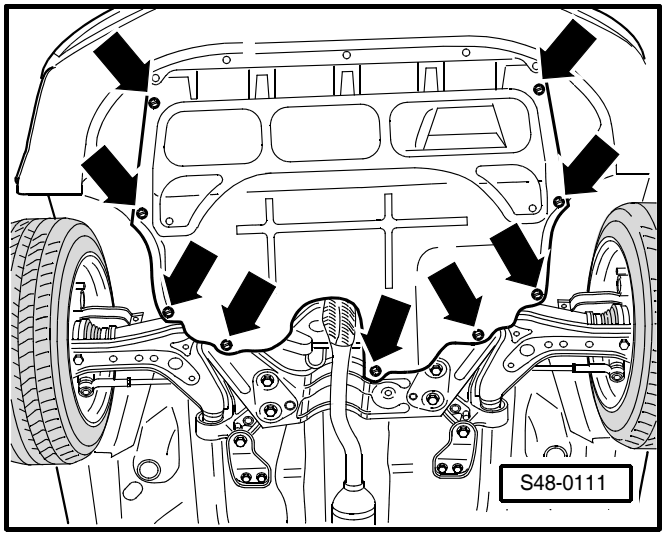
– Extract the hydraulic oil with an extraction bottle via the filler neck.
– Raise vehicle.
– Remove noise insulation panel -arrows-.



Note

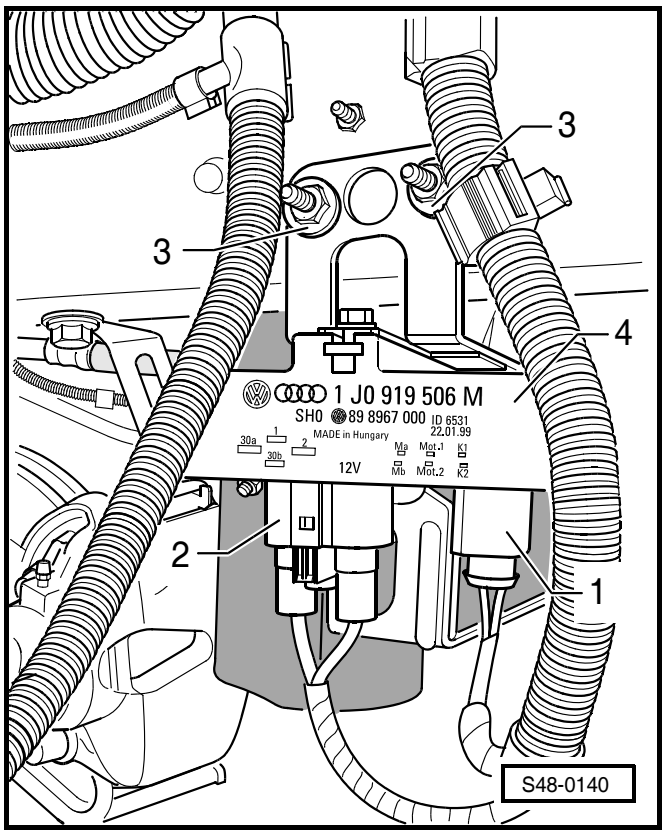
The figure shows the noise insulation panel on models with 1.4 ltr./74 kW engines. Other engine variants may have noise insulation panel versions that differ slightly from the figure.

– Remove front left wheel.
– Remove the front left wheelhouse liner ⇒ Body Work; Rep. Gr. 66

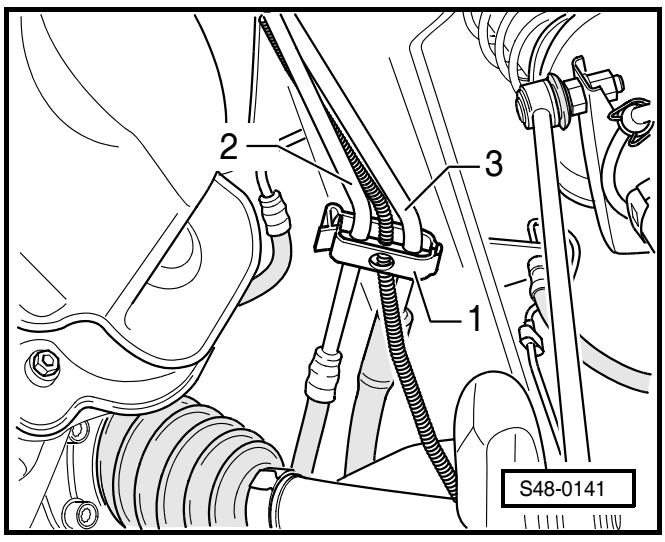
Vehicles with radiator fan control unit -J293-

– Disconnect plugs -1- and -2- from the radiator fan control unit -J293- -4-.
– Unscrew nuts -3-.
– Remove radiator fan control unit -4-.

Continued for all vehicles

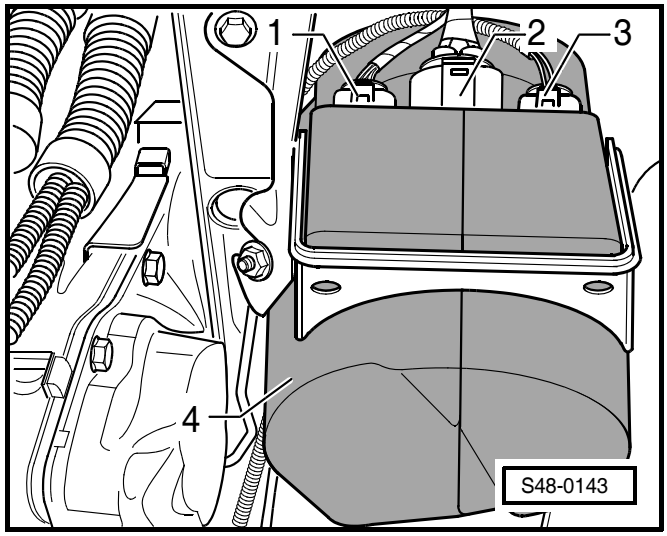


– Open spacer holder -1- and remove pressure line (expansion hose) -3-, return line -2- and the line of the power-steering sensor -G250-.
– Position the oil catch pan under the engine pump aggregate.



– Disconnect plugs -1-, -2- and -3- from the engine pump aggregate with encapsulation -4-.

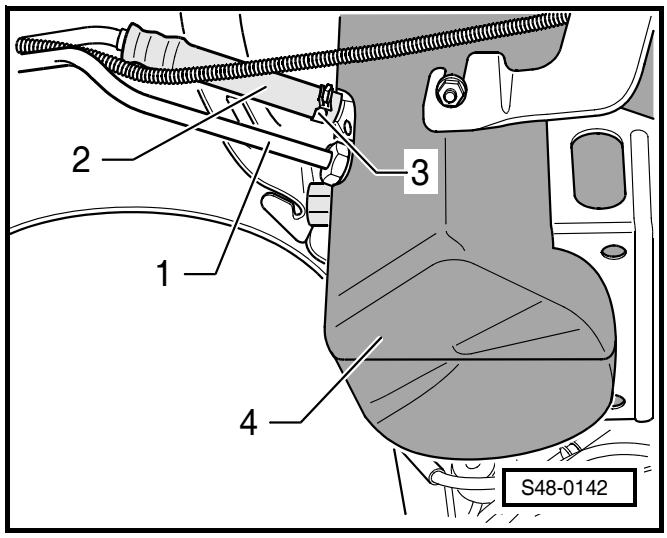
1 - Data BUS plug and terminal 15
2 - Earth plug and terminal 30
3 - Power-steering sensor -G250- plug



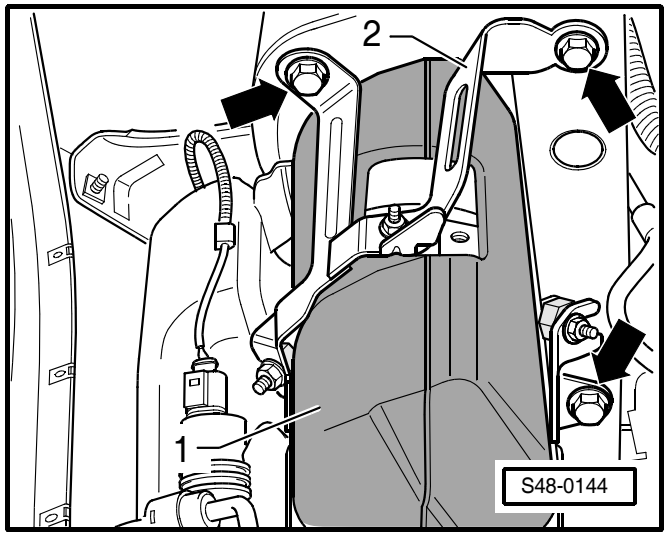
Note

- *Residual hydraulic oil remains in the engine pump aggregate. When removing the pressure line some of this residual amount will flow out.*
- *When tying up the hydraulic line make sure the bending radius of 100 mm is reached.*

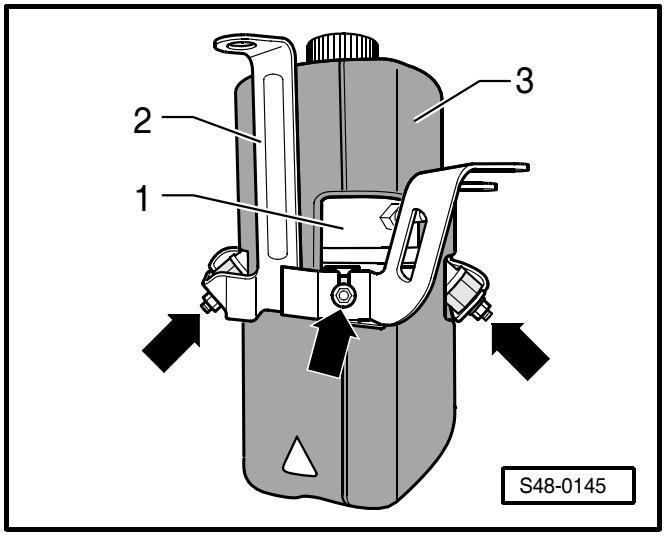
– Unscrew the pressure line (expansion hose) -1- from the engine pump aggregate and tie up.
– Shut off the pressure line with a plastic bag and adhesive tape to protect it against dirt.
– Open the spring strap clamp -3- on the return line (return hose) -2-.
– Carefully pull off the return line -2- from the reservoir support of the engine pump aggregate -4- and shut off with a plastic bag and adhesive tape to protect it against dirt.



– Release hexagon screws -arrows-.
– Remove engine pump aggregate with encapsulation -1- and with holder -2- downwards.



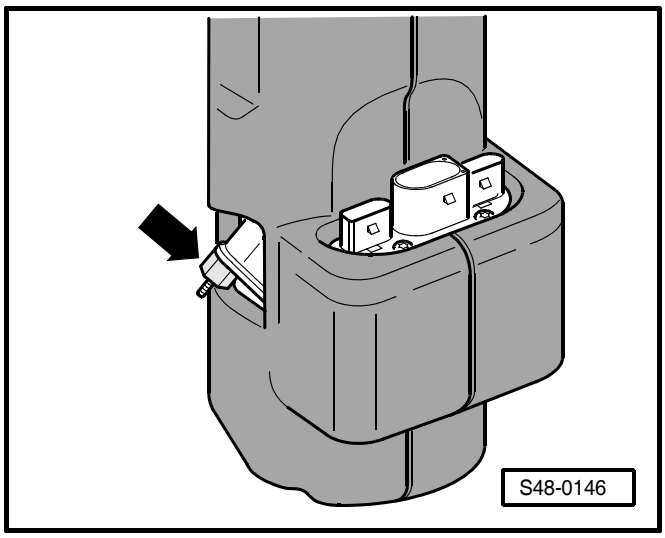
Removing the holder and rubber bearing.



– Unscrew the hexagon nuts -arrows-.
– Remove holder -2-.
– Open encapsulation -3-.
– Remove engine pump aggregate -1-.

Note

To replace the rubber bearing do not remove the encapsulation.



– Unscrew rubber bearing -arrow-.

Installing engine pump aggregate

Note

- *Only use original spring band clamps.*
- *Install spring strap clamp with assembly pliers, e.g. -VAS 5024-.*
- *Do not use drained hydraulic oil again.*
- *After installing the engine pump aggregate fill with hydraulic oil ⇒ 48-23.*
- *When installing the pressure line on the engine pump aggregate use new O-ring.*

Installation is carried out in the reverse order. Pay attention to the following:

– It is absolutely necessary to counterhold the rubber bearing when tightening the hexagon nuts to secure the holder on the engine pump aggregate.

Caution!

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

– If necessary connect removed battery to jumper cable.
– If necessary install air filter.
– Filling with hydraulic oil and bleeding the steering system ⇒ Chapter 48-23.
– If necessary disconnect the jumper cable.
– If necessary re-install the air filter.
– 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 entries from the fault memory are displayed:

– Eliminating fault ⇒ Chapter 48-25.

– Erasing fault memory ⇒ Chapter 48-25.

Tightening torques:

Rubber bearing to engine pump aggregate TRW	7 Nm
Holder to engine pump aggregate TRW	7 Nm
Holder with engine pump aggregate TRW to body ♦ Use new screws!	20 Nm + 90°
Pressure line to engine pump aggregate TRW	30 Nm
Radiator fan control unit -J293- to body	6 Nm
Wheel bolts	120 Nm

Removing and installing engine pump aggregate (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 1551/3- 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

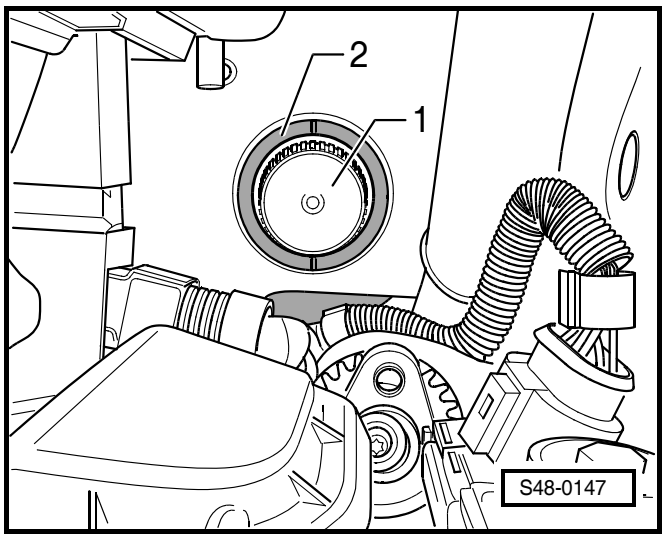
Note

- *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.

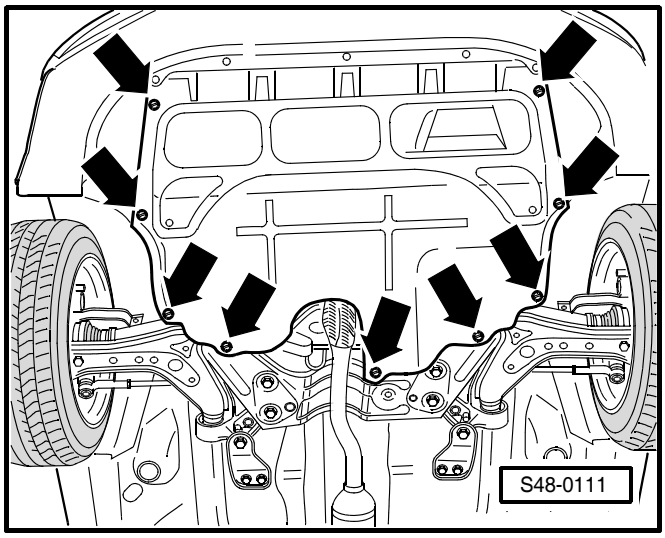
– Unscrew the screwed lid -1- of the hydraulic oil reservoir of the engine pump aggregate -2-.



– 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

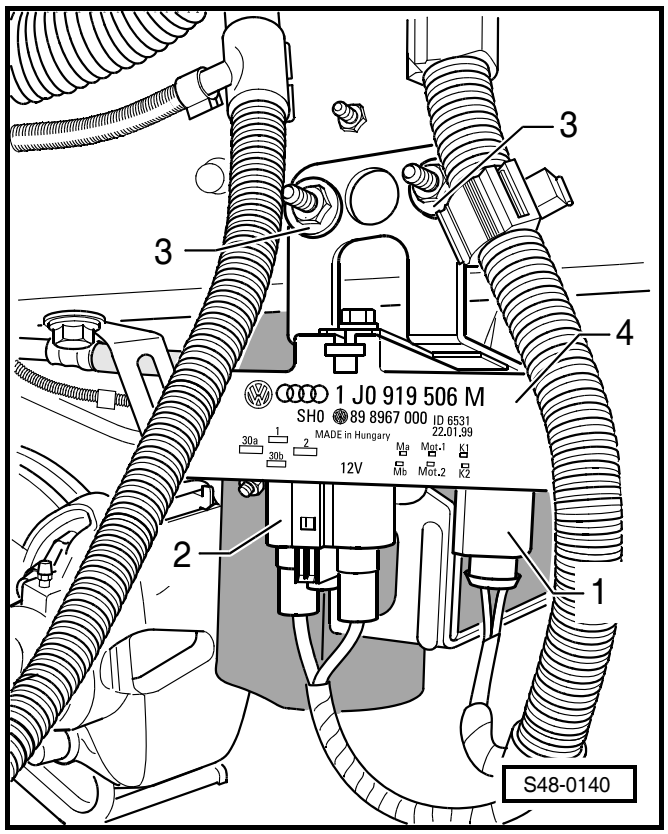
Vehicles with radiator fan control unit -J293-

– Disconnect plugs -1- and -2- from the radiator fan control unit -J293- -4-.

– Unscrew nuts -3-.

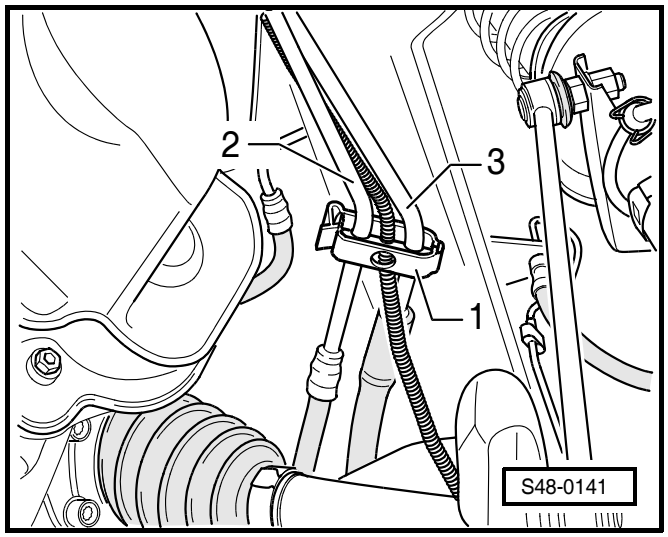
– Remove radiator fan control unit -4-.

Continued for all vehicles



– Open spacer holder -1- and remove pressure line (expansion hose) -3-, return line -2- and the line of the power-steering sensor -G250-.

– Position the oil catch pan under the engine pump aggregate.



– Disconnect plugs -1-, -2- and -3- from the engine pump aggregate.

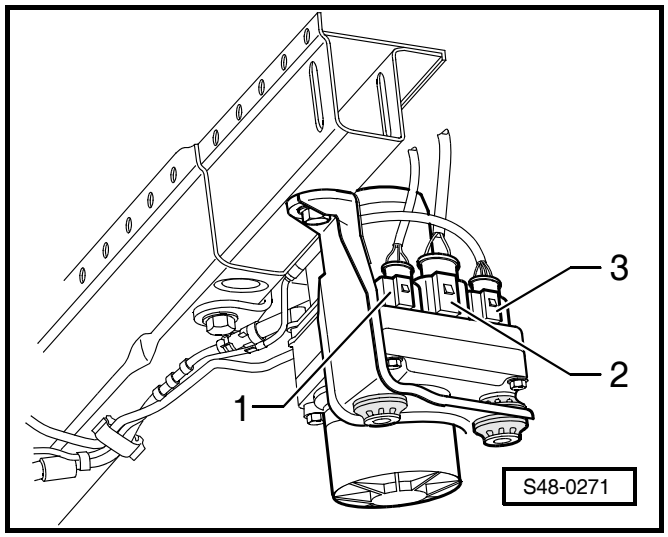
1 - Data BUS plug and terminal 15

2 - Earth plug and terminal 30

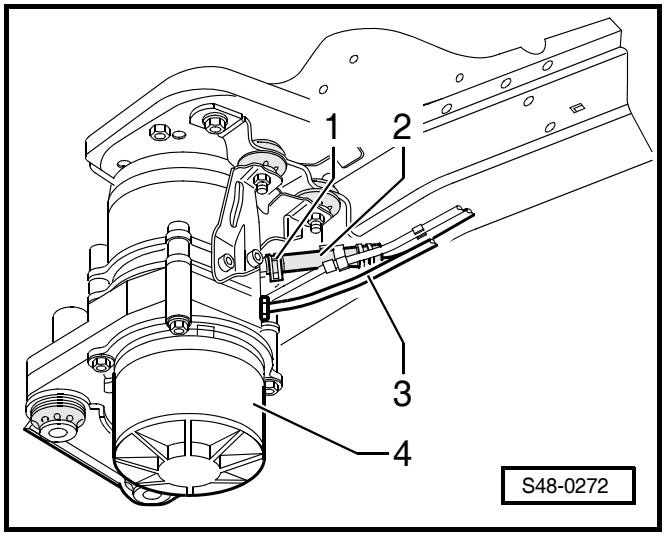
3 - Power-steering sensor -G250- plug

Note

- *Residual hydraulic oil remains in the engine pump aggregate. When removing the pressure line some of this residual amount will flow out.*
- *When tying up the hydraulic line make sure the bending radius of 100 mm is reached.*

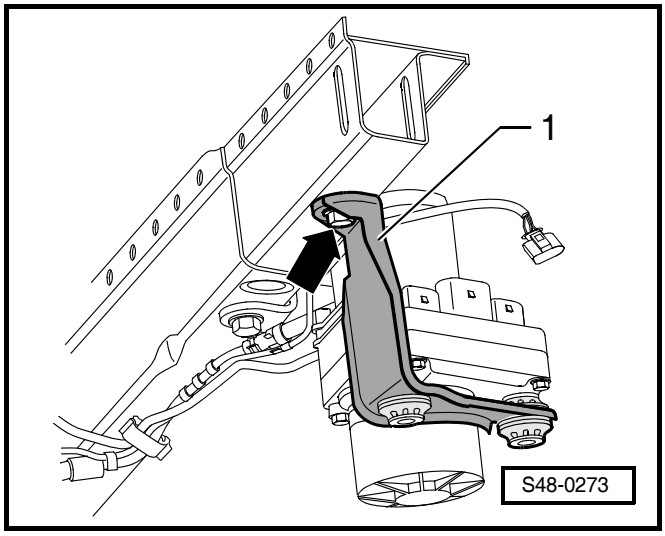


– Unscrew the pressure line (expansion hose) -3- at the engine pump aggregate -4- and tie up.
– Shut off the pressure line with a plastic bag and adhesive tape to protect it against dirt.
– Open the spring strap clamp -1- on the return line (return hose) -2-.
– Carefully pull off the return line -2- from the reservoir support of the engine pump aggregate -4- and shut off with a plastic bag and adhesive tape to protect it against dirt.

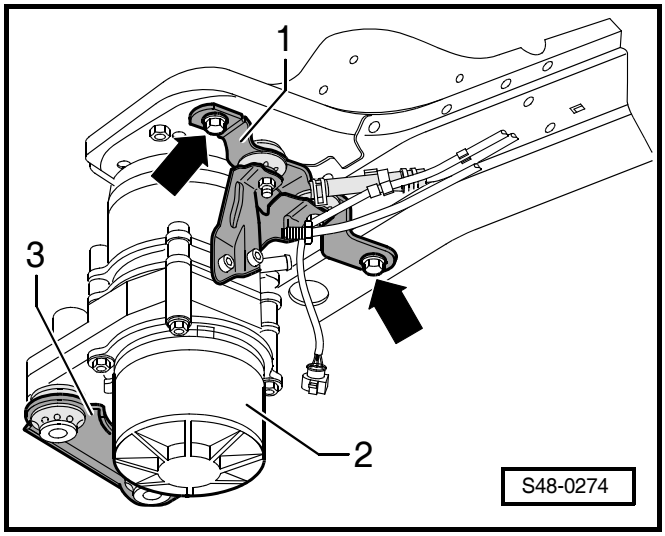


– Unscrew hexagon screw -arrow-.

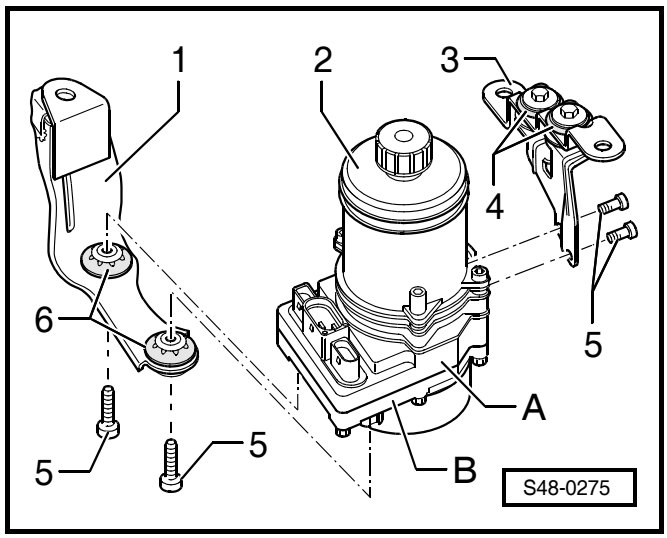
1 - Front bracket



– Release hexagon screws -arrows-.
– Remove engine pump aggregate -2- with the brackets -1- and -3- downwards.



Remove bracket



– Unscrew fillister head screws -5-.
– Remove bracket -1- and -3- from the engine pump aggregate -2-.

The bearings -4- and -6- are not used as replacement part. In case of bearing damage the corresponding bracket must be replaced.

Caution!

The power steering control unit -J500- (-A-) and the electric motor -B- must not be separated.

Installing engine pump aggregate

Note

- *Only use original spring band clamps.*
- *Install spring strap clamp with assembly pliers, e.g. -VAS 5024-.*
- *Do not use drained hydraulic oil again.*
- *After installing the engine pump aggregate fill with hydraulic oil ⇒ 48-23.*
- *When installing the pressure line on the engine pump aggregate use new O-ring.*

Installation is carried out in the reverse order. Pay attention to the following:

Caution!

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

– If necessary connect removed battery to jumper cable.
– If necessary install air filter.
– Filling with hydraulic oil and bleeding the steering system ⇒ Chapter 48-23.
– If necessary disconnect the jumper cable.
– If necessary re-install the air filter.
– 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 entries from the fault memory are displayed:

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

Tightening torques:

Front bracket on engine pump aggregate KOYO	7 Nm
Rear bracket on engine pump aggregate KOYO	7 Nm
Holder with engine pump aggregate KOYO to body ♦ Use new screws!	20 Nm + 90°
Pressure line to engine pump aggregate KOYO	29 Nm
Radiator fan control unit -J293- to body	6 Nm
Wheel bolts	120 Nm

Disposing of the engine pump aggregate

Special tools, test and measuring equipment and auxiliary items required

- Catch pan for hydraulic oil (commercially available)

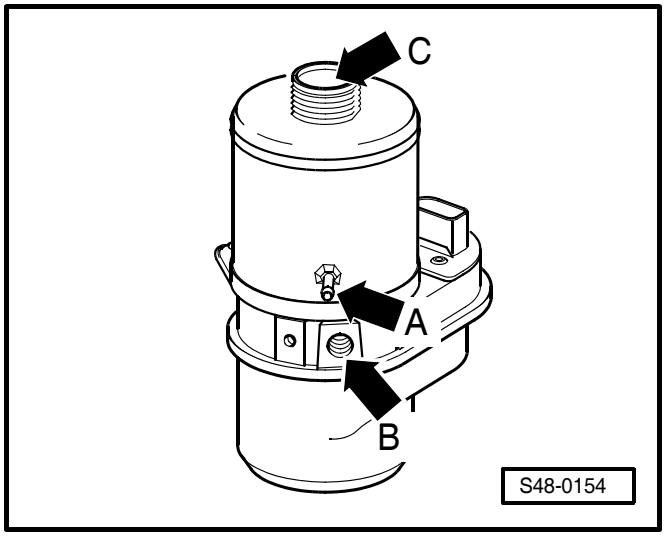
Note

- *The oils used in the engine pump aggregate do not contain any harmful substances. These oils can be disposed of together with 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 engine pump aggregate.*
- *To drain the engine pump aggregate the ambient temperature must be of at least 20 °C.*

– Removing the engine pump aggregate ⇒ Chap. 48-20.

– Removing the holder, encapsulation and rubber bearing.

Do not shut off the line connections -arrows A and B- or the filling opening of the reservoir -arrow C-. ►



– Unscrew the screwed lid of the engine pump aggregate reservoir.

– Hold the engine pump aggregate over a catch pan and fully drain the hydraulic oil by turning it repeatedly.

– Dispose of the engine pump aggregate in compliance with the applicable regulations.

48-21 Replace reservoir of engine pump aggregate

Note

- *Absolute cleanliness is required when replacing the reservoir.*
- *Clean thoroughly the area between the connection fitting for return flow at the reservoir and connection for pressure line at the engine pump aggregate before separating via the entire circumference, but do not use any aggressive cleaning agents, such as brake cleaner, petroleum, thinner or similar.*
- *Place removed parts on a clean surface and cover.*
- *Carefully cover opened components if the repair is not completed immediately.*
- *Do not use fluffy clothes.*
- *Remove spare parts from their wrapping immediately before fitting.*
- *Use only genuine wrapped parts.*
- *The contact surface of the reservoir/engine pump aggregate must not come in contact with sealants.*
- *Noise insulation not fitted on all vehicles, assignment ⇒ Spare part catalogue.*

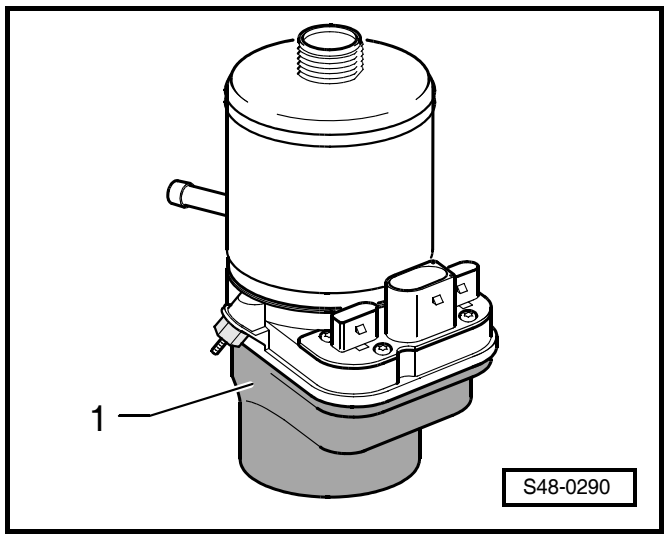
Replace reservoir of engine pump aggregate (TRW)

Special tools, test and measuring equipment and auxiliary items required

- Hot-air blower e.g. -V.A.G 1416-
- Hydraulic oil ⇒ Chap. 00-2
- Protective gloves (commercially available)
- Rubber hammer (commercially available)

Note

- *When replacing the reservoir make sure that the housing -1- of the engine pump aggregate is not exposed to traction, pressure or knock.*
- *A damage of the housing can lead to damage at the pump or at the seal power-assisted steering control unit -J500-/housing.*



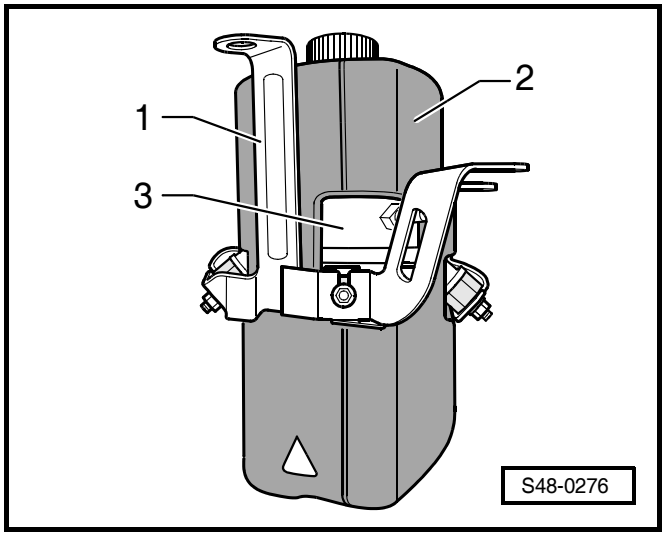
Disassemble reservoir

– Removing the engine pump aggregate ⇒ Chap. 48-20.

After extraction of the hydraulic oil there will be residues in the engine pump aggregate.

– Close screw connection for the pressure line at the engine pump aggregate.

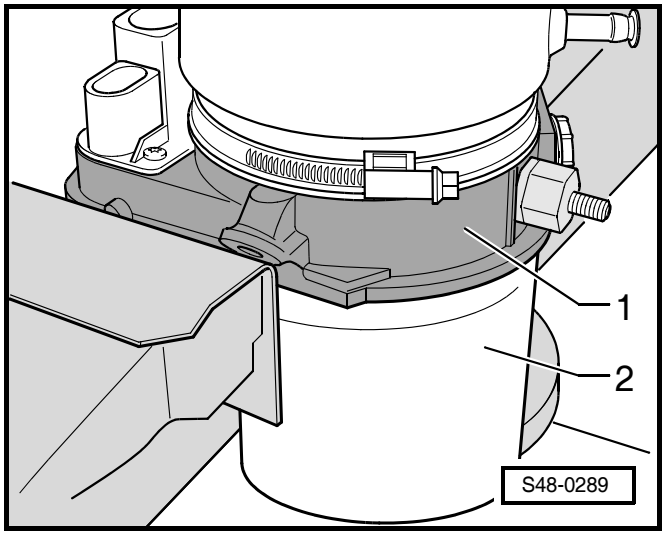
– Remove holder -1- from the engine pump aggregate -3-.
– If fitted, remove encapsulation -2- from engine pump aggregate.



– Clamp the engine pump aggregate in a vice with protective jaws.

Note

- *The engine pump aggregate must only be clamped at the power steering control unit -J500- (-1-), on no account at the housing -2-.*
- *The housing -2- must not rest against the vice or against the work bench.*
- *A non-observance of the mentioned safety measures leads to a non-repairable damage at the engine pump aggregate.*



– Open clamp -1- and remove upwards.

WARNING!

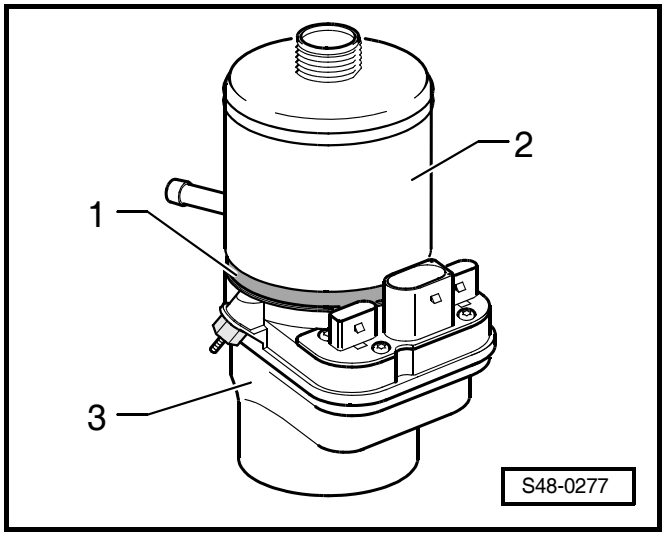
Wear gloves when heating and pulling off the reservoir.

– Heat the reservoir -2- in the lower area evenly all around with a hot-air blower e.g. -V.A.G 1416-

Caution!

The reservoir must be heated up to maximum 80 °C.

– Detach reservoir -2- from engine pump aggregate -3-.

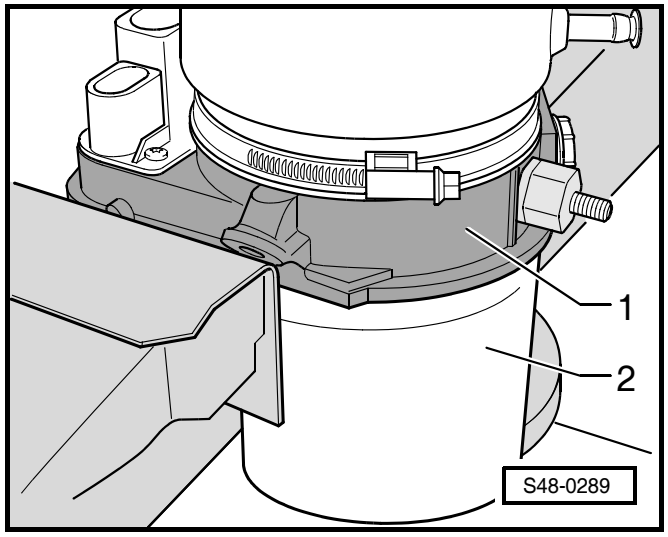


Assembling reservoir

Note

- *Ensure a clean, grease- and oil-free contact surface for gasket ring and reservoir at the engine pump aggregate.*
- *No lubricant must be used for assembling the reservoir on the engine pump aggregate.*
- *The contact surface of the reservoir/engine pump aggregate must not come in contact with sealants.*

– Clamp the engine pump aggregate in a vice with protective jaws. ►



Note

- *The engine pump aggregate must only be clamped at the power steering control unit -J500- (-1-), on no account at the housing -2-.*
- *The housing -2- must not rest against the vice or against the work bench.*
- *A non-observance of the mentioned safety measures leads to a non-repairable damage at the engine pump aggregate.*

– Insert a new gasket ring ⇒ Spare part catalogue in the sealing surface of the engine pump aggregate.

– Ensure that the gasket ring is sitting correctly.

WARNING!

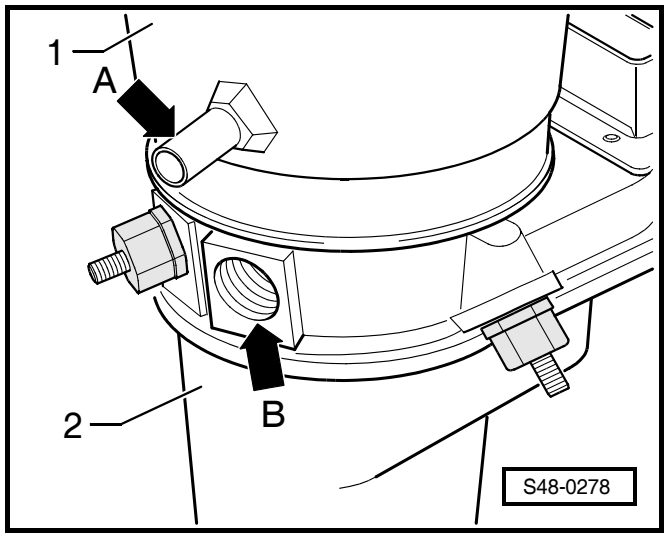
Wear gloves when heating and positioning the reservoir.

– Heat the new reservoir in the lower area evenly all around with a hot-air blower e.g. -V.A.G 1416-

Caution!

The reservoir must be heated up to maximum 80 °C.

– Position the reservoir -1- on the engine pump aggregate -2-. ►



– Position the reservoir in such a way that the connection fitting for the return-flow line -arrow A- is located vertically above the screw connection for the pressure line -arrow B-.

– Pull the reservoir -1- up to the stop onto the engine pump aggregate -2-.

– For this step knock with a rubber hammer evenly all around on the reservoir -1-, but on no account on the filler tube.

– Make sure that the reservoir does not tilt.

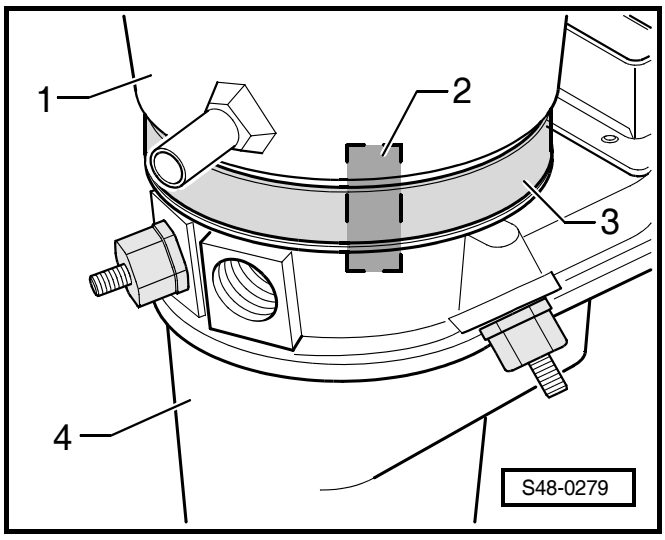
– Attach reservoir with new clamp at engine pump aggregate.

– Tighten the screw of the clamp to the specified tightening torque.

– Close connection fitting for the return-flow line at reservoir.
– Fill reservoir up to approx. $^1/_4$ with hydraulic oil and check for tightness at joint of reservoir/engine pump aggregate.
– In case of leakage eliminate the fault.
– Empty the reservoir.

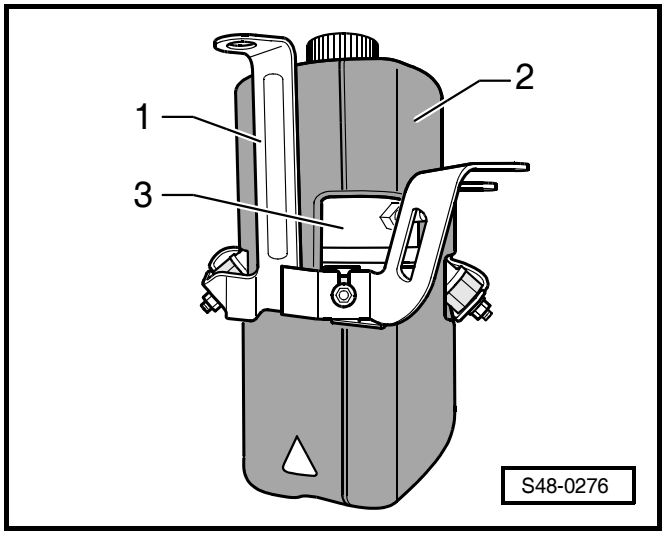
For reasons of guarantee, mark the replacement of the reservoir.

– Make an approx. 15x30 mm large permanent colour marking -2- e.g with seal paint on the location marked in the figure.



The marking must cover the reservoir -1-, the clamp -3- and the engine pump aggregate -4-.

– If fitted, mount encapsulation -2- at engine pump aggregate -3-, assignment of encapsulation ⇒ Spare part catalogue.
– Install holder -1- at the engine pump aggregate -3-.
– Open connection fitting for the return-flow line at the reservoir and screw connection for the pressure line at the engine pump aggregate.
– Installing the engine pump aggregate ⇒ Chap. 48-20.



Tightening torque:

Clamp at reservoir of engine pump aggregate ♦ Use new clamp!	3 Nm

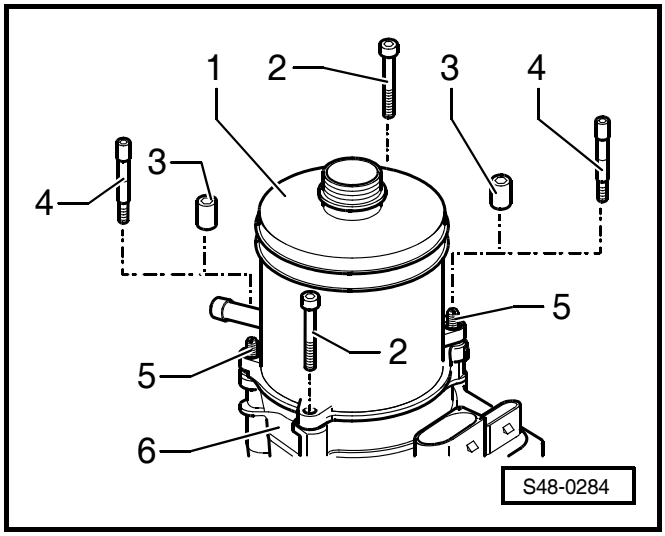
Replace reservoir of engine pump aggregate (KOYO)

Special tools, test and measuring equipment and auxiliary items required

♦ Hydraulic oil ⇒ Chap. 00-2

There are two versions for attaching the reservoir -1- at the engine pump aggregate -6-:

♦ Attachment with fillister head screws -2-, as well as with cap nuts -3- and threaded bores -5-
♦ Attachment with fillister head screws -2- and -4-



Disassemble reservoir

– Removing the engine pump aggregate ⇒ Chap. 48-20.

After extraction of the hydraulic oil there will be residues in the engine pump aggregate.

– Close screw connection for the pressure line at the engine pump aggregate.

– If fitted, remove encapsulation from engine pump aggregate.

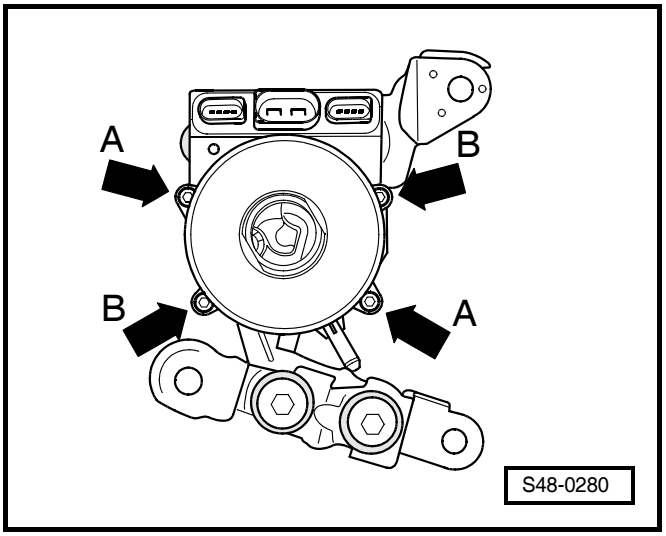
Reservoir attached with cap nuts and fillister head screws ►

– Unscrew cap nuts -arrows A-.

– Unscrew fillister head screws -arrows B-.

When detaching the reservoir, the engine pump aggregate must not be counterheld.

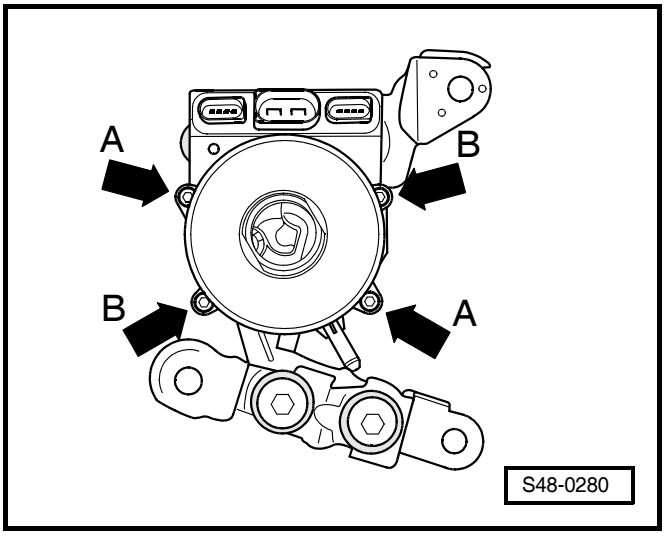
– Detach reservoir from the engine pump aggregate.



Reservoir attached with fillister head screws ►

– Unscrew fillister head screws -arrows A-.

– Unscrew fillister head screws -arrows B-.



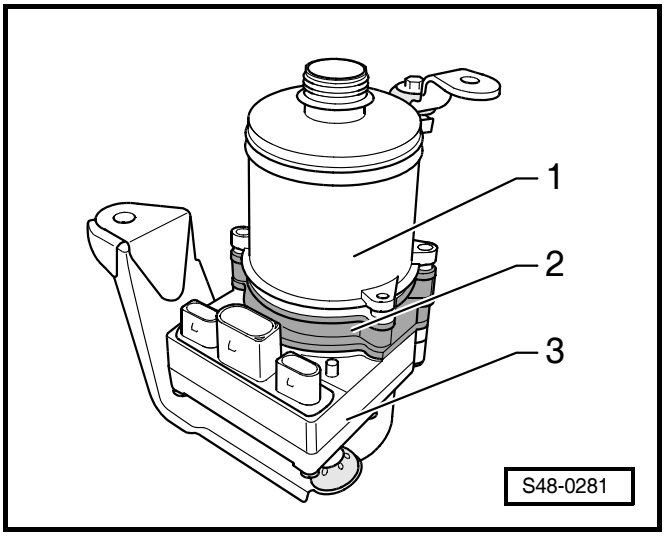
Note

When detaching the reservoir -1-, one must absolutely counterhold at pump aggregate -2- ►

Caution!

The pump aggregate -2- must on no account be pulled out from the housing with power-assisted steering control unit -J500- -3-. A separation leads to damage at the engine pump aggregate, which cannot be eliminated with workshop possibilities.

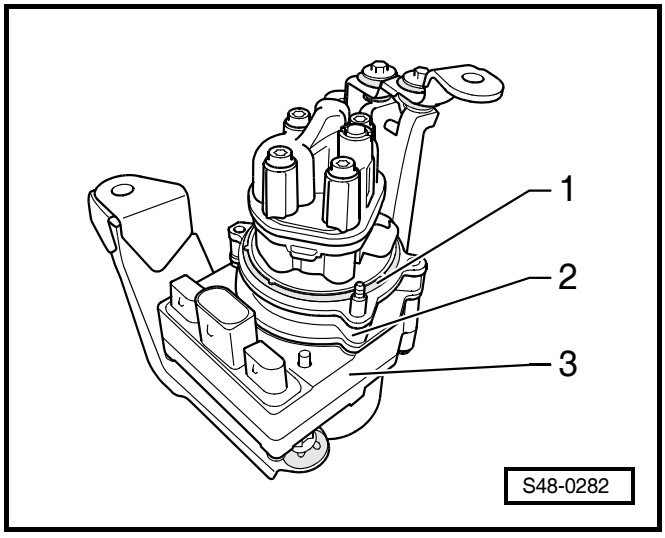
– Carefully detach reservoir -1- from pump aggregate -2-.



Assembling reservoir

Note

- *Ensure a clean, grease- and oil-free contact surface for gasket ring and reservoir at the engine pump aggregate.*
- *Do not use any sealant for sealing the contact surfaces of the reservoir/engine pump aggregate.*
- *When inserting a new gasket ring -1- and when assembling the reservoir, one must absolutely counterhold at the pump aggregate -2-.*



Caution!

The pump aggregate -2- must on no account be pulled out from the housing with power-assisted steering control unit -J500- -3-. A separation leads to damage at the engine pump aggregate, which cannot be eliminated with workshop possibilities.

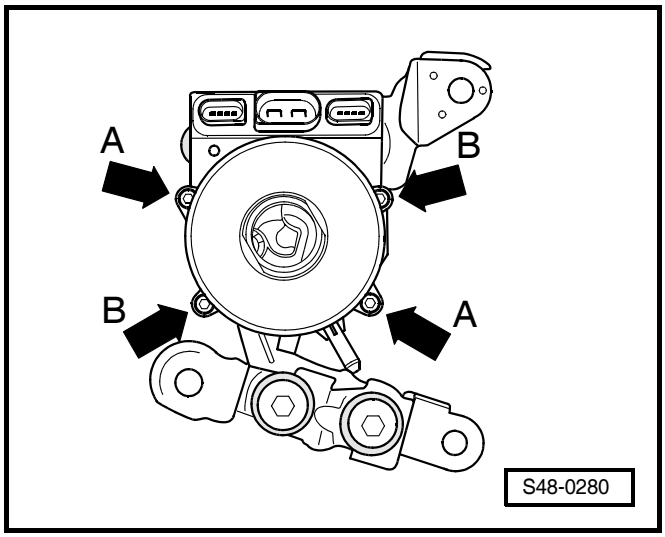
– Insert a new gasket ring -1- ⇒ Spare part catalogue in the sealing surface of the pump aggregate -2-. At the same time absolutely counterhold at pump aggregate.

– Ensure that the gasket ring is sitting correctly.

– Position new reservoir on the engine pump aggregate.

– Screw in new fillister head screws -arrows B- and pretighten hand-tight.

– Screw on or in cap nuts or fillister head screws -arrows A- and pretighten hand-tight.



Note

Begin with the tightening of the screws with fillister head screws -arrows B-.

– Tighten up fillister head screws -arrows B- and cap nuts or fillister head screws -arrows A- crosswise to the specified tightening torque.

– Close connection fitting for the return-flow line at reservoir.

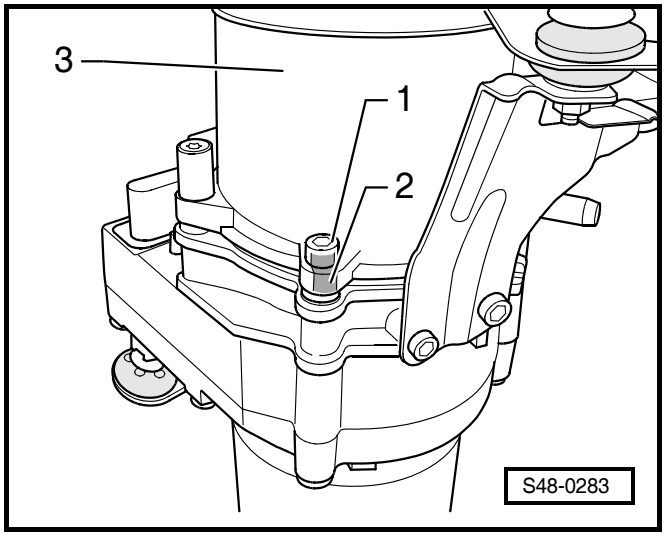
– Fill reservoir up to approx. $^1/_4$ with hydraulic oil and check for tightness at joint of reservoir/engine pump aggregate.

– In case of leakage eliminate the fault.

– Empty the reservoir.

For reasons of guarantee, mark the replacement of the reservoir.

– Make a large permanent colour marking -2- e.g with seal paint on the location marked in the figure.



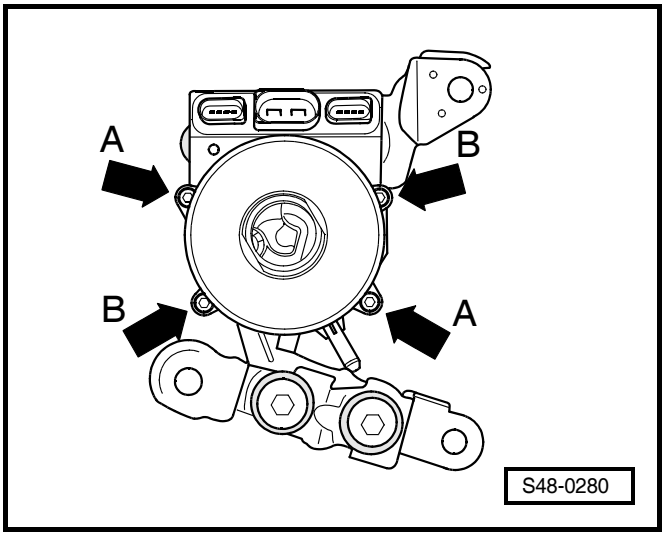
The marking must cover the reservoir -3- and the fillister head screw -1-.

– If fitted, mount encapsulation at engine pump aggregate, assignment of encapsulation ⇒ Spare part catalogue.

– Open connection fitting for the return-flow line and screw connection for the pressure line.
– Installing the engine pump aggregate ⇒ Chap. 48-20.

Tightening torques:

Reservoir to engine pump aggregate - fillister head screws -arrows B- ♦ Use new fillister head screws!	7 Nm
Reservoir to engine pump aggregate - cap nuts -arrows A-	7 Nm
Reservoir to engine pump aggregate - fillister head screws -arrows A-	7 Nm



48-22 Checking hydraulic oil level

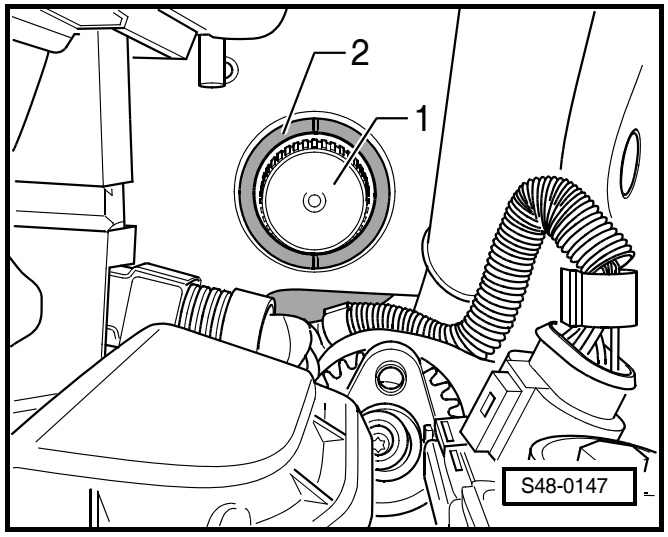
Inspecting hydraulic oil level, if necessary topping up

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 1551/3B- or -V.A.G 1551/3C- Diagnostic cable -VAS 5051/5A- or -VAS 5051/6A -
- Extraction bottle (commercially available)
- Hydraulic oil ⇒ Chap. 00-2

Note

- *Preferably check the hydraulic oil level in cold condition.*
- *Hydraulic oil amount in the system: approx. 0.80 ltr.*
- *The screwed lid -1- for the reservoir -2- is located in an opening on the frame side rail in the front left section of the engine compartment.*
- *On certain models the screwed lid -1- of the reservoir is covered by the battery tray because of the different battery dimensions. If this is the case remove the battery tray and battery.*
- *Check the hydraulic oil level with the dipstick of the screwed lid -1-.*
- *Do not refer to the „MAX“ and „MIN“ markings on the reservoir to check the hydraulic oil level.*
- *Do not use drained hydraulic oil again.*
- *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 from the engine pump aggregate reservoir.

– Wipe the oil dipstick with a clean non-fluffing cloth.

– Screw the lid by hand onto the engine pump aggregate reservoir and unscrew again.

Note

The correct oil level can only be determined for a fully screwed in screwed lid.

– Checking the oil level.

Hydraulic oil in a cold condition (for an engine temperature up to approx. 50 °C)

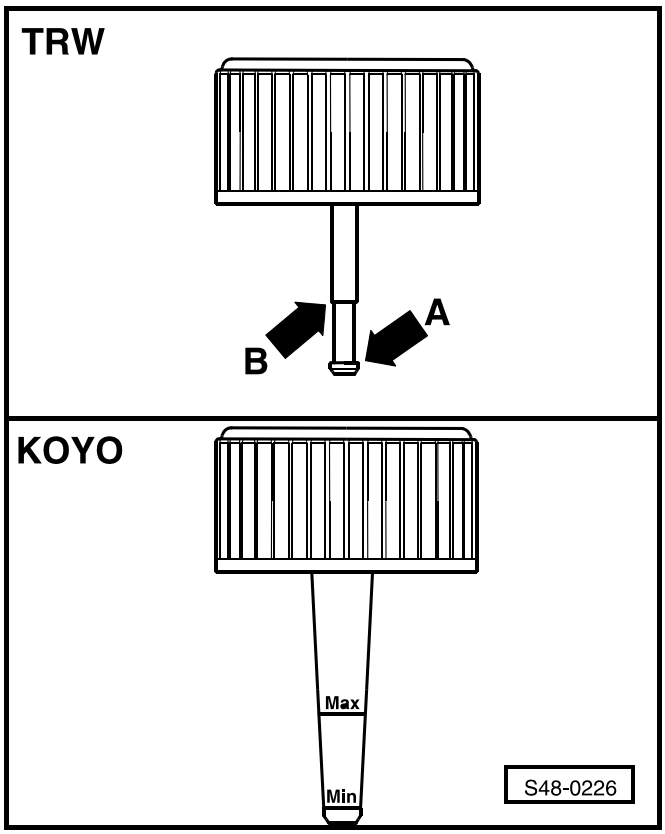
The oil level must be located:

between the bottom marking -arrow A- and the top marking -arrow B- of the oil dipstick TRW.

In the area between the markings „Min“ and „Max“ on the oil dipstick KOYO.

- If the oil level is above the upper marking -arrow B- or „Max“, drain off some oil.
- If the oil level is below the lower marking -arrow A- or „Min“, first check the hydraulic system for leaks (Inspecting power-assisted steering system for tightness ⇒ Chapter 48-23), and then one can begin to top up the system with hydraulic oil. It is not enough to simply top up the oil.
- Do not use drained hydraulic oil again.

– Screw the lid by hand onto the engine pump aggregate reservoir.



Hydraulic oil at a normal operating temperature (for an engine temperature above 50 °C)

The oil level must be located:

between the bottom marking -arrow A- and the top marking -arrow B- of the oil dipstick TRW.

In the area between the markings „Min“ and „Max“ on the oil dipstick KOYO.

- An oil level above the upper marking -arrow B- or „Max“ is permissible in warm condition, no oil is drained off.
- If the oil level is above the upper marking -arrow B- or „Max“, no oil is drained off.
- If the oil level is below the lower marking -arrow A- or „Min“, first check the hydraulic system for leaks (Inspecting power-assisted steering system for tightness ⇒ Chapter 48-23), and then one can begin to top up the system with hydraulic oil. It is not enough to simply top up the oil.

– Screw the lid by hand onto the engine pump aggregate reservoir.

– If necessary install the battery and battery tray ⇒ 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).

If the battery was removed:

– Perform self-diagnosis ⇒ Chap. 48-25.

If a fault is stored in the fault memory:

– Eliminating fault ⇒ Chapter 48-25.

– Erasing fault memory ⇒ Chapter 48-25.

48-23 Filling and bleeding the power steering system, and checking tightness

Filling and bleeding the power steering system

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 1551/3B- or -V.A.G 1551/3C- Diagnostic cable -VAS 5051/5A- or -VAS 5051/6A-
- Removal and installation pliers, e.g. -VAS 5024-
- Oil catch pan (commercially available)
- Extraction bottle (commercially available)
- Jumper cable (commercially available)
- Hydraulic oil ⇒ Chap. 00-2

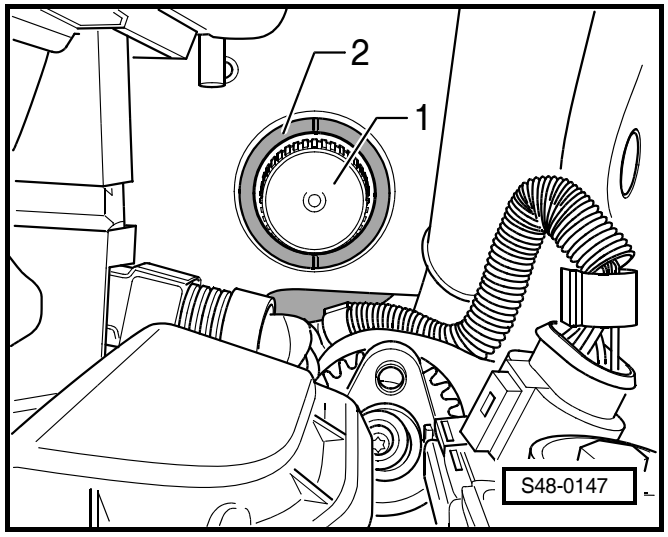
Note

- *Hydraulic oil amount in the system: approx. 0.80 ltr.*
- *The screwed lid for filling the power steering system with hydraulic oil is located in a recess on the frame side rail in the front left section of the engine compartment.*
- *Because of the different battery dimensions, on certain models the screwed lid covered by the battery tray and battery. If this is the case remove the air filter, the battery tray and battery.*
- *Only fill an empty hydraulic system when the engine is cold.*
- *Hydraulic oil ⇒ Chap. 00-2*
- *Hydraulic oil amount in the system: approx. 0.80 ltr.*
- *Use new hydraulic oil only.*
- *Topping up hydraulic oil ⇒ Chap. 48-22*
- *Check the hydraulic oil level with the dipstick of the screwed lid of the engine pump aggregate reservoir.*
- *Do not refer to the „MAX“ and „MIN“ markings on the reservoir to check the hydraulic oil level.*
- *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.

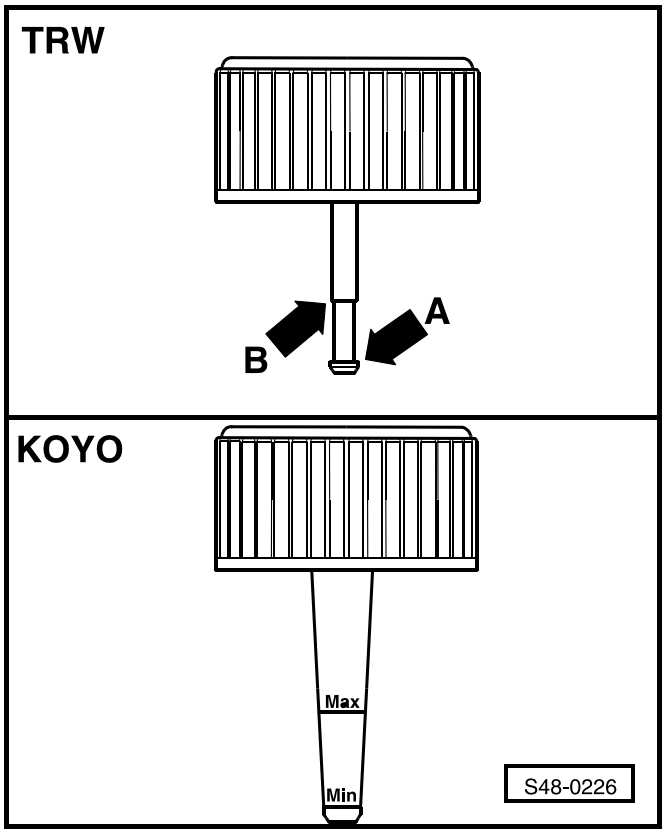
– Fill the engine pump aggregate reservoir -2- with hydraulic oil and check the hydraulic oil level with the screwed lid dipstick -1-.



For checking the hydraulic oil level, screw the screwed lid hand-tight to the reservoir.

Note

- *Only the oil level of the fully screwed in lid applies.*
- *Pay attention to the different appearances of „Min“ and „Max“ markings at oil dipstick of the screwed lid for the reservoir of TRW or KOYO.*



– For an empty power steering system fill with enough hydraulic oil to reach the top marking -arrow B- or „Max“ on the oil dipstick.

  Arrow A - bottom marking on screwed lid of TRW

  „MIN“ - bottom marking on screwed lid of KOYO

Caution!

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

– If necessary connect the battery with jumper cable.

– Install air filter, if removed ⇒ Engine, Fuel Injection System; Rep. Gr. 24 (petrol engines) or ⇒ Rep. Gr. 23 (diesel engines).

– Raise the vehicle until the front wheels are fully off the ground.

– Put the front wheels in straight ahead position.

– Open the screwed lid of the hydraulic oil reservoir.

– With the engine off turn the steering wheel 10 x from stop to stop.

– Inspecting the hydraulic oil level and if necessary top up ⇒ Chap. 48-22.

– Loosely screw on the screwed lid of the hydraulic oil reservoir, do not tighten.

– Start engine and run for approx. 10 seconds.

– Switch off engine.

– Inspecting the hydraulic oil level and if necessary top up ⇒ Chap. 48-22.

– Loosely screw on the screwed lid of the hydraulic oil reservoir, do not tighten.

– Repeat the following steps until the hydraulic oil level no longer drops. The hydraulic oil level must reach the top marking.

- Start the engine.
- Turn steering wheel 10 x from stop to stop.
- Switch off engine.
- Inspecting the hydraulic oil level and if necessary top up ⇒ Chap. 48-22.

– Screw the lid by hand onto the engine pump aggregate reservoir.

Note

Possible residual air in the steering system will automatically escape during driving after approx. 10…20 km.

– Disconnect the jumper cable.

– If necessary re-install the air filter.

Only run through the following steps if the battery has been disconnected and the battery, battery tray and air filter have been removed.

– Install the battery and battery tray ⇒ Electrical System; Rep. Gr. 27.

– Install air filter ⇒ Engine, Fuel Injection; Rep. Gr. 24 (fuel 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
Screwed lid on hydraulic oil reservoir	tightened by hand
Wheel bolts	120 Nm

Checking the power steering system for leaks

Check the power steering system for tightness after assembly work and in the event of hydraulic oil loss in the reservoir.

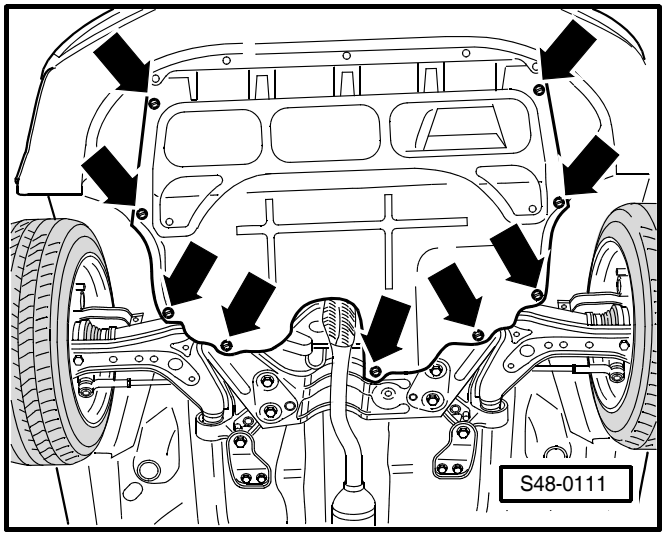
Special tools, test and measuring equipment and auxiliary items required

- 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 1551/3B- or -V.A.G 1551/3C- Diagnostic cable -VAS 5051/5A- or -VAS 5051/6A-

Note

- *Because of the different battery dimensions, on certain models the screwed lid with oil dipstick for checking and topping up the hydraulic oil 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.
– 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.

Caution!

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

– If necessary connect battery to jumper cable.
– Start engine, idling speed.

Note

A 2nd mechanic is required to check the tightness of the pressure line, return line and the connections.

– Turn the steering wheel in both directions up to the stop and hold for maximum 5…10 seconds.

  This will build up the highest possible pressure.

– Check the pressure line (expansion hose) and return line (return hose) for tightness.

  If there are leaks replace the relevant line or hose.

– Check all line and hose connections for correct position and tightness.

  In the event of leaks tighten the line or hose connections to the allowed tightening torques or replace the seal or line.

– Checking the engine pump aggregate for tightness.

  If there are leaks replace the engine pump aggregate.

– Check the hydraulic oil reservoir for tightness.

  If there are leaks replace the engine pump aggregate.

– Inspecting the hydraulic oil level and if necessary top up ⇒ Chap. 48-22.

Note

- *If there is a repeated loss of hydraulic oil from the engine pump aggregate reservoir, and if the line or hose and its connections as well as the engine pump aggregate and its reservoir have been repeatedly thoroughly inspected, remove and inspect the power steering gear.*
- *The checking of the power-steering gear is identical to the steering gears of TRW and KOYO. The figure shows the power-steering gear of TRW.*

– Removing power steering gear ⇒ Chap. 48-12.

– Remove gasket -1-.

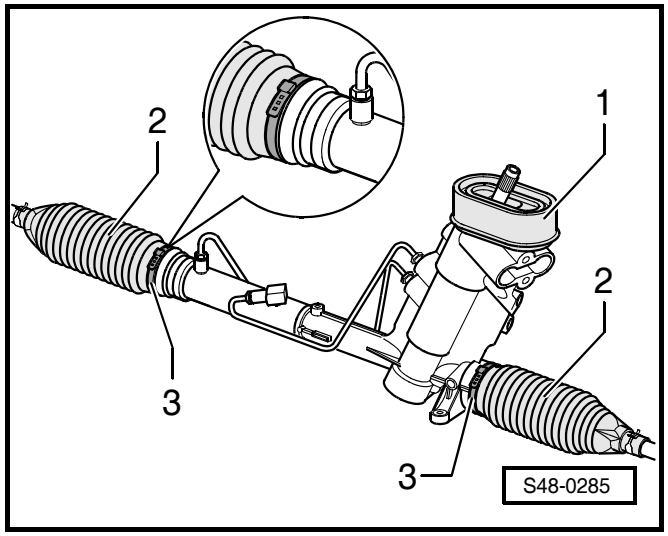
– Open warm-type clamps -3-.

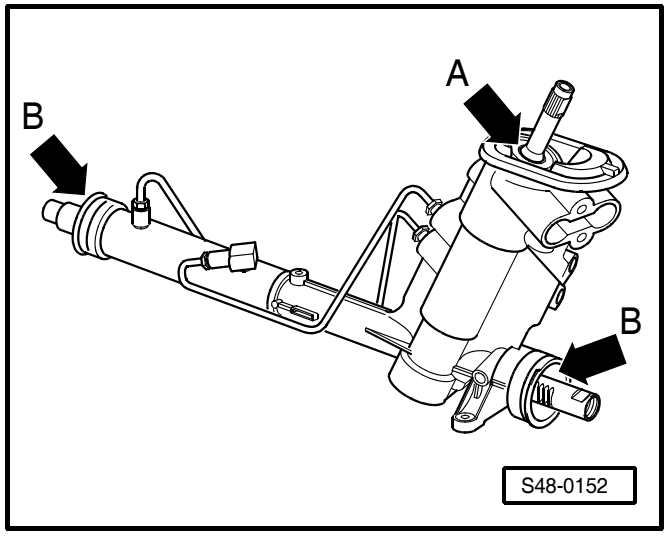
– Push back boots -2-.

– Check the input shaft gasket ring on the valve housing of the power steering gear -arrow A- for tightness.

– Check gear rack gasket rings -arrow B- for leaks.

If hydraulic oil is visible in the steering gear housing and/or in the boot, replace the power steering gear.





– If there is no hydraulic oil in the steering gear housing and/or in the boot, secure the boot -2- with new warm-type clamp -3- ⇒ Chap. 48-16.

– Mount gasket -1- on the valve housing of the power steering gear ⇒ Chapter 48-12.

– Installing power steering gear ⇒ Chap. 48-12.

Note

If there is no more hydraulic oil in the engine pump aggregate reservoir the engine pump aggregate may have »run dry« and may have been damaged.

– Replace engine pump aggregate ⇒ Chap. 48-20.

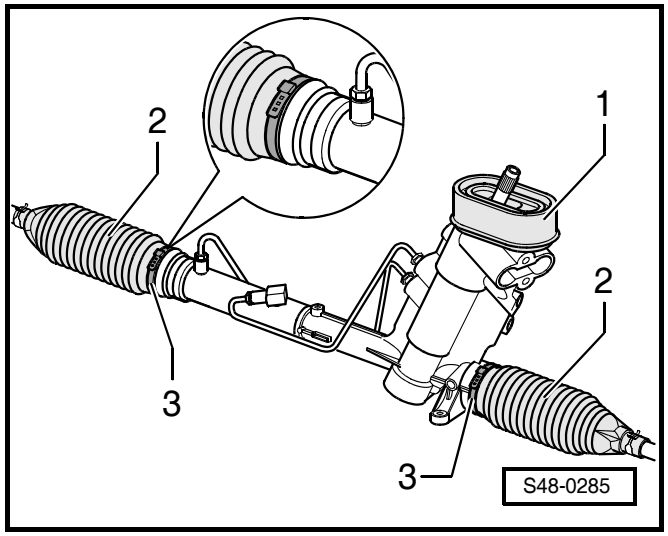
– If necessary disconnect the jumper cable.

– 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.



– Install air filter, if removed ⇒ Engine, Fuel Injection System; Rep. Gr. 24 (petrol engines) or ⇒ Rep. Gr. 23 (diesel engines).

If the battery was removed:

– 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.

48-24 Power steering noises

Notes for eliminating the noises

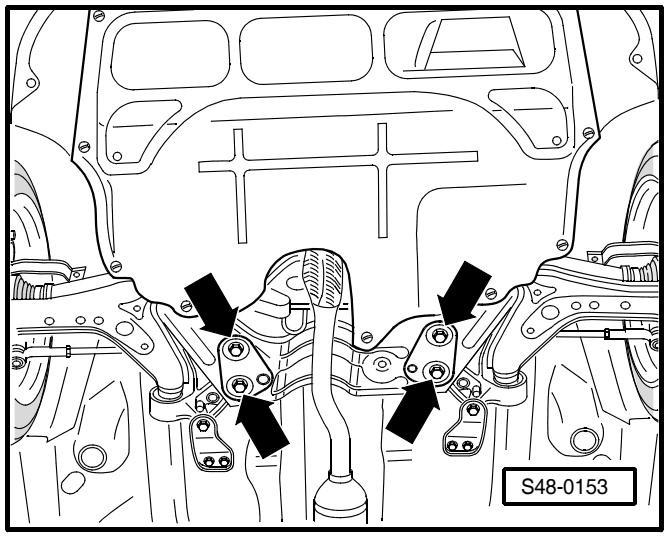
A closed hydraulic system will always produce running noise.

Noise is always produced when the steering is turned up to the end stops (this must only occur briefly).

The increased pumping noise in the steering end stops (during parking manoeuvers) is system related and technically unavoidable.

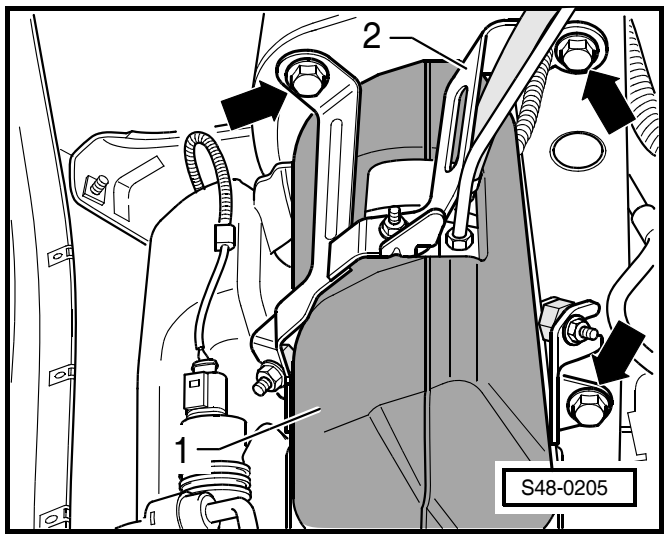
For noises that differ from the usual technically unavoidable operating noises take the following measures:

- Checking the hydraulic oil level in the reservoir of the engine pump aggregate ⇒ Chap. 48-22.
- Checking the feed pressure of the engine pump aggregate ⇒ Chap. 48-19.
- Check the connections of the pressure line (expansion hose) and return line (return hose) on the power steering gear as well as the engine pump aggregate (air in steering system).
- Check routing of the pressure line (expansion hose) and return line (return hose) (lines pinched or in contact with other vehicle parts)
- Check attachment of the power steering gear to the assembly carrier -arrows-. ►
- If necessary tighten hexagon screws.



Check attachment of engine pump aggregate (TRW)

- Check attachment of holder -2- with engine pump aggregate -1- to body -arrows-. ►
- If necessary tighten hexagon screws.

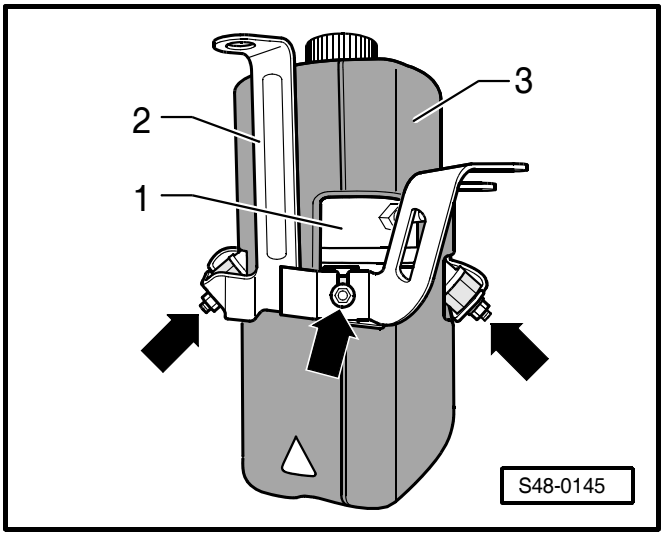


For reasons of clarity the surrounding components are not shown in the following figures.

– Check attachment of holder -2- to engine pump aggregate -1- -arrows-. ►

3 - Encapsulation

– If necessary tighten hexagon nuts to the specified tightening torques, while doing so counterhold rubber bearings.



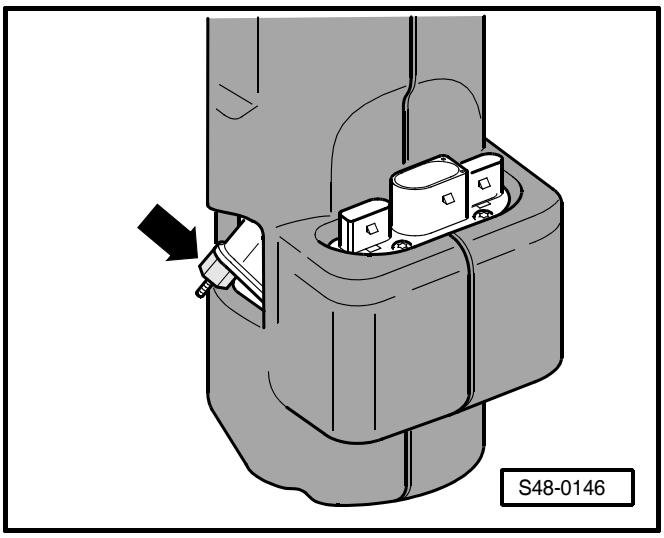
Note

To test the rubber bearing for damage remove the engine pump aggregate with encapsulation and disassemble the holder.

– Removing the engine pump aggregate ⇒ Chap. 48-20.

– Check rubber bearing (3) -arrow- for damage (e.g. tears, separation of the metal plates with threaded bores from the rubber bearing). ►

– In case of damage replace rubber bearing ⇒ Chap. 48-20.

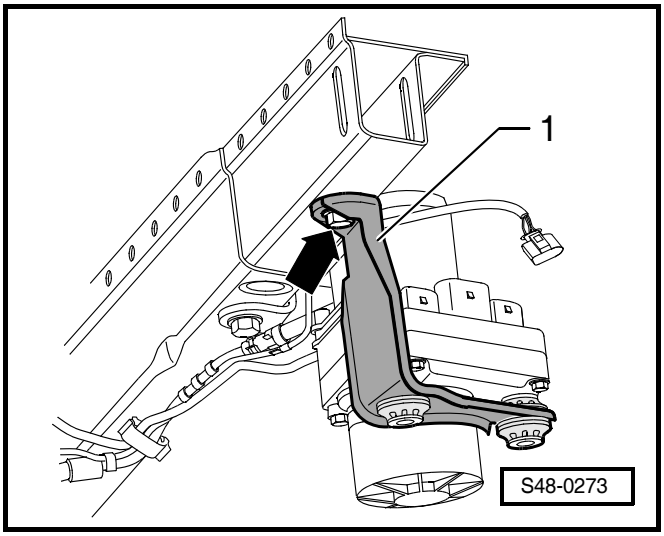


Check attachment of engine pump aggregate (KOYO)

For reasons of clarity the surrounding components are not shown in the following figures.

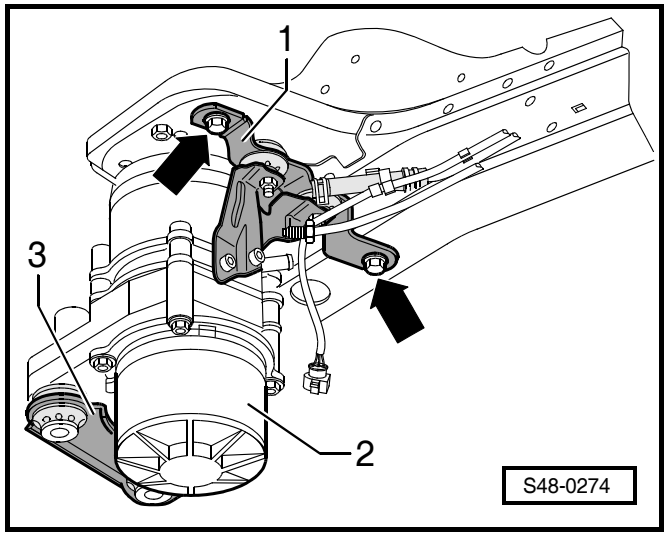
– Check attachment of front holder -1- with engine pump aggregate to body. ►

– If necessary tighten the hexagon screw -arrow- to the specified tightening torque.

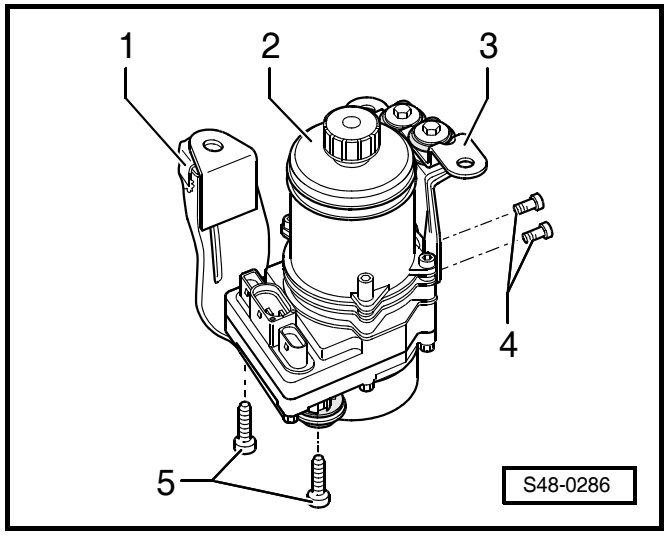


– Check attachment of rear holder -1- with engine pump aggregate -2- to body.
– If necessary tighten the hexagon screws -arrows- to the specified tightening torque.

3 - Front bracket



– Check attachment of bracket -1- and -3- at the engine pump aggregate -2-.
– If necessary tighten the fillister head screws -4- and -5- to the specified tightening torque.



Note

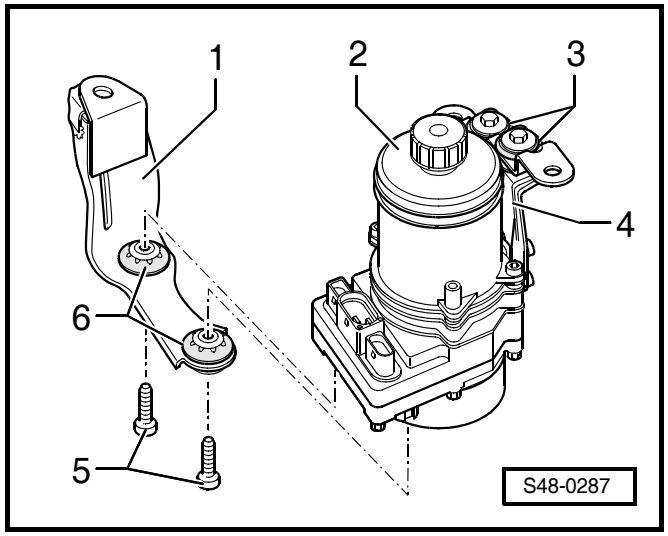
To test the rubber bearing for damage remove the engine pump aggregate -2- and disassemble the holder -1-.

– Removing the engine pump aggregate ⇒ Chap. 48-20.
– Remove holder -1- from the engine pump aggregate -2-.

The rubber bearing -3- can be checked on an installed holder -4-.

– Check rubber bearing -3- and -6- for damage (e.g. tears).
– In case of rubber bearing, replace holder -1- or holder -4- ⇒ Chapter 48-20.

5 - Fillister head screws



Tightening torques:

Pipe screw for return-flow line to power-steering gear (TRW/KOYO)	30 Nm
Hollow screw for pressure line to power steering gear (TRW) ♦ Use new hollow screw!	35 Nm
Hollow screw for pressure line to power steering gear (KOYO)	40 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
Holder with engine pump aggregate to body (TRW/KOYO) ♦ Use new screws!	20 Nm + 90°
Holder to engine pump aggregate (TRW/KOYO)	7 Nm
Rubber bearing to engine pump aggregate (TRW)	7 Nm
Power-steering gear to assembly carrier (TRW/KOYO) ♦ Use new screws!	50 Nm + 90°

48-25 Self-diagnosis on the power-assisted steering system

The power steering of TRW or KOYO can be checked with the self-diagnosis. Performing the self-diagnosis is identical on both steering systems.

The self-diagnosis can be carried out:

- using the vehicle system tester -V.A.G 1552-, or the fault read-out scan tool -V.A.G 1551- ⇒ 48-25 page 1
- or the vehicle diagnosis, measurement and information system -VAS 5051- ⇒ 48-25 page 11.

The control unit and the hydraulic unit (eletric motor and gear pump) as well as the hydraulic oil reservoir form a single unit, the so-called engine pump aggregate, which cannot be disassembled. Only the reservoir for hydraulic oil is replaceable.

The engine pump aggregate is located in the front left of the engine compartment between the bumper and the wheelhouse.

Self-diagnosis is related to the electrical and electronic parts of the power-assisted steering. The control unit detects faults during the operation of the vehicle and stores them in a permanent memory, whose information is retained even if the battery voltage is disconnected.

After the ignition is switched on servotronic warning light -K92- lights up. As soon as this starts an internal check cycle is completed ⇒ 48-25 page 1.

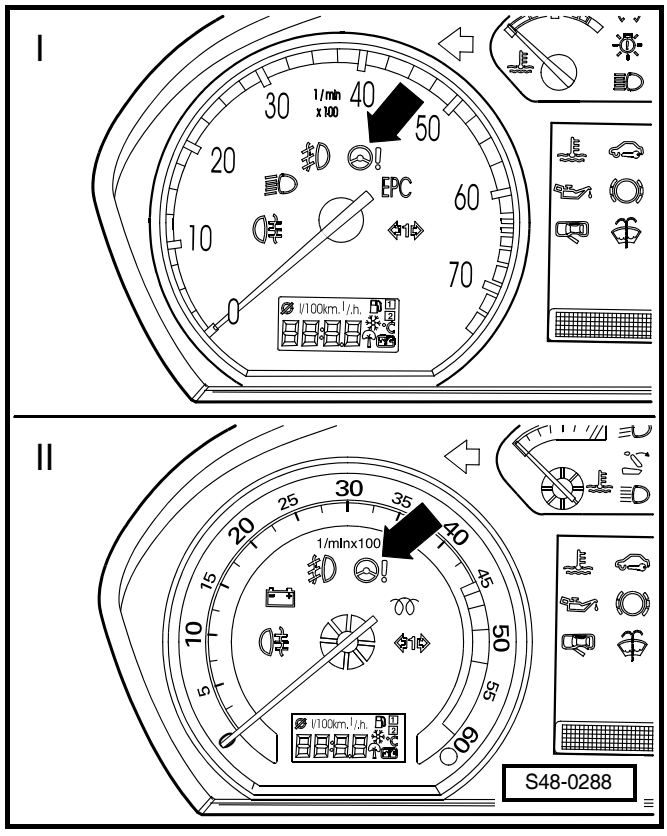
Before starting fault finding, always initiate self-diagnosis. If faults are stored, these can be displayed or be printed out with vehicle system tester -V.A.G 1552- or fault read-out scan tool -V.A.G 1551- or the vehicle diagnosis, measurement and information system -VAS 5051-.

Indication of faults by means of warning light for Servotronic -K92-

If the servotronic warning light -K92- -arrow- does not go out after the ignition is switched on faults may be stored.

I - Dash panel insert up to model year 2004

II - Dash panel insert as of model year 2005



Connect vehicle system tester -V.A.G 1552- or fault read-out scan tool -V.A.G 1551- and select functions.

Special tools, test and measuring equipment and auxiliary items required

- vehicle system tester -V.A.G 1552- or fault read-out scan tool -V.A.G 1551-
- Diagnostic cable -V.A.G 1551/3A, 3B oder 3C-

Note

- *The description of the self-diagnosis only relates to vehicle system tester -V.A.G 1552- using the current program card.*
- *The use of fault reader -V.A.G 1551- with integrated printer is similar. A minor deviation on the display read-out is possible.*

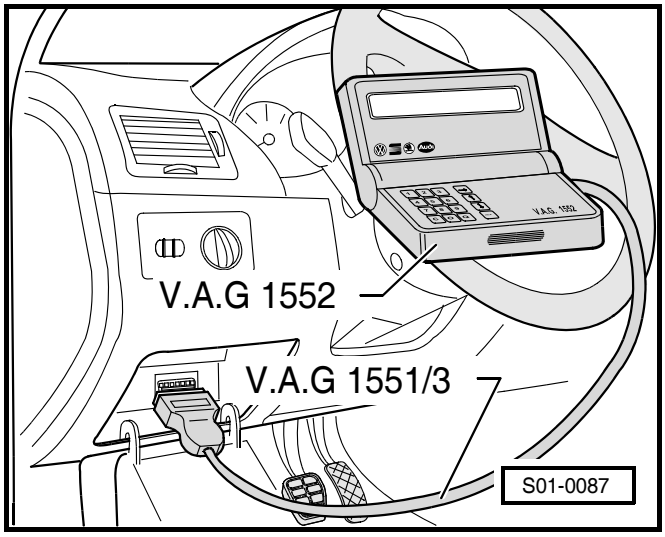
Test conditions

- Fuses must be OK in compliance with the current flow diagram.
- Battery voltage at least 11.5 volts
- All electrical components must be switched off

The diagnostic connection is located on the left next to the storage compartment on the driver's side.

– Unclip cover and remove downward.

– Connect vehicle system tester -V.A.G 1552- or fault read-out scan tool -V.A.G 1551- with appropriate cable. ►



– Switch on ignition.

Readout on display: ►

```
Vehicle system test                    HELP
Enter address word XX
```

Note

If there is no readout on the display: ⇒ Operating instructions of the vehicle system tester

– Enter address word 4 4 for „power-assisted steering“ and confirm the entry with Q.

Readout on display: ►

```
6Q0423156   Power steering       0001 ->
Coding 00110                   WSC XXXXX
```

- 6Q0423156 : Version number of the control unit
- Power-assisted steering: System denomination
- 0001: Software version number
- Coding 00110: Coding of the control unit
- WSC XXXXX : Workshop code

– Press →.

If one of the following messages appears in the display, carry out fault finding as stated in the fault finding programme in the diagnostic cable ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations. ►

```
Vehicle system test                    HELP
The control unit does not respond
```

or ►

```
Vehicle system test                    HELP
Fault in communication build-up
```

or ►

```
Vehicle system test                    HELP
K cable does not connect to earth
```

or ►

```
Vehicle system test                    HELP
K cable does not connect to pos. term.
```

Overview of the selectable functions on the Vehicle system tester -V.A.G 1552-

01 - Interrogating control unit version ⇒ 48-25 page 1

02 - Interrogating fault memory ⇒ 48-25 page 3
05 - Erasing fault memory ⇒ 48-25 page 3
06 - Ending output
07 - Coding control unit ⇒ 48-25 page 8
08 - Reading measured value block ⇒ 48-25 page 9

Interrogating and erasing fault memory

Interrogating fault memory

Readout on display:

```
Vehicle system test                    HELP
Select function XX
```

– Enter function 0 2 „Interrogate fault memory“ and confirm entry with Q.

The number of faults stored appears on the display.

```
X faults detected!
```

The stored faults are displayed in sequence.

– Find the fault displayed in the fault table ⇒ 48-25 page 5 and rectify fault.

If „No fault detected“ is shown in the display and if the key → is pressed, the programme returns to the initial position.

```
No fault detected              ->
```

Readout on display:

```
Vehicle system test                    HELP
Select function XX
```

Erasing fault memory

Note

The contents of the fault memory are output automatically after the fault memory is erased. If it is not possible to erase the fault memory, interrogate the fault memory once again and rectify any faults.

Requirements

- Fault memory was interrogated ⇒ 48-25 page 3.
- All faults were rectified.

– Select function 0 5 „Erase fault memory“ and confirm with Q.

Readout on display:

```
Vehicle system test                     ->
Fault memory erased!
```

The fault memory is now erased.

– Press →.

Readout on display:

```
Vehicle system test                    HELP
Select function XX
```

– Select function 0 6 „End output“ and confirm with Q.

Automatic test sequence

During testing and installation other control units may also detect faults, e.g. pulled-out connectors or CAN databus faults. This is why, when the work is concluded,

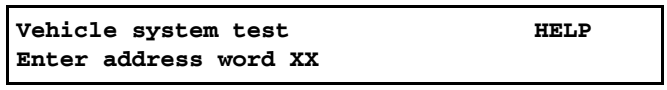
that it is necessary to interrogate and erase the fault memory on all control units.

– Select function 0 0 „Automatic test sequence“ and confirm with Q. The vehicle system tester -V.A.G 1552- sends all known address words in sequence.

When a control unit answers with its identification, the fault memory of the relevant system is also read out.

Any faults stored for one of the systems are displayed in sequence. The -V.A.G 1552- then transmits the next address word.

The automatic test sequence has ended when the following read-out appears on the display:



– Erase the fault memory and then carry out a test drive.
– Once again interrogate the fault memory of all the control units using the „automatic test sequence“.

If no fault is stored:

– Press →.

Readout on display:

– Select function 0 6 „End output“ and confirm with Q.
– Switch off ignition.

Fault table

Note

- *All the possible faults which can be detected by the dash panel insert and can be displayed by -V.A.G 1552- are listed below according to the 5-digit fault code.*
- *Do not take any notice of the SAE code to the right of the fault code or the fault index (e.g. 136).*
- *Before replacing components found to be defective first check the wiring and plug connections to these components as well as the earth cables according to the current flow diagram.*
- *After repair always interrogate the fault memory using vehicle system tester -V.A.G 1552- and erase the memory.*
- *All static and sporadic faults are stored in the fault memory. A fault is detected as static if it exists for at least 2 seconds. If the fault is then no longer present, it is stored as a sporadic (temporary) fault. „/SP“ appears on the right of the display.*
- *After switching on the ignition, all the faults which exist are set to sporadic and are not stored as static faults unless they continue to exist after completing the check.*
- *If a sporadic fault no longer occurs during 50 driving cycles (ignition on for at least 5 minutes, road speed > 30 km/h), it is erased.*

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
00566 Power steering operation	Implausible signal	♦ The motor pump assembly is defect ♦ Fault terminal 30	♦ Power steering disconnects	– Analyse measured value block 001 display field 1 ⇒ 48-25 page 9 – Replace the motor pump assembly – Electrical test ⇒ Chapter 48-26.
00816 Power steering sensor -G250	Short circuit to earth	♦ Short circuit to earth in the line connection from the power steering sensor to the control unit ♦ Sensor for power steering defective	♦ The power-assisted steering is operating in emergency mode ♦ Steering requires greater effort ♦ The control lamp on the servotronic -K92- is lit up	– Analysing measured value block 002 ⇒ 48-25 page 9 – Test wiring ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Replace sensor
00816 Power steering sensor -G250	Open circuit/ Short circuit to positive	♦ Short circuit to pos. in the line connection from the power steering sensor to the control unit ♦ Line interruption ♦ Sensor for power steering defective	♦ The power-assisted steering is operating in emergency mode ♦ Steering requires greater effort ♦ The control lamp on the servotronic -K92- is lit up	– Analysing measured value block 002 ⇒ 48-25 page 9 – Test wiring ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Replace sensor
00816 Power steering sensor -G250	defective	♦ Sensor for power steering defective	♦ The power-assisted steering is operating in emergency mode ♦ Steering requires greater effort ♦ The control lamp on the servotronic -K92- is lit up	– Analysing measured value block 002 ⇒ 48-25 page 9 – Replace sensor

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
00817 Power steering temperature protection		♦ Temperature in hydraulic system too high	♦ Steering requires greater effort ♦ Power steering disconnects	– Allow temperature to drop – Analysing measured value block 001 ⇒ 48-25 page 9
01288 Terminal 30 power steering	Signal too high Signal too low	♦ Alternator not regulating voltage ♦ Battery discharged/excessively charged	♦ Steering requires greater effort ♦ Power steering disconnects ♦ The control lamp on the servotronic -K92- is lit up	– Analysing measured value block 001 ⇒ 48-25 page 9 – Check battery ⇒ Electrical System; Rep. Gr. 27. – Test alternator ⇒ Electrical System; Rep. Gr. 27. – Check wiring and plug connections according to the current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
01289 Terminal 15 power steering	Signal too low	♦ Loose contact	♦ Steering requires greater effort ♦ Power steering disconnects	– Analysing measured value block 004 ⇒ 48-25 page 9 – Test wiring ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
01290 Power steering reference voltage	Short circuit to positive	♦ Short circuit to pos. in the line connection from the power steering sensor to the control unit ♦ Sensor defective	♦ The power-assisted steering is operating in emergency mode ♦ Steering requires greater effort	– Analysing measured value block 004 ⇒ 48-25 page 9 – Test wiring ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Replace sensor
01290 Power steering reference voltage	Short circuit to earth	♦ Short circuit to earth in the line connection from the power steering sensor to the control unit ♦ Sensor defective	♦ The power-assisted steering is operating in emergency mode ♦ Steering requires greater effort	– Analysing measured value block 004 ⇒ 48-25 page 9 – Test wiring ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Replace sensor
01309 Power steering control unit -J500	defective	♦ Power steering control unit defective	♦ Steering requires greater effort ♦ Power steering disconnects	– Replace the motor pump assembly

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
01312 Data bus drive	defective	♦ Data bus cables defect ♦ a connected control unit is faulty	♦ Power steering disconnects ♦ Steering requires greater effort	– Check data bus ⇒ Chapter 48-27
01314 Engine control unit	No communication	♦ Data bus cables defect ♦ Engine control unit defective	♦ The power-assisted steering is operating in emergency mode or does not operate at all ♦ Steering requires greater effort	– Check data bus ⇒ Chapter 48-27 – Interrogate fault memory of engine control unit ⇒ Engine, Fuel Injection; Rep. Gr. 01.
01314 Engine control unit	please read out fault memory	♦ Data bus cables defect ♦ Engine control unit defective	♦ The power-assisted steering is operating in emergency mode or does not operate at all ♦ Steering requires greater effort	– Check data bus ⇒ Chapter 48-27 – Interrogate fault memory of engine control unit ⇒ Engine, Fuel Injection; Rep. Gr. 01.
01317 Control unit with display in dash panel insert -J285	No communication	♦ Data bus cables defect ♦ Dash panel insert defective	♦ The power-assisted steering is operating in emergency mode ♦ Steering requires greater effort ♦ The control lamp on the servotronic -K92- is lit up	– Check data bus ⇒ Chapter 48-27 – Interrogate fault memory of dash panel insert ⇒ Electrical System; Rep. Gr. 90
01317 Control unit with display in dash panel insert -J285	please read out fault memory	♦ Data bus cables defect ♦ Dash panel insert defective	♦ The power-assisted steering is operating in emergency mode ♦ Steering requires greater effort	– Check data bus ⇒ Chapter 48-27 – Interrogate fault memory of dash panel insert ⇒ Electrical System; Rep. Gr. 90
01321 Airbag control unit -J234	No communication	♦ Data bus cables defect ♦ Airbag control unit defective		– Check data bus ⇒ Chapter 48-27 – Interrogate the fault memory of the airbag control unit ⇒ Body Work; Rep. Gr. 01
01321 Airbag control unit -J234	please read out fault memory	♦ Data bus cables defect ♦ Airbag control unit defective		– Check data bus ⇒ Chapter 48-27 – Interrogate the fault memory of the airbag control unit ⇒ Body Work; Rep. Gr. 01
01656 Crash signal		♦ Airbag control unit -J234- has triggered airbags ♦ Final control diagnosis Airbag control unit -J234- completed	♦ Power steering disconnects	– Erasing fault memory ⇒ 48-25 page 3

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
01656 Crash signal	Implausible signal	♦ Crash signal of airbag control unit -J234- N.O.K. ♦ Data bus cables defect ♦ Control units on the data bus are incorrectly coded	♦ Power steering disconnects	– Erasing fault memory ⇒ 48-25 page 3 – Check data bus ⇒ Chapter 48-27 – Test crash signal ⇒ Body Work; Rep. Gr. 01; Self-diagnosis airbag system

Coding control unit

– Connect up the vehicle system tester -V.A.G 1552- and select „power-assisted steering“ (address word 44) ⇒ 48-25 page 1.

Readout on display:

```
Vehicle system test                    HELP
Select function XX
```

– Enter function 0 7 „code the control unit“ and confirm with Q.

Readout on display:

```
Code control unit                      HELP
Enter code number XXXXX          (0-32000)
```

– Enter the relevant code number of the vehicle and confirm with Q.

Table of codes ⇒ 48-25 page 8

Table of codes Power steering control unit -J500-

Caution!

Recoding of the control unit for the power-assisted steering at the customer's request can only be undertaken in compliance with the table of codes. Other assignments are not allowed.

Note

The weight PR numbers for the front axle/engine can be found on the vehicle data sticker. The vehicle data sticker is located on the luggage compartment floor and in the Service Schedule.

Table of codes (up to 04/2001)

Shock absorber PR number	Selectable coding[1)]
J06, J07, J08, J13, J14, J15, J20, J21, J22	00110 00130 00160
J01, J02, J03, J04, J05, J09, J10, J11, J12, J16, J17, J18, J19, J23, J24, J25, J26	00140 00150 00160

1) Coding at customer's request

Table of codes (up to 05/2001)

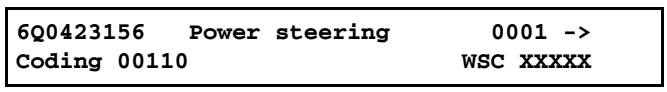
Shock absorber + power steering + airbags PR. number	Selectable coding	
	without airbag	with airbag
L05 (L06, L07, L08, L19, L20, L21, L32, L33) + 1N2 + 4UC (4UE, 4UF)		10110
L09 (L11, L12, L13, L14, L26, L35) + 1N2 + 4UC (4UE, 4UF)		10120
L01 (L02, L03, L04, L15, L16, L17, L18) + 1N2 + 4UC (4UE, 4UF)		10140
1N5 + 4UC (4UE, 4UF)		10160
L05 (L06, L07, L08, L19, L20, L21, L32, L33) + 1N2 + 4UA	00110	
L09 (L11, L12, L13, L14, L26, L35) + 1N2 + 4UA	00120	
L01 (L02, L03, L04, L15, L16, L17, L18) + 1N2 + 4UA	00140	
1N5 + 4UA	00160	

The meaning of the code numbers

Code number:	Meaning
00110	Normal power steering for »heavy vehicles«
10110[1)]	Normal power steering for »heavy vehicles«
00120	Sport steering RS
10120[1)]	Sport steering RS
00130	Convenience - greater power steering at low driving speeds (e.g. when parking) for »heavy vehicles« (has not been used before)
10130[1)]	Convenience - greater power steering at low driving speeds (e.g. when parking) for »heavy vehicles« (has not been used before)
00140	Normal power steering for »light vehicles«
10140[1)]	Normal power steering for »light vehicles«
00150	Convenience - greater power steering at low driving speeds (e.g. when parking) for »light vehicles« (has not been used before)
10150[1)]	Convenience - greater power steering at low driving speeds (e.g. when parking) for »light vehicles« (has not been used before)
00160	Handicap - greater power steering for vehicles for the handicapped
10160[1)]	Handicap - greater power steering for vehicles for the handicapped

[1)] These code numbers cannot be entered in old software versions of the control unit.

The control unit coding appears in the display, (e.g. 00110)



– Press [→].

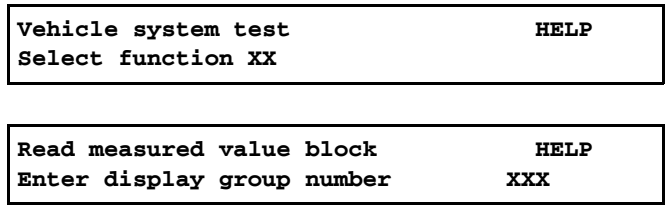
Readout on display:

– Select function [0] [6] „End output“ and confirm with [Q].

Reading measured value block

– Connect up the vehicle system tester-V.A.G 1552- and select „power-assisted steering“ (address word 44) ⇒ 48-25 page 1.

Readout on display:



– Enter function 0 8 „Read measured value block“ and confirm the entry with key Q.

Readout on display:

– Enter display group ⇒ 48-25 page 10.

List of display groups

Measured value block 001

Reading measured value block 1 →				Readout on display:
12.3 V	0.0 A	27 °C	off	
				Pump motor ♦ off ♦ on
				Temperature on the control unit for the power-assisted steering
				Pump motor current
				Voltage terminal 30

Measured value block 002

Reading measured value block 2 →				Readout on display:
0.0 °/s	0 rpm	0 rpm	0.0 A	
				Pump motor current
				Actual speed pump motor
				Nominal speed pump motor
				Angular speed on power steering sensor

Measured value block 003

Reading measured value block 3 →				Readout on display:
0 km/h	0 rpm	off	yes	
				Power steering sensor G250 ♦ yes ♦ no
				Pump motor ♦ off ♦ on
				Vehicle engine speed
				Vehicle speed

Measured value block 004

Reading measured value block 4 →				Readout on display:
0 h	2	correct	12.1 V	
				Voltage terminal 15
				Sensor for power steering reference voltage ♦ too small ♦ correct ♦ too great
				Engaging counter of power steering
				Engaging duration of the power steering in hours

Connect vehicle diagnosis, measurement and information system -VAS 5051- and select functions

Special tools, test and measuring equipment and auxiliary items required

- Vehicle diagnosis, measurement and information system -VAS 5051-
- Diagnostic cable -VAS 5051/5A- or Diagnostic cable -VAS 5051/6A-

WARNING!

- ***For test drives, test and measuring equipment must always be fastened to the rear seat.***
- ***The equipment must be operated by an assistant during test drives.***

– Mount the plug of the diagnostic cable - VAS 5051/5A- or the diagnostic cable -VAS 5051/6A - on the di-

agnostic connection in the storage compartment on the driver's side.

– Switch on the vehicle diagnosis, measurement and information system -VAS 5051-.

The vehicle diagnosis, measurement and information system -VAS 5051- is operational, if it shows the keyboards of its operating modes.

– Switch on ignition.

– On the screen, select the **Geführte Fehlersuche**.

– Select the following one after the other:

- Brand
- Type
- Model year
- Variant
- Engine identification characters

– Confirm the data entered.

Wait until the vehicle diagnosis, measurement and information system -VAS 5051- has communicated with all the control units in the vehicle (vehicle system test).

– Press the **Sprung** and choose the „Selected Functions/Components“ option.

– Select on the display „chassis“.

– Select on the display „steering“.

– Select on the display the indicated „01-self-diagnosable system…“.

– Select on the display the indicated „electrical power steering…“.

Now all possible components and functions of the steering system in the vehicle are indicated.

– Select on the display the desired component or the desired function.

48-26 Electrical Test of Power Steering

Special tools, test and measuring equipment and auxiliary items required

- Hand multimeter, e.g. -V.A.G 1526B-
- Measuring tool set, e.g. -V.A.G 1594C-

Test conditions

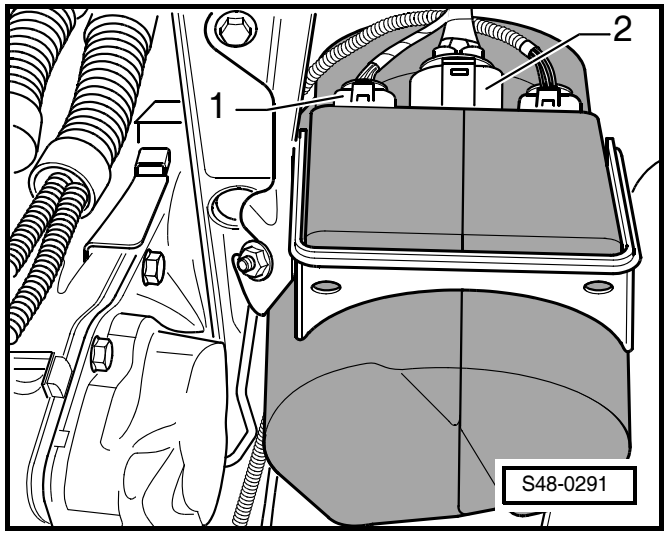
- Fuses according to current flow diagram O.K.
- Battery voltage at least 11.5 volts

Procedure

– Remove the front left wheelhouse liner ⇒ Body Work; Rep. Gr. 66

Engine pump aggregate TRW ►

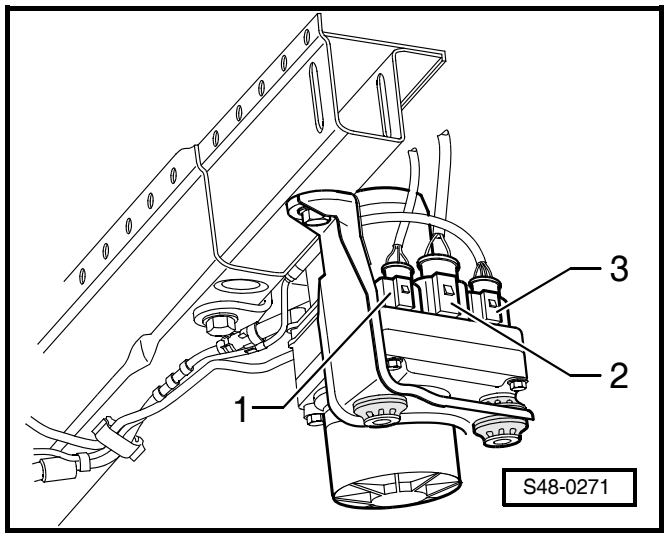
– Unplug connectors -1- and -2-.



Engine pump aggregate KOYO ►

– Unplug connectors -1- and -2-.

3 - Plug of power-assisted steering sensor -G250-, remains in position



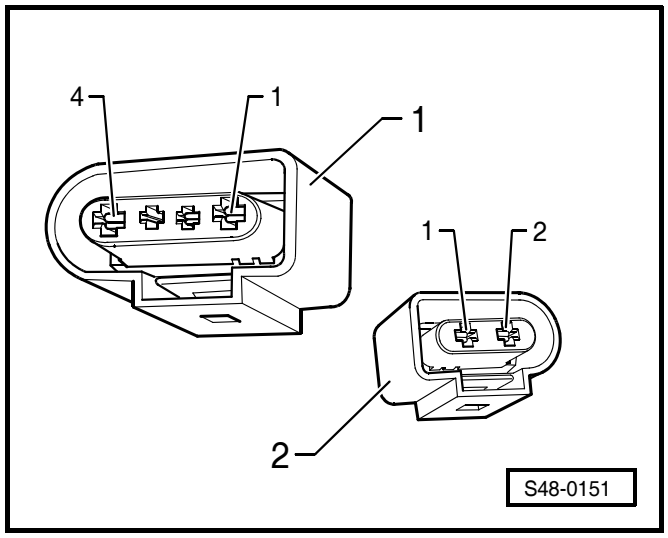
Contact assignment (TRW or KOYO) ►

Connector -1-:

1 - Data BUS Low
2 - Data BUS High
3 - not yet assigned
4 - Terminal 15

Connector -2-:

1 - Terminal 30
2 - Earth



– Switch on the ignition.

– Test with a hand-held multimeter and suitable test prods from the measuring tool set:

Contact assignment (TRW or KOYO)

Connector -1-	
between contact:	Specified value:
4 and earth	approx. battery voltage

Connector -2-	
between contact:	Specified value:
1 and 2	approx. battery voltage
1 and earth	approx. battery voltage

– Switch off the ignition.

Resistance measurement (TRW or KOYO)

Connector -1-	
between contact:	Specified value:
4 and earth	∞ Ω

Connector -2-	
between contact:	Specified value:
1 and earth	∞ Ω
2 and earth	approx. 0 Ω
1 and 2	approx. 60 Ω

If the specified values are not reached:

– Test the wiring according to the current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

48-27 Checking the data BUS

Operation

The control units that are compatible with the data bus are connected via two twisted data BUS cables (CAN_High and CAN_Low) and exchange information (messages). Both the power steering control unit -J500- and the other data bus compatible control units detect missing information on the data BUS as faults.

Other information: ⇒ Self-study Programme No. 24; The CAN data bus

Note

The central terminating resistor of the data BUS cables is located in the engine control unit. The test will thus focus on the engine control unit.

Special tools, test and measuring equipment and auxiliary items required

- Hand multimeter, e.g. -V.A.G 1526 A-
- Measuring tool set, e.g. -V.A.G 1594 A-
- Test box -V.A.G 1598/31-
- Current flow diagram

Test condition

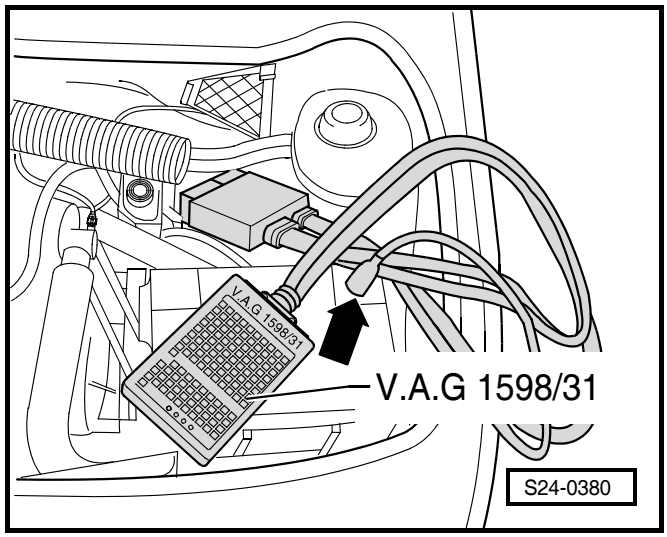
- A data BUS fault was detected by the power steering control unit -J500-.

Test sequence

– Switch off the ignition.

– Unlock the connector from the engine control unit and unplug.

– Connect the test box -V.A.G 1598/31- to the engine control unit.The control unit wiring loom is not connected.



– Connect the earth clip of the test box -arrow- to the negative battery terminal.

– Test the central terminating resistor in the engine control unit.

– To this end perform a resistance measurement between the test box bushes ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

Nominal value: 60…72 Ω

If the resistance is not within the nominal value range:

– Replace the engine control unit⇒ Chap. 24-8.

If the resistance is within the nominal value range:

– Unplug the test box -V.A.G 1598/31- from the engine control unit.

– Connect the test box -V.A.G 1598/31- to the wiring loom control unit.

  Connect the earth clip of the test box -arrow- to the negative battery terminal.

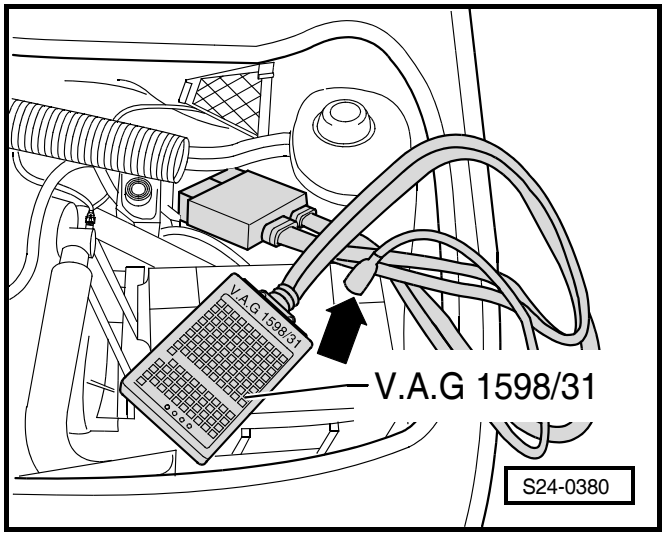
– Test the data BUS cables for short-circuits.

– To this end perform a resistance measurement between the test box bushes ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

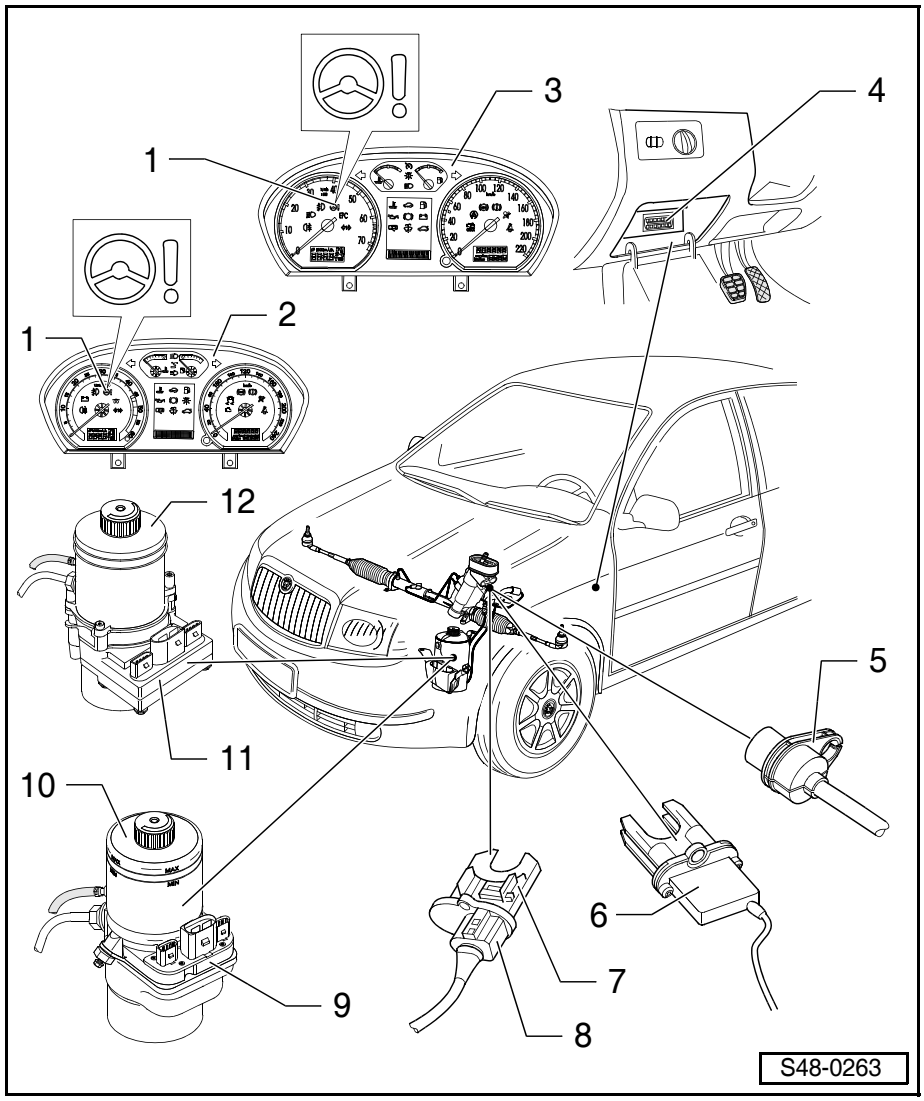
  Nominal value: ∞ Ω

If the nominal value is reached (there is no short-circuit between the cables):

– Test the data BUS cables for a short-circuit to the positive battery terminal or earth or for interruption ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.



48-28 Electric/Electronic components and fitting locations



1 - Servotronic warning light -K92-

- ❑ Fitting location: in the dash panel insert
- ❑ Operation:

The servotronic warning light

- ♦ lights up until the engine starts
- ♦ if it does not go out, faults may have been stored

- ❑ Perform self-diagnosis ⇒ Chap. 48-25

2 - Dash panel insert up to model year 2004

3 - Dash panel insert as of model year 2005

4 - Diagnostic connection

- ❑ Fitting location: in the storage area on the driver's side

5 - The power-steering sensor -G250- (KOYO)

- ❑ Fitting location: in the valve dome of the power-steering gear
- ❑ Operation:
  - ♦ Determining the steering-wheel angle and calculating the steering angle speed
  - ♦ if the sensor fails the power steering switches to programmed emergency operation, the steering function is guaranteed, but the steering effort becomes greater
  - ♦ Malfunctions of the sensor are stored in the power steering control unit -J500-
- ❑ Perform self-diagnosis ⇒ Chap. 48-25
- ❑ removing and installing ⇒ Chapter 48-13
- ❑ assignment ⇒ Spare part catalogue

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

- ❑ with fixed connecting line
- ❑ Fitting location: in the valve dome of the power-steering gear
- ❑ Operation:
  - ♦ Determining the steering-wheel angle and calculating the steering angle speed
  - ♦ if the sensor fails the power steering switches to programmed emergency operation, the steering function is guaranteed, but the steering effort becomes greater
  - ♦ Malfunctions of the sensor are stored in the power steering control unit -J500-
- ❑ Perform self-diagnosis ⇒ Chap. 48-25
- ❑ removing and installing ⇒ Chapter 48-13
- ❑ assignment ⇒ Spare part catalogue

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

- ❑ with adapter cable
- ❑ Fitting location: in the valve dome of the power-steering gear
- ❑ Operation:

- ♦ Determining the steering-wheel angle and calculating the steering angle speed
- ♦ if the sensor fails the power steering switches to programmed emergency operation, the steering function is guaranteed, but the steering effort becomes greater
- ♦ Malfunctions of the sensor are stored in the power steering control unit -J500-

❑ Perform self-diagnosis ⇒ Chap. 48-25
❑ removing and installing ⇒ Chapter 48-13
❑ assignment ⇒ Spare part catalogue

8 - Adapter cable

❑ for power-steering sensor -G250- ⇒ item 7

9 - Power-assisted steering control unit -J500-

❑ Fitting location: integrated in the engine pump aggregate ⇒ item 10
❑ Operation:

- ♦ To convert the signals for driving the gear pump in function of the steering angle speed and the vehicle speed.
- ♦ Re-engaging protection after faults
- ♦ Temperature protection for power steering
- ♦ detects faults during operation and stores them in a permanent memory

❑ Perform self-diagnosis ⇒ Chap. 48-25
❑ Power steering control unit -J500- cannot be replaced individually; replace the engine pump aggregate ⇒ Chap. 48-20

10 - Engine pump aggregate (TRW)

❑ removing and installing ⇒ Chapter 48-20

11 - Power-assisted steering control unit -J500-

❑ Fitting location: integrated in the engine pump aggregate ⇒ item 12
❑ Operation:

- ♦ To convert the signals for driving the gear pump in function of the steering angle speed and the vehicle speed.
- ♦ Re-engaging protection after faults
- ♦ Temperature protection for power steering
- ♦ detects faults during operation and stores them in a permanent memory

❑ Perform self-diagnosis ⇒ Chap. 48-25
❑ Power steering control unit -J500- cannot be replaced individually; replace the engine pump aggregate ⇒ Chap. 48-20

12 - Engine pump aggregate (KOYO)

❑ removing and installing ⇒ Chapter 48-20