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1. STEERING GEAR, GENERAL

1.1 GENERAL

Steering box

Maximum system pressure	175 + 5 bar or 150 + 10 bar, see steering box type plate

Circulation pressure

Maximum permissible circulation pressure of the steering gear at a steering oil temperature of 50°C

- Steering box TAS 75, THP 80 and TAS 85	5 bar
- Steering box TAS 86	10 bar
- Steering box TAS 87	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

Steering box internal leaks

Maximum permissible internal leakage in the steering box

Steering box without slave cylinder	3.8 l/min.
Steering box with slave cylinder	5.7 l/min.

Steering box internal play

This is not more than 0.8 mm radial (sideways) play in any direction. So there is a total perceptible play of 1.6 mm at most, measured at the end of the input shaft.

Maximum permissible internal play of the steering box with a blocked pitman arm	4.5° at 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.

0

LUK VT77 steering pump
Steering pump output at a steering oil temperature of 50°C and a pressure of 50 bar

DAF No.	Output l/min.	
	Min.	Max.
123 9411	14.4	19.2
125 0867	22.5	30.0
126 0574	22.5	30.0
129 1226	18.0	24.0
129 1227	14.4	19.2
129 1228	22.5	30.0
129 1229	18.0	24.0
129 1230	22.5	30.0
130 1265	17.1	22.8
135 3356	22.5	30.0
135 3380	22.5	30.0
137 5507	17.1	22.8

2. STEERING BOX

2.1 GENERAL

Steering box

Design	automatic bleeding system, adjustable wheel-deflection limiting valves and pressure-limiting valve.
Type:	
- TAS 75 and THP 80	single-circuit steering box. Application: front axle 150N/152N.
- TAS 85	single-circuit steering box. Application: front axle 172N/182N/186N and with multiple steerable axles (either or not in combination with a slave cylinder).
- TAS 86	dual-circuit steering box without slave cylinder. Application: vehicles requiring an emergency steering gear.
- TAS 87	dual-circuit steering box with slave cylinder. Application: vehicles requiring an 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 80 bar
Pressure-limiting valve opening pressure (peak pressures)	200 bar

Internal steering box resistance

Internal resistance outside the pressure point (slip moment)	250 Ncm max.
Internal resistance increase in the pressure point	80 - 120 Ncm

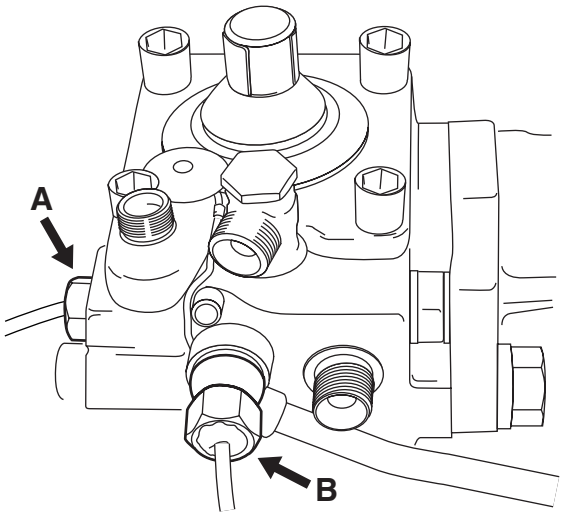
0

Pipe connections

Single-circuit steering box	
Connection P	delivery pipe
Connection R	return pipe
Steering box connection, top	slave cylinder, front(1)
Steering box connection, rear	slave cylinder, rear(1)
Dual-circuit steering box	
Connection P1	main steering pump delivery pipe
Connection P2	emergency steering pump delivery pipe
Connection R1	return pipe, circuit 1
Connection R2	return pipe, circuit 2
Connection C1	slave cylinder, front(1)
Connection C2	slave cylinder, rear(1)

(1) Viewed as if in driving direction

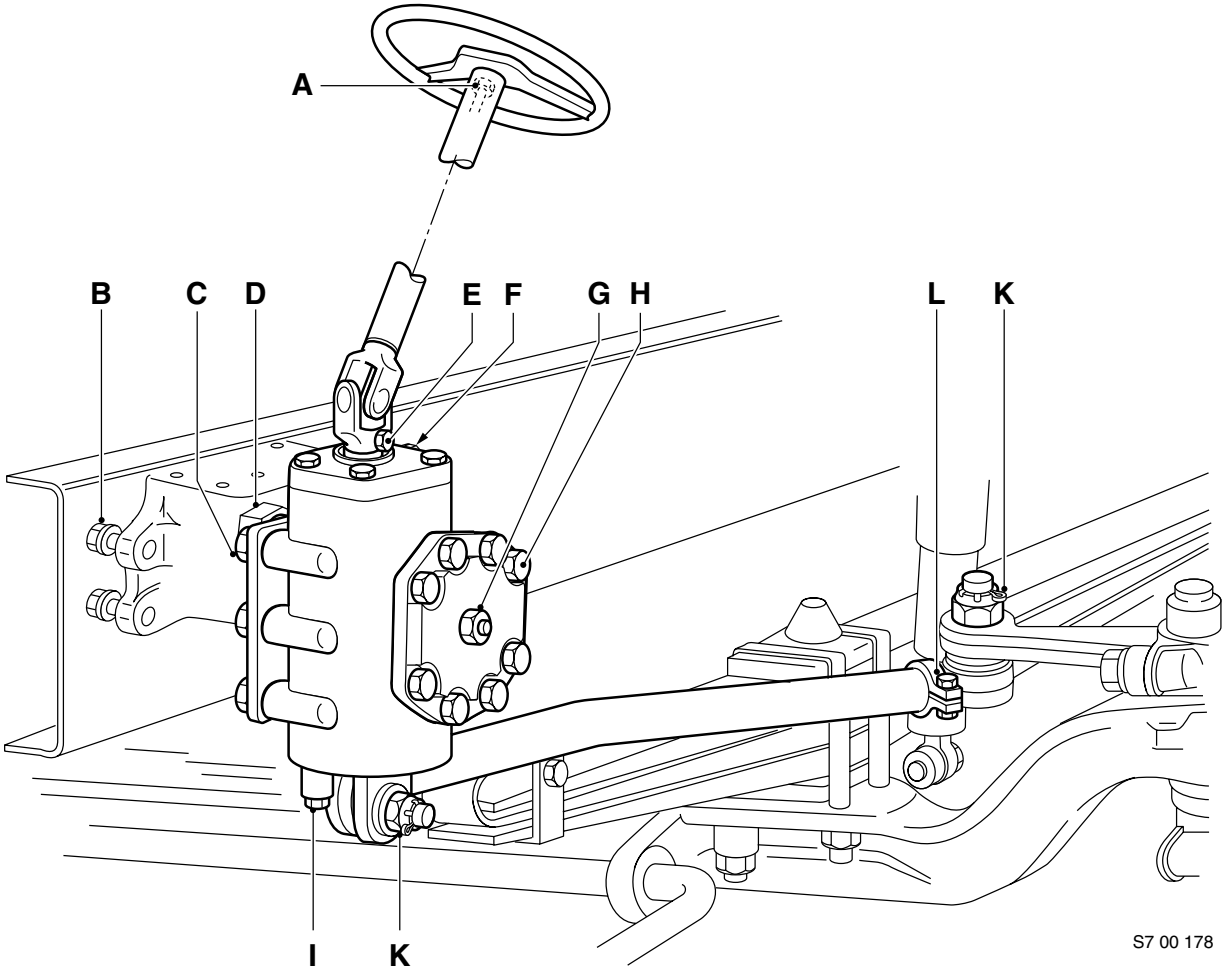
A. Output indicator circuit 1
B. Output indicator circuit 2



S7 00 441

2.2 TIGHTENING TORQUES

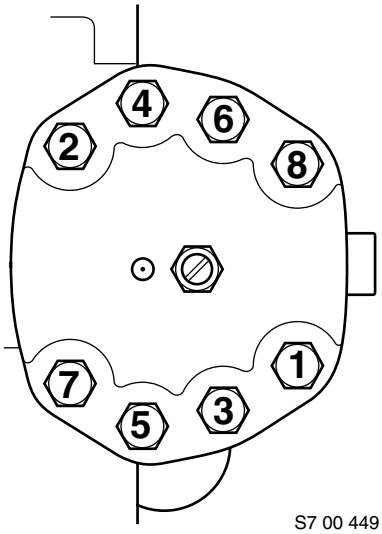
The tightening torques stated in this section are different from the standard tightening torques included in the overview of standard tightening torques. Any other threaded connections that are not specified must therefore be tightened to the tightening torque stated in the overview of standard tightening torques.
When attachment bolts and nuts are to be replaced, it is important that they are of exactly the same length and property class as the ones removed, unless stated otherwise.



A.	Steering wheel nut	65 Nm
B.	Bolts for attaching the steering bracket to the chassis	260 Nm + 60° angular displacement
C.	Bolts for attaching the steering box to the steering bracket	520 + 90° angular displacement(1)
D.	Pitman arm nut	900 Nm

0

E.	Attachment bolt, steering column universal joint	56 Nm(2)
F.	Pressure-limiting valve plug	41 Nm
G.	Lock nut for pressure-point adjusting bolt	60 Nm
H.	Steering box side cover attachment bolts	
	- if TAS 75/THP 80	180 Nm
	- if TAS 85/86/87	240 Nm
	Tightening sequence of attachment bolts on the side cover of the steering box. See illustration.	



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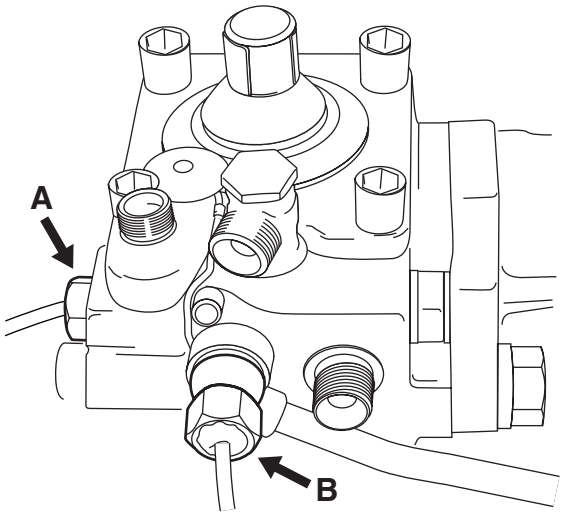
I.	Lock nut of wheel-deflection limiting valve adjusting bolt	50 Nm
K.	Steering rod nut	
	- if M20 castle nut	225 Nm(3)
	- if M24 castle nut	285 Nm(3)
	- if self-locking M20 nut	225 Nm(4)
	- if self-locking M24 nut	285 Nm(4)
M.	Bolt, steering rod clamping bracket	
	- if M10	47 Nm(5)
	- if M12	80 Nm(5)

(1) Only use new attachment bolts.
(2) Fit new original bolt and self-locking nut.
(3) Tighten until the split pin fits (max. 60°). It is not allowed to fit a self-locking nut instead of a castle nut.
(4) Check the thread of the ball end for damage before fitting a new self-locking nut to the ball end. Screw a new non-self locking nut onto the ball end by hand to check it. If the new non-self locking nut cannot be screwed down over the whole thread by hand, the ball end must be replaced. Fit new self-locking nut. Apply Loctite 243 to the nut.
(5) Fit new self-locking nut.

If a new self-locking nut is fitted to a ball end with a damaged thread, this can give rise to dangerous situations.

A.	Output indicator, circuit 1	50 Nm
B.	Output indicator, circuit 2	50 Nm



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3. STEERING PUMP

3.1 GENERAL

Main steering pump

Design	vane pump
Type	LUK VT77
Maximum pressure	see steering box type plate
(Pump does not have pressure-limiting valve.)	

Emergency steering pump

Design	radial plunger pump
Type	ZF 8604
Maximum pressure	see steering box type plate
Emergency steering pump output at a steering oil temperature of 50°C and a pressure of 50 bar	16 l/min.

3.2 TIGHTENING TORQUES

0

The tightening torques stated in this section are different from the standard tightening torques included in the overview of standard tightening torques. Any other threaded connections that are not specified must therefore be tightened to the tightening torque stated in the overview of standard tightening torques.
When attachment bolts and nuts are to be replaced, it is important that they are of exactly the same length and property class as the ones removed, unless stated otherwise.

LUK VT77 steering pump

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
Steering pump attachment bolts	
- M10, property class 8.8	46 Nm
- M10, property class 10.9	60 Nm

(1) Apply Loctite 243.

Emergency steering pump

Pump attachment bolts	
- M10, property class 8.8	46 Nm(1)
- M10, property class 10.9	80 Nm(1)
Drive sprocket attachment nut	60 Nm(1)

(1) Apply Loctite 243 to the nut or bolt.

4. PIPES/RESERVOIR AND STEERING CYLINDER

4.1 TIGHTENING TORQUES

The tightening torques stated in this section are different from the standard tightening torques included in the overview of standard tightening torques. Any other threaded connections that are not specified must therefore be tightened to the tightening torque stated in the overview of standard tightening torques.
When attachment bolts and nuts are to be replaced, it is important that they are of exactly the same length and property class as the ones removed, unless stated otherwise.

Ball end 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)
Clamping bracket bolt	
- 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 thread of the ball end for damage before fitting a new self-locking nut to the ball end. Screw a new non-self locking nut onto the ball end by hand to check it. If the new non-self locking nut cannot be screwed down over the whole thread by hand, the ball end must be replaced. Fit new self-locking nut. Apply Loctite 243 to the nut.
(3) Fit new self-locking nut.

If a new self-locking nut is fitted to a ball end with a damaged thread, this can give rise to dangerous situations.

0

5. STEERING COLUMN

5.1 TIGHTENING TORQUES

The tightening torques stated in this section are different from the standard tightening torques included in the overview of standard tightening torques. Any other threaded connections that are not specified must therefore be tightened to the tightening torque stated in the overview of standard tightening torques.
When attachment bolts and nuts are to be replaced, it is important that they are of exactly the same length and property class as the ones removed, unless stated otherwise.

Steering wheel attachment nut	65 Nm
Attachment bolt, steering column universal joint	56 Nm(1)

(1) Fit new original bolt and self-locking nut.

0

6. FRONT AXLE(S), LEADING REAR AXLE AND STEERED TRAILING SWIVEL AXLE

6.1 GENERAL

Front axles

Type:

- 150N(1) : load capacity 7500 kg
- 152N : load capacity 7500 kg
- 172N : load capacity 8500 kg
- 182N(2) : load capacity 9000 kg
- 186N : load capacity 9000 kg

Remarks

(1) The axle housing of the 150N axle is longer than the axle housing of the 152N axle.
For the rest, both axles are identical.

(2) The axle housing of the 182N axle is longer than the axle housing of the 186N axle.
For the rest, both axles are identical.

Wheel speed sensor

Anti-corrosion agent — Molykote P37

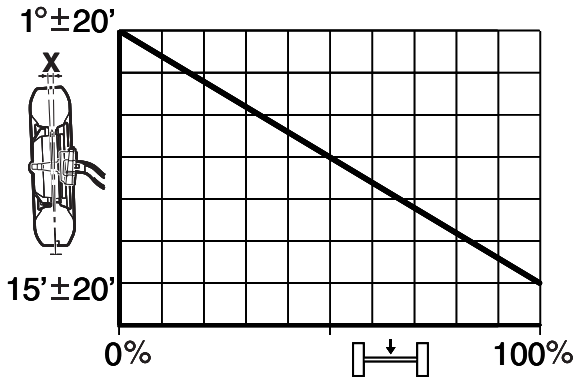
Steering rod arm

Abutting surface of steering rod arm to swivel axle treated with — Loctite 2701.

Camber angle

The 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 permissible axle load is reached.



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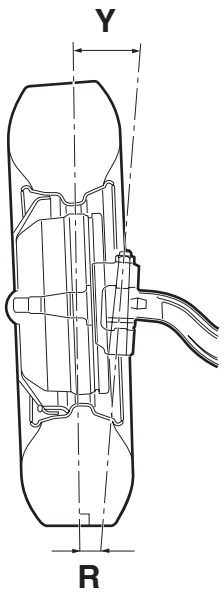
King-pin inclination

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

7°30’



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Maximum inner wheel deflection

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

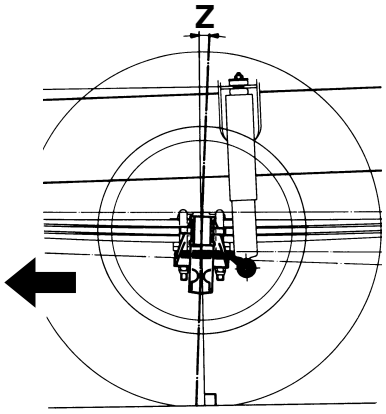
FRONT-AXLE TYPE: 152N		
Vehicle type	**Tyre size**	**Inner wheel deflection**
FT, FA, FTS/R, FAS/R, FTT, FAT	12.00 R24	43°
	Other	49°
FTG	All	43°
FTC, FAC, FTD, FAD	12.00 R24	38°
	385/65 R22.5	41°
	315/80 R22.5	43°
	13 R22.5	
	12.00 R20	
	Other	46°

FRONT-AXLE TYPE: 172N		
Vehicle type	**Tyre size**	**Inner wheel deflection**
FT, FA, FTS/R, FAS/R, FTT, FAT	12.00 R24	43°
	Other	49°
FTG	All	43°
FAD, FAC, FTD, FAD	12.00 R24	38°
	Other	43°

FRONT-AXLE TYPE: 182N/186N		
Vehicle type	**Tyre size**	**Inner wheel deflection**
FT, FA, FTG, FTS/R, FAS/R, FTT, FAT	All	43°
FTC, FAC, FTD, FAD	12.00 R24	38°
	Other	43°

Caster
Z = caster

Vehicle type	first axle	second axle
FTG	2°	0°
FAD/FAC	3°30’	3°30’
Other	2°	--



S7 00 423

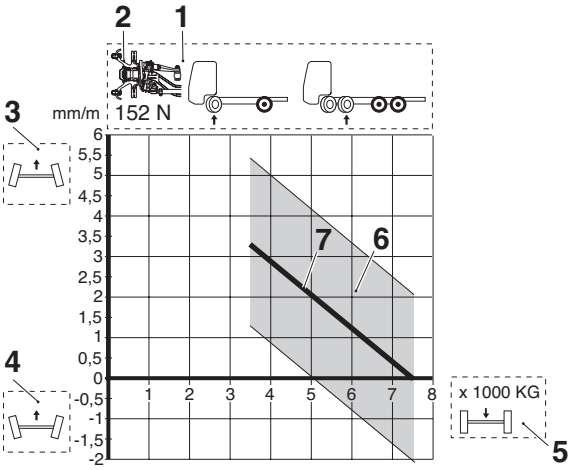
Toe
The track is shown per axle in a graph. For the 152N there is one more subdivision made on the basis of axle configuration. For the other axles, no differentiation in axle configuration is made. In the case of these axles, the axle configuration does not influence the track.

Note:
The graphs are constructed so that at 75% of the permissible loading weight, the track has a value of 0.5 ± 1 mm/m toe-in.
The axle load consists of the unloaded axle weight + loading weight.

0

Explanation of graph

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



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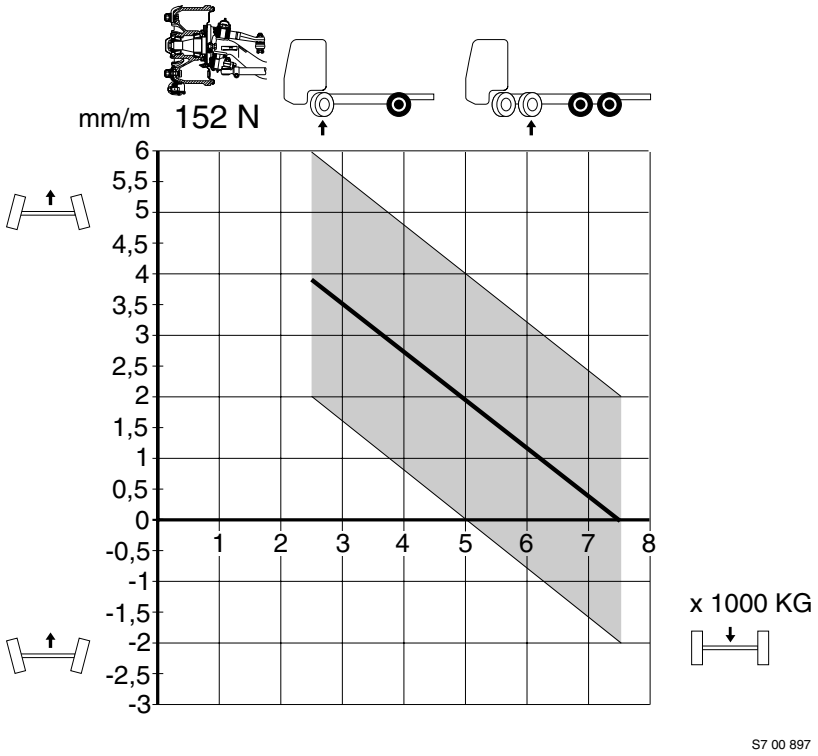
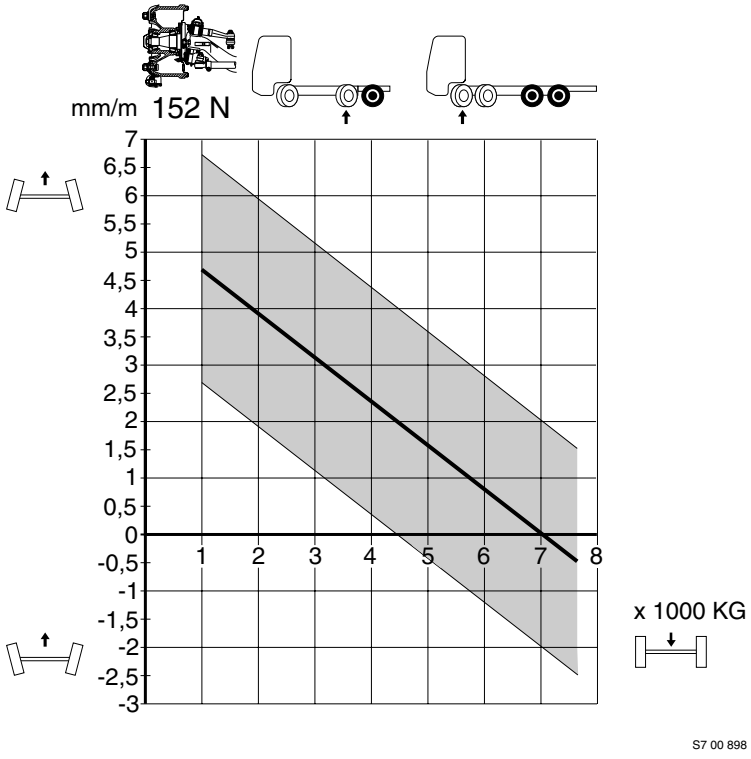
152N front axle track, configured as a single front axle or second front axle in the case of two steered front axles.



152N front axle track, configured as a leading rear axle or first front axle in the case of two steered front axles.



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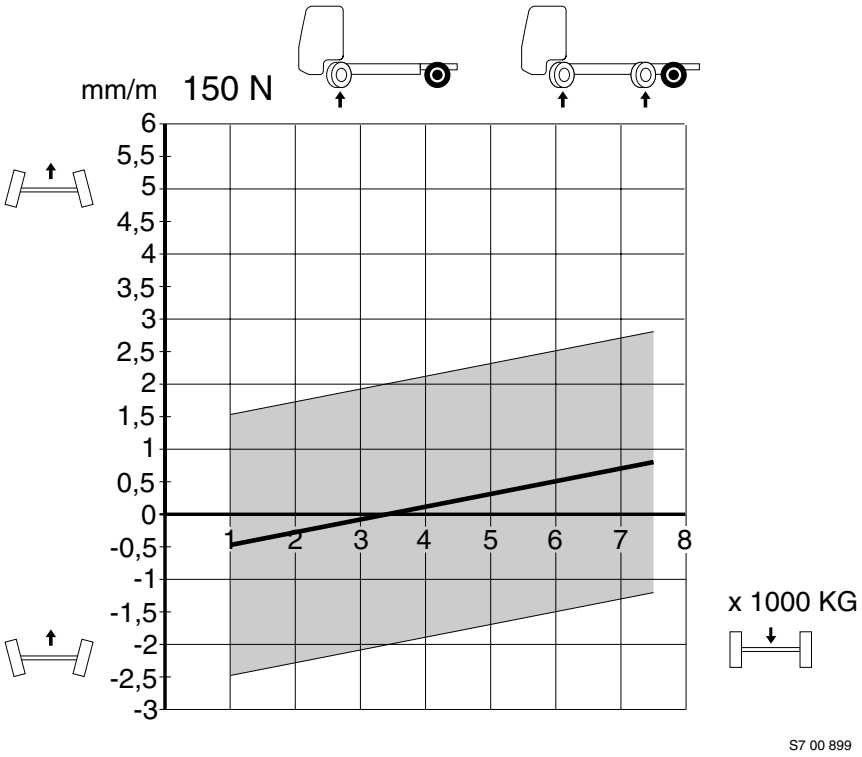
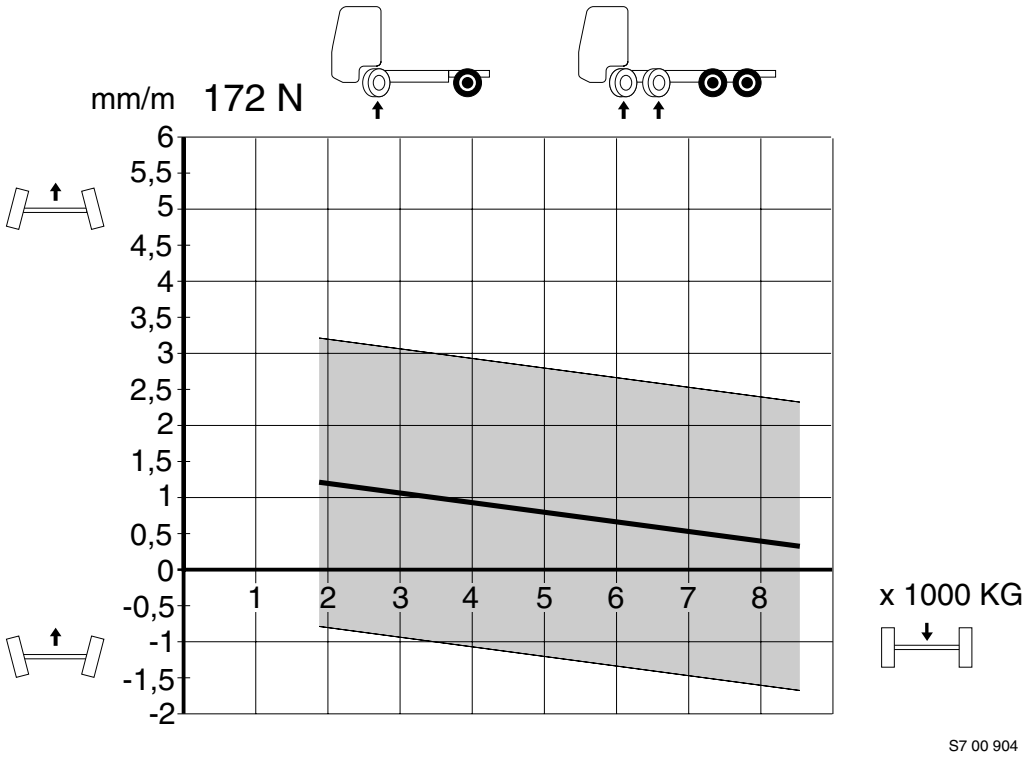
150N front axle track



172N front axle track



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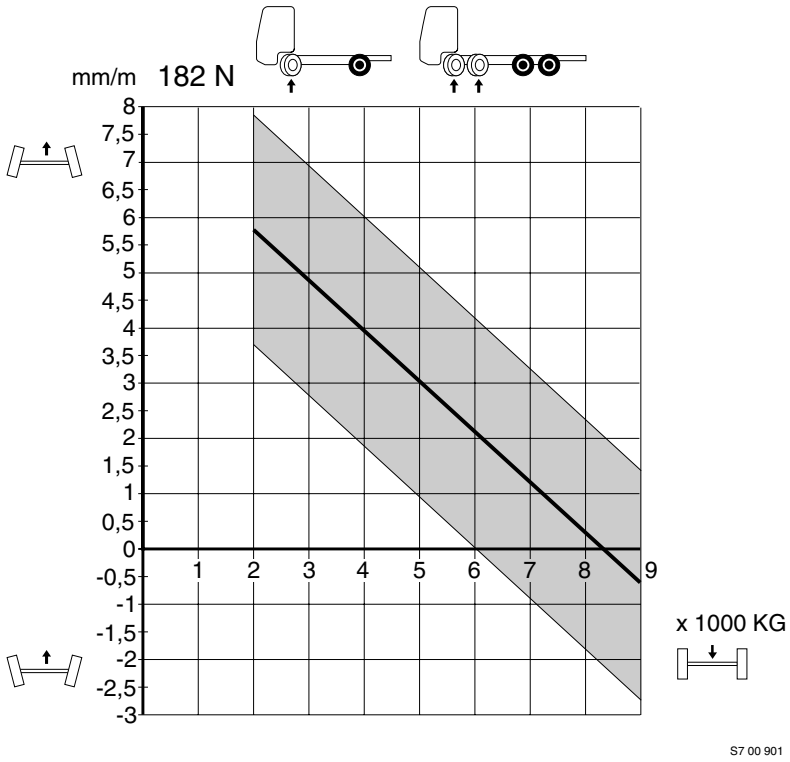
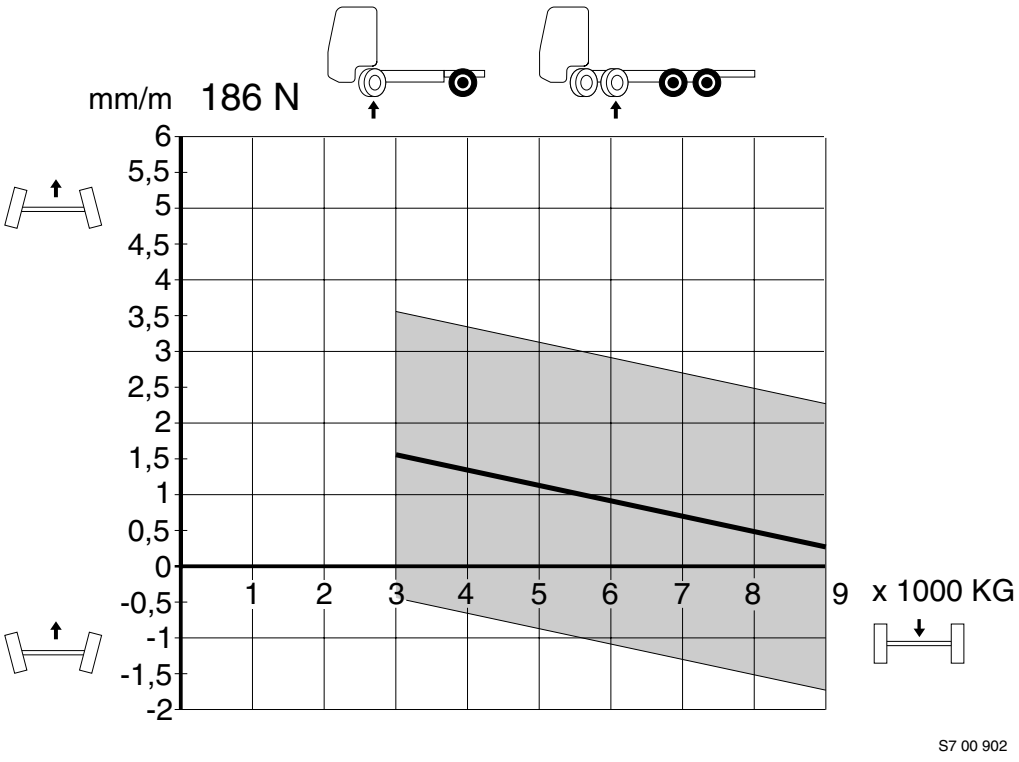
182N front axle track



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



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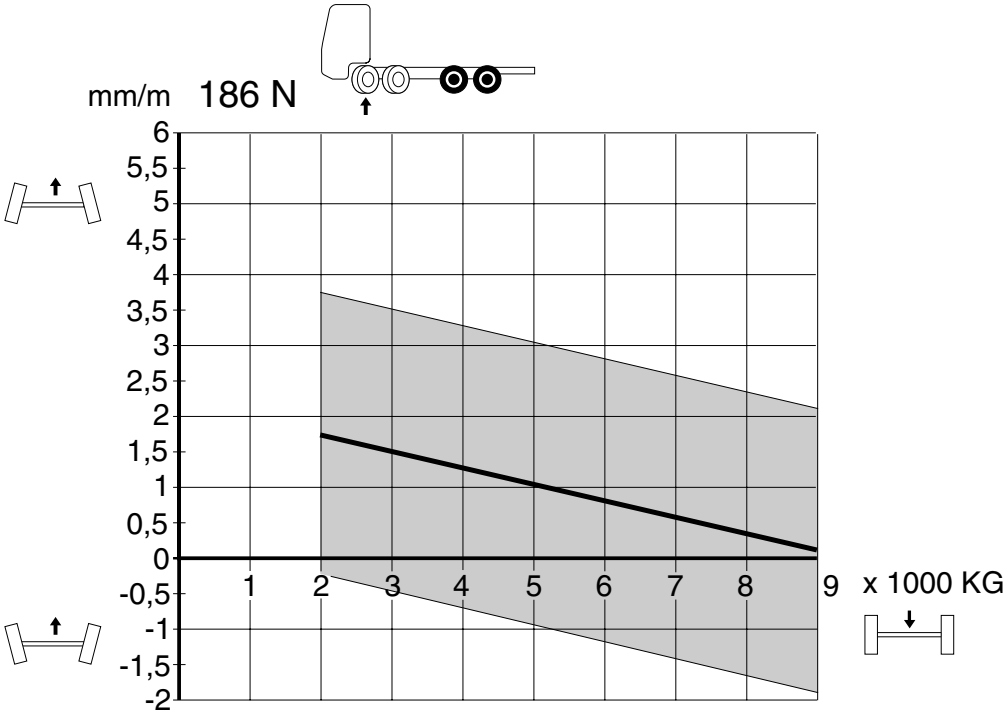
186N front axle track, configured as first front axle in the case of two steered axles.



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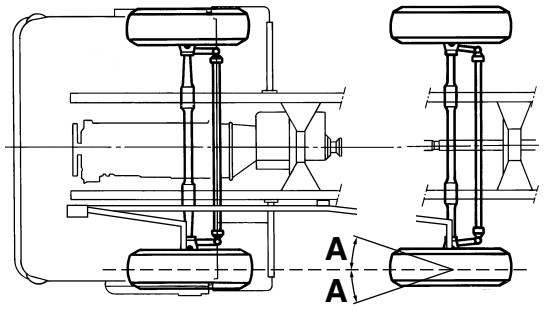
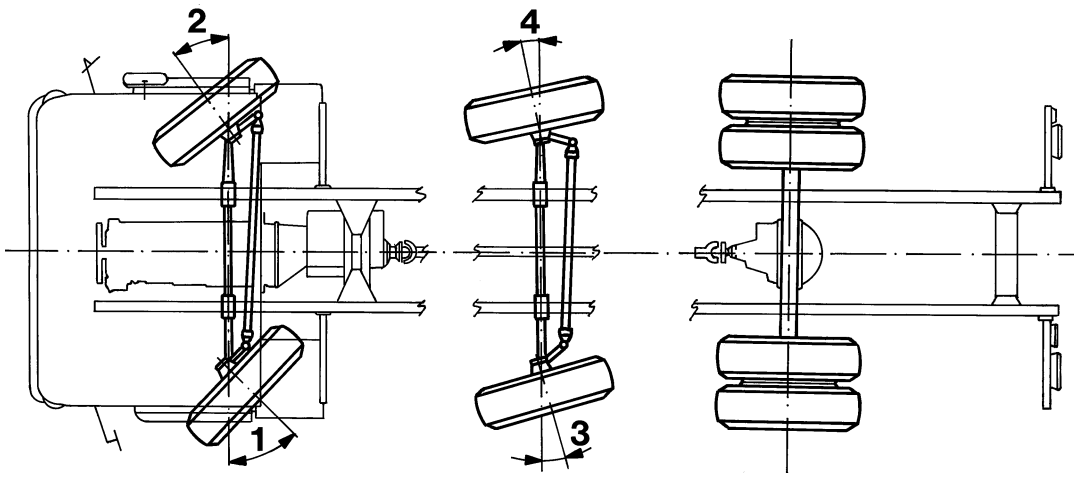
Alignment of steerable axles
Deviation in driving direction of the wheel of the second front axle or leading rear axle in relation to the front axle wheel:
- check value ± 3 mm/m (angles A).
- setting value ± 1 mm/m (angles A).

Measured on the left-hand wheels on a LHD vehicle.
Measured on the right-hand wheels on a RHD-vehicle.



S7 00 138

Check values for toe-out



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Single front axle

Front axle	Wheel base	Wheel 1	Wheel 2
150N	< 4.40 m	30°	25°
150N	> 4.40 m	30°	26°
152N	< 4.40 m	30°	25°
152N	> 4.40 m	30°	26°
172N	< 4.50 m	30°	25°
172N	> 4.50 m	30°	26°
182N	< 4.50 m	30°	25°
182N	> 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°
FAD/FAC	4.30 m	30°	26°	21°	19°
FAD/FAC	5.00 m	30°	26°	21°	19°
FAD/FAC	5.70 m	30°	26°	22°	20°
FAD/FAC	6.40 m	30°	26°	24°	21°
FAD/FAC	7.10 m	30°	26°	24°	21°

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

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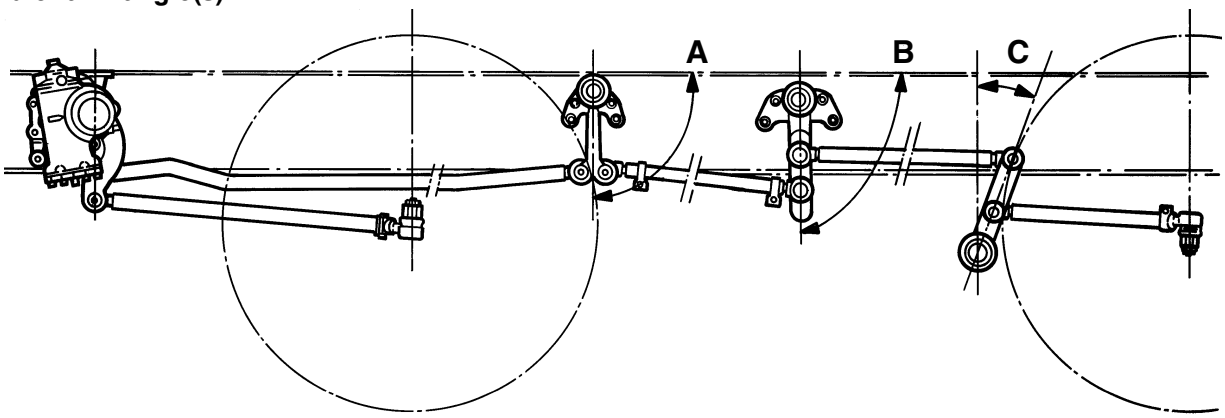
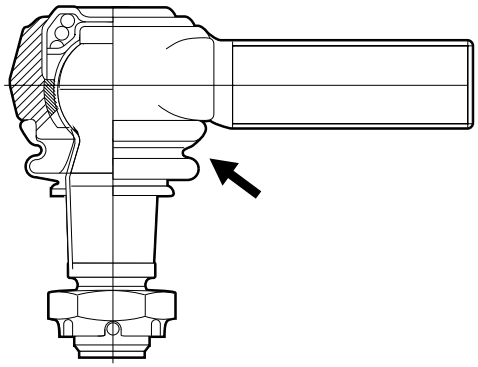
Idler arm angle(s)



S7 00 130

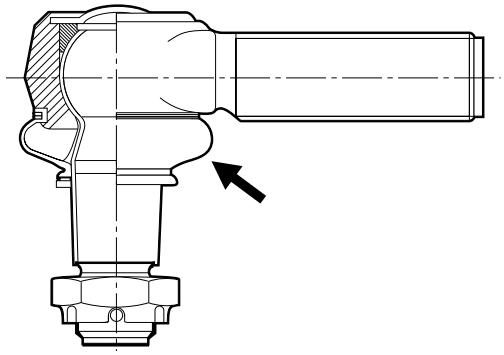
Angle A: 90°
Angle B: 90°
Angle C: 20°

Steering ball joints
Steering ball joint with constricted dust cover
axial play: max. 1.5 mm



S7 00 407

Steering ball joint with convex dust cover
axial play: max. 1.5 mm



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Wheel bearings

Play	0.025 - 0.250 mm

Swivel axle

Axial play	0.05 - 0.30 mm
List of shim sizes (thickness) for adjusting swivel axle play	1.75 mm 1.88 mm 2.00 mm 2.13 mm 2.25 mm 2.38 mm

Idler arm

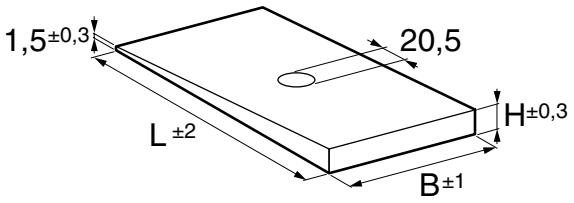
Axial bearing play	0 - 0.1 mm

Wheel speed sensor ring

Axial end play	max. 0.2 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
0.5°	98	170	2.98
1°	98	170	4.46
1.5°	98	170	5.95
2°	98	170	7.43
2.5°	98	170	8.92
3°	98	170	10.40



S7 00 107

Note:
(1) Spring leaf width

6.2 TIGHTENING TORQUES

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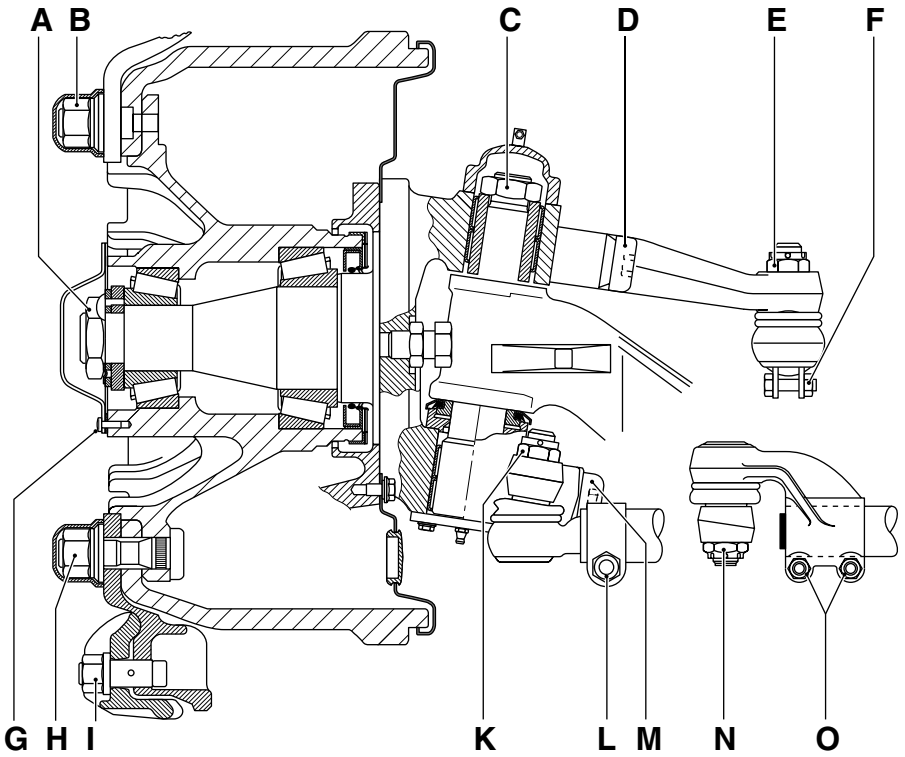
The tightening torques stated in this section are different from the standard tightening torques included in the overview of standard tightening torques. Any other threaded connections that are not specified must therefore be tightened to the tightening torque stated in the overview of standard tightening torques.
When attachment bolts and nuts are to be replaced, it is important that they are of exactly the same length and property class as the ones removed, unless stated otherwise.



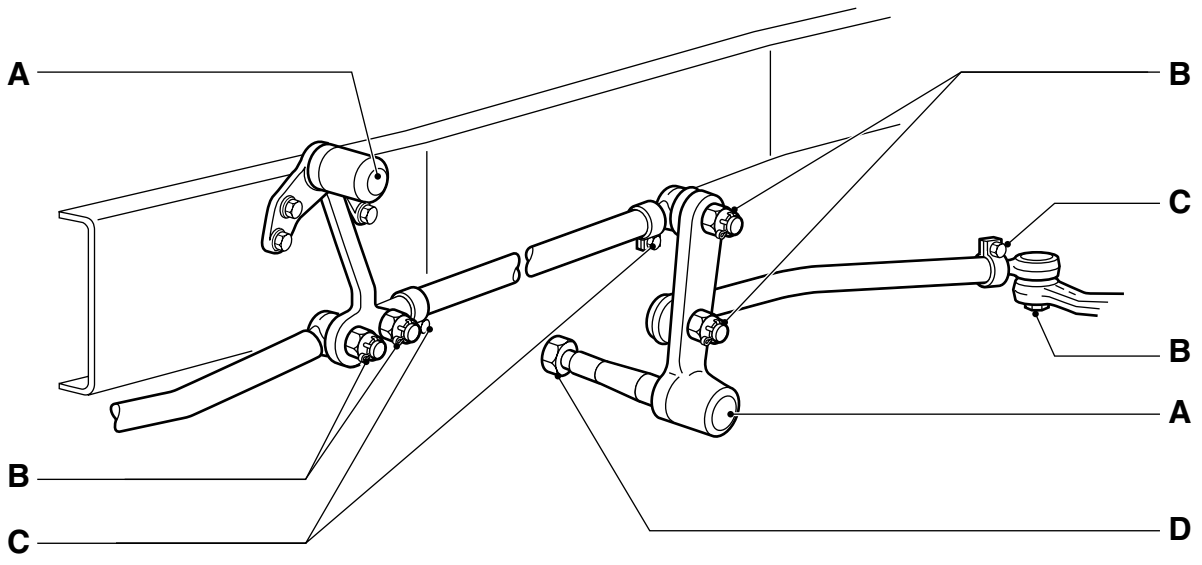
A.	Wheel hub lock nut	210 Nm
B.	Wheel nut	700 Nm(1)
C.	King-pin nut	
	- if M27 (150N/152N)	595 Nm(2)
	- if M33 (172N/182N/186N)	660 Nm(2)
D.	Steering-rod arm attachment bolt	500 Nm + 90° angular displacement(3)
E.	Steering-rod nut	
	- if M20 castle nut	225 Nm(4)
	- if M24 castle nut	285 Nm(4)
	- if self-locking M20 nut	225 Nm(5)
	- if self-locking M24 nut	285 Nm(5)

F.	Bolt, steering rod clamping bracket	
	- if M10	47 Nm(6)
	- if M12	80 Nm(6)
G.	Wheel hub bolt	8.6 Nm
H.	Trilex mounting ring nut	700 Nm(1)
I.	M20 nut (Trilex/Tublex wheel)	335 Nm(1)
K.	Track-rod nut	
	- if M20 castle nut	210 Nm(4)
	- if M24 castle nut	260 Nm(4)
	- if self-locking M20 nut	225 Nm(5)
	- if self-locking M24 nut	285 Nm(5)
L.	Bolt, track rod clamping bracket	
	- if M12	80 Nm(6)
	- if M14	170 Nm(6)
M.	Track rod arm attachment bolt	500 Nm + 90° angular displacement(3)
N.	Track-rod nut	
	- if M20 castle nut	210 Nm(4)
	- if M24 castle nut	260 Nm(4)
	- if self-locking M20 nut	225 Nm(5)
	- if self-locking M24 nut	285 Nm(5)
O.	Bolt, track rod clamping bracket	
	- if M12	80 Nm(6)
	- if M14	170 Nm(6)

Remarks

(1) Retighten after 100 km; if new wheel studs have been fitted, the wheels need additional retightening after 500 km.
(2) Apply Loctite 243 to the nut.
(3) Fit new attachment bolts. Apply Loctite 243 to the attachment bolts.
(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 thread of the ball end for damage before fitting a new self-locking nut to the ball end. Screw a new non-self locking nut onto the ball end by hand to check it. If the new non-self locking nut cannot be screwed down over the whole thread by hand, the ball end must be replaced. Fit new self-locking nut. Apply Loctite 243 to the nut.
(6) Fit new self-locking nut.

If a new self-locking nut is fitted to a ball end with a damaged thread, this can give rise to dangerous situations.



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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.	Idler-arm attachment nut	750 Nm

Remarks

(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 thread of the ball end for damage before fitting a new self-locking nut to the ball end. Screw a new non-self locking nut onto the ball end by hand to check it. If the new non-self locking nut cannot be screwed down over the whole thread by hand, the ball end must be replaced. Fit new self-locking nut. Apply Loctite 243 to the nut.

(3) Fit new self-locking nut.

If a new self-locking nut is fitted to a ball end with a damaged thread, this can give rise to dangerous situations.

CONTENTS

1

1. STEERING MECHANISM, GENERAL

1.1 FAULT-FINDING TABLE

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

1

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

FAULT: HEAVY STEERING, OCCASIONALLY	
Possible cause	**Remedy**
Semi-trailer coupling damaged or insufficiently lubricated.	Inspect/lubricate semi-trailer coupling.
Steering-oil level too low.	Check the steering-oil level. Top up oil and bleed the system. Check the system for leaks.
Air in the system.	Bleed the system. Check the steering oil for foaming.
Steering-oil line temporarily kinked or pinched off.	Check the routing of the steering-oil lines.
The supply opening in the reservoir is temporarily blocked.	Check the reservoir for impurities.
Steering-pump output too low because flow-control valve is jammed.	Check the smooth operation of the flow-control valve.
Low steering-pump output in “cold condition” and at low engine speed because the vanes jam in the rotor.	Check the pump output when the steering pump is “cold”. Replace the steering pump.
Excessive internal steering-box leakage at lower pressures.	Check the internal steering-box leakage at a preset pressure of 15 - 30 bar.

FAULT: 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 the maximum wheel deflection and if incorrectly set correct it.
Incorrect setting of wheel-deflection limiting valves.	Check the setting of the wheel-deflection limiting valves.
Axle load of steerable axle(s) too high.	Check the axle load(s). Adjust the load.
System pressure too low.	Check the maximum system pressure. Replace the pressure-limiting valve or the steering pump.
Incorrect steering-rod setting.	Check the steering-rod setting.
Pitman arm installed in the wrong position on the outgoing shaft of the steering box.	Check whether the position of the pitman arm on the sector shaft is correct, using the markings.
Wrong pitman arm installed on the steering box.	Check the part number of the pitman arm.
The sector shaft is installed at the wrong position in the steering box.	Put the 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.

1

FAULT: VEHICLE PULLS TO ONE SIDE	
Possible cause	**Remedy**
Differences in weight distribution causing misalignment of the vehicle.	Adjust the weight distribution.
Semi-trailer coupling insufficiently lubricated.	Lubricate the semi-trailer coupling.
Driving over transverse sloping roads.	When driving over transverse sloping 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 the tread depth between the tyres of the steerable axle(s).	Always fit tyres of the same type with the same 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.
Failure 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 the brakes. If required repair and readjust.
Misalignment of the universal joints of the steering column.	Check/adjust the position of the universal joints in relation to each other.
Incorrect setting of wheel-bearing play.	Check the wheel-bearing setting. Adjust the wheel-bearing play until correct.
Incorrect caster.	Check the caster. Adjust the caster until correct.
Incorrect camber angle.	Check the camber angle. Check the axle housing.
Incorrect alignment of steerable axles.	Check the alignment of the steerable axles. Adjust the steering rods until correct.
Incorrect alignment of the rear axle(s) or the trailer/semi-trailer.	Check the alignment of the rear axle(s) or the trailer/semi-trailer. Align the axles.

FAULT: VEHICLE PULLS TO ONE SIDE	
Possible cause	**Remedy**
Front-axle/rear-axle suspension play.	Check the suspension. Replace worn parts.
Difference in sagitta between the blade springs of one axle.	Measure the sagitta of the springs. Replace the springs.
Incorrect setting of air suspension. This will cause the vehicle to tilt.	Check the height adjustment. Set the height adjustment until correct.
Steering-pump output too high.	Check the pump output. Check the smooth operation of the flow-control valve.
Incorrect hydraulic central position of the steering box.	Check the hydraulic central position of the steering box. The hydraulic central position cannot be adjusted. Replace the steering box.

1

FAULT: VEHICLE IS SEARCHING, TRACKING INSTABILITY	
Possible cause	**Remedy**
Tyre pressure of steerable wheels too low.	Check the tyre pressure. Increase the tyre pressure to the specified value.
Semi-trailer coupling insufficiently lubricated or damaged.	Inspect/lubricate semi-trailer coupling.
Incorrect steering-box pressure-point setting; play at the pressure point or pressure point set too tight.	Check the pressure-point setting. Adjust the pressure point until correct.
Axle load of front axle too low.	Check the axle load and adjust the loading.
Incorrect toe-in.	Check the toe-in. Adjust the toe-in until correct.
Incorrect caster.	Check the caster. Adjust the caster until correct.
Incorrect alignment of second steerable axle.	Check the alignment of the second steerable axle. Adjust the alignment until correct.
Play in a universal joint or in the steering-column sliding joint. Tight universal joint.	Check the universal joints and the steering-column slide joint. Replace worn parts.
Misalignment of the universal joints in the steering column.	Check/adjust the position of the universal joints in relation to each other.
Play in the steering-rod ball joints.	Check the ball joints. Replace the ball joint.
Loose steering box, steering gear mounting or steering-rod attachment.	Check the attachments, retighten the bolts/nuts.
Worn or tight swivel-axle bearing.	Check the swivel-axle bearing. Replace worn parts.
Incorrect steering-rod setting; when the wheels are in the “straight ahead” position, the steering box is not in its mechanical central position (pressure point).	Check the steering-rod setting. Adjust the steering rod until correct.
Front-axle/rear-axle suspension play.	Check the axle suspension. Replace worn parts.

FAULT: VEHICLE IS SEARCHING, TRACKING INSTABILITY	
Possible cause	**Remedy**
Steering-pump output too high.	Check the steering-pump output. Check the smooth operation of the flow-control valve. If required, replace the steering pump.
Excessive internal steering-box resistance.	Check the internal steering-box resistance. Replace the steering box.
Internal defect in the steering box.	Replace the steering box.

1

FAULT: 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 the tyre pressure to the specified value.
Semi-trailer coupling insufficiently lubricated or damaged.	Inspect/lubricate semi-trailer coupling.
Misalignment of the universal joints of the steering column.	Check/adjust the position of the universal joints in relation to each other.
Axle load of front axle too low.	Check the axle load and adjust the loading.
Incorrect caster.	Check the caster. Adjust the caster until correct.
Tight universal joint or steering-column bearing.	Check the universal joints and the steering-column bearing. Replace worn parts.
Friction between mechanical parts of the steering mechanism (pitman arm, steering rod/steering arm or track rod/track-rod arm).	Check the mechanical parts of the steering mechanism.
Loose steering box or steering gear mounting.	Check the attachments, retighten the bolts.
Tight swivel-axle bearing.	Check the swivel-axle bearing.
Steering-pump output too high.	Check the pump output. Check the smooth operation of the flow-control valve. Replace the pump.
Pressure point set too tight.	Check the pressure-point setting. Adjust the pressure point until correct.
Excessive internal steering-box resistance.	Check the internal steering-box resistance. Replace the steering box.
Internal defect in the steering box.	Replace the steering box.

FAULT: CIRCUIT 1 WARNING LAMP STAYS LIT	
Possible cause	**Remedy**
Short circuit in the wire from the warning lamp to the output indicator.	Check/repair wiring.
Defective output indicator.	Remove the cover of the reservoir of circuit 1 and check, with the engine at idling speed, if oil is returned. When in doubt, check the main steering pump output. Replace the output indicator.
Circuit 1 oil level too low.	Check the oil level. Top up oil and bleed the system.
There is air in the system.	Bleed the system.
Steering-oil lines of circuit 1 kinked or pinched off.	Check/readjust the routing of the steering-oil lines.
Main steering-pump output too low.	Check the main steering-pump output. Replace the main steering pump.

FAULT: CIRCUIT 2 WARNING LAMP STAYS LIT	
Possible cause	**Remedy**
Short circuit in the wire from the warning lamp to the output indicator.	Check/repair wiring.
Defective output indicator.	Carry out the function test for the emergency steering mechanism. Replace the output indicator.
Circuit 2 oil level too low.	Check the oil level. Top up oil and bleed the system.
There is air in the system.	Bleed the system.
Steering-oil lines of circuit 2 kinked or pinched off.	Check/readjust the routing of the steering-oil lines.
Emergency steering-pump output too low.	Check the emergency steering-pump output. Replace the emergency steering pump.

1

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

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

FAULT: AIR IN THE STEERING OIL	
Possible cause	**Remedy**
Reservoir oil level too low.	Check the oil level. Top up oil. Check for leaks.
Poor sealing of the supply-line connections.	Check the connections. Replace the hose fitted with the hose clips.
Porous supply line.	Replace the hose fitted with the hose clips.
Poor internal sealing of the steering pump.	Replace the steering pump.

FAULT: STEERING-OIL LEAKAGE	
Possible cause	**Remedy**
Leaking delivery or return line. Leaking delivery or return line connection. Leaking reservoir connection line.	Check the lines and the line connections. Tighten lines securely. Replace the line.
Leaking reservoir.	Replace the reservoir.
Leaking steering pump.	Check the sealing of the pump housing at the main steering pump and the sealing of the plug at the rear of the steering pump. Check the 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.
Leaking steering box.	Check the following seals at the steering box: - input shaft sealing ring - sector-shaft oil seal in side cover (plastic plug) - side-cover gasket - valve body/cylinder - sector-shaft oil seal at pitman-arm side - various plugs - adjusting bolt wheel-deflection limiting valves Depending on the leak concerned, replace the input-shaft oil seal, the sector-shaft oil seals, the side-cover gasket, 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 by the specified grease (melting point $>130^{\circ}C$).

SOUND

Note:
The steering mechanism 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).

FAULT: STEERING PUMP PRODUCES A SQUEALING SOUND WHILE STEERING	
Possible cause	**Remedy**
Oil level too low, causing the steering pump to draw air.	Check the oil level. Top up oil and check for leaks.
Air in the steering oil.	Check the oil for the presence of air (foaming). Bleed the 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 the supply opening in the reservoir.

FAULT: 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 the steering pump. Replace the steering oil. Clean the reservoir and the lines. Replace the filter.

FAULT: WHEN STEERING THE SOUND OF METAL SCRAPING AGAINST METAL IS HEARD	
Possible cause	**Remedy**
Loose steering box, steering gear mounting or pitman arm.	Check the attachment of the components. Tighten the bolts to the specified tightening torque.
Play in a steering-rod or track-rod ball joint.	Check the ball joints. Replace the ball joint.
There is friction between the steering-mechanism components.	Turn the steering mechanism carefully from one stop to the other and check the mechanical part of the steering mechanism for friction.
Play of the steering-column sliding joint.	Check the sliding joint for wear. Replace the sliding joint.

CONTENTS

2

1. SAFETY INSTRUCTIONS

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

Repair and maintenance activities to the steering mechanism must only be carried out by experienced mechanics with sufficient training.

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 mechanism 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 mechanism such as the steering and track rods, steering and track arms, steering gear mounting, 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 when in doubt about their condition.

Components must only be replaced by DAF components.

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

Welding of steering-mechanism components is prohibited.

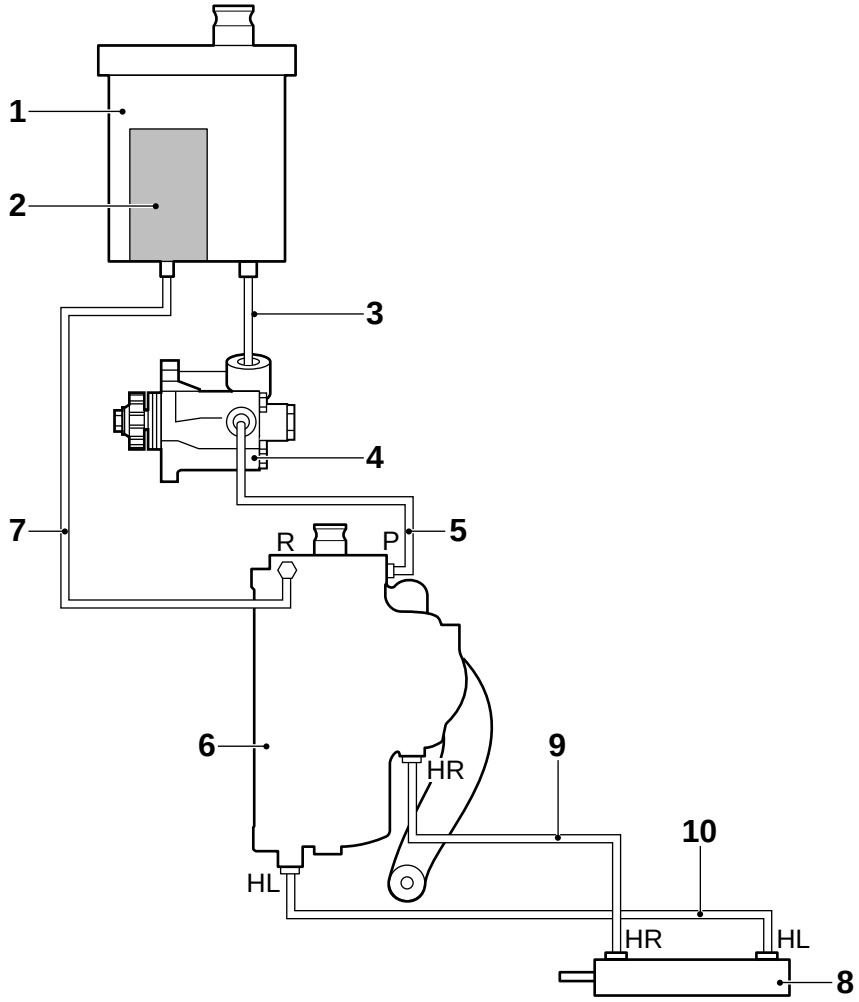
Straightening of steering-mechanism components is prohibited.

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

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

2. GENERAL

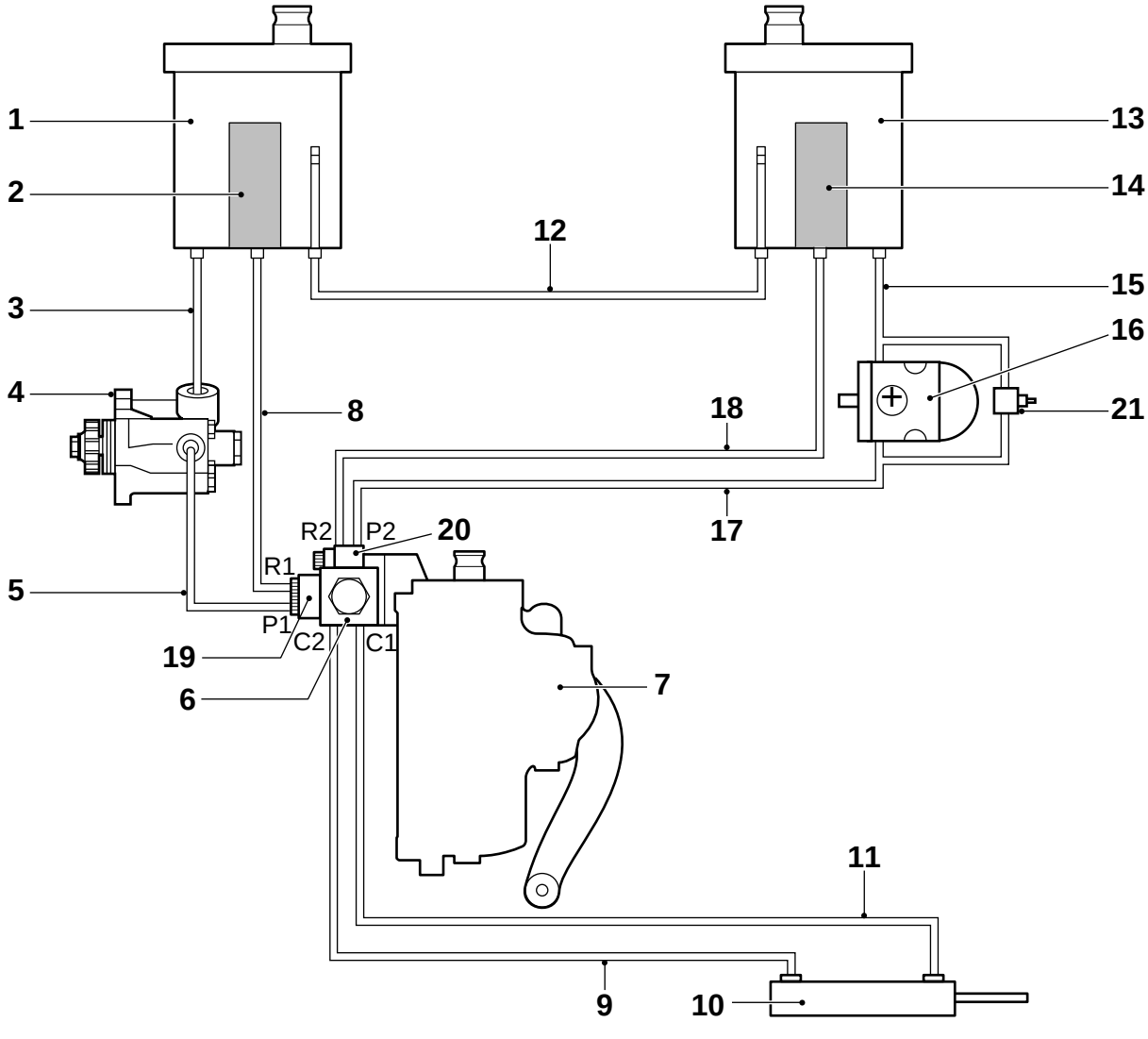
2.1 OVERVIEW DRAWING, ONE-CIRCUIT SYSTEM



1. Reservoir
2. Filter
3. Supply pipe
4. Steering pump
5. Delivery pipe
6. Steering box
7. Return pipe
8. Auxiliary cylinder (if present)
9. Auxiliary-cylinder lines
10. Auxiliary-cylinder lines

2

2.2 OVERVIEW DRAWING, TWO-CIRCUIT SYSTEM



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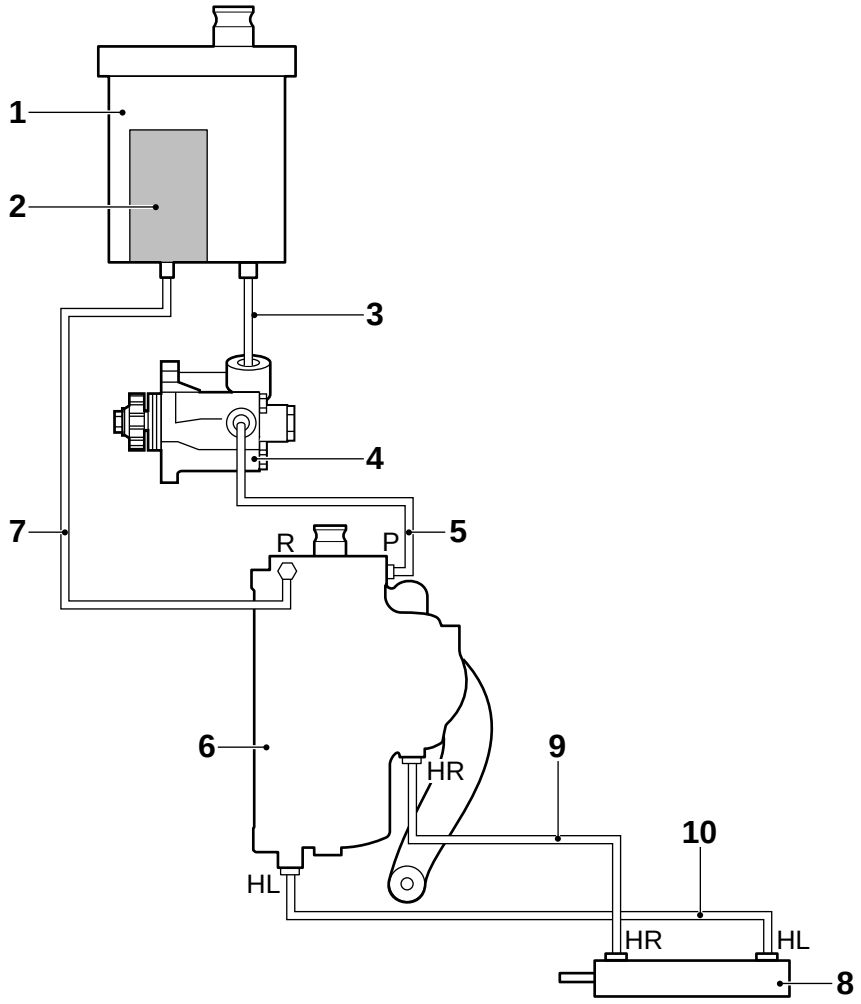
1. Main steering pump reservoir
2. Filter
3. Main steering pump supply line
4. Main steering pump
5. Main steering pump delivery line
6. Valve body
7. Steering box
8. Main steering pump return line
9. Auxiliary-cylinder line
10. Auxiliary cylinder
11. Auxiliary-cylinder line
12. Connection line reservoirs
13. Emergency steering pump reservoir
14. Filter
15. Emergency steering pump supply line
16. Emergency steering pump
17. Emergency steering pump delivery line
18. Emergency steering pump return line
19. Main steering pump output indicator
20. Emergency steering pump output indicator
21. Pressure limiting valve

2.3 SYSTEM DESCRIPTION, ONE-CIRCUIT SYSTEM



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From the reservoir (1) mounted over the steering pump (4) the oil flows through the supply line (3) to the steering pump (4).
The steering pump is a non-regenerative impeller-blade pump. When the pump is supplying oil, the steering pump (4) does become regenerative, thus causing a negative pressure in the supply line (3).
The steering pump (4) pumps the oil through the delivery line (5) to the steering box (6).

From the steering box (6) the oil is returned to the reservoir (1) through the return line (7). The return line always has a low pressure.
At a maximum pump output approx. $^{1}/_{3}$ of the oil is passed through the filter (2) and approx. $^{2}/_{3}$ of the oil is pumped to the reservoir (1).

The pressure in the delivery line (5) varies and depends on the steering force. If there is no steering action, the delivery line is at circulation pressure.
If a steering action takes place, the pressure in the delivery line can increase to the preset value of the pressure-relief valve.
This maximum pressure can occur when the vehicle is steered while at 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.

2

The steering pump is capable of generating a very high pressure in a short while (depending on the pump type up to approx. 300 bar). This very high pressure can cause certain steering-mechanism components to become overloaded or even to break off.
A pressure-limiting valve is intended to protect the steering mechanism 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.

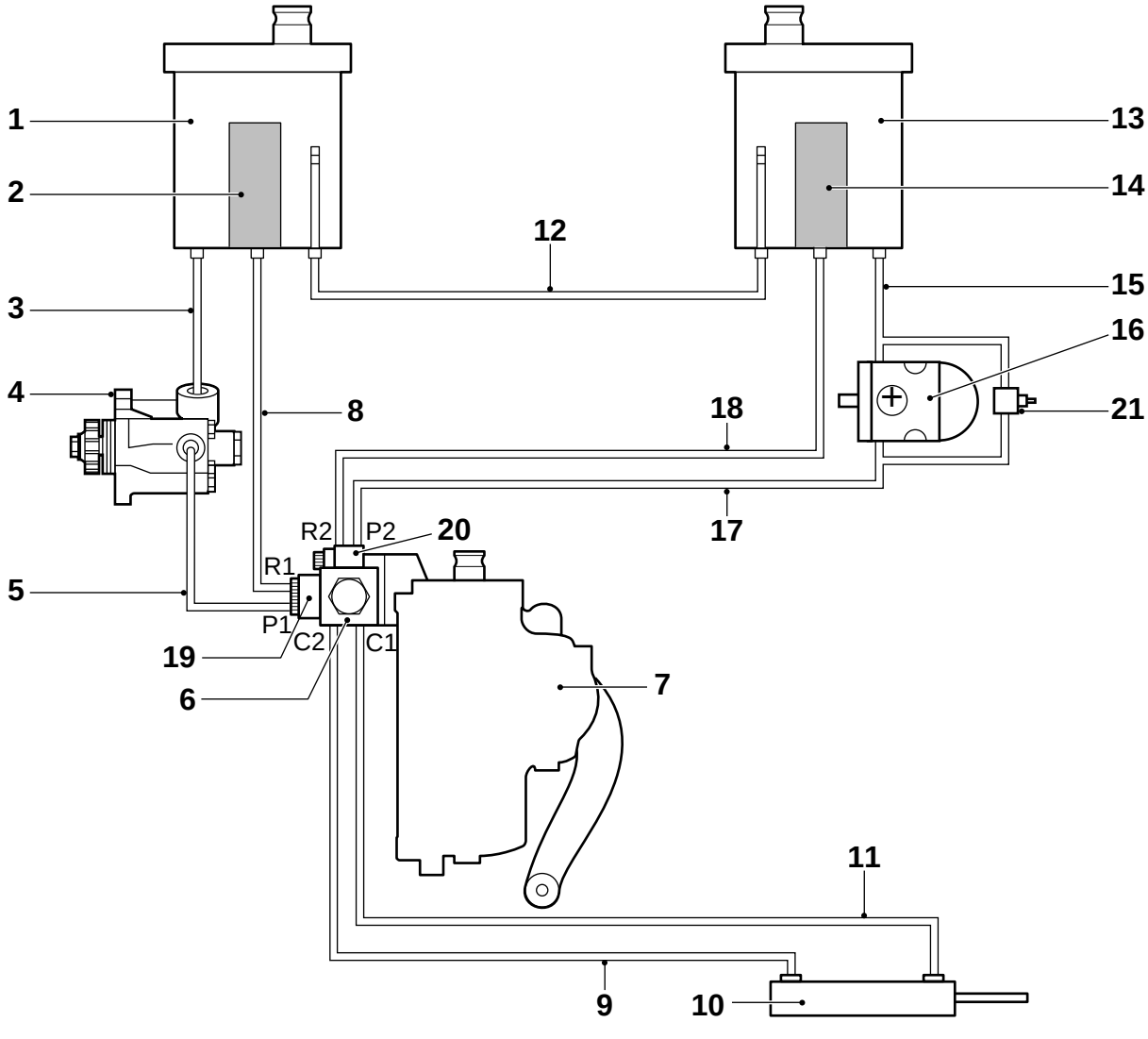
It can be very dangerous to replace the steering box or the steering pump by a different type without DAF's express permission. Such replacements are therefore prohibited. If the original type is no longer available, DAF will supply another approved type.

The steering mechanism can contain an auxiliary cylinder (8) for additional steering power. This auxiliary cylinder is located parallel to the steering-box cylinder and is supplied with oil through the steering box.

The steering box contains a suction valve.
In the case of mechanical steering when the steering pump has failed, the steering oil is drawn in through the suction valve. In this situation, the control valve is bypassed.
The suction valve prevents excessive underpressure in the steering box which would make mechanical steering very difficult.
The underpressure which is caused by the mechanical steering when the steering pump has failed, will open the suction valve. In that case the steering oil need not be drawn in by the control valve, which would result in considerable resistance.
When the steering pump is active, the system pressure keeps the suction valve closed.

2

2.4 SYSTEM DESCRIPTION, TWO-CIRCUIT SYSTEM



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During normal operation the engine-driven main steering pump (4) supplies oil to the dual-circuit valve (6) which is part of the steering box (7). The oil arrives at the steering box (7) through the dual-circuit valve (6). If an auxiliary cylinder (10) is connected, the dual-circuit valve (6) also controls the oil supply to the auxiliary cylinder.

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 (13) are interconnected by an overflow line (12). This line 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 two-circuit valve (6) adds the output of the emergency steering pump (16) to the remaining output of the main steering pump (4). The return line (8) of the main steering pump is also cut off.
The output of both pumps is returned to the emergency steering pump reservoir (13).
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 line (12).

The steering box is provided with an extra valve, which cuts off the oil supply to the auxiliary cylinder (10) and connects both lines (9) and (11) of the auxiliary cylinder when the output of the main steering pump is too low.

A detection switch (19) has been fitted in the dual-circuit valve (6). This switch is activated if the oil output of the main steering pump (4) becomes too low. The detection switch (19) activates the warning light of circuit 1 if the emergency steering pump (16) is activated.
The output indicator (20) for circuit 2 is fitted in the line connection P2 (emergency steering pump (16) delivery-line connection to dual-circuit valve).
If the output of emergency steering pump (16) is too low, the output indicator (20) activates the warning lamp of circuit 2.

Note:
If the vehicle is at standstill or driving very slowly, resulting in an output of the emergency steering pump which is zero or too low, the warning lamp of circuit 2 will light up.

A pressure-limiting valve (21) is fitted in the delivery line (17) of the emergency steering pump (16). 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 line (17) is connected with supply line (15).

3. INSPECTION AND ADJUSTMENT

3.1 INSPECTING THE STEERING MECHANISM USING A PRESSURE GAUGE

Note:
A quick check of the steering mechanism can be carried out using a pressure gauge. To this end the same pressure gauge can be used as was uses for the adjustment of the wheel-deflection limiting valves.
A pressure gauge allows you to carry out only a limited amount 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 mechanism should be diagnosed using the testing case.

Block the vehicle so that it cannot slide off the jack or the turning plates.
Be careful when fitting the 15 mm filler piece between the adjusting bolt and the axle stop, because this could result in limbs getting trapped.

Before the pressure gauge is connected:
1. Inspect the steering-box attachment.
2. Inspect the hydraulic central position.

Inspecting the steering mechanism using a pressure gauge

1. Connect the pressure gauge (DAF no. 0535653) to the T-piece in the delivery line.

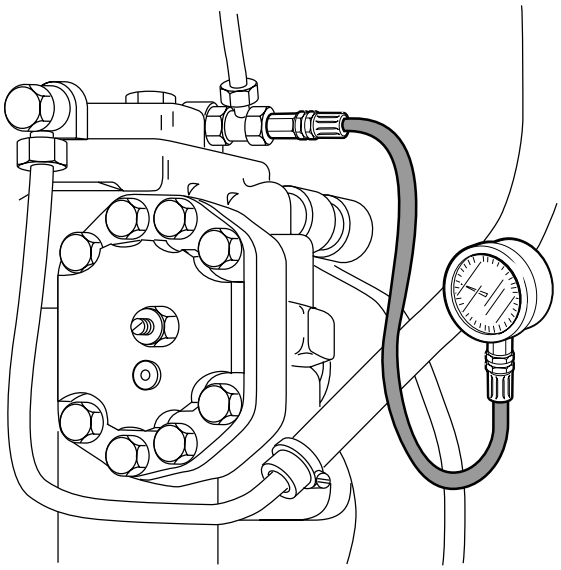
   Note:
   Later versions are not equipped with a T-piece. For these versions, a T-piece must be fitted in the delivery line.

   Make sure that the T-piece is connected as quickly as possible to prevent air from entering the system.
   Check the steering-oil level in the reservoir after connecting the T-piece and top up the oil if required.

2. Warm the steering oil as described below, until the hoses are hand warm at least.
   - Jack up the steerable axle(s).
   - Set the engine speed at 1200 - 1400 rpm.
   - Activate the steering mechanism 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.

3. Measure the circulation pressure.
   - Run the engine at idling speed.
   - Take the pressure-gauge reading. The circulation pressure depends on the steering-box type, see main group “Technical data”.

4. Front-axle inspection.
   - Run the engine at idling speed.
   - Place proper turning plates under the vehicle’s steerable wheels.
   - Turn the steering mechanism carefully from the central position to both maximum wheel deflections.
   - Take the pressure-gauge reading when activating the steering system.
   - The pressure should rise evenly.



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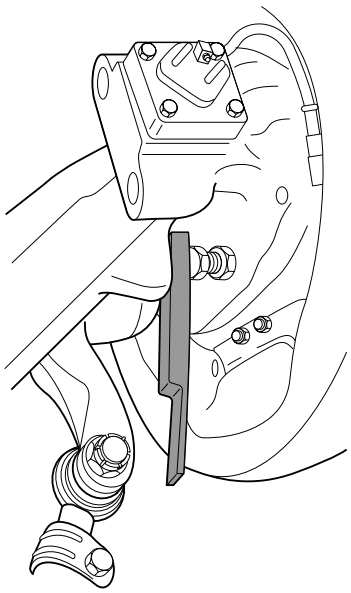
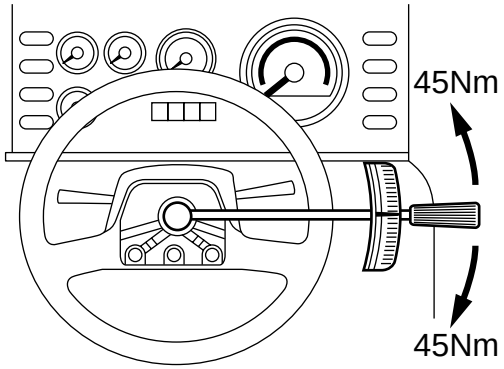
5. Test the maximum system pressure.
   - Run the engine at idling speed.
   - Activate the steering mechanism and fit a 15 mm filler piece, special tool (DAF no. 0535996), between the adjusting bolt and the axle stop.



S7 00 042

   - 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.
   - Take the maximum pressure reading on the pressure gauge (the maximum pressure should not be continued for more than 5 seconds). Compare the pressure reading with the specified value, see main group “Technical data”. If the measured value deviates more than 10% from the specified value, the cause should be identified using the test-equipment case.
   - Repeat the measurement using the 15 mm filler piece at the other side of the front axle.
   - Retighten the steering-wheel nut to the specified tightening torque, see main group “Technical data”.



S7 00 056

6. Remove the pressure gauge and the T-piece.

7. Check the steering-oil level in the reservoir after connecting the delivery line and top up the oil if required.

8. Bleed the system.

3.2 INSPECTING THE STEERING MECHANISM USING THE TEST-EQUIPMENT CASE

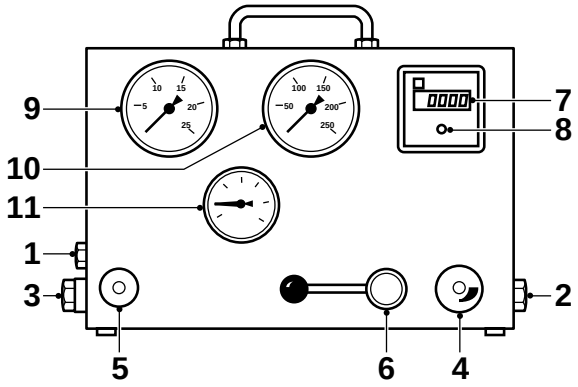
Note:
The test-equipment case makes it possible to:
- inspect the condition of the entire steering mechanism on a regular basis
- make a reliable diagnosis if the steering mechanism does not function properly.

2

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-equipment case "Servotest 550"
The inspection referred to below is carried out using the "Servotest 550" test-equipment case. It is also possible to inspect the steering mechanism using similar equipment, able to perform the same measurements as the "Servotest 550".
The test-equipment 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-equipment 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. Thermometer 0-120°C

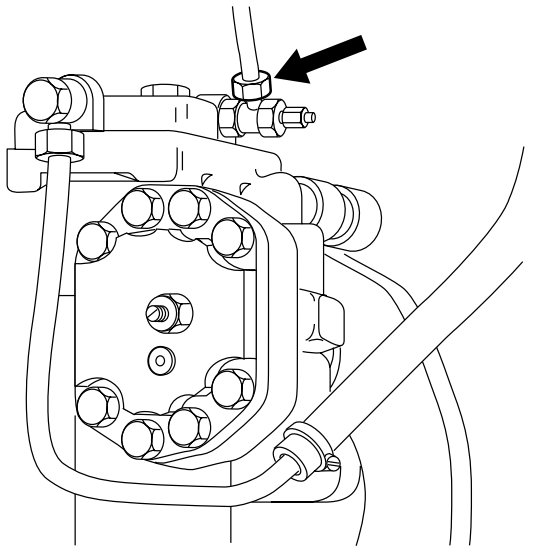


S7 00 020

Block the vehicle so that it cannot slide off the jack or the turning plates.
Be careful when fitting the 15 mm filler piece between the adjusting bolt and the axle stop, because this could result in limbs getting trapped.
Only use couplings and lines which are suited to the maximum system pressure.

Before connecting the test-equipment case you should:

1. Clean the delivery-line connection to the steering box, see arrow in the drawing.
2. Inspect the steering-box attachment.
3. Inspect the hydraulic central position.
4. Place proper turning plates under the vehicle's steerable wheels.



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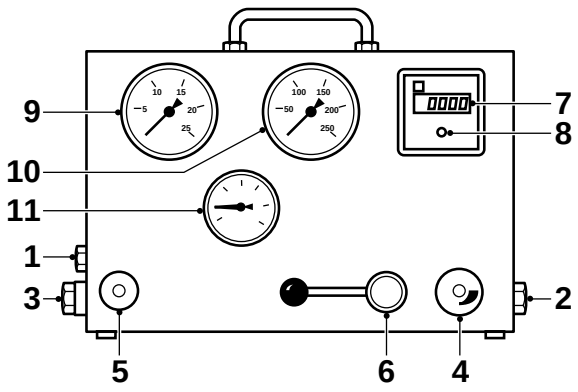
Connecting the test-equipment case

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 at 150 bar.
2. Remove the delivery line from the steering box. Make sure that as little steering oil as possible runs off.



S7 00 020

2

3. Connect the hose from the “Eingang” connection of the test-equipment case to the part of the line coming from the main steering pump.
4. Connect the hose from the “Ausgang” connection of the test-equipment case to the steering box.
5. Place the hose coming from the “Tank” connection in the reservoir. Attach this hose to the reservoir and make sure that the end of the hose stays below the oil surface (to prevent foaming).
6. Check the steering-oil level, and as necessary top up.
7. Start the engine and keep an eye on the steering-oil level.
8. Bleed the system by running the engine at idling speed for 2 minutes. Check the steering-oil level at regular intervals, and as necessary top up. Do not touch the steering wheel during these 2 minutes.

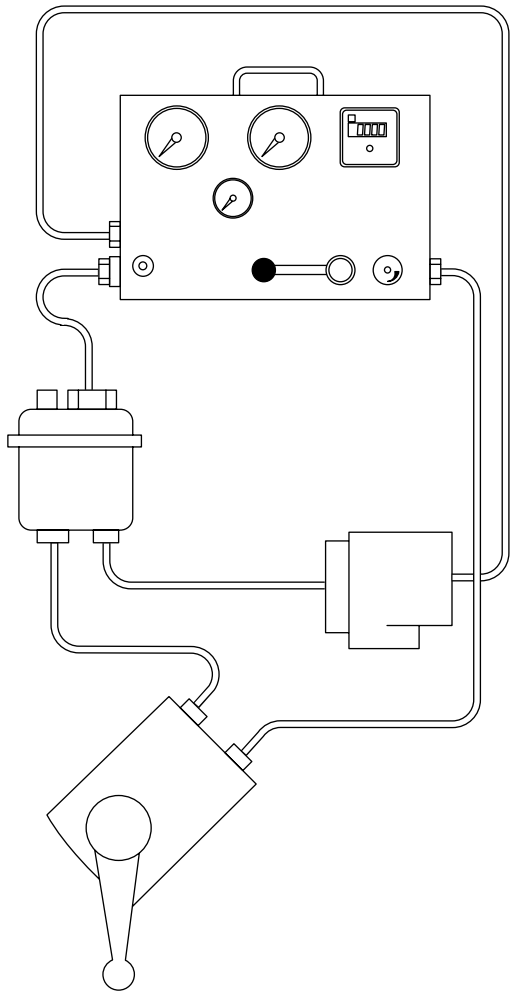
Bringing the steering oil to the test temperature

1. Run the engine at idling speed.
2. Slowly close cock (4), until pressure gauge (10) reads a pressure of 50 bar.
3. Wait until the thermometer (11) reads a value of 50°C.
4. Now open the cock (4) completely.

Inspecting the steering mechanism using the test-equipment case

Note:

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



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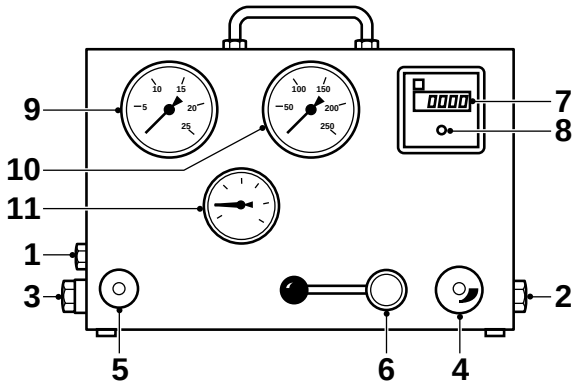
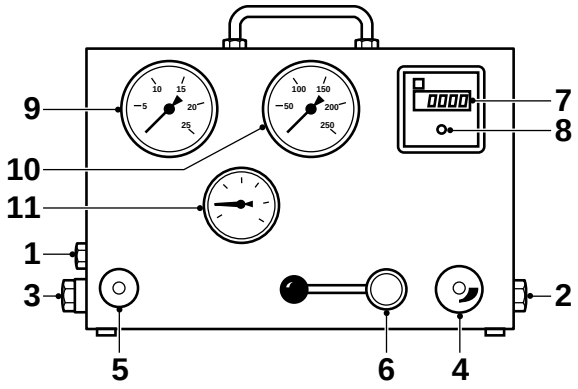


S7 00 020

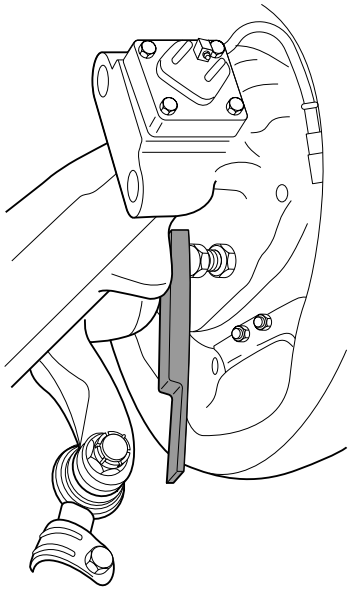
Measuring the circulation pressure
1. Run the engine at idling speed.
2. Open the cock (4) completely.
3. The circulation pressure is indicated by the pressure gauge (9). Compare the reading with the maximum admissible value, see main group “Technical data”.

Inspecting the front axle
1. Run the engine at idling speed.
2. Check whether the cock (4) is fully opened.
3. Turn the steering mechanism carefully from the central position to both maximum wheel deflections.
4. The pressure should now rise evenly.

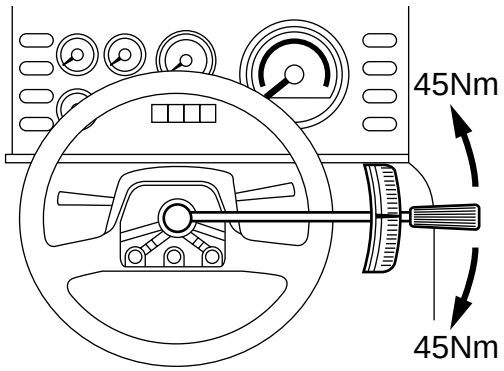


S7 00 020

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

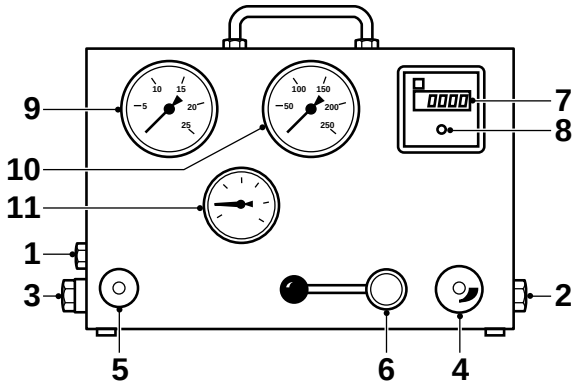

S7 00 042

3. 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 00 056

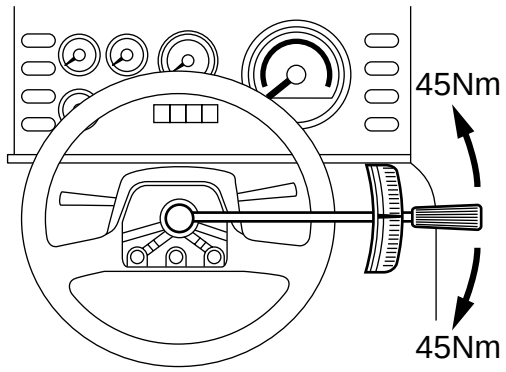
4. Read the pressure at the pressure gauge (10) (the maximum pressure should not be continued for more than 5 seconds) and compare the measured value with the specified value, see main group “Technical data”.
5. Repeat the measurement using the 15 mm filler piece at the other side of the front axle.



S7 00 020

Testing the final limiting pressure

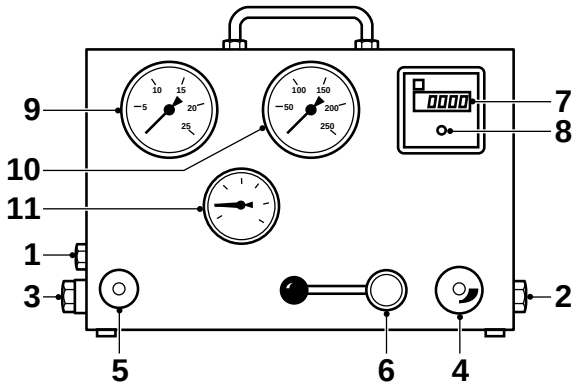
1. Fully engage the steering mechanism.
2. Set the engine speed at 1200 - 1400 rpm.
3. Fit a torque wrench with a dial to the steering-wheel nut and tighten the nut to a tightening torque of 45 Nm on the torque wrench.
4. The pressure gauge (10) will indicate the final limiting pressure.
5. Compare the reading with the specified value, see main group “Technical data”.
6. Carry out the measurement at the other axle side too.



S7 00 056

Testing the maximum pump pressure

1. Check whether the pressure-limiting valve (6) is set at 150 bar.
2. While the engine is at idling speed, slowly close the cock (4) until the maximum pressure is achieved at gauge (10). The maximum pressure may only be applied for 5 seconds. Otherwise the internal pump components will become too hot. This would result in premature wear of the pump.
   The pressure will be limited at 150 bar by the pressure-limiting valve built into the test-equipment case.



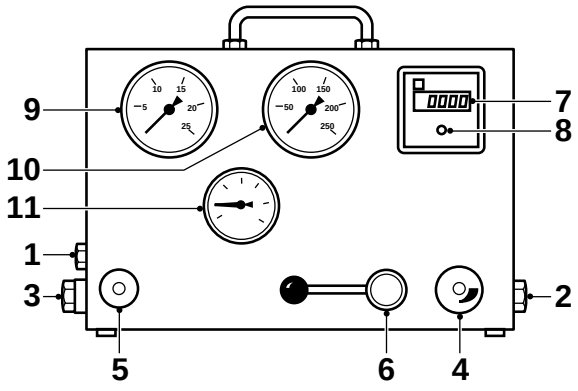
S7 00 020

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-equipment case.

3. Open the cock (4).
4. Compare the reading with the specified value, see main group “Technical data”.

Testing the pump output

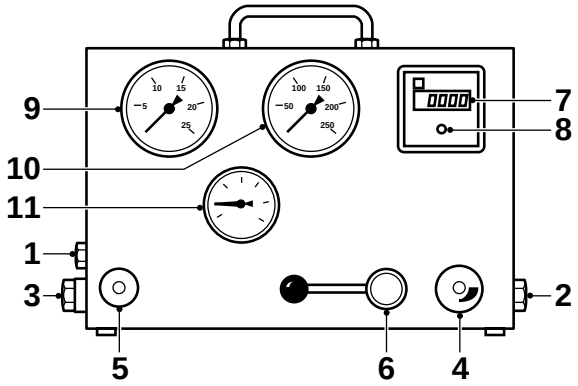
1. Activate output meter (7) using the switch (8).
2. Set the engine speed at 1200 - 1400 rpm.
3. Close the cock (4) until the pressure gauge (10) indicates the specified pump-output pressure, see main group “Technical data”.
4. Take the pump-output reading at the output meter (7) and compare this value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



S7 00 020

Testing the flow-control valve of the steering pump

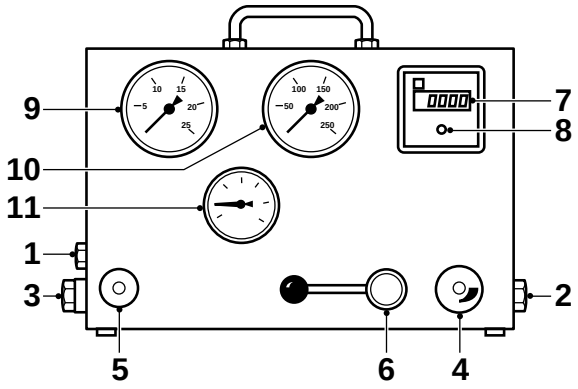
1. Activate the output meter (7) using the switch (8).
2. Slowly increase the engine speed, until the output-meter reading (7) no longer rises. Check whether the output is stable.
3. Increase and decrease the engine speed and check whether the output increases evenly and then remains stable.
4. Slowly close the cock (4) until the pressure at the pressure gauge (10) has increased to approx. 50 bar. Check whether the pressure-gauge needle (10) fluctuates while closing the cock.



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 the foaming.
2. Open the non-return valve (5).
3. Close the cock (4) completely.
4. Adjust the pressure to 30 bar under the normal system pressure using the non-return valve (5).
5. Open the cock (4) completely.
6. Activate the output meter (7) using the switch (8).
7. Activate the steering mechanism and fit a 15 mm filler piece, special tool (DAF no. 0535996), between the adjusting bolt and the axle stop.



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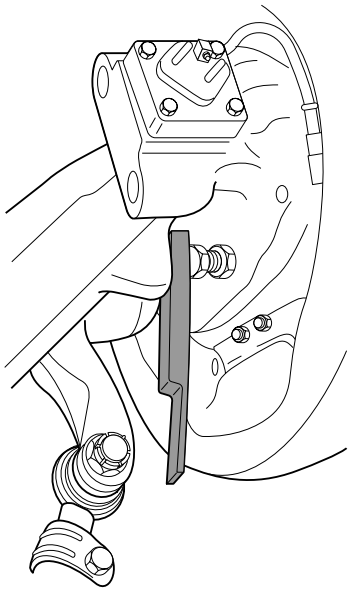
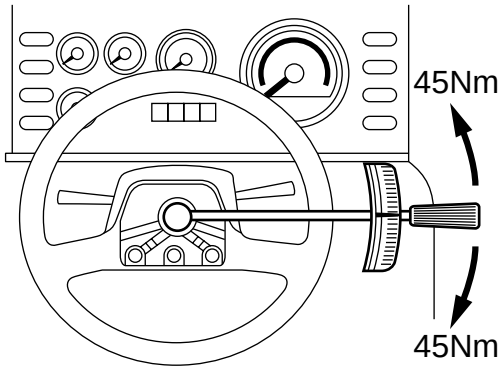


S7 00 042

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 to the maximum admissible leak-off oil quantity, see main group “Technical data”.
10. Carry out the measurement for the other wheel deflection.



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11. If excessive internal leakage is measured for a vehicle equipped with an auxiliary cylinder (see main group “Technical Data”), the measurement should be repeated with the auxiliary cylinder disconnected.
    - Mark the auxiliary-cylinder lines and remove these from the steering box.
    - Fit suitable plugs into the line connections of the auxiliary-cylinder to plug the steering box.
    - Place the lines from the auxiliary cylinder in a reservoir, as the auxiliary cylinder will force the oil from the lines while steering.

    Note:
    - Never connect the auxiliary-cylinder lines to each other. The volumes of the left- and right-hand cylinder halves are not equal, resulting in a pressure build-up while steering.
    - After the auxiliary cylinder has been disconnected, the measurement should be repeated and the reading be compared to the maximum admissible value, see the chapter on “Technical data”.

12. If the steering mechanism “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 retightened to the specified tightening torque, see main group “Technical Data”.

Removing the test-equipment case
1. Remove the hoses and reconnect the delivery line to the steering box.
2. Reconnect the auxiliary-cylinder lines, if these have been removed.
3. Check the steering-oil level, and as necessary top up.
4. Bleed the system, see chapter “Draining and filling”.
5. Inspect the line connections for leaks.
6. Remove the jack.

3.3 INSPECTION OF SECOND CIRCUIT IN TWO-CIRCUIT STEERING 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.

2

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

3. After switching off the engine, check whether warning lamp 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 $^1/_4$ to $^1/_2$ of a turn to the left and the right.
5. If the steering mechanism is not equipped with an auxiliary cylinder, the required steering force should not exceed the force required when the engine is running.

   If the steering mechanism is equipped with an auxiliary cylinder, the required steering force may exceed the force required when the engine is running, because the auxiliary 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 HYDRAULIC CENTRAL 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.

2

4. DRAINING AND FILLING

4.1 DRAINING AND FILLING/BLEEDING, ONE-CIRCUIT STEERING SYSTEM

The steering oil should be drained in case of:
- damage to the main steering pump or emergency steering pump
- contamination of steering oil
- water in the steering oil
- serious foaming of the steering oil due to drawing in air.

Draining of a one-circuit steering system

1. Clean the line connections of the steering box, reservoir and, if present, the auxiliary cylinder.
2. Jack up the steerable axle(s).
3. Place receptacles under the steering box and, if present, the auxiliary cylinder. Remove the return line from the steering box and, if present, the auxiliary-cylinder lines.
4. Turn the steering wheel slowly from one end stop to the other until the oil stops coming out of the line connection(s).
5. Reconnect the disconnected line(s).
6. Replace the filter in the reservoir.

Drained steering oil may not be reused. 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 in order 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 mechanism.

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/venting of a one-circuit steering system

1. The steering boxes are equipped with an automatic bleeding system. This bleeding system will only function if there is a circulation pressure in the system.
2. Fill the reservoir to the rim with clean oil which complies with the specifications. Wait a little while and then fill the reservoir to the rim again.
3. Crank the engine for approx. 2 seconds using the starting motor. Make sure that the reservoir remains filled. Immediately stop the cranking operation if the oil level becomes too low. Top up the steering oil.
4. Crank the engine for approx. 10 seconds using the starting motor. Make sure that the reservoir remains filled. Immediately stop the cranking operation if the oil level becomes too low.
5. Top up the steering oil to the upper marking on the oil dip stick.

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 from the floor.

Note:
If the wheel-deflection limiting valves might be incorrectly set, e.g. because the maximum wheel deflection is enlarged, these valves should be correctly set first.

8. Start the engine and, with the engine running, slowly turn the steering wheel (approx. $^1/_2$ turn of the steering wheel per second) to the left and 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 an auxiliary 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 running and, if necessary, top up to the upper marking on the dip stick.

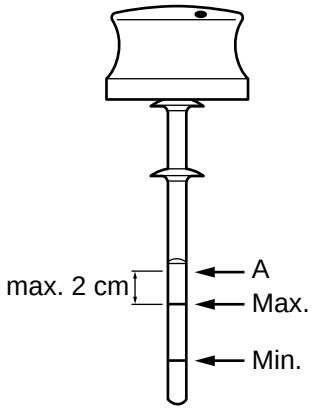
11. Shut off the engine. The steering oil may not increase more than 2 cm over the max. marking (A in drawing). If the steering-oil level increases more than 2 cm, there is still air in the system.

Note:
If the vehicle is equipped with an auxiliary cylinder, it may be necessary in some cases to bleed the auxiliary cylinder separately.
To do so, loosen the union nuts of both connections somewhat while the engine is idling and no steering action takes place. The air, if any, can now escape.

12. Put the filler cap on the reservoir again and lower the axle(s).

13. Inspect the line connections for leaks.

14. Take 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, TWO-CIRCUIT STEERING SYSTEM

The steering oil should be drained in case of:
- damage to the main steering pump or emergency steering pump
- contamination of steering oil
- water in the steering oil
- serious foaming of the steering oil due to drawing in air.

2

Draining of a two-circuit steering system
1. Clean the line connections of the steering box, the reservoirs, the emergency steering pump and, if present, the auxiliary 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 auxiliary cylinder. Remove the lines for the reservoirs (only the connection line).
4. Remove the filters from the reservoirs.
5. 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 auxiliary cylinder.
6. Reinstall the lines which were disconnected.
7. Replace the filters in the reservoirs.

Drained steering oil may not be reused. 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 in order 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 mechanism.

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 a two-circuit steering system

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

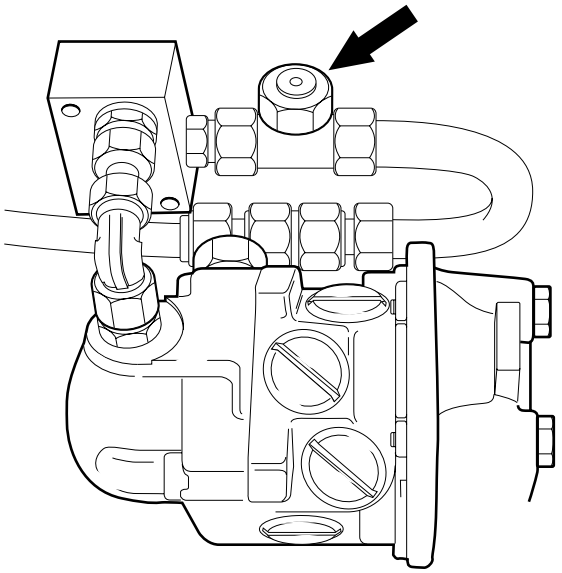
Hang the drive shaft properly to one side so that it cannot come into contact with the gearbox flange.

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 rim again.
4. Open the bleed nipple on the emergency steering pump supply line (see the arrow in the drawing) and bleed this line. Top up the reservoirs again.
5. Crank the engine for approx. 2 seconds using the starting motor. Make sure that the reservoir remains filled. Immediately stop the cranking operation if the oil level becomes too low. Top up the steering oil.
6. Crank the engine for approx. 10 seconds using the starting motor. Make sure that the reservoir remains filled. Immediately stop the cranking operation if the oil level becomes too low.
7. Top up the steering oil to the upper marking on the oil dip stick.
8. Repeat the actions described in points 6 and 7 until the steering-oil level no longer decreases.
9. Jack up the steerable axle(s) until the wheels are clear from the floor.

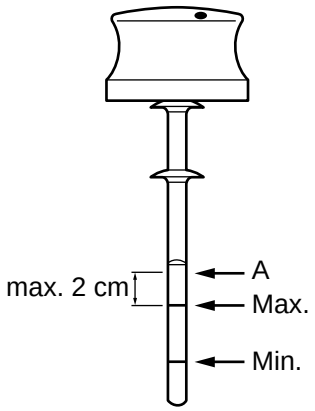
Note:
If the wheel-deflection limiting valves might be incorrectly set, e.g. because the maximum wheel deflection is enlarged, these valves should be correctly set first.

10. Start the engine and, with the engine running, slowly turn the steering wheel (approx. $^1/_2$ turn of the steering wheel per second) to the left and 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 an auxiliary cylinder.
11. Check the steering-oil level when the engine is running and, if necessary, top up to the upper marking on the dip stick.



S7 00 142

12. 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.
13. Change into a higher gear and increase the engine speed if the steering-oil level no longer decreases.
    The warning lamp of circuit 2 should now go dark.
14. Run the engine at idling speed for another 2 minutes. Do not touch the steering wheel during these 2 minutes.
15. Check the steering-oil level of both reservoirs when the engine is running and, if necessary, top up to the upper marking on the oil dip stick.
16. Shut off the engine. The steering oil may not increase more than 2 cm over the max. marking (A in drawing). If the steering-oil level increases more than 2 cm, there is still air in the system.
17. Put the filler cap on the reservoir again and lower the axle(s).
18. Inspect the line connections for leaks.
19. Fit the drive shaft.
20. Take a test drive. Now check the steering-oil level and check the line connections for leaks.



S7 00 023

2

CONTENTS

3

1. SAFETY INSTRUCTIONS

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

The steering gear mounting is also a cab suspension point.
If the steering gear mounting has been removed, the cab must not be tilted.

If the vehicle has been involved in a collision in which the steering box or other components of the steering mechanism 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.

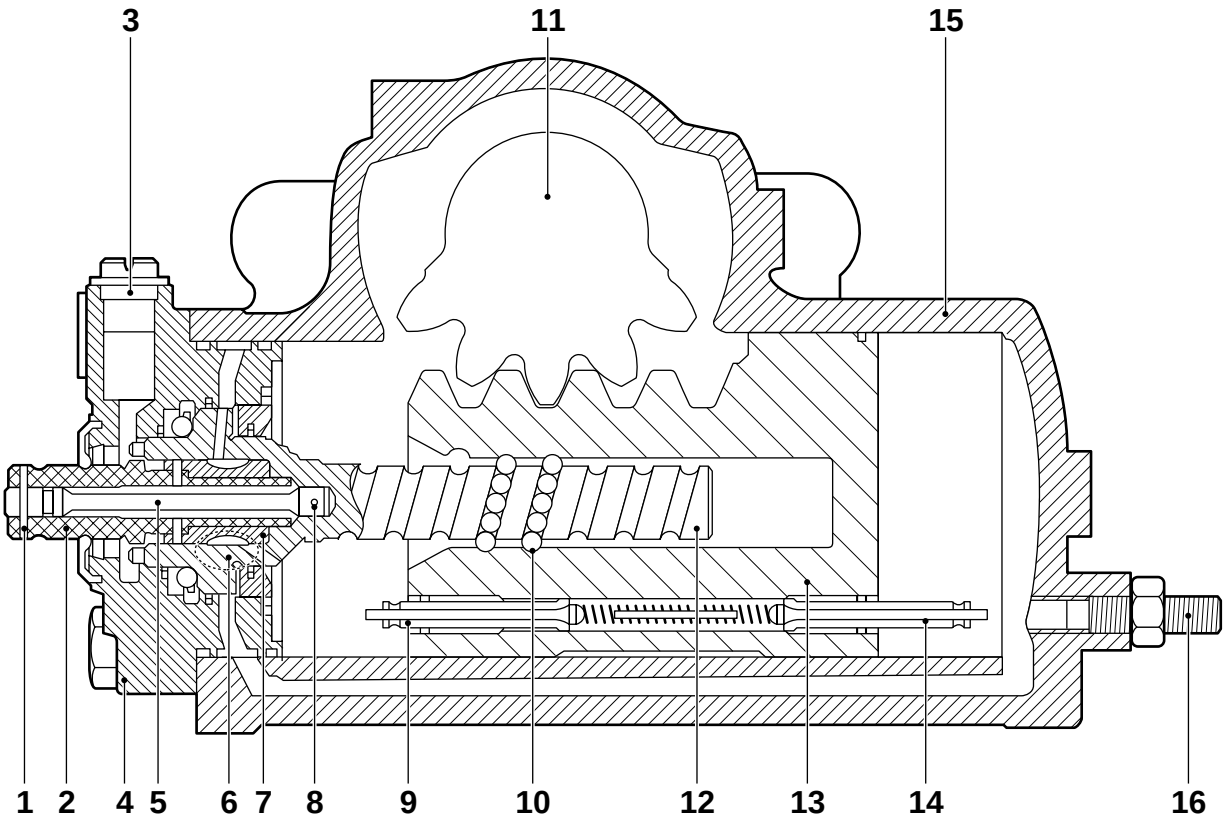
The pitman arm should only be removed using the prescribed special tools.
Under no circumstances should the pitman arm be removed by dislodging it using a hammer or by heating, if the prescribed tools are not available.
This would not only result in the pitman arm becoming highly unreliable, but would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

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

3

2. GENERAL

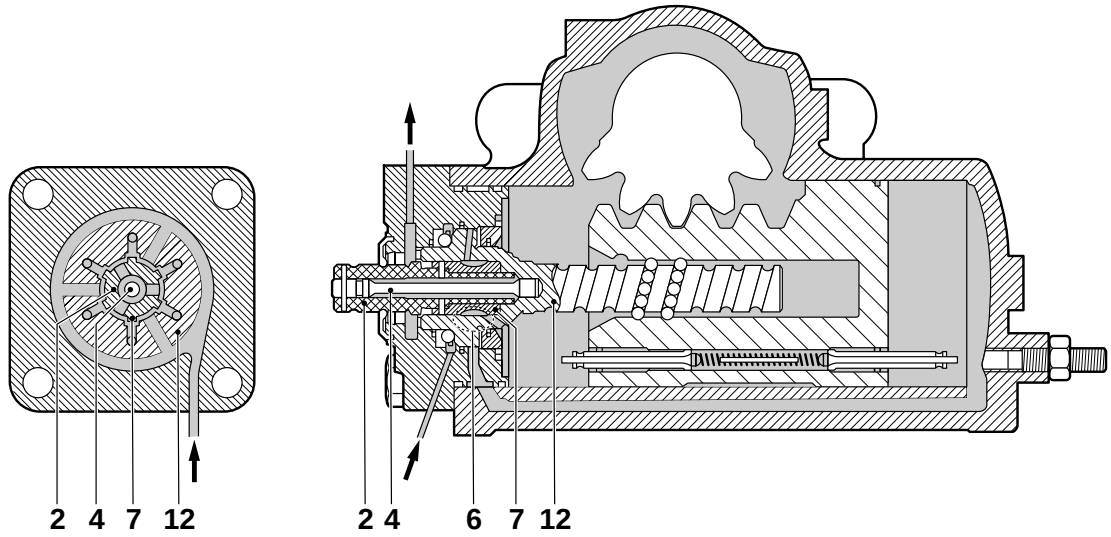
2.1 OVERVIEW DRAWING, STEERING BOX



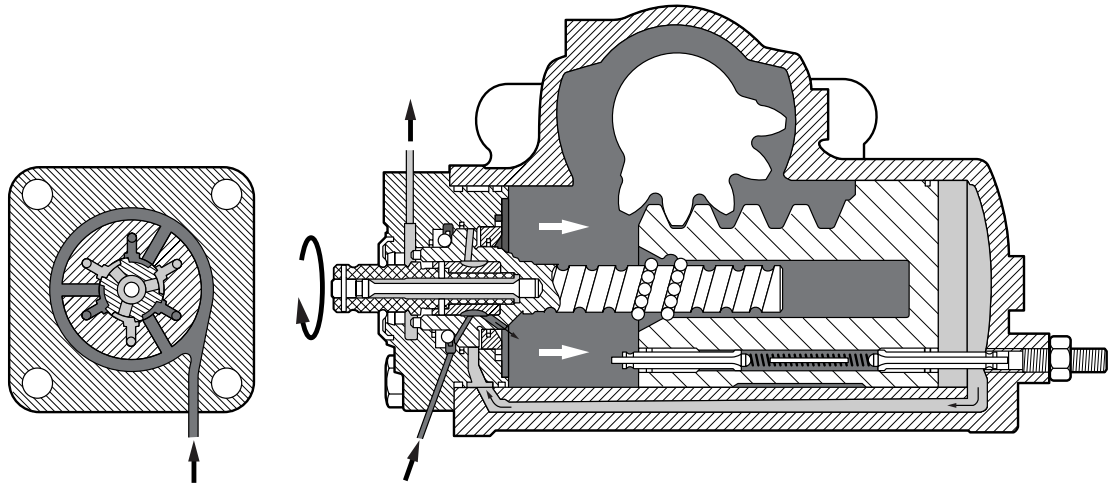
S7 00 013

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

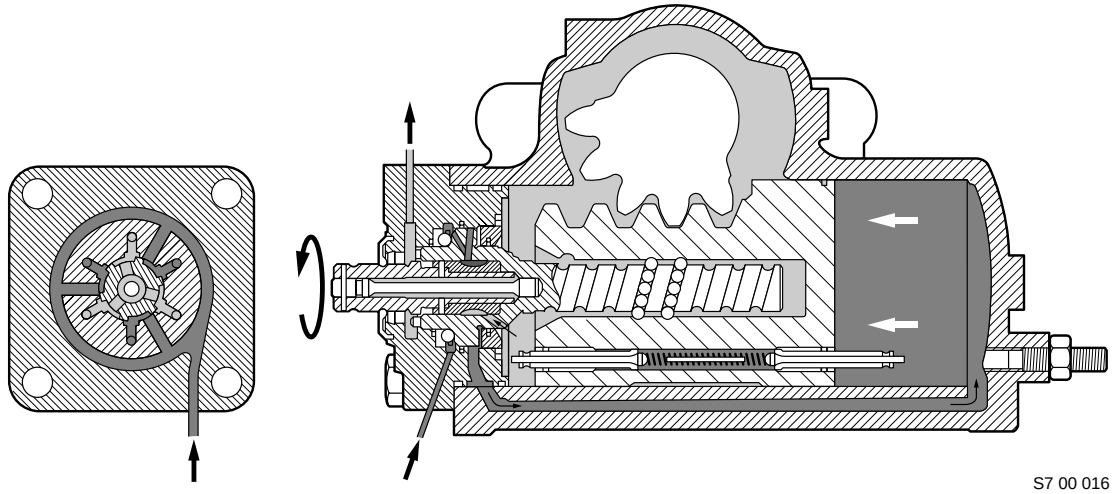
2.2 OPERATION OF THE STEERING BOX



S7 00 014



S7 00 015

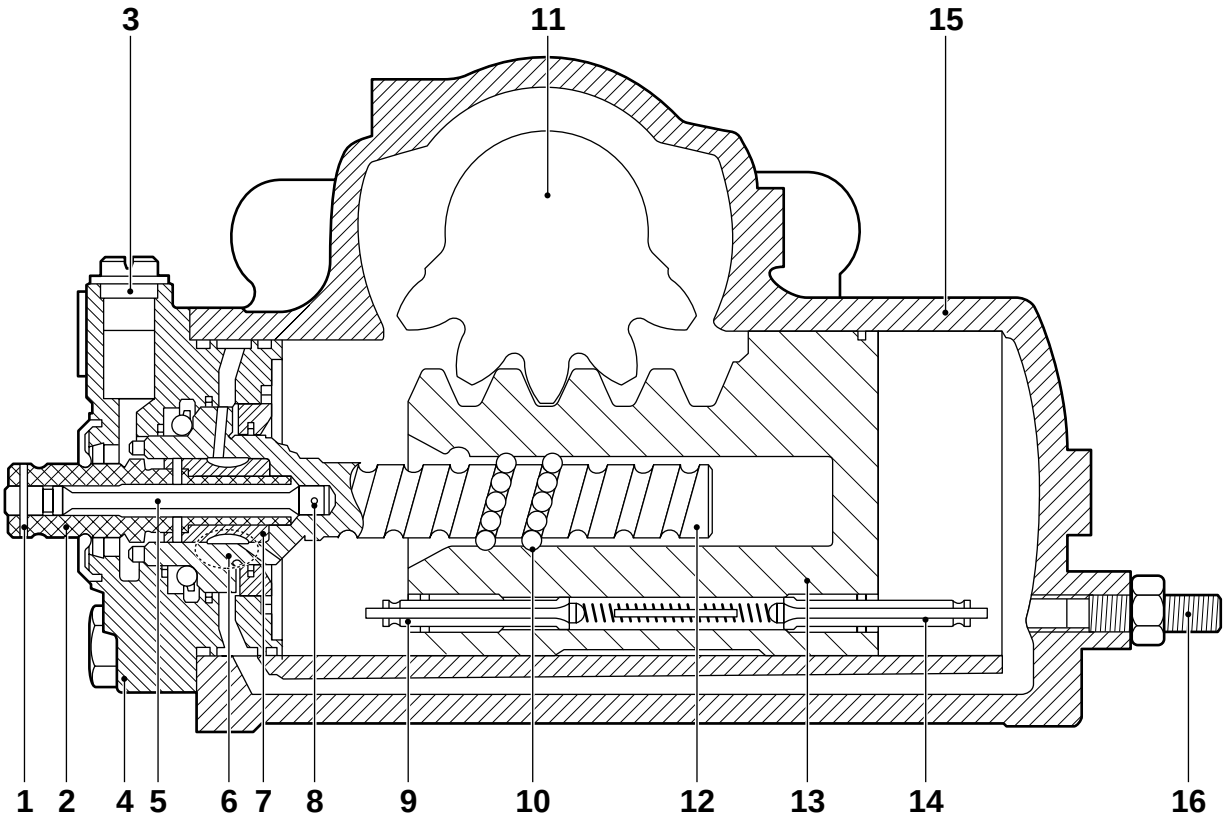


S7 00 016

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 space 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.

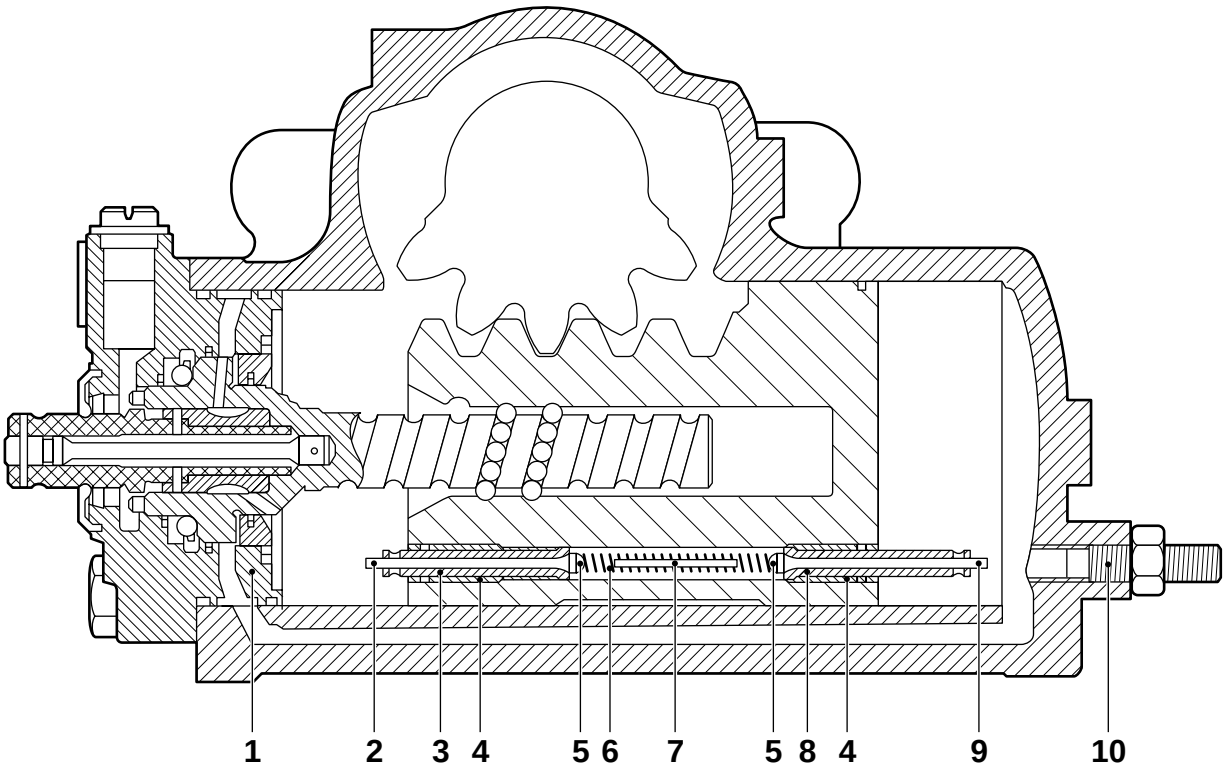


S7 00 013

A torsion bar (5) is fitted between the input shaft (2) and the worm shaft (12) which is 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 no steering takes place anymore), 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.

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



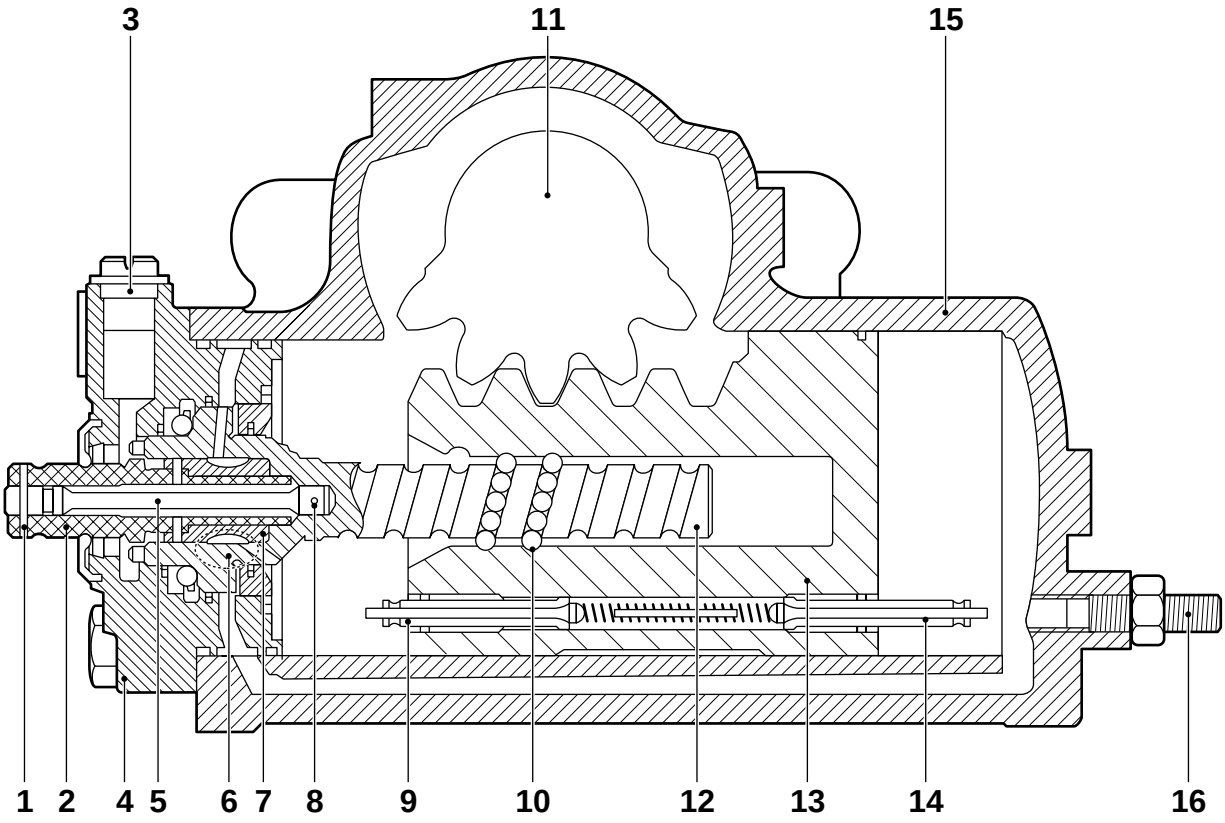
S7 00 017

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 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 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. Between both wheel-deflection limiting valves (3 and 8) a distance pin (7) is fitted. 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 the correct setting of the valve (3). During this action the wheel-deflection limiting valve (8) is also pushed partially from the piston.
The correct setting of the wheel-deflection limiting valve (8) is finally restored using the adjusting bolt (10).



S7 00 013

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 nut (10) transfers the rotating movement of the worm shaft into the linear movement of the piston (13). The toothing of the piston (13) rotates 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) when driving straight forward are constantly engaged, 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 toothing (11) is such that the tooth engaging the piston teeth when the steering box is in its central position, is somewhat 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.

3. INSPECTION AND ADJUSTMENT

3.1 INSPECTION AND ADJUSTMENT, WHEEL-DEFLECTION LIMITING VALVES

Inspection wheel-deflection limiting valves

1. Connect the pressure gauge (DAF no. 0535653) to the delivery line using a T-piece.

   Note:
   Later versions are not equipped with a T-piece. For these versions, a T-piece must be fitted in the delivery line.

   Make sure that the T-piece is connected as quickly as possible to prevent air from entering 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 mechanism. To do so, run the engine at idling speed for approx. 2 minutes, without steering.

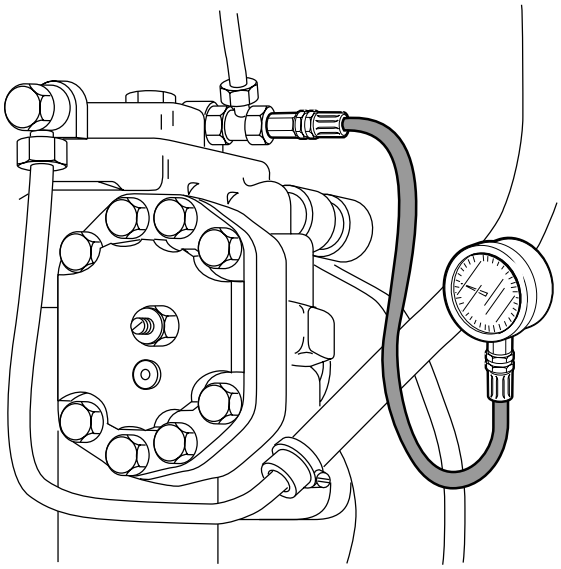
3. Jack up the steerable axle(s).

4. Warm the steering oil as described below, until the hoses are hand warm at least.
   - Set the engine speed to 1200 - 1400 rpm.
   - Activate the steering mechanism 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.

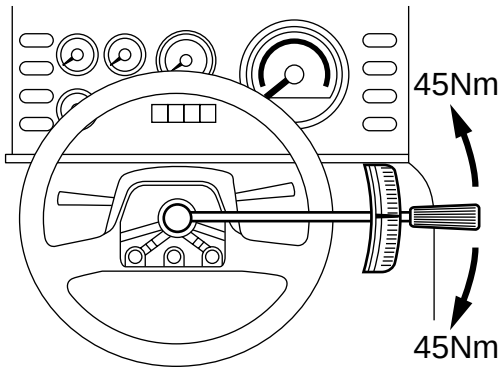
6. Increase the engine speed to 1200 - 1400 rpm.



S7 00 187

3

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 allowable value, see main group “Technical data”. If the value measured is too high, the wheel-deflection limiting valves should be readjusted.
9. Carry out the measurement once again, with the wheel being turned fully to the right.
10. Remove the jack.
11. Remove the pressure gauge.
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 mechanism. 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 main group “Technical data”.



S7 00 056

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 input shaft of the steering box has not been rotated more than 1.5 turns just prior to connecting the steering rod to the steering mechanism.

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 mechanism.

Note:
A steering box whose wheel-deflection limiting valves have already been adjusted according to procedure C can be recognised 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 attachment bolts of the steering box and the steering gear mounting are tightened to the specified tightening torques, see main group “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 left and 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.

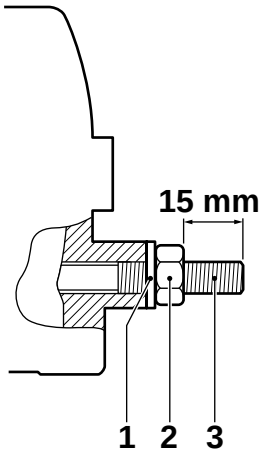
Adjusting according to procedure B

1. Turn the steering wheel fully left and 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 sealing ring (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 from the floor.
4. Remove the steering rod from the pitman arm.

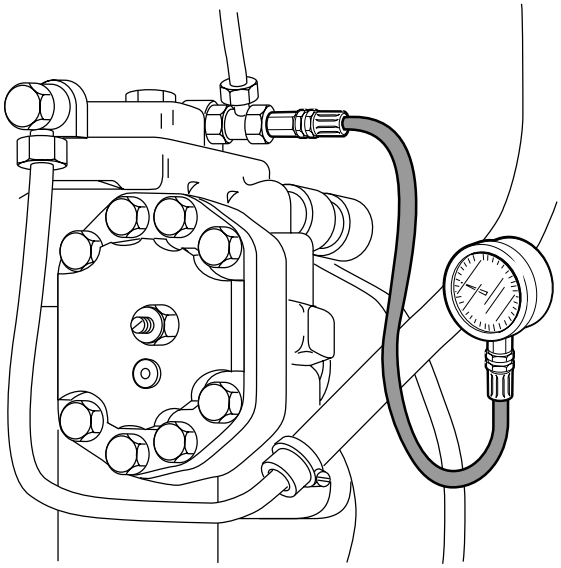


S7 00 046

5. Connect the pressure gauge (DAF no. 0535653) to the delivery line using a T-piece.

   Note:
   Later versions are not equipped with a T-piece. For these versions, a T-piece must be fitted in the delivery line.

   Make sure that the T-piece is connected as quickly as possible to prevent air from entering 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 mechanism. To do so, run the engine at idling speed for approx. 2 minutes, without steering.



S7 00 187

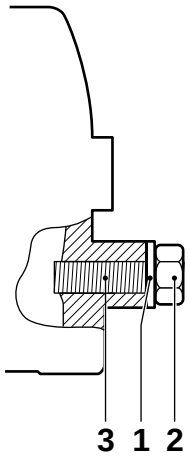
7. Warm the steering oil as described below, until the hoses are hand warm at least.
   - Set the engine speed to 1200 - 1400 rpm.
   - Activate the steering mechanism for 5 seconds at its maximum, making sure that the pressure does not exceed 50 bar.
   - Do not touch the steering wheel for 5 seconds.
   - Continue this operation until the required temperature is reached.

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

8. Shut off 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). In that case, the RHD situation is described between brackets.

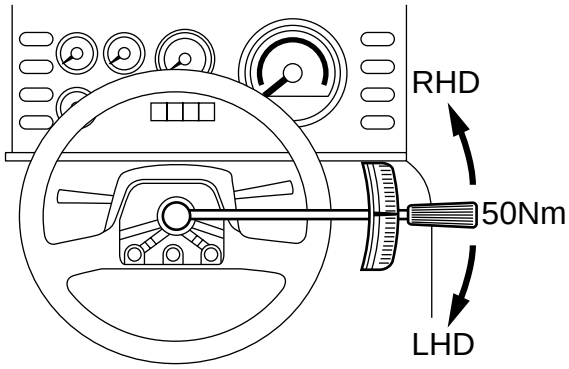


S7 00 159

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 mechanism further until a tightening torque of 50 Nm is achieved.
    This will press the wheel-deflection limiting valves into the “reset” position.

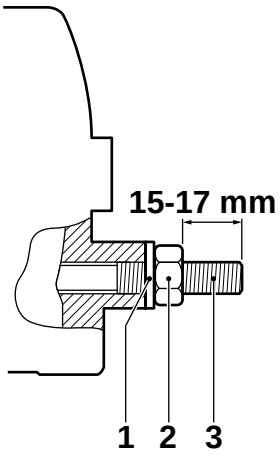
11. Remove the torque wrench and turn the steering mechanism into the central position.

12. Fit the steering rod into the pitman arm.



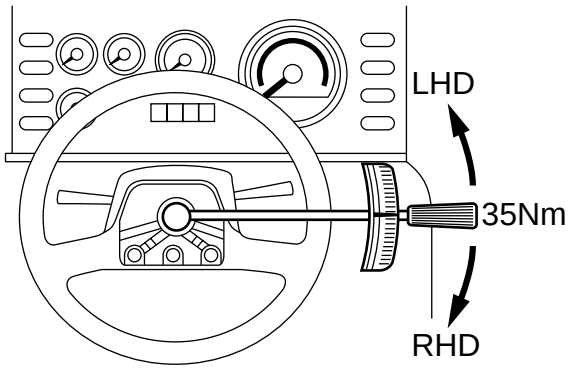
S7 00 057

13. Loosen the lock nut (2) and turn the adjusting bolt 15 - 17 mm from 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.



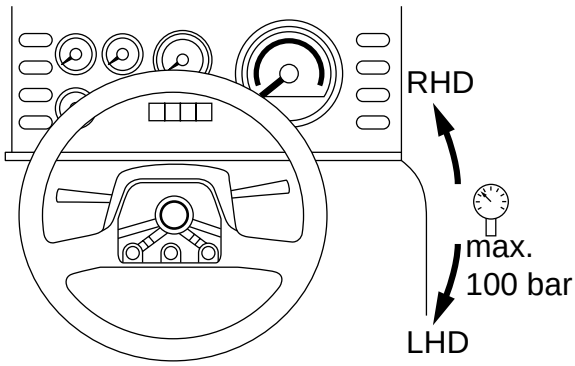
S7 00 158

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 readjust the wheel-deflection limiting valve, which has its end stop at the steering-box cover.



S7 00 059

17. Run the engine at idling speed and turn the steering wheel fully right (RHD fully left) until the end stop is reached. Make sure that the pressure does not exceed approx. 100 bar and that the pressure is not maintained for longer 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 the adjusting bolt in, until the pressure is reduced to maximum 80 bar. This will correctly readjust the wheel-deflection limiting valve, whose end stop abuts the adjusting bolt.
19. Set the engine speed to 1200 - 1400 rpm. The final limiting pressure should not exceed 80 bar.



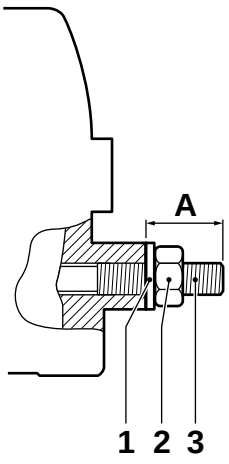
S7 00 058

Note:
Do not screw in the adjusting bolt further than strictly required, as the other wheel-deflection limiting valve could lose its previously adjusted setting in this way, in which case the adjusting procedure must be repeated all over again.
There is also the chance that the wheel-deflection limiting valve will open too early, thus reducing the pressure too fast and not reaching the maximum wheel deflection.

20. Tighten the lock nut to the specified tightening torque, see main group “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.

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.



S7 00 045

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

23. Remove the jack.

24. Remove the pressure gauge.

25. Check the steering-oil level in the reservoir after removing the pressure gauge and top up the oil if required.

26. Bleed the steering mechanism. To do so, run the engine at idling speed for approx. 2 minutes, without steering.

27. Retighten the steering-wheel nut to the specified tightening torque, see main group “Technical data”.

3.2 INSPECTION AND ADJUSTMENT, PRESSURE POINT

Inspection of the pressure point

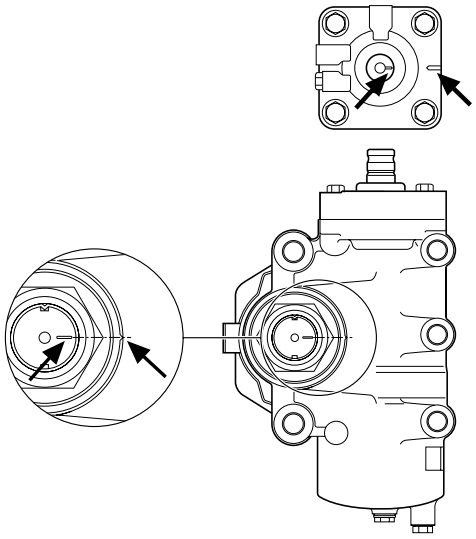
1. Place the sector shaft in the central position by aligning the markings on the sector shaft and input shaft with those on the steering box.

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 central position, using the markings.

4. Take hold of the pitman arm and carefully move it in its direction of movement 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.



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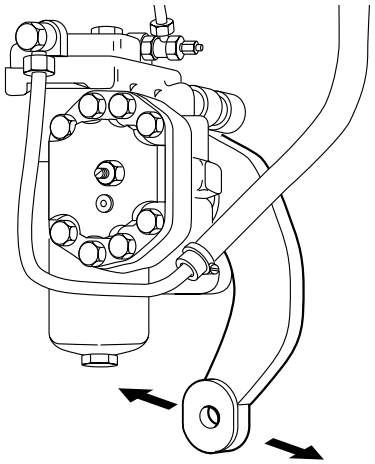
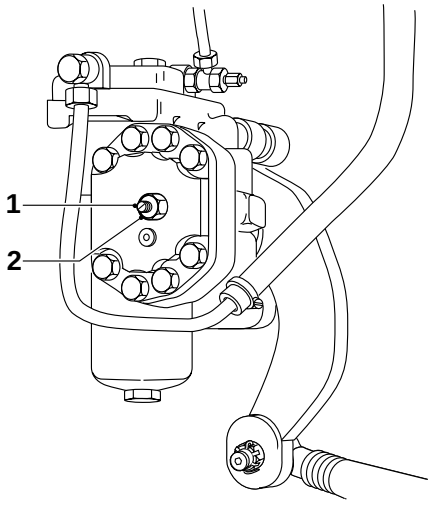


S7 00 188

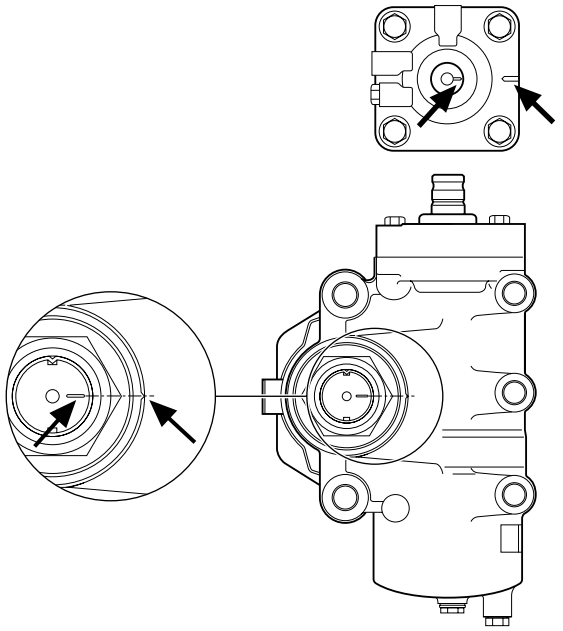
5. If play can be felt, this can be remedied using the adjusting bolt (1).



S7 00 175

Adjusting the pressure point

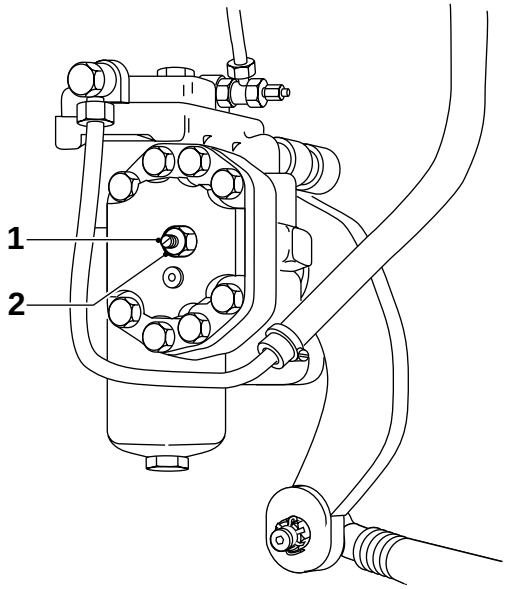
1. Check whether the sector shaft is still in central position, using the markings.



S7 00 166

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 $^1/_4$ to $^1/_2$ turn tighter.

If the adjusting bolt is turned too far to the right, 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 00 175

6. Tighten the lock nut (2) to the specified tightening torque, see main group “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. Left and right from the central position of the input shaft no play may be felt during $^1/_4$ turn.

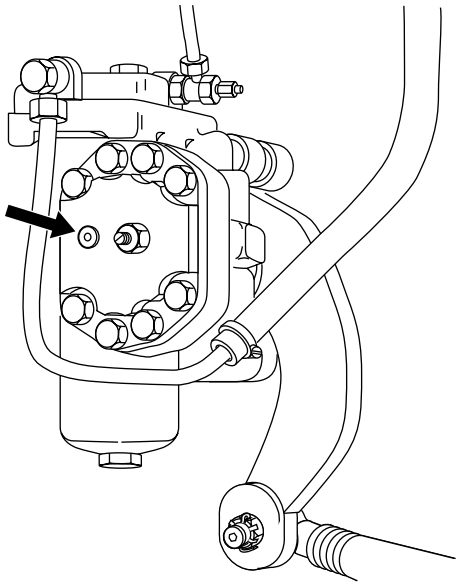
8. If play can still be felt, the adjusting procedure should be repeated.
9. Fit the steering rod onto the pitman arm.
10. Make a test run and check the vehicle's directional stability. Also check whether the steering wheel returns to the central position after taking a turn.

3.3 INSPECTION, SECTOR-SHAFT OIL SEAL LEAKS

1. A plastic plug is fitted into the steering-box side cover.
2. Any oil leak at this plug indicates that the sector-shaft oil seal in the side cover leaks.
3. In the case of leakage, replace the sector-shaft oil seal in the steering-box side cover.

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 to 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.


S7 00 450

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

3.4 INSPECTION, INTERNAL STEERING-BOX RESISTANCE

1. Place a receptacle under the steering box. Clean the line connections and remove the steering-oil lines from the steering box. Collect the oil flowing out and plug the line openings.
2. Turn the steering wheel from one end stop to the other until the oil stops coming out of the steering box. Do not plug the line connections on the steering box.
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 op to a maximum of 1.5 turns on 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), as this will change the setting of the wheel-deflection limiting valves.
6. Compare the reading with the maximum admissible value, see main group “Technical data”.
7. If the reading deviates, the pressure-point setting must be checked.

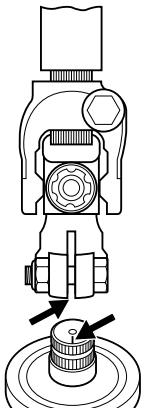
   Note:
   The internal resistance outside the pressure point cannot be adjusted.
8. Fit the lines to the steering box.

9. Fit the steering shaft to the steering-box input shaft so that the joint and the marking in the steering-box input shaft align.

   Note:
   Replace bolts fitted with self-locking nuts by new bolts fitted with flange nuts.

   Install the universal joint bolt using Loctite 243 (or equivalent).
   Tighten the bolt to the specified tightening torque, see main group “Technical data”.

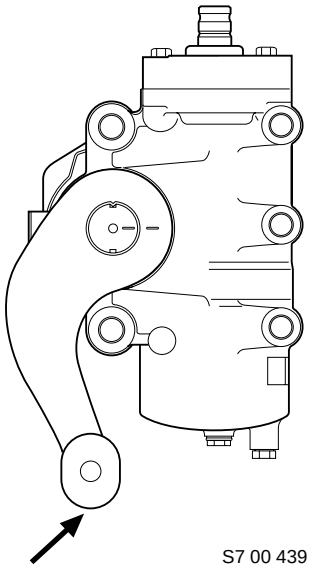
10. Install the steering rod.
11. Fill and bleed the steering mechanism.
12. If the steering-box input shaft may possibly been rotated more than 1.5 turns (as seen from the central position) the final limiting pressures should be checked.
13. Take a test drive. During the test drive, check the proper functioning of the steering mechanism. After the test drive the system should be checked for leaks.



S7 00 179

3.5 CHECKING THE PART NUMBER OF THE PITMAN ARM

The part number of the pitman arm is stamped near the steering-rod attachment eye. See the arrow in the drawing.



S7 00 439

4. REMOVAL AND INSTALLATION

4.1 REMOVAL AND INSTALLATION, ENTIRE STEERING BOX

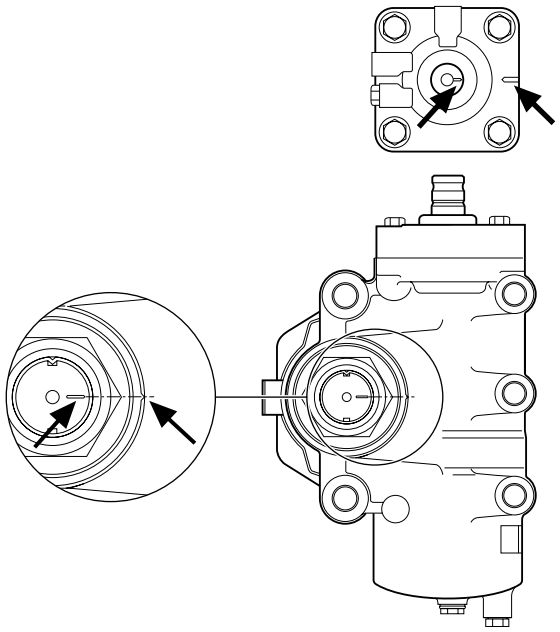
If the vehicle has been involved in a collision in which the steering box or other components of the steering mechanism have (possibly) been damaged, the steering box should always be sent to DAF for inspection or be replaced. This instruction even applies if no external damage is visible. In the collision,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

Removing the entire steering box

1. Remove the corner part of the cab and the headlight bracket in front of the steering box.
2. Clean the steering box and the surrounding area.
3. Place the steering mechanism in the central position. This can be checked using the markings on the steering box.
4. Remove the steering-oil lines from the steering box. Collect the steering oil flowing out and plug the openings of the lines and at the steering box, to prevent dirt entering.

   Note:
   If the line 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. Remove the universal joint from the steering box.



S7 00 166

7. Slacken the steering-box attachment bolts.

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

8. Remove the attachment bolts from the steering box to the steering gear mounting and remove the steering box from the vehicle.

Installation of the entire steering box

1. Carefully clean and inspect the threaded holes of the steering box.
2. Remove all paint from the contact surfaces of both the steering box and the steering gear mounting (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 a new or revised steering box, fit the line connections. For the connection points, see the main group “Technical data”.
4. Replace the fixing bolts. Because the yield stress is exceeded while tightening the bolts, they may not be reused.
   Grease the new bolt sparingly.
5. Fit the steering box with the pitman arm to the steering gear mounting. Make sure that the locating bolt is fitted into the lower threaded hole at the front of the steering box.
6. Tighten the fixing bolts evenly.
   Tighten the bolts to the specified tightening torque, see main group “Technical data”.
7. Fit the lines to the steering box.

8. Fit the steering shaft to the steering-box input shaft so that the joint and the marking in the steering-box input shaft align.

   Note:
   Replace bolts fitted with self-locking nuts by new bolts fitted with flange nuts.

   Install the universal joint bolt using Loctite 243 (or equivalent).
   Tighten the bolt to the specified tightening torque, see main group “Technical data”.

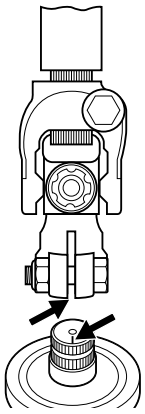
9. Install the steering rod.

10. Fill and bleed the steering mechanism.

11. 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 chapter “Checking and adjusting”.

12. Fit the corner part of the cab and the headlight bracket.

13. Take a test drive. During the test drive the proper functioning of the steering mechanism should be checked. After the test drive the system should be checked for leaks.



S7 00 179

4.2 REMOVAL AND INSTALLATION, STEERING GEAR MOUNTING

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

The steering gear mounting is also a cab suspension point.
If the steering gear mounting has been removed, the cab must not be tilted.

Removal of the steering gear mounting

1. Remove the steering box.
2. Remove the radiator/intercooler.
3. Remove the steering-oil reservoir.
4. Disconnect the wiring from the steering gear mounting.
5. After tilting the cab, slacken the steering gear mounting attachment bolts.
6. Loosen the attachment bolts used to fit the cab suspension to the steering gear mounting.
7. Tilt the cab back to the driving position.
8. Support the cab at the front side. Install a cab jacking point at the front of the cab, or suspend the cab front in a hoist using the lifting yoke.
9. Remove the bolts connecting the cab suspension to the steering gear mounting.
10. Support the steering gear mounting. Remove the attachment bolts and take the steering gear mounting off the chassis.

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

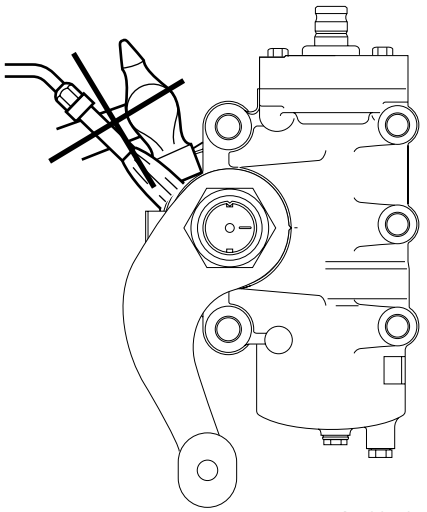
Installation of the steering gear mounting

1. Carefully clean the attachment bolts.
2. 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.
3. Screw the nut on the attachment bolt by hand. If the nut can be easily screwed on the bolt by hand, the bolt may be reused. If necessary, the attachment bolts should be renewed.
4. Remove all paint from the contact surfaces of both the steering box and the steering gear mounting (a thin, factory applied layer of paint is allowed).
   The contact surfaces should be absolutely free from dirt and grease.
5. Place the steering gear mounting on the chassis. Tighten the bolts evenly. Do not tighten the bolts until the cab has been tilted back.
6. Install the cab suspension on the steering gear mounting. Tighten the attachment bolts to the specified torque.
7. Remove the cab support.
8. Tilt the cab.
9. Tighten the attachment bolts of the steering gear mounting to the specified tightening torque, see main group “Technical data”.
10. Install the radiator/intercooler.
11. Install the steering-oil reservoir.
12. Install the steering box.
13. Fit the wiring in the same way as it was connected previously.

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.

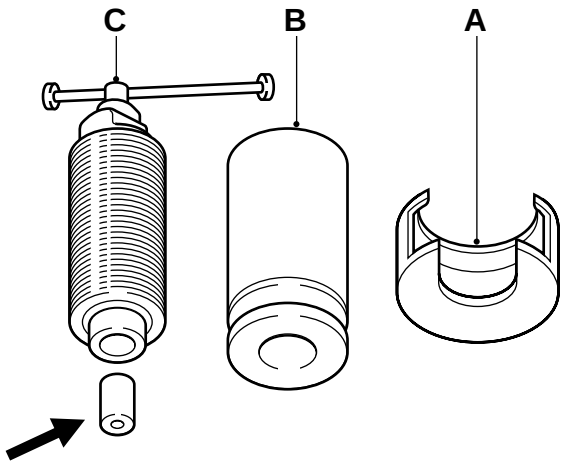
The pitman arm should only be removed using the prescribed special tools.
Under no circumstances should the pitman arm be removed by dislodging it with a hammer or by heating, if the prescribed tools are not available.
This would not only result in the pitman arm becoming highly unreliable, but would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



S7 00 167

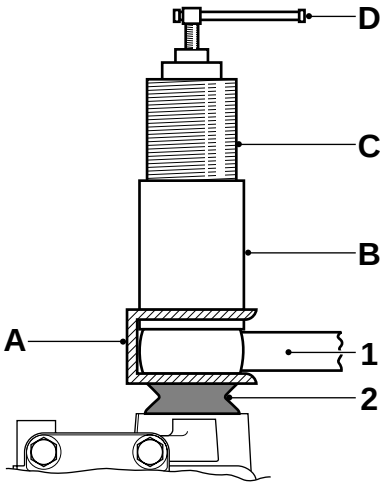
Removal of the pitman arm

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 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 the spindle (D) of the hydraulic puller (C) out as far as possible. Subsequently screw the hydraulic puller (C) as far as possible into adapter (B) 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 as far as possible into the adapter (B). Then screw in spindle (D) again until the pitman arm comes off.

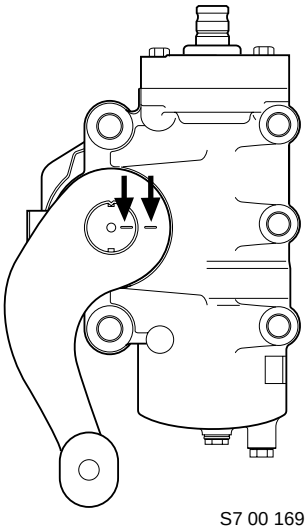


S7 00 030

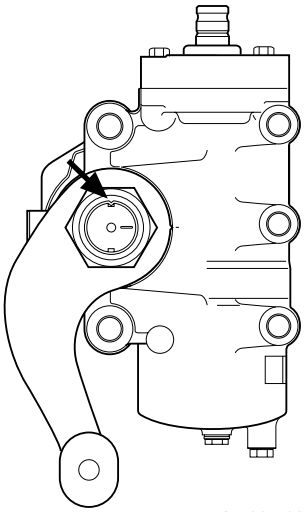
Installation of the pitman arm

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 that meets the specifications (melting point of $>130^{\circ}C$).
3. Install the pitman arm on the sector shaft so that the markings on the pitman arm and the sector shaft align.

   Note:
   As the sector shaft is normally secured at the same position, the sector-shaft lock 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 00 169

4. Fit the nut on the sector shaft and tighten it to the specified tightening torque, see main group “Technical data”.
5. 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.
6. Install the steering box.

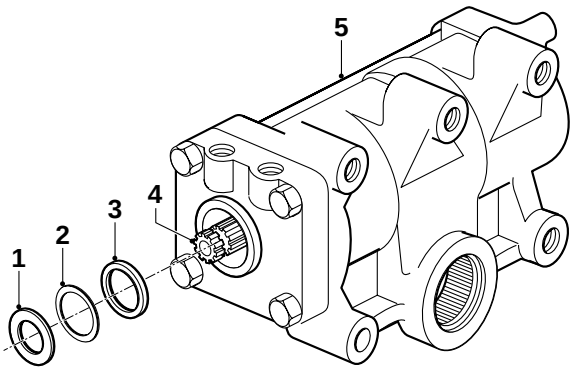


S7 00 168

4.4 REMOVAL AND INSTALLATION, INPUT SHAFT OIL SEAL

Removal of the input-shaft oil seal

1. Remove the steering box.
2. Fit false jaws to the bench vice. 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 dust seal (1) from the steering box.
5. Remove the grease from around the input shaft (4).
6. Remove the circlip (2) located above the oil seal (3).
7. For a one-circuit steering box, the oil seal (3) should be removed as follows:
   - Close off the delivery-line connection (P) using a plug.
   - Connect a hydraulic pump to the return-line connection (R) which can generate a pressure of approx. 150 bar.
   - Cover the opening at the input shaft, to prevent any oil splashes.
   - Using the hydraulic pump, carefully increase the pressure until the oil seal (3) is driven from the steering box.
   - Remove the hydraulic pump and the plug.
8. For a two-circuit steering box, the oil seal (3) should be removed as follows:
   - Close off the delivery-line connections P1, P2, R1, C1 and C2 using plugs.
   - Connect a hydraulic pump to line connection R2 which can generate a pressure of approx. 150 bar.
   - Cover the opening at the input shaft, to prevent any oil splashes.
   - Using the hydraulic pump, carefully increase the pressure until the oil seal (3) is driven from the steering box.
   - Remove the hydraulic pump and the plugs.



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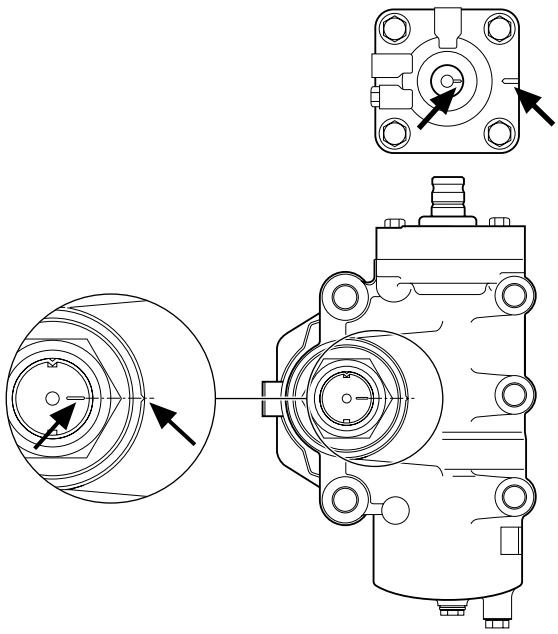
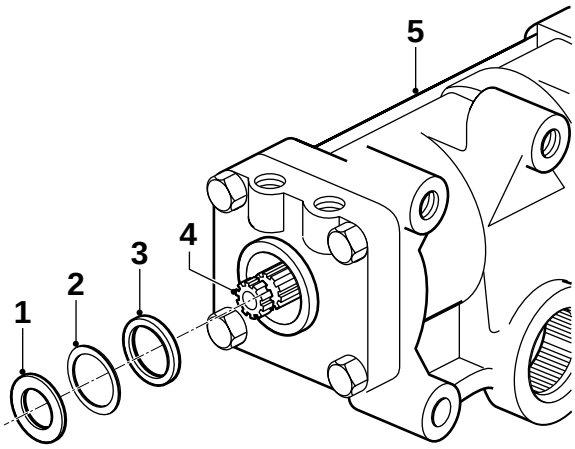


S7 00 166

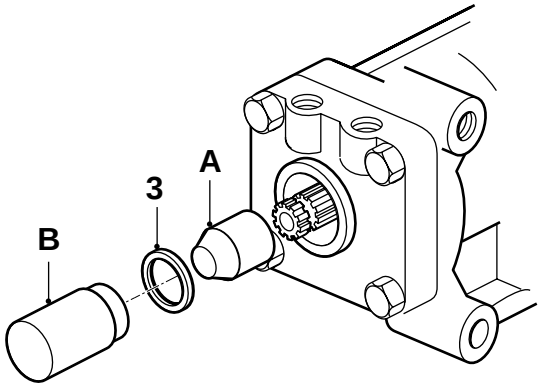
Installation of the input-shaft oil seal

1. Check the oil-seal chamber (3) for rough edges, grooves and residual sealing-ring particles.



S7 00 443

2. Slide guide bush (A), special tool (DAF no. 1240095) onto the gearing of the input shaft (4) in order not to damage the new oil seal (3).
3. Grease the inside of the new oil seal (3) and install the oil seal, with its spring side towards the steering box, into the steering box.
4. Tap the oil seal (3) carefully into the chamber using a plastic mallet and driver (B).
   Check whether the groove for the circlip (2) is entirely free.
   Make sure that the oil seal (3) is not fitted into the chamber too deeply.
5. Check whether no parts of the oil seal (3) were left behind during its installation. Remove these particles, if any.
6. Install a new circlip (2). Place the lower circlip lip into the groove and turn the circlip to the left while pushing it slightly into the groove.
7. Fill the space on top of the circlip with the specified grease (melting point of $>130°C$).
8. The specified grease (melting point of $>130°C$) should also be applied to the underside of the dust cover (1). After that, slide the dust cover onto the input shaft (4).
9. Place the steering box on a test bench, if available, and check for leaks.
10. Install the steering box.



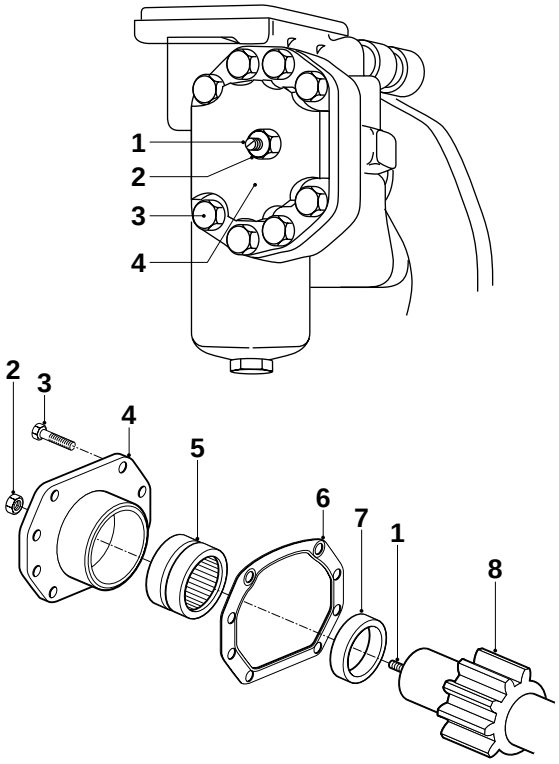
S7 00 444

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

Removal of the sector-shaft oil seal in 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 oil flowing out of the system.
5. Use a plastic mallet to tap the side cover (4) loose while, at the same time, turning the adjusting bolt (1) clockwise.
   The adjusting bolt (1) is fitted in the sector shaft (8) and should be removed entirely from the side cover (4).
6. Remove the gasket (6) from the side cover. This gasket may not be reused.

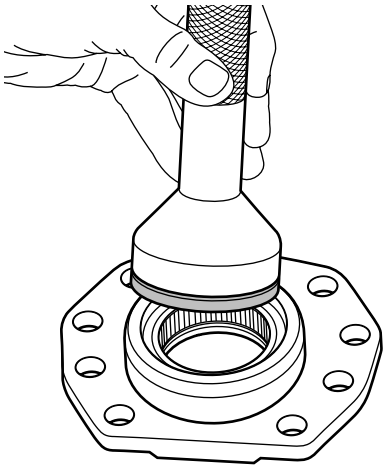
   Note:
   Work in very clean conditions. Prevent dirt from entering the needle bearing.
7. Use a universal internal puller to remove the sector-shaft oil seal (7) from the side cover.



S7 00 448

Take care not to damage the needle bearing (5) when removing the sector-shaft oil seal.

8. Check the needle valve for smooth operation and damage after removal of the sector-shaft oil seal.


S7 00 455

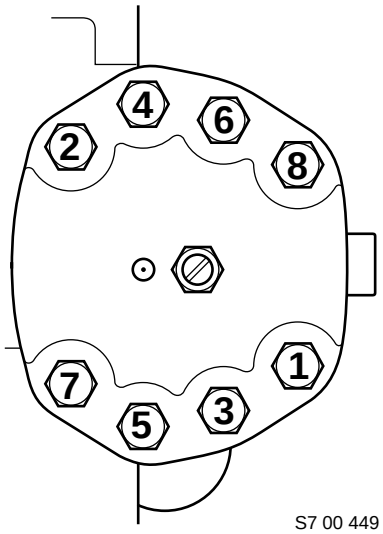
Installation of the sector-shaft oil seal in side cover

1. Apply clean grease that meets the specifications (melting point of $>130^{\circ}C$) to the needle bearing (5).
2. Fit a new sealing ring into the side cover using the special tool (DAF no. 1329453).
3. Fit a new gasket onto the side cover. Stick the gasket to the cover using a little clean grease.
4. Install the side cover (4) to the steering box while, at the same time, turning the adjusting bolt (1) counter-clockwise into the side cover.

5. Clean the attachment bolts.

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

   Apply one drop of steering oil to the bolt head and the first turns of the screw thread.
   Fit the bolts.
   Tighten the bolts evenly in the sequence as shown in the drawing.
   Subsequently, tighten the bolts to the specified tightening torque in the sequence as shown, see main group “Technical data”.



S7 00 449

6. Fit the lock nut and readjust the pressure point, see chapter “Checking and adjusting”.

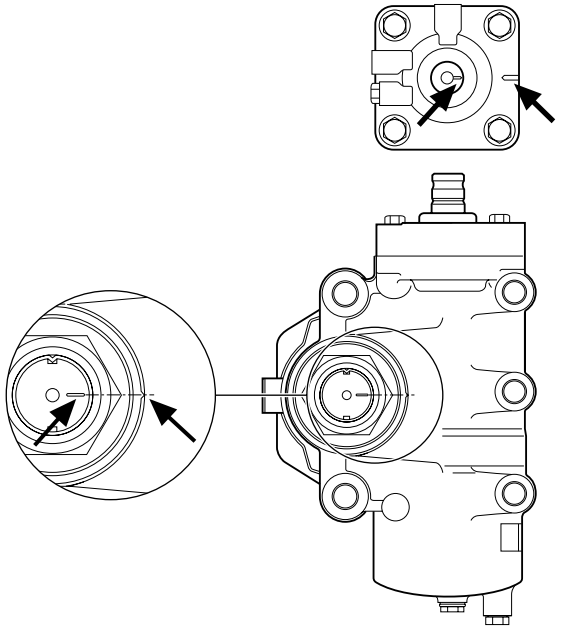
7. Fill and bleed the steering mechanism.

8. Take a test drive. During the test drive the proper functioning of the steering mechanism should be checked. After the test drive, the system should be checked for leaks.

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

Removal of sector-shaft oil seal on pitman-arm side

1. Remove the steering box.
2. Fit false jaws to the bench vice. 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.



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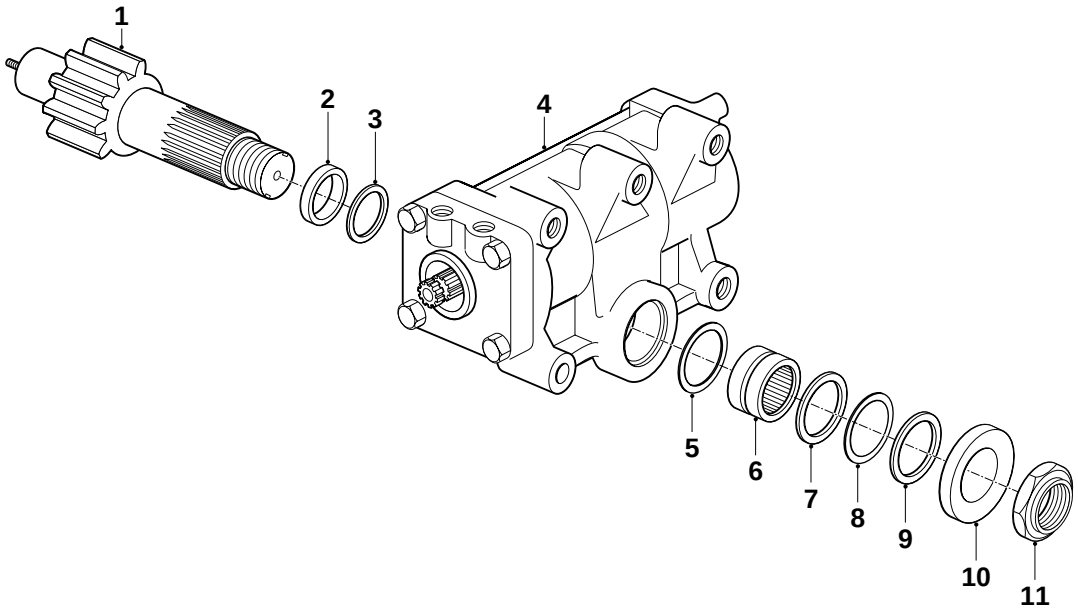


S7 00 452

5. Remove the dust seal (10).
6. Remove dirt and paint or rust, if any, from the sector shaft (1).

   Note:
   Work in very clean conditions. Prevent dirt from entering the steering box or parts of the steering box.
   Please pay attention to the way parts have been installed prior to disassembling these. This is to ensure correct assembly of the new sealing rings.

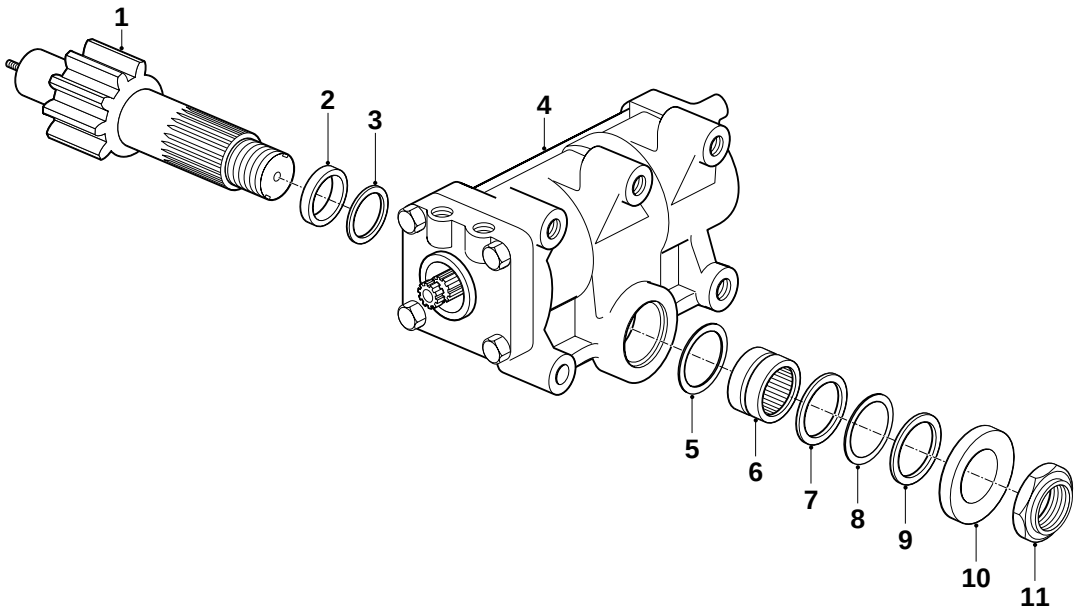
3

7. Remove the side cover from the steering box.
8. Remove the sector shaft (1).
9. Carefully remove the dirt/water seal (9) from the steering box (4) using a small screw driver.
10. If fitted, carefully remove the circlip (8). Prevent damage to the circlip and the steering box.
11. Carefully remove the dirt seal (7), if any, from the steering box (4) using a small screw driver.
12. Place the steering box in horizontal position and remove the sector-shaft oil seal (2) from the steering box using a universal internal puller.

Take care not to damage the needle bearing (6) when removing the sector-shaft oil seal.

13. Check the needle valve for smooth operation and damage after removal of the sector-shaft oil seal. Leave the spacer (3) and circlip (5), if fitted, in position.

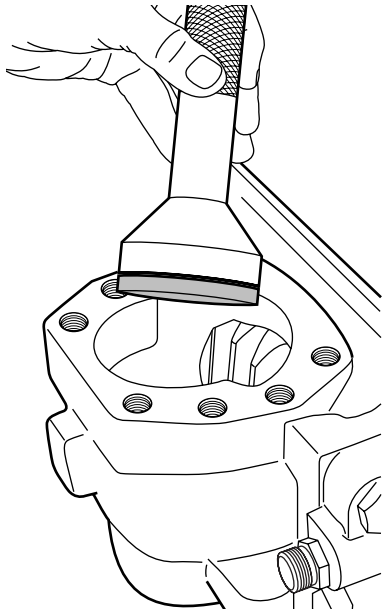
    Note:
    Later versions are not fitted with the parts with position numbers 3, 5, 7 and 8. For these versions, the sector-shaft oil seal must be very carefully removed using a screwdriver.



S7 00 452

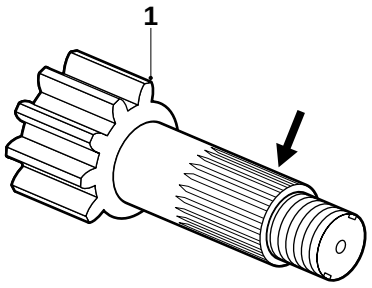
Installation of sector-shaft oil seal on pitman-arm side

1. Install the spacer (3), if it has been removed. The wide side of the spacer must abut the sector-shaft oil seal.
2. Fit a new sector-shaft sealing ring (2) into the steering box (4) using the special tool (DAF no. 1329453).
3. Apply clean grease that meets the specifications (melting point of >130°C) to the needle bearing (6).
4. If fitted, install a new dirt seal (7).
5. If fitted, install the circlip (8). Ensure that the circlip is correctly fitted into the groove.
6. Apply the specified grease (melting point of >130°C) to the back of the new dirt/water seal (9) and subsequently fit the dirt/water seal (9) into the steering box.



S7 00 454

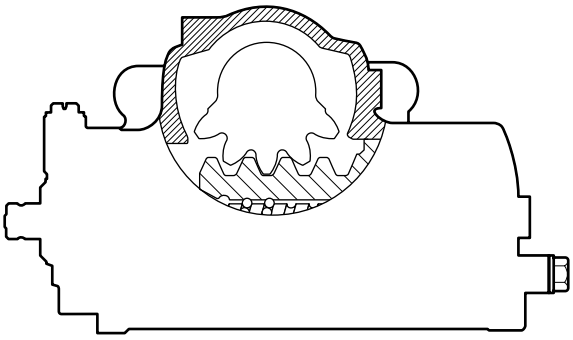
7. Stick adhesive tape to groove toothing on the sector shaft (1) (see arrow in drawing). This will prevent damage to the sector-shaft oil seal when installing the sector-shaft into the steering box.



S7 00 453

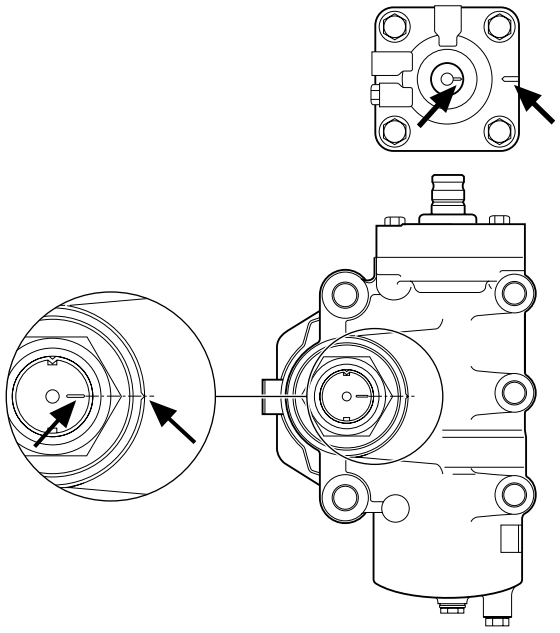
8. Check whether the piston is still in its central position, so that the middle sector-shaft tooth engages the correct piston teeth.

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



S7 00 036

9. Install the sector shaft (1) into the steering box (4).
10. Check whether the middle tooth of the sector shaft engages the correct piston teeth, using the markings on the sector and input shaft.
11. Remove the adhesive tape from the groove toothing.



S7 00 166

12. Fit a new dust seal (10) and grease the dust-seal surface which is positioned against the steering box using a grease that meets the specifications (melting point of $>130°C$).
13. Fit the side cover.
14. Install the pitman arm.
15. Readjust the pressure point, see chapter “Inspection and adjustment”.
16. Place the steering box on a test bench, if available, and check for leaks.
17. Install the steering box.
18. Fill and bleed the steering mechanism.
19. Take a test drive. During the test drive the proper functioning of the steering mechanism should be checked. After the test drive the system should be checked for leaks.

4.7 REMOVAL AND INSTALLATION, PRESSURE-LIMITING VALVE

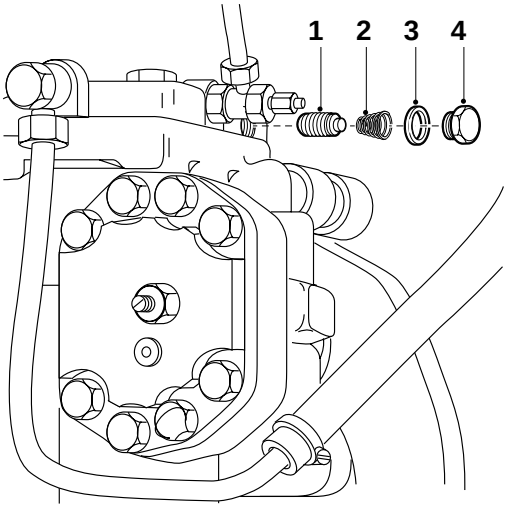
Removal of the pressure-limiting valve

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

   Note:
   Do not change the pressure-limiting valve setting.

Installation of the pressure-limiting valve

1. Fit a new O-ring (3) on the plug (4).
2. Place the valve (1) with the spring (2) in the steering box. Fit the plug (4) and tighten it to the specified tightening torque, see main group “Technical data”.
3. Take a test drive. During the test drive, the proper functioning of the steering mechanism should be checked. After the test drive, the plug (4) should be checked for leaks.



S7 00 176

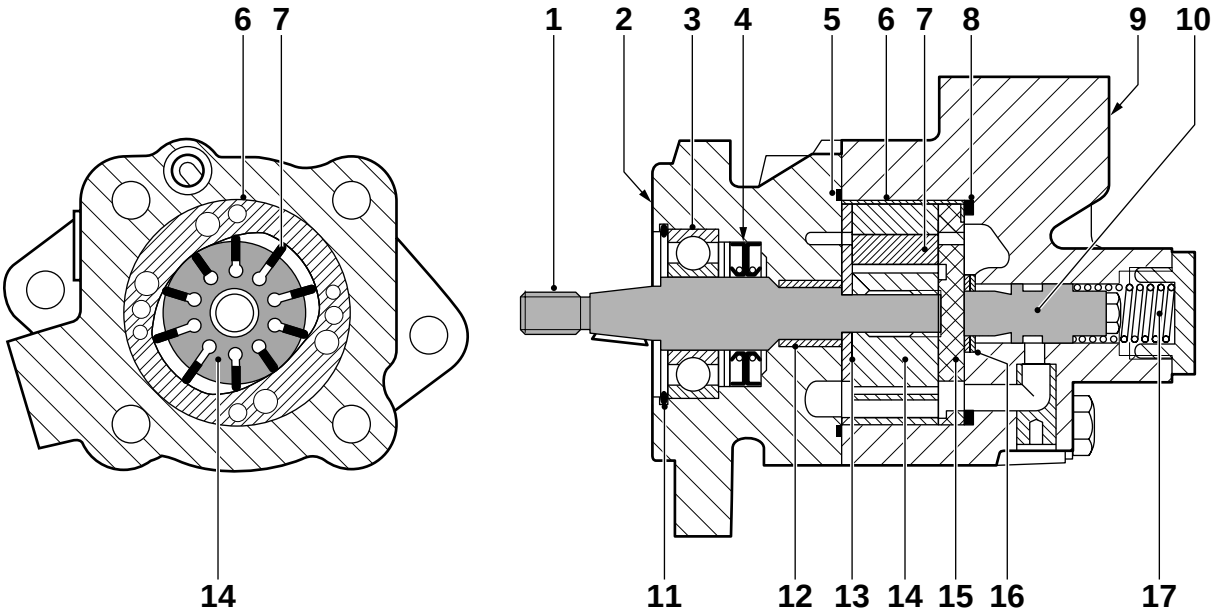
CONTENTS

4

4

1. GENERAL

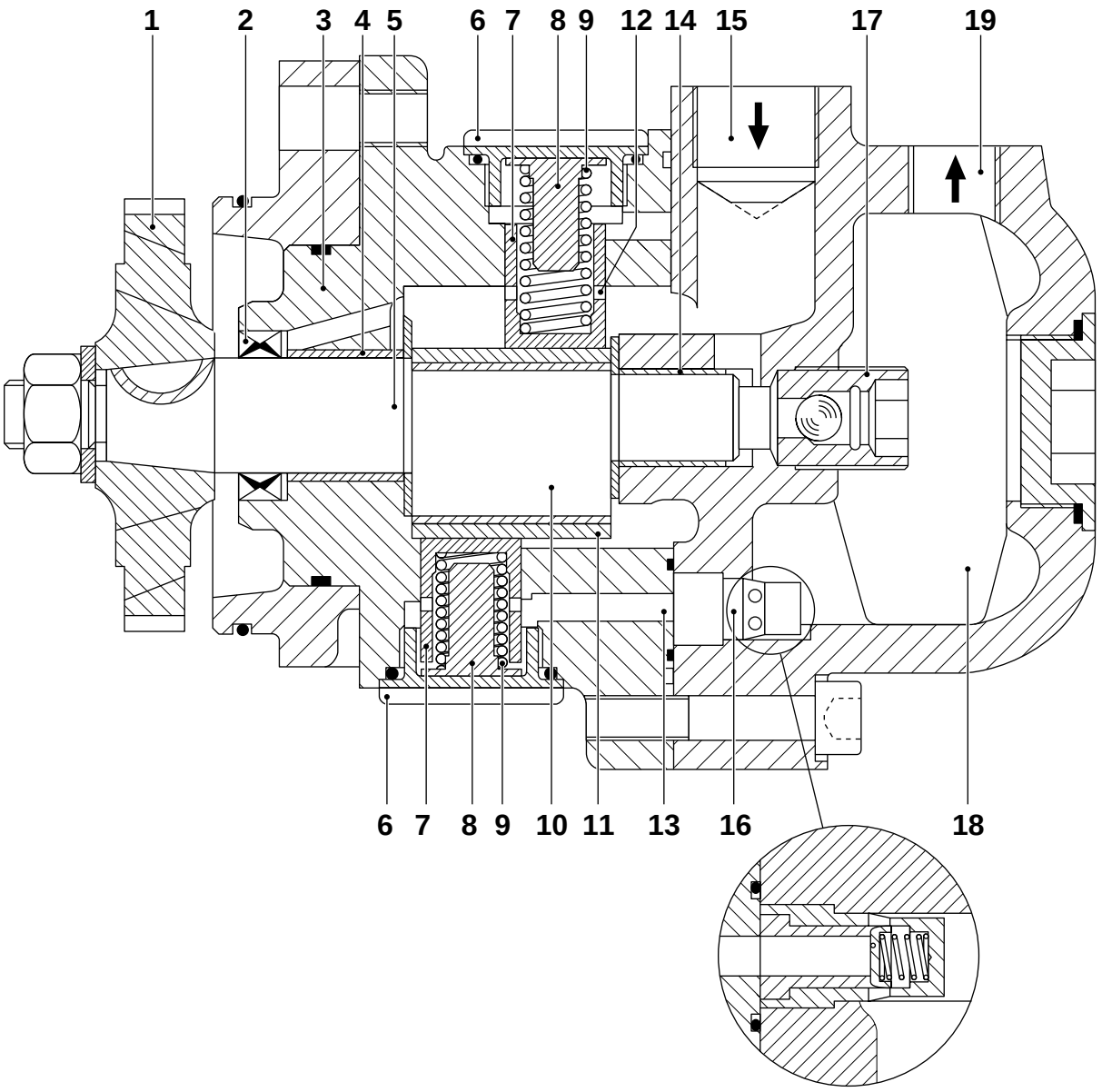
1.1 OVERVIEW DRAWING, STEERING PUMP



S7 00 037

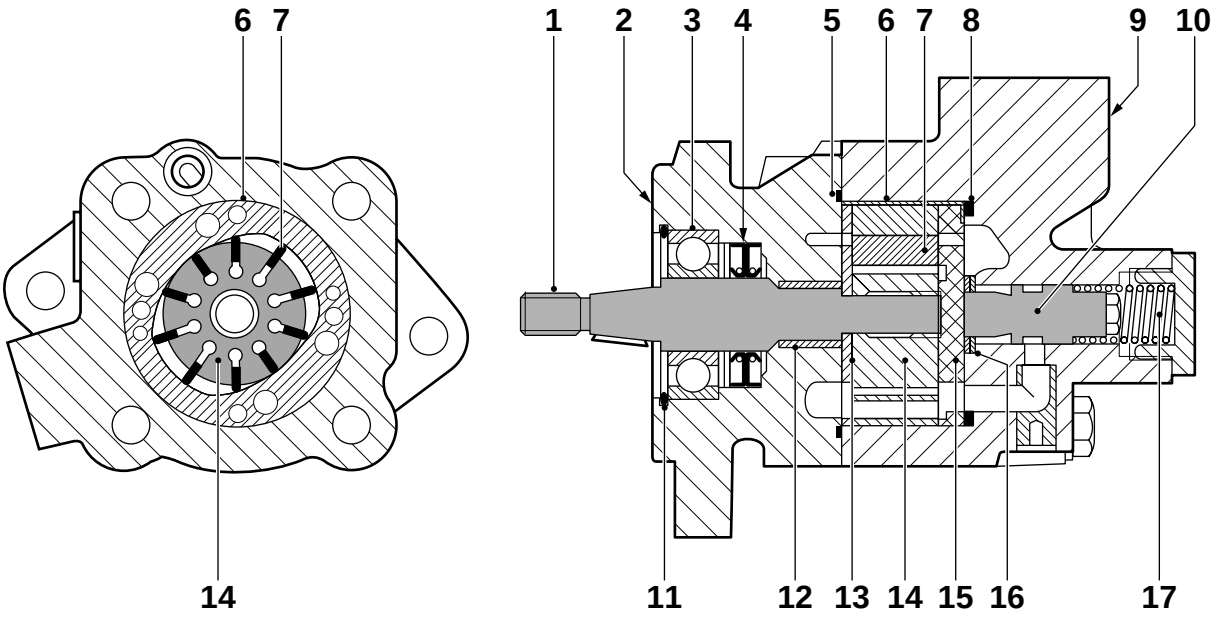
1. Drive shaft
2. Housing
3. Ball bearing
4. Double oil seal
5. O-ring
6. Stator
7. Vanes
8. O-ring
9. Cover
10. Flow-control valve
11. Circlip
12. Bearing bush
13. Thrust plate
14. Rotor
15. Thrust plate
16. Sealing ring
17. Spring

1.2 OVERVIEW DRAWING, EMERGENCY STEERING PUMP



1. Gearwheel
2. Double oil seal
3. Housing
4. Bearing bush
5. Axle
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 pipe
16. Delivery valve
17. Suction valve
18. Cushioning chamber
19. Delivery pipe

1.3 OPERATION OF THE STEERING PUMP



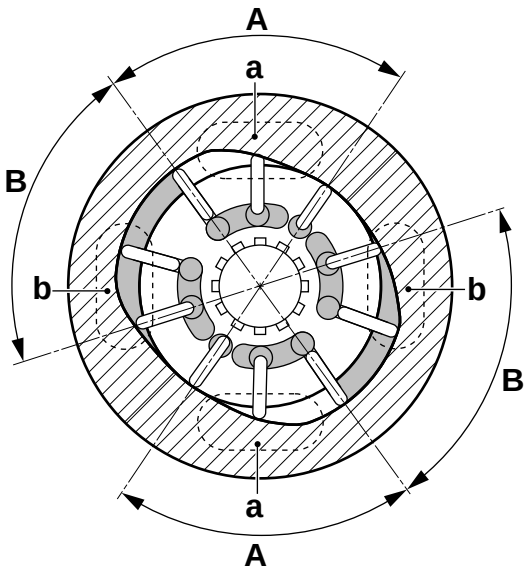
S7 00 037

The pump can be divided into a pump and a control part.
The pump part consists of the shaft (1), the rotor (14), the vanes (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 line and the flow-control valve (10) with spring (17).
The shaft (1) is carried by the ball bearing (3) and the bearing bush (12).

The ball bearing (3) is lubricated with engine oil from the engine distribution. 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 pressurising, 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 causes the volume of the pumping-chamber to increase twice per revolution, the suction stroke (angular rotation A). At the same time the volume of the pumping chamber is decreased twice per revolution, the delivery stroke (angular rotation B).
The two spaces in which the volume is increased are connected to the supply line (a).
The two spaces in which the volume is decreased are connected to the delivery line (b).
To achieve adequate sealing between the vanes and the stator, the underside of the vanes are connected to the pump's internal delivery line.
This construction presses the vanes 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 line.

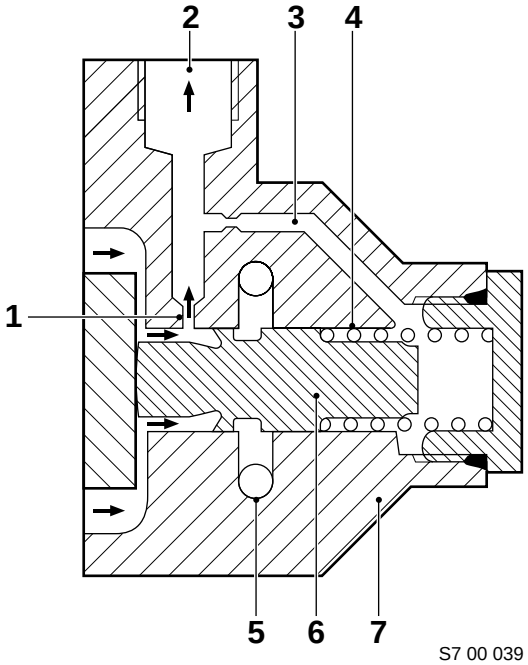


S7 00 038

4

Regulated output control
In principle, the pump output depends on the speed.
The steering mechanism, 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 line 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 line (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-line connection (2).

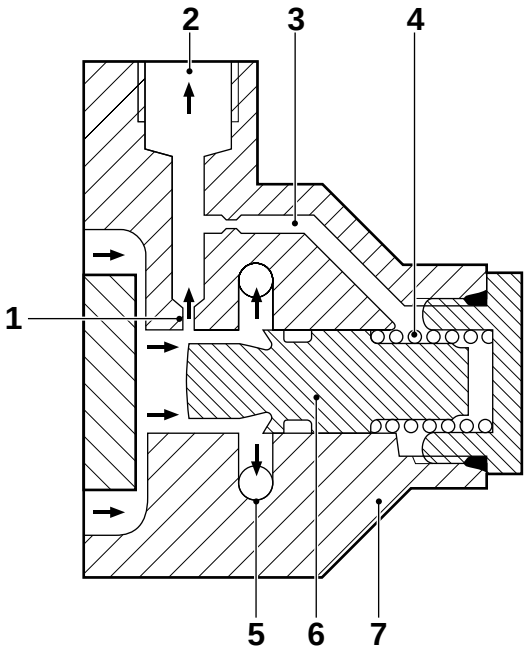


S7 00 039

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.

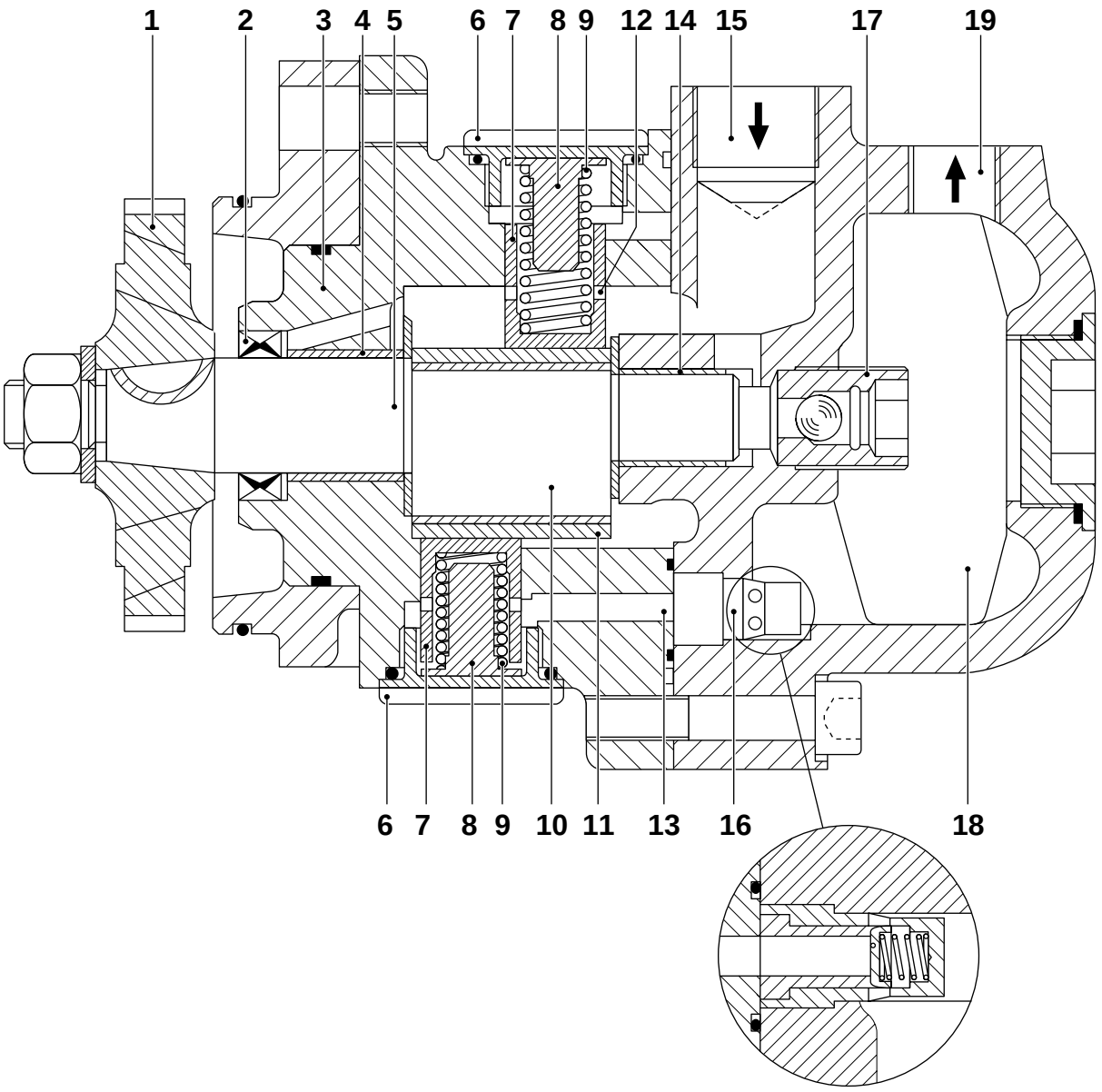
This control system supplies a fairly constant oil output to the steering mechanism, despite the engine-speed variations.

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



S7 00 040

1.4 OPERATION OF THE 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 final 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 reduces the amount of time during which the steering oil can flow into the hollow piston, 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 piston on the oil is damped.

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 standstill. The suction valve (17) is opened 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 differential pressure between the supply and the delivery line.

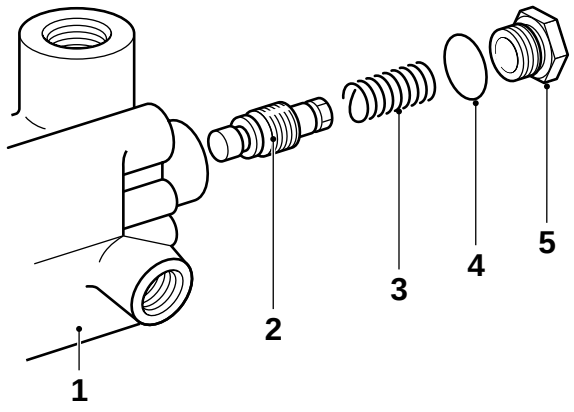
4

2. INSPECTION AND ADJUSTMENT

2.1 INSPECTION, FLOW-CONTROL VALVE

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 beneath 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 required.
6. Apply plenty of clean steering oil to the valve and fit the valve in the correct position (hexagon-headed bolt facing outwards) in the bore.
7. Check the valve for smooth operation. The valve should not jam.
   If a pump has been removed, check whether the valve can shift from one side to the other in the valve bore under its own weight.
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 main group “Technical data”.
10. Fill and bleed the hydraulic system of the steering mechanism.
11. Take a test drive and check the plug for leaks.



S7 00 052

4

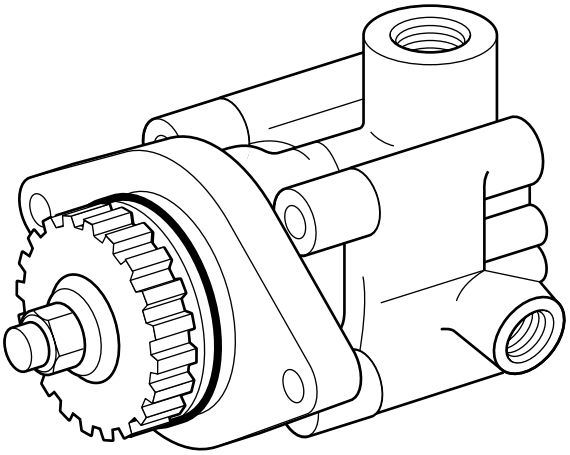
3. REMOVAL AND INSTALLATION

3.1 REMOVAL AND INSTALLATION, STEERING PUMP

Removal, steering pump

Note:
When replacing a worn steering pump you are advised to fully drain the steering oil, disassemble 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 into the steering box. Check the steering box for internal wear using the test-equipment case.

1. Clean the line connections.
2. Place a receptacle beneath the steering pump.
3. 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 system.
4. Remove the fixing bolts and remove the steering pump from the engine distribution.



S7 00 053

Installation of the steering pump
1. Transfer the drive sprocket to the steering pump to be fitted, if necessary.
   Thoroughly remove any preserving grease, especially from the tapered parts.
   Tighten the fixing nut to the specified tightening torque. See main group “Technical data”.
2. Transfer the pipe couplings to the steering pump to be fitted, if necessary. Tighten the couplings to the specified torque. See “Technical data”.

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

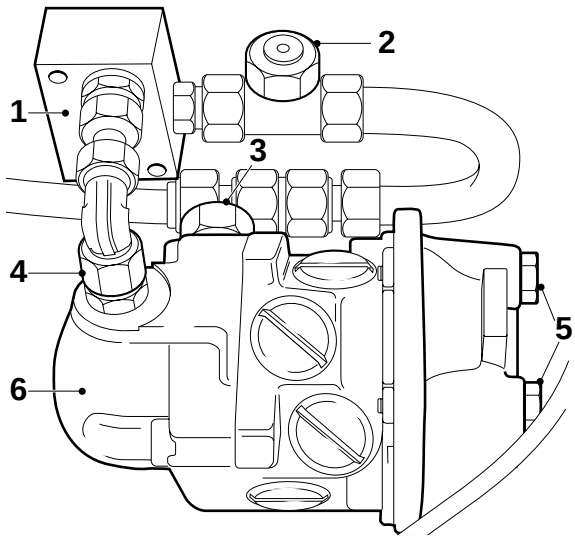
3. Fit a new O-ring to the steering pump and grease it lightly.
4. Install the pump on the engine. Tighten the attachment bolts evenly to the specified tightening torque, see main group “Technical data”.
5. Connect the lines.
6. Fill and bleed the hydraulic system of the steering mechanism.
7. Take a test drive and check the line connections for leaks.

3.2 REMOVAL AND INSTALLATION, EMERGENCY STEERING PUMP

Removal of 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 into the steering box. Check the steering box for internal wear using the test-equipment case.

1. Clean the line connections.
2. Place a receptacle beneath the emergency steering pump.
3. 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 system.
4. Remove the fixing bolts (5) and remove the pump (6) from the gearbox.



S7 00 141

Installation of the 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. Tighten the fixing nut to the specified tightening torque. See main group “Technical data”.
2. Replace the O-ring at the drive side of the pump.
3. Fill the pump with clean steering oil through the line connection (3) of the supply line before installing it.
4. Install the pump on the gearbox.
5. Tighten the attachment bolts (5) to the specified torque, see main group “Technical data”.
6. Connect the lines (3 and 4).
7. Fill and bleed the system.
8. Make a test run 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.

4

CONTENTS

5

1. GENERAL

1.1 LINES

Supply pipe
The supply line connects the reservoir to the steering pump and consists of a thick, flexible rubber line with a linen sheathing.
Within the engine encapsulation the hose may be fitted with a protective, braided, steel sheathing.
The hose is attached to the reservoir with a hose clip and to the steering pump with a union-nut connection or a hose clip.
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 pipe
The delivery line connects the steering pump to the steering box and consists of a rubber line with an internal, braided, steel casing. The admissible pressure is marked on the hose.
If lines are longer, steel lines are sometimes also applied.
The line is connected to the steering pump and the steering box using a union-nut connection.

Return pipe
The return line connects the steering box to the reservoir and consists of a flexible rubber line with a linen sheathing. If lines are longer, steel lines are sometimes also applied.
The line is connected to the steering box with a union-nut connection and to the reservoir with a hose clip.

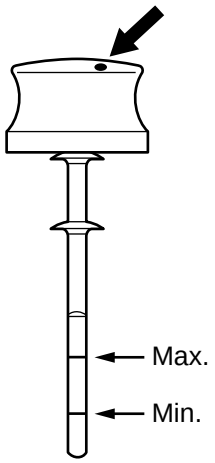
1.2 OPERATION OF THE RESERVOIR

General
The reservoir can be made of plastic or steel.
The reservoir is equipped with a filter element, which filters a part of 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 mechanism, prevent dirt from entering the reservoir or the lines. The steering oil is drawn in unfiltered, allowing impurities to enter into the steering mechanism.

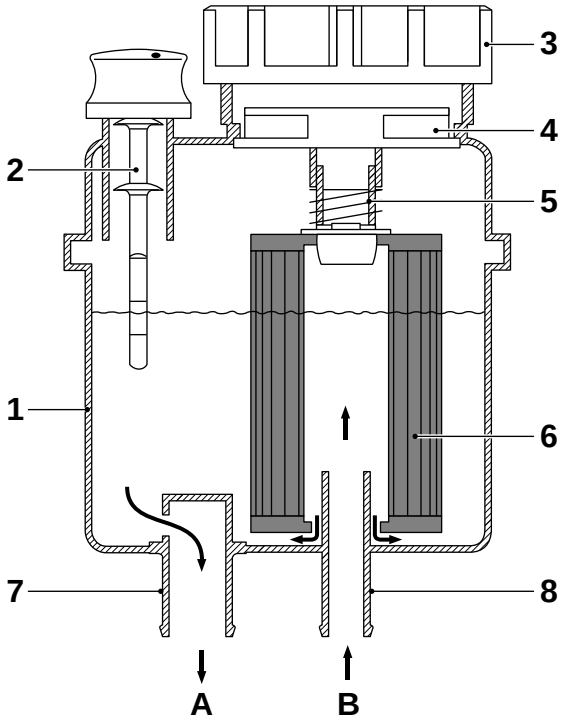
A by-pass valve is fitted under the filter.
When the engine is at idling speed and the steering pump's output is limited, the by-pass valve is closed. In this situation, the entire return-oil quantity passes through the filter. If the steering pump's output is at its maximum, approx. $^1/_3$ of the oil will pass through the filter and $^2/_3$ will flow directly into the reservoir through the by-pass valve.
As the circulation speed of the oil is very high, the total oil quantity will pass through the filter often enough.
As only a part of the oil is filtered, the filter element can remain small.

A dip stick 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 dip-stick cap. This hole should never be blocked, as the return pressure would become too high.



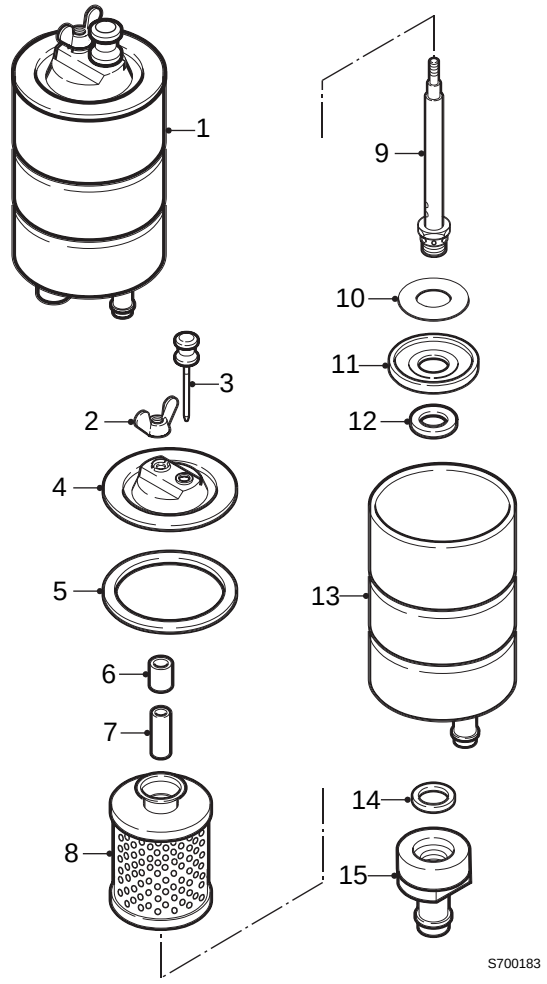
S7 00 051

Reservoir, one-circuit system
In one-circuit systems, plastic reservoirs (1) are applied. The reservoir (1) is equipped with a screw cap (3) and a dip stick (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).
The force which the return oil exerts on the filter element (6) partly lifts the filter element (6) off its 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).



S7 00 088

Reservoir, two-circuit system
In the two-circuit system, two steel reservoirs (1) are applied. Both reservoirs are equipped with steel lids (4), which are closed using a wing nut (2). The lid (4) is sealed with a rubber ring (5).
The lid (4) is equipped with a dip stick (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 disk (10) placed under the filter element.



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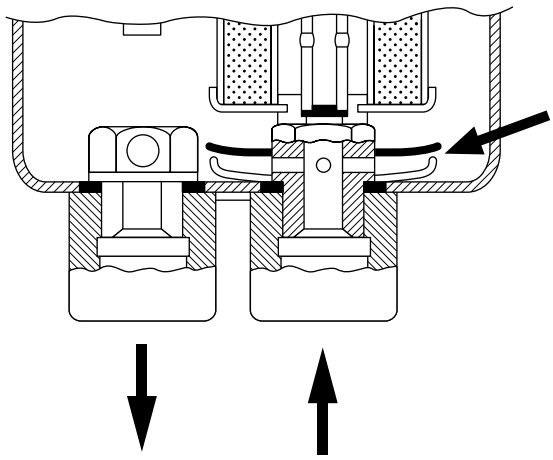
The force which the return oil exerts on the clamping disk (10) pushes the disk (10) off the seat (11). Part of the steering oil flows directly into the reservoir, see the arrow in the drawing.

The line connection (15) is sealed by the sealing ring (14).
The two reservoirs are interconnected by an overflow line.



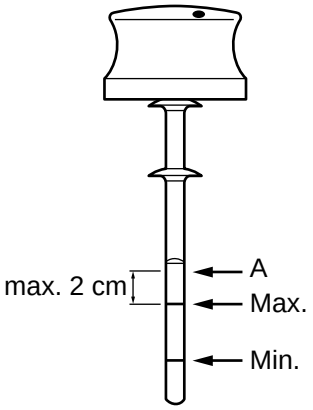
S7 00 050

5

2. INSPECTION AND ADJUSTMENT

2.1 INSPECTION, STEERING OIL LEVEL

1. Clean the dip stick and its immediate surroundings, to prevent oil from entering the reservoir.
2. Check the fluid level in the reservoir using the dip stick.
3. The fluid level should reach the upper dip-stick marking (max.) when the engine is running. When the engine is not running, the fluid level should be approx. 2 centimetres higher (A).



S7 00 023

2.2 INSPECTION, LINES

1. Condition of the pipes
   - Check all parts for porosity and wear. In particular the suction pipes, which are subjected to underpressure, are likely to cause complaints when they are porous (air in the system).
   - If in doubt, always replace the pipe.

2. Pipe connections
   - Check every pipe connection for leaks.

3. Pipe routing
   - Pipes must not be twisted during assembly.
     To check for twisting, use the markings which may be shown on the pipes (sometimes in the form of text).
   - Pipes should not touch other parts (this is in view of chafing).
   - Pipes should not bend sharply; this applies especially to the flexible suction pipe and return pipes.
   - Pipes should not be pinched off by other components.

3. REMOVAL AND INSTALLATION

3.1 REMOVAL AND INSTALLATION, RESERVOIR

Removal of 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 line connections.
4. Remove the filter element from the reservoir.
5. Loosen the clamping strips and remove the reservoir from the bracket.

Installation of the reservoir

1. Thoroughly clean the inside of the reservoir.
2. Fit a new filter element into the reservoir.
3. Place the reservoir on the support.
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 using new hose clips. Tighten the hose clip.
6. Fill and bleed the system.
7. Inspect the line connections for leaks.

3.2 REMOVAL AND INSTALLATION, LINES

Removal of 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.

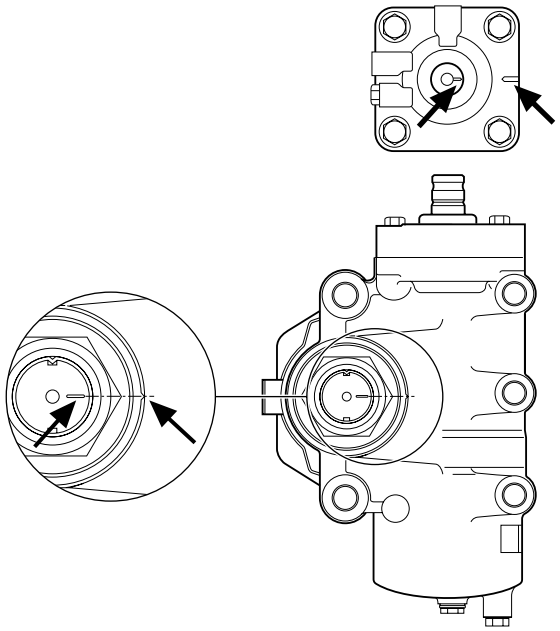
Installation of lines

1. Only install original lines supplied by DAF.
2. When connecting the line make sure that:
   - The line is not twisted during the installation of the coupling. To check for twisting, use the markings which may be shown on the pipes (sometimes in the form of text).
   - The line does not touch other parts (this in view of chafing).
   - The line does 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 clip, the hose clip should be replaced. Tighten the hose clip.
   Check the tapered parts for damage in case of a union-nut connection.
4. Fill and bleed the system.
5. Inspect the line connections for leaks.

3.3 REMOVAL AND INSTALLATION, AUXILIARY CYLINDER

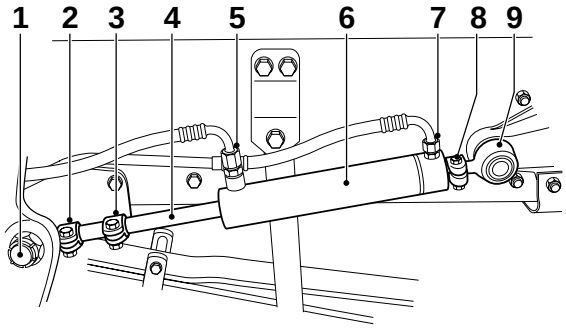
Removal of the auxiliary cylinder

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



S7 00 166

5. Remove the piston rod (4) from the coupling piece (2). To do so, slacken the bolt of clamping bracket (3) and screw the piston rod from the coupling piece.
6. Remove the cylinder (6) from the ball pin (9). To do so, slacken the bolt of clamping bracket (8) and screw the piston rod from the ball pin.
7. Remove the auxiliary cylinder from the vehicle and push the piston rod (4) fully into the cylinder (6), to avoid damaging the piston rod.



S7 00 165

Installation of the auxiliary cylinder

1. Thoroughly clean and check the clamping-bracket bolts. If corroded or damaged, replace the bolts.
   Replace the self-locking nut.

2. Screw the cylinder (6) as far as possible onto the ball pin (9), making sure that the line connections (5 and 7) are at the top of the cylinder.

   Note:
   For both clamping brackets make sure that:
   - The clamping bracket is correctly positioned by the bolt in relation to the slot. If not, fit the clamping bracket so that the open side is positioned over the slot.
   - The clamping bracket always fully engages the screw thread, see the drawing.

3. Replace the nut of the clamping bracket (8) and tighten the nut to the specified tightening torque, see main group “Technical data”.

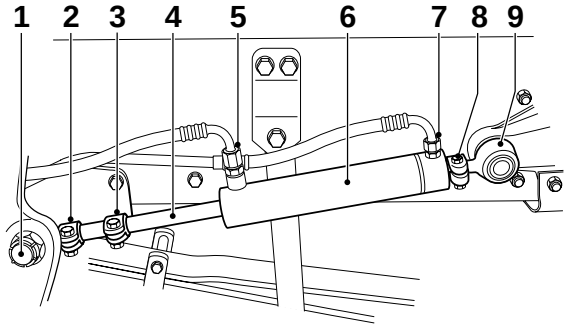
4. Slide the piston rod (4) from the cylinder (6) and screw the piston rod as far as possible into the coupling piece (2).

5. Replace the nut of the clamping bracket (3) and tighten the nut to the specified tightening torque, see main group “Technical data”.

6. Connect the lines.

7. Fill and bleed the system.

8. Inspect the line connections for leaks.



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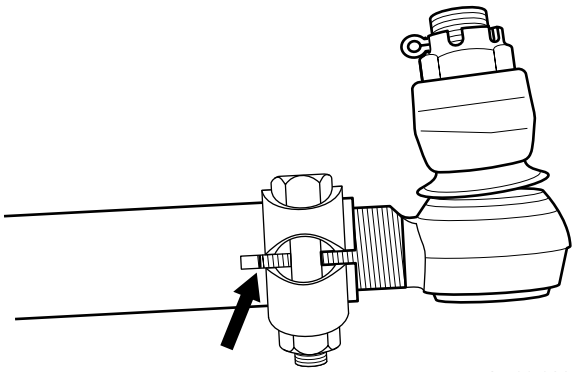
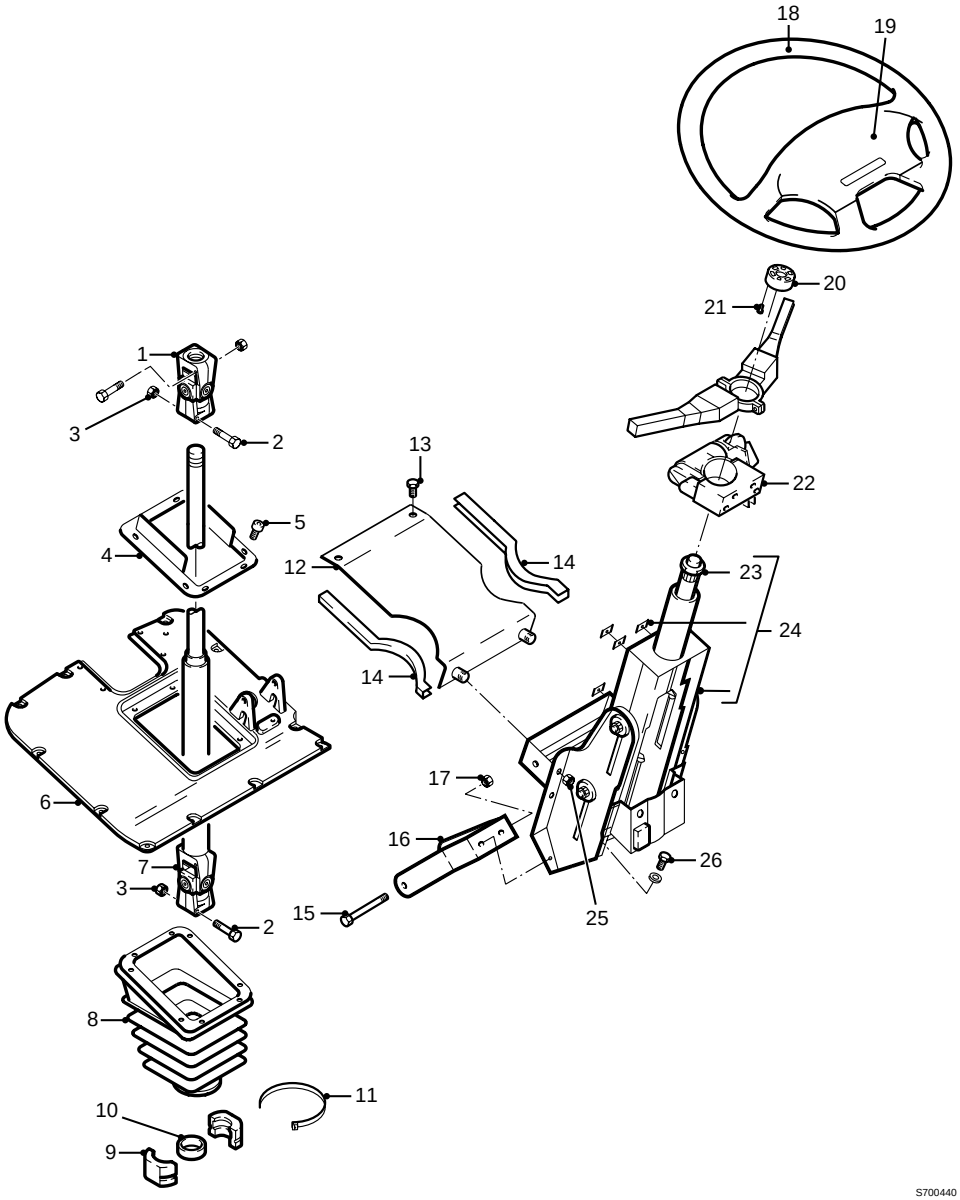

S7 00 026

CONTENTS

6

1. GENERAL

1.1 OVERVIEW DRAWING, STEERING COLUMN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S700440

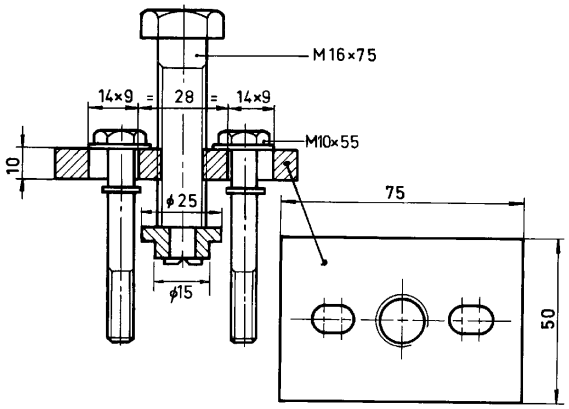
1. Universal joint
2. Bolt
3. Flange nut
4. Fixing plate
5. Screw
6. Pedal plate
7. Steering shaft
8. Socket
9. Split ring
10. Ring
11. Clamping strip
12. Steering-column bracket
13. Flange bolt
14. Finishing profile
15. Flange bolt
16. Steering-column brakcet
17. Flange nut
18. Steering wheel
19. Protective guard
20. Switching ring
21. Screw
22. Steering-column lock
23. Steering wheel attachment nut
24. Steering column
25. Self-locking nut
26. Flange bolt

6

2. REMOVAL AND INSTALLATION

2.1 REMOVAL AND INSTALLATION OF THE STEERING WHEEL

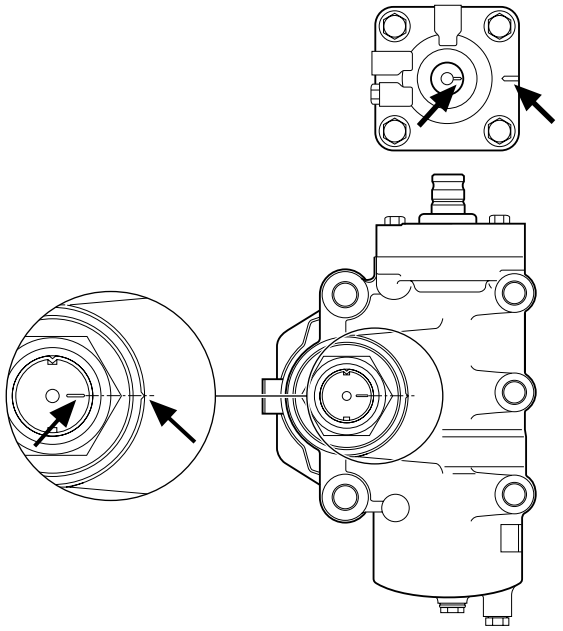
Note:
The special tools required to remove the steering wheel cannot be obtained from DAF. The tools required should be manufactured by yourself according to the drawing.



S7 00 065

Removal of the steering wheel

1. Place the steering mechanism in the central position using the markings on the steering box.

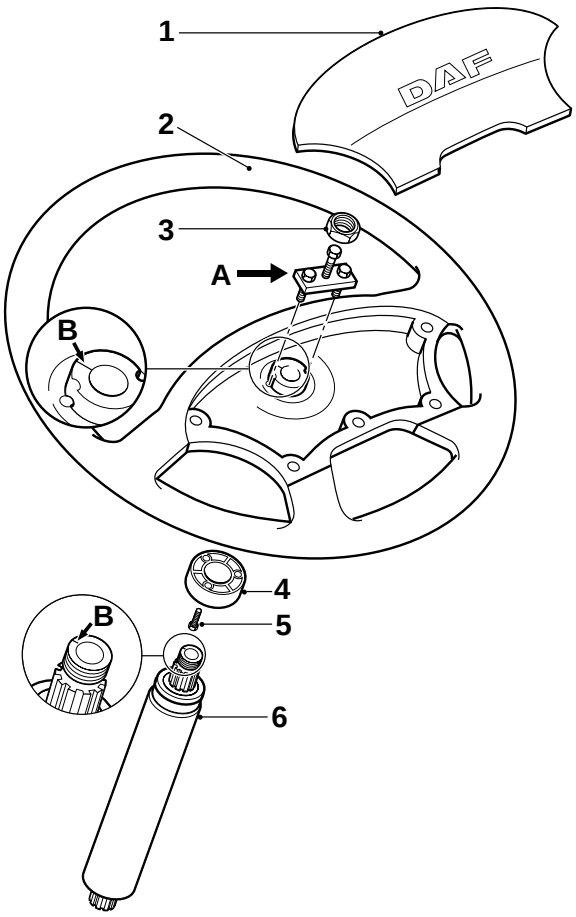


S7 00 166

2. Remove the cover plate (1) from the steering wheel (2).
3. Remove the steering-wheel nut (3).
4. Fit the steering-wheel puller (A), special tool, to the steering wheel using its two outer bolts. Screw in the central bolt of the steering-wheel puller until the steering wheel is released.

Installation of the steering wheel

1. If a new steering wheel (2) is installed, fit the switching ring (4) in the correct position on the steering wheel (2), see the drawing.
2. Check whether the steering mechanism is still in the central position using the markings on the steering box or the steering mechanism.
3. Fit the steering wheel (2) on the steering shaft (6) so that the markings on the steering wheel and the steering shaft “align” (see the arrows B).
4. Fit the nut (3). Tighten the nut to the specified tightening torque, see main group “Technical data”.
5. Fit the cover plate (1).

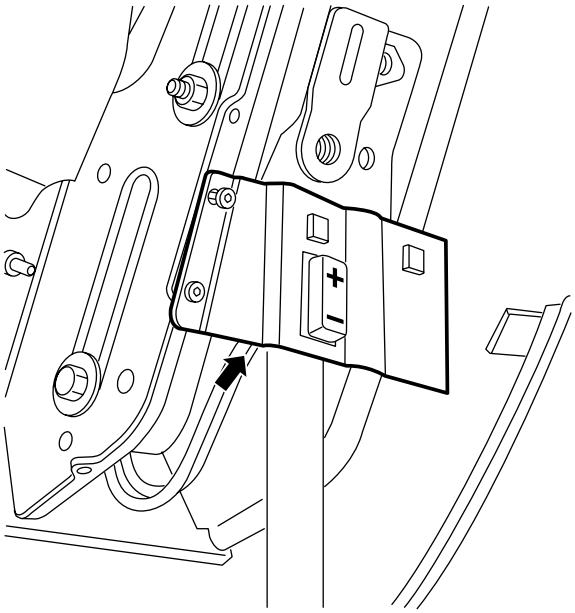


S7 00 427

2.2 REMOVAL AND INSTALLATION OF THE STEERING COLUMN

Removing the steering column

1. Remove the steering column panels.
2. Disconnect the earth clamp from the batteries.
3. Remove the steering wheel.
4. Remove the combination switches and the ignition lock.
5. Remove the bracket with the height-adjustment switch.
6. Disconnect the air pipes from the control valve and plug the supply pipe.
7. Loosen one of the universal joints of the steering shaft (which one depends on the operation to be performed; either the universal joint below the steering wheel or the universal joint on the steering box). Before disconnecting, mark the position of the universal joint relative to the steering shaft.
8. Remove the three attachment bolts at the bottom of the steering column.
9. Remove the lock nuts of the steering column.
10. Remove the steering column.



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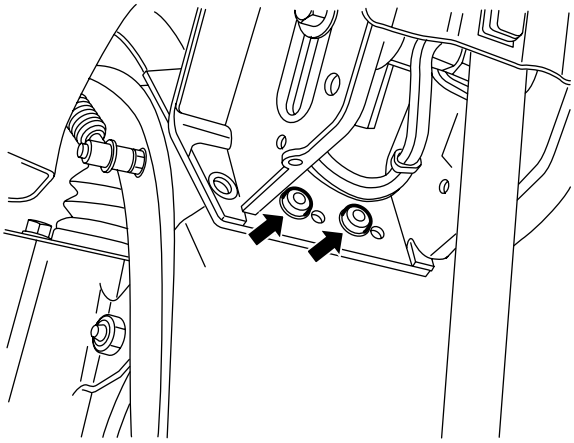
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Installing the steering column

1. Fit the steering column and make sure that the marks made on the universal joint and steering shaft are in alignment.
2. **Note:**
   Replace bolts fitted with self-locking nuts by new bolts fitted with flange nuts.

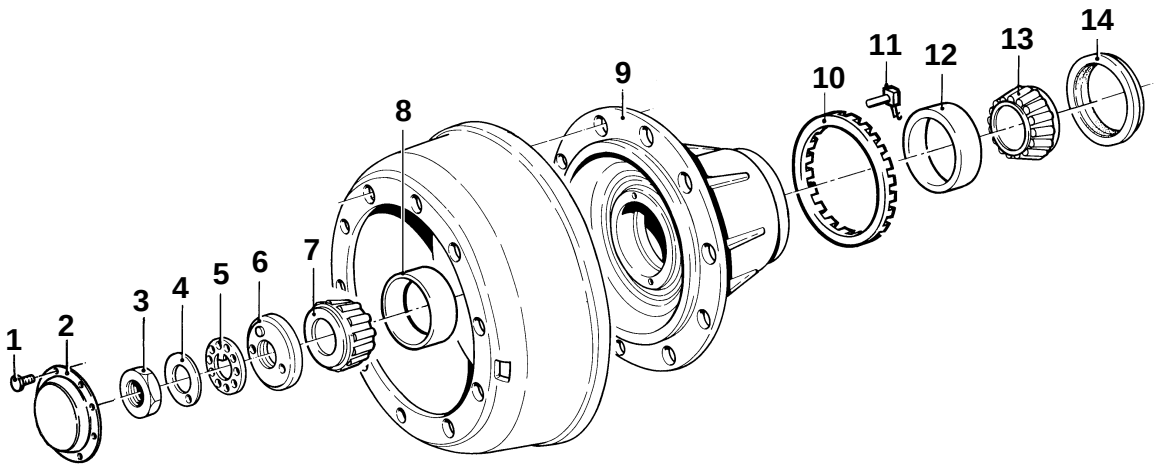
   Install the universal joint bolt using Loctite 243 (or equivalent).
   Tighten the bolt to the specified tightening torque, see main group “Technical data”.
3. Connect the air pipes to the control valve.

4. Install the bracket with the height-adjustment switch.
5. Install the ignition lock and combination switches.
6. Install the steering column panels.
7. Install the steering wheel.

CONTENTS

1. GENERAL

1.1 OVERVIEW DRAWING, WHEEL HUB

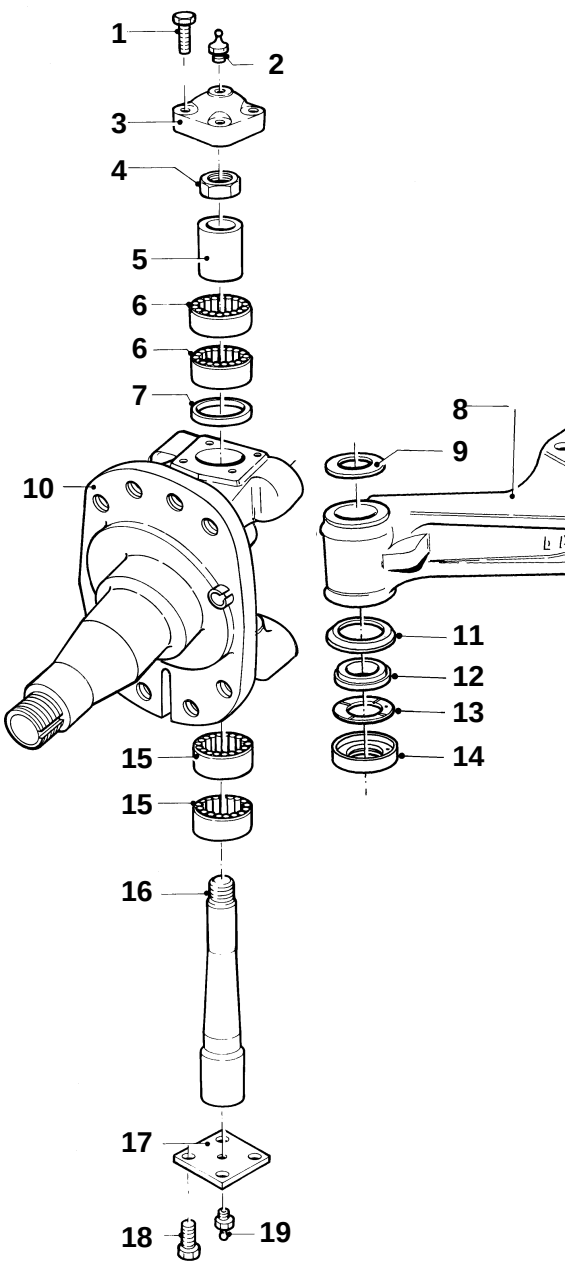


S7 00 401

1. Fixing bolt
2. Hub cap
3. Lock nut
4. Locking plate
5. Circlip
6. Adjusting nut
7. Bearing
8. Outer race
9. Hub
10. Sensor ring
11. ABS sensor
12. Outer race
13. Bearing
14. Sealing ring

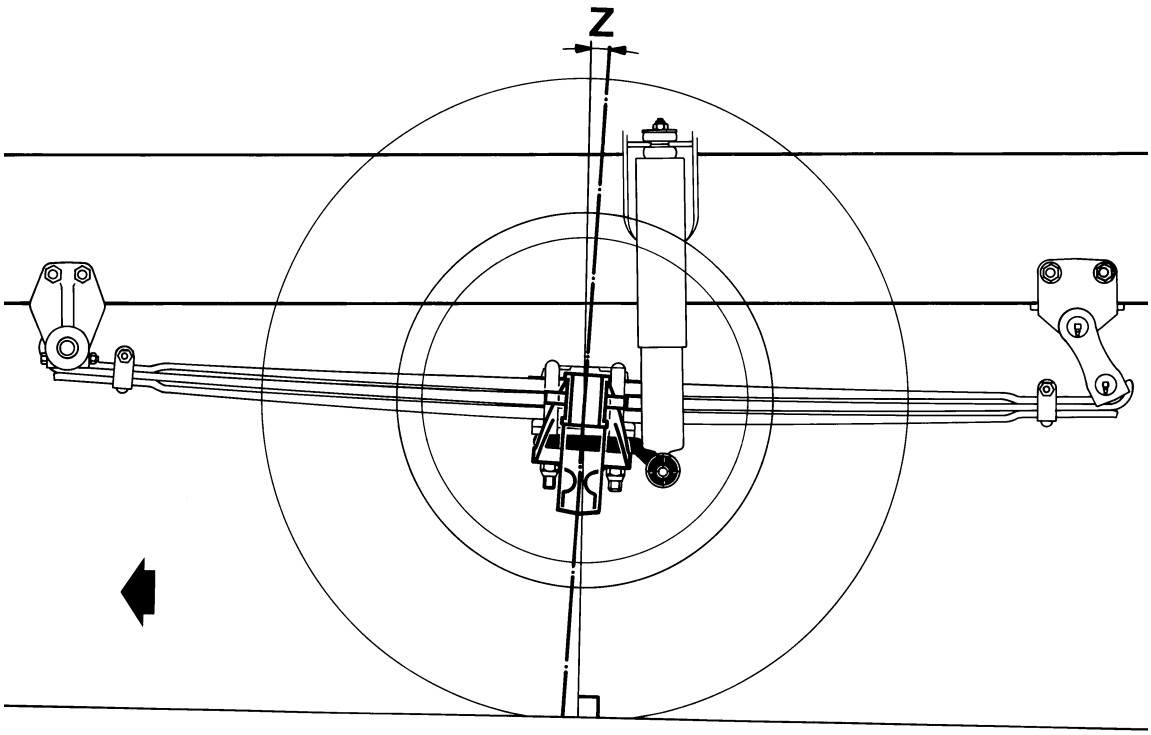
1.2 OVERVIEW DRAWING, SWIVEL AXLE

1. Bolt
2. Lubricating nipple
3. Cover
4. Nut
5. Bearing bush
6. Needle bearing
7. Sealing ring
8. Front-axle housing
9. Filler ring
10. Swivel axle
11. Sealing ring
12. Thrust washer
13. Bearing ring
14. Collar ring
15. Needle bearing
16. King pin
17. Sealing plate
18. Bolt
19. Lubricating nipple



s7 00 101

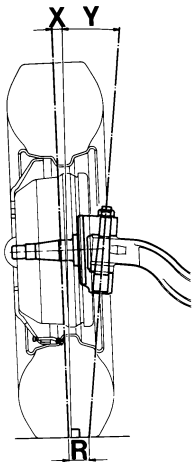
1.3 DESCRIPTION OF THE WHEEL SETTINGS



S7 00 120

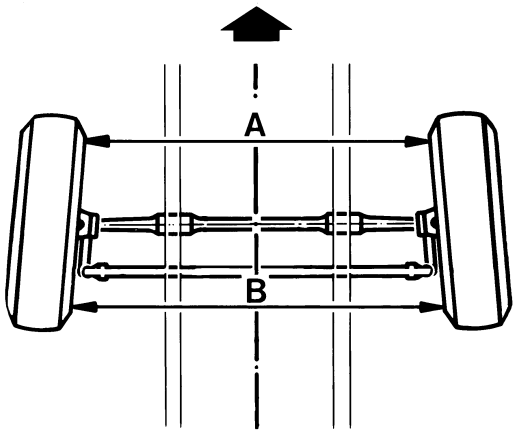
Caster
The caster (Z) is the angle of the axle housing to the road surface. The caster is important for the directional stability of the vehicle. Too little caster will lead to “searching” behaviour by the vehicle, while too much caster will result in “heavy” steering.
A deviating caster will not result 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.
Checking and adjusting the caster are very easy operations for which no complicated equipment is needed.
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 or vehicles with multiple steerable axles do not differ. The inspection should be carried out on each individual wheel.



S7 00 129

Toe-in and toe-out
Toe-in 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. 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.



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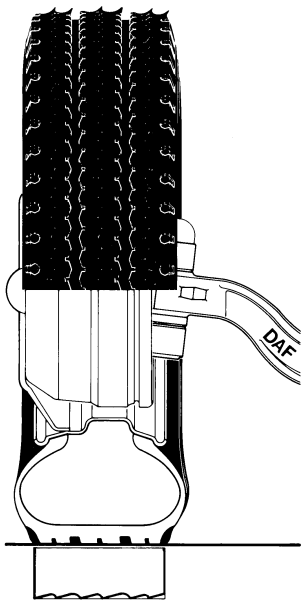
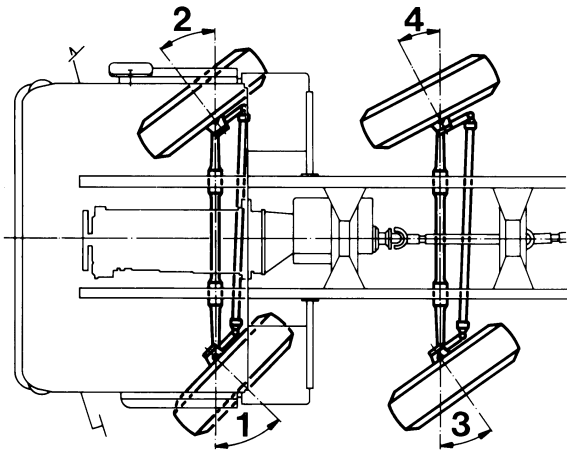


S7 00 126

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



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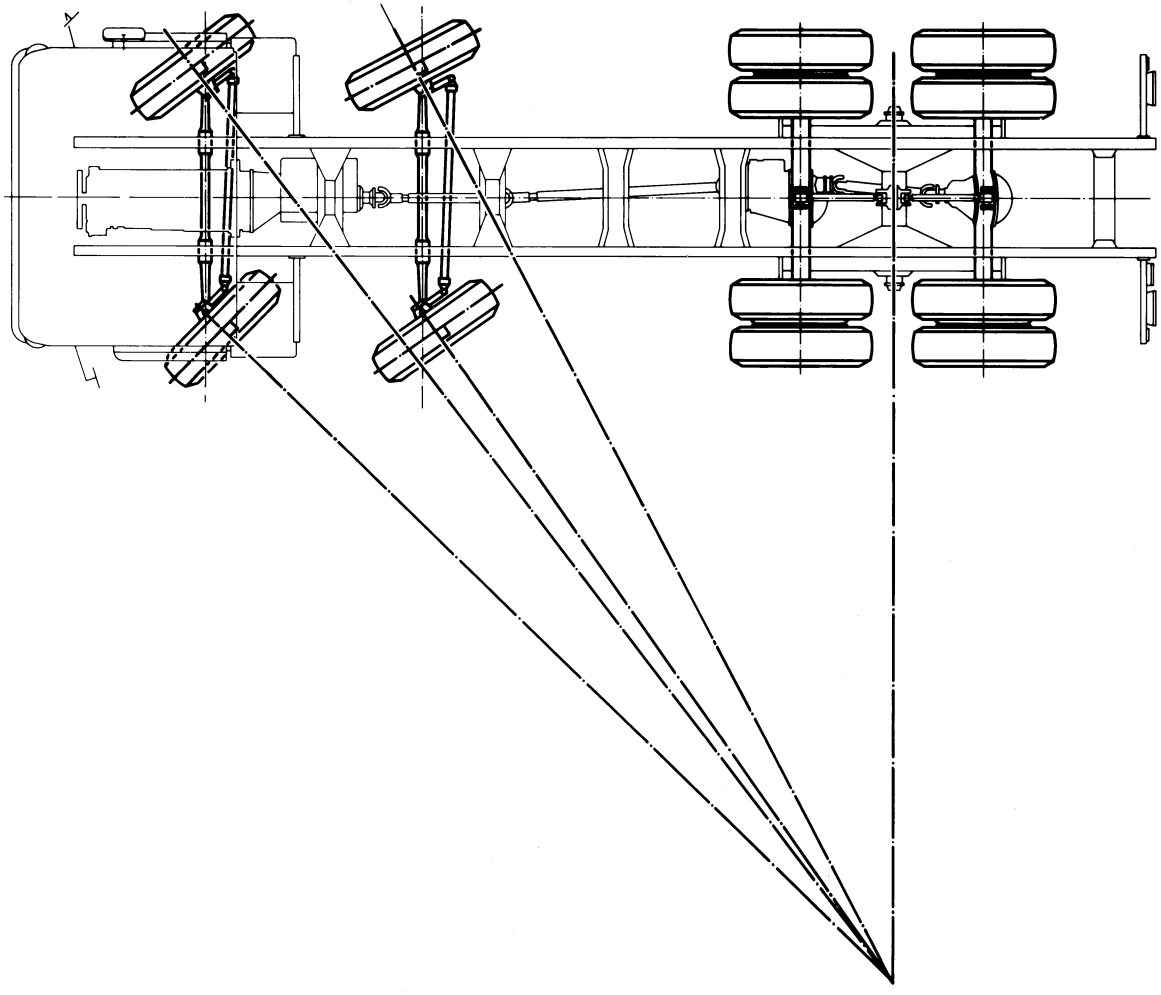
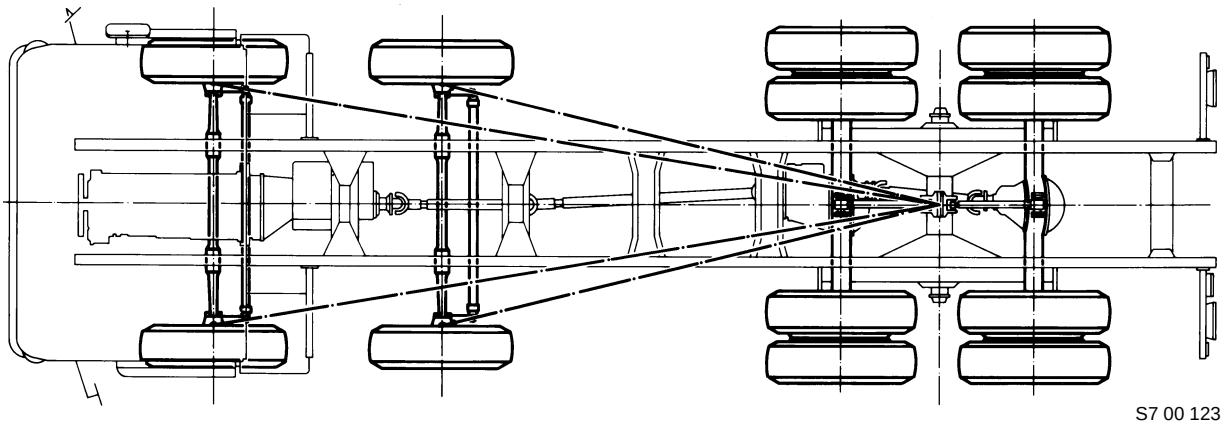


S7 00 122

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



S7 00 123

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-rod arms, it is possible to comply as closely as possible with the Ackermann principle.
If the wheel base 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 the rear-axle(s) suspension.

2. INSPECTION AND ADJUSTMENT

2.1 INSPECTION AND ADJUSTMENT, SWIVEL-AXLE PLAY

Inspection of the swivel-axle play

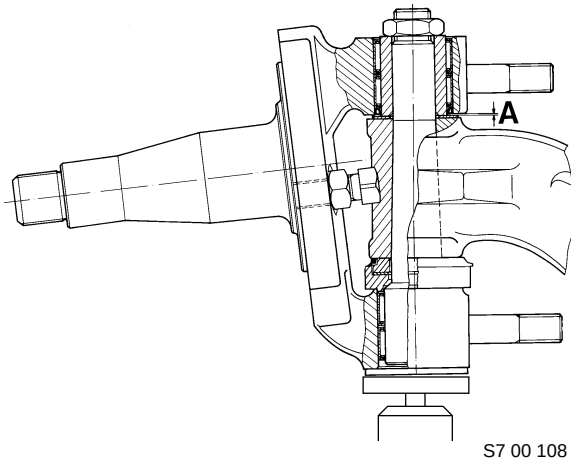
1. The vehicle should stand with the wheels on the ground.

   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. Measure the distance (A) between the swivel axle and the filler ring along the entire circumference at the top of the axle end using a feeler gauge.
   Compare the reading with the admissible tolerance, see main group “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 of the axle end falls outside the axial-play tolerance, the needle bearings should be replaced, see the chapter “Removal and installation”.

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



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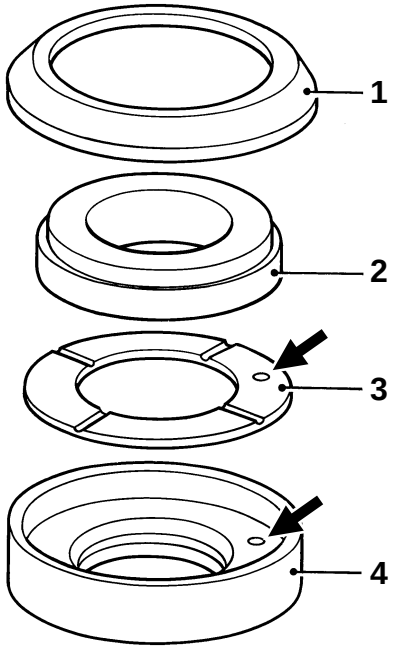
Adjustment of the swivel-axle play

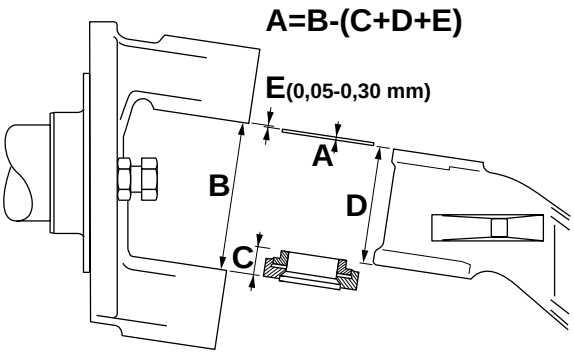
1. Remove the swivel axle from the axle end, see chapter “Removal and installation”.
2. Degrease and clean the thrust bearing.
3. Check the thrust bearing for wear or damage. When in doubt, replace the thrust bearing.
4. Check the machined surfaces of the axle end and the swivel axle for damage.
5. Remove 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 collar ring (4), see the arrows in the drawing.
7. Fit the swivel axle with its original filler ring 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.
10. Measure the clearance between the filler ring and the swivel axle (distance A in the drawing) using a feeler gauge.
    If necessary, use a filler ring with a different thickness, see main group “Technical data”, until the specified axial play is achieved.



S7 00 114

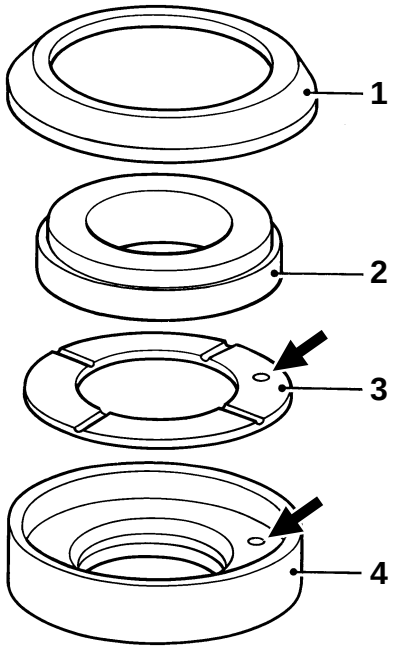
Note:
The filler-ring thickness can also be determined using the formula in the drawing.

A = filler-ring 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



S7 00 137

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 filler ring on the axle end, see chapter “Removal and installation”.
15. Measure the play again.



S7 00 114

2.2 INSPECTION AND ADJUSTMENT, WHEEL BEARING PLAY

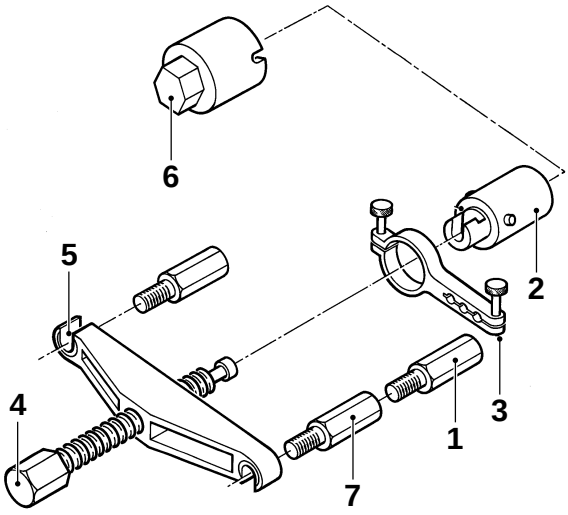
Inspection of the wheel bearing play

1. To make sure that the inspection of the wheel bearing play is reliable, use the special tool (DAF no. 0535595).

   The special tool consists of:
   1. extensions
   2. central nut
   3. dial gauge holder
   4. threaded spindle
   5. bridge
   6. socket wrench
   7. additional extensions

2. Remove the hub caps.

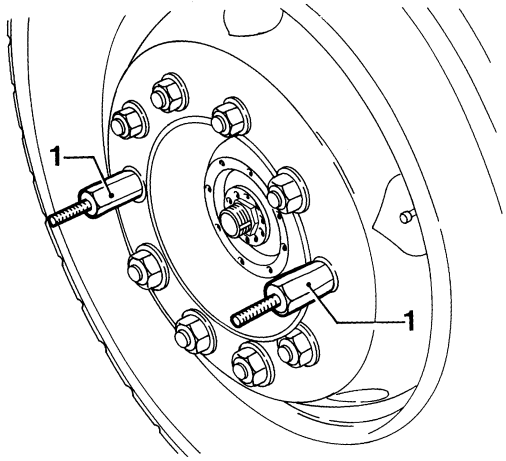
3. Remove two opposite wheel nuts.



S7 00 131

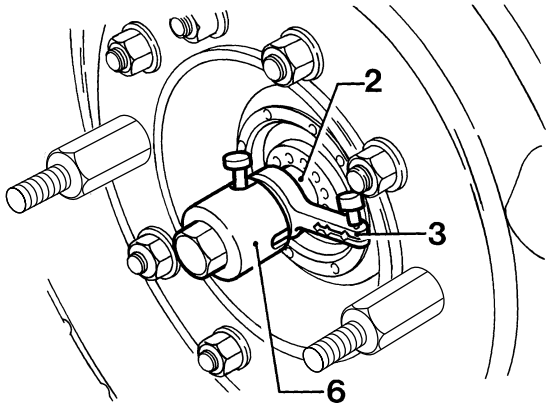
4. Fit the extensions (1) to the vacant wheel studs. The extensions belonging to the set should now be extended using the extension pieces (7).

5. Place the dial gauge holder (3) on the central nut (2).



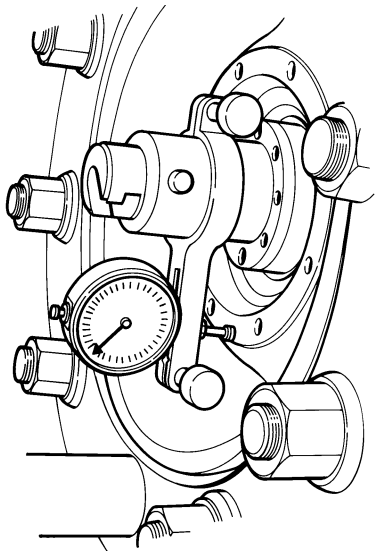
S7 00 079

6. Fit the central nut (2) to the axle end using the socket wrench (6). If too little screw thread protrudes from the lock nut to fit the central nut (2) to the axle stub, the lock nut should be removed from the axle stub.
   If the lock nut is removed from the axle stub, the central nut (2) should be tightened to the tightening torque as specified for the lock nut, see main group “Technical data”.



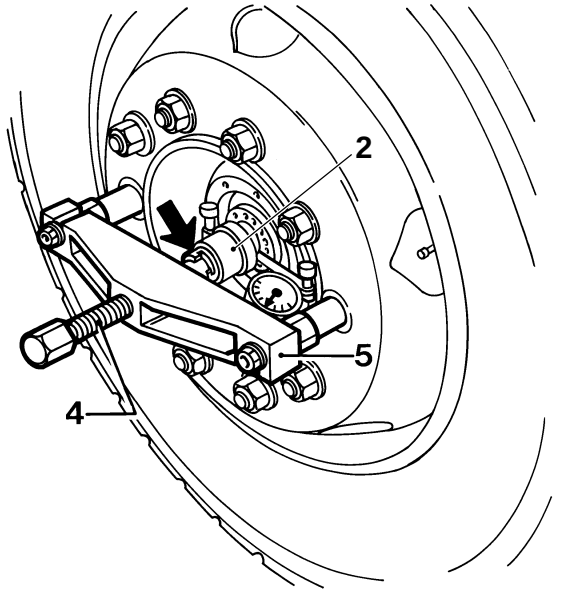
S7 00 080

7. Place the dial gauge in the dial-gauge holder (3) so that the stylus abuts the hub. Make sure that the stylus of the dial gauge does not enter into a threaded hole of the hub, because the stylus might break off when the wheel is turned.



S7 00 081

8. Position the bridge (5) on the extensions (1) so that the end of the spindle fits into the recess of the central nut (2). Tighten the bridge with the nuts.



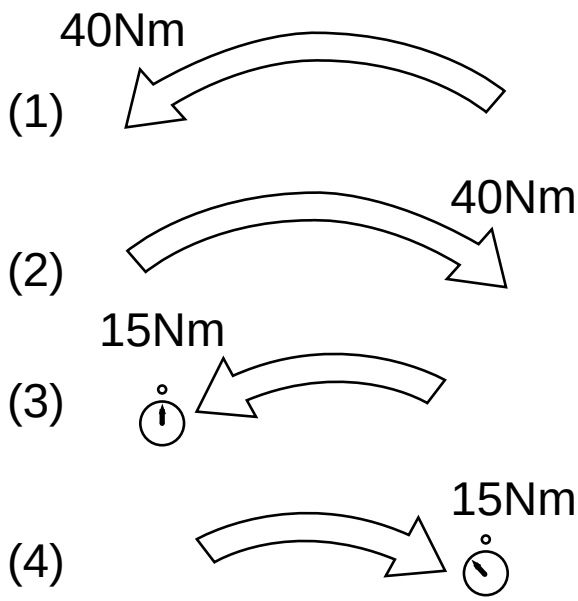
S7 00 082

9. Place a torque wrench on the hexagon head of the spindle (4).
Press the hub firmly on to the axle stub by screwing out the spindle, until a tightening torque of 40 Nm is reached.

10. Withdraw the hub by screwing in the spindle, until a tightening torque of 40 Nm is reached.

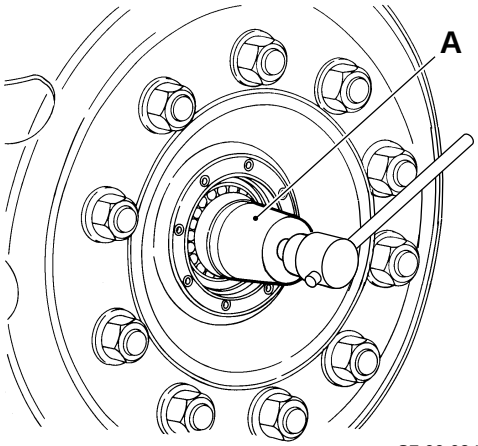
11. Press the hub onto the axle stub by screwing out the spindle, until a tightening torque of 15 Nm is reached, and set the dial gauge to “O”.
12. Withdraw the hub by screwing in the spindle, until a tightening torque of 15 Nm is reached. Take the reading at the dial gauge and compare this value with the specified value, see main group “Technical data”.

    If the reading falls outside the tolerance range, the wheel bearing play should be readjusted.
13. Remove the special tool.
14. If the lock nut has been removed, the locking plate should be replaced. Tighten the lock nut to the specified tightening torque. See “Technical data”.
15. Apply some grease to the outside of the bearing cage.
16. Clean the wheel hub sealing surfaces and the hub cap, and make sure they are dry and grease-free.
17. Apply a locking compound (silicone paste) to the wheel hub sealing surface.
18. Install the hub cap. Tighten the small bolts to the specified tightening torque, see main group “Technical data”.
19. Tighten the two wheel nuts to the specified torque. See “Technical data”.
    Mark these two nuts and tighten them after 100 km to the specified tightening torque.



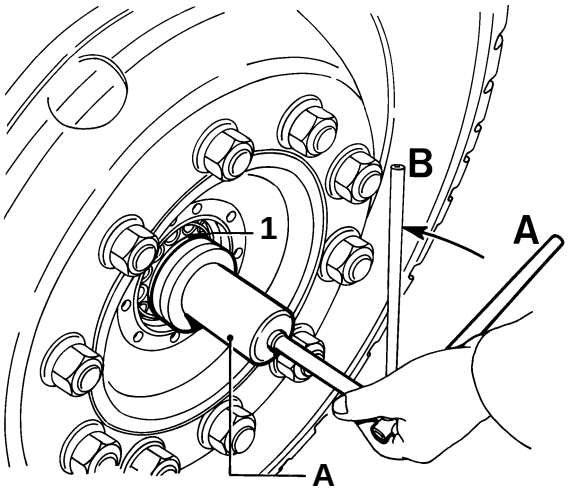
Adjustment of the wheel bearing play

1. Remove the lock nut from the axle end using socket wrench (A), special tool (DAF no. 0535832).
2. Remove the lock plate and the circlip from the axle end.



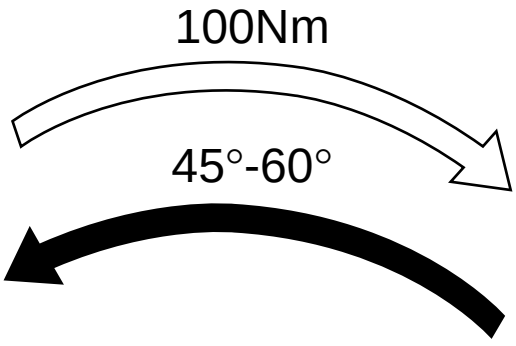
S7 00 084

3. Loosen adjusting nut (1) one turn using adjusting spanner (A), special tool (DAF no. 0694783).



S7 00 085

4. Place a torque wrench on the adjusting spanner. Tighten the adjusting nut to a tightening torque of 100 Nm, while turning the hub.



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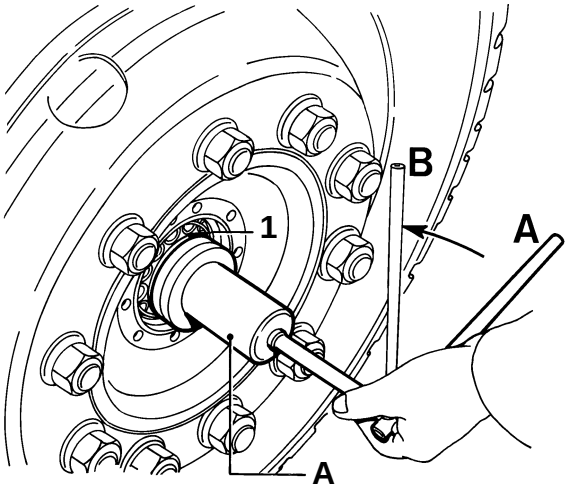
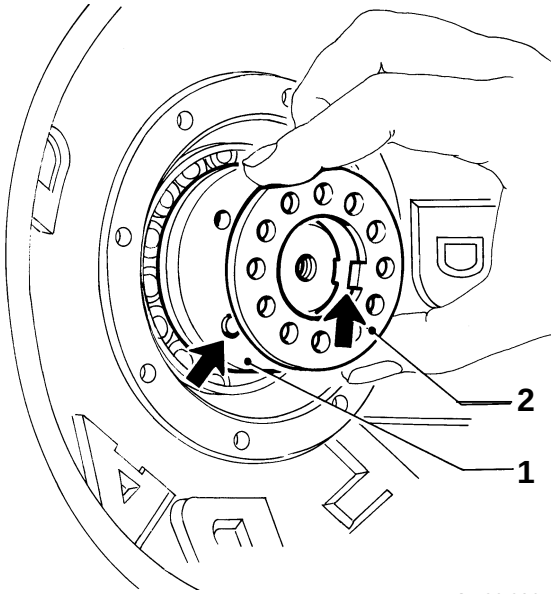
5. The specified wheel-bearing play is achieved by turning the adjusting nut (1) counter-clockwise between 45° en 60° (distance A - B in the drawing) using the adjusting spanner (A). The precise angle should be such that circlip (2) can be fitted.



S7 00 085

6. Fit the circlip (2) so that the circlip lip catches in the key groove of the axle end and the dowel of the adjusting nut (1) catches in one of the holes of the circlip (2).

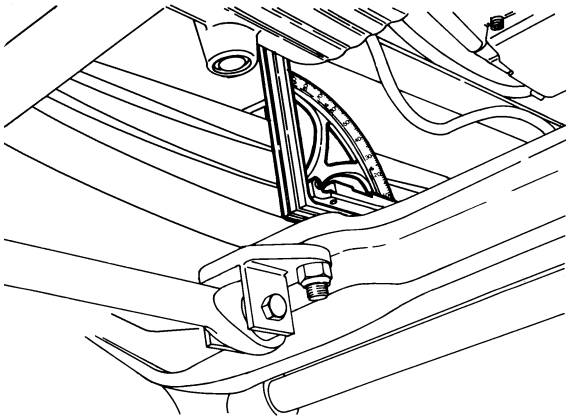


S7 00 086

2.3 INSPECTION AND ADJUSTMENT, CASTER

General
- The vehicle should be placed on a flat and horizontal surface, with the steering mechanism in the “straight ahead” position.
- The caster can be measured using a protractor or wheel-aligning equipment.

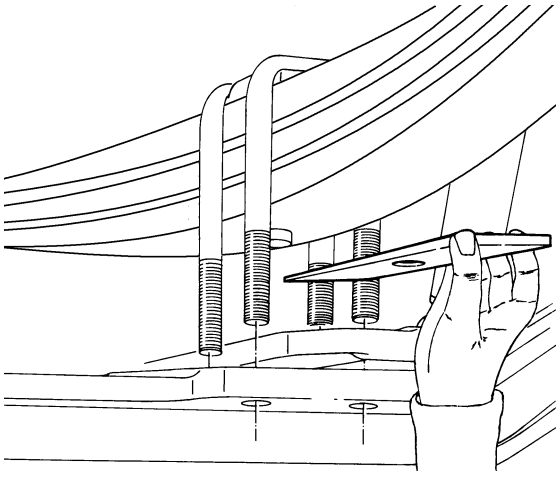
Inspection of the caster using a protractor
1. Clean the spot where the protractor is to be placed on the spring seat.
2. Place the protractor on a chassis side member, parallel to the floor.
   If not, the caster reading should be adjusted to the chassis position.
3. Place the protractor on the spring seat and measure the angle.
   Compare the reading with the specified value, see main group “Technical data”.
4. Carry out the caster measurement on the other axle side too.
   If different readings are obtained, the front-axle suspension should be inspected for deviations.



S7 00 145

Inspection of the 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.

Adjustment of the caster
1. Fit a key of the required thickness between the spring seat and the spring. For the keys available, see the main group “Technical data”.
2. Repeat the measurement once the key has been fitted.



S7 00 146

2.4 INSPECTION, 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 placed on a flat and horizontal surface, with the steering mechanism in the “straight ahead” position.
- The tyre pressure should be correct.
- The vehicle should be unloaded.
- The caster can be measured using a protractor or wheel-aligning equipment.
- The measurement should be carried out on both wheels.

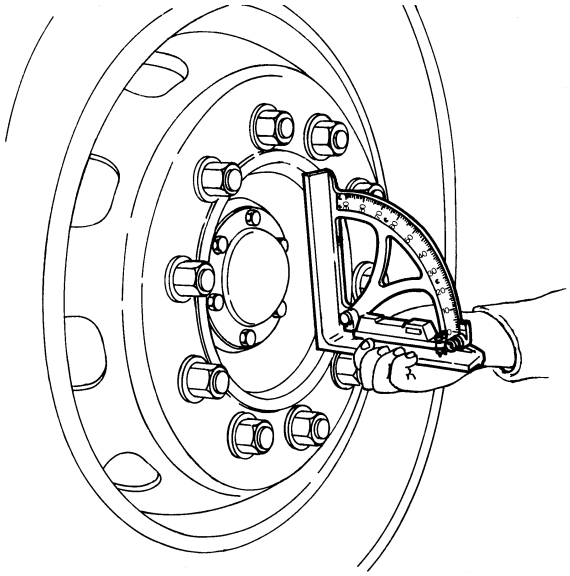
Inspection of the camber angle using a protractor
1. Thoroughly clean the side of the wheel hub and place the protractor with a spirit level against the surface. Keep the protractor in the vertical position.

2. Adjust the spirit level and take the angle reading. See main group “Technical data” for the correct angle.

Inspection of the 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. See main group “Technical data” for the correct angle.

The following points can 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 as specified.



S7 00 147

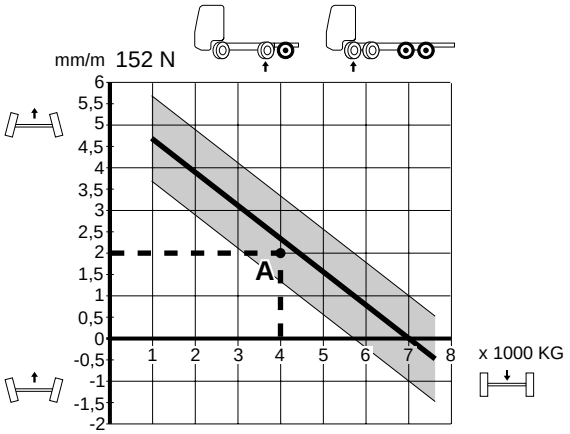
2.5 INSPECTION AND ADJUSTMENT, TOE

Inspection of the 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. Make sure that the steering mechanism is free of stress. For this purpose, drive the vehicle at straight angles to the measuring location (if possible). If the latter is not possible, drive the vehicle forward en backward several times with the steering mechanism in the “straight ahead” position.
3. Measure axle load of the axle to be inspected.
4. Measure axle toe.
5. Check whether the axle toe is correct or whether it needs adjusting. Use the relevant graph to do so, also see main group “Technical data”.
   Two examples are provided on how to read the graphs specified in the main group “Technical data”.

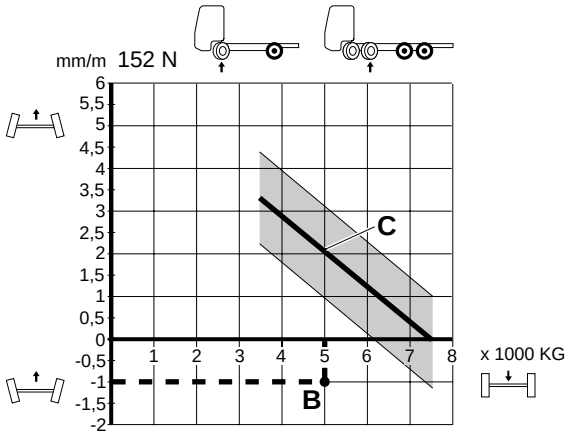
Note:
If a large deviation is measured, the cause should be traced. The deviation could for example have been caused by a collision during which components were bent. If so, the remaining steering-mechanism components should be inspected carefully.

Example 1
Graph for toe of front-axle 152N, when used as leading axle or first front axle in the case of a vehicle with two steered front axles.
The axle load measured is 4,000 kg and the toe measured is 2 mm/m (toe in).
The lines intersect (A) in the shaded part. From this it follows that the toe is within the tolerance limits.
The toe need not be adjusted.



S7 00 421

Example 2
Graph for axle 152N, when used as single front axle or second front axle in the case of a vehicle with two steered front axles.
The axle load measured is 5,000 kg and the toe measured is –1 mm/m (toe out).
The lines intersect (B) outside the shaded part. From this it follows that the toe is outside the tolerance limits. The toe must be adjusted so that, following adjustment, the toe measured coincides with line (C) drawn.



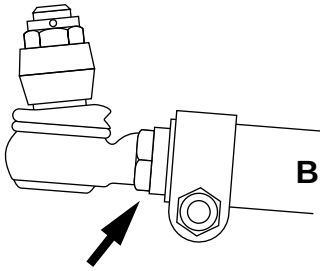
S7 00 420

7

Adjusting the toe

1. Slacken the bolts of the clamping brackets until the track rod can be rotated.
2. Lengthen or shorten the track rod to obtain the correct toe, see main group “Technical data”.

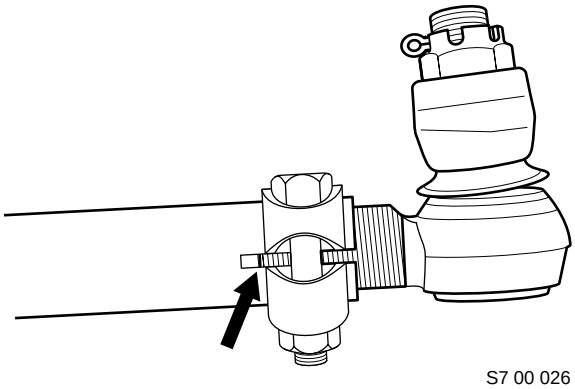
   Track-rod type B can be adjusted using the nuts with internal and external thread.
   Both bolts should receive an equal number of turns.

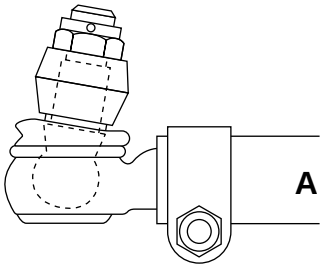


S7 00 061

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

3. Thoroughly clean and check the clamping-bracket bolts. If corroded or damaged, the bolt should be replaced. Replace the self-locking nut.
4. Tighten the locking bolts of the clamping brackets to the specified tightening torque, see main group “Technical data”.
5. Now check the toe once again.
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 clamping bracket of the straight track rod (type A) may have any position.


S7 00 026



S7 00 060

2.6 INSPECTION AND ADJUSTMENT, WHEEL DEFLECTION

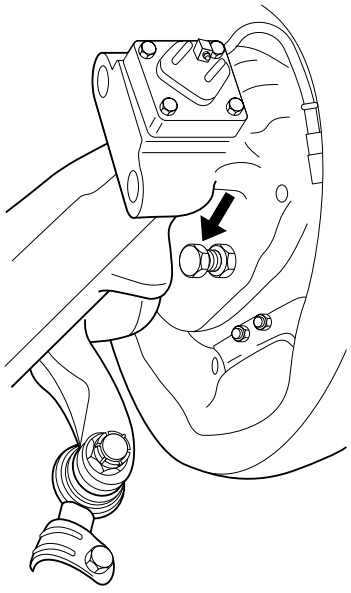
Work safely and block the vehicle so that it cannot slide off the turning plates.

Inspection of the wheel deflection

1. Engage the vehicle's parking brake and place chocks before 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 main group "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 main group "Technical data".

Adjustment of 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 mounted, 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, readjust the wheel-deflection limiting valves of the steering box.



S700064

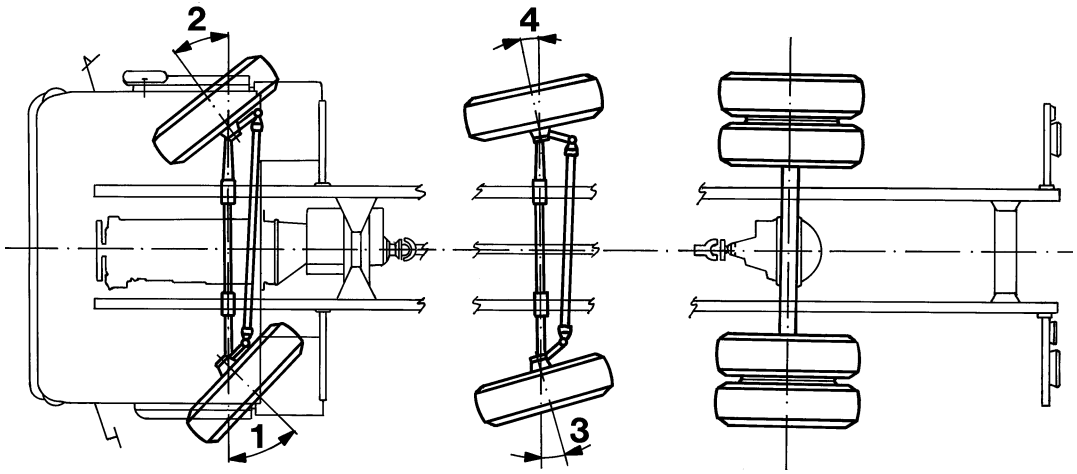
2.7 INSPECTION TOE-OUT WHEN TURNING

Measuring the toe-out while the vehicle is turning (especially for vehicles with two steerable axles) is a method of inspecting the setting of the steering mechanism.
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 toe-out when turning

1. Engage the vehicle's parking brake and place chocks before 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 at 0°.



4. Turn the steering mechanism until the inside wheel of the front steerable axle (wheel 1 in the drawing) reaches a 30° angle.

5. Fix the steering mechanism in this position and note down the wheel deflections of the remaining steerable wheels.

6. Carry out this measurement both on the left and the right side.

7. For the correct values, see the main group “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-mechanism components should be inspected carefully.

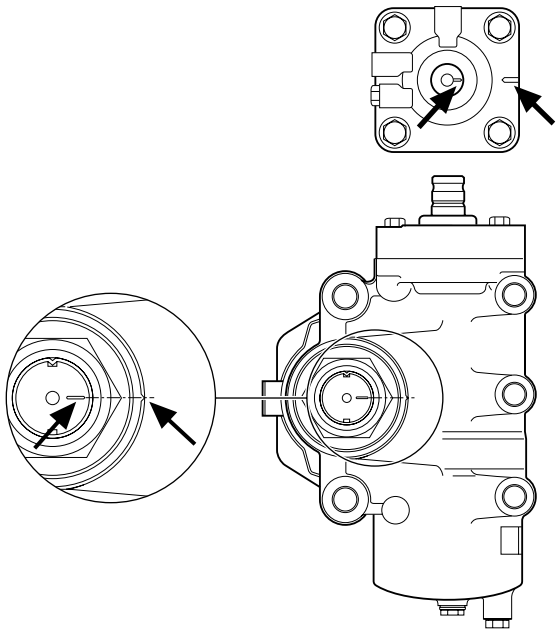
2.8 INSPECTION AND ADJUSTMENT, STEERING ROD

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

Note:
If there are any complaints, carry out the inspection with a 40% vehicle load (if possible).

Inspection of the steering-rod adjustment

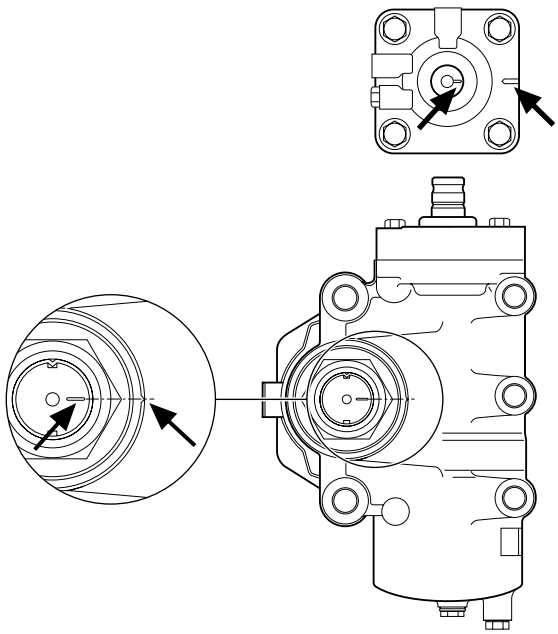
1. Engage the vehicle's parking brake and place chocks before and behind the rear wheels.
2. Jack up the steerable axle and place turning plates under the wheels.
   Only use turning plates which allow for wheel displacement caused by the wheel offset.
3. Place the wheels in the "straight ahead" position and lower them until they rest on the turning plates.
4. Check whether the steering mechanism is in the central position using the markings in the steering box. The marking on the input shaft should be visible in the slot.
5. 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.
6. Adjust the steering-rod length, if the values deviate.
   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-mechanism components should be inspected carefully.



S7 00 166

Adjustment of the steering rod

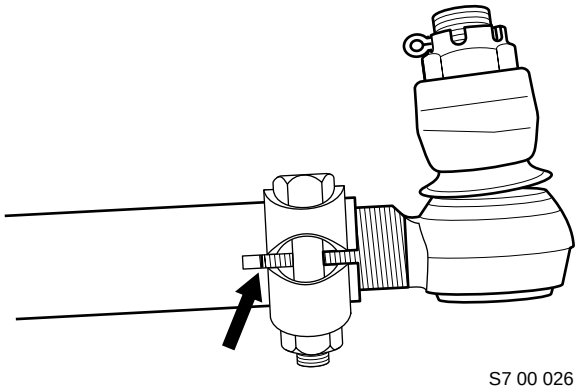
1. Place the wheel to which the steering rod is connected in the “straight ahead” position. This can be done using wheel-alignment equipment or by measuring the distance from the wheel rim to the spring leafs at the front and rear of the wheel. The distances at the front and rear of the wheel should be equal.
2. Loosen the bolt of the clamping bracket on the steering rod.
3. Remove the steering rod from the steering arm, see the chapter “Removal and installation”.
4. Place the steering box in the centre position by aligning the markings.
5. Set the correct length of the steering rod by screwing the ball pin in or out.
   If the vehicle is unloaded, turn the ball pin one additional turn.



S7 00 166

Make sure that the threaded end of the ball joint is not pushed from the steering rod too far. The clamping bracket should always fully engage the screw thread of the ball joint, see the drawing.

Note:
If the length is not correct because the ball pin can only be rotated a 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.



S7 00 026

6. Install the steering rod in the steering arm, see chapter “Removal and installation”.
7. Thoroughly clean and check the clamping-bracket bolt. If corroded or damaged, the bolt should be replaced. Replace the self-locking nut.
8. Tighten the bolt of the clamping bracket to the specified tightening torque, see main group “Technical data”.
9. Check the steering-wheel position when it is in the “straight ahead” position. If necessary, change the position by changing the position of the steering wheel on the steering shaft.

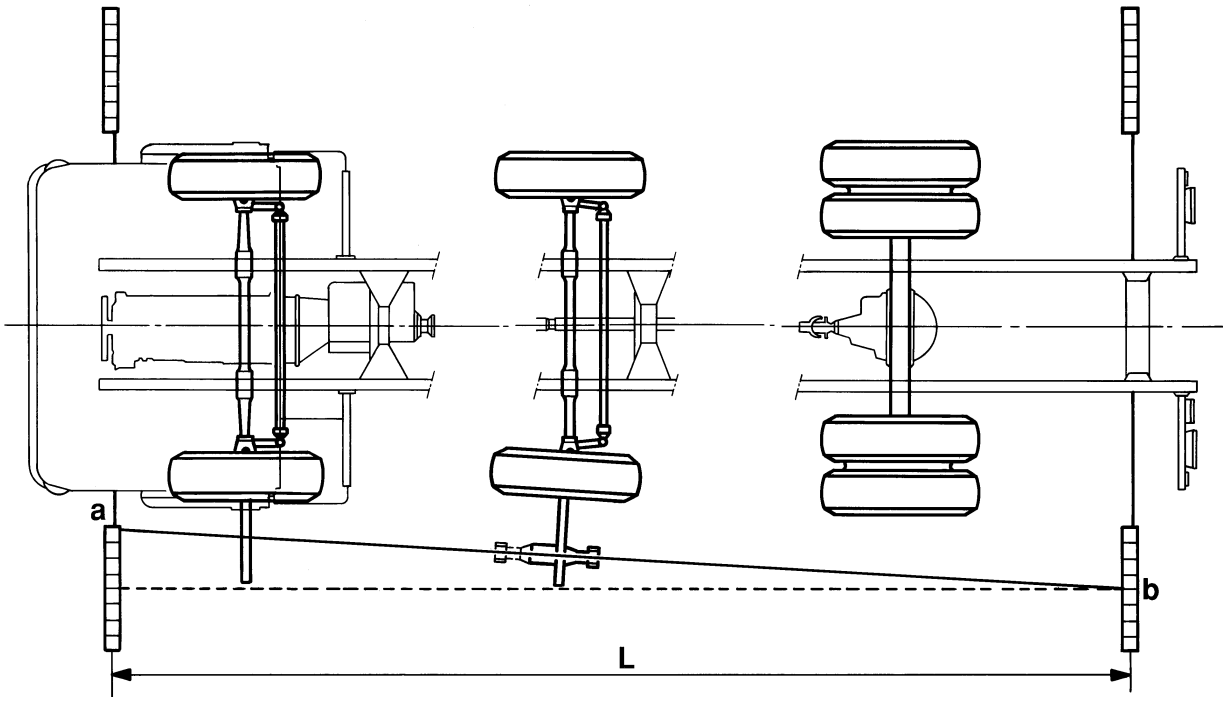
2.9 INSPECTION AND ADJUSTMENT OF THE STEERABLE-AXLE ALIGNMENT

General

- Both for the inspection and adjustment of the steering rods, quality alignment tools should be used. They 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 instable.
- Check the alignment of the non-steerable axles. If a deviation is found, it should be corrected.
- Before measuring, the following points should be checked:
  - the tyre pressure
  - the sagitta of the springs
  - play of the steering mechanism, if any
  - the play of the axle-suspension.

  If a deviation is found, it should be corrected before the measurement.
- 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 value 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).



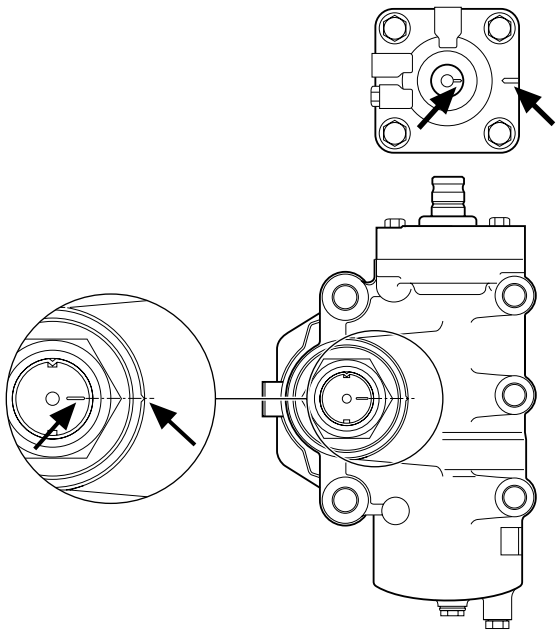
S7 00 093

Preparatory activities

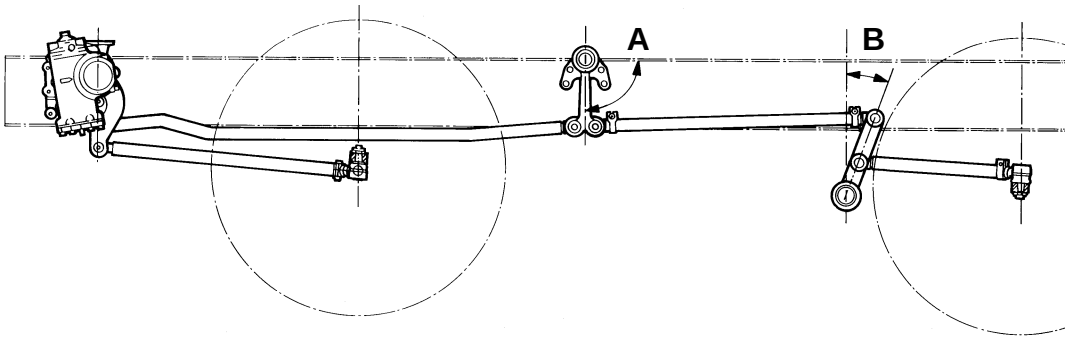
1. Drive the vehicle straight to the test location to avoid stresses in the chassis or in the axle suspension system.
2. Place the vehicle on the turning plates. Only use turning plates which allow for wheel displacement caused by the wheel offset.
3. Place chocks before and behind the non-steerable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

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

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



S7 00 166



S7 00 091

5. Measure the angle of the idler arms in relation to the chassis (the angles A and B in the drawing).
   Compare the angles measured with the specified angles, see main group “Technical data”. If these deviate, the cause should be traced.

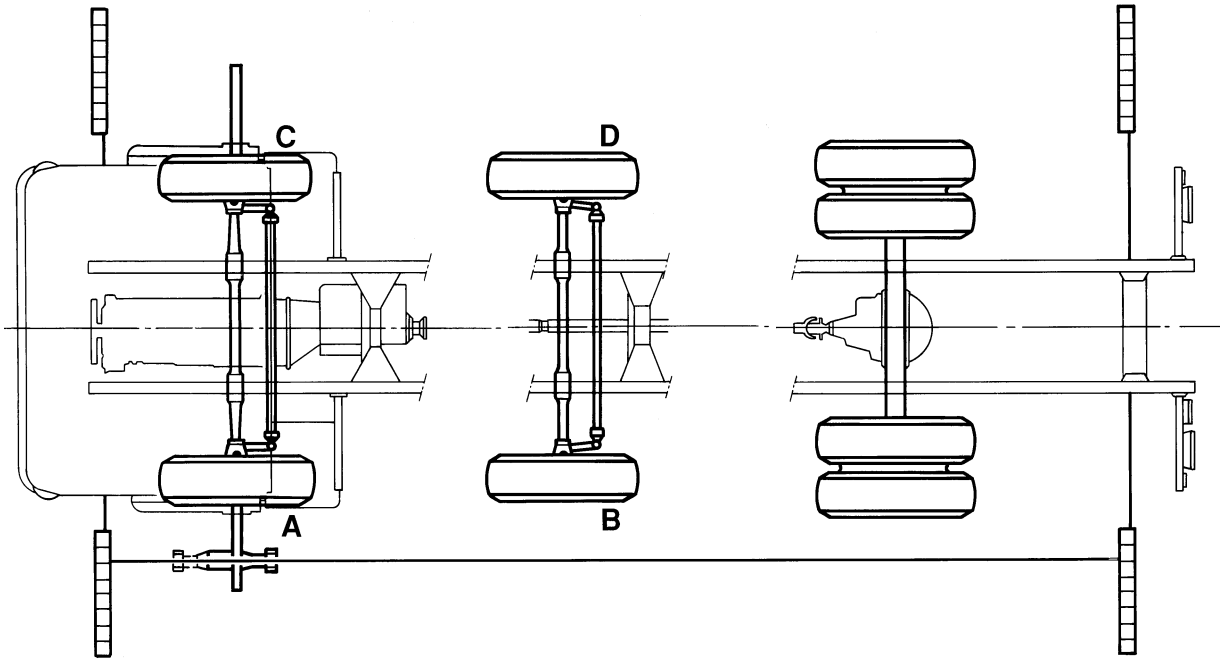
6. Fit alignment equipment to the steerable axles.

7. Calibrate the alignment equipment, if possible.

8. Consult the alignment-equipment manual and follow the instructions given there.

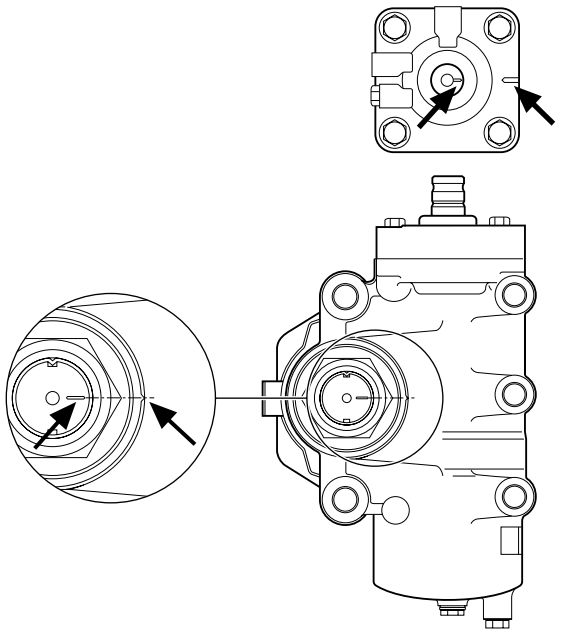
Inspection and adjustment of the steerable-axle alignment

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

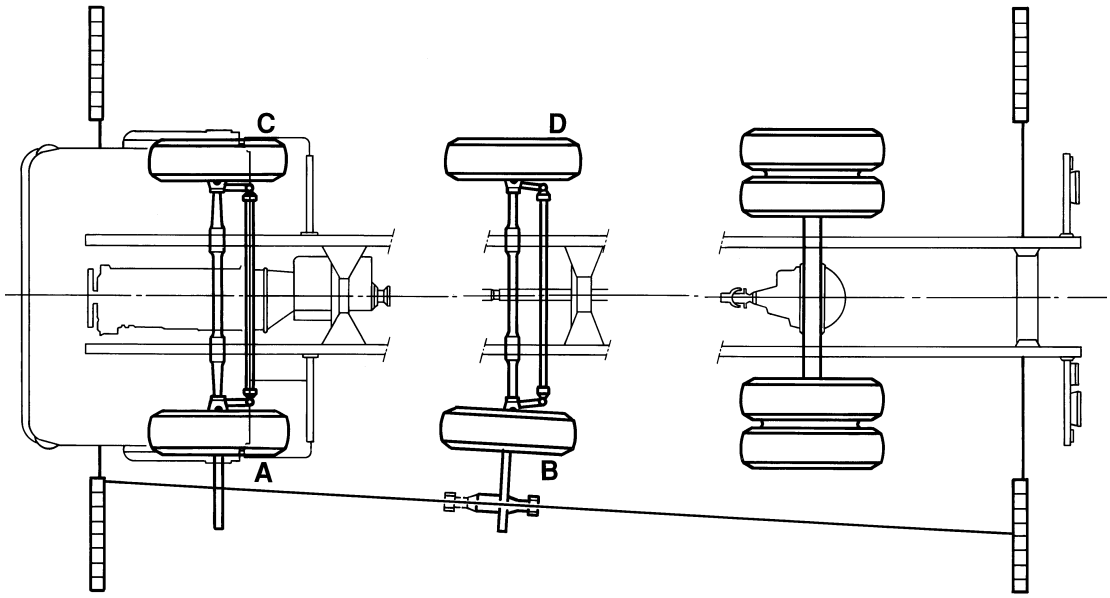


S7 00 089

1. Place wheel A (LHD-type vehicle) or wheel C (RHD-type vehicle) in the “straight ahead” position using the alignment equipment.
2. Check whether the steering mechanism is in the central position using the markings on the steering box.
3. 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.

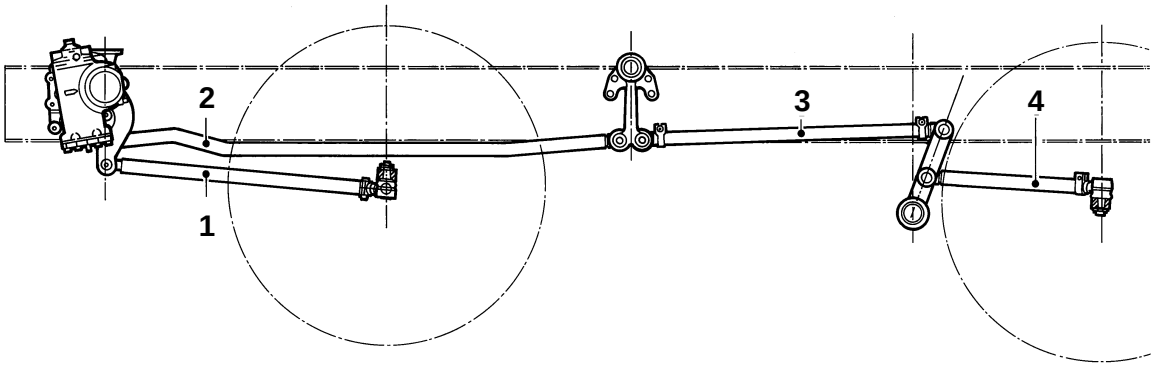


S7 00 166



S7 00 090

4. Check whether the front-axle wheel still is in the “straight ahead” position.
Now measure the position of wheel B (LHD-type vehicle) or the position of wheel D (RHD-type vehicle).



S7 00 115

5. If the position of the front-axle wheel is outside the specified tolerance, see main group “Technical data”, this should be corrected by lengthening or shortening the steering rod (4) which is connected to the wheel concerned.

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-mechanism components should be inspected carefully.

6. Make sure that the rear steering rod (4) is as close as possible to its specified length. If the position still deviates too much, it should be corrected by adjusting the second-last steering rod (3), which is equipped with an adjusting device on both sides.

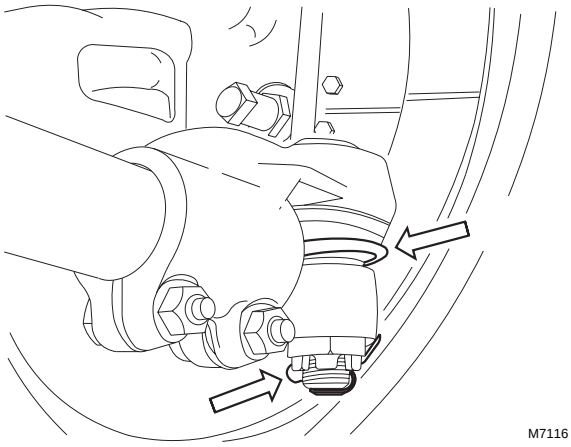
   Note:
   After adjusting of the steering rod (3), make sure the clamping brackets of this steering rod do not come into contact with other components. Check this by turning the steering mechanism carefully from one end stop to another.

7. After tightening the clamping brackets, check the wheel alignment once again.

2.10 INSPECTION, STEERING-BALL JOINT

Inspection of locking devices and dust cover

1. Check whether the locking devices are present and undamaged.
2. Check the dust cover of the steering-ball joint. Make sure its gasket is not damaged. Replace the steering ball joint if damage is detected.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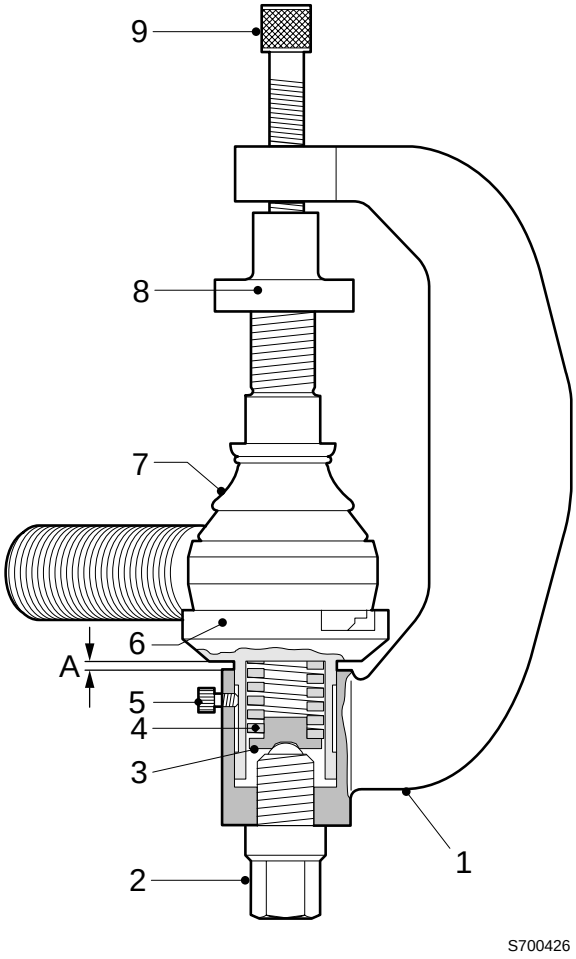
Check axial steering ball joint play

1. Check the axial steering ball joint play using special tool (DAF no. 1329426).
2. Jack up the vehicle until the wheels are clear from the floor. Support the axle with stands.
3. Make sure that the castle nut split pin (if fitted) does not come into contact with the top of the threaded end.
4. Screw thrust washer (8) onto the threaded spindle.
5. Fit 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 rim of the steering ball joint (7).
6. Screw back thrust bolt (2) until the flange of the pressure sleeve (6) abuts the bracket (A = 0 mm).
7. Apply the special tool to 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).



S700426

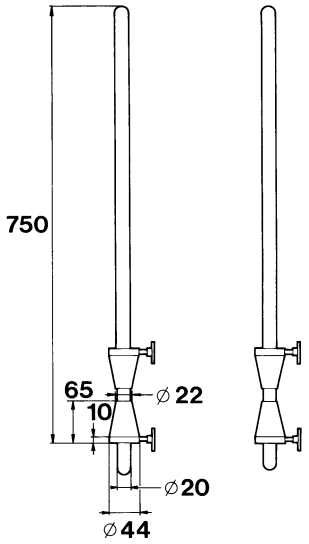
9. Measure play “A” between the pressure sleeve and the bracket using a feeler gauge.
   Compare the reading with the maximum allowable steering ball joint play.
   See “Technical data”.
   If necessary, replace the steering ball joint.

2.11 INSPECTION OF THE FRONT-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.

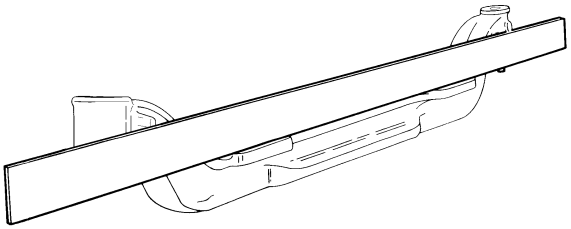
A number of the following measurements can also be carried out using alignment equipment. Consult the manual of the alignment equipment to this end.

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

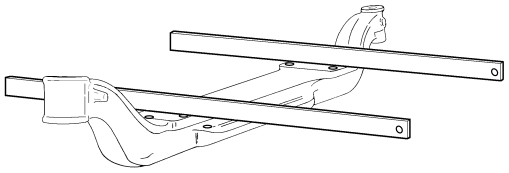


S7 00 119

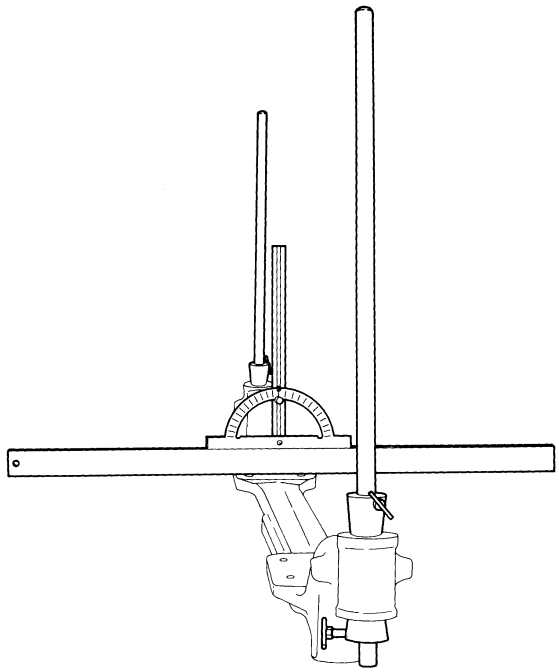
Inspection of the front-axle housing
1. Remove the vehicle's front axle and both swivel axles, see chapter "Removal and installation".
2. Place a straight edge over the spring seats of the front-axle housing and check whether these are aligned.


S7 00 151

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


S7 00 152

4. Place the two gauge bars in the holes of the swivel axle.
   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°.

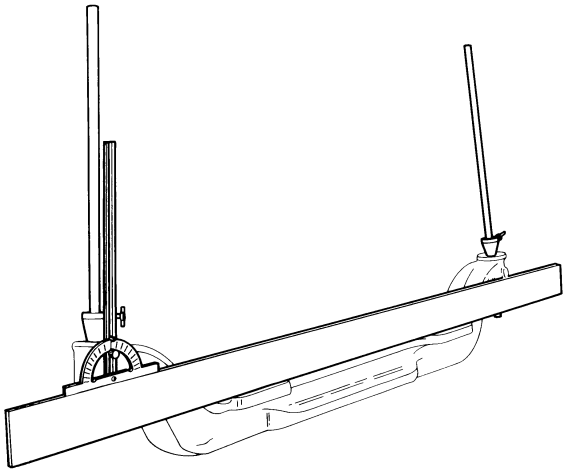


S7 00 149

5. Measure the king-pin inclination (KPI) by placing a straight edge with a protractor on the spring seats.
   By placing the ruler of the straight edge parallel to the gauge bar, the angle can be read.

6. If during one of the inspections a deviation is found, the axle housing should be replaced.

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



S7 00 150

2.12 INSPECTION, 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 two 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.

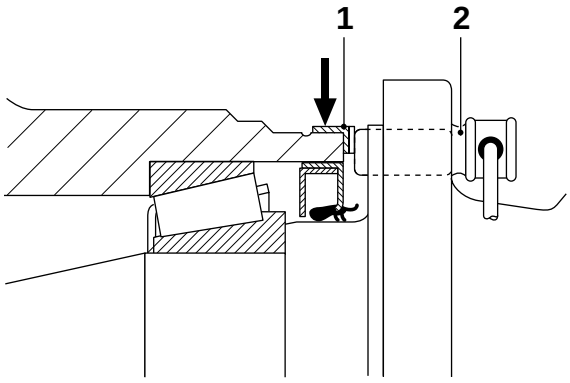
When removing such a damaged wheel rim from the vehicle, deflate the tyre (remove the tyre valve) in view of possible tensions in the wheel rim.

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 the chapter on “Paint treatment”.
   Before respraying 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.

2.13 INSPECTION, ABS SENSOR RING

1. Remove the wheel hub, see chapter “Removal and installation”.
2. Check the sensor ring (1) for deposits. Special attention should be paid to deposits between the teeth of the sensor ring. Clean the sensor ring, if necessary.
3. Check the sensor ring (1) for damage. Even the slightest damage can cause a failure. If required, replace the sensor ring.
4. If possible, the sensor ring (1) should be checked for the maximum admissible radial and axial end play, seen main group “Technical data”.
5. Check the sensor (2) for smooth operation. If necessary, clean the sensor and apply new grease.

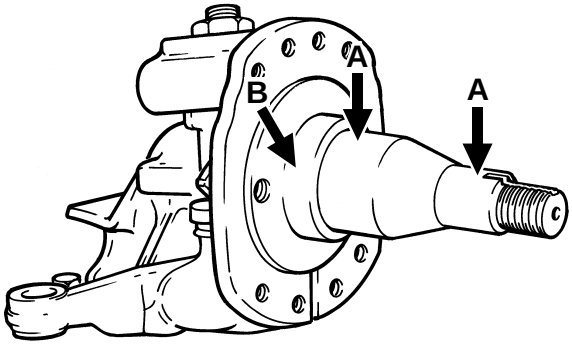


S7 00 134

2.14 INSPECTION, HUB AND WHEEL BEARINGS

1. Inspect the bearings for damage at the following points:
   - the raceways of the bearing rollers
   - the bearing cage
   - the raceways of the inner and outer race for damage.

   If damage is found, the entire bearing (inner race/bearing cage and outer race) should be replaced.
2. When the outer race of the bearing is loose in the hub or has turned in the hub, the hub should be replaced.
3. The following points of the axle end should be inspected for damage: the screw thread, the bearing surfaces of the inner bearing races (A) and the running surface of the oil seal (B).
4. Check the ABS sensor ring for damage. If even the slightest damage is found, it should be replaced.



S7 00 116

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.

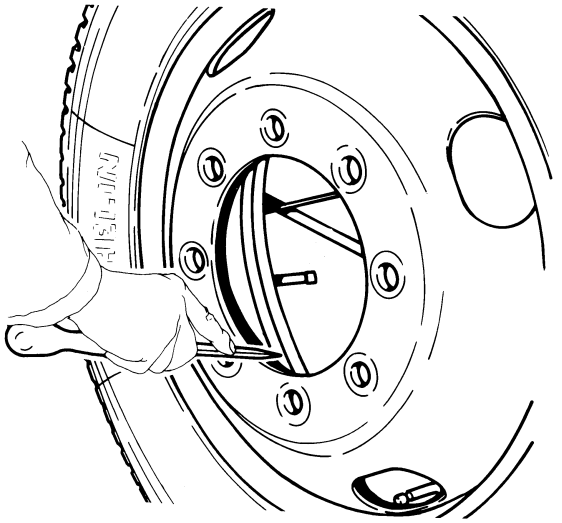
General
- Only use the original DAF wheel rims specified for the vehicle concerned.
- Make sure that tyres of the same type are fitted on both sides of the axle.
- Insufficient cleaning of the mating surfaces and/or uneven tightening of the wheel nuts may cause vibrations during driving or braking.

Removal of the disc 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.

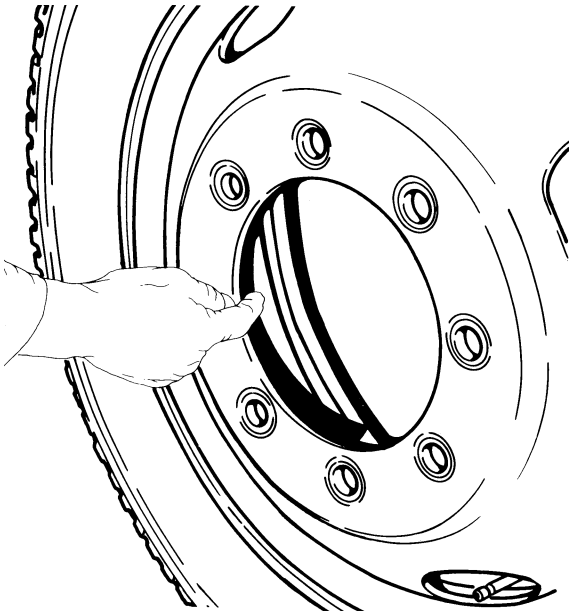
Installation of the disc wheel

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



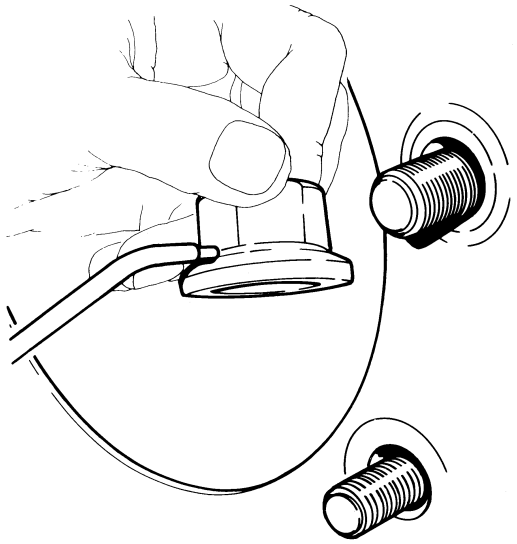
S7 00 096

2. Apply a thin layer of grease on the fitting edge of the wheel hub.
3. Also apply a thin layer of grease on 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 the drum brake are clean. Clean these if necessary.



S7 00 097

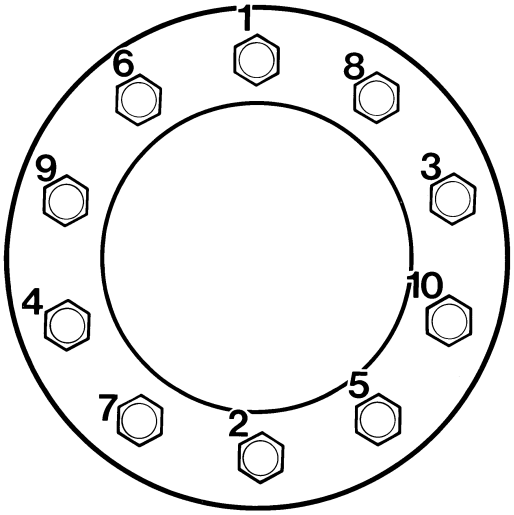
5. Clean the wheel nuts and then apply a drop of oil between the thrust washer and the nut.
6. Also apply a drop of oil to the first turn of the wheel-stud screw threads.



S7 00 098

7. Fit the wheel nuts and tighten these evenly according to the sequence 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. For the specified tightening torque, see main group “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.
9. Retighten the wheel nuts after 100 km and also after 500 km.



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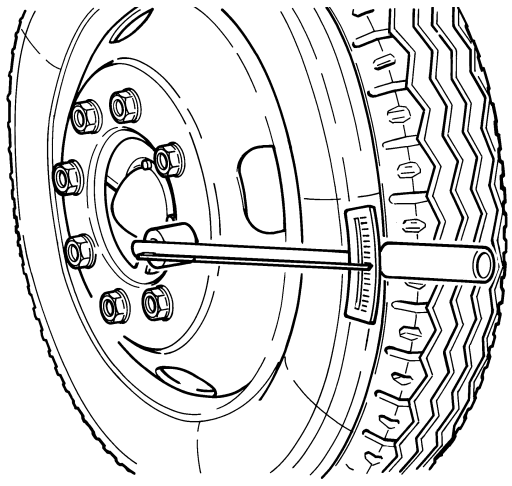
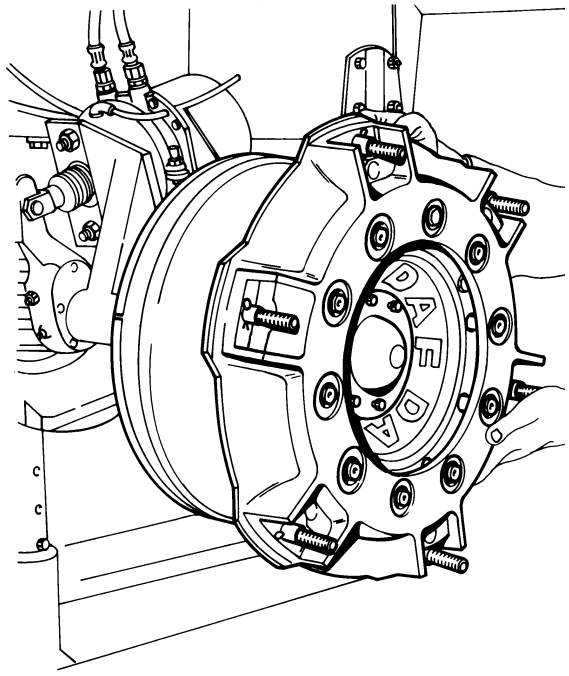


S7 00 099

Removal and installation, Trilex rim

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 disc wheel also apply to the removal and installation of a Trilex rim on a Trilex hub or adapter ring, except for the tightening sequence and the tightening torque of the attachment nuts.
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 specified tightening torque, see main group “Technical data”.
4. Retighten the wheel nuts after 100 km and also after 500 km.



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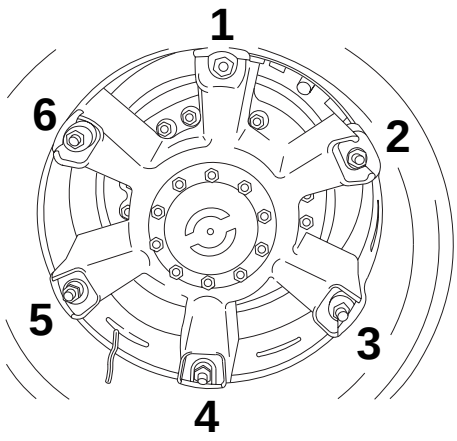

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3.2 REMOVAL AND INSTALLATION, ENTIRE FRONT AXLE

Removal of the entire front axle

1. Engage the vehicle's parking brake, and remove the lines from the brake chambers. If spring-brake cylinders are fitted to the front axle the rear wheels should be blocked and the spindle of the spring-brake cylinders should be fully screwed out.
2. Remove the steering rod from the steering arm.
3. Loosen the wheel nuts on both sides of the axle, but do not remove these yet.
4. Jack up the vehicle until the wheels are off the ground and position sound stands under the chassis.
5. Remove the wheel nuts and take the wheel off the axle.
6. Support the axle securely and remove the U-bolt nuts.
7. Lower the axle with the brake drums to the floor. Make sure that the axle does not tilt as it is freed from the U-bolts!
   Move the axle from under the vehicle on the brake drums.

Installation of the entire front axle

1. Check the U-bolts and U-bolt nuts for corrosion and damage. If necessary, replace them. If they are to be re-used, thoroughly clean the thread and remove any paint.
2. Lift the axle under the vehicle and fit the U-bolts.
3. Put the wheels back on.
4. Lower the vehicle and tighten the U-bolt nuts.
5. Apply grease to the protruding threaded ends of the U-bolts.

6. Fit the steering rod into the steering arm.
7. Connect the brake air lines.
8. Completely screw in the spindle of the spring-brake cylinder and tighten it to the specified tightening torque.
9. Retighten the wheel nuts after 100 km and after 500 km.
10. Retorque the U-bolt nuts after 2500 km.

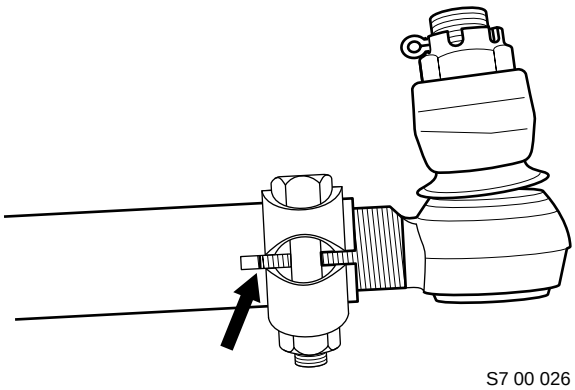
3.3 REMOVAL AND INSTALLATION, STEERING ROD

Removal of the steering rod

1. Remove the split pin of the steering rod on both sides and subsequently the castle nut.
2. Remove the ball pins from the steering arm and the pitman arm using a ball-pin puller.

Installation of the 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 arm and the pitman arm. The tapered surfaces should be absolutely free from dirt, grease and paint.
3. Fit the steering rod and the castle nuts.
4. Check the steering-rod adjustment and readjust, if necessary. See chapter “Checking and adjusting”.
5. 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 joint, see the drawing.
6. Check whether the bolt of the clamping bracket is tightened to the specified tightening torque, see main group “Technical data”.
7. Tighten the castle nuts to the specified torque, see main group “Technical data”. If the split-pin hole of the ball pin does not match the recesses in the castle nut, the castle nut should be tightened further.
8. Fit new split pins.



S7 00 026

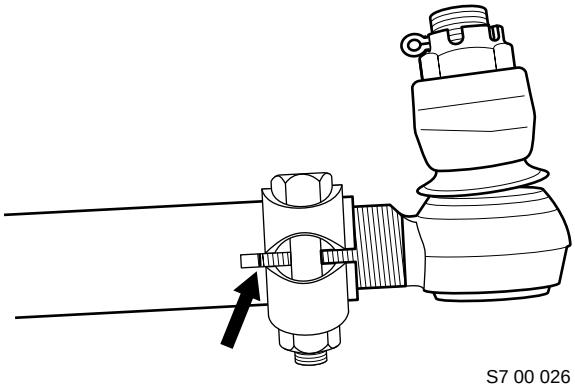
3.4 REMOVAL AND INSTALLATION, TRACK ROD

Removal of the track rod

1. Remove the split pin of the track rod on both sides and the castle nut.
2. Remove the ball pins from the track-rod arms using a ball-pin puller.

Installation of the track rod

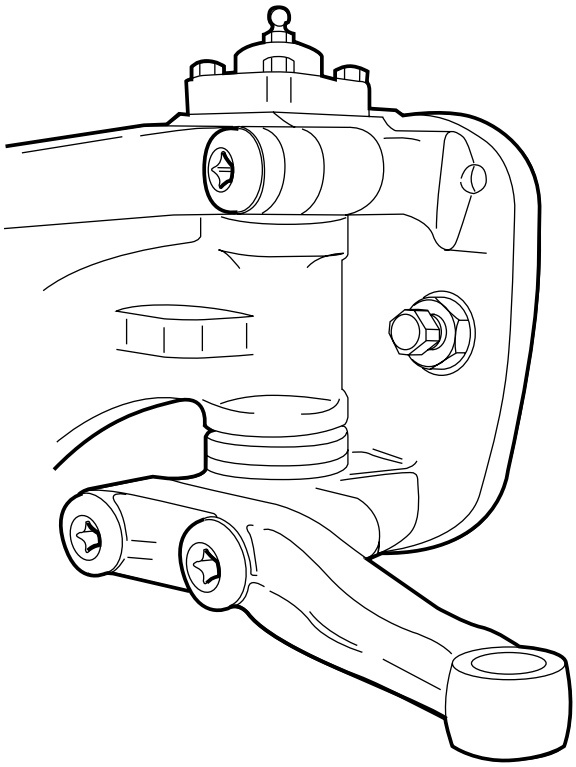
1. If installing a new track rod, copy the settings of the track rod to be replaced.
2. Clean the tapered contact surfaces of both the track-rod balls and the swivel axles. The tapered surfaces should be absolutely free from dirt, grease and paint.
3. Fit the track rod and the castle nuts.
4. Check the axle toe and readjust, if necessary. See chapter “Checking and adjusting”.
5. Check whether the threaded ends of the track rod and the ball joints are fully engaged by the clamping pieces.
6. Check whether the bolts of the clamping pieces are tightened to the specified tightening torque, see main group “Technical data”.
7. Tighten the castle nuts to the specified torque, see main group “Technical data”. If the split-pin hole of the ball pin does not match the recesses in the castle nut, the castle nut should be tightened further.
8. Fit new split pins.



S7 00 026

3.5 REMOVAL AND INSTALLATION, TRACK-ROD AND STEERING ARMS

These instructions should be followed to the letter. The attachment of the track-rod and steering 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 arms.
Always use original attachment bolts of the prescribed length supplied by DAF.



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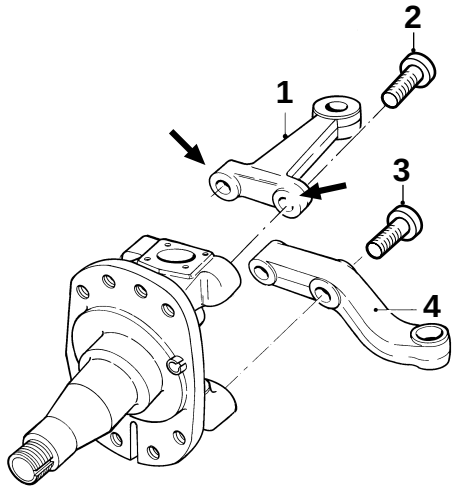
Removal of the track-rod and steering arm

1. Remove the track rod and the steering rod from the track-rod and steering arm.

2. Remove the attachment bolts (2 and 3) using special tool (DAF no. 1240113).

   Note:
   These bolts should not be reused.

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



S7 00 160

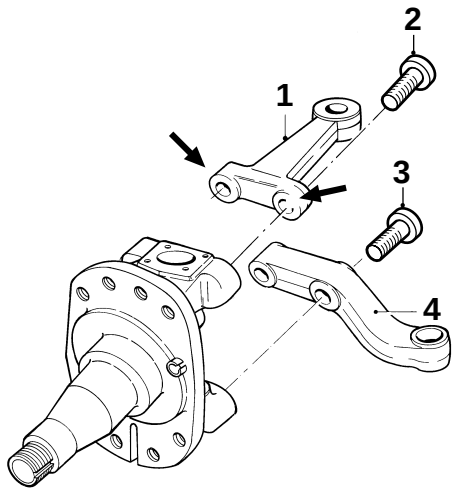
Installation of the track-rod and steering arms

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. Loctite 603 should be applied around the bolt holes at the steering arm, see the arrows in the drawing.
4. Always use new attachment bolts when installing the track-rod arm (4) and the steering arm (1).

   Note:
   - For track rods and steering rods with a thickness of 35 and 40 mm, a bolt length of 72 mm should be applied.
   - For track rods and steering rods with a thickness of 48 mm, a bolt length of 85 mm should be applied.

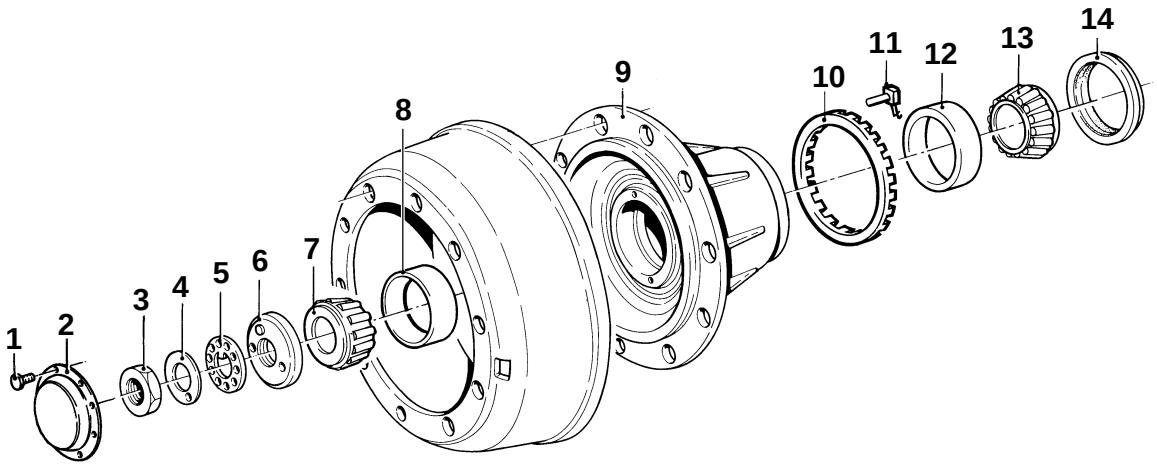
   The new attachment bolts have already been provided with a locking compound. Apply a lubricant to the attachment bolts before fitting them.
5. Tighten the attachment bolts (alternately) evenly.
   Tighten the attachment bolts to the specified tightening torque and then tighten the bolts further to the prescribed angle, see main group “Technical data”.

   Note:
   During the angular rotation process the bolt yield stress is exceeded, and the bolt will lengthen noticeably.
6. Install the track rod and the steering rod.



S7 00 160

3.6 REMOVAL AND INSTALLATION, HUB

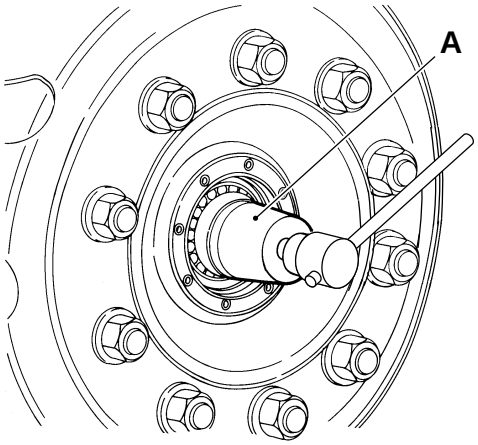


S7 00 401

Removal of the hub

1. Jack up the axle until the wheels are clear from the floor and position suitable stands under the axle.
2. Release the brake shoes.
3. Remove the hub cap (2).
4. Tap back the lock plate (4) and remove the lock nut (3) from the axle end, using socket spanner (A) special tool (DAF No. 0535832).
5. Remove the lock plate (4) and the circlip (5) from the axle end.
6. Position a tyre lift under the wheel.
7. Use an adjusting spanner (A), special tool (DAF No. 0694783), to remove the adjusting nut (6) from the axle end.
8. Remove the outer wheel bearing (7) from the hub.

   Note:
   If the bearings are removed from both wheels, they should be marked. Each bearing should be reinstalled in its original hub.



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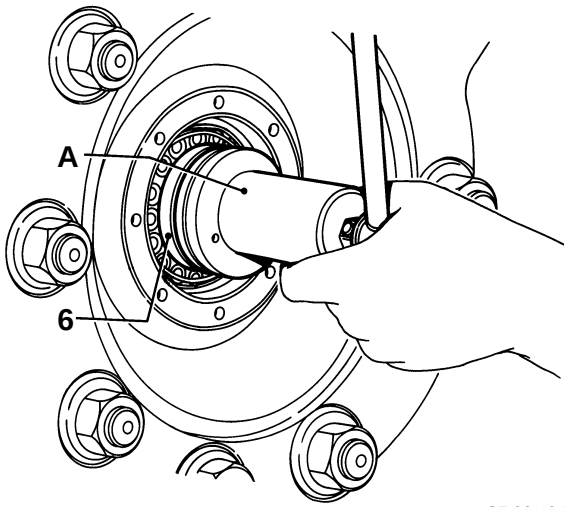
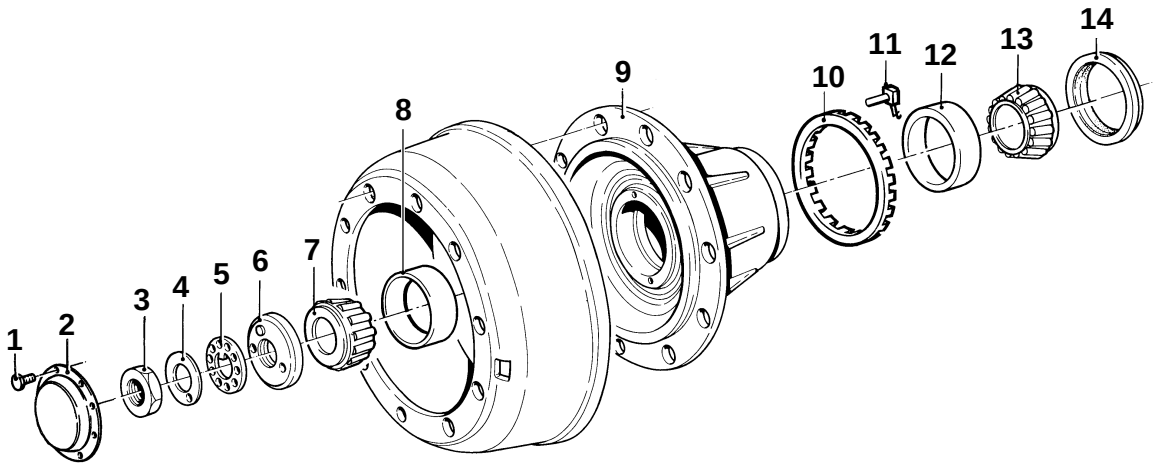


S7 00 404

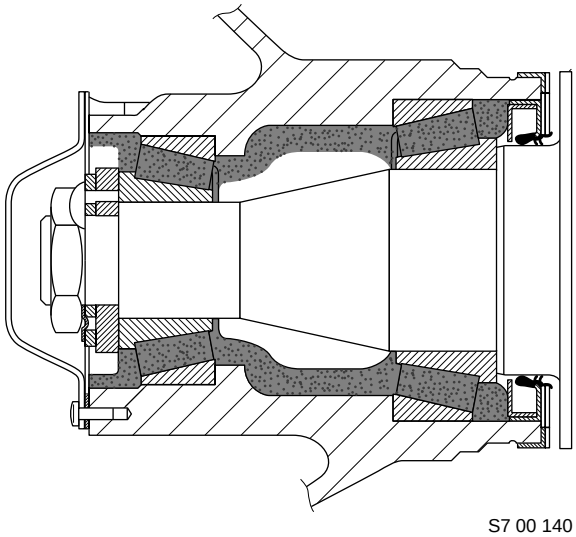
9. Remove the hub with the wheel from the axle stub.
   Made sure that the sensor ring (10) of the ABS system is not damaged in the process.
10. Remove the sealing ring (14) from the wheel hub.
11. Remove the inner wheel bearing (13) from the hub (9).
12. Remove the grease from the hub (9) and clean the hub.
13. Thoroughly clean the bearing cages using a cleaning liquid.
14. Remove the outer races (8 and 12) of the wheel bearings, if necessary.



S7 00 401

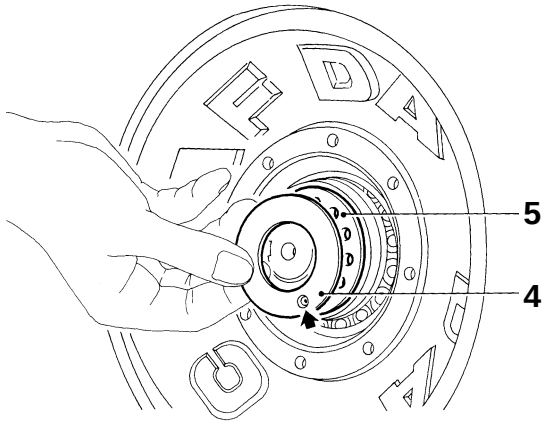
Installation of the hub

1. Check the hub and the wheel bearings for wear and damage, see chapter “Inspection and adjustment”.
2. Fit a new ABS sensor ring (10) to the hub, if necessary.
3. Fit new wheel bearings into the hub, if necessary.
4. Blow-dry the wheel bearings (7 and 13) using compressed air.
5. Fill the wheel bearings with the specified wheel bearing grease.
   Also apply a layer of grease to the wheel bearing circumference.
6. Fit the wheel bearing (13) into the wheel hub (9).
7. Fill the hub at the inside circumference with wheel-bearing grease.
8. Fit a new hub oil seal (14) in the hub (9).
9. Apply a little grease to the sealing lips of the lubricant seal (14).
10. Check whether the ABS sensor (11) is correctly clamped in the swivel axle.
    Replace the clamping sleeve of the sensor, if necessary.
11. Position the wheel in front of the axle end using the tyre lift.
    Fit the outer wheel bearing (7) into the hub so that the outer wheel bearing can also serve as a guide when installing the hub.



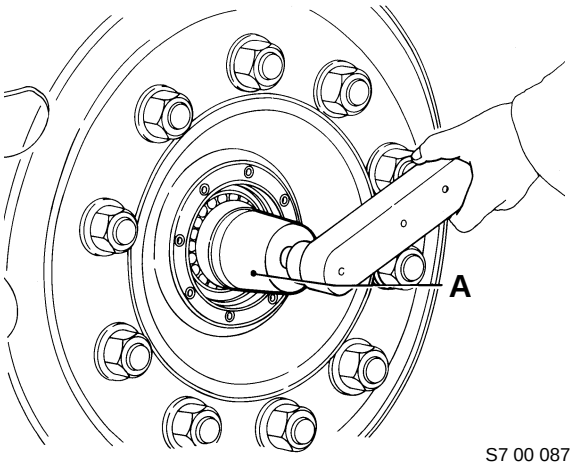
S7 00 140

12. Slide the hub over the axle stub. Do not pry, as the oil seal (14) might be damaged in the process.
13. Fit the adjusting nut (6) to the axle end.
14. Adjust the specified wheel bearing play and fit the circlip (5) to the axle end, see chapter “Inspection and adjustment”.
15. Fit a new lock plate (4) to the axle end. The lock plate cam (see the arrow) should catch in one of the holes of the circlip (5).



S7 00 402

16. Fit the lock nut (3) to the axle end. Tighten the lock nut (3) to the specified tightening torque, seen main group “Technical data”. Use a socket spanner (A), special tool (DAF no. 0535832).
17. Secure lock nut (3) by tapping back the lock plate (4) against the side of the lock nut.
18. Apply the specified grease to the front of the outer wheel bearing.
19. Clean the hub (9) sealing surfaces and the hub cap (2), and make sure they are dry and grease-free.



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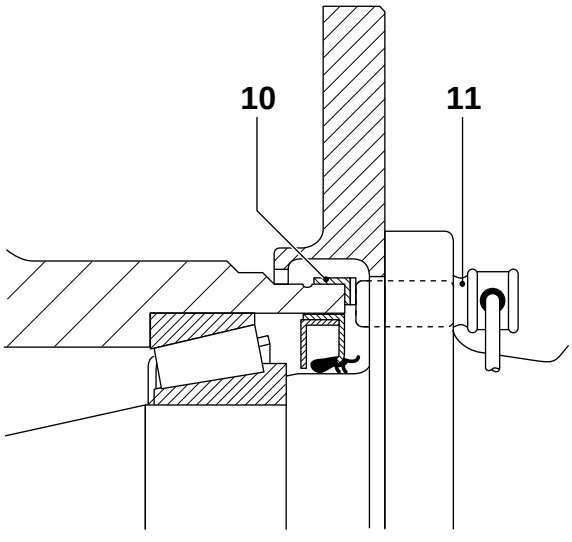
20. Apply a locking compound (silicone paste) to the hub sealing surface (9).
21. Fit the hub cap (2). Tighten the bolts (1) to the specified tightening torque. See “Technical data”.
22. Press the ABS sensor (11) against the sensor ring (10). While the vehicle is being driven, the air gap between the sensor (11) and the sensor ring (10) is adjusted automatically.
23. Adjust the brakes.

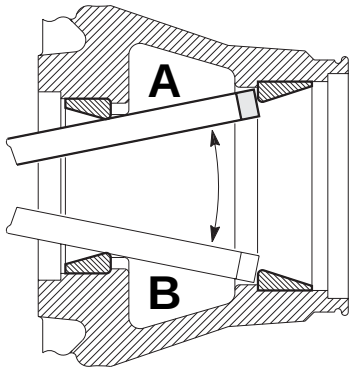


S7 00 403

3.7 REMOVAL AND INSTALLATION, WHEEL BEARINGS

Removal of the wheel bearings

1. Remove the hub from the axle stub.
2. Remove the oil seal from the hub.
3. Tap the outer races of the bearings from the hub using a driver. For this purpose, the hub has been fitted with two recesses (A) and (B).



M8120

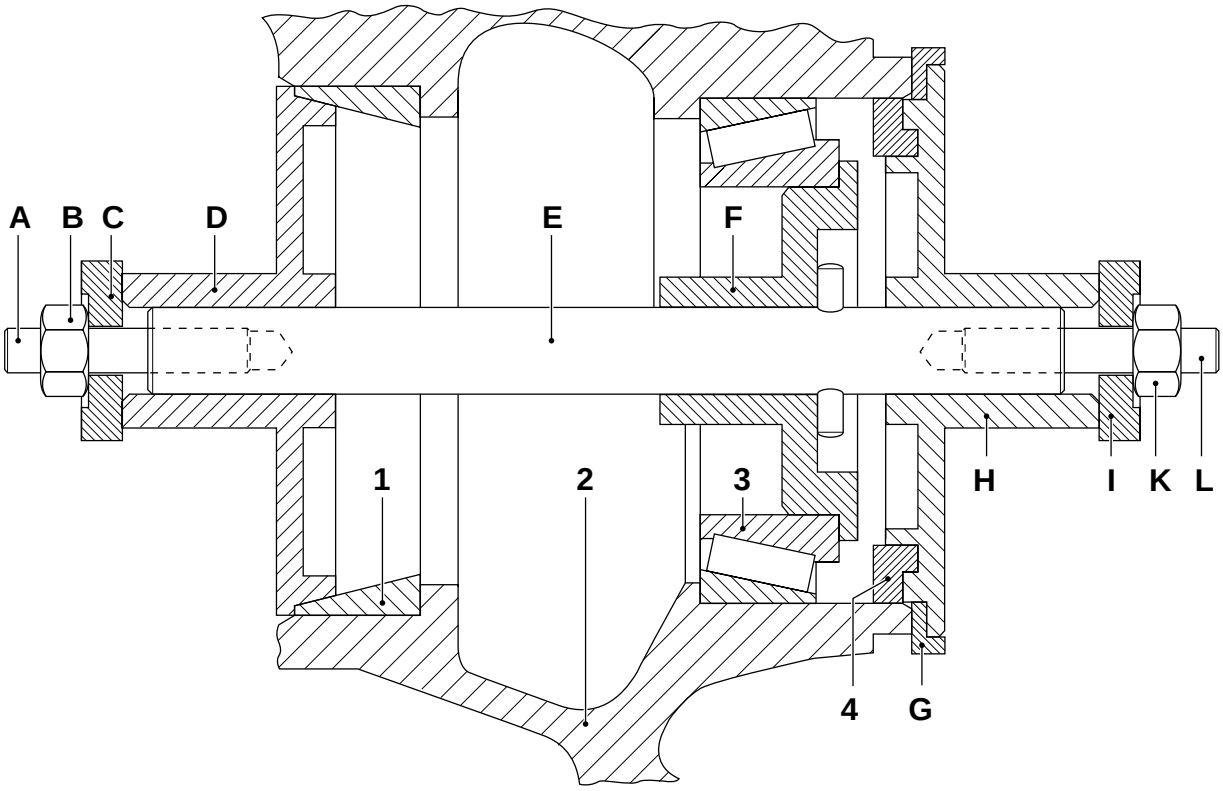
Installation of the wheel bearings

1. Fit the new outer races into the hub using a punch. Take care not to damage the outer races in the process.
2. Fit a new oil seal in the hub.
3. Install the hub on the axle stub.

3.8 REMOVAL AND INSTALLATION, HUB OIL SEAL

Removal of the hub oil seal

1. Remove the hub from the axle stub.
2. Drill two holes into the oil seal and turn the special tool (DAF no. 0484899) into the oil seal. Pull the oil seal from the hub using the special tool (DAF no. 0694928).



S7 00 180

Installation of the hub oil seal

1. Check the oil-seal chamber (4) in the hub (2) for damage.
2. For the installation of the hub oil seal (4) use special tool (DAF no. 1240036).
3. The special tool is assembled as follows: screw the threaded ends (A and L) into the centring spindle (E).
   The shorter threaded end (L) is fitted on the side where the pin is inserted into the centring spindle (E).
4. Slide the appropriate centring flange (F) over the centring spindle (E).
5. Install the inner wheel bearing (3).
   Slide the centring axle (E) with the centring flange (F) into the hub (2).
6. Press the centring flange (F) into the inner wheel bearing (3).
7. Slide the appropriate centring flange (D) over the centring spindle (E).
8. Fit the lock plate (C) and the nut (B) onto the centring spindle (E).

9. Align the centring flange (D) on the outer race of the outer wheel bearing and hand-tighten nut (B) (max. 20 Nm).
   The centring axle (E) should be free from play in the hub (2).

   Note:
   If the hub (2) is not equipped with an ABS sensor ring (5), the dummy sensor ring (G) should be fitted to the draw-in flange (H).
   If the hub (2) is equipped with an ABS sensor ring (5), the draw-in flange (H) should be installed without the dummy sensor ring.

10. Position the oil seal (4) in front of the hub with the seal lip pointing to the outside of the hub.
    Slide the draw-in flange (H) over the centring spindle (E) against the oil seal (4).

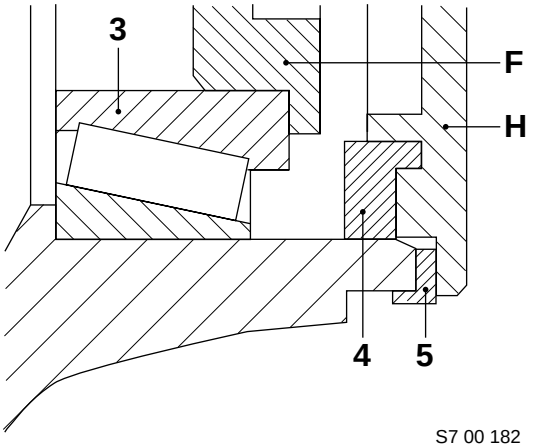
11. Fit the lock plate (I) and the nut (K).

12. Push the oil seal (4) evenly into the hub (2) using the nut (K). In the case of a hub with ABS sensor ring (5) the oil seal should be pressed in until draw-in flange (H) abuts the ABS sensor ring (5).
    In the case of a hub without ABS sensor ring (5) the oil seal should be pressed in until the dummy ABS sensor ring (G) abuts the hub rim.

13. Remove the special tool.

14. Apply grease to the sealing lips of the oil seal (4).

15. Install the hub on the axle stub.



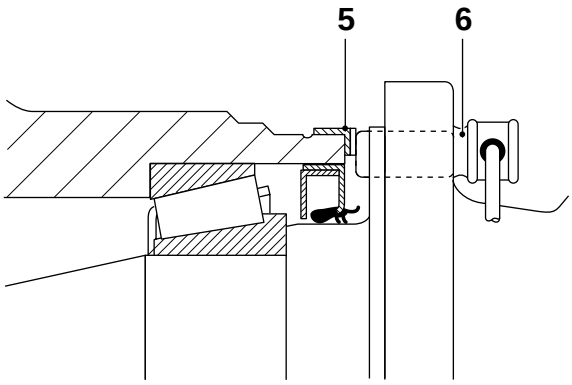
S7 00 182

3.9 REMOVAL AND INSTALLATION, ABS SENSOR RING

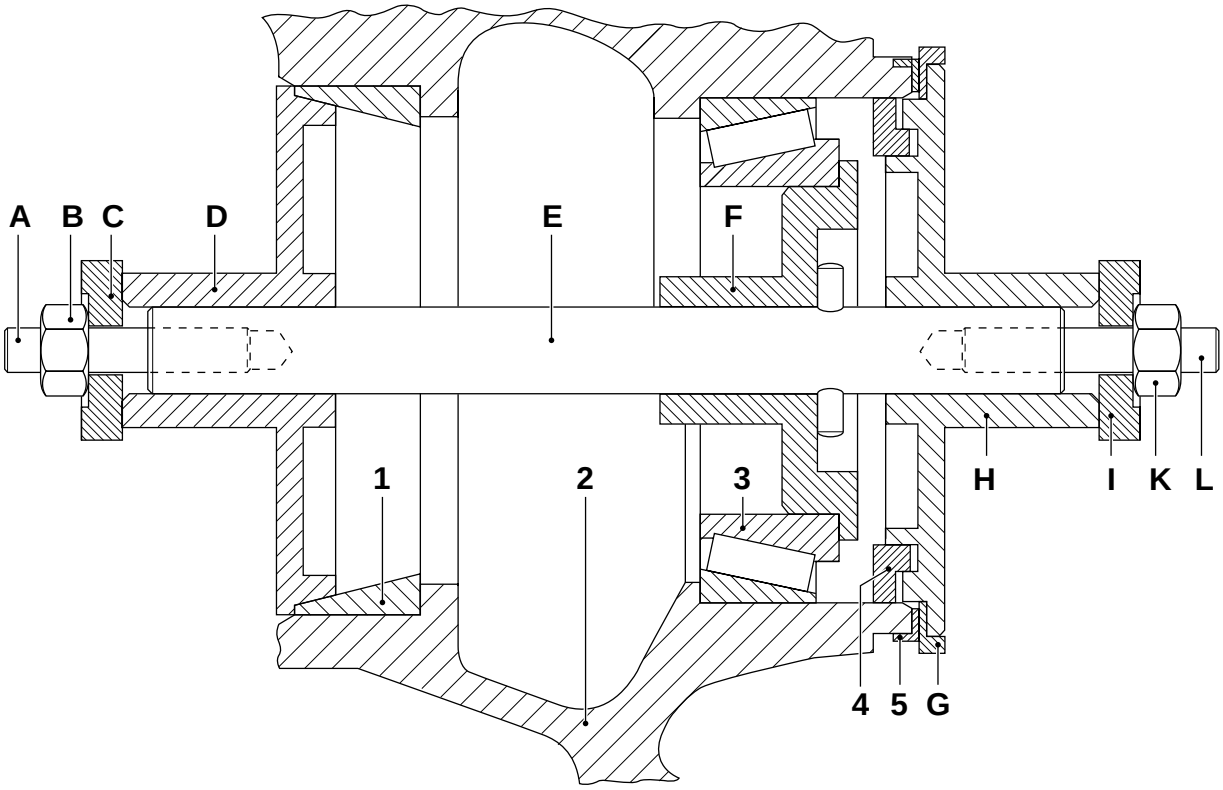
Removal of the sensor ring

1. Remove the ABS sensor (6).
2. Remove the hub from the axle stub.
3. Remove the sensor ring (5) from the hub using a puller. Make sure that the clamping face of the sensor ring on the hub is not damaged in the process.

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



S7 00 186

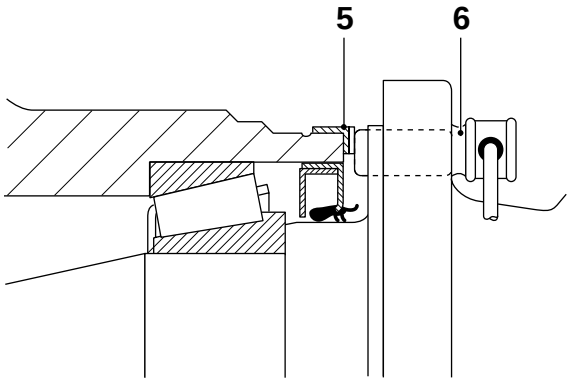


S7 00 181

Installation of the sensor ring

1. Use the special tool (DAF no. 1240036) for the installation of the sensor ring.
2. Check the clamping surface of the sensor ring on the hub for damage.
3. Check the new sensor ring carefully for possible transport damage.

4. Clean and degrease the contact surfaces of the hub (2) and the sensor ring (5).
5. The special tool is assembled as follows: screw the threaded ends (A and L) into the centring spindle (E).
   The shorter threaded end (L) is fitted on the side where the pin is inserted into the centring spindle (E).
6. Slide the appropriate centring flange (F) over the centring spindle (E).
7. Install the inner wheel bearing (3).
   Slide the centring axle (E) with the centring flange (F) into the hub (2).
8. Press the centring flange (F) into the inner wheel bearing (3).
9. Slide the appropriate centring flange (D) over the centring spindle (E).
10. Fit the lock plate (C) and the nut (B) onto the centring spindle (E).
11. Align the centring flange (D) on the outer race of the outer wheel bearing and hand-tighten nut (B) (max. 20 Nm). The centring axle (E) should be free from play in the hub (2).
12. Install the dummy sensor ring (G) on the draw-in flange (H).
13. Position the sensor ring (5) before the hub. Slide the draw-in flange (H) with the dummy sensor ring (G) over the centring spindle (E) until it abuts the sensor ring (5).
14. Fit the lock plate (I) and the nut (K).
15. Press the sensor ring (5) evenly onto the hub (2) using the nut (K) until the sensor ring is completely flush.
16. Install the hub on the axle stub.
17. Install the ABS sensor (6) and press it against the sensor ring (5).
    While the vehicle is being driven, the air gap between the sensor and the sensor ring is adjusted automatically.



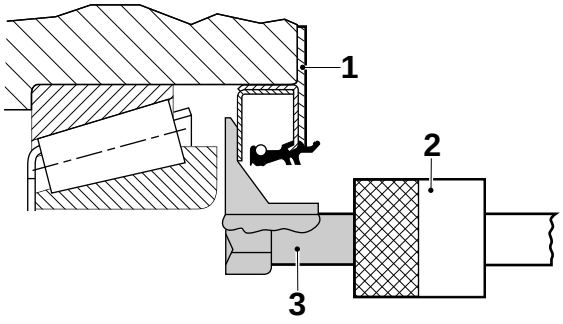
S7 00 186

3.10 REMOVAL AND INSTALLATION, COMBINED HUB LUBRICANT SEAL/ABS SENSOR RING

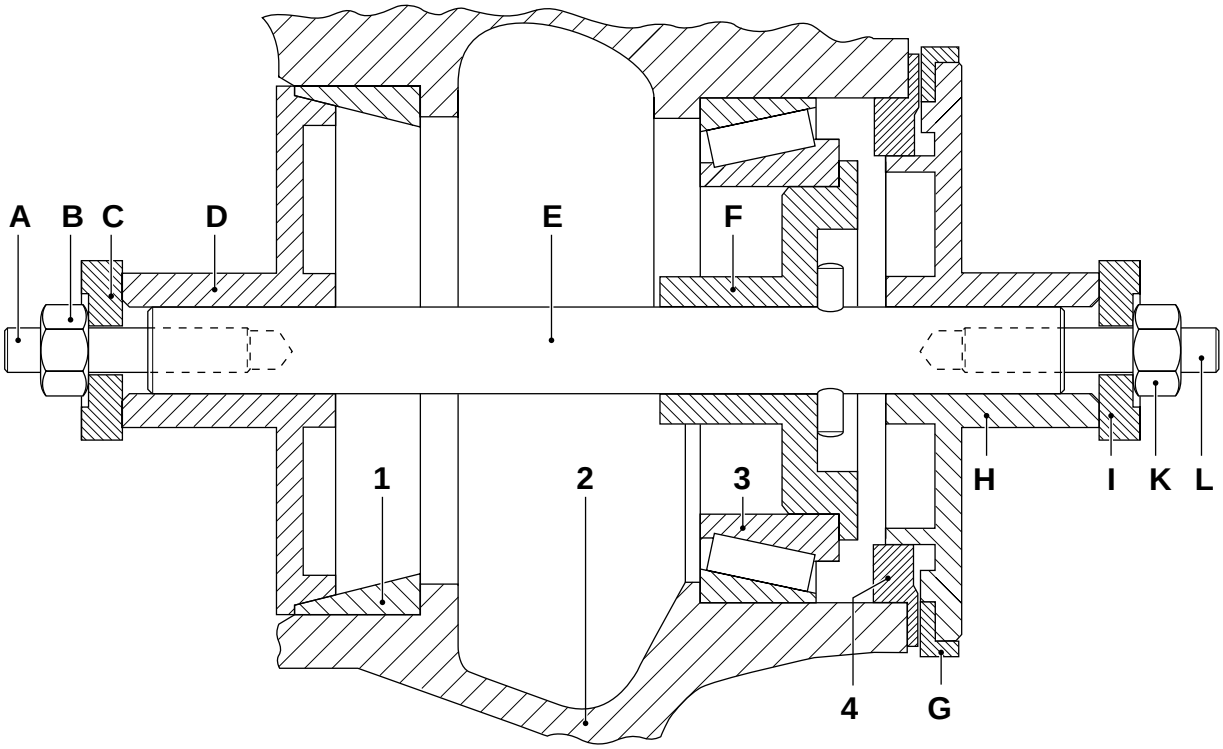
Removing the hub oil seal/ABS sensor ring

1. Remove the hub from the axle stub.

2. Fit the special tool (3) (DAF no. 1329411) to the impact extractor (2), special tool (DAF no. 0694928).
   Hook the special tool (3) (DAF no. 1329411) behind the oil seal (1).
   Pull the oil seal (1) from the hub using the impact extractor (2).
   Once the oil seal (1) has been removed, it cannot be re-used.



S7 00 424



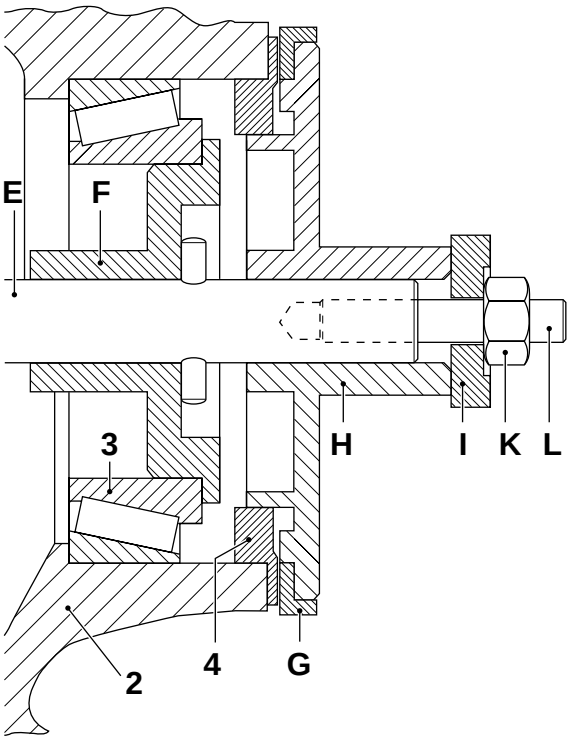
S7 00 405

Installing the hub oil seal/ABS sensor ring

1. Check the oil-seal chamber (4) in the hub (2) for damage.

2. For the installation of the hub oil seal (4) use special tool (DAF no. 1240036).

3. The special tool is assembled as follows: screw the threaded ends (A and L) into the centring spindle (E).
   The shorter threaded end (L) is fitted on the side where the pin is inserted into the centring spindle (E).
4. Slide the appropriate centring flange (F) over the centring spindle (E).
5. Install the inner wheel bearing (3).
   Slide the centring axle (E) with the centring flange (F) into the hub (2).
6. Press the centring flange (F) into the inner wheel bearing (3).
7. Slide the appropriate centring flange (D) over the centring spindle (E).
8. Fit the lock plate (C) and the nut (B) onto the centring spindle (E).
9. Align the centring flange (D) on the outer race of the outer wheel bearing and hand-tighten nut (B) (max. 20 Nm). The centring axle (E) should be free from play in the hub (2).
10. Fit washer (G) on draw-in flange (H).
11. Position the oil seal (4) in front of the hub (2).
    Slide the draw-in flange (H) with the washer (G) over the centring spindle (E) against the oil seal (4).
12. Fit the lock plate (I) and the nut (K).
13. Press the oil seal (4) evenly into the wheel hub (2) using nut (K), until the ABS sensor ring abuts the hub (2).
14. Remove the special tool.
15. Apply grease to the sealing lips of the oil seal (4).
16. Install the hub on the axle stub.

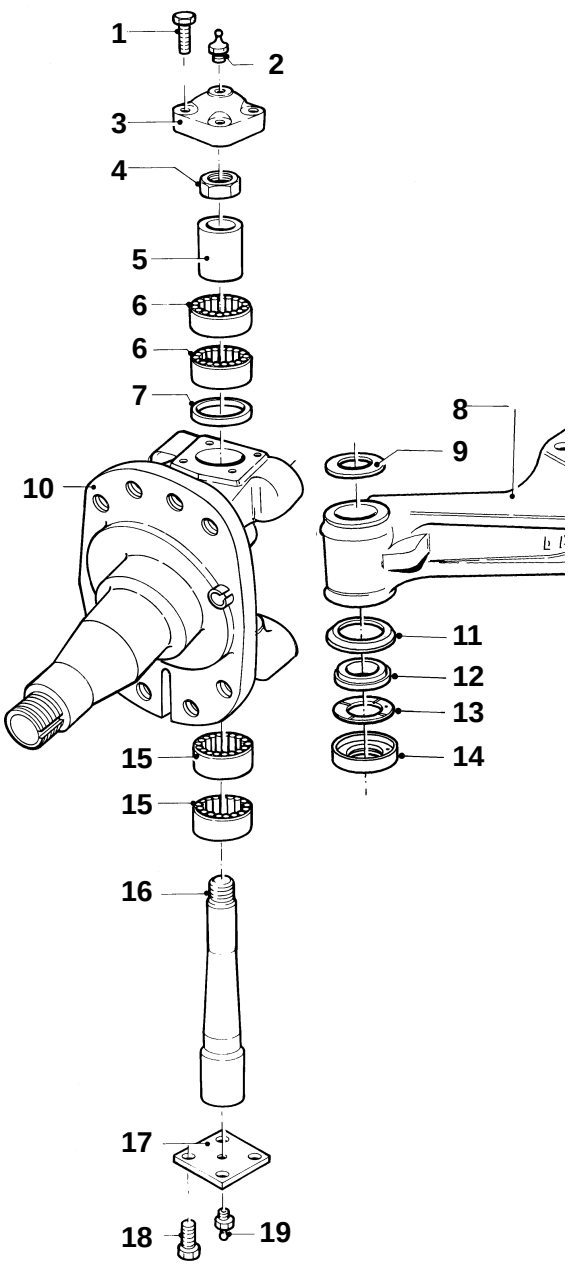


S7 00 411

3.11 REMOVAL AND INSTALLATION, SWIVEL AXLE

Removal of the swivel axle

1. Remove the wheel hub
2. Remove the brake back plate.
3. Remove the track rod and, if necessary, the steering rod.
4. Remove the cover (3).
   The length of the attachment bolts may deviate. In that case the position of the attachment bolts should be marked.
5. Remove the sealing plate (17).
6. Remove the nut (4).



s7 00 101

7. Screw the hydraulic puller (B), special tool (DAF no. 0535891), into the king-pin puller (C), special tool (DAF no. 0694767).

8. Fit the centring plate (E), special tool (DAF no. 0694823) to the bottom plate of the king-pin puller.

9. Position the appropriate pivot (D) for the axle type (special tool DAF no. 0694919 for 150N and 152N axles, or DAF no. 0694920 for the 172N axle) to the king pin.

10. Fit the king-pin puller to the king pin.

11. Align the king-pin puller at the top of the pivot. At the bottom the centring pins of the centring plate should fall into the swivel-axle bolt holes.

12. Screw out the spindle (A) of the hydraulic puller (B) as far as possible.

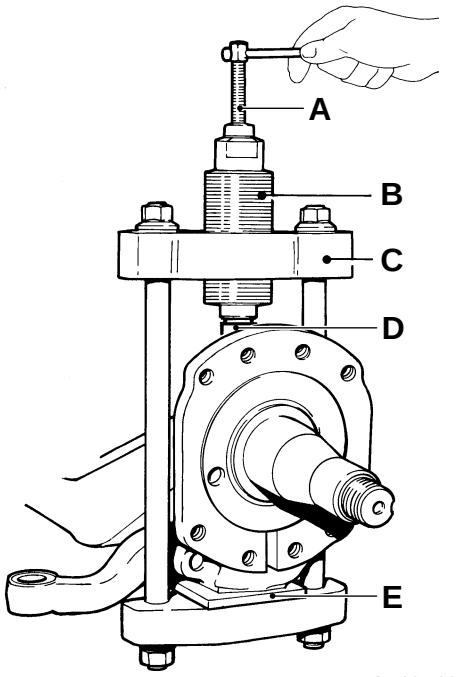
13. Use a spanner to screw the hydraulic puller (B) into the king-pin puller (C) as far as possible.

14. Screw the spindle (A) in until the king-pin (16) is released. If the king-pin is not released after the spindle (A) is fully screwed in, the spindle (A) should be fully screwed out and the hydraulic puller (B) screwed in further into the king-pin puller (C). Subsequently screw the spindle (A) back in.

    Note:
    If the king-pin is not released, it may be "quenched". Tap with a mallet on the axle-end stop which is not used.

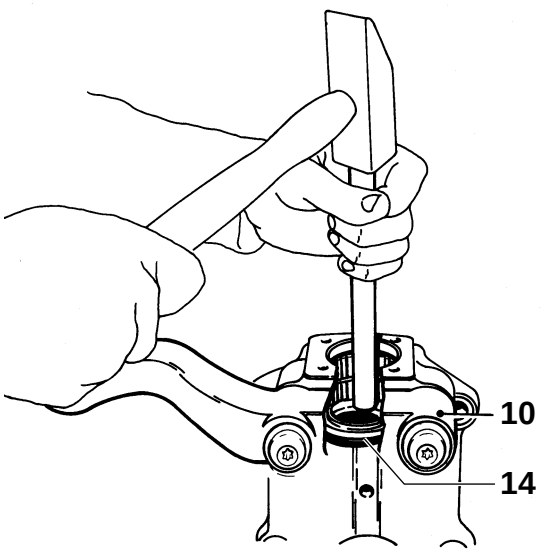
15. Remove the king pin (16) from the swivel axle. Make sure that no needles fall from the needle bearings (6 and 15).

16. Remove the bearing bush (5) from the swivel axle. Make sure that no needles fall from the needle bearings (6 and 15).



S7 00 106

17. Remove the swivel axle (10) with the entire thrust bearing and filler ring (9) from the axle end.
18. Disassemble the thrust bearing and clean the parts.
19. Remove the sealing ring (11) from the thrust washer (12).
20. Tap the collar ring (14) from the swivel axle (10) using a driver. Make sure that no needles fall from the needle bearings (6 and 15).

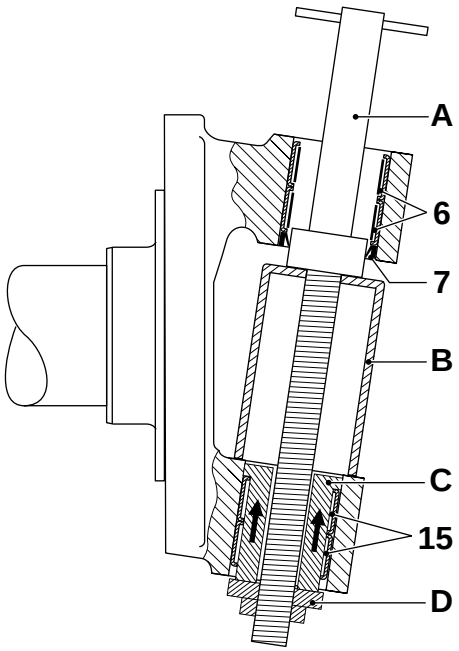


S7 00 103

Removal of the needle bearings
Remove the needle bearings (6 and 15) from the swivel axle, if necessary. Use the needle-bearing puller, special tool (DAF no. 0694827).

For axles 172N and 182N, 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).

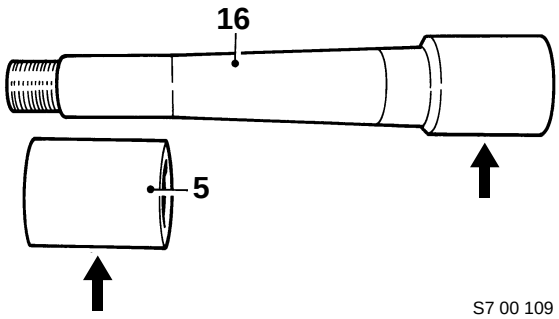
1. Insert the bush (C) in the needle bearings.
2. Place the sleeve (B) on the swivel-axle ear.
3. Fit the threaded end (A) into the sleeve (B) and through sleeve (C).
4. Screw the thrust piece (D) on the threaded spindle, until it abuts the outer needle bearing.
5. Pull the needle bearings from the outside to the inside out of the swivel axle (see the arrows in the drawing).
   When the needle bearings (6) are removed from the swivel axle, the oil seal (7) will also be removed.



S7 00 136

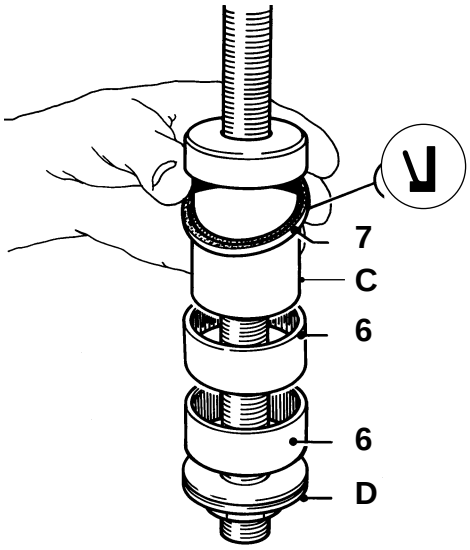
Inspection of the swivel axle
After a collision or when the camber angle is incorrect, the swivel axle should be magnaflux tested. When in doubt, always replace the swivel axle.

1. Check the condition of the needle bearings (6, and 15).
2. Check the bearing surfaces of the king pin (16) and the bearing bush (5) for grooves (see the arrows). A small needle puncture may be polished away using fine polishing paper. When in doubt, always replace the king pin (16) and the bearing bush (5).
3. Check the bearing surfaces of the thrust washer (12) and the collar ring (14).
4. Replace the bearing ring (13).
5. Check the surfaces of the filler ring (9) for damage. If required, replace the filler ring.



S7 00 109

Installation of the needle bearings
1. To prevent the needle bearings from becoming damaged while inserted, use special tool (DAF no. 0694827).
   For the 172N and 182N axles, the special tool should be supplemented by special tool (DAF no. 0694937).
2. Apply plenty of grease to the needle bearings.
3. Slide the needle bearings on the bush (C). For the upper needle bearings (6) first oil seal (7) should be fitted on the bush (C), with the open side towards the shoulder of the bush (see the drawing).

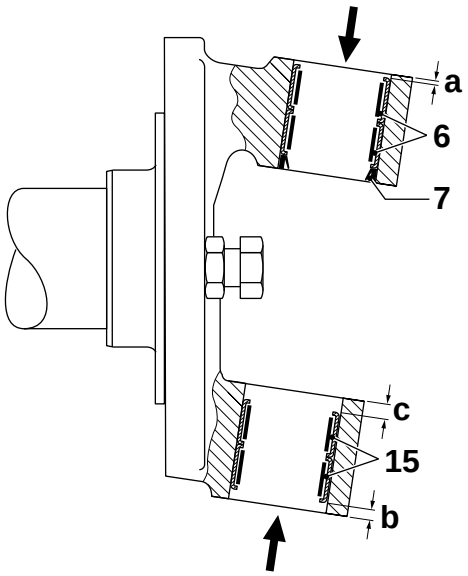


S7 00 105

4. Press the needle bearings from the outside to the inside into the swivel axle, in view of the bevelled sides of the swivel axle.
   The pressing-in procedure is the same as the pressing-out procedure.

5. Press the needle bearings into the swivel axle to the prescribed depth.
   - The pressing-in depth (a) at the top of the swivel axle for all axle types is: 1.5 - 2.5 mm.
   - The depth (b) at the bottom of the swivel axle for the 150N/152N axles is: 3 - 4 mm.
   - The pressing-in depth (b) at the bottom of the swivel axle for the 172N and 182N axles is: 6 - 7 mm.
   - After pressing in the needle bearings with the 172N and 182N axles, check the distance (c) (the distance over the needle bearings); this distance should be 4 mm at least.

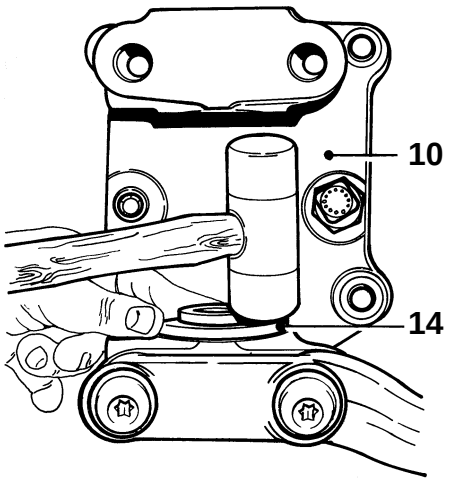
     Note:
     The markings on the thrust piece (D) are not applicable when pressing in the needle bearings into the 150N/152N axles.



S7 00 135

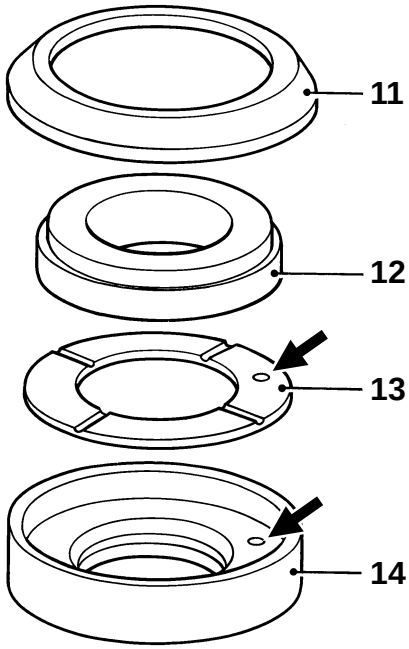
Installation of the swivel axle

1. Tap the thrust bearing collar ring (14) evenly into the swivel axle (10) using a plastic mallet. The collar ring should abut all around.

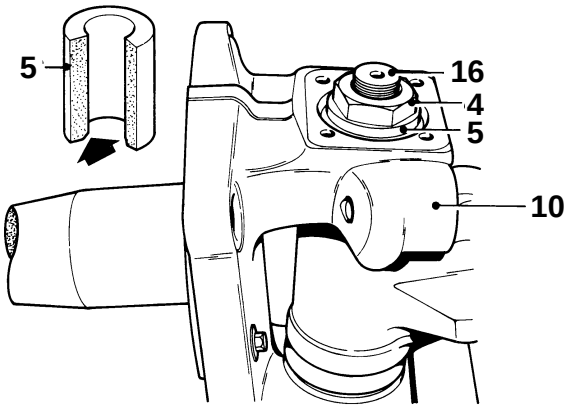


S7 00 113

2. Fit the bearing ring (13) into the collar ring (14) without greasing it.
   Make sure that the cam of the bearing ring falls into the hole of the collar ring.
3. Fit the thrust washer (12) without the sealing ring (11) on the bearing ring (13).
4. Install the swivel axle (10) on the axle end and adjust the axial play using the correct filler ring (9), see chapter “Checking and adjusting”.
5. After determining the correct filler ring (9), remove the swivel axle from the axle end.
6. Disassemble the thrust bearing and apply plenty of grease to the top side of bearing ring (13) (ribbed side with lubricating grooves).
7. Fit a new sealing ring (11) to the thrust washer (12).
   Make sure that the top of the sealing is positioned under the top of the thrust washer.
8. Place the thrust washer (12) on the bearing ring (13).
9. Install the swivel axle (10) with the correct filler ring (9) on the axle end.
10. Align the filler ring (9) using a driver as otherwise the needles might be pushed from the bearings or the bearing cage might get damaged.
11. Fit the bearing bush (5) with the tapered side pointing down (see the arrow in the drawing) in the needle bearings (6).
12. Degrease the tapered part of the king pin (16) and fit the king pin into the swivel axle.
13. Apply Loctite 243 (or an equivalent product) to the king-pin screw thread (16), and fit the nut (4).
14. Tighten the nut (4) to the specified tightening torque, see main group “Technical data”.
15. Apply a sealing compound to the cover (3) and fit the cover. Pay attention to possible differences in the length of the attachment bolts (1).

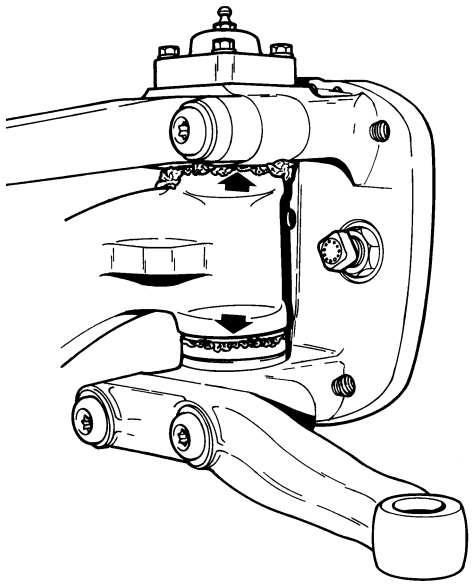


S7 00 110



S7 00 111

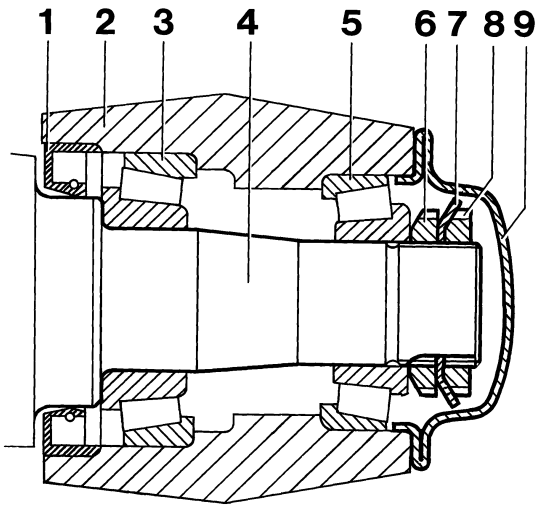
16. Apply a sealing compound to the sealing plate (17) and install the sealing plate.
17. Grease the swivel axle at the top and bottom.
    Check whether the grease has penetrated from the top between the axle end and the swivel axle. At the thrust bearing the grease should be pressed out along the entire circumference between the oil seal and the thrust bearing (see arrows in drawing).
18. Check whether the swivel axle operates smoothly and does not get stuck anywhere.
19. Install the track rod and, if necessary, the steering rod.
20. Fit the brake back plate.
21. Fit the wheel hub.



S7 00 104

3.12 REMOVAL AND INSTALLATION, IDLER ARM

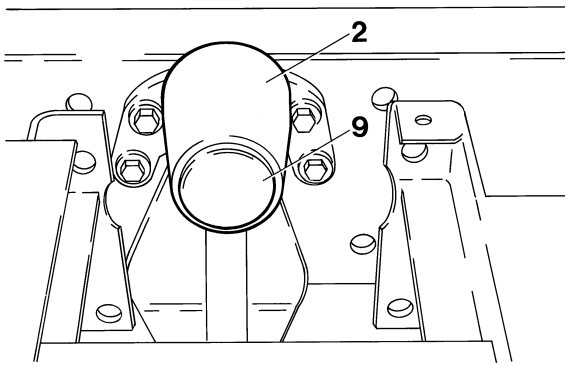
If the idler arm has been subjected to extremely high loads (e.g. an accident), the idler arm and its support should be magnaflux tested.
If it is not possible to magnaflux test these components, they should be replaced.



S7 00 067

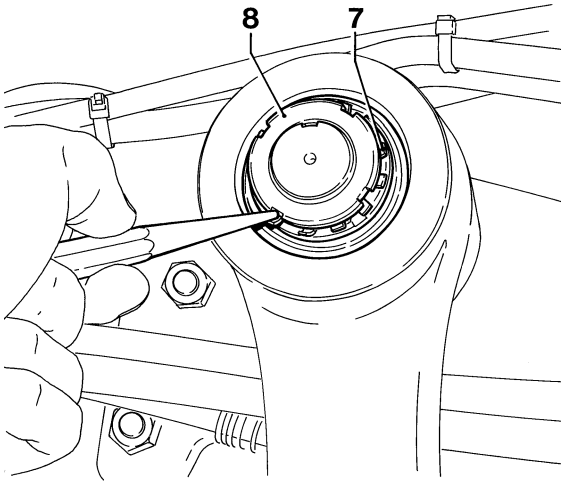
Removal of the idler arm

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-pin puller.
3. Remove the cover (9) clamped in the idler arm (2).



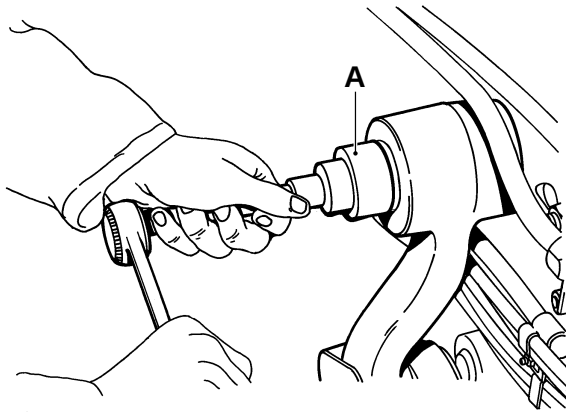
S7 00 068

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



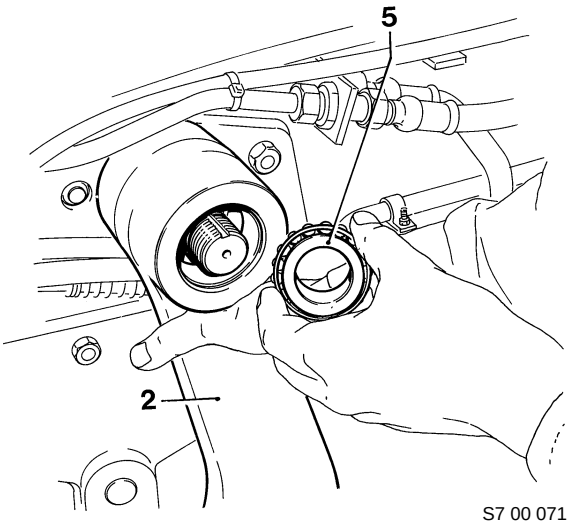
S7 00 069

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



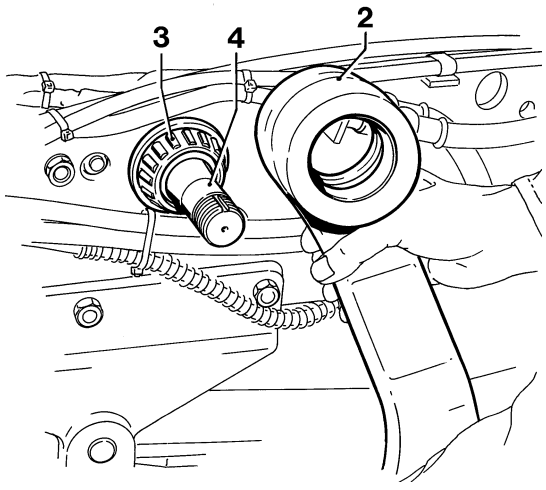
S7 00 070

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



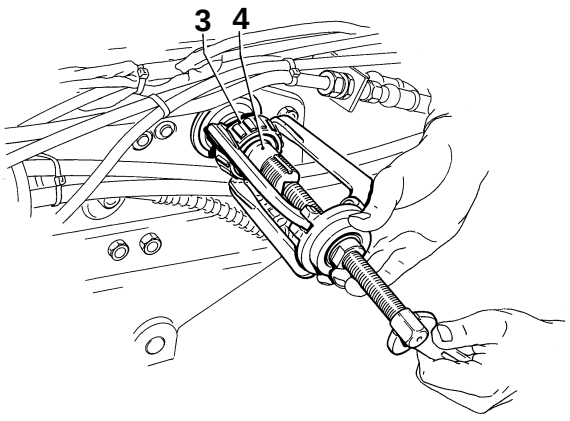
S7 00 071

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



S7 00 072

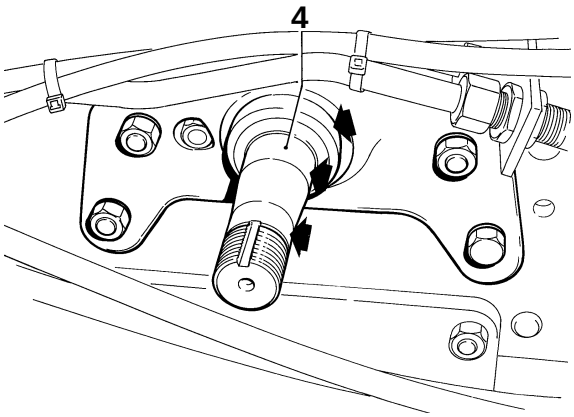
10. Remove the inner bearing (3) from the axle (4) using a puller.



S7 00 073

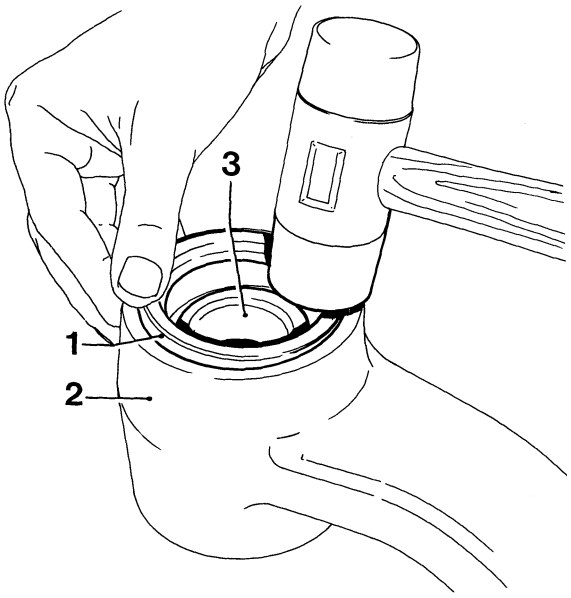
Installation of the idler arm

1. Before installation, check the running surface of the oil 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.



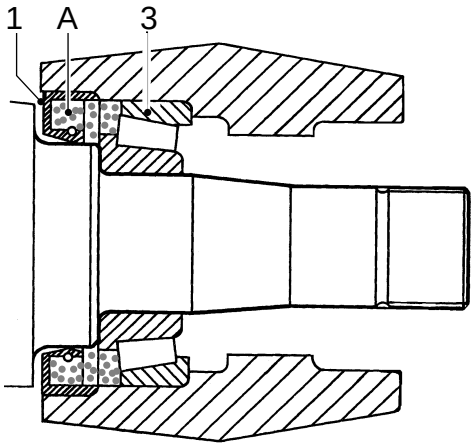
S7 00 074

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



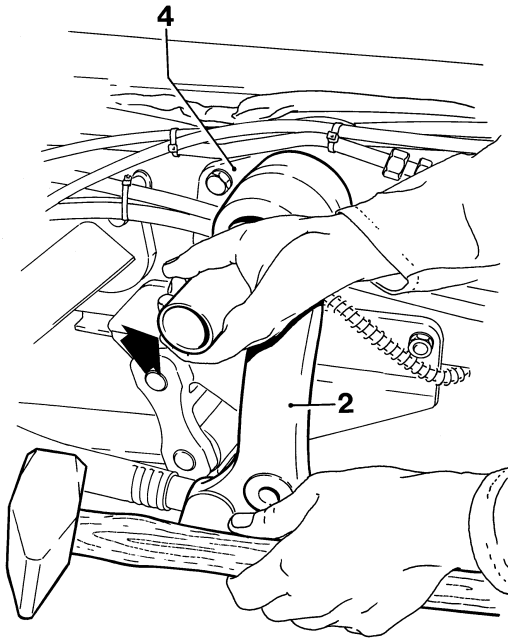
S7 00 075

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



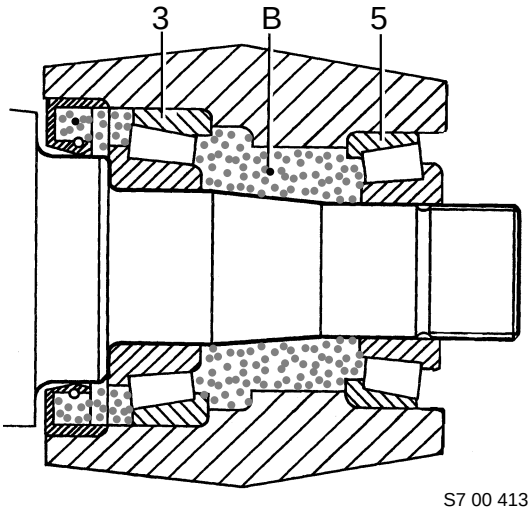
S7 00 412

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



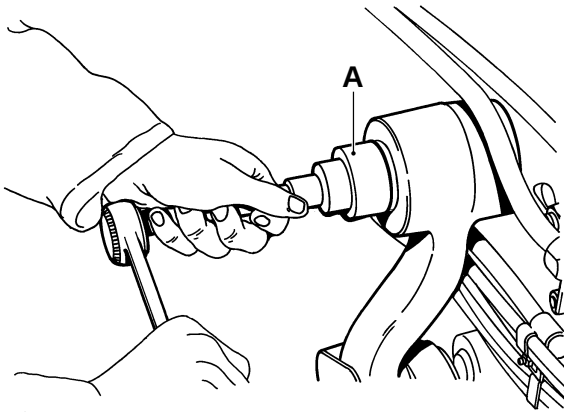
S7 00 076

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



S7 00 413

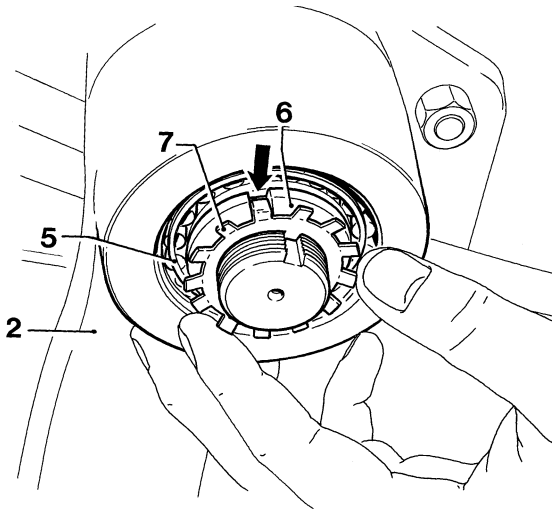
8. Apply grease to the outer bearing (5) and fit the bearing into the idler arm (2). Fit the adjusting nut (6) with the tapered side pointing to the bearing. Use a spanner (A), special tool (DAF no. 0694821). Adjust the bearing play using the adjusting nut (6), see main group “Technical data”.



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. Use special tool (DAF no. 0694821).
Tighten the lock nut to the specified torque, see main group “Technical data”.



S7 00 077

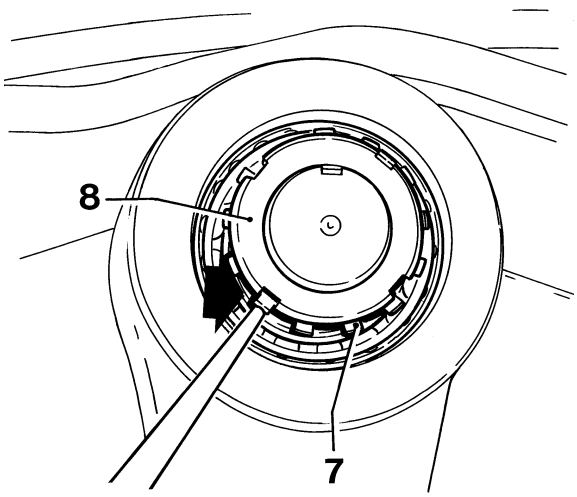
11. Secure the lock nut (8) by tapping the lip of the oil seal (7) into a recess of the lock nut. If the lip is not positioned over the recess of the adjusting nut, the adjusting nut should be tightened until a recess can be reached. Never loosen the lock nut (8).

Note:
Do not apply grease inside 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