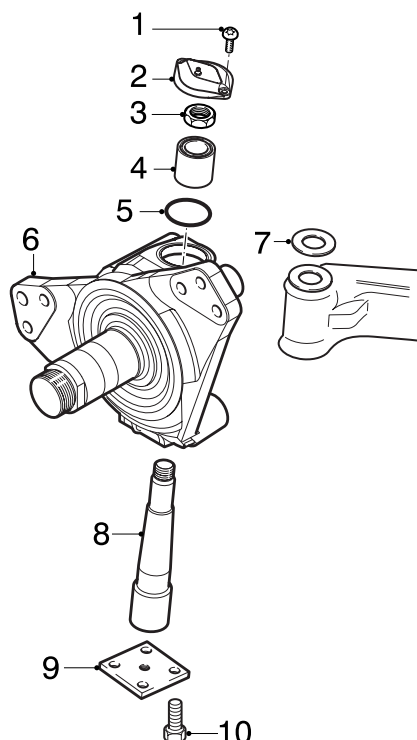


13. Screw the spindle (A) in until the king pin (8) is released. If the king pin (8) is not released after the spindle (A) is fully screwed in, the spindle (A) should be fully unscrewed and the hydraulic puller (B) screwed in further into the king pin puller (C). Then screw the spindle (A) back in.

Note:

If the king pin (8) is not released, it may be "knocked out". Tap with a hammer on the axle end stop which is not used.

14. Remove the king pin (8) from the swivel axle (6). Make sure that no needles fall from the needle bearings.
15. Remove the bearing bush (4) from the swivel axle. Make sure that no needles fall from the needle bearings.
16. Remove the swivel axle (6) from the axle end. Ensure that the adjusting ring (7) does not get lost.

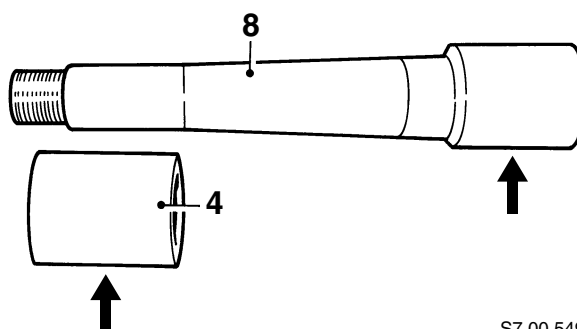


S7 00 538

Installation of front axle swivel axle

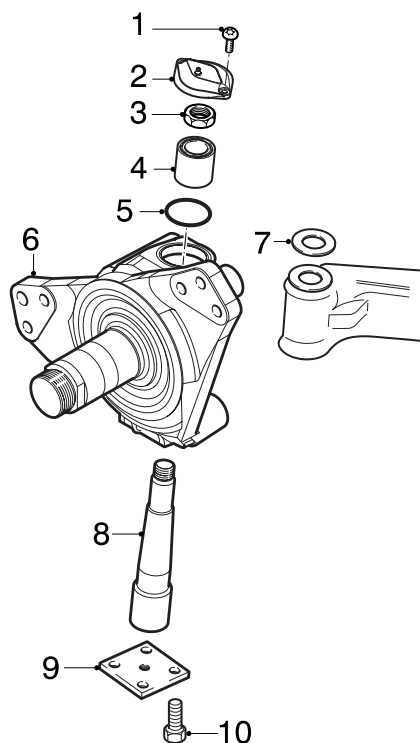
After a collision or when the camber angle is incorrect, the swivel axle should be magnaflux tested. If in doubt, always replace the swivel axle.

1. Check the condition of the needle bearings.
2. Check the bearing surfaces of the king pin (8) and the bearing bush (4) for grooves (see the arrows). A small needle puncture may be polished away using fine polishing paper. If in doubt, always replace the king pin (8) and the bearing bush (4).
3. Check the thrust bearing for wear.
4. Check the adjusting ring (7) for damage. If required, replace the adjusting ring (7).
5. Check the contact surfaces of the swivel axle adjusting ring (7) and the axle end for damage.
6. Fit the swivel axle (6) with a adjusting ring (7) of the same thickness as the original to the axle end.

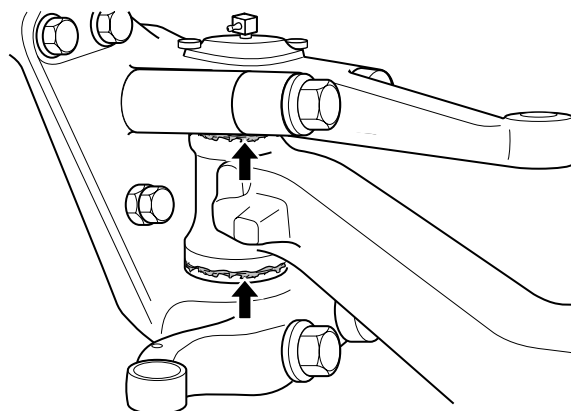


S7 00 549

7. Centre the adjusting ring (7) with a driver, ensuring that the needles are not pushed out of the bearings in the process.
8. Fit the bearing bush (4) with the tapered side pointing up in the needle bearings.
9. Remove grease from the tapered part of the king pin (8). Fit the king pin (8) in the swivel axle. Fit the nut (3) and secure it.
10. Check the axial play of the swivel axle; see 'Inspection and adjustment'.
11. Remove the nut (3). Apply locking compound to the screw thread of the king pin. See 'Technical data'. Fit the nut (3) and tighten the nut (3) specified torque. See 'Technical data'.
12. Install the O-ring (5).
13. Fit the cover (2).
14. Apply seal to the sealing plate (9). Fit the sealing plate.
15. Grease the swivel axle at the top and bottom. Check whether the grease has penetrated from the top between the axle end and the swivel axle. At the thrust bearing, the grease should be pressed out along the entire circumference between the oil seal and the thrust bearing (see arrows in drawing).
16. Check that the swivel axle operates smoothly and is not getting stuck anywhere.
17. Install the track rod and, if necessary, the steering rod.
18. Fit the wheel hub unit.



S7 00 538

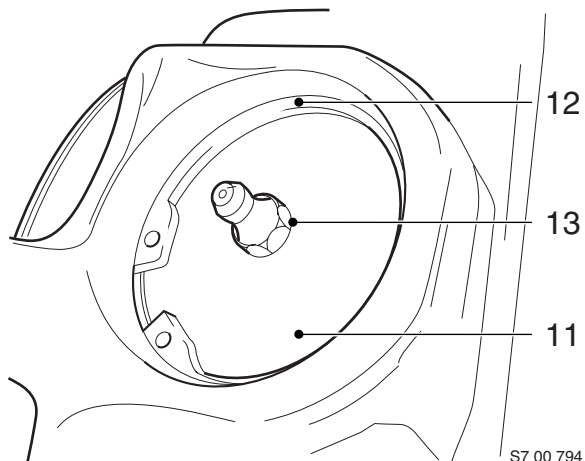


S7 00 545

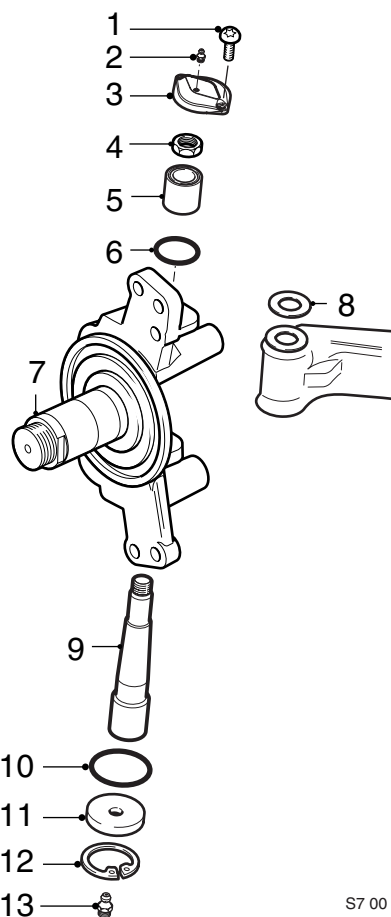
3.9 REMOVAL AND INSTALLATION, LEADING REAR AXLE SWIVEL AXLE

Removing the leading rear axle swivel axle

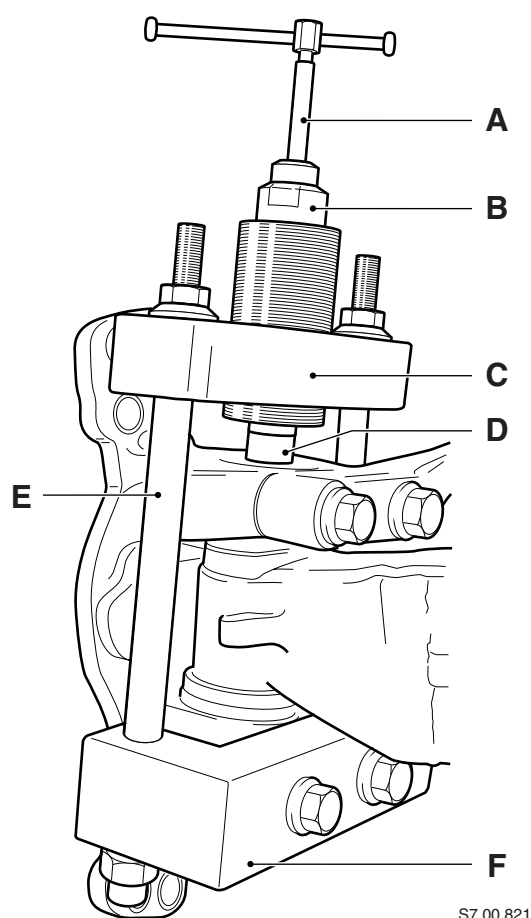
1. Remove the wheel hub unit.
2. Remove the track rod arm and, if necessary, the swivel axle steering rod.
3. Remove the circlip (12) from the swivel axle.
4. Remove the lubricating nipple (13) from the cover (11).
5. Turn an M8 x 1 bolt in the lubricating nipple hole. Remove the cover (11) using the bolt.



6. Remove the cover (3).
7. Remove the nut (4).

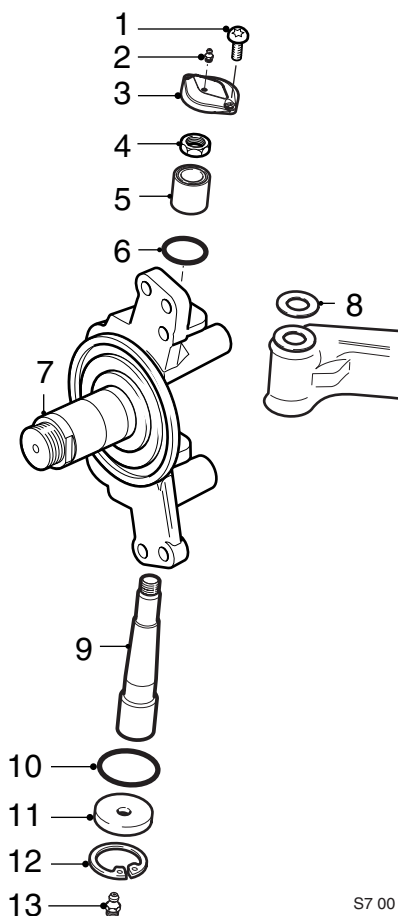


8. Using the track rod attachment bolts, fit the attachment block (F), special tool (DAF no. 1453150), at the location of the track rod arm. Tighten the attachment bolts securely.
 9. Screw the hydraulic puller (B), special tool (DAF no. 0535891), into the king pin puller (C), special tool (DAF no. 1453127).
 10. Fit the tie rods (E) (DAF no. 1453150) into the attachment block (F).
 11. Place the pivot (D), special tool (DAF no. 0694919) on the king pin.
 12. Fit the king pin puller to the king pin. Align the king pin puller at the top of the pivot (D). Tighten the nuts at the top of the tie rods (E).
 13. Screw out the spindle (A) of the hydraulic puller (B) as far as possible.
 14. Use a spanner to screw the hydraulic puller (B) into the king pin puller (C) as far as possible.
 15. Screw the spindle (A) in until the king pin is released. If the king pin is not released after the spindle (A) is fully screwed in, the spindle (A) should be fully unscrewed and the hydraulic puller (B) screwed in further into the king pin puller (C). Then screw the spindle (A) back in.
- Note:**
If the king pin is not released, it may be "knocked out". Tap with a hammer on the axle end stop which is not used.
16. Remove the king pin puller from the swivel axle.
 17. Remove the special tool (F) from the swivel axle.



S7 00 821

18. Remove the king pin (9) from the swivel axle (7). Make sure that no needles fall out of the needle bearings.
19. Remove the bearing bush (5) from the swivel axle. Make sure that no needles fall out of the needle bearings.
20. Remove the swivel axle (7) from the axle end. Ensure that the adjusting ring (8) does not get lost.

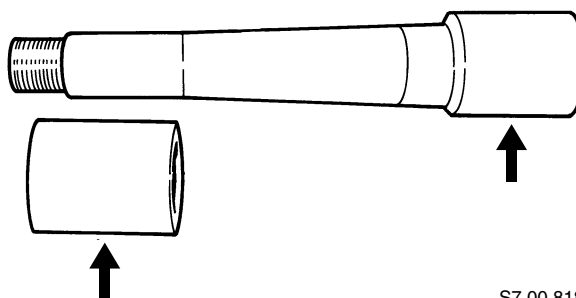


S7 00 791

Installation of front axle swivel axle

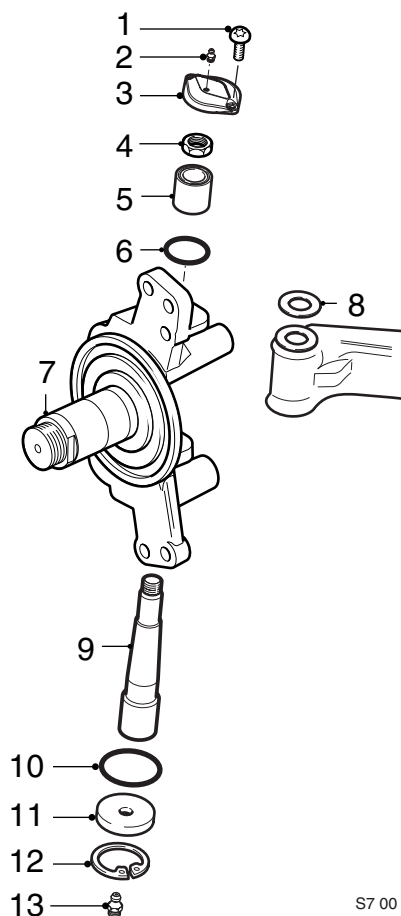
After a collision or when the camber angle is incorrect, the swivel axle should be magnaflux tested. If in doubt, always replace the swivel axle.

1. Check the condition of the needle bearings.
2. Check the bearing surfaces of the king pin (9) and the bearing bush (5) for grooves (see the arrows). A small needle puncture may be polished away using fine polishing paper. If in doubt, always replace the king pin (9) and the bearing bush (5).
3. Check the thrust bearing for wear.

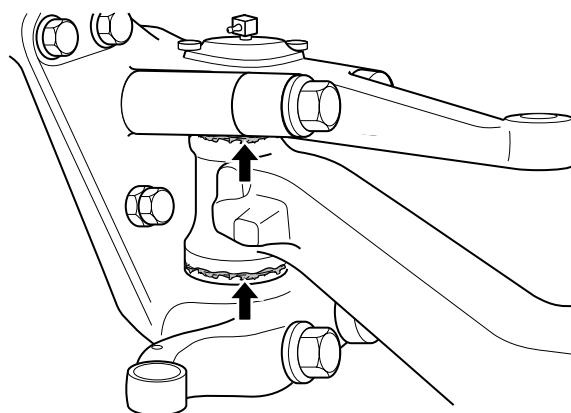


S7 00 818

4. Check the adjusting ring (8) for damage. If required, replace the adjusting ring (8).
5. Check the contact surfaces of the swivel axle adjusting ring (8) and the axle end for damage.
6. Fit the swivel axle (7) with an adjusting ring (8) of the same thickness as the original to the axle end.
7. Centre the adjusting ring (8) with a driver, ensuring that the needles are not pushed out of the bearings in the process.
8. Fit the bearing bush (5) with the tapered side pointing up in the needle bearings.
9. Remove grease from the tapered part of the king pin (9). Fit the king pin (9) in the swivel axle. Fit the nut (4) and secure it.
10. Check the axial play of the swivel axle; see 'Inspection and adjustment'.
11. Remove the nut (4). Apply locking compound to the screw thread of the king pin (9). See 'Technical data'. Fit the nut (4) and tighten the nut (4) specified torque. See 'Technical data'.
12. Install the O-ring (6).
13. Fit the cover (3).
14. Fit a new O-ring (10) to the cover (11).
15. Install the circlip (12).
16. Install the lubricating nipple (13).
17. Grease the swivel axle at the top and bottom. Check whether the grease has penetrated from the top between the axle end and the swivel axle. At the thrust bearing, the grease should be pressed out along the entire circumference between the sealing ring and the thrust bearing (see arrows in drawing).
18. Check that the swivel axle operates smoothly and is not getting stuck anywhere.
19. Install the track rod arm and the track rod.
20. If applicable, fit the steering rod.
21. Fit the wheel hub unit.



S7 00 791

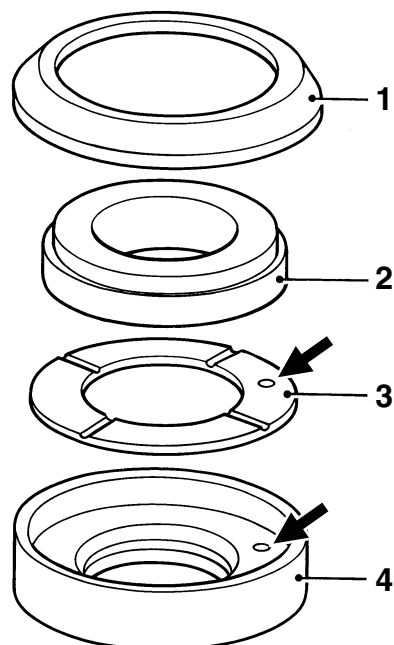


S7 00 545

3.10 REMOVAL AND INSTALLATION, THRUST BEARING, SPLIT VERSION

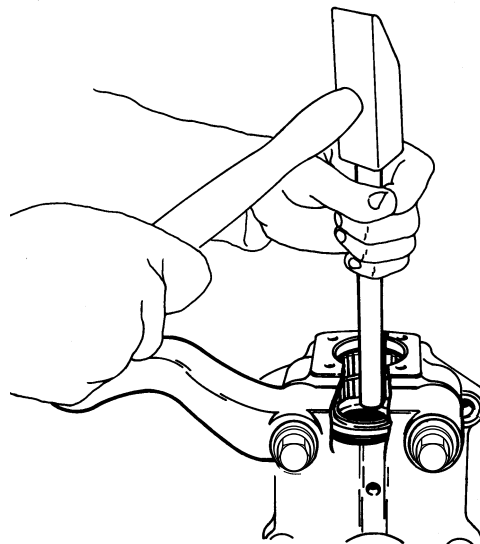
Removing the thrust bearing, split version

1. Remove the swivel axle from the axle end.
2. Remove the thrust washer (2) with the clamped-on sealing ring (1) and the bearing ring (3) from the shoulder ring (4).



S7 00 114

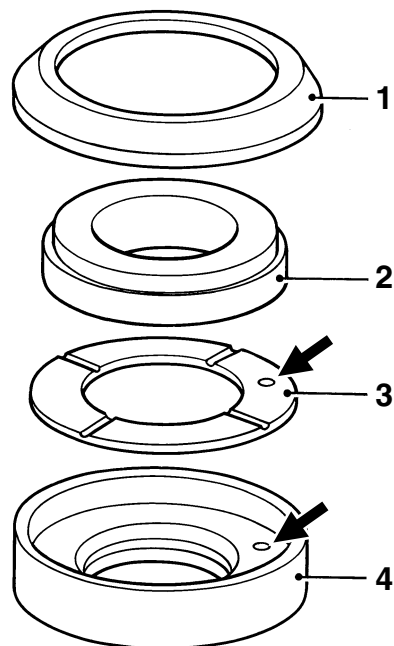
3. Tap the shoulder ring (4) out of the swivel axle using a driver. Make sure that no needles fall out of the needle bearings.



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Installation of thrust bearing, split version

1. Fit the shoulder ring (4) in the swivel axle using a press or a plastic mallet. Make sure that no needles fall out of the needle bearings.
2. Check that the shoulder ring (4) makes contact with the swivel axle in all places.
3. Fit the bearing ring (3) into the shoulder ring (4) without greasing it. Make sure that the bearing ring lug falls into the hole of the shoulder ring.
4. Fit the thrust washer (2) without the sealing ring (1) to the bearing ring (3).
5. Install the swivel axle (10) on the axle end and adjust the axial play using the correct shim. See 'Inspection and adjustment'.
6. After determining the correct shim (9), remove the swivel axle from the axle end.
7. Disassemble the thrust bearing and apply plenty of grease to the top side of bearing ring (3) (ribbed side with lubricating grooves).
8. Fit a new sealing ring (1) to the thrust washer (2). Make sure that the top of the seal (1) is positioned under the top of the thrust washer (2).
9. Place the thrust washer (2) on the bearing ring (3).
10. Fit the swivel axle with the correct shim on the axle end.

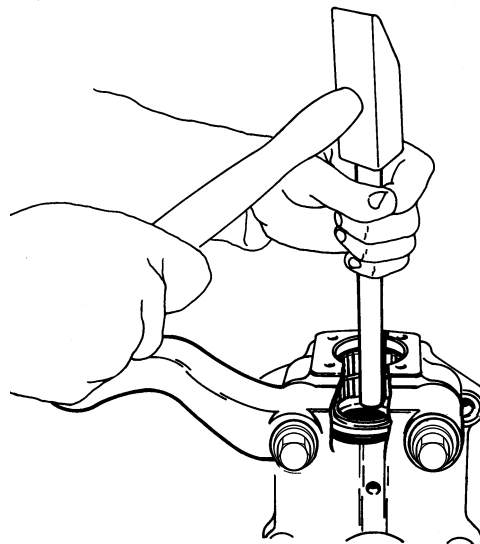


S7 00 114

3.11 REMOVAL AND INSTALLATION, THRUST BEARING, ASSEMBLED VERSION

Removing the thrust bearing, assembled version

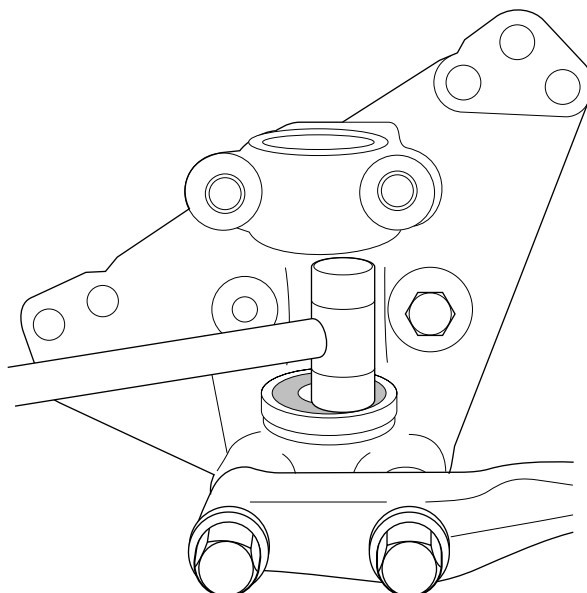
1. Remove the swivel axle from the axle end.
2. Tap the entire thrust bearing out of the swivel axle using a driver. Make sure that no needles fall from the needle bearings.



S7 00 551

Installing the thrust bearing, assembled version

1. Fit the thrust bearing in the swivel axle using a press or a plastic mallet. Make sure that no needles fall from the needle bearings.
2. Check that the thrust bearing makes contact in all places with the swivel axle.
3. Fit the swivel axle to the axle end.

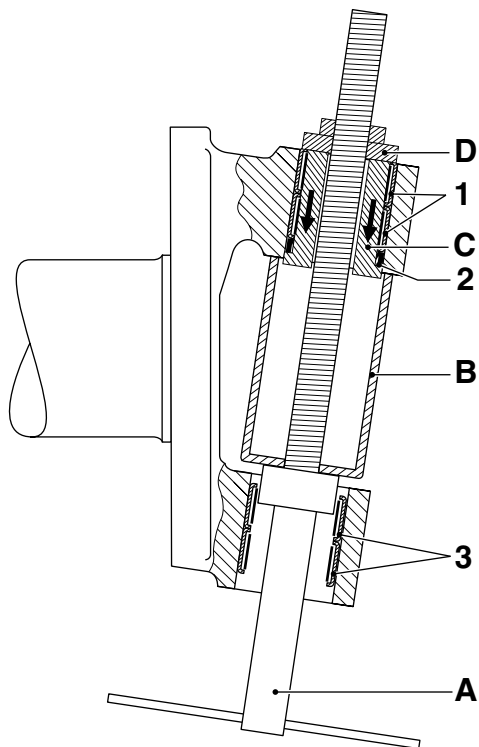


S7 00 553

3.12 REMOVAL AND INSTALLATION, NEEDLE BEARINGS

Removing the needle bearings

1. Remove the swivel axle from the axle end.
2. Remove the thrust bearing
3. Use the needle bearing puller, special tool (DAF no. 0694827), to remove the needle bearings.
For 182N and 186N axles the additional set, special tool (DAF no. 0694937), should be fitted to the needle bearing puller. The additional set consists of a bush (C) and a thrust piece (D).
4. Insert the bush (C) in the needle bearings (1).
5. Place the sleeve (B) on the swivel axle ear.
6. Fit the threaded end (A) into the sleeve (B) and through bush (C).
7. Screw the thrust piece (D) on the threaded spindle, until it abuts bush C.
8. Pull the needle bearings from the outside to the inside of the swivel axle (see the arrows in the drawing). When the needle bearings (1) are removed from the swivel axle, the oil seal (2) will also be removed.
9. The lowest needle bearings (3) are removed from the swivel axle in the same way (from the outside to the inside).



S7 00 550

Installation of needle bearings

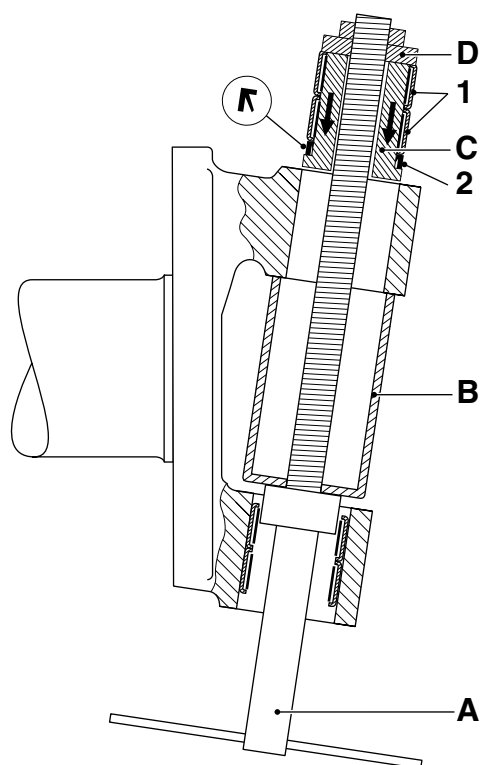
1. To prevent the needle bearings from becoming damaged while being inserted, use special tool (DAF no. 0694827).
For the 182N and 186N axles, the special tool must be supplemented with special tool (DAF no. 0694937).

Note:

The needle bearings have different lengths. The longest needle bearings must be fitted in the lowest part of the swivel axle.

2. Apply plenty of grease to the needle bearings.

3. To fit the needle bearings in the upper side of the swivel axle, work in the following manner:
Fit the oil seal (2) with the open side next to the bush collar pointing towards the bush (C).
Fit both needle bearings (1) to the bush (C).
4. Assemble the special tool (DAF no. 0694827). Press the needle bearings from the outside to the inside into the swivel axle, in view of the bevelled sides of the swivel axle.



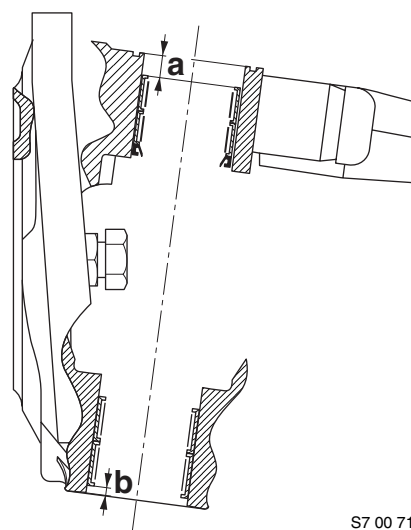
S7 00 548

5. Press the needle bearings into the swivel axle to the specified depth (a), see 'Technical data'.

Note:

The marked lines on the thrust piece (D) are not applicable.

6. The lowest needle bearings are fitted to the swivel axle in the same way (from the outside to the inside).
7. Press the needle bearings into the swivel axle to the specified depth (b), see 'Technical data'.
8. Fit the thrust bearing.
9. Fit the swivel axle to the axle end.

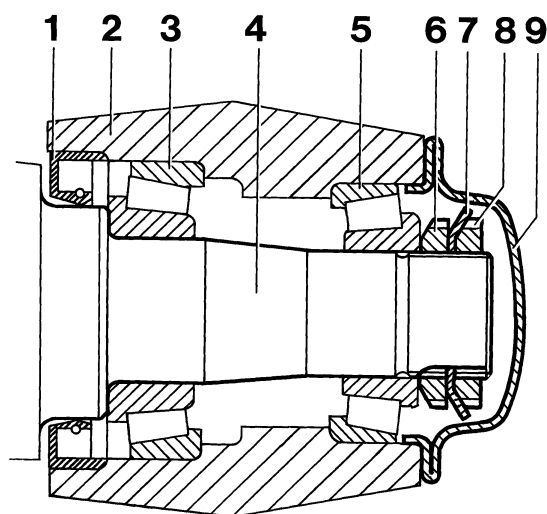


S7 00 710

3.13 REMOVAL AND INSTALLATION, IDLER ARM



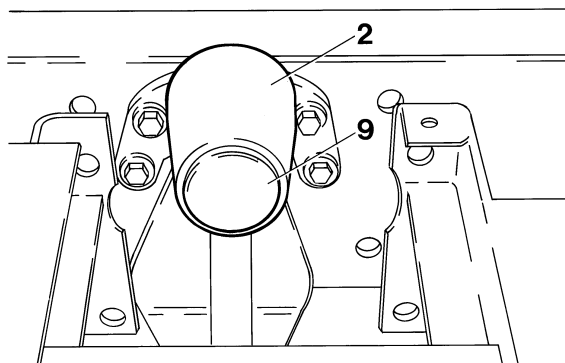
If the idler arm has been subjected to extremely high loads (e.g. an accident), the idler arm and its support should be magnaflux tested. If it is not possible to magnaflux test these components, they should be replaced.



S7 00 067

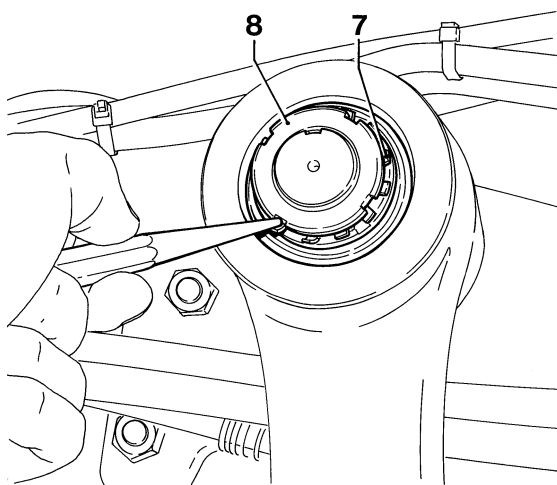
Removing the idler arm

1. Remove all components which are in the way when removing the idler arm.
2. Remove the steering rod balls from the idler arm (2) using a ball end puller.
3. Remove the cover (9) clamped in the idler arm (2).



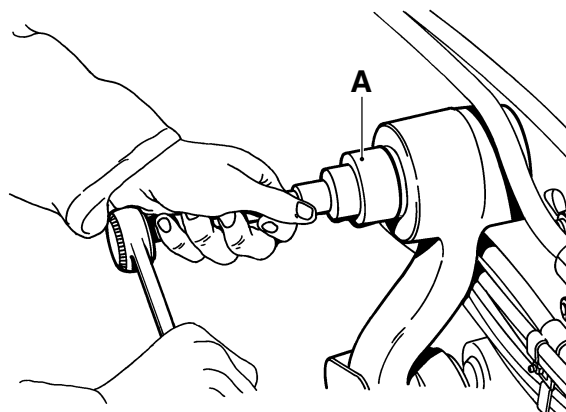
S7 00 068

4. Tap the lip of the circlip (7) from the lock nut (8) using a punch.



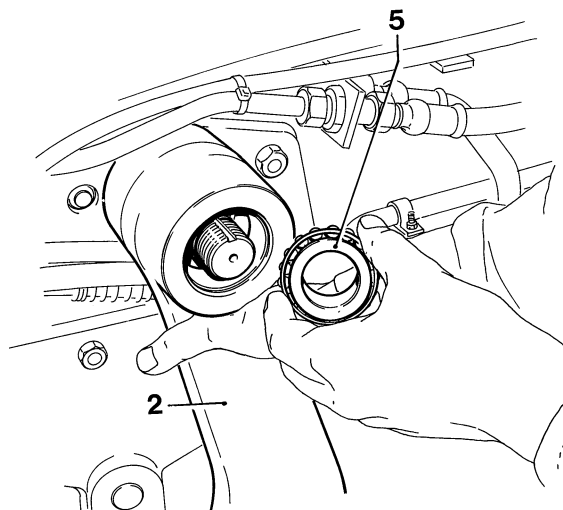
S7 00 069

5. Loosen the lock nut (8) using spanner (A), special tool (DAF no. 0694821).
6. Remove the lock nut (8) and the circlip (7).
7. Loosen the adjusting nut (6) using the spanner, special tool (DAF no. 0694821) and remove the nut.



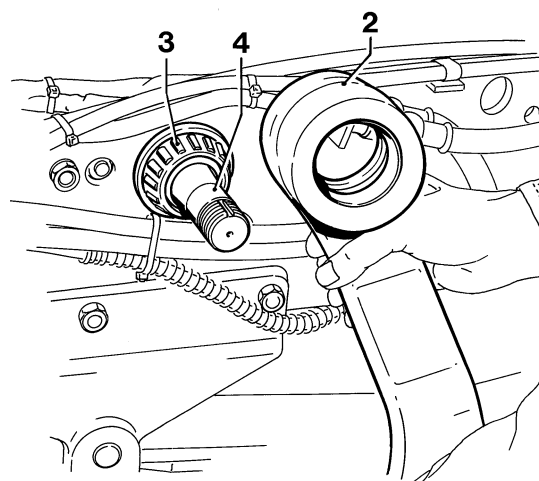
S7 00 070

8. Remove the outer bearing (5) from the idler arm (2).



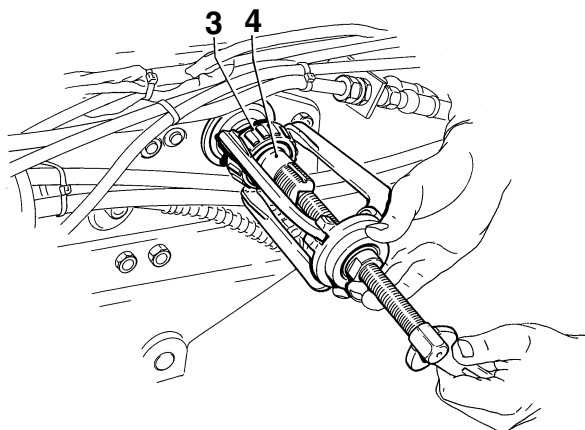
S7 00 071

9. Remove the idler arm (2) from the axle (4). If necessary, use a puller to do so.



S7 00 072

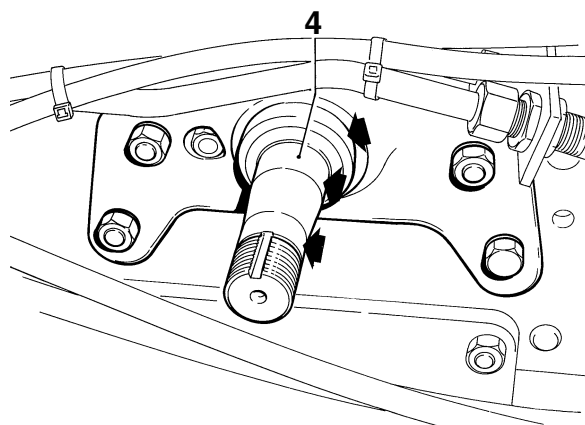
10. Remove the inner bearing (3) from the axle (4) using a puller.



S7 00 073

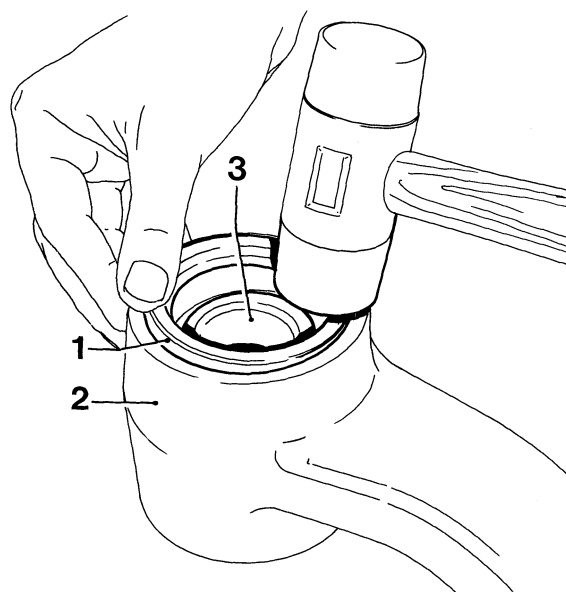
Installation of idler arm

1. Before installation, check the running surface of the seal (1) and the bearing surfaces of the bearings (3) and (5) on the axle (4). If damaged, the support should be replaced.
2. If required, replace the bearings.



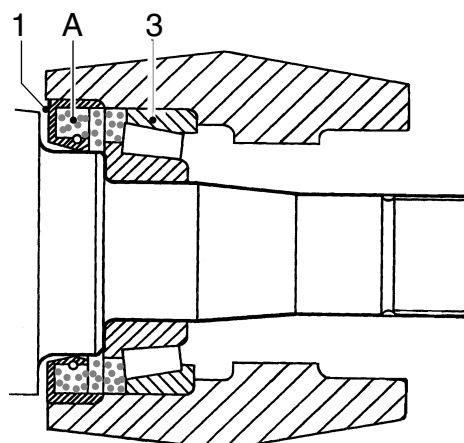
S7 00 074

3. Apply grease to the inner bearing (3) and fit the bearing into the idler arm (2).
4. Install the new lubricant seal (1) using a plastic mallet.



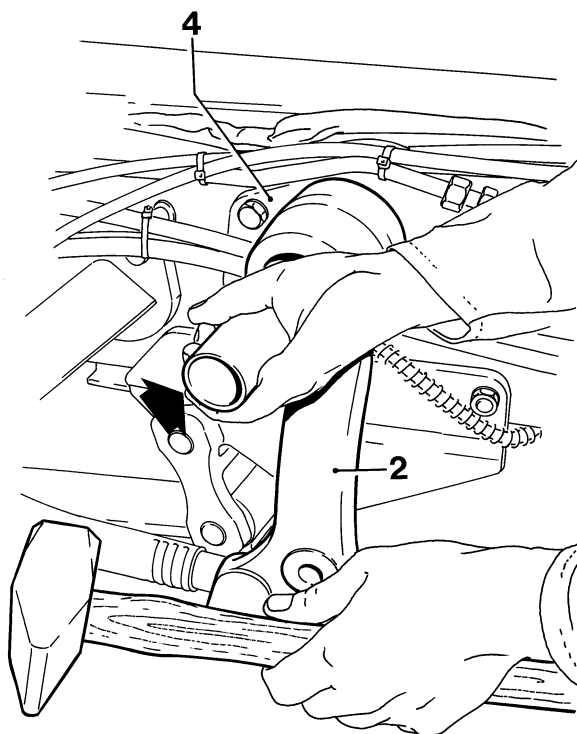
S7 00 075

5. Fill space (A) between the lubricant seal (1) and the bearing (3) fully with grease.



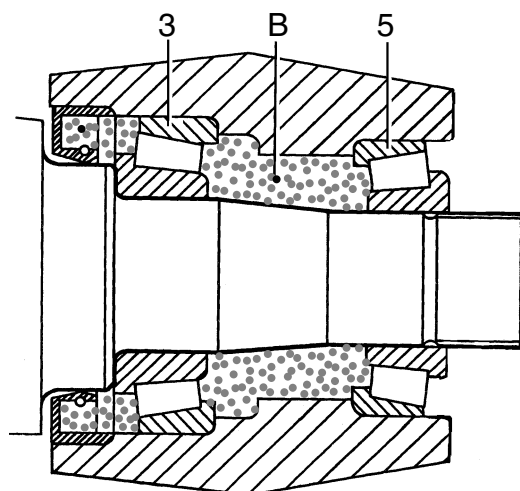
S7 00 412

6. Install the idler arm (2), fitted with the lubricant seal (1) and the inner bearing (3), on the bearing support (4). Tap the inner bearing (3) on to the bearing support (4) using an appropriate driving tool (see arrow).



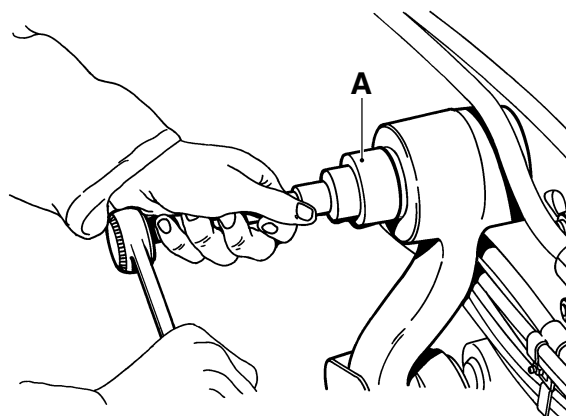
S7 00 076

7. Fill space (B) between the bearing (3) and the bearing (5) fully with grease.



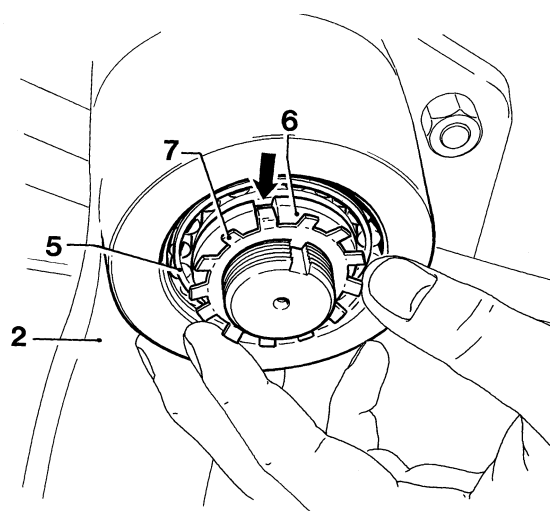
S7 00 413

8. Apply grease to the outer bearing (5) and fit the bearing into the idler arm (2). Fit the adjusting nut (6) with the tapered side pointing to the bearing. Use a socket wrench (A) for this, special tool (DAF no. 0694821). Adjust the bearing play using the adjusting nut (6). See 'Technical data'.



S7 00 070

9. Fit a new lock plate (7) and tap the lip into the recess of the adjusting nut (6) (see the arrow). If the lip is not positioned over the recess of the adjusting nut (6), the circlip (7) can be turned.
10. Fit the lock nut (8) with the tapered side pointing to the circlip. To do this, use the special tool (DAF no. 0694821). Tighten the lock nut to the specified torque. See 'Technical data'.



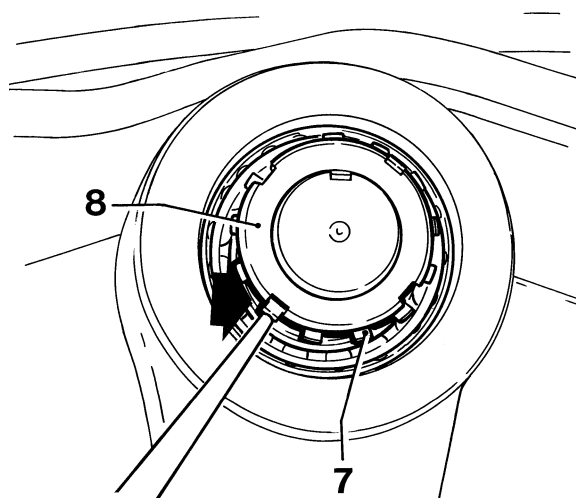
S7 00 077

11. Secure the lock nut (8) by tapping the lip of the oil seal (7) into a recess of the lock nut. If the lip is not positioned over the recess of the adjusting nut, the adjusting nut should be tightened until a recess can be reached. Never loosen the lock nut (8).

Note:

Do not put grease in the cover.

12. Fit the cover (9) using a plastic mallet.
13. Install the steering rods.
14. Refit the remaining components you have removed.



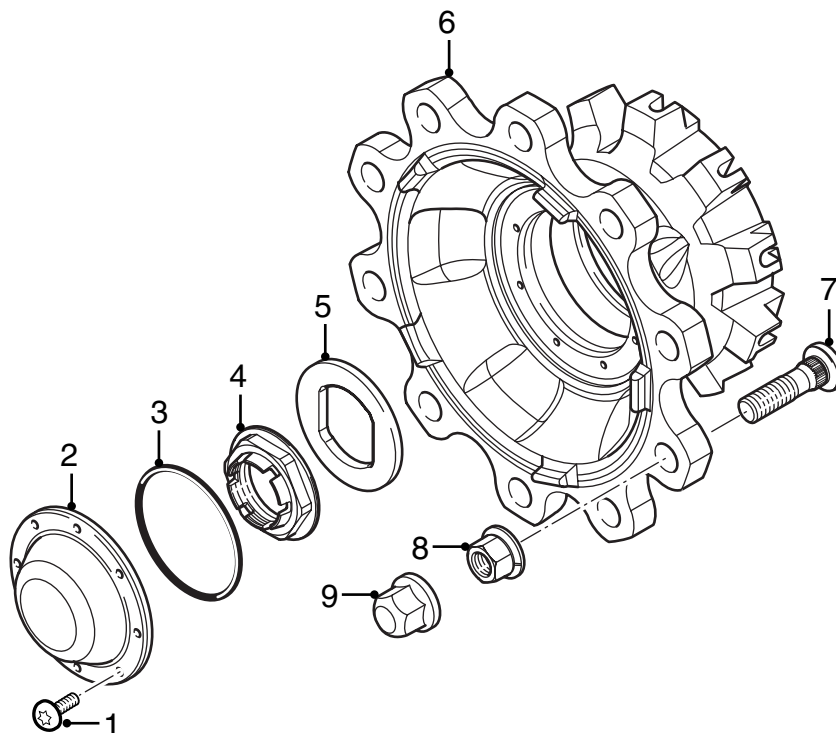
S7 00 078

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1. GENERAL

1.1 OVERVIEW DRAWING, WHEEL HUB

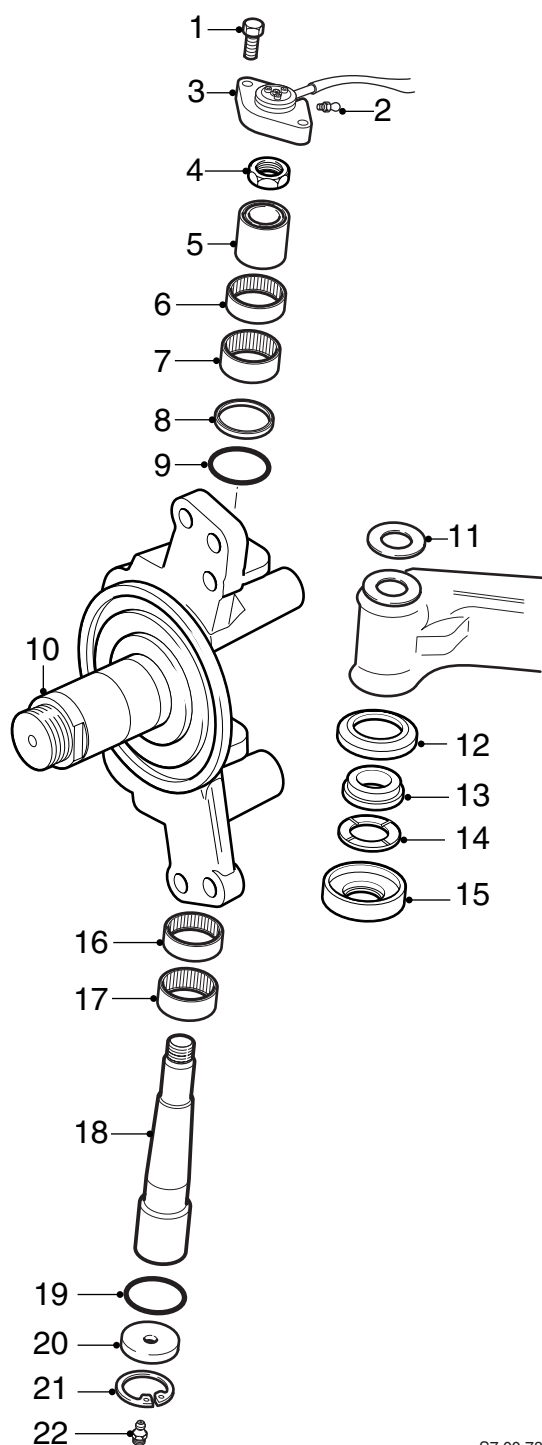


S7 00 709

1. Attachment bolt
2. Hub cap
3. O-ring
4. Hub nut
5. Locking plate
6. Wheel hub unit
7. Wheel stud
8. Wheel nut
9. Wheel nut cap

1.2 OVERVIEW DRAWING, SWIVEL AXLE

1. Bolt
2. Lubricating nipple
3. Angle sensor
4. Nut
5. Bearing bush
6. Needle bearing
7. Needle bearing
8. Oil seal
9. O-ring
10. Swivel axle
11. Shim
12. Sealing ring
13. Thrust washer
14. Bearing ring
15. Shoulder ring
16. Needle bearing
17. Needle bearing
18. King pin
19. O-ring
20. Cover
21. Lock
22. Lubricating nipple



S7 00 788

1.3 DESCRIPTION OF WHEEL HUB UNIT

Wheel hub unit

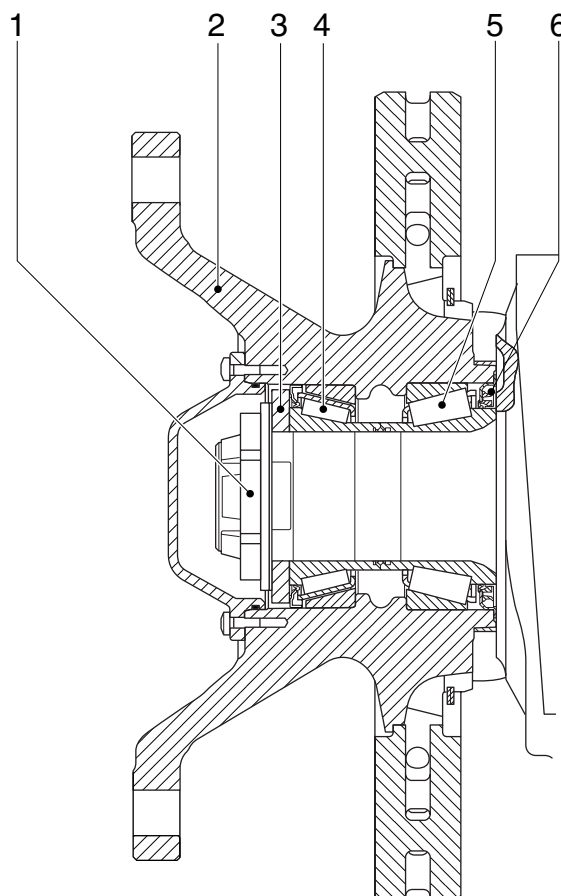
The wheel hub (2), wheel bearings (4) and (5) and oil seal (6) form a whole that is called the wheel hub unit.

The thrust washer (3), on the inner side of two straight surfaces, prevents the hub nut (1) from coming loose if there are any problems with the bearings. The hub nut (1) is of the self-locking type. The nut is locked by bending the lips on the hub nut (1) outward.

The bearings (4) and (5) of the wheel hub unit are greased and are maintenance free.

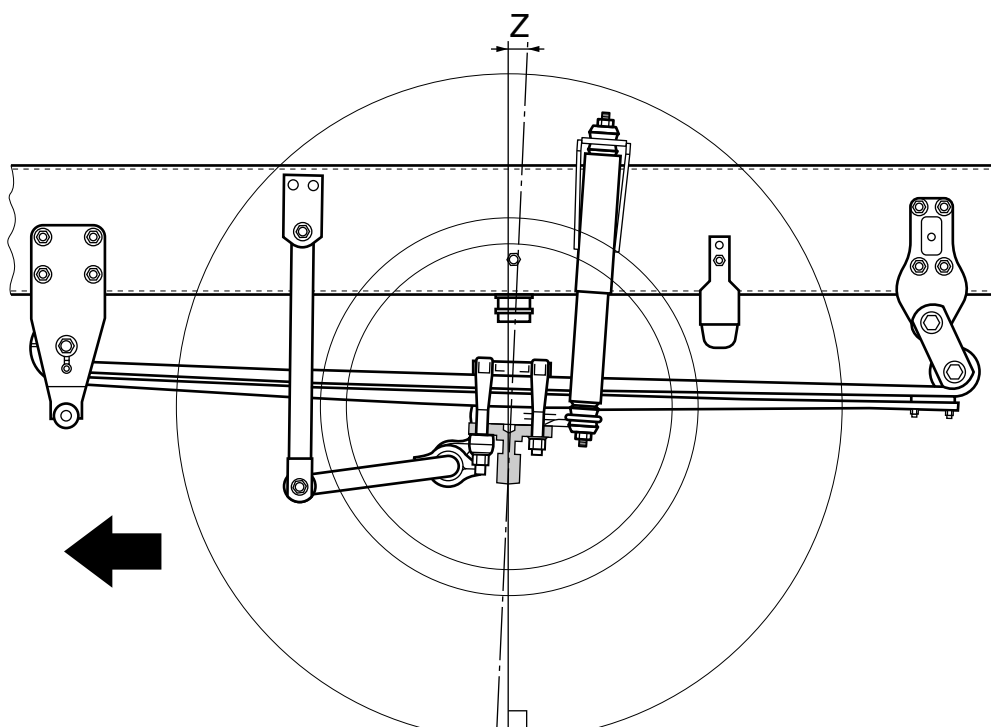
The correct wheel bearing pre-load is achieved by installing the hub nut (1) as specified.

It is not possible to replace wheel bearings (4) and (5) and/or hub oil seal (6).



S7 00 578

1.4 DESCRIPTION OF WHEEL SETTINGS



S7 00 606

Caster

The caster (Z) is the angle of the axle housing to the road surface. The caster is important for the directional stability of the vehicle. Too little caster will lead to "searching" behaviour by the vehicle, while too much caster will result in "heavy" steering.

A deviating caster will not result in tyre wear.

The caster is determined by the relation between the road surface and the chassis, assuming that the chassis is parallel with the road surface.

The caster can be very easily inspected and adjusted and requires no complicated equipment.

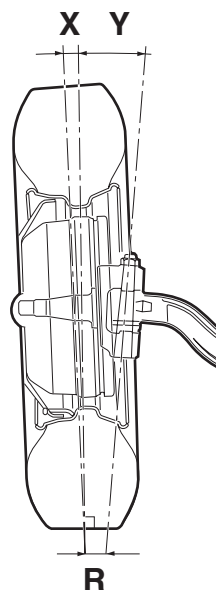
If a vehicle has two steerable axles, this inspection should be carried out on both axles.

Camber angle and king pin inclination

The camber angle (X) and the king pin inclination (Y) are determined by the construction of the swivel axle and the axle housing. In DAF vehicles, neither setting can be adjusted. Wheel alignment deviations can only be caused by collisions and/or a bent front axle due to overloading.

If a vehicle has a deviation in one of these wheel alignments, the load of the tyre will be unevenly distributed across the road surface. This will result in irregular tyre wear.

Inspections of vehicles with one steerable axle and vehicles with two steerable axles do not differ. The inspection should be carried out on each individual wheel.

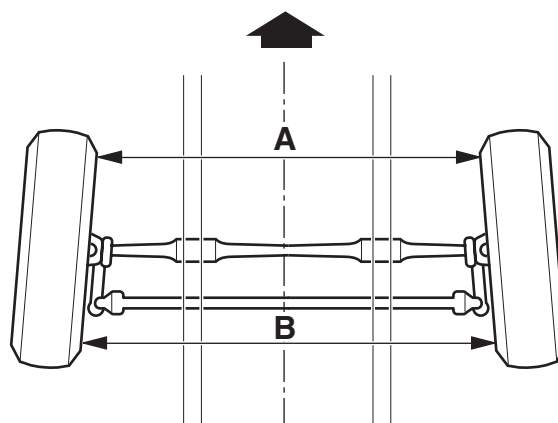


S7 00 129

Toe

Toe is the difference between distances A and B. If distance A is smaller than B, this is called toe-in. If, however, distance A exceeds distance B, this is called toe-out.

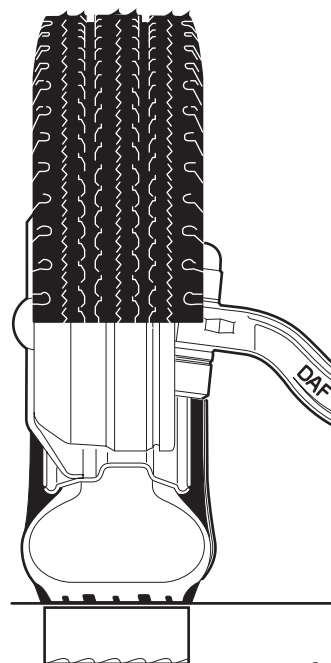
Whether a vehicle should have toe-in or toe-out is determined by the manufacturer of the vehicle. Toe-in or toe-out is required to ensure that the wheels have perfect rolling characteristics while the vehicle is driving straight ahead.



S7 00 125

Toe-in or toe-out deviations will cause "chafing" of the tyres on the road surface. This will result in irregular tyre wear.

The same irregular tyre wear is found in vehicles with multiple steerable axles if the wheels are "misaligned" while the vehicle is driving straight ahead.



S7 00 126

2. INSPECTION AND ADJUSTMENT

2.1 INSPECTION AND ADJUSTMENT, SWIVEL AXLE PLAY

Inspection of swivel axle play

1. The vehicle should have its wheels on the ground.

Note:

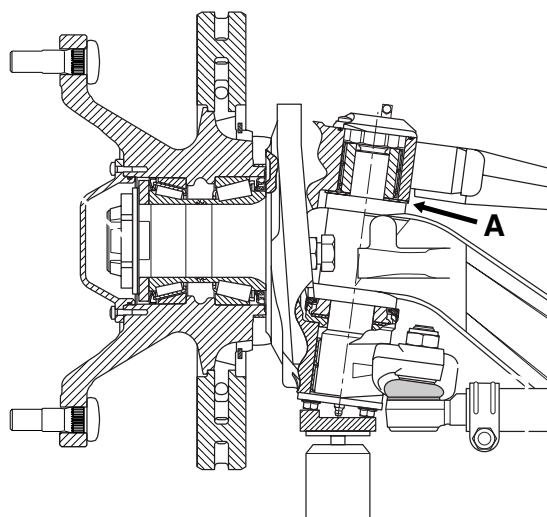
If the wheels have been removed from the front axle, e.g. for overhaul purposes, the swivel axle will hang at the axle end. In that case, the swivel axle should be supported by a jack, pushing the swivel axle against the bottom of the axle end.

2. Using a feeler gauge measure the distance between the shim and the swivel axle at (A). Take measurements in several places. Compare the reading with the admissible play. See 'Technical data'.

Note:

The play should be about equal along the entire circumference of the axle end. If the play is not equal, this is caused by radial play in the needle bearings. If the radial play of one of the values measured along the circumference differs from the specified value, the needle bearings should be replaced, see the chapter 'Removal and installation'.

If an excessive axial play is measured along the entire circumference of the axle end, this is probably caused by a worn swivel axle thrust bearing.

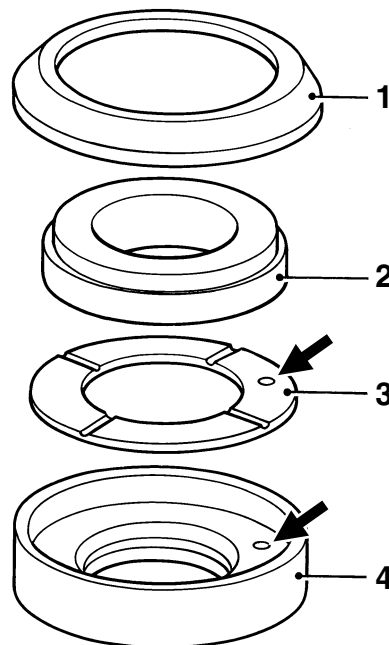


S7 00 579

Adjusting the swivel axle play, thrust bearing, split version

1. Remove the swivel axle from the axle end. See 'Removal and installation'.
2. Degrease and clean the thrust bearing.
3. Check the thrust bearing for wear or damage. If in doubt, replace the thrust bearing.
4. Check the machined surfaces of the axle end and the swivel axle for damage.

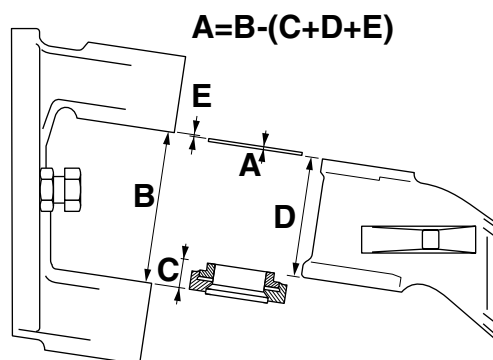
5. Remove the dust seal (1) from the thrust washer (2).
6. Assemble the thrust bearing without greasing it and without the dust seal (1). Make sure that the cam at the bottom of the bearing ring (3) falls in the recess of shoulder ring (4). See the arrows in the drawing.
7. Fit the swivel axle with its original shim on the axle end.
8. Fit the king pin. Hand tighten the nut.
9. Place a jack under the swivel axle, pushing the thrust bearing against the axle end.



S7 00 114

- A = shim thickness
 B = distance between the swivel axle contact surfaces
 C = total thickness of the thrust bearing without the dust seal
 D = axle end dimensions
 E = play

10. Using a feeler gauge measure the gap between the shim and the swivel axle. If necessary, use a shim with a different thickness until the specified axial play is achieved. See 'Technical data'.

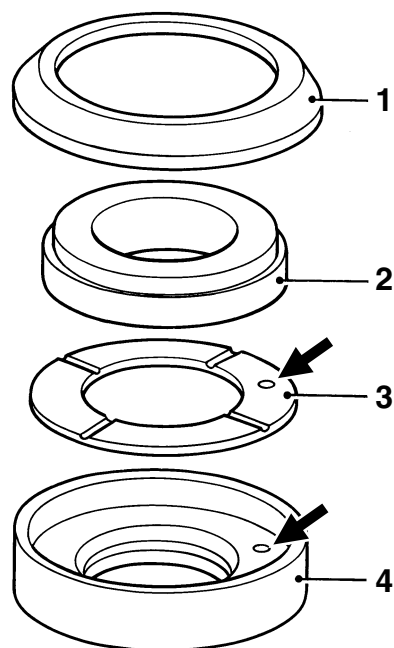


S7 00 815

Note:

The shim thickness can also be determined using the formula in the drawing.

11. Remove the swivel axle from the axle end.
12. Disassemble the thrust bearing and grease the top side of bearing ring (3) (ribbed side with lubricating grooves).
13. Fit a new dust seal (1) to the thrust washer (2).
Make sure that the top of the dust seal is positioned under the top of the thrust washer.
14. Install the swivel axle with the correct shim on the axle end. See 'Removal and installation'.
15. Measure the play again.



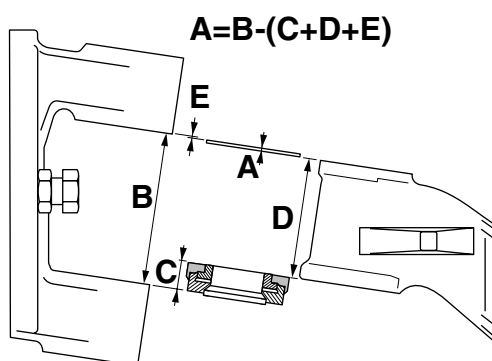
S7 00 114

Adjusting the swivel axle play, thrust bearing, assembled version

1. Remove the swivel axle from the axle end. See 'Removal and installation'.
2. Check the thrust bearing for wear or damage. If in doubt, replace the thrust bearing.
3. Check the machined surfaces of the axle end and the swivel axle for damage.
4. Fit the swivel axle with its original shim on the axle end.
5. Fit the king pin. Hand tighten the nut.
6. Place a jack under the swivel axle, pushing the thrust bearing against the axle end.

- A = shim thickness
 B = distance between the swivel axle contact surfaces
 C = total thickness of the thrust bearing
 D = axle end dimensions
 E = play

7. Using a feeler gauge measure the gap between the shim and the swivel axle. If necessary, use a shim with a different thickness until the specified axial play is achieved. See 'Technical data'.



S7 00 577

Note:

The shim thickness can also be determined using the formula in the drawing.

8. Remove the swivel axle from the axle end.

9. Install the swivel axle with the correct shim on the axle end. See 'Removal and installation'.
10. Check the play once again.

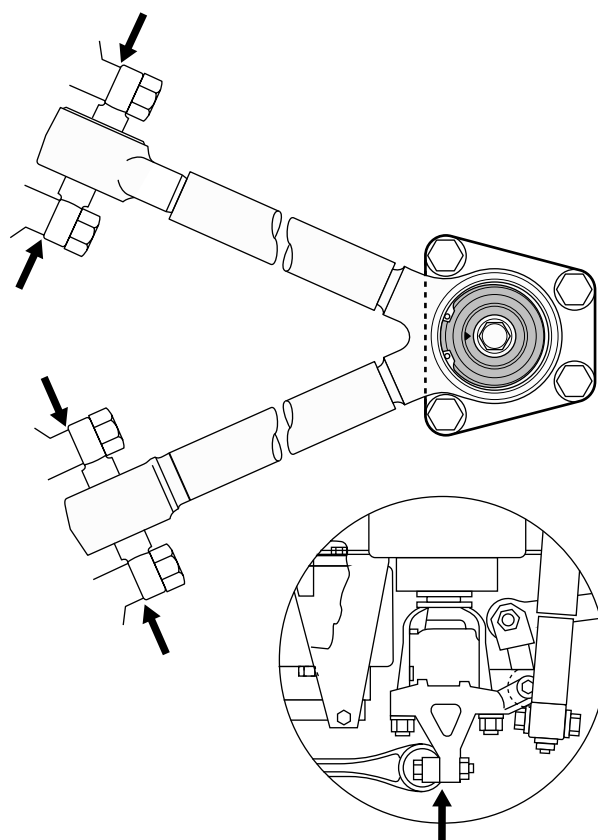
2.2 INSPECTION AND ADJUSTMENT, CASTER

Inspection of caster

1. Place the vehicle on a level and horizontal surface.
2. Put the trailing axle in the "straight ahead" position.
3. Use high-quality wheel alignment equipment for the inspection. The equipment must be calibrated regularly and preferably be of the type that can be calibrated before every use.
4. Follow the instructions for the wheel alignment equipment carefully.
5. Compare the reading with the specified value. See 'Technical data'.
6. Carry out the caster measurement on the other axle side too.
If different readings are obtained, the axle suspension should also be inspected for deviations.

Adjusting the caster

1. Adjust the caster by fitting hardened steel washers between attachment of the torque rods or the triangular link (DAF no. 0202838). The washers are 3 mm thick. Grind the washers if necessary. The application of more than one washer per bolt is not acceptable.
2. Repeat the measurement once the steel washers have been fitted.



S7 00 728

2.3 INSPECTION OF CAMBER ANGLE AND KING PIN INCLINATION**Note:**

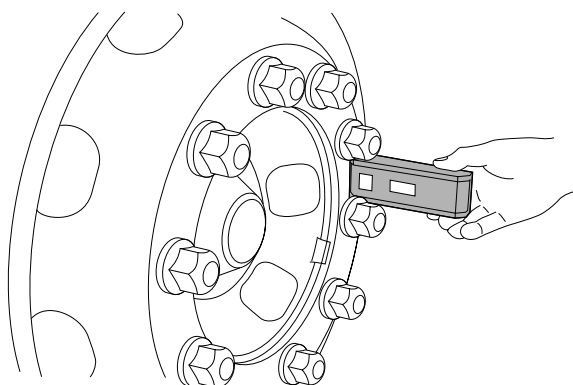
In the following measurement, only the camber angle is measured. If the camber angle is correct, the king pin inclination must also be correct.

General

- The vehicle should be on a flat and horizontal surface, with the steering gear in the "straight ahead" position.
- The tyre pressure should be correct.
- The camber angle can be measured using an angle measuring device or wheel alignment equipment.
- The measurement should be carried out on both wheels.

Inspection of camber angle using angle measuring device

1. Thoroughly clean the side of the wheel rim. Position the angle measuring device against the wheel rim. Keep the angle measuring device in the vertical position.
2. Read off the angle shown. For the permitted angle, see 'Technical data'.



S7 00 566

Inspection of camber angle using wheel alignment equipment

1. Use high-quality wheel alignment equipment for the inspection. The equipment must be calibrated regularly and preferably be of the type that can be calibrated before every use.
2. Follow the instructions for the wheel alignment equipment carefully. For the permitted angle, see 'Technical data'.

The following points may cause the reading to deviate:

- excessive swivel axle bearing play
- bent front axle. In this case, the king pin inclination will also deviate from the values specified.

2.4 INSPECTION AND ADJUSTMENT, TOE

Inspection of toe

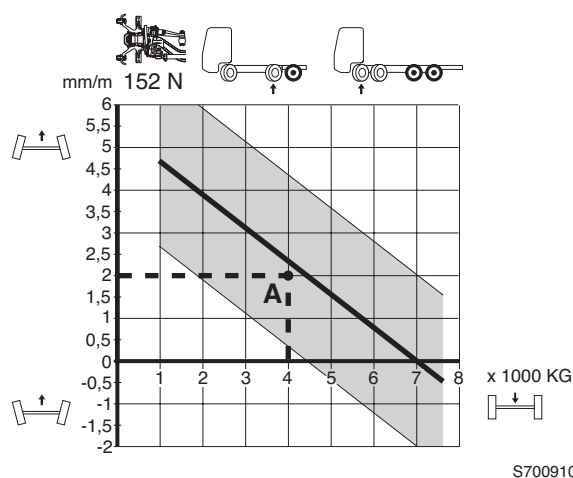
1. Use high-quality wheel alignment equipment for the inspection. The equipment must be calibrated regularly and preferably be of the type that can be calibrated before every use. Follow the instructions for the wheel alignment equipment carefully.
2. Ensure that the steering gear is free of tension. To that end, drive the vehicle, if possible, directly to the place of measurement. If this is not possible, drive forwards and backwards at the place of measurement with the steering gear in the "straight ahead" position. Do not brake excessively because of weight transmission to front axle.
3. Measure the axle load of the axle being inspected.
4. Measure the toe of the axle.
5. Using the graph for the axle concerned, inspect whether the toe is correct or must be corrected (see 'Technical data'). There are two examples explaining how the graphs are to be read in 'Technical data'.

Note:

If a large deviation is measured, the cause should be traced. The deviation could, for example, have been caused by a collision, during which components were bent. If so, the remaining steering gear components should be inspected carefully.

Example 1

Look at the graph for the 152N axle, disc brake version, used as a leading rear axle or first front axle in a vehicle with two steered front axles. The measured axle load is 4,000 kg and the measured toe is 2 mm/m (toe-in). The intersection of the lines (A) occurs in the shaded area. This shows you that the toe is within the permitted tolerance. The toe does not have to be corrected.

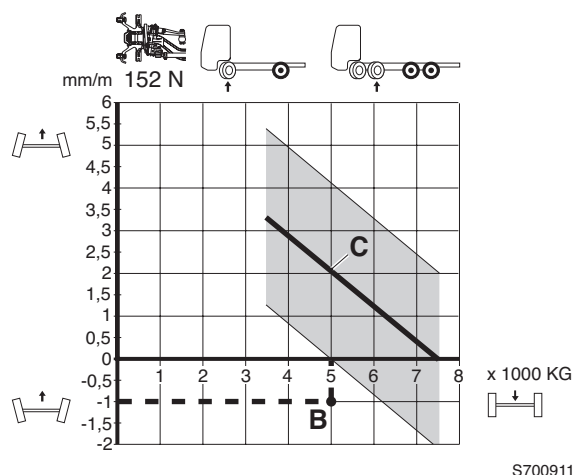


S700910

Example 2

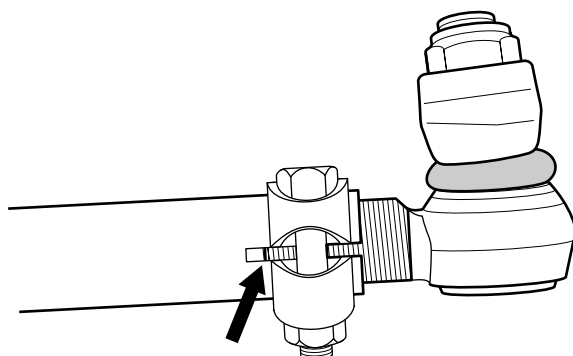
Look at the graph for the 152N axle, disc brake version, used as a single front axle or second front axle in a vehicle with two steered front axles. The measured axle load is 5,000 kg and the measured toe is 1-mm/m (toe-out).

The intersection of the lines (B) occurs outside the shaded area. This shows you that the toe is outside the permitted tolerance. If the amount measured lies outside the shaded area, the toe must be adjusted to the amount indicated by the intersecting line (C).



Adjusting the track

1. Slacken the bolts of the clamping brackets until the track rod can be rotated.
2. Set the correct length by lengthening or shortening the track rod.
3. Make sure that the threaded ends of the ball end are not screwed too far from the track rod. The clamping bracket should always fully engage the screw thread of the ball end (see drawing).
4. Thoroughly clean and check the clamping bracket bolts. A corroded or damaged bolt must be replaced. Replace the self-locking nut.
5. Tighten the locking bolts of the clamping brackets to the specified tightening torque. See 'Technical data'.
6. After this, check the toe once again.
7. Make sure that the clamping brackets do not come into contact with the axle housing at maximum wheel deflection. Turn the clamping brackets if necessary.



2.5 INSPECTION AND ADJUSTMENT, ALIGNMENT

Alignment inspection

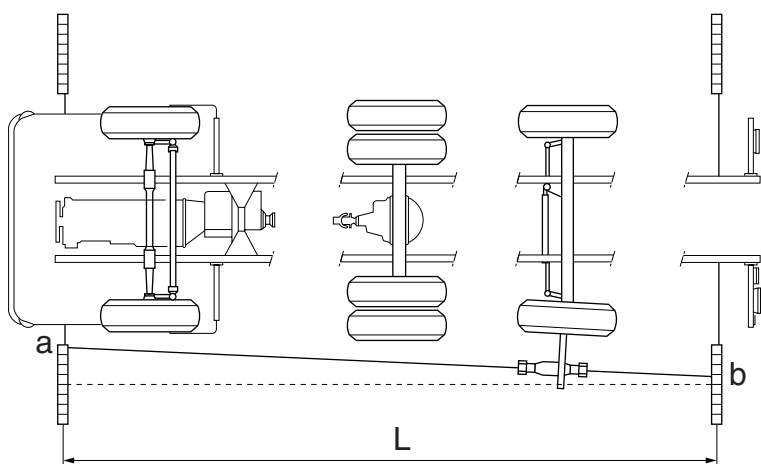
- Use high-quality wheel alignment equipment for the inspection. The equipment must be calibrated regularly and preferably be of the type that can be calibrated before every use.
- The vehicle load must be in accordance with the vehicle's normal load conditions. The load should be at least 40% of the vehicle's admissible load.
- For a vehicle combination (truck with trailer, or tractor with semi-trailer), the alignment of the total vehicle combination must be checked. A misaligned trailer or semi-trailer can cause the combination to become directionally unstable.
- Before measuring, the following points should be checked:
 - tyre pressure
 - spring opening of the spring
 - play of the axle suspension.

Note:

If a deviation is found, it should be corrected before the measurement is taken.

- The work should be carried out very precisely. The wheel alignment (the angle of the wheel in relation to the central axis of the chassis) should be calculated in millimetres per metre.

This wheel position is calculated by dividing the difference (in millimetres) in the readings on the measuring boards (a - b in the drawing below) by the distance (in metres) between the measuring boards (L in the drawing).



S7 00 726

Note:

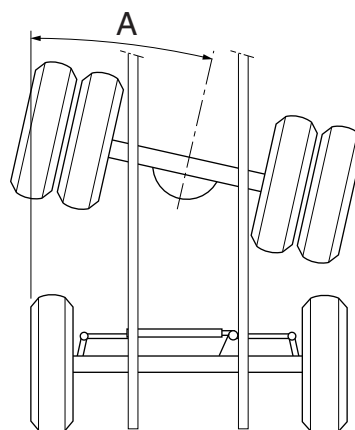
The drawing shows the alignment equipment, with a loose projector and measuring boards being hung in the chassis.

1. Drive the vehicle in a straight line to the test location, so that the steered trailing swivel axle is blocked in centre position.
2. Remove the fuses from the EMAS system, so that the steered trailing swivel axle remains blocked in centre position.
3. Place the vehicle on the turning plates.
4. Place chocks before and behind the non-steerable wheels.



Block the vehicle so that it cannot slide off the turning plates.

5. Install the alignment equipment. Calibrate the alignment equipment, if possible. Consult the alignment equipment manual and follow the instructions given there.
6. Check the axle position of the driven axle relative to the vehicle's centre line. Correct the axle position if it is outside the permitted value.
7. Check the toe of the steered trailing swivel axle. Correct the toe if it is outside the permitted value, see 'Technical data'.
8. Check the wheel position (A) of the left wheel of the steered trailing swivel axle in relation to the axle position of the driven axle. Correct the wheel position if it is outside the permitted value.

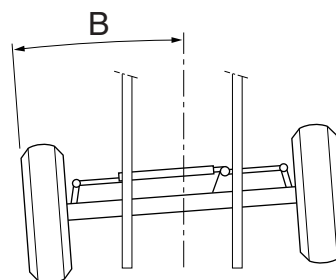


S7 00 725

9. Check the wheel position (B) of the left wheel of the steered trailing swivel axle in relation to the centre line of the vehicle. Adjust the wheel position if it is outside the permitted value.

Note:

If a large deviation is measured, the cause should be traced. The deviation could, for example, have been caused by a collision.

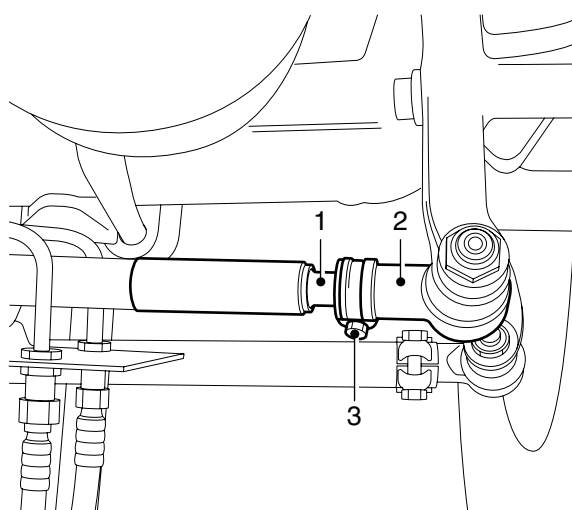


S7 00 727

10. Fit the fuses to the EMAS system.

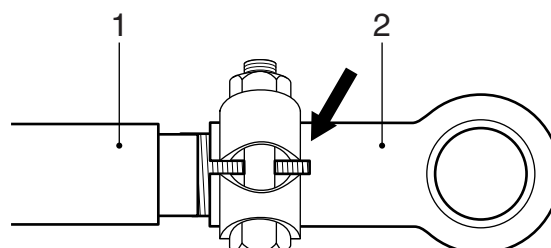
Adjusting alignment

1. Remove the clamping bracket bolt (3) from the ball joint (2).
2. Lengthen or shorten the piston rod (1) on the steering cylinder.



S7 00 741

3. Check that the piston rod (1) on the steering cylinder is not unscrewed too much from the ball joint (2). The clamping bracket should always fully engage the screw thread of the piston rod (see drawing).
4. Thoroughly clean and check the clamping bracket bolt. A corroded or damaged bolt must be replaced. Replace the self-locking nut.
5. Tighten the clamping bracket bolt to the specified tightening torque. See 'Technical data'.
6. After tightening the clamping bracket, check the wheel alignment once again.
7. Calibrate the EMAS system.



S7 00 743

2.6 INSPECTION OF THE STEERING BALL JOINT

Inspection of the steering ball joint screw thread with a self-locking nut

1. Check the ball end thread for damage before fitting a new self-locking nut.
2. To do so, hand-tighten a new non-self-locking nut on the ball end.
3. If the new nut cannot be fully hand-screwed onto the entire thread, the ball end must be replaced.



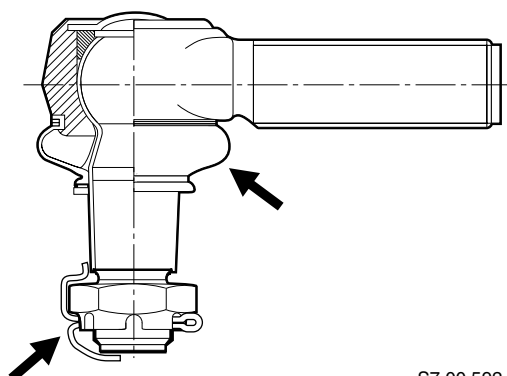
Fitting a new self-locking nut to a ball end with a damaged thread may lead to dangerous situations.

Inspection of locking with castle nut

1. If a castle nut is fitted, check that the locking devices are present and undamaged.

Inspection of dust cover

1. Check that the steering ball joint dust cover or seal is not damaged. Replace the steering ball joint if damaged.



S7 00 592

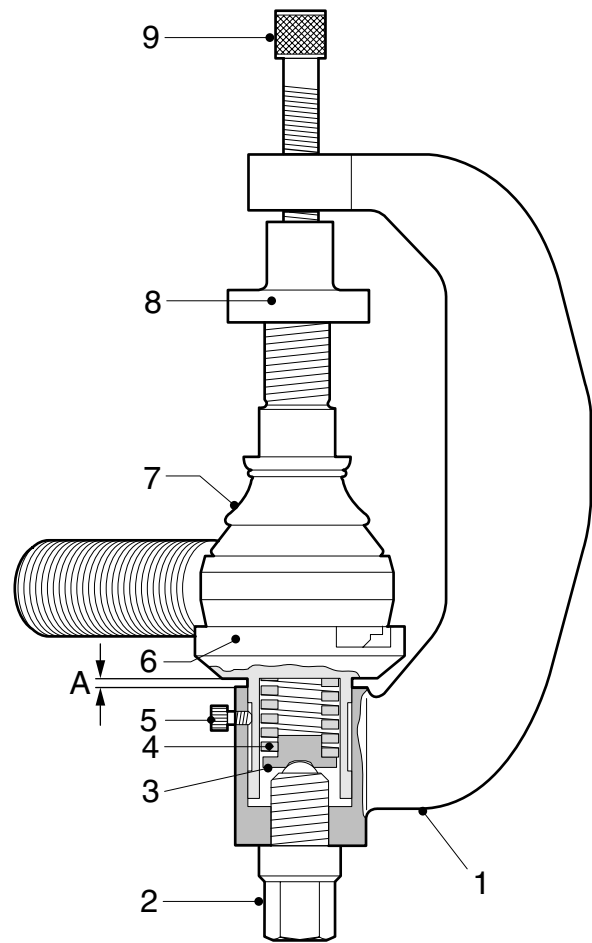
Inspection of axial steering ball joint play

1. Check the axial steering ball joint play using special tool (DAF no. 1329426).
2. First jack up the axle until the wheels come off the ground and put the axle on stands.
3. Make sure that the castle nut split pin (if fitted) at the nut does not come into contact with the head of the threaded end.
4. Screw the thrust washer (8) onto the threaded spindle.
5. Fit the spring retainer (3), spring (4) and pressure sleeve (6) into bracket (1). Fit the locking screw (5). It should be possible to move the pressure sleeve (6) freely.

Note:

Fit the correct pressure sleeve (6).
The pressure sleeve (6) must abut the outer edge of the steering ball joint (7).

6. Loosen thrust bolt (2) until the flange of the pressure sleeve (6) abuts the bracket (A=0 mm).
7. Fit the special tool over the steering ball joint (7) and turn the threaded spindle (9) by hand until the special tool is tight around the steering ball joint (7).
8. Tighten thrust bolt (2) until its head abuts bracket (1).
9. Measure play "A" between the pressure sleeve and the bracket using a feeler gauge. Compare the reading with the maximum permissible steering ball joint play, see 'Technical data'.
If necessary, replace the steering ball joint.



S700426

2.7 INSPECTION OF AXLE HOUSING

General

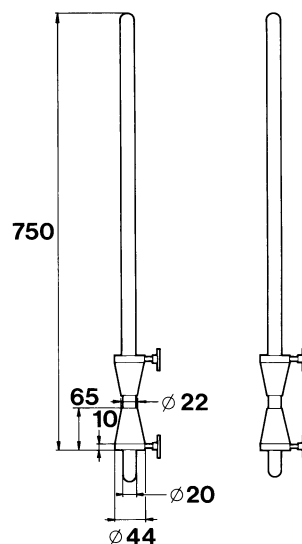
When the vehicle has been involved in a collision or when abnormal deviations are measured during the inspection of the wheel alignment, it may be wise to inspect the axle housing.

A number of the following measurements can also be carried out using alignment equipment. Consult the alignment equipment manual for this.

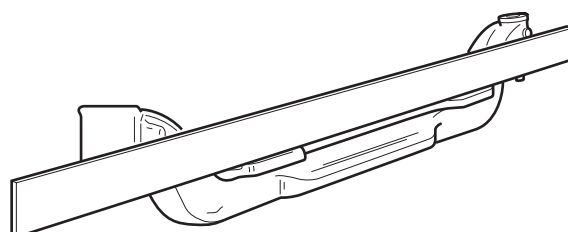
The special tools required cannot be obtained from DAF and should be manufactured by yourself.

Inspection of axle housing

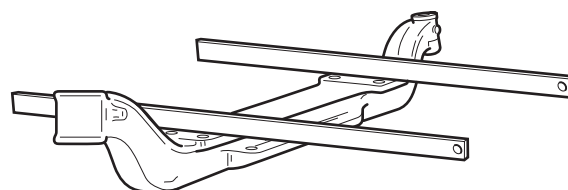
1. Remove the vehicle's axle and both swivel axles. See 'Removal and installation'.
2. Place a straight edge over the spring seats of the axle housing and check whether they are aligned.
3. Place a straight edge over both spring seats and check whether they are parallel with each other.



S7 00 119

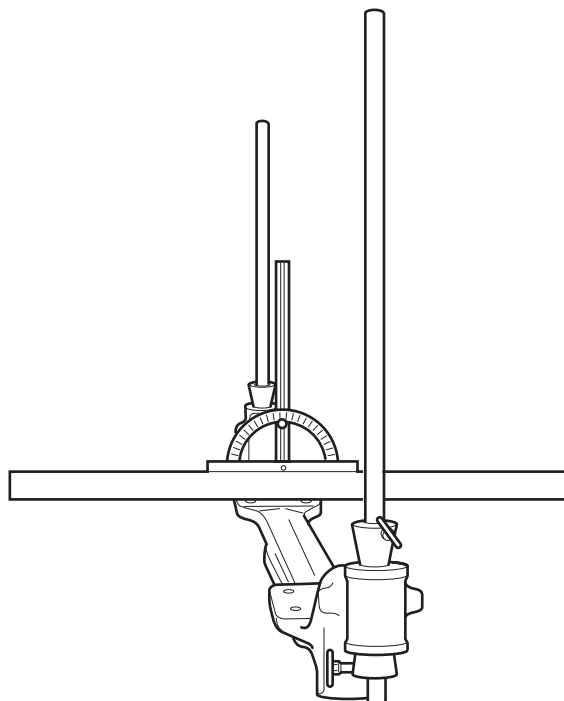


S7 00 151



S7 00 152

4. Place the two gauge bars in the swivel axle holes.
Place a straight edge with a protractor on the spring seat. Measure the angle of the gauge bars in relation to the spring seats. The angle measured should be 90° .

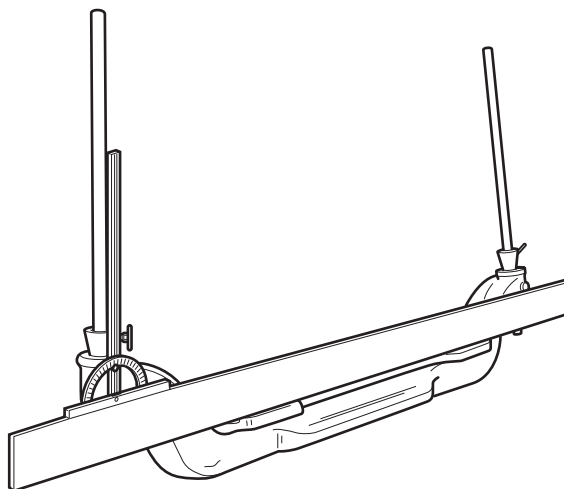


S7 00 149

5. Measure the king pin inclination (KPI) by placing a straight edge with a protractor on the spring seats.
By placing the straight edge of the ruler parallel with the gauge bar, the angle can be read.
6. If a deviation is found during one of the inspections, the axle housing should be replaced.



The axle housing should not be straightened. This could affect the material strength.



S7 00 150

2.8 INSPECTION OF WHEEL RIM

General

1. Inspect the wheel rims for the following points:
 - deformation of the wheel rims, wheel disc and/or Trilex parts. In the case of twin wheels, also inspect the inside wheel.
 - deformation or cracking of the wheel stud holes.
 - corrosion, including at the tyre side of the rim and on the rim ring.
2. Cracked or damaged wheel rims or wheel rims with cracked or deformed wheel stub holes should be replaced.
It is prohibited to weld wheel rims or repair these in some other way. After some time, the weld will crack again due to the dynamic load.



When removing such a damaged wheel rim from the vehicle, deflate the tyre (remove the tyre valve) in view of possible tensions in the wheel rim.

3. To prevent damage to the tyre due to corrosion and/or indirect tension cracks (due to notching), the anti-corrosion treatment of the wheel rim should stay fully intact.
For the removal of corrosion and repair of the paint layer, see 'Paint treatment'.
Before re-spraying, remove the old paint layer to prevent the total paint layer from becoming too thick. The total paint layer thickness should not exceed 50 microns.



At a total paint layer thickness (wash primer and finishing paint) of more than 50 microns, the pre-tension of the wheel studs might be reduced if this layer were to be crushed. This could result in the wheel nuts coming loose.

3. REMOVAL AND INSTALLATION

3.1 REMOVAL AND INSTALLATION, WHEEL



When removing a wheel with a cracked or damaged wheel rim, always deflate the tyre (remove the tyre valve) in view of possible tensions in the wheel rim.

General

- Only use the original DAF wheel rims specified for the vehicle concerned.
- Make sure that tyres of the same type are fitted on both sides of the axle.
- Insufficient cleaning of the mating surfaces and/or uneven tightening of the wheel nuts may cause vibrations during driving or braking.

Note:

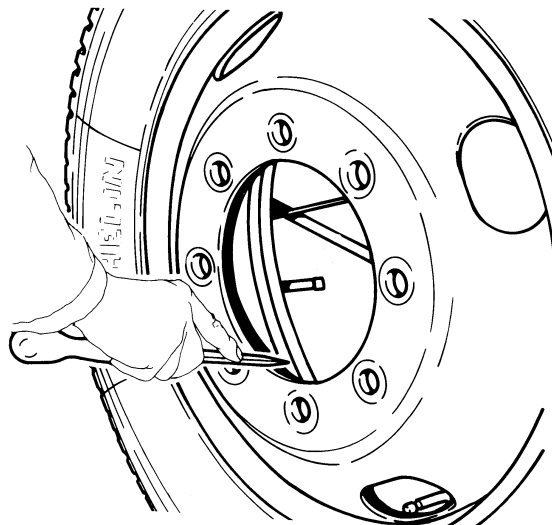
If a wheel stud is renewed, the other wheel studs on the relevant wheel must also be renewed.

Removing the wheel

1. Chock the wheels to prevent the vehicle moving off.
2. Clean the screw thread of the wheel studs using a wire brush.
3. Oil the wheel studs sparingly.
4. Unscrew the wheel nuts.
5. Fit a jack as close as possible to the wheel to be replaced.
6. Jack up the vehicle and, if possible, place a support under the axle.
7. Remove the wheel nuts and take the wheel off the hub.

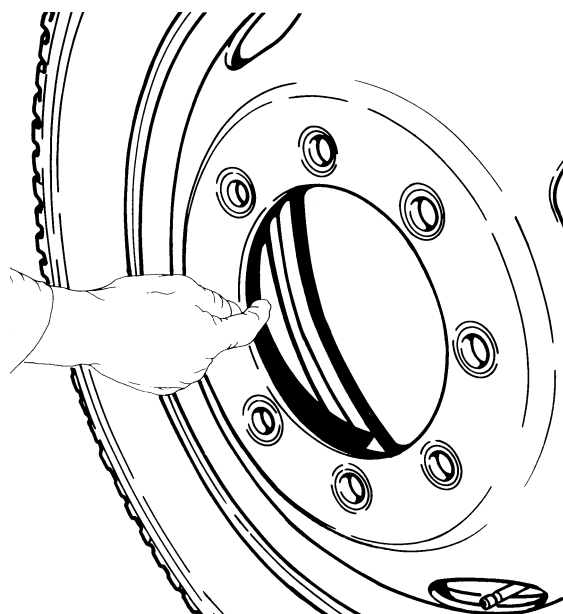
Installation of wheel

1. Clean the fitting edge of the wheel rim by scraping off dirt and corrosion with a scraper.



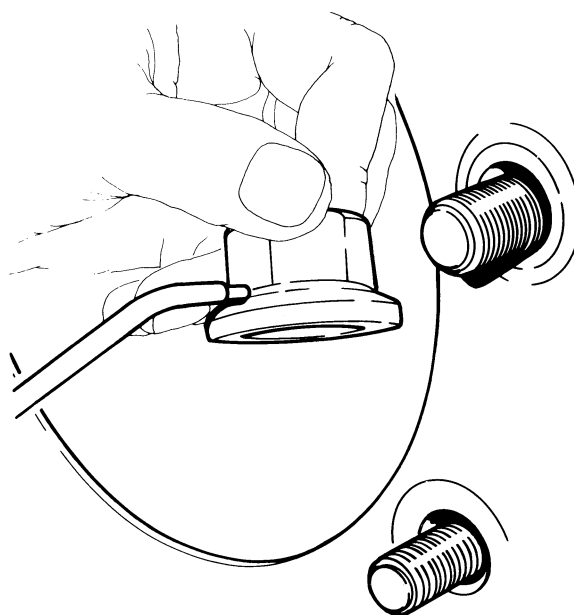
S7 00 096

2. Apply a thin layer of grease to the fitting edge of the wheel hub.
3. Also apply a thin layer of grease to the fitting edge of the wheel rim. This grease layer should prevent the wheel rim and the wheel hub from becoming 'rust-bound'.
4. Check whether the contact surfaces of the wheel rim and hub are clean. Clean them if necessary.



S7 00 097

5. Clean the wheel nuts and then apply a drop of oil between the thrust washer and the nut.
6. Also apply a drop of oil to the first turn of the wheel-stud screw threads.



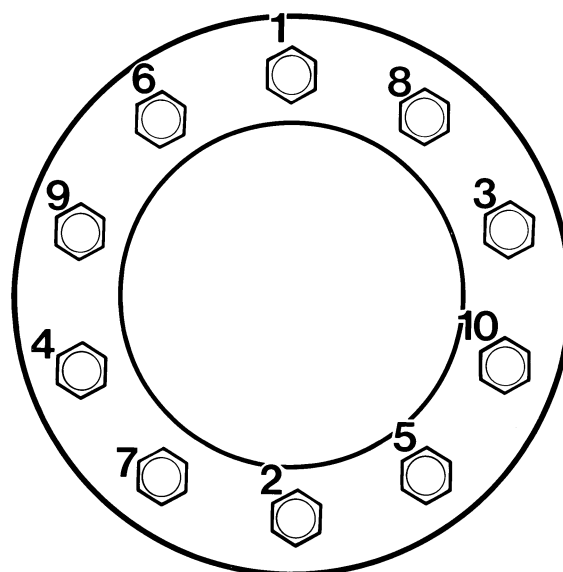
S7 00 098

7. Fit the wheel nuts and tighten them evenly according to the sequence in the illustration. A pneumatic spanner may be used for this purpose, but its tightening torque is not very reliable. It will therefore be necessary to retighten the wheel nuts to the specified tightening torque. For the prescribed tightening torque, see 'Technical data'.

Note:

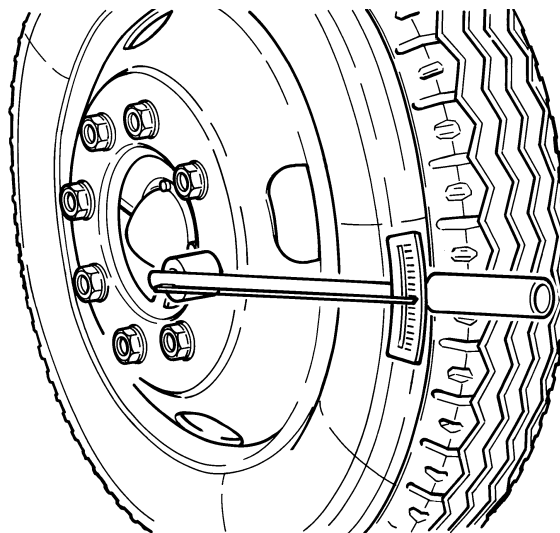
Wheel nuts should always be tightened and retightened in cold condition. However, tightening wheel studs in extreme cold should be avoided.

8. Check the tyre pressure.



S7 00 095

9. Retorque the wheel nuts with a torque wrench after 100 km. If new wheel studs are fitted, they need additional retorquing after 500 km.



S7 00 099

3.2 REMOVAL AND INSTALLATION, TRACK ROD

Removing the track rod

1. Remove the wheel speed sensor and the connector bracket.

Note:

When the track rod has been removed, the swivel axle can be at such an angle that the wheel speed sensor is damaged, which can damage the wheel speed sensor ring.

2. Remove the attachment nuts. These nuts should not be re-used.
3. Remove the ball ends from the track rod arms using a ball end puller (A).

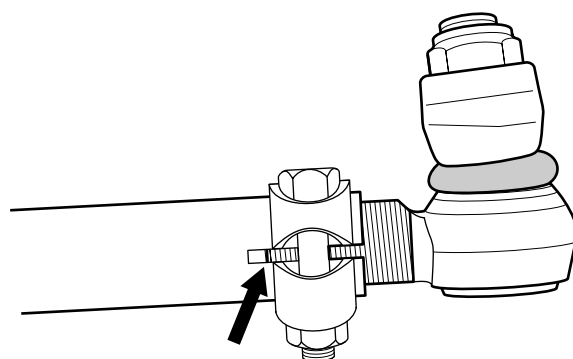
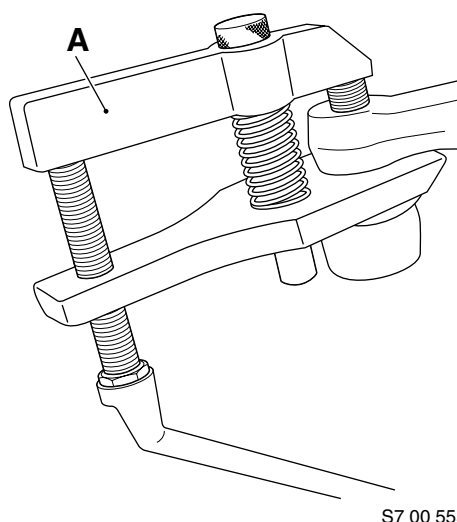
Installation of track rod

1. If installing a new track rod, copy the settings of the track rod to be replaced.
2. Check the ball end thread for damage before fitting a new self-locking nut. See 'Inspection and adjustment'.



Fitting a new self-locking nut to a ball end with a damaged thread may lead to dangerous situations.

3. Clean the tapered contact surfaces of both the track rod balls and the track rod arms. The tapered surfaces should be absolutely free from dirt, grease and paint.
4. Fit the track rod.
5. Fit a new self-locking nut to the ball end. Apply locking compound to the nut. See 'Technical data'.
6. Tighten the new self-locking nuts to the specified torque. See 'Technical data'.
7. Check the axle toe and adjust, if necessary. See 'Inspection and adjustment'.
8. Check whether the threaded ends of the ball joints are fully engaged by the clamping pieces.
9. Check whether the clamping piece bolts are tightened to the specified tightening torque. See 'Technical data'.
10. Fit the wheel speed sensor and the connector bracket.



3.3 REMOVAL AND INSTALLATION, TRACK ROD ARM AND STEERING CYLINDER ARM



These instructions should be followed to the letter. The attachment of the track rod arms and steering cylinder arm is one of the most critical factors in terms of the safety of the vehicle. Always use new attachment bolts for the track rod and steering cylinder arms. Always use original attachment bolts of the prescribed length supplied by DAF.

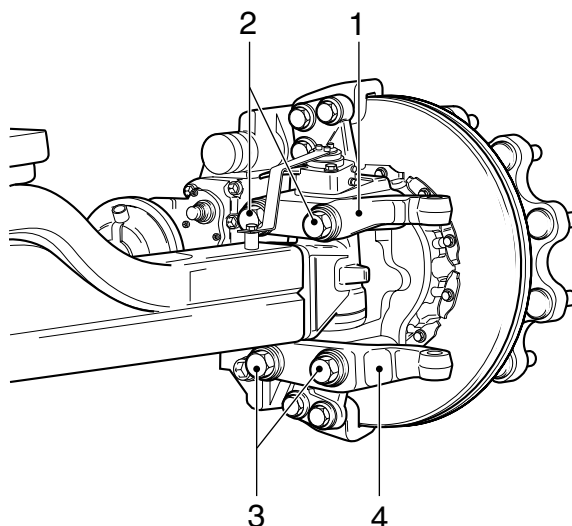
Removing the track rod and steering cylinder arms

1. Remove the track rod and the ball end of the steering cylinder from the track rod and steering cylinder arms.
2. Remove the attachment bolts (2) and (3).

Note:

These bolts should not be re-used.

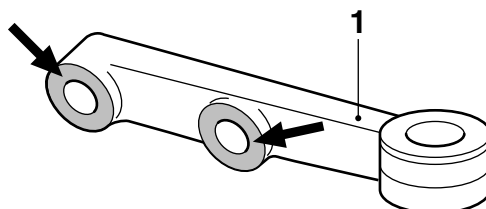
3. Remove the track rod arm (4) and the steering cylinder arm (1) from the swivel axle. When removing the steering cylinder arm a plastic mallet may be used, because locking agent has been applied between the arm and the swivel axle.



S7 00 739

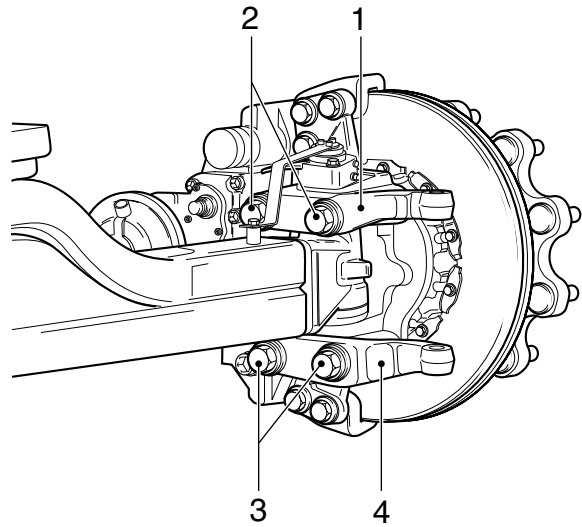
Installation of track rod arm and steering cylinder arm

1. Thoroughly clean and check the screw thread in the swivel axle. The screw thread should be undamaged.
2. Clean and degrease the contact surfaces of the swivel axle and the arm.
3. Apply locking agent around the bolt holes on the steering cylinder arm, see 'Technical data'..



S7 00 740

4. Always use new attachment bolts when installing the track rod arm (4) and the steering cylinder arm (1). Apply locking compound to the new attachment bolts. See 'Technical data'.
Tighten the attachment bolts (alternately) evenly. Tighten the attachment bolts to the specified torque. See 'Technical data'.
5. Install the track rod and the ball end of the steering cylinder.

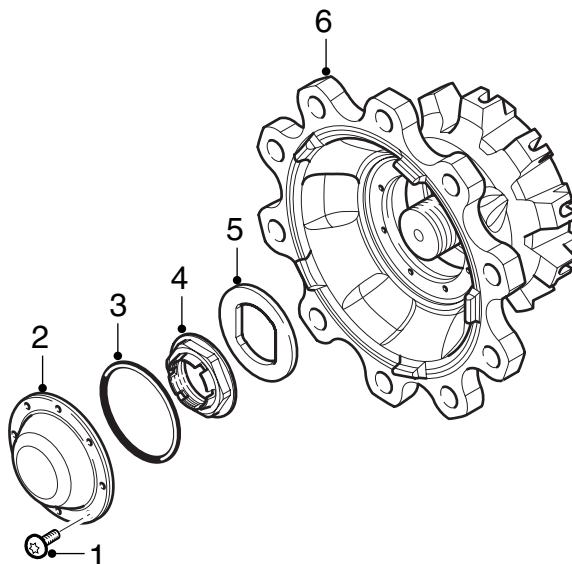


S7 00 739

3.4 REMOVAL AND INSTALLATION, WHEEL HUB UNIT

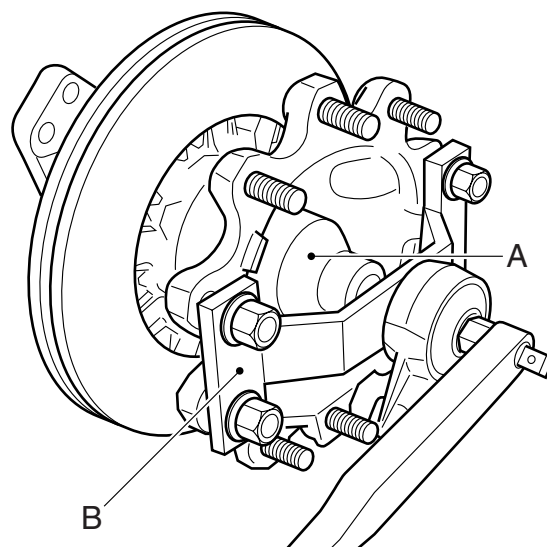
Removing the wheel hub unit

1. Jack up the axle until the wheels are clear from the floor. Place suitable supports under the axle.
2. Remove the wheel.
3. Remove the brake calliper.
4. Remove the hub cap (2).



S7 00 581

5. Remove the hub nut (4) using the special tool set (DAF no. 1329496). Fit the socket wrench (A) to the hub nut. Fit the socket wrench guide (B) to the wheel hub unit using four wheel studs. Loosen the nut using a torque amplifier.
6. Remove the thrust washer (5).



S7 00 641

7. Install the guide sleeve (A), which is part of the special tool set (DAF no. 1329496), on the axle journal.
8. Remove the wheel hub unit (6) using a lifting device. Take care that the wheel hub unit does not rest on the guide bush (A) as the latter is not strong enough to take the weight of the wheel hub unit.

Installation of wheel hub unit

1. Check the axle journal thread carefully for damage.



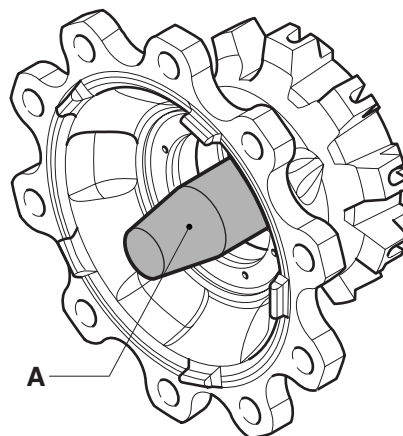
You must never fit a wheel hub unit on an axle journal with a damaged thread.

2. Apply a thin and even layer of the prescribed anti-corrosion agent to the entire circumference of the axle journal, see 'Technical data'.

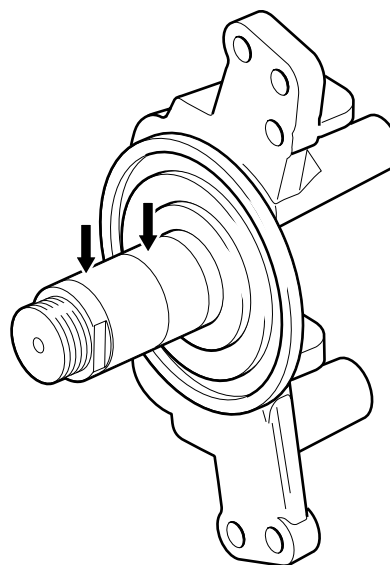
Note:

Do not apply too much anti-corrosion agent to the axle journal. While fitting the wheel hub unit, the excess anti-corrosion agent will collect at the backside of the wheel hub. When the vehicle is used in daily operation, this can leak out so that the seal wrongly appears to be leaking.

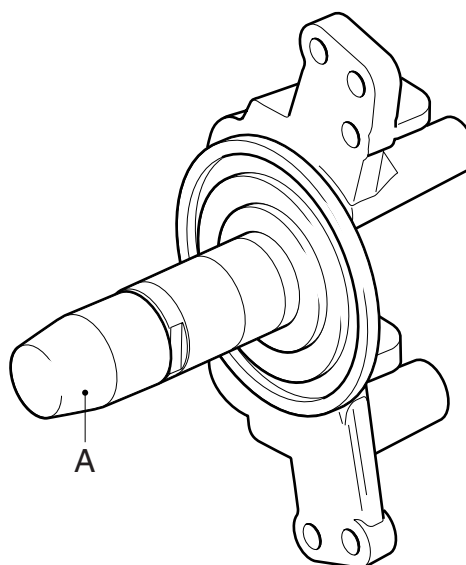
3. Install the guide sleeve (A), which is part of the special tool set (DAF no. 1329496), on the axle journal.



S7 00 580

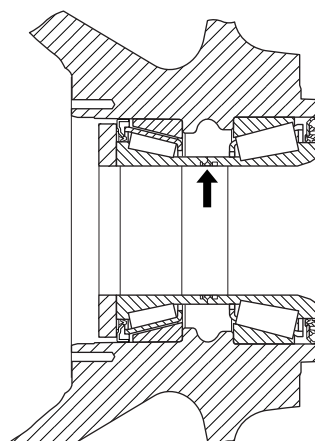


S7 00 745



S7 00 746

4. Check that the spring clip, located between the inner bearing races, is positioned correctly.

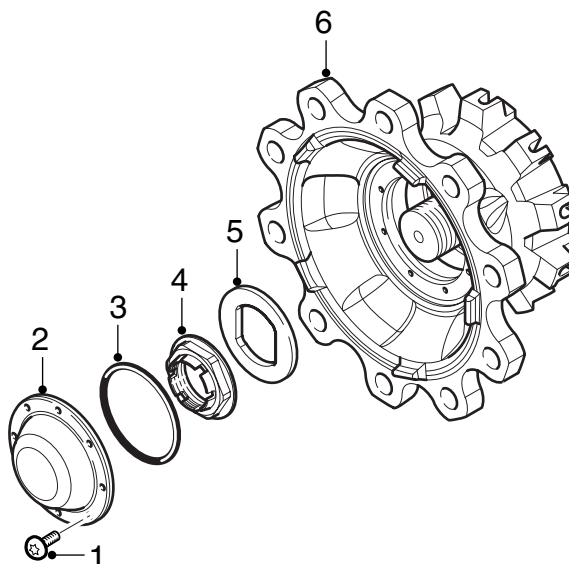


S7 00 747

5. Position the wheel hub unit (6) precisely in front of the axle journal using a lifting device. Slide the wheel hub unit (6) onto the axle journal without twisting it. Take care that the wheel hub unit does not rest on the guide bush (A) as the latter is not strong enough to take the weight of the wheel hub unit.

6. Fit the thrust washer (5).

7. Replace the hub nut (4). Apply a few drops of oil to the abutting surface of the hub nut. Fit the hub nut.



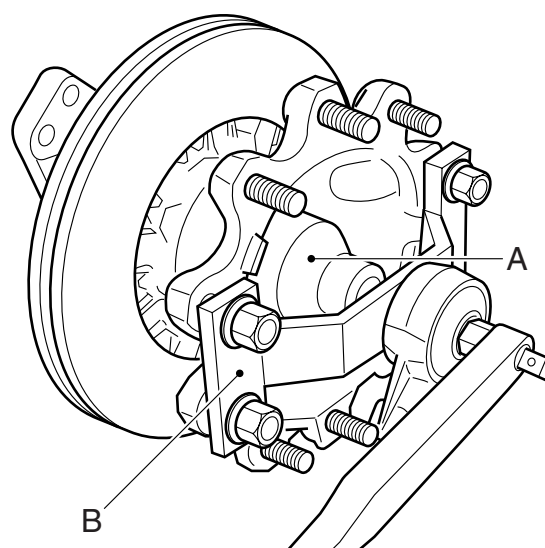
S7 00 581

8. Fit the hub nut (4) using the special tool set (DAF no. 1329496). Fit the socket wrench (A) to the hub nut. Fit the socket wrench guide (B) to the wheel hub unit using four nuts. Tighten the hub nut (4) in the specified manner using a torque amplifier, see 'Technical data'.

9. Fit a new O-ring (3) to the hub cap (2).

10. Fit the brake calliper.

11. Fit the wheel.

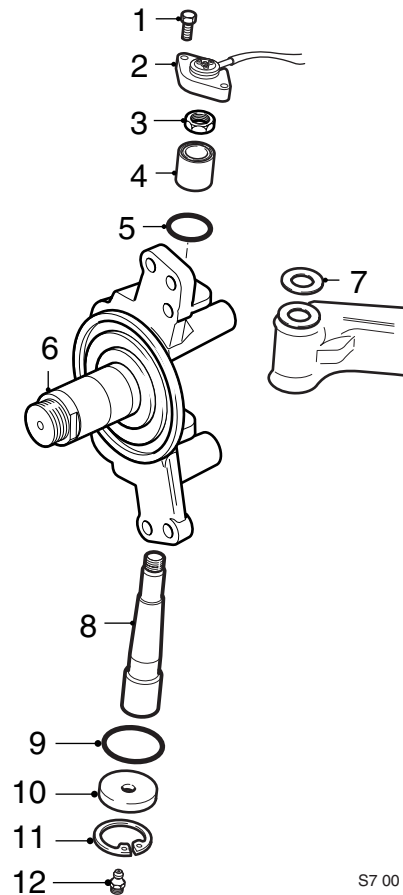


S7 00 641

3.5 REMOVAL AND INSTALLATION, SWIVEL AXLE

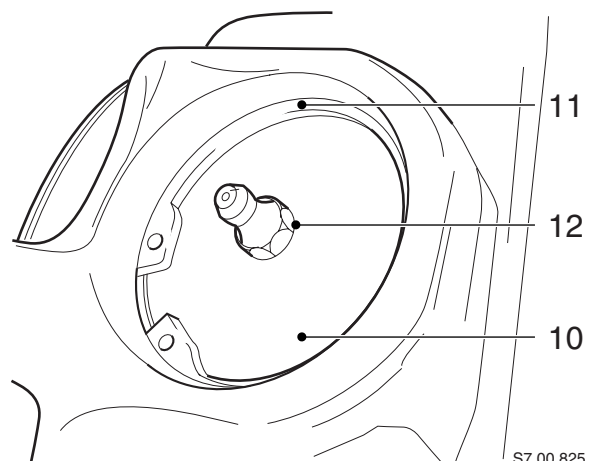
Removing the swivel axle

1. Remove the wheel hub unit.
2. Remove the track rod arm and, if necessary, the swivel axle steering cylinder.
3. Remove the angle sensor (2).
4. Remove the nut (3).



S7 00 790

5. Remove the circlip (11) from the swivel axle.
6. Remove the lubricating nipple (12) from the cover (10).
7. Turn an M8 x 1 bolt in the lubricating nipple hole. Remove the cover (10) using the bolt.



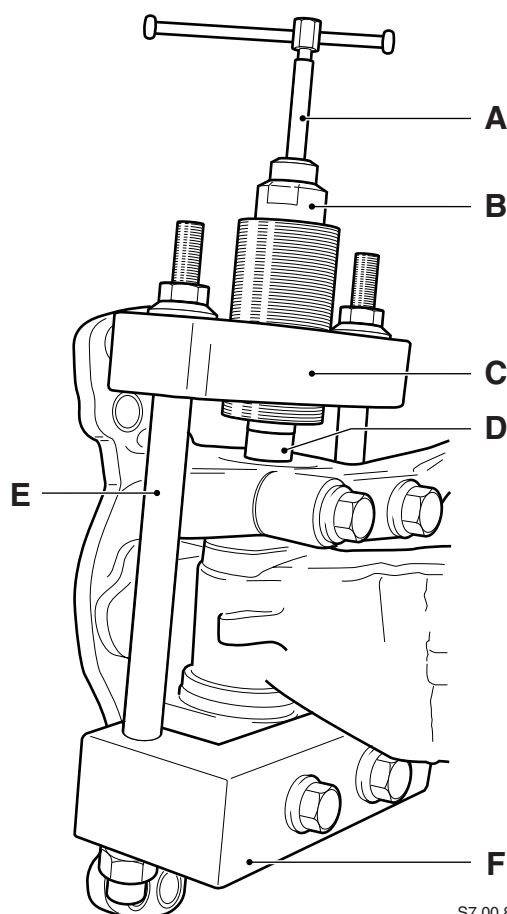
S7 00 825

8. Using the track rod attachment bolts, fit the attachment block (F), special tool (DAF no. 1453150), at the location of the track rod arm. Tighten the attachment bolts securely.
9. Screw the hydraulic puller (B), special tool (DAF no. 0535891), into the king pin puller (C), special tool (DAF no. 1453127).
10. Fit the tie rods (E), special tool (DAF no. 1453150), into the attachment block (F).
11. Place the pivot (D), special tool (DAF no. 0694919) on the king pin.
12. Fit the king pin puller to the king pin. Align the king pin puller at the top of the pivot (D). Tighten the nuts at the top of the tie rods (E).
13. Screw out the spindle (A) of the hydraulic puller (B) as far as possible.
14. Use a spanner to screw the hydraulic puller (B) into the king pin puller (C) as far as possible.
15. Screw the spindle (A) in until the king pin is released. If the king pin is not released after the spindle (A) is fully screwed in, the spindle (A) should be fully unscrewed and the hydraulic puller (B) screwed in further into the king pin puller (C). Then screw the spindle (A) back in.

Note:

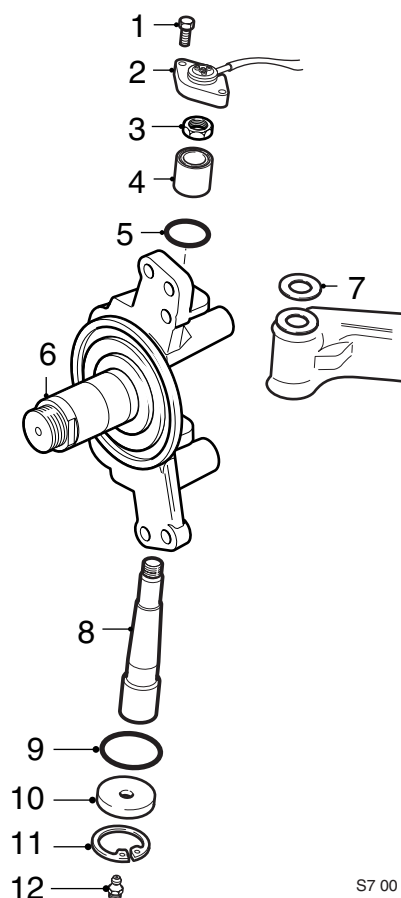
If the king pin is not released, it may be "knocked out". Tap with a hammer on the axle end stop which is not used.

16. Remove the king pin puller from the swivel axle.
17. Remove the special tool (F) from the swivel axle.



S7 00 821

18. Remove the king pin (8) from the swivel axle (6). Make sure that no needles fall out of the needle bearings.
19. Remove the bearing bush (4) from the swivel axle. Make sure that no needles fall out of the needle bearings.
20. Remove the swivel axle (6) from the axle end. Ensure that the adjusting ring (7) does not get lost.

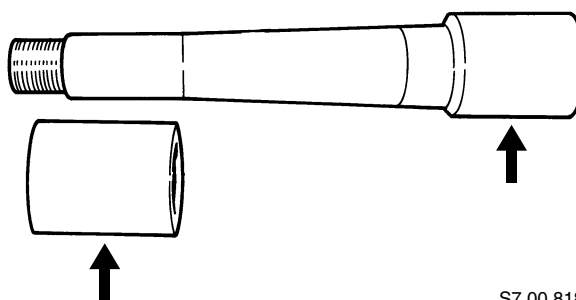


S7 00 790

Installation of swivel axle

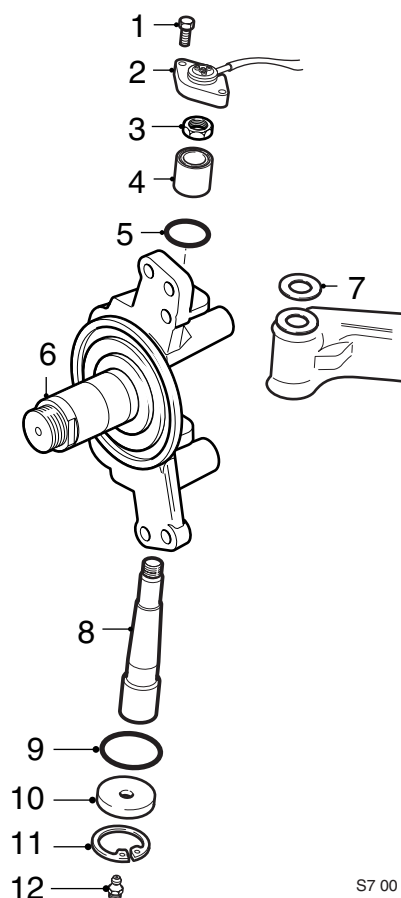
After a collision or when the camber angle is incorrect, the swivel axle should be magnaflux tested. If in doubt, always replace the swivel axle.

1. Check the condition of the needle bearings.
2. Check the bearing surfaces of the king pin (8) and the bearing bush (4) for grooves (see the arrows). A small needle puncture may be polished away using fine polishing paper. If in doubt, always replace the king pin (8) and the bearing bush (4).
3. Check the thrust bearing for wear.

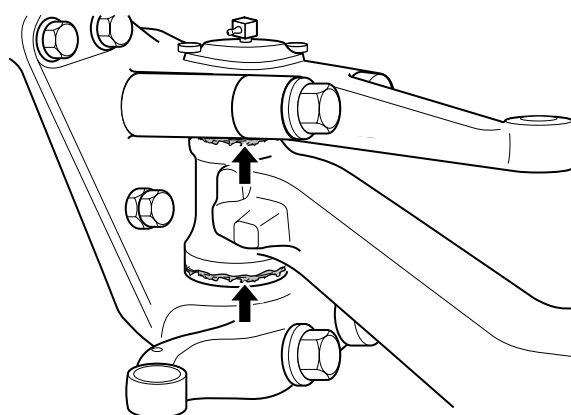


S7 00 818

4. Check the adjusting ring (7) for damage. If required, replace the adjusting ring (7).
5. Check the contact surfaces of the swivel axle adjusting ring (7) and the axle end for damage.
6. Fit the swivel axle (6) with a adjusting ring (7) of the same thickness as the original to the axle end.
7. Centre the adjusting ring (7) with a driver, ensuring that the needles are not pushed out of the bearings in the process.
8. Fit the bearing bush (4) with the tapered side pointing up in the needle bearings.
9. Remove grease from the tapered part of the king pin (8). Fit the king pin (8) in the swivel axle. Fit the nut (3) and secure it.
10. Check the axial play of the swivel axle; see 'Inspection and adjustment'.
11. Remove the nut (3). Apply locking compound to the screw thread of the king pin (8). See 'Technical data'. Fit the nut (3) and tighten the nut (3) specified torque. See 'Technical data'.
12. Install the O-ring (5).
13. Fit the angle sensor (2).
14. Fit the cover (10) which is fitted with a new O-ring (9).
15. Install the circlip (11).
16. Install the lubricating nipple (12).
17. Grease the swivel axle at the top and bottom. Check whether the grease has penetrated from the top between the axle end and the swivel axle. At the thrust bearing, the grease should be pressed out along the entire circumference between the sealing ring and the thrust bearing (see arrows in drawing).
18. Check that the swivel axle operates smoothly and is not getting stuck anywhere.
19. Install the track rod arm and the track rod.
20. If applicable, position the steering cylinder.
21. Fit the wheel hub unit.
22. Calibrate the angle sensor.



S7 00 790

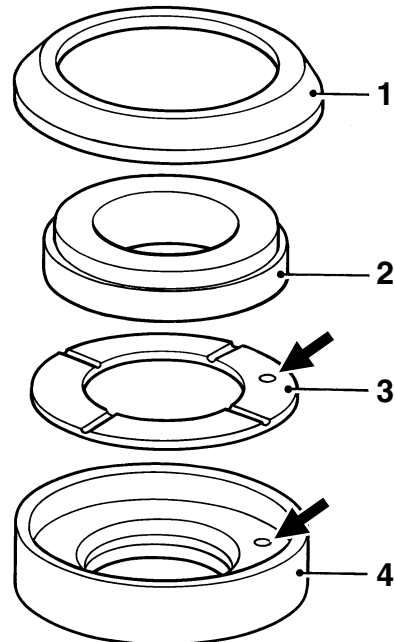


S7 00 545

3.6 REMOVAL AND INSTALLATION, THRUST BEARING, SPLIT VERSION

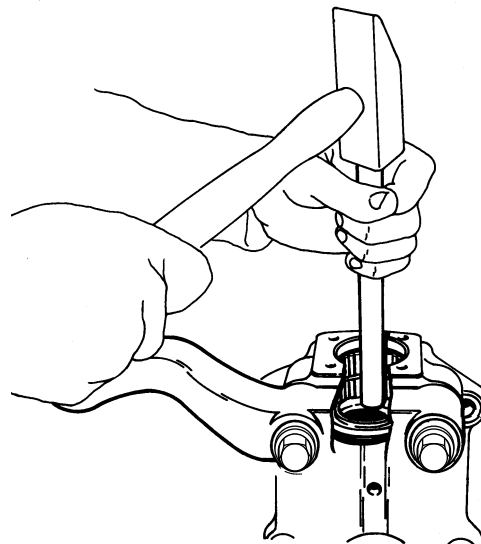
Removing the thrust bearing, split version

1. Remove the swivel axle from the axle end.
2. Remove the thrust washer (2) with the clamped-on sealing ring (1) and the bearing ring (3) from the shoulder ring (4).



S7 00 114

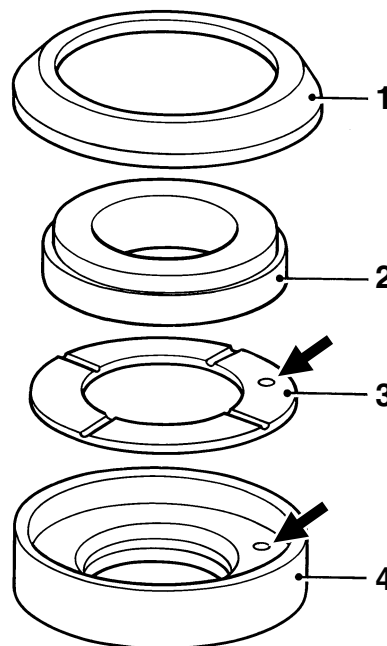
3. Tap the shoulder ring (4) out of the swivel axle using a driver. Make sure that no needles fall out of the needle bearings.



S7 00 551

Installation of thrust bearing, split version

1. Fit the shoulder ring (4) in the swivel axle using a press or a plastic mallet. Make sure that no needles fall out of the needle bearings.
2. Check that the shoulder ring (4) makes contact with the swivel axle in all places.
3. Fit the bearing ring (3) into the shoulder ring (4) without greasing it. Make sure that the bearing ring lug falls into the hole of the shoulder ring.
4. Fit the thrust washer (2) without the sealing ring (1) to the bearing ring (3).
5. Install the swivel axle (10) on the axle end and adjust the axial play using the correct shim. See 'Inspection and adjustment'.
6. After determining the correct shim (9), remove the swivel axle from the axle end.
7. Disassemble the thrust bearing and apply plenty of grease to the top side of bearing ring (3) (ribbed side with lubricating grooves).
8. Fit a new sealing ring (1) to the thrust washer (2). Make sure that the top of the seal (1) is positioned under the top of the thrust washer (2).
9. Place the thrust washer (2) on the bearing ring (3).
10. Fit the swivel axle with the correct shim on the axle end.

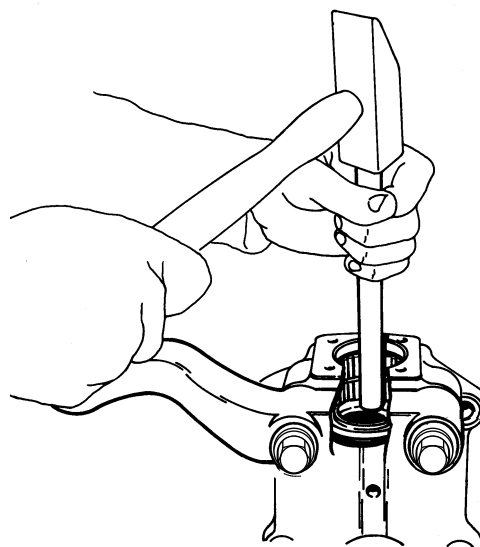


S7 00 114

3.7 REMOVAL AND INSTALLATION, THRUST BEARING, ASSEMBLED VERSION

Removing the thrust bearing, assembled version

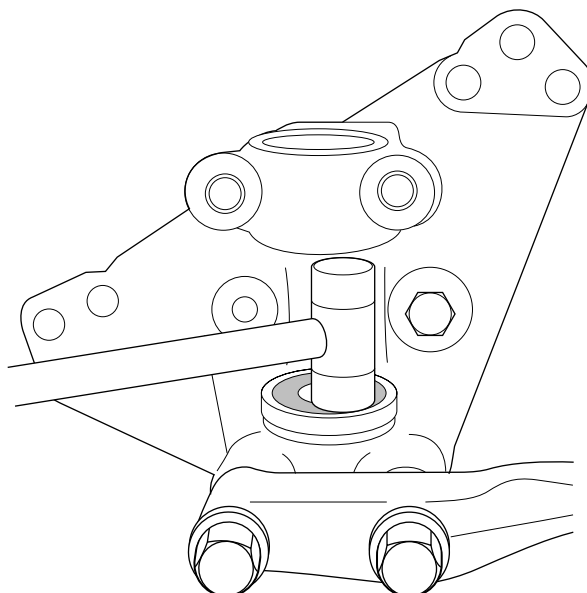
1. Remove the swivel axle from the axle end.
2. Tap the entire thrust bearing out of the swivel axle using a driver. Make sure that no needles fall from the needle bearings.



S7 00 551

Installing the thrust bearing, assembled version

1. Fit the thrust bearing in the swivel axle using a press or a plastic mallet. Make sure that no needles fall from the needle bearings.
2. Check that the thrust bearing makes contact in all places with the swivel axle.
3. Fit the swivel axle to the axle end.

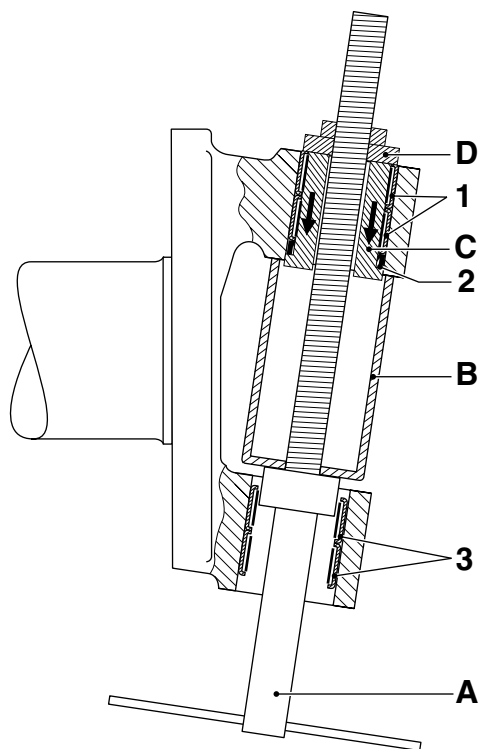


S7 00 553

3.8 REMOVAL AND INSTALLATION, NEEDLE BEARINGS

Removing the needle bearings

1. Remove the swivel axle from the axle end.
2. Remove the thrust bearing
3. Use the needle bearing puller, special tool (DAF no. 0694827), to remove the needle bearings.
For 182N and 186N axles the additional set, special tool (DAF no. 0694937), should be fitted to the needle bearing puller. The additional set consists of a bush (C) and a thrust piece (D).
4. Insert the bush (C) in the needle bearings (1).
5. Place the sleeve (B) on the swivel axle ear.
6. Fit the threaded end (A) into the sleeve (B) and through bush (C).
7. Screw the thrust piece (D) on the threaded spindle, until it abuts bush C.
8. Pull the needle bearings from the outside to the inside of the swivel axle (see the arrows in the drawing). When the needle bearings (1) are removed from the swivel axle, the oil seal (2) will also be removed.
9. The lowest needle bearings (3) are removed from the swivel axle in the same way (from the outside to the inside).



Installation of needle bearings

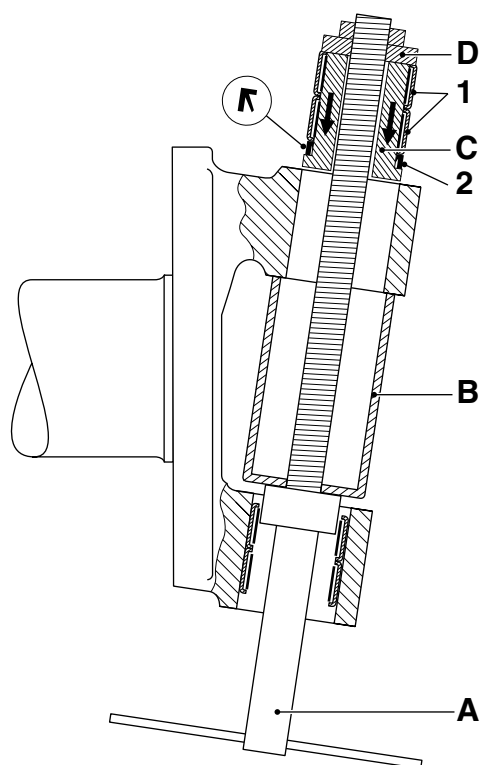
1. To prevent the needle bearings from becoming damaged while being inserted, use special tool (DAF no. 0694827).
For the 182N and 186N axles, the special tool must be supplemented with special tool (DAF no. 0694937).

Note:

The needle bearings have different lengths. The longest needle bearings must be fitted in the lowest part of the swivel axle.

2. Apply plenty of grease to the needle bearings.

3. To fit the needle bearings in the upper side of the swivel axle, work in the following manner:
Fit the oil seal (2) with the open side next to the bush collar pointing towards the bush (C).
Fit both needle bearings (1) to the bush (C).
4. Assemble the special tool (DAF no. 0694827). Press the needle bearings from the outside to the inside into the swivel axle, in view of the bevelled sides of the swivel axle.



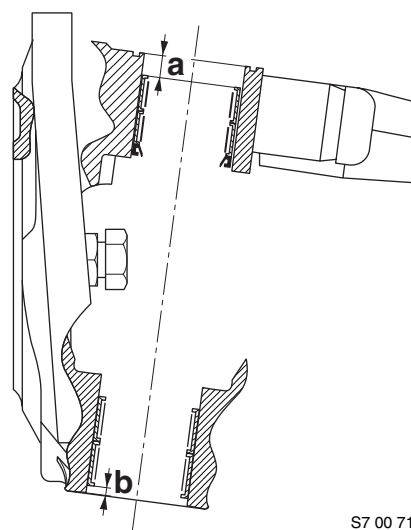
S7 00 548

5. Press the needle bearings into the swivel axle to the specified depth (a), see 'Technical data'.

Note:

The marked lines on the thrust piece (D) are not applicable.

6. The lowest needle bearings are fitted to the swivel axle in the same way (from the outside to the inside).
7. Press the needle bearings into the swivel axle to the specified depth (b), see 'Technical data'.
8. Fit the thrust bearing.
9. Fit the swivel axle to the axle end.



S7 00 710

