Summary of components of power-assisted steering (KOYO)

1 - Self-tapping screw, 6 Nm

2 - Heat shield

- □ assignment ⇒ Spare part catalogue
- 3 Steering column universal joint
- 4 Screw, 20 Nm + torque a further 90° (1/4 turn)
 - ☐ replace after each removal

5 - Gasket

- ☐ for power-steering sensor -G250- ⇒ item 6
- replace after each removal
- ☐ assignment ⇒ Spare part catalogue

6 - Sensor for power steering -G250-

- □ removing and installing
 ⇒ Chapter 48-13
- □ assignment ⇒ Spare part catalogue

7 - Screw, 7,5 Nm

- ☐ for power-steering sensor -G250-
- ⇒ item 6
- ☐ assignment ⇒ Spare part catalogue

8 - Nut, self-locking, 20 Nm and torque a further 90° (1/4 turn)

- ☐ replace after each removal
- 9 Steering-knuckle arm (of the wheel-bearing housing)

10 - Return-flow line

- ☐ Pipe screw M16x1.5
- power-assisted steering gear engine pump aggregate
- ☐ Torque for pipe screw on the power-assisted steering gear: 30 Nm

11 - O-ring

replace after each removal

12 - Hollow screw, 40 Nm

- with non-return valve
- ☐ M14x1.5

13 - Gasket ring

replace after each removal

14 - Pressure line

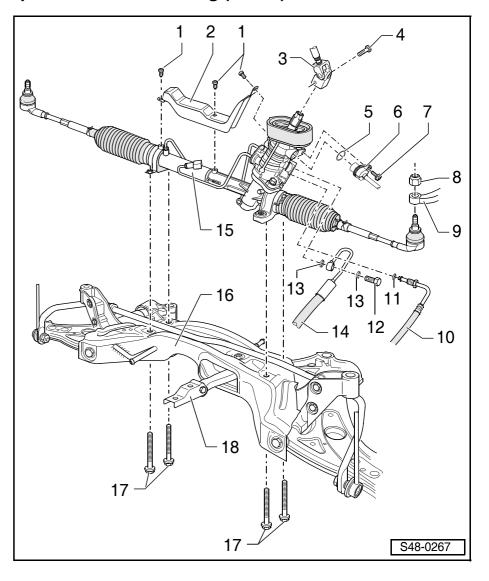
- power-assisted steering gear engine pump aggregate
- $\hfill \square$ Pay attention to installation position relative to subframe \Rightarrow 48-11 page 6
- ☐ Torque for pipe screw on the engine pump aggregate: 30 Nm

15 - Power-steering gear

□ removing and installing ⇒ Chapter 48-12

16 - Assembly carrier

- with impression (as shown in Figure), only if the front exhaust pipe is fitted below the engine-gearbox assembly carrier
- uith impression (not shown), only if the front exhaust pipe is fitted below the engine-gearbox assembly carrier



17 - Screw, 50 Nm + torque a further 90° (1/4 turn)

replace after each removal

18 - Hinged bracket

☐ The shape of the hinged bracket depends on the gearbox

Summary of components of pressure line (hose) - power steering TRW or KOYO

In the figure, the hose is illustrated at an engine pump aggregate of the TRW. The hose is analogous for the engine pump aggregate of KOYO

1 - Engine pump aggregate

- with encapsulation, assignment ⇒ Spare part catalogue
- with half encapsulation, assignment ⇒ Spare part catalogue
- without encapsulation, assignment ⇒ Spare part catalogue

2 - Return line (return hose)

- □ assignment ⇒ Spare part catalogue
- ☐ must not be pinched off during disassembling work
- No less than minimum bending radius of 100 mm
- removing and installing ⇒ Chapter 48-13

3 - Line holder

4 - Power-steering gear

5 - Pressure line (expansion hose)

- □ assignment ⇒ Spare part catalogue
- ☐ must not be pinched off during disassembling work
- ☐ No less than minimum bending radius of 100 mm
- □ Pay attention to installation position relative to subframe \Rightarrow 48-11 page 6
- removing and installing ⇒ Chapter 48-13

6 - Spacer holder

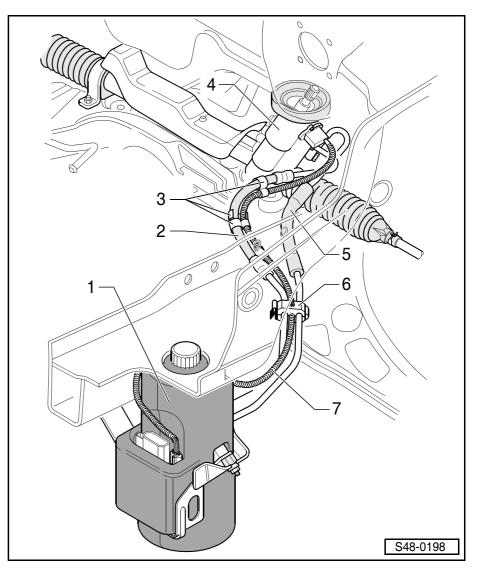
clipped onto body

7 - Cable of power-assisted steering sensor -G250-

power-assisted steering gear - engine pump aggregate

Fitting location of pressure line (flexible hose)

Maintain a clearance of about 10 mm between pressure line (flexible hose) and subframe.



Insert a suitable spacer between subframe and pressure line.

Use new hollow screw for power-assisted steering gear of TRW.

- Tighten banjo bolt of pressure line by hand with new seals at the power-assisted steering gear.
- Remove spacer.
- Inspect clearance between subframe and pressure line, adjust if necessary.
- Tighten banjo bolt fully to the specified tightening torque.

Tightening torque:

Pressure line to the power-assisted steering gear (TRW)	35 Nm
Use new hollow screw!	
Pressure line to the power-assisted steering gear (KOYO)	40 Nm

48-12 Removing and installing power-steering gear (TRW or KOYO)

Special tools, test and measuring equipment and auxiliary items required

- Gearbox jack with adapter, e.g. V.A.G 1383 A- with -V.A.G 1359/2-
- Vehicle system tester -V.A.G 1552- or vehicle diagnosis, measurement and information system
 -VAS 5051-
- Diagnostic cable -V.A.G 1551/3A -, V.A.G 1551/3B-,
 V.A.G 1551/3C- or -VAS 5051/6A-
- Fixing device -T10096-
- Extractor -Matra V176-
- Jumper cable (commercially available)
- Extraction bottle (commercially available)
- Oil catch pan (commercially available)
- Wooden insert 490 x 270 x 50 mm for adapter -V.A.G 1359/2-
- Plastic screw plugs for line connections on the powerassisted steering gear (commercially available)
- Hydraulic oil ⇒ Chap. 00-2

$oldsymbol{i}$

Note

- Apart from replacing the bellows, track rod ends and track rods no other repairs may be carried out on the power-steering gear.
- Absolute cleanliness is required when working on the power steering.
- Thoroughly clean the connection points and their surroundings before releasing.
- Place removed parts on a clean surface and cover if the repair cannot be carried out immediately.
- Do not use fluffy clothes.
- Remove spare parts from their wrapping immediately before fitting.
- Use only genuine wrapped parts.
- Do not use drained hydraulic oil again.
- Replace gaskets on hydraulic lines after each disassembly.
- ◆ For vehicles with KOYO steering manufactured as of 43/04 a component modification was performed as an enhancement for which the steering gear pinion has been offset by 1 tooth. For these reasons the steering gear is modified as of this date. For vehicles manufactured before this date the steering wheel is turned by approx. 1/8 turn when replacing the steering gear. Do not set the steering wheel with track rods, rather offset the steering wheel in the grooves of the steering column ⇒ Body Work; Rep. Gr. 69.
- Disposing of the power-steering gear ⇒ Chap. 48-17.

Removing the power-assisted steering drive

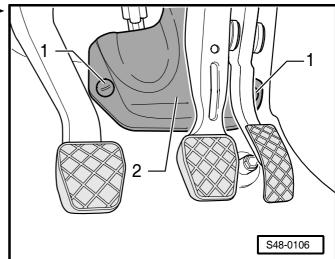


Caution!

Bring the steering wheel in its central position (with the wheels straight ahead) and make sure that it does not turn during repairs as this could damage the coil spring of the airbag unit.

- Secure the steering wheel with the wheels in straight
 ahead position with adhesive tape -arrow- against unintended turning.
- Unscrew plastic nuts -1-.
- Remove cover -2-.

S48-0196

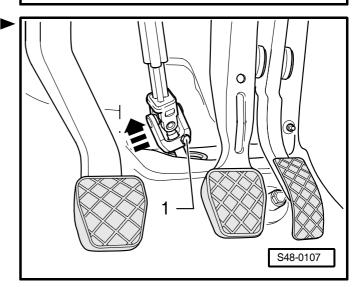


- Release screw -1-.
- Remove universal joint in the direction of the arrow from the input shaft of the power-steering gear.
- Before disconnecting the battery determine the code of radio sets fitted with anti-theft coding.

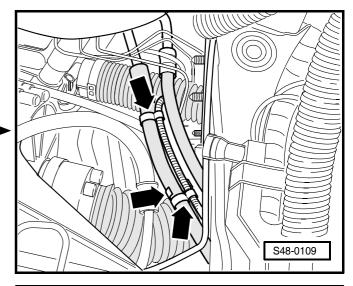


Note

Because of the different dimensions of the battery the screw cap of the hydraulic oil reservoir on certain vehicle versions is concealed by the battery tray and battery. If this is the case remove the battery tray and battery.



- Disconnect battery ⇒ Electrical System; Rep. Gr. 27.
- Remove air filter, if necessary ⇒ Engine, Fuel Injection System; Rep. Gr. 24 (petrol engines) or ⇒ Rep. Gr. 23 (diesel engines).
- If necessary remove the battery and battery tray
 ⇒ Electrical System; Rep. Gr. 27.
- Unhook cable of power-steering sensor -G250- from line holder -arrows-.
- Raise vehicle.



Remove noise insulation panel -arrows-.



Note

The figure shows the noise insulation panel on models with 1.4 ltr./74 kW engines. Other engine variants may have noise insulation panel versions that differ slightly from the figure.

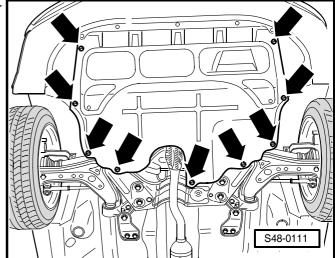
- Remove front wheels.

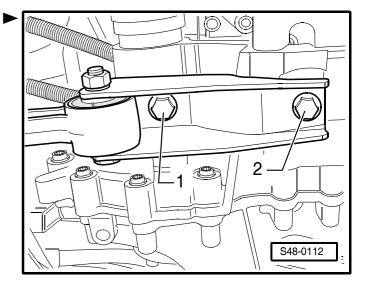
Vehicles with exhaust pipe under the assembly carrier

 Removing front exhaust pipe with catalyst ⇒ Engine -Mechanics; Rep. Gr. 26.

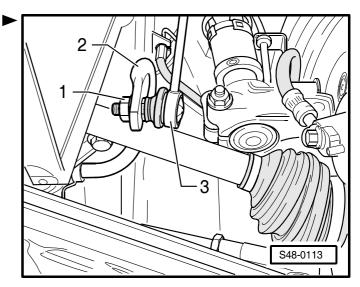
Continued for all vehicles

Unscrew screws -1- and -2- from the pendulum support.

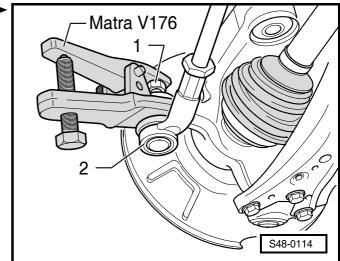




- Screw out the left and right nuts -1-.
- Pull out left and right coupling rod -3- from stabilizer
 -2-.



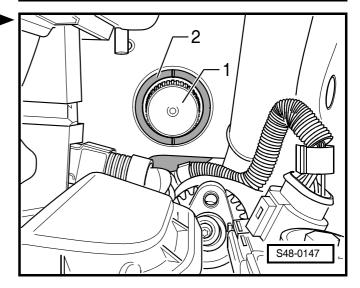
- Screw up nut of the track rod end -1- sufficiently so that the extractor -Matra V176- is supported on the nut.
- Use puller Matra V176- to press track rod/track rod end -2- off the steering arm.
- Screw off the nut on both sides from the track rod end.
- Pull track rod end on both sides out of steering arm.



- Unscrew the screwed lid -1- of the hydraulic oil reser- ►
 voir -2- of the engine pump aggregate.
- Extract the hydraulic oil with an extraction bottle via the filler neck.

Note

- After extraction there will be residual hydraulic oil in the engine pump aggregate as well as in the return hose and expansion hose.
- Do not use drained hydraulic oil again.
- Do not pinch off the expansion hose and the return hose with hose clamps -MP 7-602- or any other tools. Pinching off may result in damage to the expansion hose and return hose.
- To avoid damage make sure the bending radius of at least 100 mm is respected when bending or tying up the expansion hose or return hose.



- Place the oil catch pan to catch drained off hydraulic oil under the steering gear.
- Insert wooden insert (490 x 270 x 50 mm) -2- in the adapter, e.g. -V.A.G 1359/2-.
- Position gearbox jack with adapter and support assembly carrier.
- Release screws -1- for power-steering gear.



Note

- Observe the recommended sequence for the following steps.
- The fixing bolts for -T10096- must only be tightened to maximum 20 Nm as otherwise the fixing bolt thread becomes damaged.
- Unscrew left screw -4- for assembly carrier -3- and screw in a fixing bolt of -T10096- to 20 Nm.
- Unscrew right screw -4- for assembly carrier (not shown in figure) and screw in a fixing bolt of - T10096to 20 Nm.
- Release screws -1- on both sides.
- Unscrew the left screw -2- and remove support -5-.
- Screw in fixing bolts of -T10096- to 20 Nm.
- Unscrew the right screw -2- and remove support -5-.
- Screw in fixing bolts of -T10096- to 20 Nm.

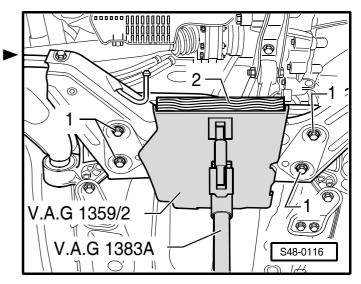
The fixing of the assembly carrier is completed once all 4 screws (Pos. -2- and -4-) are consecutively replaced with the fixing bolts.

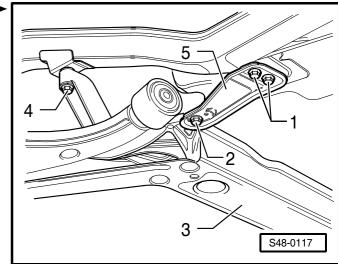


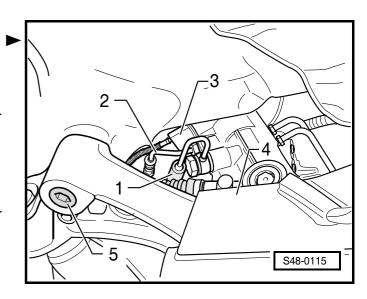
Caution!

When lowering the assembly carrier make sure the pressure line (expansion hose), return hose and the line of the power-steering sensor -G250- are not exposed to traction.

- Lower subframe -4- about 4 cm.
- 5 Fixing bolt of -T10096-
- Unscrew pressure line (expansion hose) -1- and return line (return hose) -2- on the power-steering gear.
- Shut off the pressure line and return line with a plastic bag and adhesive tape.
- Tie up the pressure line and return line.
- Shut off the threaded bores (connections for pressure and return lines) on the power-steering gear with plastig screw plugs.



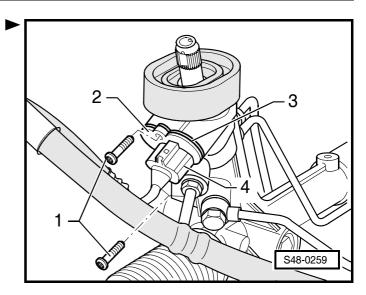




Vehicles with power steering (TRW)

- Release Allen screws -1-.
- Remove the power-assisted steering sensor -G250-(-2-) with seal -3- out of the power-steering gear valve housing.

The new removal of the power-assisted steering sensor -G250- with adapter cable is illustrated in the figure. The removal of the power-assisted steering sensor -G250-with fixed connection line occurs in the same way.



Vehicles with power steering (KOYO)

- Release Allen screw -1-.
- Remove the power-assisted steering sensor -G250-(-2-) with seal -3- out of the power-steering gear valve housing.

Continued for all vehicles



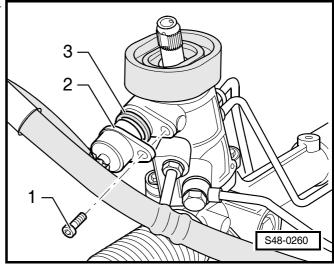
Note

When lowering the assembly carrier make sure there is sufficient clearance between the drive shafts and the stabilizer.

- Slowly lower assembly carrier with gearbox jack and adapter, e.g. -V.A.G 1383 A- with -V.A.G 1359/2-.
- Remove power-steering gear towards the rear.

Installing the power-assisted steering drive

- ◆ Pay attention to fitting position when attaching pressure line (flexible hose) to the power steering gear ⇒ Chap. 48-11.
- When tensioning and while driving the pressure line (expansion hose) and the return line (return hose) must not touch or chafe.
- To connect the pressure line use new gasket rings.
- Use new hollow screw for the connection of the pressure line to the power steering gear (TRW).
- To connect the return line use new O-rings.
- Coat the seal on the power-steering gear with lubricant before installing the power-steering gear, e.g. lubricating soap.
- Make sure all sealing surfaces are clean.
- After positioning the power-steering gear on the drive shaft of the steering column make sure the seal on the power-steering gear is not bent on the assembly plate and correctly seals the footwell opening. Otherwise this could cause water penetration and/or noise.



Before fitting the power-steering gear check the centre position of the gear rack ⇒ Chap. 48-14.

- Before positioning the universal joint of the steering column on the input shaft of the steering gear, first make sure the vehicle is on the ground and all wheels are pointing straight ahead.
- ◆ For vehicles with KOYO steering manufactured as of 43/04 a component modification was performed as an enhancement for which the steering gear pinion has been offset by 1 tooth. For these reasons the steering gear is modified as of this date. For vehicles manufactured before this date the steering wheel is turned by approx. 1/8 turn when replacing the steering gear. Do not set the steering wheel with track rods, rather offset the steering wheel in the grooves of the steering column ⇒ Body Work; Rep. Gr. 69.
- Check the centre position of the gear rack of the power-steering gear, if necessary adjust ⇒ Chap. 48-14.
- Place the power-steering gear from the rear onto the lowered assembly carrier and tighten new screws -1by hand.
- Check correct fit of the seal on the power-steering gear valve housing.
- Align the assembly carrier with the fixing bolts of -T10096- screwed into the body.



Note

Raise the assembly carrier until a distance of approx. 4 cm is between the console and body.

- Slowly raise the assembly carrier with gearbox jack and adapter, and while doing so insert the input shaft of the power-steering gear in the opening in the vehicle floor.
 - 2 Wooden insert (490 x 270 x 50 mm)

Vehicles with power steering (TRW)

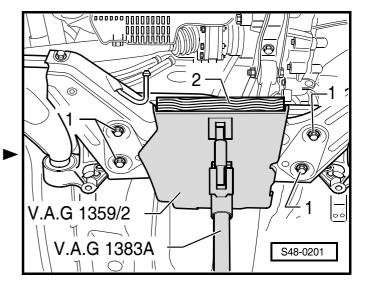
- Insert the power-assisted steering sensor -G250- (-2-) with new seal -3- into the power-steering gear valve housing.
- Insert and tighten screws -1-.

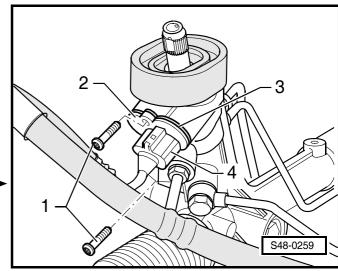
The installation of the power-assisted steering sensor -G250- with adapter cable is illustrated in the ilustration. The installation of the power-assisted steering sensor -G250- with fixed connection line occurs in the same way.

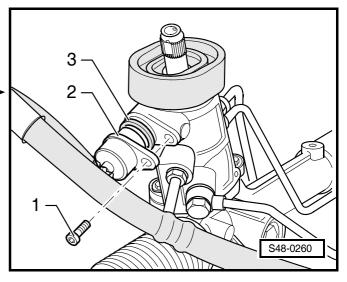
Vehicles with power steering (KOYO)

- Insert the power-assisted steering sensor -G250- (-2-) with new seal -3- into the power-steering gear valve housing.
- Insert and tighten screw -1-.

Continued for all vehicles







- Mount the pressure line (expansion hose) -1- and return line (return hose) -2- on the power-steering gear with new gasket rings.
- A new hollow screw must be used to connect the pressure line (expansion hose) -1- to the power-steering gear (TRW).
- 3 for power-assisted steering sensor -G250- with fixed connecting line
- 4 Assembly carrier
- 5 Fixing bolt of -T10096-

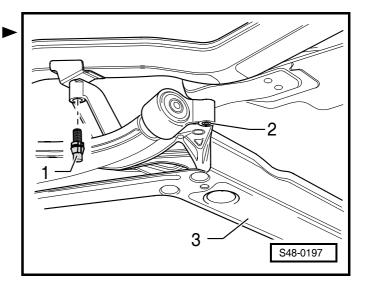
Pay attention to fitting location of pressure line \Rightarrow Chap. 48-11.

 Raise assembly carrier until the console touches the body.

2 - 3 - 4 - 4 - 5 - S48-0115 - -

Note

- Observe the recommended sequence for the following steps.
- Unscrew the fixing bolts of -T10096- one at a time. It should be subsequently replaced by a new bolt tightened to the recommended torque.
- Unscrew fixing bolt -1- of -T10096- from the left and screw in new bolt to the recommended tightening torque.
 - 3 Assembly carrier
- Unscrew fixing bolt -1- of -T10096- from the right (shown in figure) and screw in new bolt to the recommended tightening torque.
- Unscrew fixing bolt -2- of -T10096- from the left.
- Install left support.
- Tighten new bolts for the rear left support by hand.
- Tighten new bolts for left console and support to the recommended tightening torque.
- Tighten the rear left support bolts to the recommended tightening torque.
- Unscrew right fixing bolts -2- of -T10096- (shown in figure).
- Install right support.
- Tighten new bolts for the rear right support by hand.
- Tighten new bolts for left console and support to the recommended tightening torque.
- Tighten up the rear right support bolts to the recommended tightening torque.
- Remove gearbox jack with adapter.
- Tighten screws for fixing the steering gear to the assembly carrier to the recommended tightening torque.
- Insert track rod end/track rod into steering arm and tighten new nut ⇒ Chap. 48-16.



If the joint stub rotates when tightening, counterhold with hexagon socket wrench (SW 6).

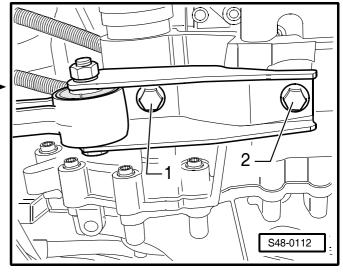
- Hook the coupling rod joint stub in the stabilizer and tighten nut.
- Mount pendulum support on the gearbox and tighten I new screws -1- and -2-.

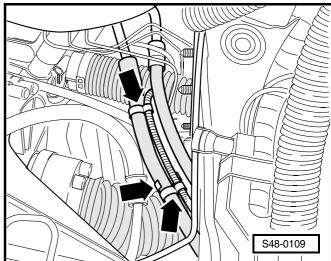
Vehicles with exhaust pipe under the assembly carrier

 Installing front exhaust pipe with catalyst ⇒ Engine -Mechanics; Rep. Gr. 26.

Continued for all vehicles

- Fit front wheels.
- Install noise insulation panel.
- Attach line of power-steering sensor -G250- with the line holders -arrows-.





- Slide the universal joint of the steering column in the I -direction of the arrow- onto the input shaft of the power steering and tighten with a new screw -1-.
- Fit cover for universal joint.

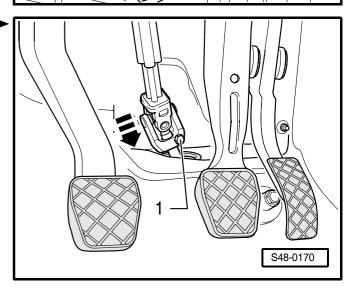
①

Caution!

Observe the applicable safety instructions for disconnecting the battery with the jumper cable!

- Connect the removed battery with jumper cable.
- Filling and bleeding the power-steering system
 ⇒ Chap. 48-23.
- Disconnect the Jumper cable.
- If necessary install the battery and battery tray
 ⇒ Electrical System; Rep. Gr. 27.
- Connect battery ⇒ Electrical System; Rep. Gr. 27.
- Install air filter, if removed ⇒ Engine, Fuel Injection System; Rep. Gr. 24 (petrol engines) or ⇒ Rep. Gr. 23 (diesel engines).
- Perform self-diagnosis ⇒ Chap. 48-25.

If faults are displayed in the fault memory:



- Eliminating fault ⇒ Chapter 48-25.
- Erasing fault memory ⇒ Chapter 48-25.
- Perform a test drive.



Caution!

If after the test drive and with the front wheels pointing straight ahead the steering wheel is off straight, perform a chassis alignment.

Carry out check of chassis alignment ⇒ Chapter 44-2



Note

For vehicles with KOYO steering manufactured as of 43/04 a component modification was performed as an enhancement for which the steering gear pinion has been offset by 1 tooth. For these reasons the steering gear is modified as of this date. For vehicles manufactured before this date the steering wheel is turned by approx. 1/8 turn when replacing the steering gear. Do not set the steering wheel with track rods, rather offset the steering wheel in the grooves of the steering column \Rightarrow Body Work; Rep. Gr. 69.

Tightening torques:

Power-steering gear to assembly carrier Use new screws! Assembly carrier to body Use new screws! Support to body Use new screws! Pendulum support to gearbox Use new screws! Track rod end/track rod to steering arm Use new nuts! power-assisted steering sensor -G250- to power-assisted steering gear (TRW) power-assisted steering gear (KOYO) Hollow screw for pressure line to power steering gear (M14x1.5) - TRW Use new hollow screw! Hollow screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar Use new screw! Wheel bolts 120 Nm + 90° 40 Nm + 90°			
Assembly carrier to body Use new screws! Support to body Use new screws! Pendulum support to gearbox Use new screws! Track rod end/track rod to steering arm Use new nuts! power-assisted steering sensor -G250- to power-assisted steering gear (TRW) power-assisted steering gear (KOYO) Hollow screw for pressure line to power steering gear (M14x1.5) - TRW Use new hollow screw! Hollow screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar Use new screw! Use new screw! Use new screw! ONM + 90° A Nm A Nm A Nm Universal joint to power-steering gear Use new screw!	Power-steering gear to assembly carrier	50 Nm + 90°	
 ◆ Use new screws! 20 Nm + 90° ◆ Use new screws! Pendulum support to gearbox ◆ Use new screws! Track rod end/track rod to steering arm ◆ Use new nuts! power-assisted steering sensor -G250-to power-assisted steering gear (TRW) power-assisted steering gear (KOYO) Hollow screw for pressure line to power steering gear (M14x1.5) - TRW ◆ Use new hollow screw! Hollow screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar ◆ Use new screw! Use new screw! Use new screw! 	• Use new screws!		
Support to body ◆ Use new screws! Pendulum support to gearbox ◆ Use new screws! Track rod end/track rod to steering arm ◆ Use new nuts! power-assisted steering sensor -G250- to power-assisted steering gear (TRW) power-assisted steering gear (KOYO) Hollow screw for pressure line to power steering gear (M14x1.5) - TRW ◆ Use new hollow screw! Hollow screw for pressure line to power steering gear (M14x1.5) - KOYO Pipe screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar Universal joint to power-steering gear ◆ Use new screw!	Assembly carrier to body	70 Nm + 90°	
 ◆ Use new screws! Pendulum support to gearbox ◆ Use new screws! Track rod end/track rod to steering arm ◆ Use new nuts! power-assisted steering sensor -G250- to power-assisted steering gear (TRW) power-assisted steering gear (KOYO) Hollow screw for pressure line to power steering gear (M14x1.5) - TRW ◆ Use new hollow screw! Hollow screw for pressure line to power steering gear (M14x1.5) - KOYO Pipe screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar 40 Nm Universal joint to power-steering gear ◆ Use new screw! 	Use new screws!		
Pendulum support to gearbox Use new screws! Track rod end/track rod to steering arm Use new nuts! power-assisted steering sensor -G250- to power-assisted steering gear (TRW) power-assisted steering gear (KOYO) Hollow screw for pressure line to power steering gear (M14x1.5) - TRW Use new hollow screw! Hollow screw for pressure line to power steering gear (M14x1.5) - KOYO Pipe screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar Universal joint to power-steering gear Use new screw!	Support to body	20 Nm + 90°	
 ◆ Use new screws! Track rod end/track rod to steering arm ◆ Use new nuts! power-assisted steering sensor -G250- to power-assisted steering gear (TRW) power-assisted steering gear (KOYO) Hollow screw for pressure line to power steering gear (M14x1.5) - TRW ◆ Use new hollow screw! Hollow screw for pressure line to power steering gear (M14x1.5) - KOYO Pipe screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar 40 Nm Use new screw! Use new screw! 	Use new screws!		
Track rod end/track rod to steering arm ◆ Use new nuts! power-assisted steering sensor -G250- to power-assisted steering gear (TRW) power-assisted steering gear (KOYO) Hollow screw for pressure line to power steering gear (M14x1.5) - TRW ◆ Use new hollow screw! Hollow screw for pressure line to power steering gear (M14x1.5) - KOYO Pipe screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar Universal joint to power-steering gear ◆ Use new screw!	Pendulum support to gearbox	30 Nm + 90°	
 ◆ Use new nuts! power-assisted steering sensor -G250-to power-assisted steering gear (TRW) power-assisted steering gear (KOYO) Hollow screw for pressure line to power steering gear (M14x1.5) - TRW ◆ Use new hollow screw! Hollow screw for pressure line to power steering gear (M14x1.5) - KOYO Pipe screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar 40 Nm Use new screw! Use new screw! 	Use new screws!		
power-assisted steering sensor -G250- to power-assisted steering gear (TRW) power-assisted steering sensor -G250- to power-assisted steering gear (KOYO) Hollow screw for pressure line to power steering gear (M14x1.5) - TRW Use new hollow screw! Hollow screw for pressure line to power steering gear (M14x1.5) - KOYO Pipe screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar Universal joint to power-steering gear Use new screw!	Track rod end/track rod to steering arm	20 Nm + 90°	
to power-assisted steering gear (TRW) power-assisted steering sensor -G250- to power-assisted steering gear (KOYO) Hollow screw for pressure line to power steering gear (M14x1.5) - TRW Use new hollow screw! Hollow screw for pressure line to power steering gear (M14x1.5) - KOYO Pipe screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar Universal joint to power-steering gear Use new screw!	Use new nuts!		
power-assisted steering sensor -G250- to power-assisted steering gear (KOYO) Hollow screw for pressure line to power steering gear (M14x1.5) - TRW Use new hollow screw! Hollow screw for pressure line to power steering gear (M14x1.5) - KOYO Pipe screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar Universal joint to power-steering gear Use new screw!		6 Nm	
to power-assisted steering gear (KOYO) Hollow screw for pressure line to power steering gear (M14x1.5) - TRW • Use new hollow screw! Hollow screw for pressure line to power steering gear (M14x1.5) - KOYO Pipe screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar Universal joint to power-steering gear • Use new screw!	to power-assisted steering gear (TRVV)		
steering gear (M14x1.5) - TRW ◆ Use new hollow screw! Hollow screw for pressure line to power steering gear (M14x1.5) - KOYO Pipe screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar Universal joint to power-steering gear ◆ Use new screw! 40 Nm 40 Nm		7.5 Nm	
Hollow screw for pressure line to power steering gear (M14x1.5) - KOYO Pipe screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar Universal joint to power-steering gear ◆ Use new screw! 40 Nm 40 Nm 20 Nm + 90°		35 Nm	
steering gear (M14x1.5) - KOYO Pipe screw for return line to power steering gear (M16x1.5) Coupling rod to anti-roll bar Universal joint to power-steering gear Use new screw!	Use new hollow screw!		
steering gear (M16x1.5) Coupling rod to anti-roll bar Universal joint to power-steering gear Use new screw! 40 Nm 20 Nm + 90°		40 Nm	
Universal joint to power-steering gear ◆ Use new screw! 20 Nm + 90°		30 Nm	
Use new screw!	Coupling rod to anti-roll bar	40 Nm	
, , , , , , , , , , , , , , , , , , , ,	Universal joint to power-steering gear	20 Nm + 90°	
Wheel bolts 120 Nm	Use new screw!		
	Wheel bolts	120 Nm	

48-13 Power-assisted steering sensor -G250- and the hydraulic line for power steering

Check power-assisted steering sensor -G250- (TRW or KOYO)

Check power-assisted steering sensor -G250- (TRW) \Rightarrow Chapter 48-25

Check power-assisted steering sensor -G250- (KOYO) \Rightarrow Chapter 48-25

Remving and installing power-assisted steering sensor -G250- (TRW or KOYO)

Special tools, test and measuring equipment and auxiliary items required

- Vehicle system tester -V.A.G 1552- or vehicle diagnosis, measurement and information system
 -VAS 5051-
- Diagnostic cable -V.A.G 1551/3A-, V.A.G 1551/3Bor -V.A.G 1551/3C- Diagnostic cable -VAS 5051/5Aor -VAS 5051/6A-

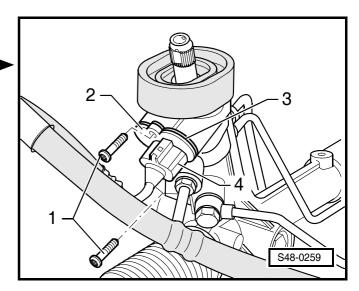
Removing

- Before disconnecting the battery determine the code of radio sets fitted with anti-theft coding.
- Disconnect battery ⇒ Electrical System; Rep. Gr. 27.
- Remove air filter, if necessary ⇒ Engine Fuel Injection System; Rep. Gr. 24 (petrol engines) or ⇒ Rep. Gr. 23 (diesel engines).
- Raise vehicle.
- Remove front left wheel.
- Remove soundproofing panel.
- Remove the front left wheelhouse liner ⇒ Body Work;
 Rep. Gr. 66.



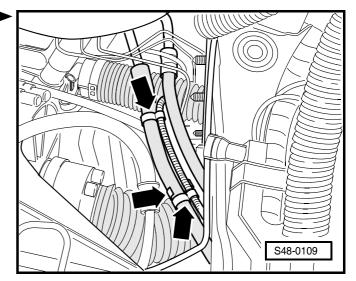
Note

The followings steps for removing the line do not need to be carried out on vehicles with a power steering of TRW and a power-assisted steering sensor -G250- (-2-) with an adapter cable -4-.

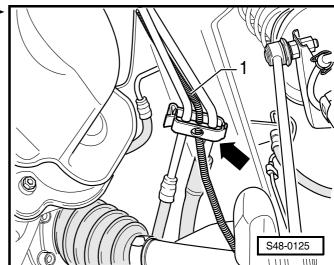


Unhook line of the power-assisted steering sensor
 -G250- from the line holders -arrows-.

The line of the power-assisted steering sensor -G250- is attached with 3 line holders and a spacer holder.

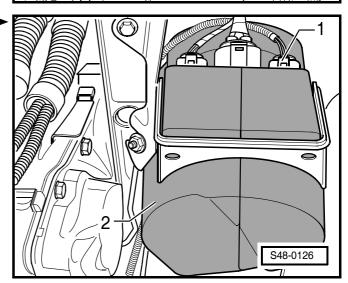


- Open spacer holder -arrow-.
- Remove line -1- power-assisted steering sensor/engine pump aggregate.



Disconnect plug -1- from the engine pump aggregate with noise encapsulation -2-.

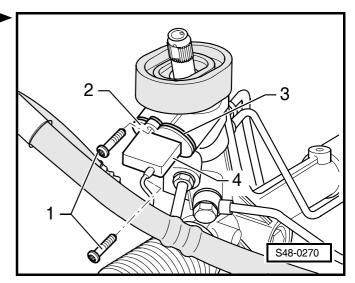
The engine pump aggregate of TRW is illustrated in the figure. The plug assignment for the engine pump aggregate of KOYO is analogous to the version of TRW.



Inspecting the power-assisted steering sensor -G250- (TRW)

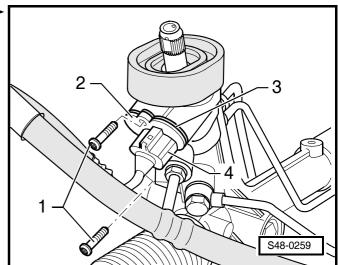
for power-assisted steering sensor -G250- with fixed connecting line (TRW):

- Unscrew bolts -1- completely.
- Pull the power-assisted steering sensor -G250- (-2-) with the seal -3- out of the power-steering gear.



for power-assisted steering sensor -G250- with adapter cable (TRW):

- Detach the adapter cable -4-from the power-assisted steering sensor -G250- (-2-).
- Unscrew bolts -1- completely.
- Pull the power-assisted steering sensor -G250- (-2-) with the seal -3- out of the power-steering gear.



The power-steering sensor -G250- (KOYO)

- Unscrew bolt -1-.
- Pull the power-assisted steering sensor -G250- (-2-) with the seal -3- out of the power-steering gear.

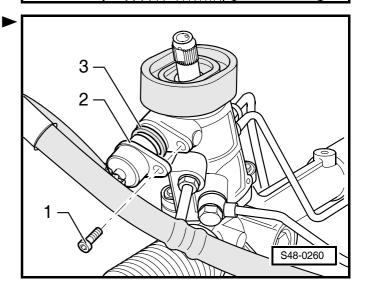
Installing

Installation is performed in a similar way in the reverse order. Pay attention to the following points:

- Use new seal for power-assisted steering sensor -G250-!
- Install air filter, if removed ⇒ Engine, Fuel Injection System; Rep. Gr. 24 (petrol engines) or ⇒ Rep. Gr. 23 (diesel engines).
- Connect battery ⇒ Electrical System; Rep. Gr. 27.
- Perform automatic test sequence ⇒ Chapter 48-25 either using the vehicle system tester -V.A.G 1552- or using the vehicle system test \Rightarrow Chapter 48-25 using the vehicle diagnosis, measurement and information system -VAS 5051-.

If a fault is stored in the fault memory:

Eliminating fault ⇒ Chapter 48-25.



Erasing fault memory ⇒ Chapter 48-25.

Tightening torques:

power-assisted steering sensor -G250 - to power-assisted steering gear (TRW)	6 Nm
power-assisted steering sensor -G250 - to power-assisted steering gear (KOYO)	7.5 Nm
Wheel bolts	120 Nm

Removing and installing hydraulic lines (TRW or KOYO)

Special tools, test and measuring equipment and auxiliary items required

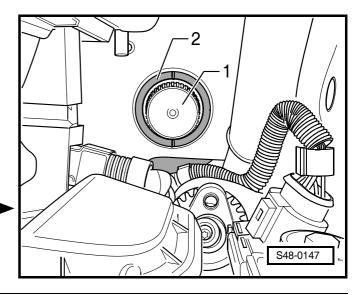
- Gearbox jack with adapter, e.g. V.A.G 1383 A- with -V.A.G 1359/2-
- Fixing device -T10096-
- ◆ Extractor -Matra V176-
- Extraction bottle (commercially available)
- Catch pan (commercially available)
- Wooden insert 490 x 270 x 50 mm for adapter -V.A.G 1359/2-
- Plastic screw plugs for line connections on the powerassisted steering gear (commercially available)
- Hydraulic oil ⇒ Chap. 00-2

Notes for working on hydraulic lines

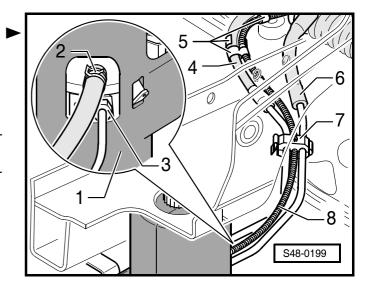
- After extraction there will be residual hydraulic oil in the engine pump aggregate as well as in the return line and pressure line (expansion hose).
- Do not use drained hydraulic oil again.
- Do not pinch off the pressure line (expansion hose) and the return line with hose clamps -MP 7-602- or with any other tools. Pinching off may cause damage to the hydraulic lines.
- Use new hollow screw for the connection of the pressure line to the power steering gear (TRW).
- Pay attention to fitting location of pressure line (flexible hose) ⇒ Chapter 48-11.
- To avoid damage make sure the bending radius of at least 100 mm is respected when bending the pressure line (expansion hose) or return line.
- Replace O-rings as well as gasket rings on the hydraulic lines after each disassembly.

Removing

- Use catch pan to collect the drained off hydraulic oil.
- Unscrew the screwed lid -1- of the hydraulic oil reser- voir -2- of the engine pump aggregate.
- Extract the hydraulic oil with an extraction bottle via the filler neck.



- Remove front wheels.
- Remove the front left wheelhouse liner ⇒ Body Work;
 Rep. Gr. 66.
- Unclip return line -4- from the line holders -5-.
- Open spacer holder -7-.
- Take return-flow line -4- or pressure line -6- out of the spacer -7-.
- Open spring strap clamp -2- with assembly pliers and carefully pull off return line from the support of the engine pump aggregate -1-.
- Unscrew pipe screw -3- from the engine pump aggragate and pull out the pressure line.
- 8 Lines of power-assisted steering sensor -G250-
- Close the threaded bores and supports on the engine pump aggregate.
- Remove the screws attaching the assembly carrier to the body in the prescribed sequence and replace them with the fixing bolts from -T10096- ⇒ Chapter 48-12.





Caution!

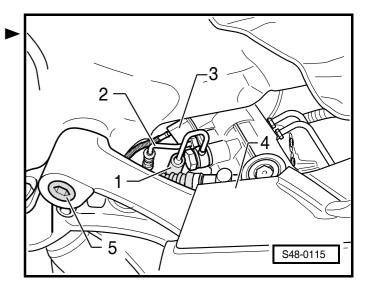
When lowering the assembly carrier make sure the line of the power-assisted steering sensor -G250- is not exposed to traction, if necessary pull out the plug on the engine pump aggregate.

- Lowering assembly carrier with power-assisted steering gear.
- Disconnect pressure line -1- or return-flow line -2from steering gear.
- 3 for power-assisted steering sensor -G250- with fixed connecting line (TRW):
- 4 Assembly carrier
- 5 Fixing bolt from -T10096-
- Seal threaded holes on the steering gear (e.g. with plastic screw plugs).
- Remove pressure or return line.

Installing

- When installing the pressure line it is essential to pay attention to the fitting location ⇒ Chapter 48-11.
- Mount return line with new O-ring on the power steering gear.
- Attach a pressure line tightly with new seals to the power steering gear ⇒ Chapter 48-11.
- Screw return line with new O-ring onto the engine pump aggregate.

Further installation occurs in reverse order, while paying attention to the following:



- Installing assembly carrier ⇒ Chapter 48-12.
- Filling with hydraulic oil and bleeding the steering system ⇒ Chapter 48-23.
- Perform a test drive.



Caution!

If after the test drive and with the front wheels pointing straight ahead the steering wheel is off straight, perform a chassis alignment.

Carry out check of chassis alignment \Rightarrow Chapter 44-2

Tightening torques:

Hollow screw for pressure line to power- assisted steering gear (M14 x 1.5), TRW	35 Nm
Use new hollow screw!	
Hollow screw for pressure line to power- assisted steering gear (M14 x 1.5), KOYO	40 Nm
Pipe screw for return line to power-assisted steering gear (M16 x 1.5)	30 Nm
Pipe screw for pressure line to engine pump aggregate (TRW)	30 Nm
Pipe screw for pressure line to engine pump aggregate (KOYO)	29 Nm
Wheel bolts	120 Nm

48-14 Inspecting and adjusting the power-steering gear

The checking and adjusting is illustrated on a powersteering gear of TRW. For the power-steering gear of KOYO the checking and adjusting is performed analogously to the power-steering gear of TRW.

Check the centre position of the gear rack of the power-steering gear, if necessary adjust

Special tools, test and measuring equipment and auxiliary items required

- Caliper gauge (commercially available)
- Before installing the power-steering gear place the gear rack in centre position.



- The gear rack of spare part steering gears is already in centre position.
- Dimension -a- must be equal on both the right and left side if the steering gear. If the dimension on the two sides is not the same, distance -a- must be corrected.
- Check dimension -a-, if necessary adjust.

-a- = 72.5 mm

- Adjusting dimension -a- by turning the input shaft -1- of the power-steering gear.
- 2 Gear rack

Adjusting the power-steering gear (adjusting the pressure plate clearance)



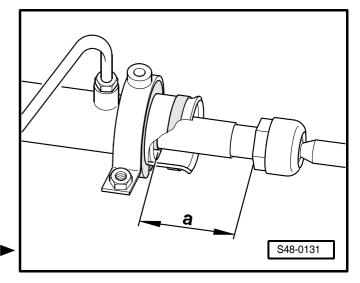
Note

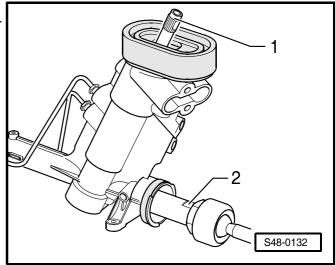
2 mechanics are required for this adjustment.

Inspection requirement:

- Put the wheels in straight-ahead position.
- Raise vehicle.
- Move the steering wheel alternately approx. 30°. on the centre axle.

If the steering clearance is too great rattling noises will be audible inside the vehicle.



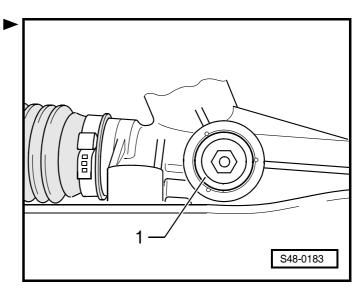


- While moving the steering wheel have the 2nd mechanic carefully screw in the ajusting screw -1- until no more rattling noises can be heard inside the vehicle.
- Perform a test drive.

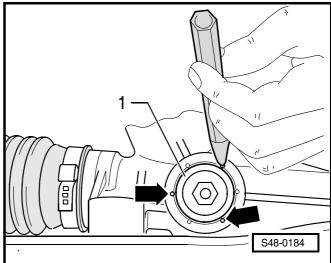


Caution!

The steering must automatically return to straight ahead position after a manoeuvre or cornering without sticking, correct if necessary.



- Secure adjusting screw -1- against turning.
- Apply 3 centre punch marks -arrows- uniformly distributed on the collar of the power-steering gear housing.



48-15 Disassembling and assembling the power-assisted steering gear

Disassembling and assembling the power-assisted steering gear (TRW)

Special tools, test and measuring equipment and auxiliary items required

- ♦ Hose strap pliers, e.g. -V.A.G 1275-
- Removal and installation pliers, e.g. -VAS 5024-
- Steering gear grease ⇒ Chapter 00-2



Note

- If the front axle is damaged as a result of an accident these steering components must be replaced: Position 1 to 5 and position 9 to 20.
- No provision is made for repairing the power-steering gear ⇒ item 12 in 48-15 page 3. In the event of failure determine the cause with the pressure and tightness test as well as by performing self-diagnosis or vehicle system test. If there is a complaint about the power -assisted steering gear ⇒ item 12 in 48-15 page 3 then it must be replaced.
- Welding and straightening of the steering components is not allowed.
- Always use original clamping collars and circlips.
- Only use steering gear grease to grease the gear rack
 ⇒ Chapter 00-2.
- A mixed lining of TRW and KOYO components is not permissible, assignment ⇒ Spare part catalogue.

1 - Right track rod end

- ☐ inspect ⇒ Chapter 48-16
- □ removing and installing⇒ Chapter 48-16
- before installing, remove grease on tapered stud

2 - Lock nut, 50 Nm

3 - Spring strap clip

 □ use assembly pliers, e.g.
 -VAS 5024- for removing and installing

4 - Boot

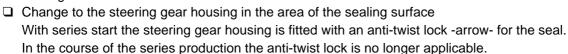
- can only be replaced with the power steering gear removed
- □ before removing boot detach the track-rod end ⇒ Chapter 48-16
- must not be twisted
- ☐ inspect for wear and damage (cuts, splits)

5 - Warm-type clamp

- □ replace after each removal
- removing: open with cutting pliers
- ☐ tensioning ⇒ Chapter 48-16

6 - Gasket

- □ pay attention to installation instructions for installing
 ⇒ Chapter 48-12
- with and without recess for anti-twist lock
- □ assignment ⇒ Spare part catalogue



7 - Self-tapping screw, 6 Nm

for attaching heat shield

8 - Heat shield

□ Allocation ⇒ Spare parts catalogue

9 - Clamp

Fitting position:

- inscription must point in direction of travel
- · Replace the clamp if the thread of the nut is damaged

10 - Right track rod

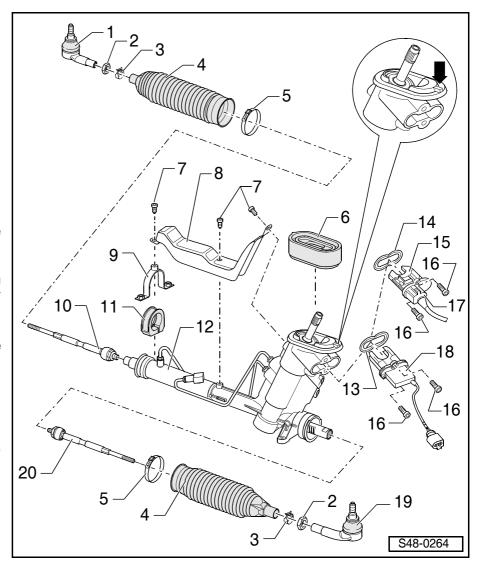
- ☐ tightening torque on steering rack: 80 Nm
- ☐ removing and installing ⇒ Chapter 48-16
- ☐ track rod and track rod end are supplied as replacement part pre-set
- □ lock nut for track rod/track rod end on replacement parts tightened initially only to 10 Nm.

 After installing the replacement track rod/track rod end and track adjuster, tighten lock nut fully to 50 Nm.
- \Box Setting wheel toe \Rightarrow Chap. 44-2.

11 - Rubber bearing

Fitting position:

- the larger internal diameter points towards the outer side of the vehicle
- replace if damaged or worn



12 -	- Power-steering gear
	□ assignment ⇒ Spare part catalogue
	☐ no provision made for repairs
	☐ removing and installing ⇒ Chapter 48-12
	□ setting ⇒ Chapter 48-14
	□ inspecting centre position ⇒ Chapter 48-14
	☐ Change to the steering gear housing in the area of the sealing surface
	With series start the steering gear housing is fitted with an anti-twist lock -arrow- for the seal.
	In the course of the series production the anti-twist lock is no longer applicable.
13 -	- Gasket
	☐ replace after each removal
14 -	- Gasket
	☐ replace after each removal
15 -	- for power-assisted steering sensor -G250- with adapter cable
	☐ removing and installing ⇒ Chapter 48-13
16 -	- Screw, 6 Nm
17 -	- Adapter cable
18 -	- for power-assisted steering sensor -G250- with fixed connecting line
	☐ removing and installing ⇒ Chapter 48-13
19 -	- Left track rod end
	☐ inspect ⇒ Chapter 48-16
	☐ removing and installing ⇒ Chapter 48-16
	☐ before installing, remove grease on tapered stud
20 -	- Left track rod
	☐ tightening torque on steering rack: 80 Nm
	☐ removing and installing ⇒ Chapter 48-16
	track rod and track rod end are supplied as replacement part pre-set
	☐ lock nut for track rod/track rod end on replacement parts tightened initially only to 10 Nm.
	After installing the replacement track rod/track rod end and track adjuster, tighten lock nut fully to 50 Nm.
	☐ Setting wheel toe ⇒ Chap. 44-2.

Disassembling and assembling the power-assisted steering gear (KOYO)

Special tools, test and measuring equipment and auxiliary items required

- ♦ Hose strap pliers, e.g. -V.A.G 1275-
- Removal and installation pliers, e.g. -VAS 5024-
- Steering gear grease ⇒ Chapter 00-2



Note

- If the front axle is damaged as a result of an accident these steering components must be replaced: Position 1 to 5 and position 9 to 17.
- No provision is made for repairing the power-steering gear ⇒ item 12 in 48-15 page 5. In the event of failure determine the cause with the pressure and tightness test as well as by performing self-diagnosis or vehicle system test. If there is a complaint about the power -assisted steering gear ⇒ item 12 in 48-15 page 5 then it must be replaced.
- Welding and straightening of the steering components is not allowed.
- ◆ Always use original clamping collars and circlips.
- Only use steering gear grease to grease the gear rack ⇒ Chapter 00-2.
- A mixed lining of TRW and KOYO components is not permissible, assignment ⇒ Spare part catalogue.

1 - Right track rod end

- ☐ inspect ⇒ Chapter 48-16
- □ removing and installing⇒ Chapter 48-16
- before installing, remove grease on tapered stud

2 - Lock nut, 50 Nm

3 - Spring strap clip

 □ use assembly pliers, e.g.
 -VAS 5024- for removing and installing

4 - Boot

- can only be replaced with the power steering gear removed
- □ before removing boot detach the track-rod end ⇒ Chapter 48-16
- must not be twisted
- inspect for wear and damage (cuts, splits)

5 - Warm-type clamp

- replace after each removal
- removing: open with cutting pliers
- □ tensioning ⇒ Chapter 48-16

6 - Gasket

- □ pay attention to installation instructions for installing
 ⇒ Chapter 48-12
- □ assignment ⇒ Spare part catalogue

7 - Self-tapping screw, 6 Nm

for attaching heat shield

8 - Heat shield

□ Allocation ⇒ Spare parts catalogue

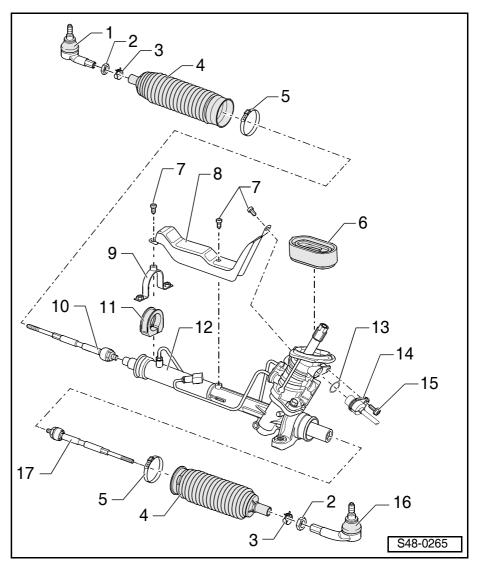
9 - Clamp

Fitting position:

- inscription must point in direction of travel
- · Replace the clamp if the thread of the nut is damaged

10 - Right track rod

- ☐ tightening torque on steering rack: 80 Nm
- □ removing and installing ⇒ Chapter 48-16



	☐ track rod and track rod end are supplied as replacement part pre-set
	☐ lock nut for track rod/track rod end on replacement parts tightened initially only to 10 Nm.
	After installing the replacement track rod/track rod end and track adjuster, tighten lock nut fully to 50 Nm.
	\Box setting the wheel toe \Rightarrow Chapter 44-2.
11 -	Rubber bearing
	Fitting position:
	 the larger internal diameter points towards the outer side of the vehicle
	replace if damaged or worn
12 -	Power-steering gear
	□ assignment ⇒ Spare part catalogue
	☐ no provision made for repairs
	☐ removing and installing ⇒ Chapter 48-12
	□ setting ⇒ Chapter 48-14
	☐ inspecting centre position ⇒ Chapter 48-14
13 -	Gasket
	☐ replace after each removal
14 -	Sensor for power steering -G250-
	☐ removing and installing ⇒ Chapter 48-13
15 -	Screw, 6 Nm
16 -	Left track rod end
	☐ inspect ⇒ Chapter 48-16
	☐ removing and installing ⇒ Chapter 48-16
	☐ before installing, remove grease on tapered stud
17 -	Left track rod
	☐ tightening torque on steering rack: 80 Nm
	□ removing and installing ⇒ Chapter 48-16
	☐ track rod and track rod end are supplied as replacement part pre-set
	□ lock nut for track rod/track rod end on replacement parts tightened initially only to 10 Nm.
	After installing the replacement track rod/track rod end and track adjuster, tighten lock nut fully to 50 Nm.
	\square Setting wheel toe \Rightarrow Chap. 44-2.

48-16 Track rod ends, track rods for power steering and mechanical steering

The checking as well as removing and installing the track rod ends are identical on the power steering of TRW or KOYO of the mechanical steering.

Inspecting play, correct attachment and boots of track rod ends

 Raise vehicle (wheel clear of the ground) and inspect play by moving the track rods and wheels.

Nominal value play: no play

- Inspect attachment.
- Check boots for damaged (e.g. tears) and for correct position.
- If necessary replace track rod ends.

Removing and installing track rod ends

Special tools, test and measuring equipment and auxiliary items required

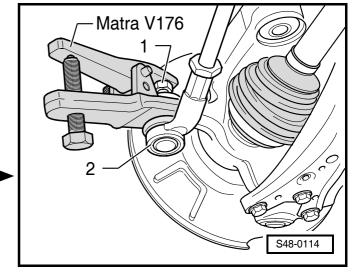
◆ Extractor -Matra V176-

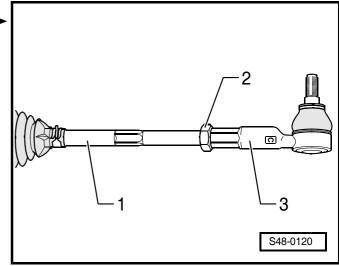
Removing

The track rod ends can be replaced with the track rods and the power steering gear installed.

- Raise vehicle.
- Remove front wheel.
- Screw up hexagon nut -1- sufficiently so that the puller
 Matra V176- is supported on the hexagon nut.
- Use puller -Matra V176- to press track rod/track rod end -2- off the steering arm.
- Unscrew hexagon nut from the track rod end.
- Pull track rod end out of steering arm.
- Release hexagon nut (lock nut) -2-.
- Unscrew track rod end -3- from track rod -1-.

The surrounding components are not shown to simplify the illustration.





Installing



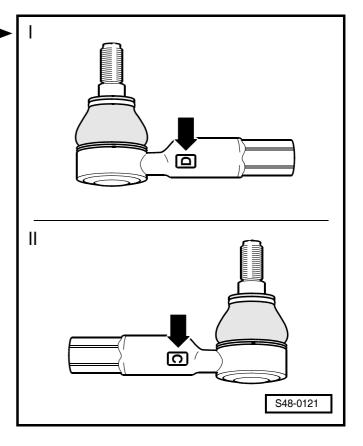
Note

When installing pay attention to marking on the shank of the track rod end -arrow-.

- I Left track rod end marking "D"
- II Right track rod end marking "C"
- Remove grease on tapered shank of track rod end.
- Screw track rod end fully onto the track rod.
- Tighten hexagon nut (lock nut).
- Align track rod in such a way that the stud of the track rod end is in the installation position.
- Insert track rod end/track rod into steering arm and tighten hexagon nut. If the joint stub rotates when tightening, counterhold with hexagon socket wrench (SW6).
- Fit front wheel.
- Lower the vehicle.
- Carry out check of chassis alignment ⇒ Chapter 44-2

Tightening torques:

Lock nut of track rod/track-rod end	50 Nm
Hexagon nut of track rod end/track rod to steering arm	20 Nm + 90°
◆ Use new nut!	
Wheel bolts	120 Nm



Removing and installing track rods

Special tools, test and measuring equipment and auxiliary items required

- Hose strap pliers, e.g. -V.A.G 1275-
- ◆ Torque wrench, e. g. -V.A.G 1332-
- Open-jawed wrench insert waf 32, e.g. -V.A.G 1332/ 6-
- Open-jawed wrench insert waf 36, e.g. -V.A.G 1332/ 8-
- Removal and installation pliers, e.g. -VAS 5024-
- Grease EN-0042, Material No. N 052 721 00 conforming to TL 721



Note

The track rods can only be removed and installed if the mechanical steering gear or power-steering gear is removed.

Removing

- Removing mechanical steering gear ⇒ Chap. 48-7, or power-steering gear ⇒ Chap. 48-12.
- Clean outside of steering gear in the area of the boot.
- Open warm-type clamp as well as spring strap clip and push back boot.

Mechanical steering gear

 Grip the steering gear in a vice with protective jaws on the gear rack.

Make sure the gear rack serration is not gripped.

- When removing counterhold the track rods on the gear rack of the steering gear.
- Unscrew track rod -1- from the gear rack -2-.

Power-steering gear



Note

When removing and installing the right-hand track rod, open the warm-type clamp and wring strap clip of the left-hand boot additionally and push back the boot. The reason for this is that it is always necessary to counterhold at the left-hand side of the steering rack when slackening and tightening the track rods.

Unscrew the front track rod -1- of the steering rack -2-.
 To do so use torque wrench with open-jawed wrench insert SW 32, e. g. -V.A.G 1332/6-. Counterhold open-end wrench SW 19 -3- on the left side of the steering rack.

Installing

Mechanical steering gear

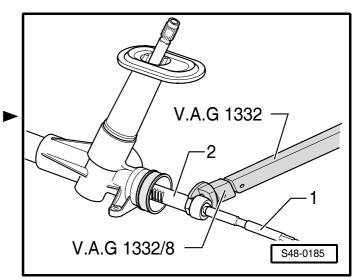
- Grip the steering gear in a vice on the gear rack. Use protective jaws.
- Screw track rod into the gear rack of the steering gear.
- When installing counterhold the track rods on the gear rack of the steering gear.
- Tighten track rod.

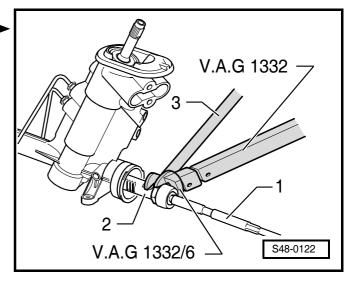
Power-steering gear

- Screw track rod into the gear rack of the steering gear.
- Counterhold on flattened part of left gear rack with open-end wrench.
- Tighten track rod.

Continued for all vehicles

- Unscrew track rod end from the track rod ⇒ 48-16 page 1.
- Inspect boot for wear (cuts, splits) and inspect sealing surfaces for boot cleanliness. If there is any damage, replace boot.







Note

Always use original clamping collars and circlips.

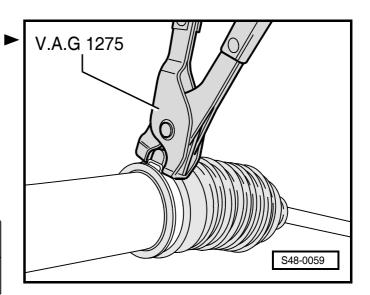
- Push boot, warm-type clamp and spring strap clips onto track rod.
- Screw track rod end onto the track rod \Rightarrow 48-16 page 1.
- Turn track rod in such a way that the stud of the track rod end is in the installation position.
- Grease contact surface of boot on track rod (recess) with grease EN-0042, Material No. N 052 721 00 conforming to TL 721 (grease quantity: 0.8g).
- Fit on boot.

The boot must on no account be installed twisted (distorted).

- Tighten the warm-type clamp using the hose binding law, e.g. -V.A.G 1275-.
- Install spring strap clamp with assembly pliers, e.g.
 -VAS 5024-.
- Installing mechanical steering gear ⇒ Chap. 48-7, or installing power-steering gear ⇒ Chap. 48-12.
- Check overall track and adjust if necessary, vehicle alignment ⇒ Chapter 44-2.

Tightening torques:

Track rod in gear rack of the mechanical steering gear	80 Nm
Track rod in steering rack of power steering gear	80 Nm



48-17 Disposing of the powersteering gear

Special tools, test and measuring equipment and auxiliary items required

Catch pan for hydraulic oil (commercially available)



Note

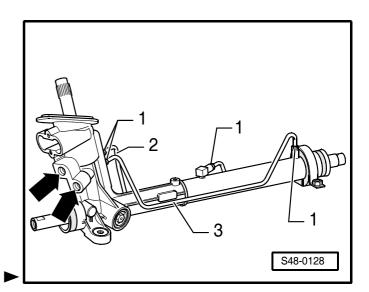
- The disposal of the power-steering gear of TRW or KOYO is identical.
- The oils used in the power-steering gears do not contain any harmful substances. These oils may be disposed of together with the drained engine and gearbox oil.
- Dispose of used oils in compliance with the applicable environmental regulations.
- Used oils (this concept refers to used engine and gear oils including ATF as well as mineral hydraulic oils), suitable for preparation must never be mixed with brake fluid, antifreeze agent, artificial resin or thinners, chemicals etc.
- After »draining« the used parts must be allowed to drip.
- When disposing of used parts comply with the applicable regulations as there are minor residual amounts of hydraulic oil in the power-steering gear.
- ◆ The ambient temperature must be of at least 20°C to drain the steering gear.
- Unscrew pipe screws -1-.
- Pull off coolant hoses -2- and -3-.



Note

Do not shut off the threaded bores -arrows-.

- Hold the power-steering gear over a catch pan and repeatedly turn the steering pinion from stop to stop until no more hydraulic oil runs out of the threaded bores.
- Disposing of the power-steering gear.



48-18 Engine pump aggregate

Summary of components of engine pump aggregate (TRW)

The engine pump aggregate

• is a complete component consisting of steering hydraulics pump -V119- (electric motor and gear rack pump), the power-steering control unit -J500- and the hydraulic oil reservoir.

has a re-engaging protection after faults, failure or crash \Rightarrow Chap. 48-11.



Note

- No provision is made for repairing the engine pump aggregate.
- The cause of any problems which may be arising is determined by the pressure and tightness test.
- If there is insufficient hydraulic oil in the reservoir always check the steering system for leaks.
- If there is a leak in the area of the line connections first check the lines/line connections for tightness, if necessary tighten and wipe dry.
- Do not use drained hydraulic oil again.
- Always replace gasket rings.
- Oil types: Hydraulic oil \Rightarrow Chapter 00-2.

1 - Encapsulation

- bottom open version
- not fitted to all vehicles
- □ assignment ⇒ Spare part catalogue

2 - Encapsulation

- bottom closed version
- not fitted to all vehicles
- ☐ Disassembling is only possible after removing the engine pump aggregate and the holder
- □ assignment ⇒ Spare part catalogue

3 - Screwed lid

with oil dipstick

4 - Gasket ring

5 - Reservoir

□ replacing ⇒ Chapter 48-21

6 - Clamp

- replace after each removal
- different versions
- □ assignment ⇒ Spare part catalogue
- ☐ Tightening torque: 3 Nm

7 - Gasket ring

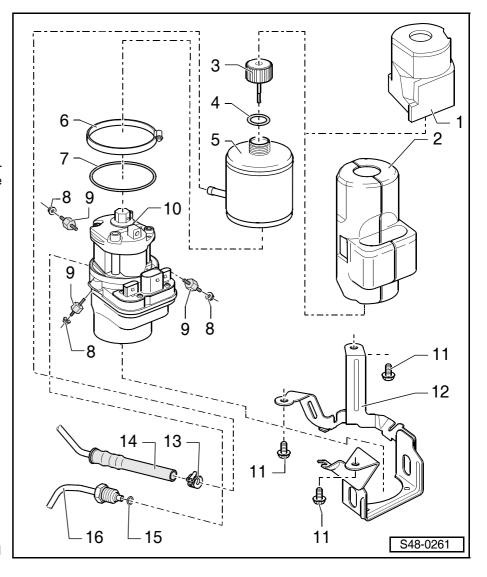
- different versions
- □ assignment ⇒ Spare part catalogue

8 - Hexagonal nut, 7 Nm

when tightening counterhold on rubber bearing ⇒ item 9

9 - Rubber bearing

☐ Tightening torque: 7 Nm



	□ check for damage (tears in rubber, rubber torn away from metal plate), if necessary replace
10 -	Engine pump aggregate
	□ with power-assisted steering control unit -J500-
	☐ No provision is made for repair
	☐ Replacing reservoir ⇒ Chap. 48-21
	☐ inspect ⇒ Chapter 48-19
	☐ Self-diagnosis ⇒ Chap. 48-25
	☐ Electrical test ⇒ Chap. 48-26
	☐ removing and installing ⇒ Chapter 48-20
11 -	Tighten hexagon screw 20 Nm + 90°
	☐ replace after each removal
12 -	Bracket
	☐ for engine pump aggregate
13 -	Spring strap clip
	☐ install with assembly pliers, e. gVAS 5024-
14 -	Return line (return hose)
	□ power-assisted steering gear - engine pump aggregate
15 -	O-ring
	☐ replace after disassembling the pressure line
16 -	Pressure line (expansion hose)
	☐ Tightening torque of the pipe screws: 30 Nm

☐ Engine pump aggregate - Power-steering gear

Summary of components of engine pump aggregate (KOYO)

The engine pump aggregate

 is a complete component consisting of steering hydraulics pump -V119- (electric motor and gear rack pump), the power-steering control unit -J500- and the hydraulic oil reservoir.

has a re-engaging protection after faults, failure or crash ⇒ Chap. 48-11.

- No provision is made for repairing the engine pump aggregate.
- The cause of any problems which may be arising is determined by the pressure and tightness test.
- If there is insufficient hydraulic oil in the reservoir always check the steering system for leaks.
- If there is a leak in the area of the line connection first check the lines/line connections for tightness, if necessary tighten and wipe dry.
- Do not use drained hydraulic oil again.
- Always replace gasket rings.
- Oil types: Hydraulic oil \Rightarrow Chapter 00-2.

1 - Rear bracket

- ☐ for engine pump aggregate
- ☐ the bearings in the bracket are not used as replacement part, in case of bearing damage replace bracket

2 - Tighten hexagon screw 20 Nm + 90°

□ replace after each removal

3 - Fillister head screw, 7 Nm

4 - Screwed lid

- with flat gasket ring
- □ as replacement part only screwed lid with oil dipstick is available together
- □ assignment ⇒ Spare part catalogue

5 - Flat gasket ring

6 - Screwed lid

- with O-ring
- □ assignment ⇒ Spare part catalogue

7 - O-ring

8 - Encapsulation

- bottom open version
- not fitted to all vehicles
- □ assignment ⇒ Spare part catalogue

9 - Self-locking fillister head screw, 7 Nm

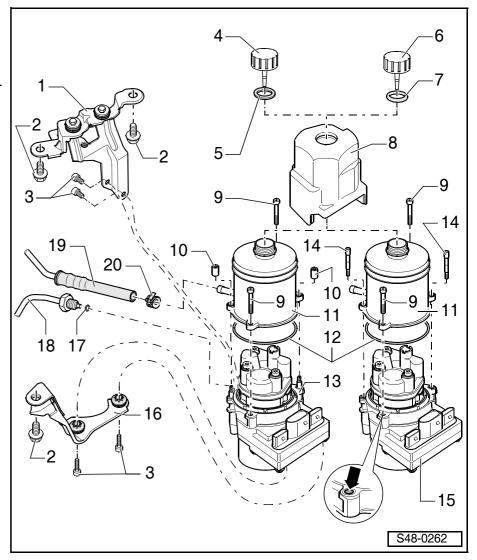
- replace after each removal
- □ assignment ⇒ Spare part catalogue

10 - Cap nuts, 7 Nm

□ assignment ⇒ Spare part catalogue

11 - Reservoir

□ replacing ⇒ Chapter 48-21



	□ assignment ⇒ Spare part catalogue
12 -	Gasket ring
	☐ replace after each removal
13 -	Engine pump aggregate
	☐ with screwed in threaded bores
	☐ with power-assisted steering control unit -J500-
	☐ power-assisted steering control unit -J500- and electric motor must not be separated
	☐ No provision is made for repair
	☐ Replacing reservoir ⇒ Chap. 48-21
	□ inspect ⇒ Chapter 48-19
	□ Self-diagnosis ⇒ Chap. 48-25
	☐ Electrical test ⇒ Chap. 48-26
	□ removing and installing ⇒ Chapter 48-20
	□ assignment ⇒ Spare part catalogue
14 -	Fillister head screw, 7 Nm
	□ assignment ⇒ Spare part catalogue
15 -	Engine pump aggregate
	□ without threaded bores
	□ Screw insert -arrow- only with fillister head screws ⇒ item 9
	with power-assisted steering control unit -J500-
	 power-assisted steering control unit -J500- and electric motor must not be separated No provision is made for repair
	☐ Replacing reservoir ⇒ Chap. 48-21
	□ inspect ⇒ Chapter 48-19
	□ Self-diagnosis ⇒ Chap. 48-25
	☐ Electrical test ⇒ Chap. 48-26
	☐ removing and installing ⇒ Chapter 48-20
	□ assignment ⇒ Spare part catalogue
16 -	Front bracket
	☐ for engine pump aggregate
	☐ the bearings in the bracket are not used as replacement part, in case of bearing damage replace bracket
17 -	O-ring
	☐ replace after disassembling the pressure line
18 -	Pressure line (expansion hose)
	☐ Tightening torque of the pipe screws: 29 Nm
	☐ Engine pump aggregate - Power-steering gear
19 -	Return line (return hose)
	power-assisted steering gear - engine pump aggregate

20 - Spring strap clip

☐ install with assembly pliers, e. g. -VAS 5024-

48-19 Inspecting engine pump aggregate

The engine pump aggregates TRW or KOYO can also be checked apart from the inspections described in this chapter in the framework of the self-diagnosis of the power-steering \Rightarrow Chapter 48-25, of the electrical test \Rightarrow Chapter 48-26 or the self-diagnosis with the vehicle diagnosis, measurement and information system -VAS 5051- \Rightarrow Chapter 48-25.

Testing function of the engine pump aggregate

Special tools, test and measuring equipment and auxiliary items required

- Vehicle system tester -V.A.G 1552- or vehicle diagnosis, measurement and information system -VAS 5051-
- ◆ Diagnostic cable -V.A.G 1551/3- or -VAS 5051/6A-

The checking of the function is identical for the engine pump aggregates of TRW or KOYO.

Check for proper operation

- Raise vehicle.
- Remove front left wheel.
- Remove the front left wheelhouse liner ⇒ Body Work;
 Rep. Gr. 66.
- Switch on ignition.
- Start engine.
- If necessary turn steering up to stop.
- Listen to and/or touch the engine pump aggregate to check whether it is running.

If the engine pump aggregate is not working:

- Perform self-diagnosis ⇒ Chap. 48-25.
- Switch off ignition.
- Carry out electrical test ⇒ Chap. 48-26.
- Remove fault.
- Install the front left wheelhouse liner ⇒ Body Work;
 Rep. Gr. 66.
- Install left front wheel.
- Lower the vehicle.

If the engine pump aggregate is working and if there are other faults:

Perform self-diagnosis ⇒ Chap. 48-25.

If entries from the fault memory are displayed:

- Eliminating fault ⇒ Chapter 48-25.
- Erasing fault memory ⇒ Chapter 48-25.

If no faults are displayed in the fault memory:

Check the feed pressure of the engine pump aggregate ⇒ 48-19 page 2.

Tightening torque:

Wheel bolts	120 Nm
-------------	--------

Check the feed pressure of the engine pump aggregate

The checking of the feed pressure is identical for the engine pump aggregates of TRW or KOYO. The description of the test is performed on an engine pump aggregate of TRW.

Special tools, test and measuring equipment and auxiliary items required

- Vehicle system tester -V.A.G 1552- or vehicle diagnosis, measurement and information system
 -VAS 5051-
- ◆ Diagnostic cable -V.A.G 1551/3- or -VAS 5051/6A-
- Power-assisted steering testing device, e. g. -V.A.G 1402-
- Adapter, e.g. -V.A.G 1402/1A-
- Adapter, e.g. -V.A.G 1402/2-
- Adapter, e.g. -V.A.G 1402/3-
- Hose from adapter set, e. g. -V.A.G 1402/6-
- Extraction bottle (commercially available)
- Jumper cable (commercially available)
- Oil catch pan (commercially available)
- Hydraulic oil ⇒ Chap. 00-2



Note

- ◆ If there is insufficient hydraulic oil in the reservoir of the engine pump aggregate always check the powersteering system for leaks ⇒ Chap. 48-23.
- If there is a leak on the power-steering gear first check the lines/line connections for tightness, if necessary tighten and wipe dry.
- Inspecting the gasket ring on the input shaft of the power-steering gear and on the gear rack seal
 ⇒ Chap. 48-23. If there are leaks on the gasket ring or on the gear rack seal replace the power-steering gear.
- Disposing of the power-steering gear ⇒ Chap. 48-17.
- After extraction there will be residual hydraulic oil in the engine pump aggregate as well as in the pressure line (expansion hose).
- Do not use drained hydraulic oil again.
- After the feed pressure test replace the O-ring on the pipe screw of the pressure line.

 Do not pinch off the pressure hose and the return hose with hose clamps -MP 7-602- or any other tools. Pinching off may result in damage to the pressure and return line.

 To avoid damage make sure the bending radius of at least 100 mm is respected when bending or tying up the pressure line.

Test requirements

- · Tightness of the system
- Pressure and return line not buckled or tied up.



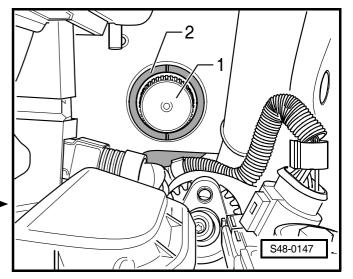
Note

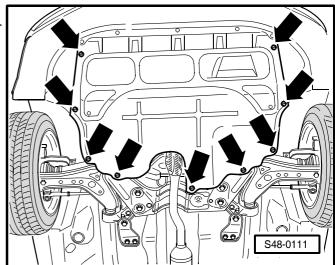
- Because of the different battery dimensions, on certain models the screwed lid of the hydraulic oil filler and inspection hole is covered by the battery tray and battery. If this is the case remove the air filter, the battery tray and battery.
- Before disconnecting the battery determine the code of radio sets fitted with anti-theft coding.
- Remove air filter, if necessary ⇒ Engine, Fuel Injection System; Rep. Gr. 24 (petrol engines) or ⇒ Rep. Gr. 23 (diesel engines).
- If necessary remove the battery and battery tray
 ⇒ Electrical System; Rep. Gr. 27.
- Unscrew the screwed lid -1- of the hydraulic oil reser- voir of the engine pump aggregate -2-.
- Extract the hydraulic oil with an extraction bottle via the filler neck.
- Raise vehicle.
- Remove noise insulation panel -arrows-.



Note

The figure shows the noise insulation panel on models with 1.4 ltr./74 kW engines. Other engine variants may have noise insulation panel versions that differ slightly from the figure.





- Remove front left wheel.
- Remove the front left wheelhouse liner ⇒ Body Work;
 Rep. Gr. 66
- Open spacer holder -1- and remove pressure line (ex- pansion hose) -2-.

$oldsymbol{i}$

Note

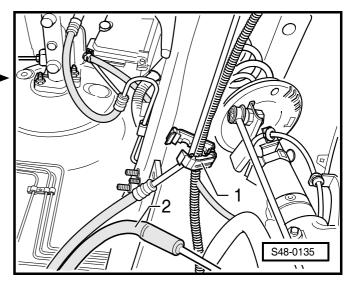
After removing the pressure line from the engine pump aggregate hydraulic oil will escape from the connection opening.

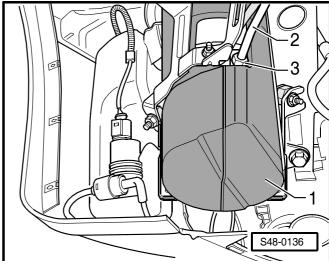
- Place the catch pan under the engine pump aggregate to collect escaping hydraulic oil.
- Release pipe screws -3- from the engine pump aggregate -1-.
- Pull out the pressure line (expansion hose) -2- from the engine pump aggregate.



Note

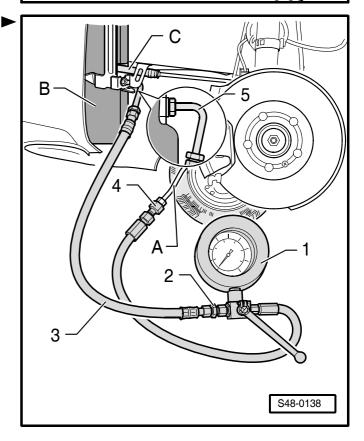
- ◆ The pressure line must not be exposed to traction.
- Make sure the bending radius of the pressure line is no less than 100 mm.
- Tie up the pressure line on the stabilizer.





Connect tester

- Connect Power-steering tester -1-, e. g. -V.A.G 1402-.
- Suspend the power-steering tester on front axle. Hoses must not be exposed to tension.
- 2 Adapter, e.g. -V.A.G 1402/3-
- 3 Hose from adapter set, e. g. -V.A.G 1402/6-
- 4 Adapter, e.g. -V.A.G 1402/2-
- 5 Adapter, e.g. -V.A.G 1402/1A-
- A Pressure line (expansion hose)
- B Engine pump aggregate with encapsulation
- C Return line (return hose)



Test preparations

- Open the shut-off valve on the power-steering tester pressure gauge -1-. Lever -2- points perpendicularly down.
- Lower the vehicle.



Caution!

Observe the applicable safety instructions for disconnecting the battery with the jumper cable!

- If necessary connect battery to jumper cable.
- Filling with hydraulic oil and bleeding the steering system ⇒ Chapter 48-23.

Test



Note

- A 2nd mechanic is required to check the feed pressure of the engine pump aggregate or the system pressure.
- To avoid damaging the engine pump aggregate or the power-steering system, the test of the feed or system pressure must not last longer that approx. 5...10 seconds.
- Do not close the shut-off valve of the tester pressure gauge during this test. If the shut-off valve is closed the indicated nominal pressure will drop to 0 MPa (bar) once a pressure valve in the engine pump aggregate responds.
- Start engine.
- Given a maximum left and right steering angle hold the steering wheel in position with a force of approx. 10...20 Nm during approx. 5...10 seconds.
- Read off pressure at maximum steering angle (left/ .right) and with the engine at idling speed.
- Compare the measured value to the nominal value according to the following table.

Engine	Nominal value	overpressure ¹⁾
Liigiile	MPa	bar
Fuel engines	9,610,4	96104
Diesel engines	9,610,4	96104

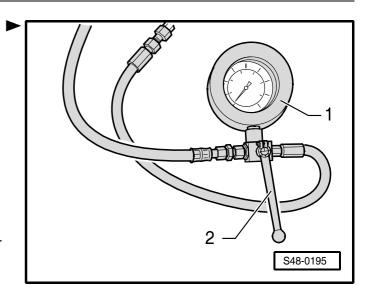
maximum system pressure or feed pressure of the engine pump aggregate

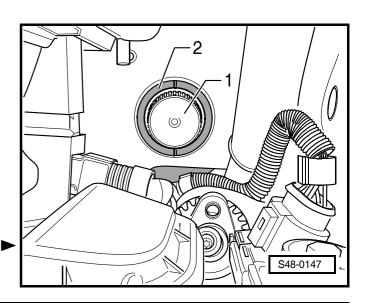


Note

If the nominal value is exceeded or if it is not reached replace the engine pump aggregate.

- Switch off engine.
- Unscrew the screwed lid -1- of the hydraulic oil reservoir of the engine pump aggregate -2-.





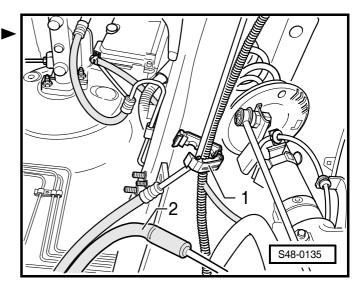
- Extract the hydraulic oil with an extraction bottle via the filler neck.
- Removing Power-steering tester, e. g. -V.A.G 1402-.
- If necessary replace defective engine pump aggregate ⇒ Chap. 48-20.
 - Disposing of the engine pump aggregate \Rightarrow Chap. 48-20
- Position pressure line (expansion hose) -2- in spacer | holder -1- and close spacer holder.
- Mount pressure line on the engine pump aggregate.
- Filling with hydraulic oil and bleeding the steering system ⇒ Chapter 48-23.
- Disconnect the jumper cable.
- Install the front left wheelhouse liner ⇒ Body Work;
 Rep. Gr. 66.
- Install noise insulation panel.
- Fit front wheel.
- If necessary install the battery and battery tray
 ⇒ Electrical System; Rep. Gr. 27.
- If necessary connect battery ⇒ Electrical System;
 Rep. Gr. 27.
- Install air filter, if removed ⇒ Engine, Fuel Injection System; Rep. Gr. 24 (petrol engines) or ⇒ Rep. Gr. 23 (diesel engines).
- Perform self-diagnosis ⇒ Chap. 48-25

If entries from the fault memory are displayed:

- Eliminating fault ⇒ Chapter 48-25.
- Erasing fault memory ⇒ Chapter 48-25.

Tightening torques:

Pressure line to engine pump aggregate TRW	30 Nm
Pressure line to engine pump aggregate KOYO	29 Nm
Wheel bolts	120 Nm



48-20 Removing and installing as well as disposing of engine pump aggregate

Removing and installing engine pump aggregate (TRW)

Special tools, test and measuring equipment and auxiliary items required

- Vehicle system tester -V.A.G 1552- or vehicle diagnosis, measurement and information system
 -VAS 5051-
- Diagnostic cable -V.A.G 1551/3- or -VAS 5051/6A-
- Removal and installation pliers, e.g. -VAS 5024-
- Jumper cable (commercially available)
- Oil catch pan (commercially available)
- Extraction bottle (commercially available)
- Hydraulic oil ⇒ Chap. 00-2

In the event of failure determine the cause with the functional, pressure and tightness test as well as by performing self-diagnosis.



Note

- Do not use drained hydraulic oil again.
- After extraction there will be residual hydraulic oil in the engine pump aggregate as well as in the hydraulic lines.
- Do not pinch off the hydraulic lines with hose clamps -MP 7-602- or any other tools. Pinching off may result in damage to the pressure and return line.
- To avoid damage make sure the bending radius of at least 100 mm is respected when bending or tying up the pressure line.

Removing engine pump aggregate



Note

- Because of the different battery dimensions, on certain models the screwed lid of the hydraulic oil filler and inspection hole is covered by the battery tray and battery. If this is the case remove the air filter, the battery tray and battery.
- Before disconnecting the battery determine the code of radio sets fitted with anti-theft coding.
- Remove air filter, if necessary ⇒ Engine, Fuel Injection System; Rep. Gr. 24 (petrol engines) or ⇒ Rep. Gr. 23 (diesel engines).
- If necessary remove the battery and battery tray
 ⇒ Electrical System; Rep. Gr. 27.
- Unscrew the screwed lid -1- of the hydraulic oil reservoir of the engine pump aggregate -2-.

