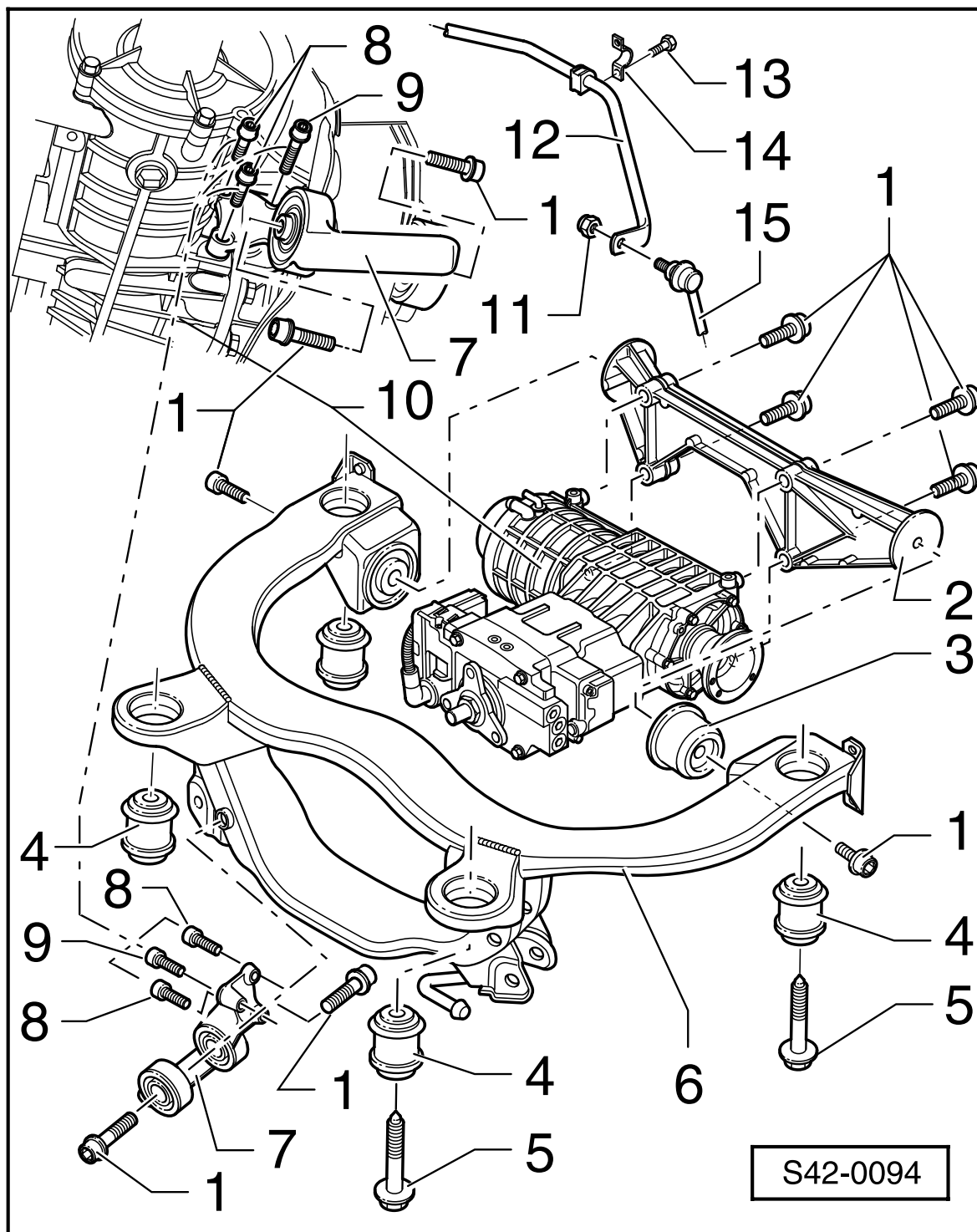


Assembly overview for subframe and final drive



1 - Internally serrated bolt, 60 Nm

2 - Cross member

3 - Bonded rubber bush for final drive

- ◆ Removing and installing
⇒ page 42-68
- ◆ Pay attention to installation position:
kidney-shaped openings and arrow
must point up or down

4 - Bonded rubber bush for subframe

- ◆ Is supplied as replacement part in a
sealed plastic bag
- ◆ Do not fit bonded rubber bushes which
have been stored unwrapped
- ◆ Removing and installing ⇒ page 42-66
- ◆ Pay attention to installation position:
ribbed side must face up

5 - Hexagon bolt, 110 Nm + 90°

- ◆ Replace each time removed

6 - Subframe

- ◆ Removing and installing
⇒ page 42-61

7 - Support for final drive**8 - Hexagon socket bolt, 40 Nm + 45°**

- ◆ M10 x 40
- ◆ Replace each time removed

9 - Hexagon socket bolt, 40 Nm + 45°

- ◆ M10 x 55
- ◆ Replace each time removed

10 - Final drive

- ◆ Removing and installing

⇒ 5-Speed Manual Gearbox 02C 4x4; Repair Group 39; Removing and installing rear final drive

11 - Self-locking nut, 25 Nm

- ◆ Replace each time removed

12 - Anti-roll bar**13 - Hexagon bolt, 20 Nm**

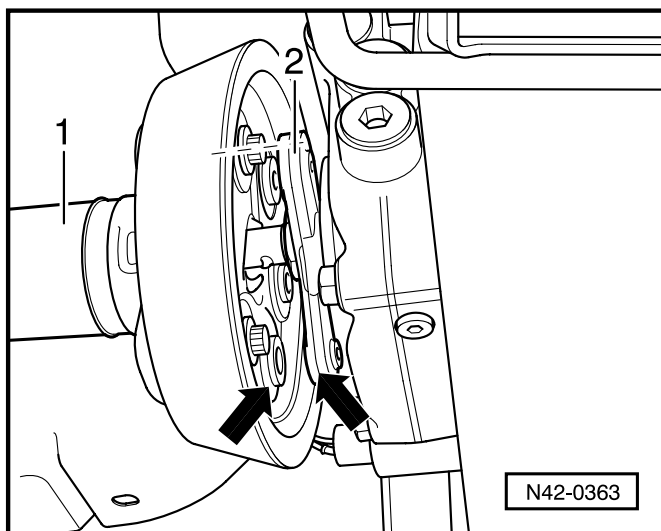
- ◆ Insert both bolts, tighten initially to 5 Nm, and then tighten fully

14 - Clip**15 - Coupling rod****Removing and installing subframe with final drive****Special tools, testers and aids required**

- ◆ Gearbox lift, e.g. V.A.G 1383 A
- ◆ Attachment, e.g. T10031

Removing

- Raise vehicle.
- Take off wheel.
- Remove coil spring ⇒ page 42-35.
- Open double pipe clamp downstream of catalytic converter and remove rear part of exhaust system.
- Remove the heat shield of the rear silencer.

**Note:**

After unbolting the propshaft, it is essential to mark the installation position. If the propshaft is installed incorrectly, the imbalance will be too large.

- ◀ - Unbolt the propshaft from the final drive.

1 - Propshaft with balancing shaft

2 - Flange for propshaft

Do not twist propshaft or flange for propshaft.

- Mark installation position of propshaft to flange for propshaft -arrows-.

- Lower vehicle.

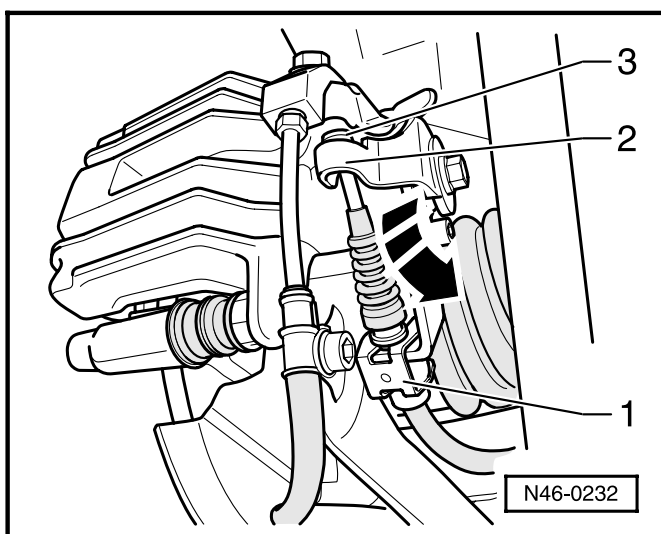
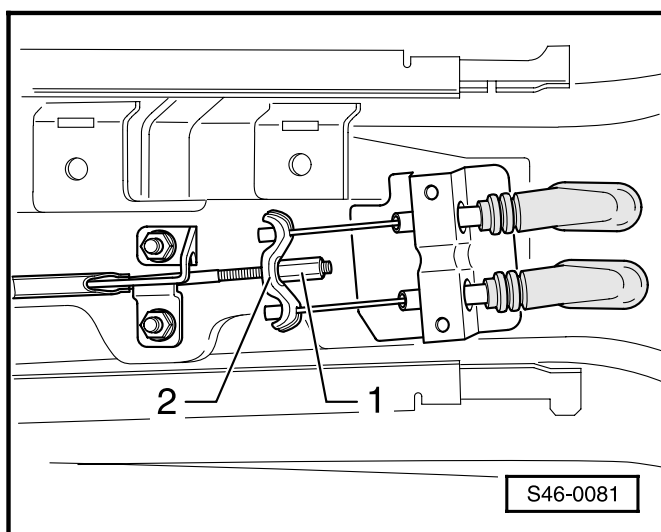
- Remove rear centre console.

⇒ Body Fitting Work; Repair Group 68; Interior Equipment

- Release handbrake.

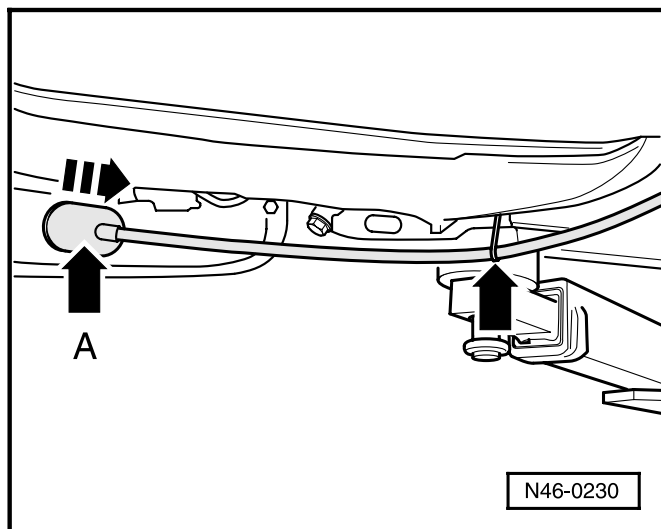
- ◀ - Slacken adjusting nut -1- sufficiently until it is possible to release the handbrake cable from the compensating bar -2-.

- Raise vehicle.



- ◀ - Use a screwdriver to lever out clip -1- and pull down and off.

- Press brake lever -2- in direction of arrow and release handbrake cable -3-.

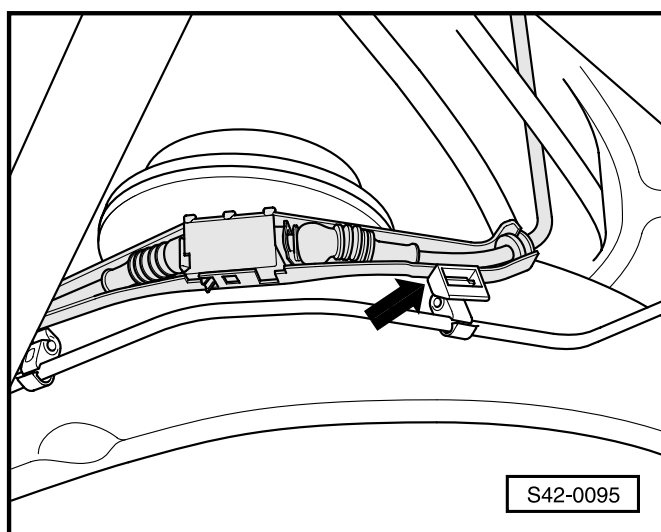


- ◀ - Remove rubber grommet -arrow A- from the trailing arm.

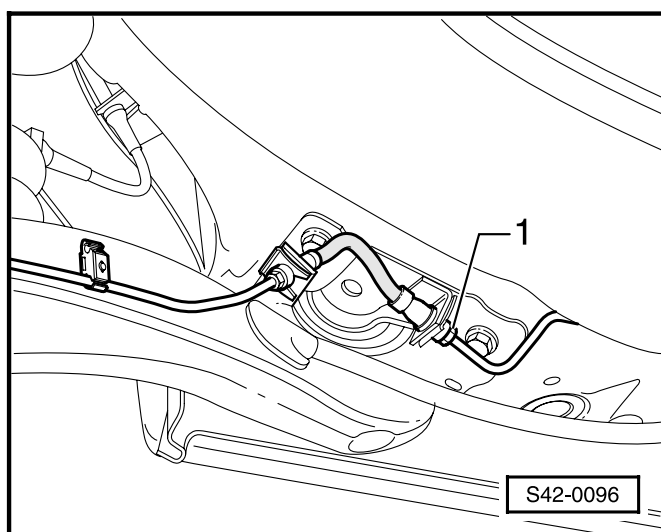
Note:

If the subframe is only to be lowered, e.g. for replacing the bonded rubber bush, it is not necessary to pull the handbrake cables out of the trailing arm.

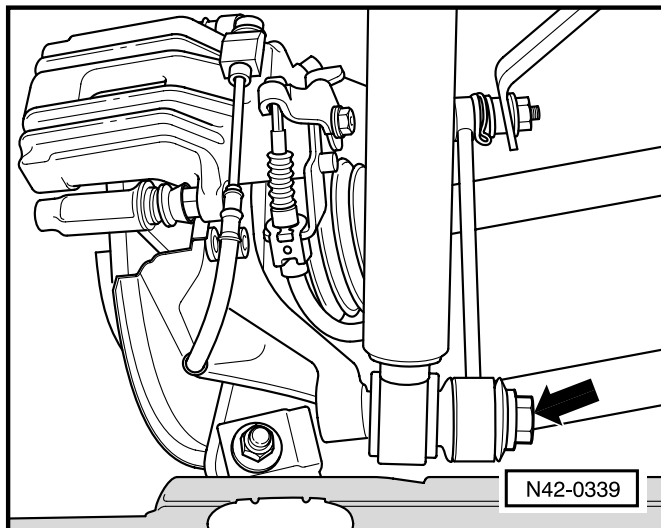
- Detach handbrake cable from fixture -arrow- and pull it out of trailing arm in direction of arrow.



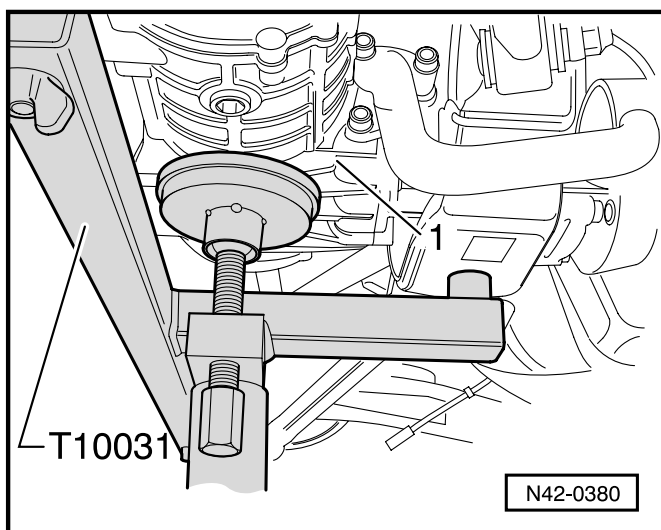
- ◀ - Unclip cable for wheel speed sensor from fixture -arrow-.
- Remove ABS wheel speed sensor from trailing arm housing.



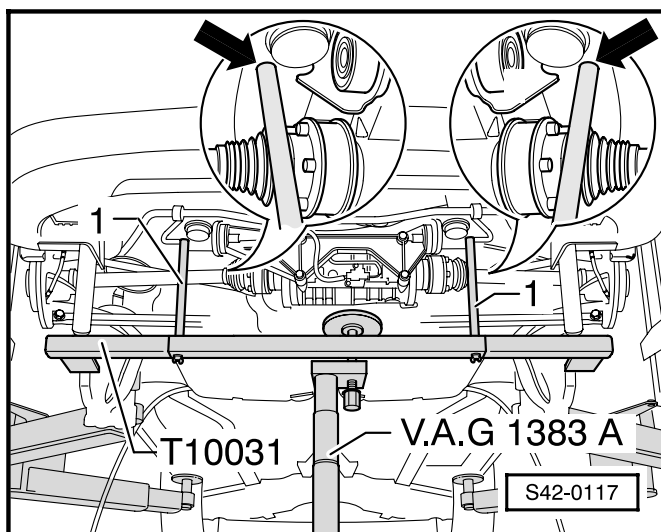
- ◀ - Separate brake lines at the pipe union -1-.
- Seal brake lines.



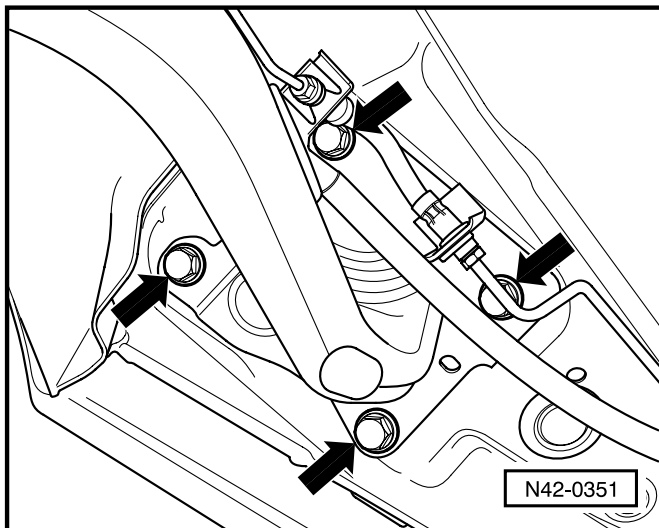
- ◀ - Unscrew bottom bolt for shock absorber -arrow-.



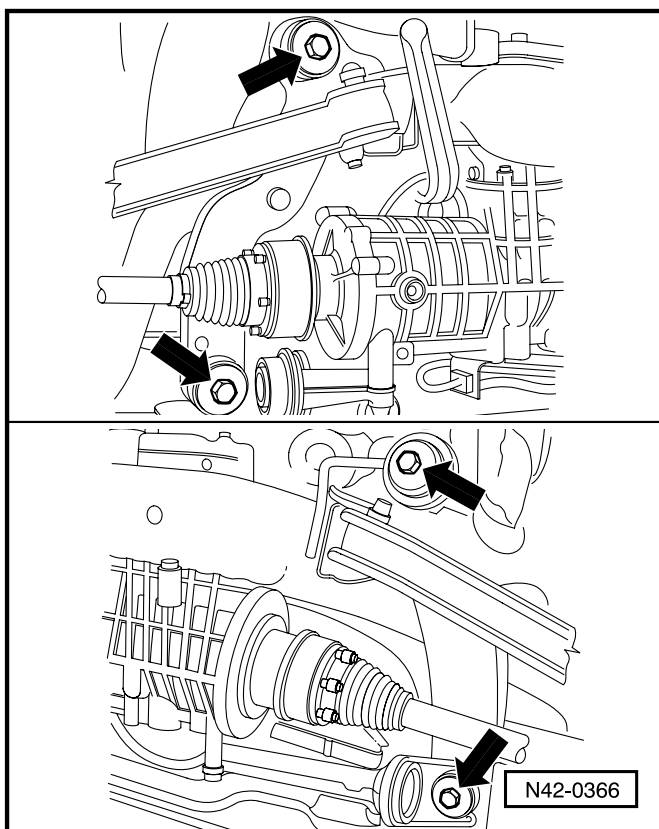
- ◀ - Place gearbox lift together with attachment, e.g. V.A.G 1383 A with T10031, below the final drive -1-.



- ◀ - Insert the pins -1- into the holes of the subframe -arrows-.
- Separate vacuum line and electric cable.



- Mark the installation position of the bearing bracket at the body.
- ◀ - Unbolt the bearing bracket from the body -arrows-.



- ◀ - Unscrew bolts for subframe -arrows-.
- Slowly lower rear suspension with gearbox lift and attachment, e.g. V.A.G 1383 A with T10031.

Installing

Installation is carried out in the reverse order.

- Tighten the bolts for the subframe and the bearing brackets fully at the marked installation position.
- Bleed brake system ⇒ page 47-18.
- Adjust handbrake ⇒ page 46-29.

After installing, inspect camber and wheel toe on axle alignment stand, and set if necessary ⇒ page 44-1.

Tightening torques:

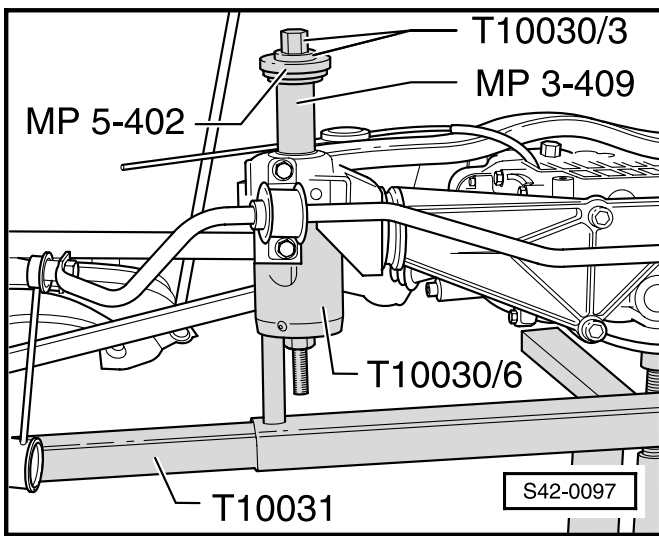
Bearing bracket to body Use new bolts!	75 Nm
Subframe to body Use new bolts!	110 Nm + 90°
Propshaft to final drive	60 Nm
Shock absorber to trailing arm Vehicle must be standing on its wheels and one person seated on the rear seat for this step.	110 Nm
Pipe union of brake line	14 Nm
Wheel bolt	120 Nm

Removing and installing bonded rubber bush for subframe

Special tools, testers and aids required

- ◆ Pipe section MP 3-409
- ◆ Assembly device MP 5-402
- ◆ Assembly device T10030

Removing

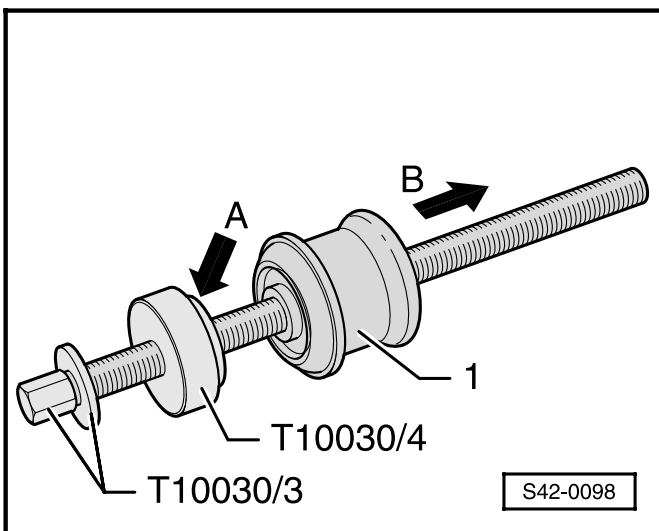


- Raise vehicle.
- Take off wheels.
- Remove coil spring ⇒ page 42-35.
- Remove subframe together with final drive ⇒ page 42-61.
- ◀ - Install the special tools.
- Pull out the bonded rubber bush by turning the spindle.

Installing

Notes:

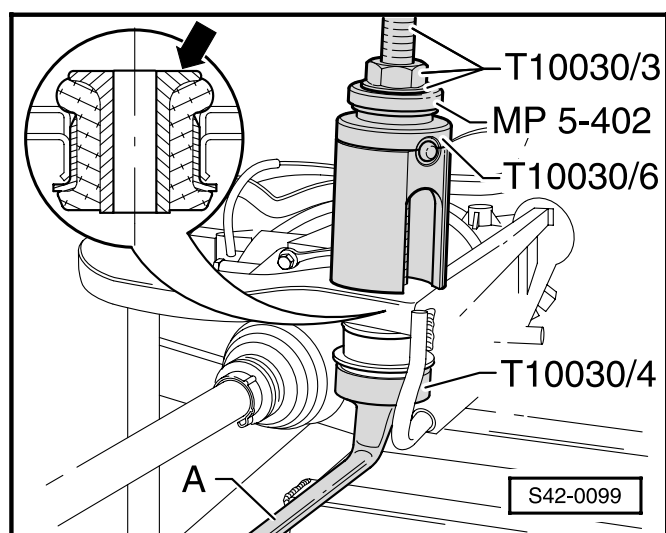
- ◆ The bonded rubber bushes are supplied as replacement parts in a sealed plastic bag.
- ◆ Do not use bonded rubber bushes which have been stored unwrapped!



- ◀ - Fit together special tools and the bonded rubber bush.

The ribbed side must point in direction -arrow B- to ensure the bonded rubber bush is correctly installed in the subframe.

Shoulder of special tool T10030/4 -arrow A- points toward bonded rubber bush -1-.



- Coat the bonded rubber bush with water, if necessary, for drawing in.
- ◀ - Now, place the bonded rubber bush and the special tools against the subframe.
- Draw in the bonded rubber bush by turning the spindle.

Ribbed side of the bonded rubber bush must point up -arrow-.

A - Ring wrench

Note:

The spindle must be inserted from below for drawing the front bonded rubber bushes at the subframe out and in.

Further installation is carried out in the reverse order.

- Install subframe together with final drive
⇒ page 42-61.
- Bleed brake system ⇒ page 47-18.
- Adjust handbrake ⇒ page 46-29.

After installing, inspect camber and wheel toe on axle alignment stand, and set if necessary ⇒ page 44-1.

Tightening torques:

Bearing bracket to body	75 Nm
Use new bolts!	
Subframe to body	110 Nm + 90°
Use new bolts!	
Propshaft to final drive	60 Nm
Shock absorber to trailing arm	110 Nm
Vehicle must be standing on its wheels and one person sitting on the rear seat for this step.	
Pipe union of brake line	14 Nm
Wheel bolt	120 Nm

Removing and installing bonded rubber bush for final drive

Special tools, testers and aids required

- ◆ Assembly device MP 5-401
- ◆ Assembly device MP 5-402
- ◆ Assembly device T10030
- ◆ Assembly device T30016

- Raise vehicle.
- Take off wheels.
- Remove coil spring ⇒ page 42-35.

- ◀ - Remove subframe together with final drive ⇒ page 42-61.

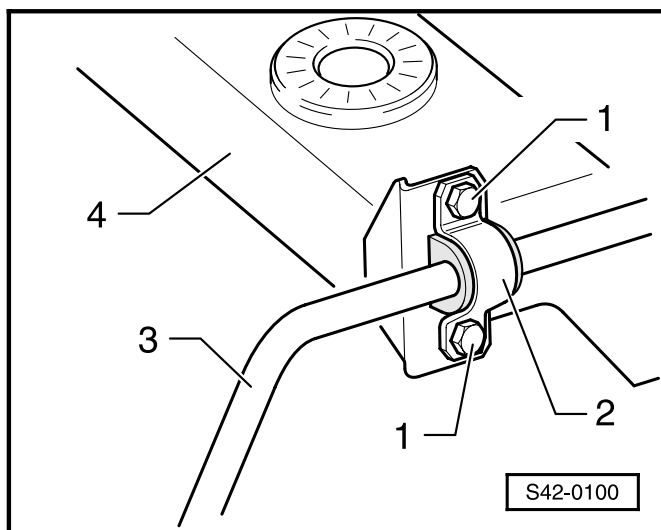
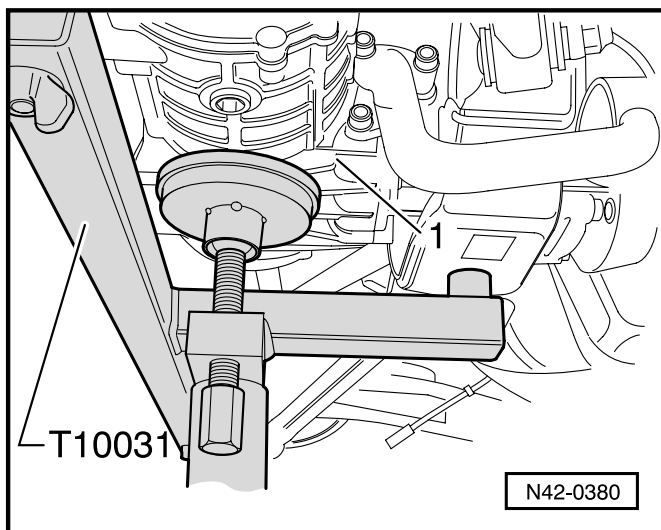
Use gearbox lift with attachment, e.g. V.A.G 1383 A with T10031, for this step.

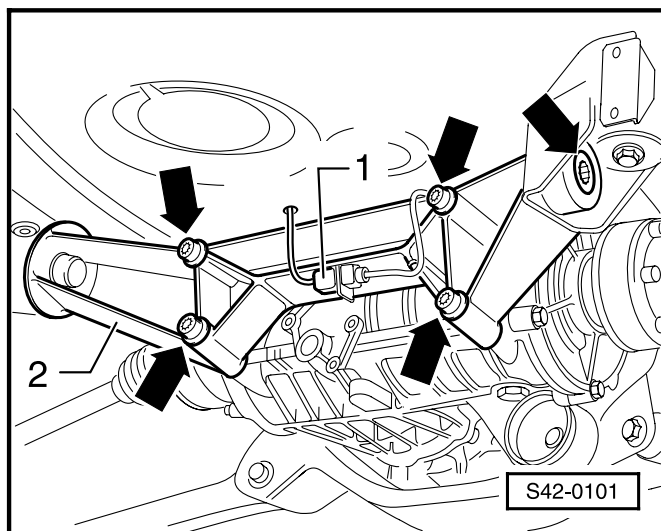
- Support the final drive -1-.

Note:

The surrounding area is not shown in Fig. S42-0100 to simplify the illustration.

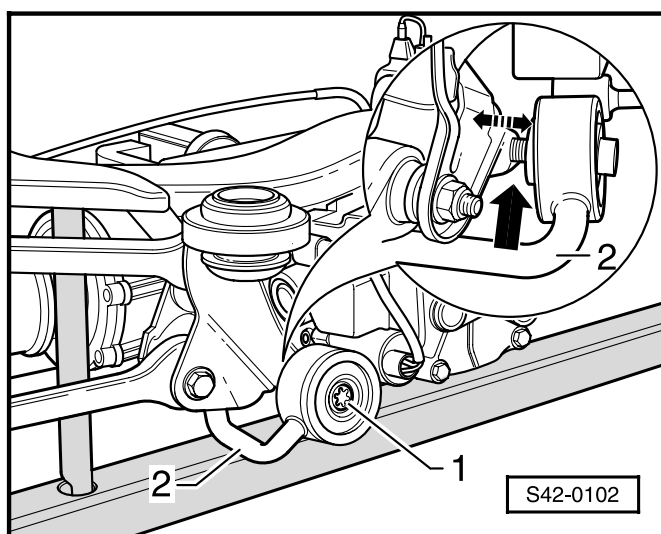
- ◀ - Remove anti-roll bar -3-, if necessary.
 - Unscrew bolts -1-.
 - Take off clamp -2- and anti-roll bar together with bush and coupling rod.
- 4 - Subframe



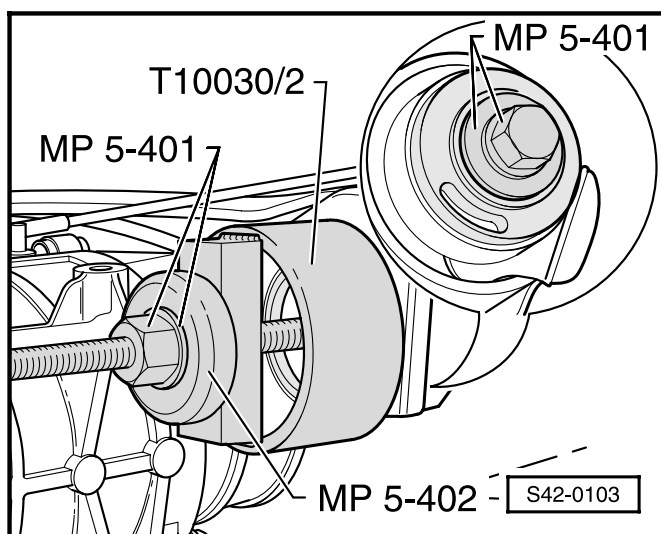
**Note:**

The surrounding area is not shown in Fig. S42-0101 to simplify the illustration.

- ◀ - Detach the plug connection -1- from the bracket.
- Unscrew the internally serrated bolts -arrows-.
- Take the cross member -2- off the final drive.



- ◀ - Slacken the internally serrated bolts -1- of the final drive support -2- on both sides.
- Move the final drive by about 15 to 20 mm -arrow-.



- ◀ - Install the special tools.
- Draw the bonded rubber bush out by turning the spindle.

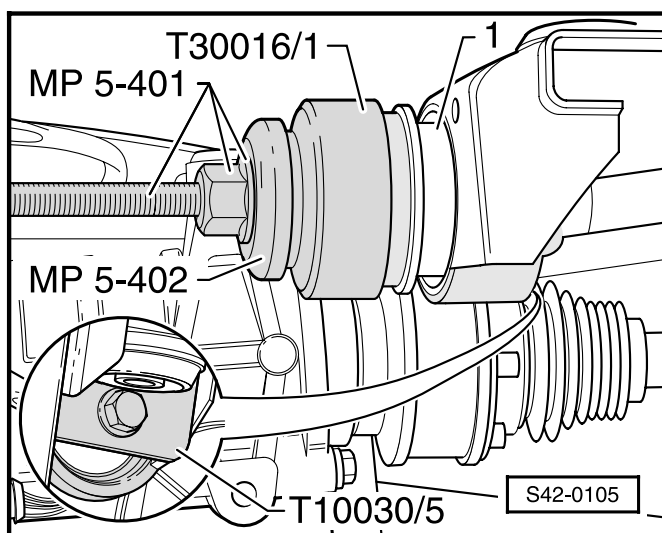
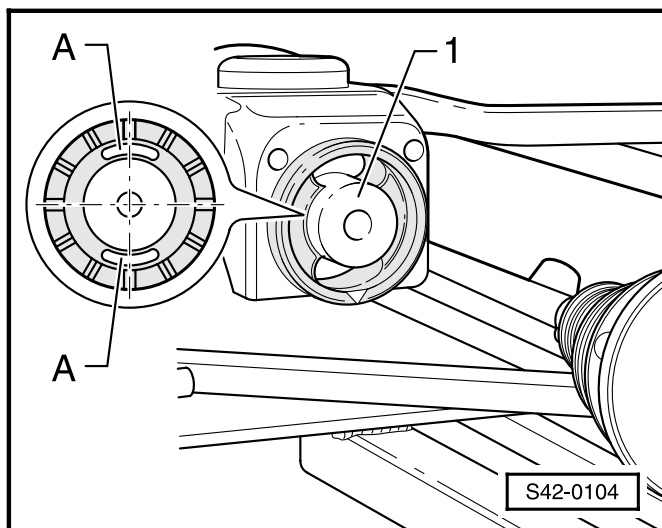
Installing

Installation position of bonded rubber bush

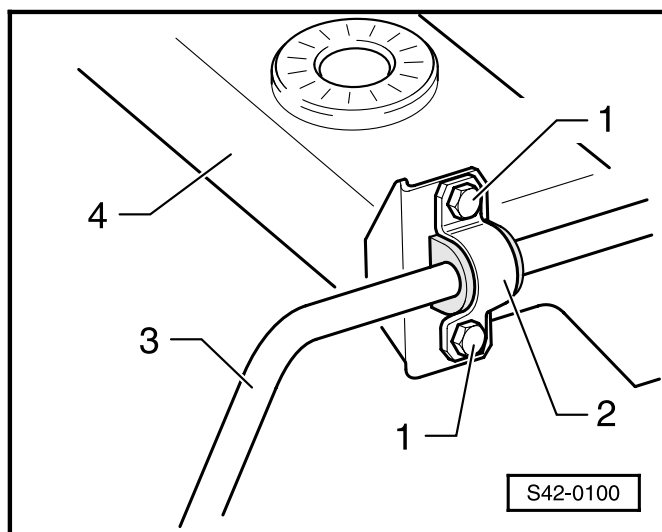
- ◀ The kidney-shaped openings -A- and the arrow on the bonded rubber bush -1- must be pointing up or down.

Variation from vertical of $\pm 2^\circ$ permissible.

- Coat the bonded rubber bush with water, if necessary, for drawing in.



- ◀ - Install the special tools.
- 1 - Bonded rubber bush
- Draw in the bonded rubber bush by turning the spindle.
 - Install subframe together with final drive
⇒ page 42-61.



- ◀ - If removed, install anti-roll bar -3- together with coupling rod. 2nd person required for this step.
- Place clamp -2- onto the bearing, insert both bolts -1- and tighten initially to 5 Nm.
 - Tighten both bolts finally to the specified tightening torque.
- 4 - Subframe

Further installation is carried out in the reverse order.

- Bleed brake system ⇒ page 47-18.
- Adjust handbrake ⇒ page 46-29.

After installing, inspect camber and wheel toe on axle alignment stand, and set if necessary ⇒ page 44-1.

Tightening torques:

Bearing bracket to body Use new bolts!	75 Nm
Subframe to body Use new bolts!	110 Nm + 90°
Anti-roll bar to subframe	20 Nm
Propshaft to final drive	60 Nm
Shock absorber to trailing arm Vehicle must be standing on its wheels and one person sitting on the rear seat for this step.	110 Nm
Cross member for final drive to subframe	60 Nm
Support for final drive to subframe	60 Nm
Pipe union of brake line	14 Nm
Wheel bolt	120 Nm

Servicing drive shaft

Removing and installing drive shafts

Special tools, testers and aids required

- ◆ Release tool MP 6-425
- ◆ Torque wrench 75...400 Nm, e.g. 1576
- ◆ Torque angle wrench, e.g. V.A.G 1756

Removing

Notes:

- ◆ *No load should be acting on the wheel bearing when the twelve-point nut is slackened. If a load from the deadweight of the vehicle is acting on the wheel bearing, it will suffer initial damage and the wheel bearing life will thus be reduced.*
- ◆ *If it is necessary to move the vehicle on which the drive shaft has been taken out, first of all install an outer joint in place of the drive shaft and tighten to 50 Nm otherwise the wheel bearing will be damaged.*

Drive shaft assignment and marking

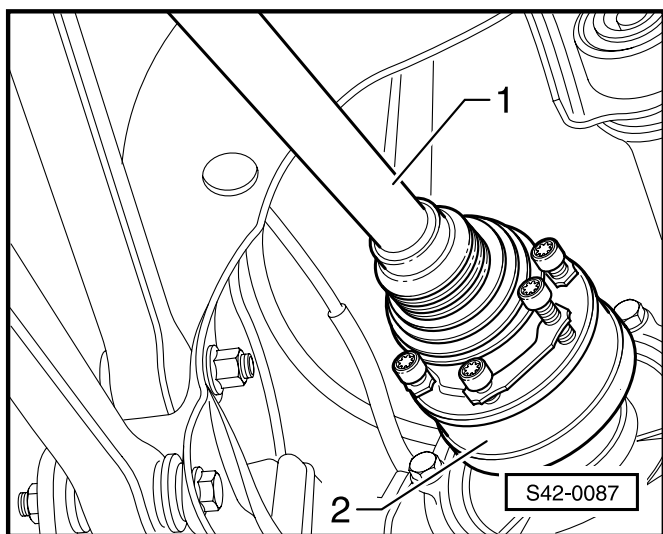
⇒ Parts List

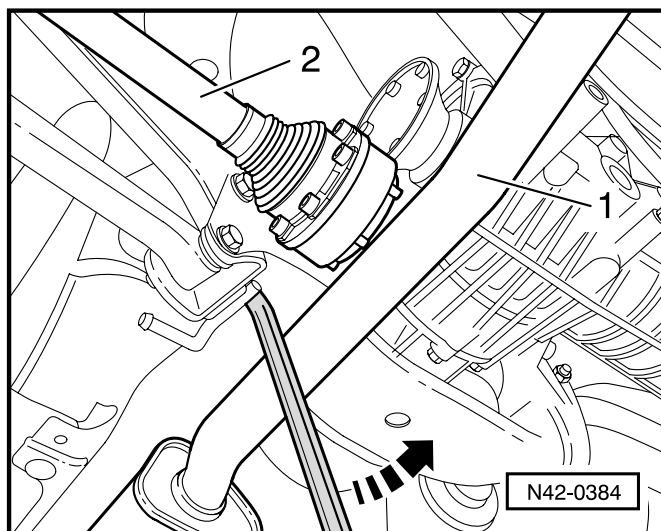
Left and right drive shafts

- Take off wheel trim; pull off cap of light alloy wheels (pulling hook in tool kit).
- Raise vehicle sufficiently to take the load off the rear axle.

The wheel must still be touching the ground.

- Slacken twelve-point nut.
- Raise vehicle to working height.
- ◀ - Unbolt drive shaft -1- from the flange shaft of the final drive -2-.





Left drive shaft

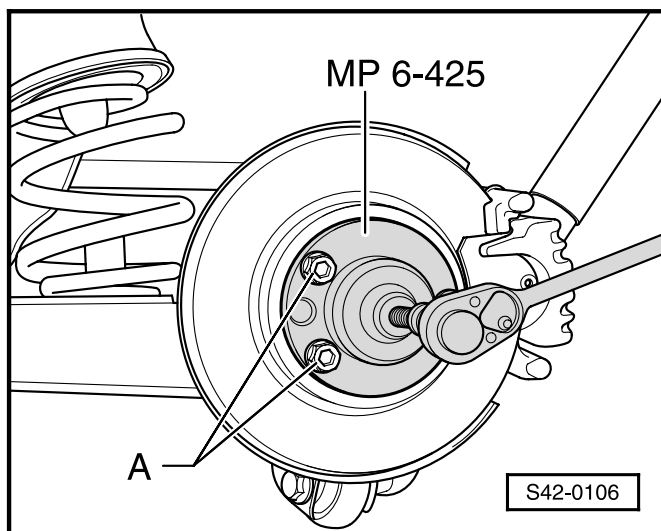
- ◀ - Use an assembly lever to press the exhaust system -1- to the side in direction of arrow.
- Take the inner joint of the drive shaft -2- off the final drive.

The further operations from this point on are now identical for both sides.

- Unscrew twelve-point nut.

Note:

- ◆ Ensure adequate clearance when pressing out the drive shaft.



- ◀ - Press out drive shaft.
- A - Wheel bolts
- Take out drive shaft.

Installing

- **Remove any varnish residues and/or corrosion present in the thread/spline of the outer joint.**
- Before inserting the drive shaft, moisten
 - ◆ the spline of the outer joint
 - ◆ the thread of the outer joint
 - ◆ the spline of the wheel hub
 - ◆ the contact surface and the thread of the new twelve-point nut
- with oil.
- Insert drive shaft.
- Insert outer joint as far as possible into the spline of the wheel hub.
- Draw outer joint sufficiently far into the wheel hub until outer joint is making contact with the wheel bearing by screwing on the new twelve-point nut.
- Position inner joint of drive shaft against the flange shaft of the final drive and tighten bolts fully to 40 Nm.

- Make sure when lowering the vehicle that the wheels do not touch the ground.

The wheel bearing will be damaged if the wheel bearings are burdened though the weight of the vehicle. The working life of the wheel bearing decreases through this.

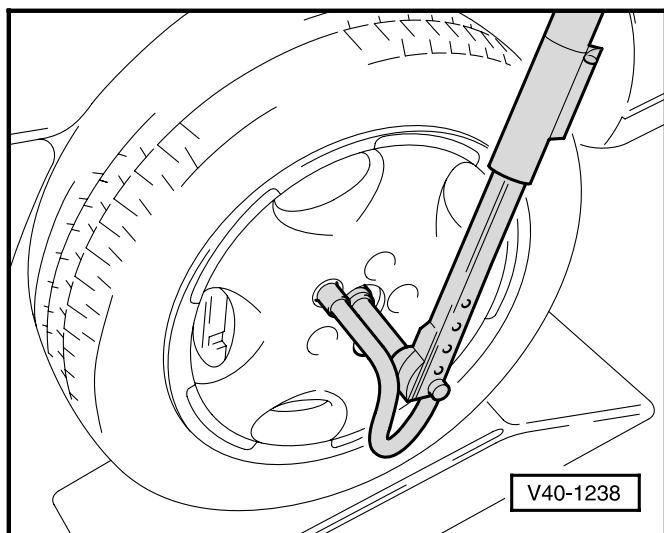
- Operate brake (second mechanic required) or tighten handbrake
- Tighten the new twelve-point nut with 250 Nm and slacken half a turn.
- Turn wheel hub at least 90°
- Tighten twelve-point nut:

Tightening torque:

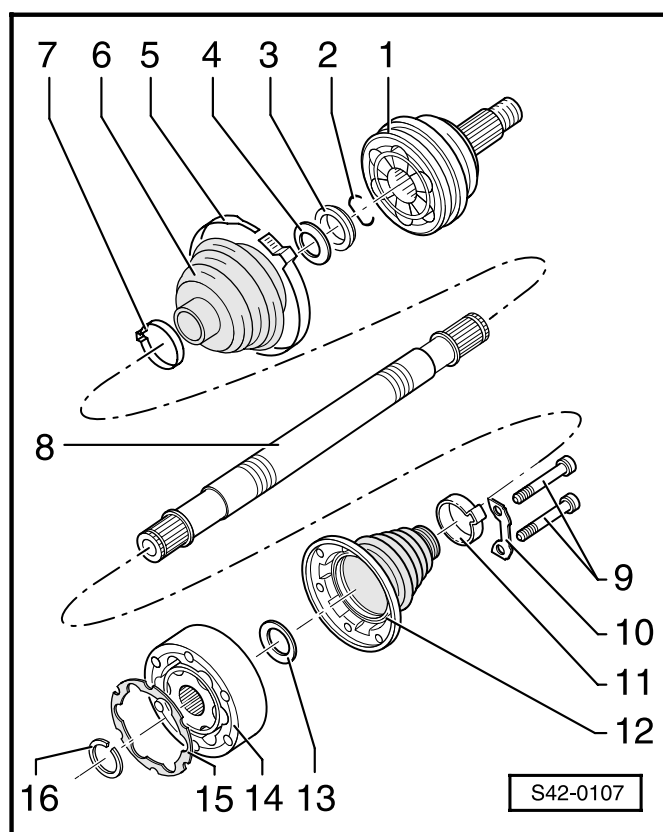
50 Nm and torque a further 60°

Note:

◀ It is recommended to use the torque wrench V.A.G 1756 for tightening the twelve-point nut.



Servicing drive shaft with CV joint



Special tools, testers and aids required

- ◆ Circlip pliers, e.g. VW 161 A
- ◆ Thrust plate MP 3-406
- ◆ Thrust plate MP 3-407
- ◆ Thrust plunger MP 3-448
- ◆ Supporting sleeve MP 6-428
- ◆ Clamping device MP 6-429
- ◆ Tensioning pliers, e.g. V.A.G 1682
- ◆ Torque wrench
- ◆ Workshop press, e.g. V.A.G 1290 A

Notes:

- ◆ *Assignment of drive shafts*
⇒ Spare Part catalogue
- ◆ *Grease joint if necessary, when replacing the joint boot*
- ◆ *Spread the grease filling evenly in the joint boot*

1 - Outer CV joint

- ◆ must be replaced completely
- ◆ removing ⇒ Fig. 1
- ◆ installing: drive onto the shaft with a plastic hammer until the compressed circlip expands
- ◆ grease ⇒ page 40-40
- ◆ inspecting ⇒ page 40-45

2 - Circlip

- ◆ replace
- ◆ insert in the groove on the shaft

3 - Thrust ring

- ◆ fitting location ⇒ Fig. 4

4 - Disc spring

- ◆ fitting location ⇒ Fig. 4

5 - Warm-type clamp

- ◆ replace
- ◆ tighten with tensioning pliers, e.g. V.A.G 1682 ⇒ Fig. 6

6 - Joint boot

- ◆ material: Hytel (Polyelastomere)
- ◆ inspecting for tears and chafing points

7 - Warm-type clamp

- ◆ replace
- ◆ tighten ⇒ Fig. 7

8 - Drive shaft (solid shaft)

- ◆ assignment ⇒ Spare Part catalogue

9 - Fillister head screw with internal serration, 40 Nm

- ◆ M8 x 48

10 - Shim

11 - Warm-type clamp

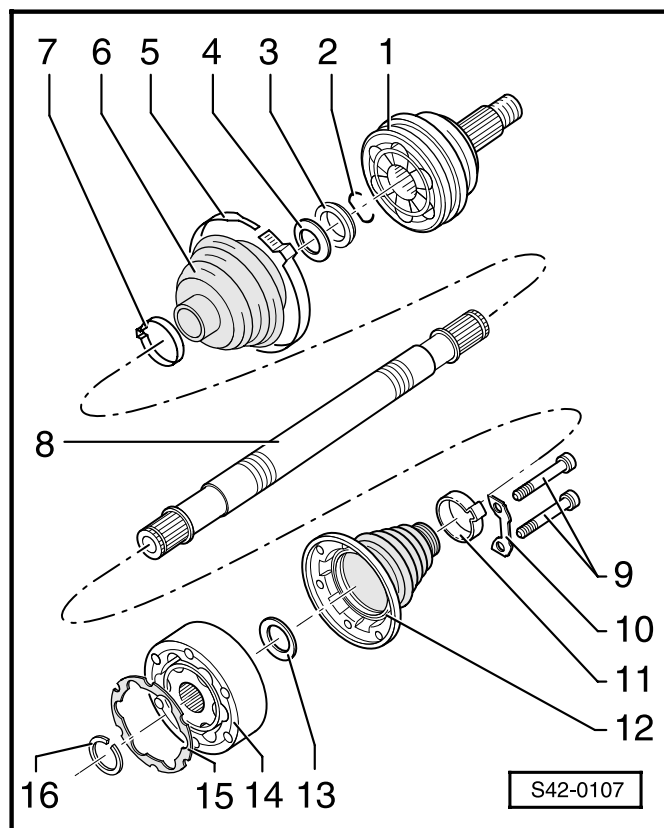
- ◆ replace
- ◆ tighten ⇒ Fig. 8

12 - Joint boot for inner CV joint

- ◆ material: Hytel (Polyelastomere)
- ◆ inspecting for tears and chafing points
- ◆ drive off with drift

13 - Disc spring

- ◆ fitting location ⇒ Fig. 3

**14 - Inner CV joint**

- ◆ always replace complete
- ◆ pressing off ⇒ Fig. 2
- ◆ pressing on ⇒ Fig. 5
- ◆ greasing ⇒ page 42-76
- ◆ inspecting ⇒ page 40-46

15 - Gasket

- ◆ bonded surface at CV joint must be free of oil and grease
- ◆ replace
- ◆ pull off protective sheet and stick gasket into inner joint

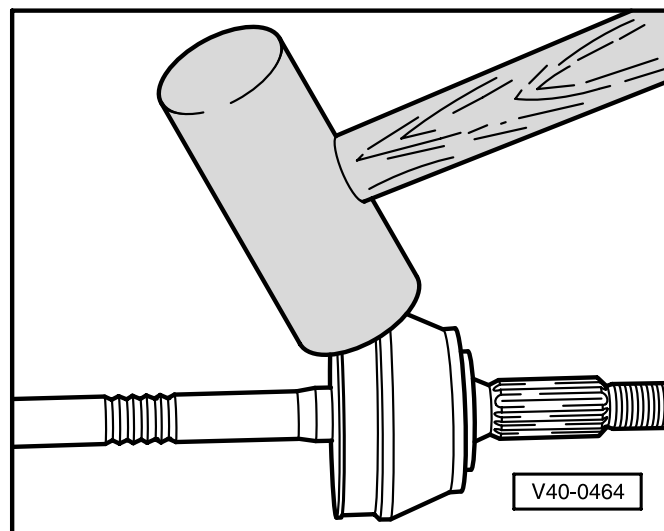
16 - Circlip

- ◆ replace
- ◆ use circlip pliers, e.g. VW 161 A, for removing and installing

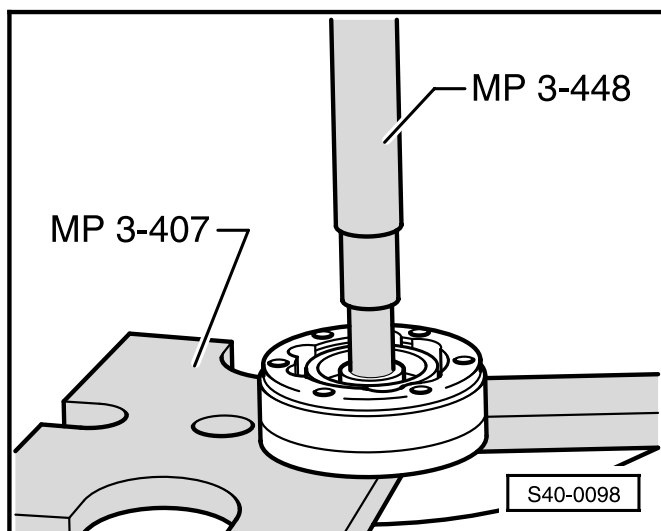
Grade and quantities of grease**Note:**

- ◆ CV joints are packed with normal-temperature grease, e.g. N 052 738.00.

Grease	Outer joint	of which in:	
	Total qty.	Joint	Joint boot
Ø mm	[g]	[g]	[g]
90	90	40	50
Inner joint			
100	120	50	70

**Fig. 1 Removing outer CV joint**

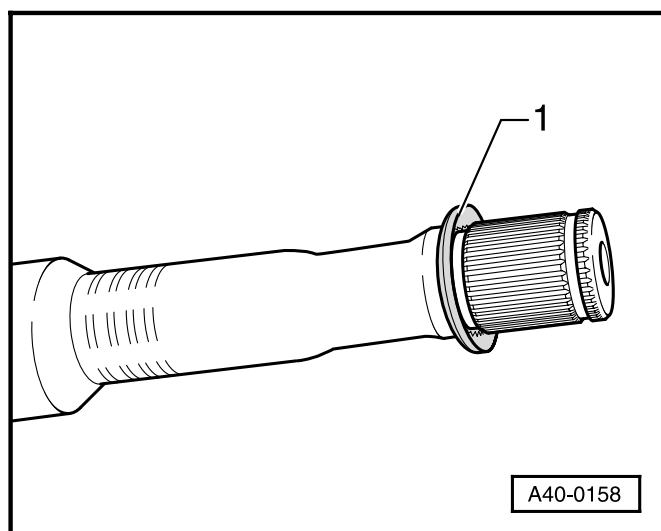
- Knock joint off drive shaft by striking firmly with a plastic-headed hammer.



◀ Fig. 2 Pressing off inner CV joint

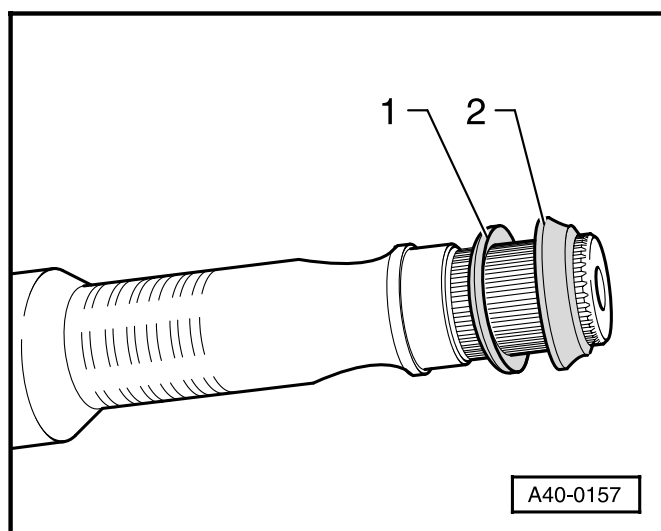
Notes:

- ♦ Knock joint boot off first of all with a drift.
- ♦ Support ball hub.



◀ Fig. 3 Installation position of dished washer at inner joint

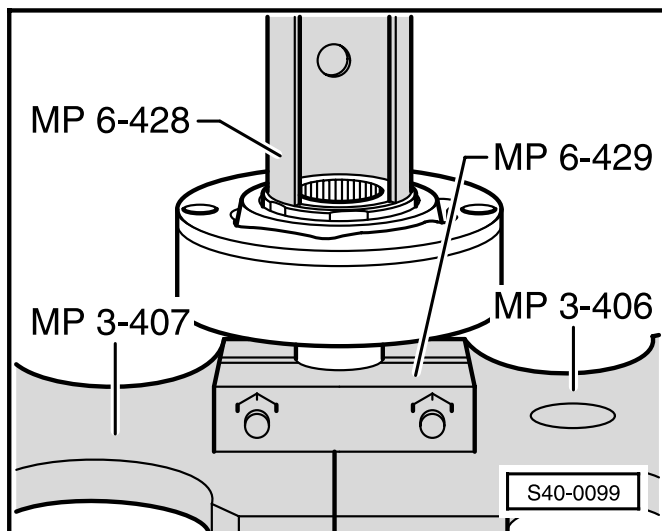
1 - Dished washer



◀ Fig. 4 Installation position of dished washer and thrust ring at outer joint

1 - Dished washer

2 - Thrust ring



◀ Fig. 5 Pressing in inner CV joint

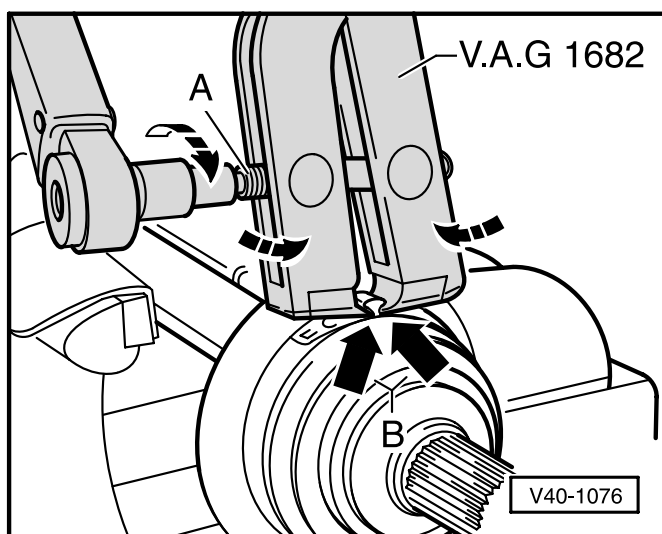
Note:

Chamfer on inner diameter of the ball hub (serration) must point toward the bearing collar of the drive shaft.

- Press in the joint up to the stop
- Compressing the circlip.

Notes:

- ♦ *In view of the hard material (as opposed to rubber) of the joint boot, which requires the use of a stainless steel warm-type clamp, it can only be tightened with tensioning pliers, e.g. V.A.G 1682.*
- ♦ *Tightening torque: 20 Nm*
- ♦ *Use a torque wrench.*
- ♦ *Make sure the thread of the spindle -A- of the tensioning pliers is smooth. If necessary grease with Molykote MOS₂.*
- ♦ *If it is not smooth, e.g. if the thread is dirty, the necessary tensioning force of the warm-type clamp is not reached at the given torque.*

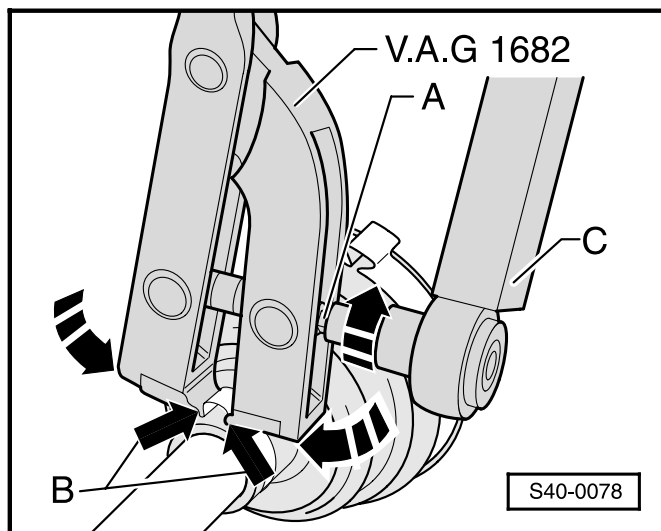


◀ Fig. 6 Tighten warm-type clamp at outer joint (large diameter)

- Position the tensioning pliers, e.g. V.A.G 1682, as shown in the Fig. Make sure the cutting edges of the pliers are positioned in the corners -arrows B- of the warm-type clamp.
- Tighten the warm-type clamp by turning the spindle with a torque wrench (do not tilt the pliers during this process).

A - Spindle of tensioning pliers

B - Cutting edges of tensioning pliers



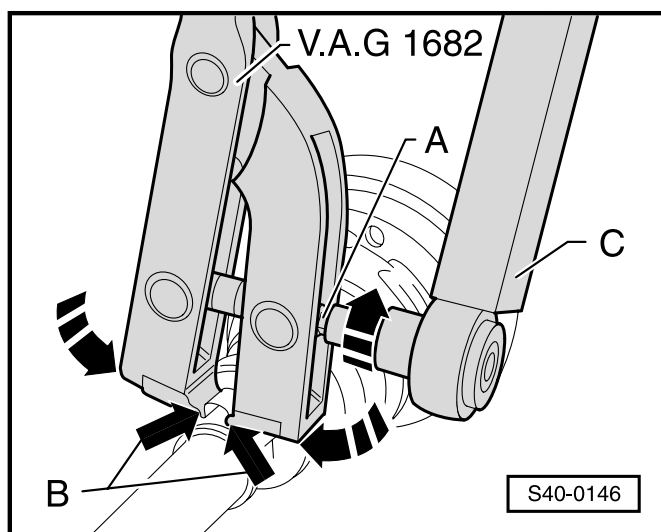
◀ Fig. 7 Tighten warm-type clamp at outer joint (small diameter)

- Position the tensioning pliers, e.g. V.A.G 1682, as shown in the Fig. Make sure the cutting edges of the pliers are positioned in the corners -arrows B- of the warm-type clamp.
- Tighten the warm-type clamp by turning the spindle with a torque wrench (do not tilt the pliers during this process).

A - Spindle of tensioning pliers

B - Cutting edges of tensioning pliers

C - Torque wrench



◀ Fig. 8 Tighten warm-type clamp at inner joint

- Position the tensioning pliers, e.g. V.A.G 1682, as shown in the Fig. Make sure the cutting edges of the pliers are positioned in the corners -arrows B- of the warm-type clamp.
- Tighten the warm-type clamp by turning the spindle with a torque wrench (do not tilt the pliers during this process).

A - Spindle of tensioning pliers

B - Cutting edges of tensioning pliers

C - Torque wrench

Vehicle measurement

General points

The vehicle must only be measured up using an axle measuring device which is authorised for use by the vehicle manufacturer!

We recommend that one measures the front and the rear axle during every vehicle measurement operation.

Correct driving behaviour cannot be guaranteed otherwise!

Comments:

- ◆ *It is only meaningful to measure up the vehicle once it has driven its first 1000 to 2000 km. since it is only then that the helical springs have settled into place.*
- ◆ *One should always seek to precisely obtain the nominal values in each case when making adjustments.*
- ◆ *The „basic setting“ should be undertaken after measuring up the axles on vehicles with ESP, Function 04, Group 060 ⇒ Page 45-124.*

If the installed position of the rear axle and thus the running direction of the vehicle is not taken into account then a tilted steering wheel can be the result.

Removing and installing the steering wheel
⇒ Body work; Re. Gr. 69

The necessity for undertaking a vehicle measurement exists when:

- ◆ There is some deficiency in the driving characteristics of the vehicle;
- ◆ There is damage to the vehicle due to an accident and parts had to be replaced;
- ◆ Parts of the axle have been removed;
- ◆ There is one-sided wear on the tyres.

Component on the front axle replaced	Measurement necessary		Component on the rear axle replaced	Measurement necessary	
	Yes	No		Yes	No
Axle guide	X		Shock absorber		X
Wheel bearing housing	X		Helical spring		X
Track rod/track rod end	X		Rear axle complete	X	
Steering gear	X		Assembly carrier ¹⁾	X	
Assembly carrier	X		Transverse control arm below ¹⁾ Transverse control arm above ¹⁾	X	
Suspension strut	X		Trailing arm ¹⁾	X	

¹⁾ Only for vehicles with four-wheel drive

Conditions for performing checking and tests

- Establishment of the chassis design according to the vehicle data carrier
⇒ Page 00-4

- The wheel suspension, wheel bearings, steering and steering linkage have been checked for inadmissibility high levels of play and damage and have been repaired if necessary.

- The tyre pressure has been checked and corrected as necessary.

⇒ Inspection and Maintenance; or a sticker on the vehicle

- The tyre profiles have been checked. The difference between the left and right hand tyres on a given axle should not exceed 2 mm.

- The empty weight of the vehicle has been checked according to the vehicles papers.

Empty weight:

The weight of a ready-to-operate vehicle with a fully filled fuel tank as well as the water reservoir for the windscreen/headlight washing system, spare wheel, tools and lifting jack must be at the position specified by the vehicle manufacturer.

- The vehicle is aligned, rocked a number of times to settle the springs and settled.
- Make sure that no sliding base and turning plate has reached its end position during the measurement process.
- The steering wheel must be in the position required to drive straight ahead.

Attention!

- For correct fitting and adjustment of the wheel-alignment analyser, strictly adhere to the operating instructions of the equipment manufacturer!

If necessary, ask the manufacturer of your wheel-alignment analyser to instruct you on its use.

The wheel-alignment platform and wheel-alignment analyser/analysing computer may in the course of time vary from their original levelling/setting.

The wheel-alignment platform and wheel-alignment analyser/analysing computer should at least once per year, as part of the routine maintenance, be checked and if necessary adjusted in accordance with the data specified in the operating instructions of the equipment manufacturer!

These highly sensitive apparatus should be treated carefully and scrupulously!

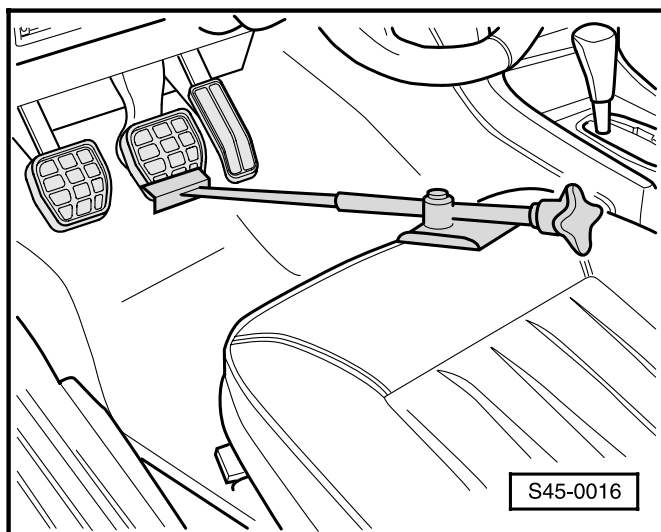
Measuring preparations

The lateral rim runout present must be compensated, otherwise an incorrect measurement result is obtained.

A correct toe-in setting is not possible without rim runout compensation!

Make sure to observe the relevant instructions of the wheel-alignment analyser manufacturer.

- Perform rim runout compensation.
- Lower vehicle and bounce.
- ◀ - Use brake-pedal arrester, e.g. V.A.G 1238 /B.



Overview of procedure for checking vehicle alignment

It is essential to observe the following sequence of steps!

1 - Find out which suspension is fitted to the vehicle.
You can find this information on the vehicle data sticker ⇒ page 00-4.

2 - Inspect camber at front suspension, centre if necessary ⇒ page 44-2.4.

3 - Inspect camber at rear suspension
⇒ page 44-2.5.

4 - Inspect toe at rear suspension, centre/set if necessary ⇒ page 44-2.5.

FWD models:

The toe of the rear suspension cannot be set, but only centred.

4x4 models:

The toe of the rear suspension can be set.

5 - Inspect toe at front suspension, set if necessary ⇒ page 44-2.6.

The following general rule applies!

If one of the measurements obtained is not within the tolerance, it is necessary to check the lateral inclination of the vehicle before carrying out the setting ⇒ page 44-2.3.

Suspension designations

⇒ page 00-4

Specifications for vehicle alignment

◆ Specifications for front suspension
⇒ page 00-1

◆ Specifications for rear suspension
⇒ page 00-3 and page 00-3.2

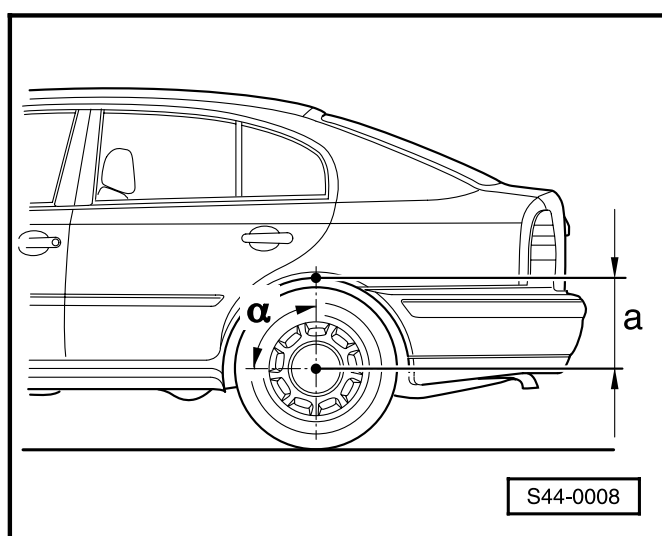
Inspecting the vehicle's transversal inclination

“Zero position” transversal inclination of vehicle

If the measured values fall outside the tolerances of the front and rear axle nominal values ($\Rightarrow$ page 00-1), this may be caused by the inclined position of the vehicle.

Right-hand drive vehicles or vehicles with automatic transmission may exhibit a slight inclination.

This is normal and is due to the fitting position of the assemblies and the associated weight transfer.



- Bounce vehicle several times and allow to settle.

Note:

Dimension “a” to be determined only on the rear axle.

- Determining dimension “a” for the left and right vehicle side.

a_{left} - left vehicle side

a_{right} - right vehicle side

$\alpha = 90^\circ$

- Compare dimensions a_{left} and a_{right} .

The deviation between a_{left} and a_{right} should not exceed ± 5.0 mm in either direction.

- Correct deviations that fall outside the ± 5.0 mm tolerance.

If the positive tolerance is exceeded, e.g. + 8.0 mm, the deviation shall be corrected on the rear axle by placing weights in the bootspace on the relevant side.

If the negative tolerance is exceeded, e.g. -8.0mm, the deviation shall be corrected on the front axle by placing weights on the relevant suspension strut dome in the boot-space

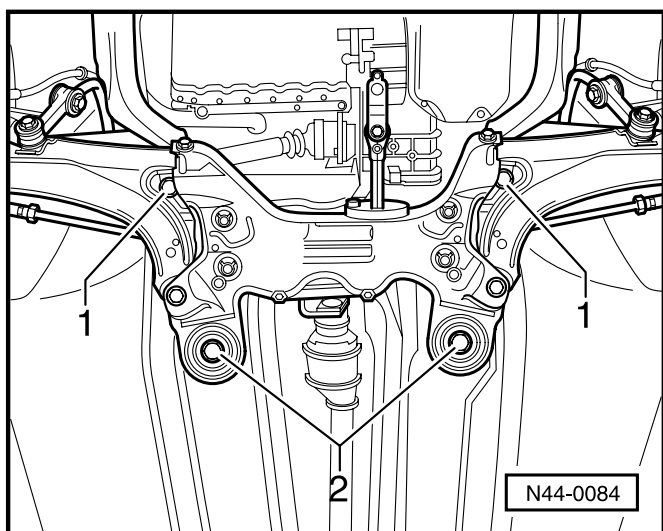
Sandbags of approx. 10 kg can be used as weight.

Inspecting front suspension camber, center if necessary

The camber cannot be aligned but only centered!

If the values are out of tolerance, first the transversal inclination must be inspected and compensated if necessary ⇒ page 44-2.3

Uniform centering of the camber to bring it within the tolerance range is only possible by shifting the assembly support.



- ◀ - Loosen screws -1- and -2-.
 - Shift the assembly support until a uniform camber is obtained on both sides.
 - **Subsequently check the caster offset.**
- The caster offset may have changed due to the shifting of the assembly support.**
- Screw down the assembly support using new screws.

Tightening torques:

Assembly support on body screw position -1- 100 Nm + 90°
Use new screws!

Assembly support on body screw position -2- 100 Nm + 90°
Use new screws!

Inspecting camber at rear suspension

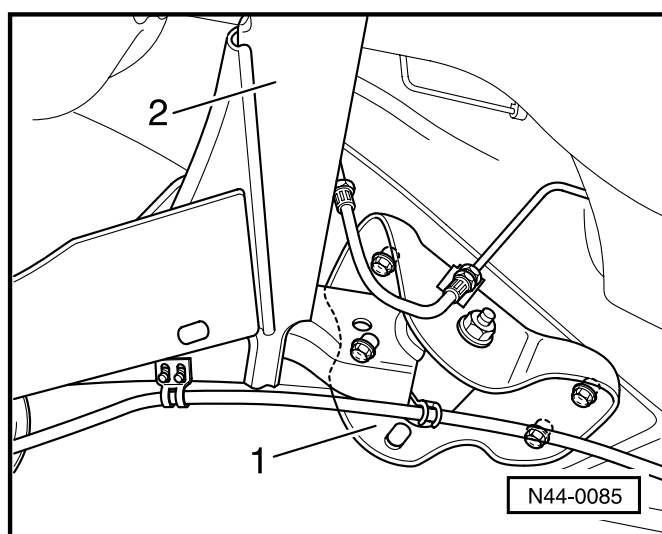
The camber cannot be set.

If the measurements are not to tolerance, it is first of all necessary to check the lateral inclination and to equalise this ⇒ page 44-2.3.

If the measurements are still not within the permissible tolerance, inspect the axle beam for damage and replace, if necessary.

Inspecting toe at rear suspension, centring/setting if necessary

If the measurements are not to tolerance, it is first of all necessary to check the lateral inclination and to equalise this ⇒ page 44-2.3.



FWD models

It is not possible to set the total toe of the rear suspension.

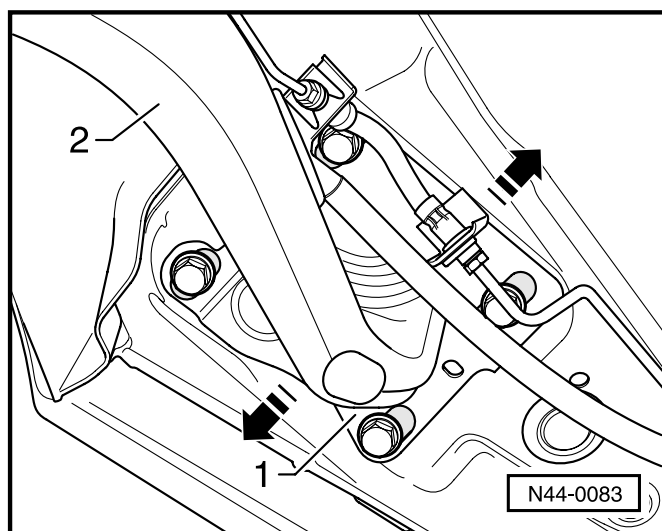
It is possible to uniformly centre the individual toe settings only by altering the position of the bearing brackets.

- ◀ - Slacken all the bolts of the bearing bracket -1-.
 - Move bearing bracket -1- in transverse direction.
 - 2 - Rear axle beam
 - Tighten the bolts fully to 30 Nm + 90°.
- Always use new bolts!**

If the measurements obtained are still not within the permissible tolerance, inspect the axle beam for damage and replace, if necessary.

4x4 models

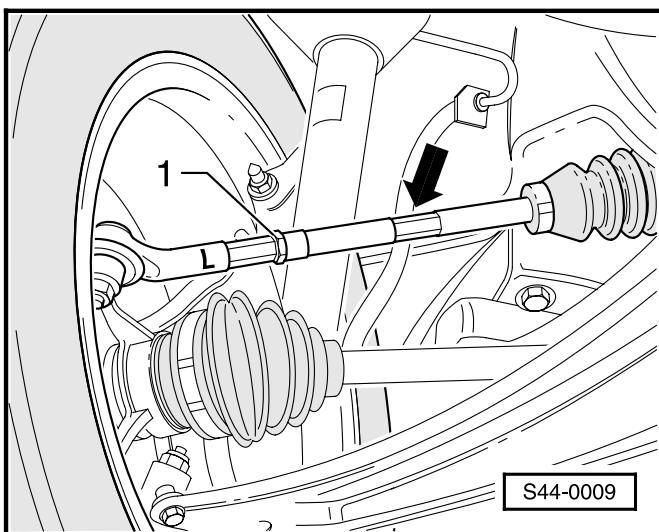
The toe of the rear suspension can be set.



- ◀ - Slacken all the bolts of the bearing bracket -1-.
 - Move bearing bracket -1- in transverse direction.
 - 2 - Trailing arm
 - Tighten the bolts fully to 75 Nm.
- Always use new bolts!**
- After setting the individual wheel toe, inspect total wheel toe.
- Total wheel toe must equal the specification ⇒ page 00-3.2.

Inspecting front suspension track, align if necessary

If the values are out of tolerance, first the transversal inclination must be inspected and compensated if necessary ⇒ page 44-2.3.



- ◀ - Loosen locknut -1-.
- Align front end by moving the left and/or right tie rods.

For this, an open-end spanner can be used on the hexagon of the tie rod (see arrow).

Make sure that the bellows are not twisted after moving the tie rods!

Twisted bellows wear rapidly.

- Tighten locknut -1- with 50 Nm and again check the track width.

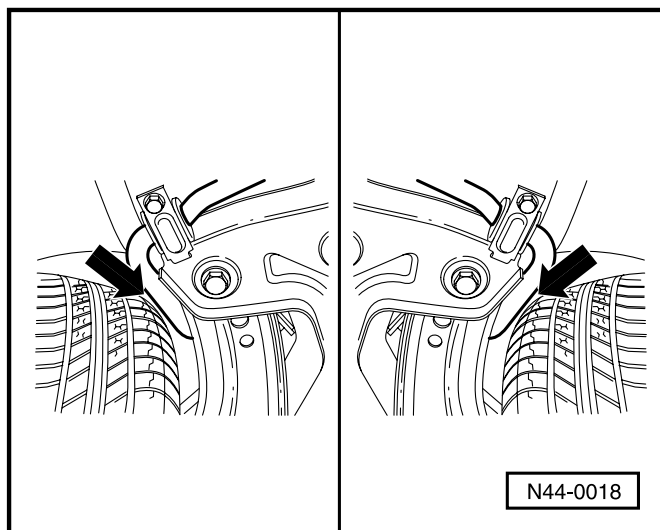
After tightening locknut -1- the set value may have changed slightly.

Make sure that this value always lies within the nominal value tolerance. If this is not the case, the front-end alignment must be repeated.

Inspecting steering angle left and right

This inspection only needs to be carried out:

- ♦ if the steering angles, starting from the steering centre, vary more than 2° ,
- ♦ if on one side there is contact between the tyres and the front-axle or body components with maximum steering angle,
- ♦ if there is a difference between the turning clearane circle left/right.



◀ The distance between front-axle components and tyres (arrow) must be the same on both sides with maximum steering angle.

If this is not the case, the distance can be corrected by moving the left and right tie rods.

Example:

Distance between front-axle components and tyres is smaller on the right side than on the left.

- Loosen locknuts of tie rods.
- Move left tie rod (screw out of tie-rod end)
- Move right tie rod over same distance in opposite direction (screw into tie-rod end).
- Check total track.

After this alignment the total track must correspond with the nominal value specified!

- Tighten locknuts with 50 Nm.

After tightening the locknuts the set value may have changed slightly.

Make sure that this value always lies within the nominal value tolerance. If this is not the case, the total track alignment must be repeated.

Make sure that the bellows are not twisted after moving the tie rods!

Arithmetical determination of rolling direction deviation of rear suspension**Note:**

The values below are only given by way of example.

- For track values with the same sign (+/+ or -/-), subtract the smaller value and divide by 2.

Track value for rear left wheel

+15'

Track value for rear right wheel

+5'

$$15' - 5' = 10'$$

$$10' : 2 = 5'$$

Rolling direction deviation = 5'

- Values with different signs (+/-) are added together and the sum is divided by 2.

Track value for rear left wheel

+15'

Track value for rear right wheel

-5'

$$15' + 5' = 20'$$

$$20' : 2 = 10'$$

Rolling direction deviation = 10'

The result thus obtained is the actual rolling direction deviation of the longitudinal vehicle axis.

Wheels and tyres

Wheel/tyre combinations ⇒ page 00-8

General

For safety reasons never change tyres individually but at least in axle pairs.

Tyres with the greatest tread depth must always be fitted at the rear.

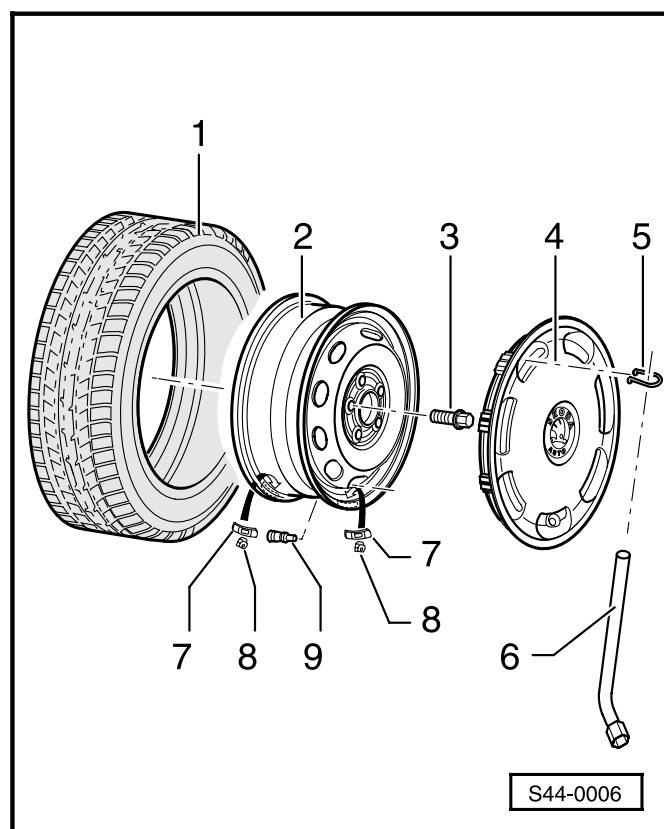
It is recommended to fit tyres of the same make, same type and tread pattern on all wheels.

When replacing the rim or the tyre always replace the valve.

Mount the tyre with the DOT marking pointing towards the outside of the wheel. This applies only to the left side of the vehicle for directional tyres.

For directional tyres mount a wheel/tyre combination for the right side of the vehicle as spare wheel.

Disc wheel



Notes:

- ◆ Because of design variations the disc wheel and wheel trim cap may differ from the figure.
- ◆ When using anti-theft wheel bolts, the anti-theft bolt must be as close as possible to the valve.

1 - Tyres

2 - Wheel rim

- ◆ 6J x 14 H2, ET 38
- ◆ 6J x 15 H2, ET 38

3 - Wheel bolt, 120 Nm

4 - Wheel trim cap

5 - Pull-off hook

6 - Wheel bolt key

- ◆ included in tool kit

7 - Balancing weights

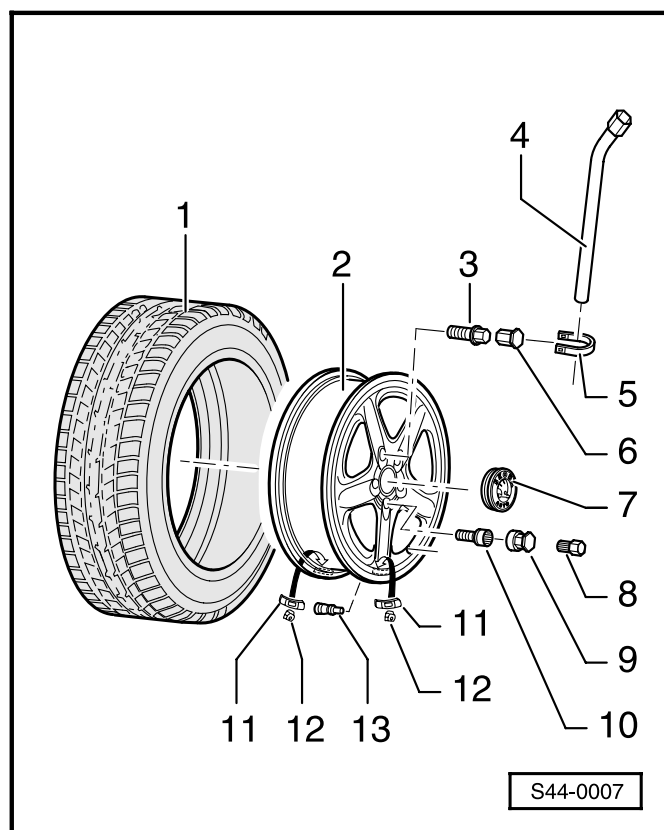
- ◆ max. 60 g allowed per rim flange

8 - Retaining spring for balancing weights

9 - Valve

- ◆ only use valve in accordance with spare part catalogue

Light alloy wheel

**Note:**

Light alloy wheel and wheel trim may differ in appearance from the illustration as a result of design modifications.

1 - Tyre**2 - Light alloy wheel**

- ◆ 6J x 15 H2, offset 38
- ◆ 6½J x 15 H2, offset 43
- ◆ 6½J x 16 H2, offset 42

3 - Wheel bolt, 120 Nm**4 - Wheel bolt wrench****5 - Removal tool**

- ◆ Contained in car tool kit

6 - Bolt cap**7 - Wheel trim cap****8 - Adapter for theft-deterrent wheel bolt****9 - Bolt cap****10 - Theft-deterrent wheel bolt, 120 Nm****11 - Balancing weights**

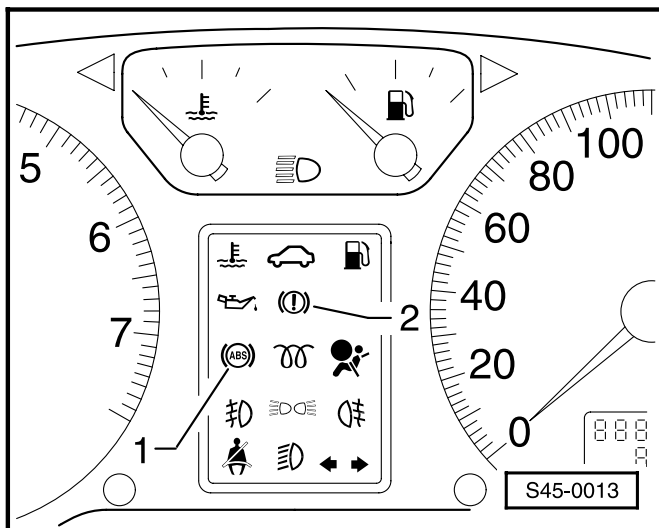
- ◆ Max. 60 g permissible for each wheel flange

12 - Retaining spring for balancing weights**13 - Valve**

- ◆ Fit only valve as specified in Parts List

Anti-lock brake system (ABS) ITT Mark 20 IE

Safety precautions, basic information on fault finding and on servicing ABS and ABS/EDL ITT Mark 20 IE



♦ The ABS, ABS/EDL are vehicle safety systems; system knowledge is required for working on such systems.

♦ Faults are indicated by the ABS warning light (K47) -1- and the red warning light for hand-brake/brake fluid level (K14/33) -2- coming on. Certain faults are not detected until after a minimum speed of 20 km/h has been exceeded (conduct a road test).

♦ If the ABS warning light -K47- and hand-brake/brake fluid warning light -K14/33- do not come on and the brake system is nevertheless not fully operational, look for the fault in the conventional brake system ⇒ from page 46-1 and from page 47-1.

♦ Notes on rectifying current faults
⇒ Technical Service Handbook and
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

Notes on repair work on ABS and ABS/EDL IT Mark 20 IE

♦ Before commencing work on the ABS system, it is necessary to interrogate the fault memory in order to be able to check complaints and conduct specific fault finding.

♦ Do not separate plug connections unless the ignition is switched off.

♦ Before commencing work on the ABS, ABS/EDL, switch off ignition and disconnect the earth strap at the battery. On models fitted with coded radio set, pay attention to coding; determine if necessary.

♦ Welding work using electric welding equipment may affect the ABS, ABS/EDL system.

- ◆ *Before carrying out welding work with electric welding equipment:*
 - *Disconnect the negative terminal of the battery and cover over the negative pole of the battery; remove battery if necessary.*
 - *Connect the earth connection of the electric welding equipment directly to the part to be welded. There must not be any electrically insulated parts between the earth connection and the welding point.*
 - *Do not allow electronic control units and electric wiring to come into contact with the earth connection or the welding electrode.*
- ◆ *Do not drive the vehicle with the connector unplugged from the control unit.*
- ◆ *The only work which may be carried out on the hydraulic control unit are the repair measures stated in this manual.*
- ◆ *Scrupulous cleanliness is essential when working on the anti-lock brake system. On no account, use products containing mineral oils, such as oils, grease etc.*
- ◆ *Thoroughly clean connection points and the surrounding area before disconnecting, but do not use any aggressive cleaning products, such as brake cleaner, petroleum, thinner or similar products.*
- ◆ *Place removed parts down on a clean surface and cover over.*
- ◆ *Fit on the transport protection for the valve domes after separating the control unit/hydraulic unit.*
- ◆ *Carefully cover over or seal open components if repairs are not carried out immediately (use the plugs from repair kit 1H0 698 311 A).*
- ◆ *Do not use any fluffing cloth.*
- ◆ *Do not remove replacement parts from their wrapping until just before installing.*
- ◆ *Use only genuine, wrapped parts.*
- ◆ *If the system is opened, avoid working with compressed air and avoid moving the vehicle.*
- ◆ *Ensure that no brake fluid flows into the connectors.*

- ◆ *Pay attention to the applicable instructions when handling brake fluid
⇒ from page 47-18.*
- ◆ *After completing work which involved opening the brake system, bleed brake system with the brake filling and bleeding appliance, e.g. ROMESS S15 ⇒ page 47-18.*
- ◆ *When carrying out the final road test, ensure that a controlled brake application is carried out at least once (pulsing at the brake pedal must be felt).*

Technical information required

- ◆ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
- ◆ Self Study Programme No. 26: „Vehicle safety - new technical information“
- ◆ Technical Service Handbook

Distinguishing features of the ABS ITT Mark 20 IE and ABS/ EDL ITT Mark 20 IE

General information

The ABS prevents the wheels locking during a brake application initiated by the driver.

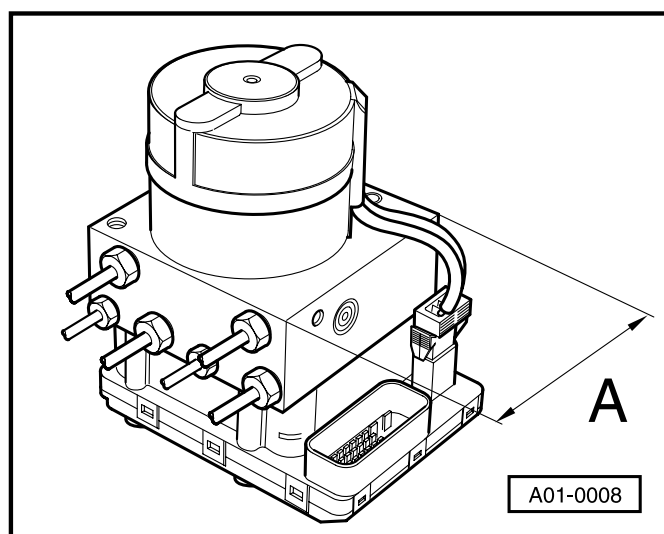
The electronic differential lock, EDL, is a starting-off aid. A supporting torque is created for the differential by electronically controlling the braking of the driven wheel which is slipping. The engine power is thus available for the gripping wheel with the better adhesion. This also applies when reversing.

The brake system is split diagonally. Brake servo assistance is provided pneumatically by the vacuum brake servo unit.

Models fitted with ABS and ABS/EDL ITT Mark 20 IE do not have a mechanical brake pressure regulator. Specifically matched software in the control unit, the electronic brake pressure distribution, EBD, regulates the brake pressure at the rear wheels.

The hydraulic pump -V64-, the hydraulic unit -N55- and the control unit -J104- form the hydraulic control unit. Repairs can only be carried out when the parts are removed.

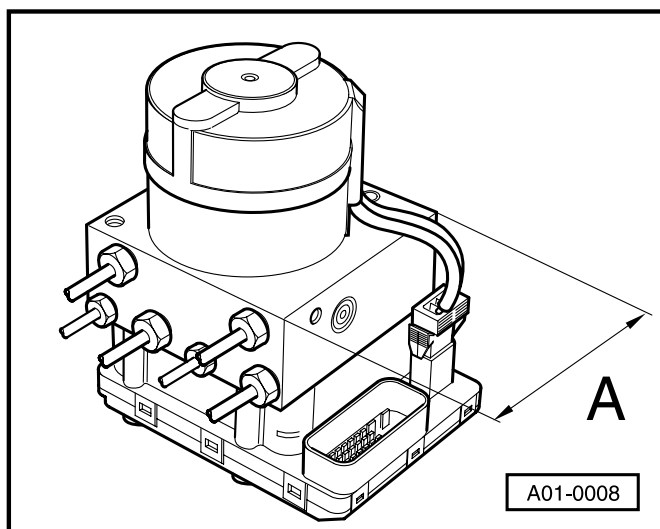
New control units supplied through the Parts Sector are not coded. They require to be coded after being installed ⇒ page 45-22.



ABS ITT Mark 20 IE

◀ Distinguishing features:

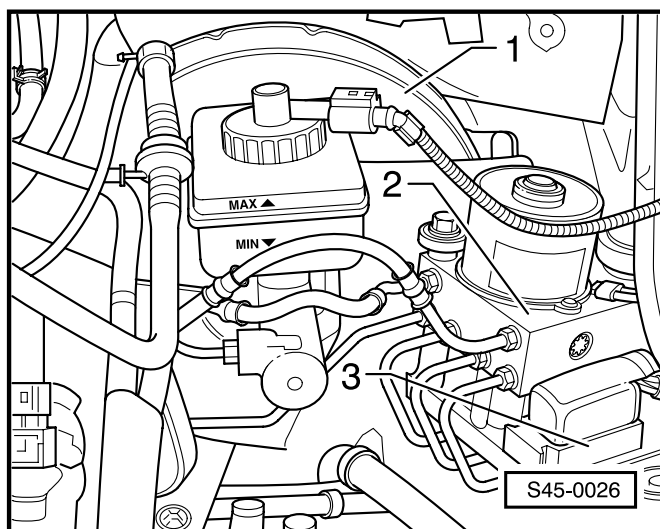
- ◆ *Dimension A: 100 mm*
- ◆ *8 valve domes: The protective sleeves for the valves are visible if the control unit is separated from the hydraulic unit ⇒ page 45-57.*
- ◆ *Control unit identification*
The control unit version appears in the display of V.A.G 1552. Select function 01 „Interrogating control unit version“ for this purpose ⇒ page 45-9.
ABS without CAN-BUS
ABS with CAN-BUS
 ⇒ Parts List
- ◆ *List of available functions ⇒ page 45-12.*



ABS/EDL ITT Mark 20 IE

◀ Recognition features:

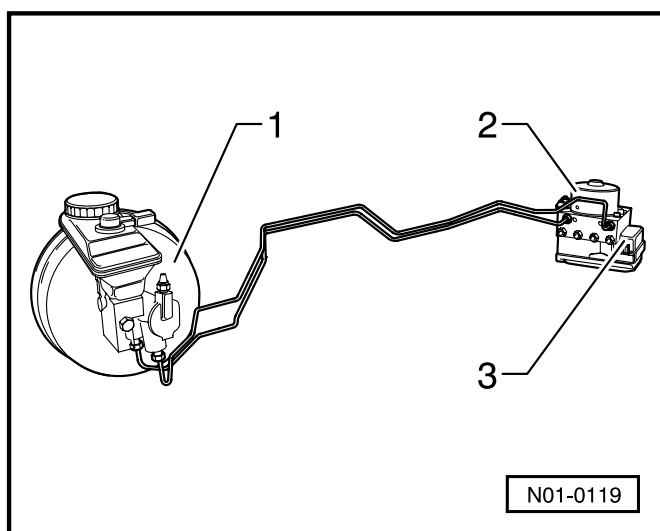
- ◆ Dimension A: 130 mm
- ◆ 10 valve domes: The protective sleeves for the valves are visible when the control unit is separated from the hydraulic unit ⇒ page 45-57.
- ◆ Control unit identification
The control unit identification appears in the display of V.A.G 1552. Select function 01 „Interrogate control unit version” for this purpose ⇒ page 45-9.
ABS/EDL without CAN-BUS
ABS/EDL with CAN-BUS
⇒ Parts List
- ◆ List of available functions ⇒ page 45-12.



Installation position of ABS or ABS/EDL ITT Mark 20 IE

◀ LHD models

- 1 - Brake servo unit 10"
- 2 - Hydraulic unit
- 3 - Control unit, 25-pin bolted to hydraulic unit



◀ RHD models

- 1 - Brake servo unit 7"/8"
- 2 - Hydraulic unit
- 3 - Control unit, 25-pin bolted to hydraulic unit

Self-diagnosis

Function of self-diagnosis

Models fitted with data BUS (CAN-BUS)

In view of the various control units which are interlinked over a databus line, the first step when commencing fault finding is always to interrogate the contents of the fault memories of the control units fitted to the vehicle.

This is done with the „Automatic test sequence“ which is activated with the key function 00.

The point to verify here is whether a fault which may be stored, could have an effect on the ABS system.

All models

The 25-pin ABS control unit (J104), together with the hydraulic unit, forms a compact unit. The unit is located in the left of the engine compartment. The control unit is equipped with a fault memory. The connection for self-diagnosis is located in the storage compartment on the driver's side.

Self-diagnosis relates to the electrical/electronic part of the ABS, in other words faults are detected only over the electrical connection to the control unit (e.g. open circuit of a wheel speed sensor).

The control unit detects faults during operation of the vehicle and stores them in a permanent memory. This information is retained even if the battery voltage is disconnected.

Faults which occur sporadically are likewise detected and stored. If this fault no longer occurs during 50 vehicle starts and starting-off operations, it is erased in the fault memory (fault delete counter), with the exception of the fault „Control unit defective“.

After the ignition is switched on, the ABS warning light (K47) and the red warning light for handbrake/brake fluid level (K14/33) come on for about 2 seconds.

During this period a self-check is performed in the control unit with the following functions:

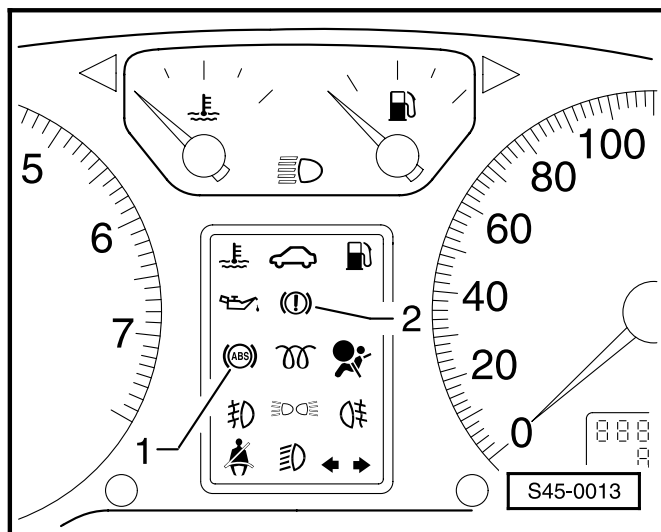
- ◆ Test of supply voltage, min. 10.0 V.
- ◆ Test of control unit including valve coils.
- ◆ Check of coding of control unit.
- ◆ Static test of wheel speed sensors (without wheel speed signal).
- ◆ If, after starting off and reaching a vehicle speed of about 20 km/h, it is found that the wheel speed signal is not o.k., the ABS warning light -K47- comes on again.

When commencing fault finding, always initiate self-diagnosis and interrogate the information stored with the

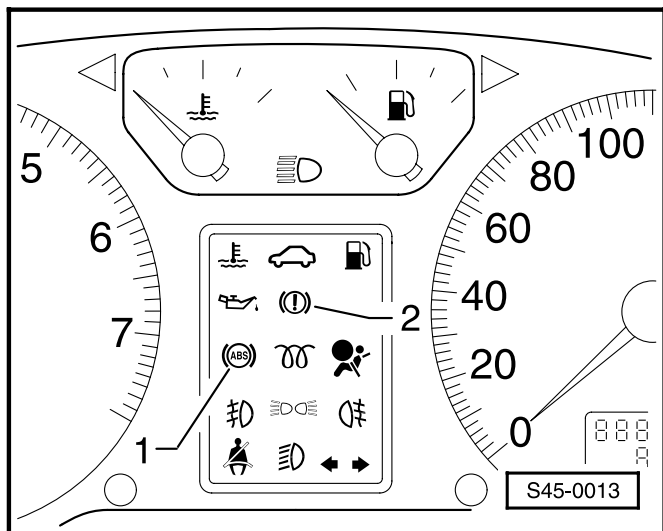
Vehicle system tester V.A.G 1552 or fault reader V.A.G 1551**Notes:**

- ♦ The description which follows relates only to the vehicle system tester V.A.G 1552 using the current programme card.
- ♦ Use of the fault reader V.A.G 1551 with integrated printer is similar. Slight differences in the readouts which appear in the display are possible.
- ♦ To end self-diagnosis or to switch to another address word, select function 06 „End output“.
- ♦ The faults presented can be identified by referring to the fault table, and then conducting fault rectification.

The functions of Reading measured value block, Coding control unit, Basic setting (is required only for models fitted with EDL) and Final control diagnosis have been added to self-diagnosis of the ABS system.

**Indication of faults by means of the warning lights K47 and K14/33**

- ♦ If the ABS warning light (K47) -1- does not go out after the ignition is switched on and after completion of the test sequence, the causes of the fault may be:
 - a - voltage supply is less than 11 V
 - b - an ABS fault is present
 - If an ABS fault is present, the anti-lock brake system remains switched off while the conventional brake system remains fully operational.
 - c - a fault existed at a wheel speed sensor after last vehicle start (sporadic fault).
 - If a fault exists at a wheel speed sensor, the ABS warning light goes out automatically after restarting the vehicle and speed increased to more than 20 km/h.
 - d - there is an interruption in the link from the dash panel insert to control unit -J104-.
 - ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
 - e - the dash panel insert is faulty.



◆ If the ABS warning light goes out, but the handbrake/brake fluid level warning light (K14/33) -2- remains on, the causes of the fault may be:

- a - the handbrake is still applied
- b - the brake fluid level is too low
- c - there is a fault in the wiring

⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder

◆ If the ABS warning light -1- and the handbrake/brake fluid level warning light -2- do **not** go out, the ABS and EBD (electronic brake pressure distribution) systems have then failed.

In this case, you have to expect a change in the braking characteristics of the vehicle as the brake pressure at the rear wheels is no longer regulated.

- d - switch -F9- for the warning light -K14/33- is faulty or incorrectly set.

Models fitted with ABS/EDL - EDL does not operate

Special tools, testers and aids required

- ◆ Vehicle system tester V.A.G 1552
- ◆ Diagnosis cable V.A.G 1551/3

Complaint: „EDL system of vehicle does not operate“

When dealing with such a complaint, a possible cause of the fault may be that the brake light switch is incorrectly set or not operating ⇒ page 45-24, Reading measured value block, display group number 003 and ⇒ page 45-69, Setting brake light switch.

Performing self-diagnosis

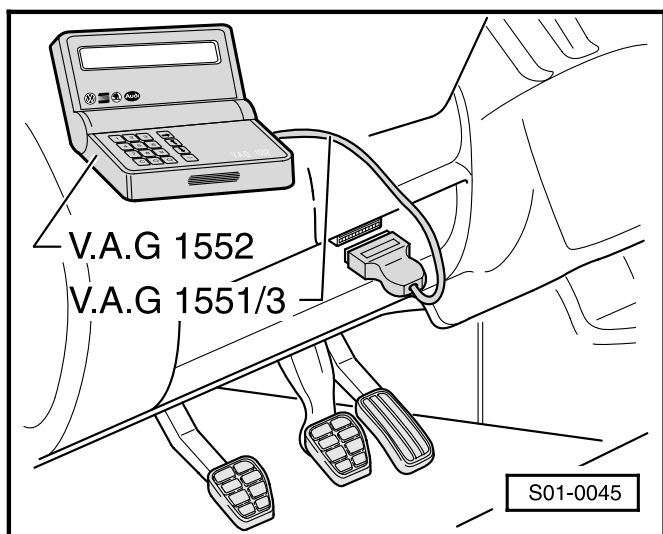
Test requirements

- Approved tyre size fitted to all wheels; tyres inflated to the specified pressure.
- Mechanical/hydraulic part of brake system together with brake light switch and brake lights operating properly.
- No leaks in hydraulic connections and lines (visual inspection of hydraulic unit, brake calipers, wheel brake cylinders, tandem brake master cylinder).
- Wheel bearings and wheel bearing play o.k.
- Control unit correctly bolted to hydraulic unit.
- Plug connection at control unit (J104) correctly plugged in (lock is engaged).
- Inspect plug contacts of ABS components for damage and correct fitting.
- All fuses according to current flow diagram o.k. (as a check, remove fuses from fuse box).
- Supply voltage o.k. (at least 10.0 V).

Connecting vehicle system tester V.A.G 1552 and selecting function

Special tools, testers and aids required

- ◆ Vehicle system tester V.A.G 1552
- ◆ Diagnostic cable V.A.G 1551/3

**Notes:**

- ◆ The ABS function in the control unit is switched off during self-diagnosis.
- ◆ The fault memory can be erased after completing repairs and interrogating memory.

- ◀ - Switch off ignition (if not already off) and connect vehicle system tester V.A.G 1552 to the diagnosis connection using diagnostic cable V.A.G 1551/3.

Interrogating control unit version

Test of vehicle systems
Enter address word XX

HELP

- ◀ Readout in display:

If no readout appears in the display, inspect plug connection for self-diagnosis, Electrical Test ⇒ from page 45-41, test steps 14 and 15.

Notes:

- ◆ Depending on the programme, additional user information can be displayed by pressing the HELP key of V.A.G 1552.
- ◆ The → key is used for moving forward within the test programme.

- Switch on ignition.

Test of vehicle systems
Enter address word XX

HELP

- ◀ Readout in display:

- Press keys 0 and 3 for the address word „Brake electronics“ and confirm the entry with the key Q.

1J0907379	ABS	ITT AE 20 GI	V00	→
Coding 03604			WSC XXXXX	

Models not fitted with CAN databus

◀ The following readout then appears (example):

What is displayed is:

- ◆ the control unit identification number, e.g. 1J0907379
 - ◆ the system designation, e.g. ABS ITT AE 20 GI
 - ◆ the number of the version, e.g. V00
 - ◆ the code No. of the control unit, e.g. 03604
 - ◆ the workshop code (WSC)
- ⇒ Operating instructions of vehicle system tester V.A.G 1552

1J0907379 H	ABS/EDL 20 IE CAN	0001	→
Coding 13504		WSC XXXXX	

Models fitted with CAN databus

◀ The following readout then appears (example):

Models fitted with MK 60

1J0907379 C	ABS FRONT MK60	0102	→
Coding 0001025		WSC XXXXX	

◀ The following readout then appears (example):

Continued for all models

Assignment of control unit
⇒ Parts List

Coding control unit ⇒ page 45-22.

If the control unit identification number does not appear ⇒ page 45-12, List of available functions.

- Press → key.

Note:

A list of the possible functions is displayed after pressing the **HELP** key:

The programme returns to the initial position after pressing the → key.

Test of vehicle systems Select function XX	HELP
---	------

◀ Readout in display:

⇒ page 45-12, List of available functions.

List of available functions

	Page
00 - Automatic test sequence	45-13
01 - Interrogating control unit version	45-10
02 - Interrogating fault memory	45-12
03 - Final control diagnosis	45-29
04 - Initiating basic setting ¹⁾	45-36
05 - Erasing fault memory	45-21
06 - Ending output	45-22
07 - Coding control unit	45-22
08 - Reading measured value block	45-24

¹⁾ is required only for models fitted with EDL

Interrogating fault memory

Test of vehicle systems Select function XX	HELP
---	------

◀ Readout in display:

- Press keys 0 and 2 for the function „Interrogate fault memory“ and confirm the entry with the key Q.

X faults recognized!

◀ The number of stored faults or „No fault recognized“ appears in the display.

No fault recognized! →

- Press → key.

The faults stored are displayed one after the other.

Test of vehicle systems
Select function XX

HELP

- Look in the fault table to find the fault message displayed ⇒ page 45-14. In the case of MK 60 ⇒ page 45-183.

In the same way as when „No fault recognized!“ is displayed, the programme returns to the initial position when the → key is pressed:

◀ Readout in display:

- End output (function 06) ⇒ page 45-22.
- Switch ignition off and separate diagnostic plug connection.

Notes:

If a fault has been recognized:

- ◆ 1. Rectify fault (repair)
- ◆ 2. Interrogate fault memory (function 02)
- ◆ 3. Erase fault memory (function 05)
- ◆ 4. End output (function 06)
- ◆ 5. Conduct road test
- ◆ 6. Once again interrogate fault memory.

Automatic test sequence

Note:

With the automatic test sequence the contents of all the fault memories of the control units are interrogated.

- Switch ignition on.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- Press key 0 twice for the function “Automatic test sequence” and confirm the entry with the key Q.

1J0907379 H ABS/EDL 20 IE CAN 0001 →
Coding 13504 WSC XXXXX

◀ The control unit identification appears in the display.

After this, all the control unit identifications appear in the display together with any entries from the fault memories.

- End output (function 06) ⇒ page 45-22.

Fault table

Notes:

- ◆ In view of the control units which are interlinked over a databus line, always commence fault finding by initiating the „Automatic test sequence“ with the key function 0 and 0 at all the control units fitted to the vehicle. This interrogates the control unit fitted to the vehicle and any faults which may be stored in them.
 - ◆ All the possible faults which can be detected by the ABS control unit (J104) and displayed on V.A.G 1552, are listed below according to the 5-digit fault code.
 - ◆ In addition, the fault type may also be indicated in the fault table.
 - ◆ Reference is made in the column „Rectifying fault“ to individual test steps of the electrical test.
 - ◆ Before replacing components indicated as faulty, test the appropriate plug connections, cables and earth connections according to the current flow diagram.
- ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
- ◆ After completing repairs, always once again interrogate and then erase the fault memory with the vehicle system tester V.A.G 1552, and conduct a road test (at a speed of more than 20 km/h).
 - ◆ After conducting the road test, once again interrogate the fault memory.

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
No fault recognized	If „no fault recognized“ appears after completing repairs, self-diagnosis is ended. If the ABS does not operate properly although „no fault recognized“ is displayed, then proceed as described below: 1. Conduct a road test at a speed of more than 20 km/h. 2. Once again interrogate the fault memory; if no fault is again stored. 3. Continue fault finding without self-diagnosis and work through the electrical test in full ⇒ page 45-41.	
00283 Front left wheel speed sensor -G47	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G47- and control unit -J104 ◆ Damage to pulse rotor or speed sensor -G47 ◆ Coil of speed sensor -G47- faulty ◆ ABS control unit -J104- faulty	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41 - Inspect speed sensor -G47- and pulse rotor for damage - Replace pulse rotor/speed sensor -G47- ⇒ page 45-60 and 45-65 If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-57

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00283 Front left wheel speed sensor -G47 Signal not to tolerance ¹⁾	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G47- and control unit -J104 ◆ Electrical interference because of external sources (high-frequency interference, e.g. ignition cable not insulated) ◆ Damage to pulse rotor or speed sensor -G47 ◆ Air gap between speed sensor -G47- and pulse rotor too large (signal not o.k.)	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41 - Read measured value block ⇒ page 45-24, display group number 001 - Inspect speed sensor -G47- and pulse rotor for damage - Replace pulse rotor/speed sensor -G47- ⇒ page 45-60 and 45-65
00283 Front left wheel speed sensor -G47 Mechanical fault ¹⁾	◆ Air gap between speed sensor -G47- and pulse rotor too large (signal not o.k.) ◆ Outlet valves in hydraulic unit -N55- faulty	- Inspect installation of speed sensor -G47- and pulse rotor ⇒ page 45-60 and 45-65 - Read measured value block ⇒ page 45-24, display group number 002 - Perform final control diagnosis ⇒ page 45-29 If the fault occurs once again: - Replace hydraulic unit -N55- ⇒ page 45-57

¹⁾ Fault type cannot be detected until speed more than 20 km/h (conduct road test).

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00285 Front right wheel speed sensor -G45	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G45- and control unit -J104 ◆ Damage to pulse rotor or speed sensor -G45 ◆ Coil of speed sensor -G45- faulty ◆ ABS control unit -J104- faulty	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41 - Inspect speed sensor -G45- and pulse rotor for damage - Replace pulse rotor/speed sensor -G45- ⇒ page 45-60 and 45-65 If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-57
00285 Front right wheel speed sensor -G45 Signal not to tolerance ¹⁾	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G45- and control unit -J104 ◆ Electrical interference because of external sources (high-frequency interference, e.g. ignition cable not insulated) ◆ Damage to pulse rotor or speed sensor -G45 ◆ Air gap between speed sensor -G45- and pulse rotor too large (signal not o.k.)	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41 - Read measured value block ⇒ page 45-24, display group number 001 - Inspect speed sensor -G45- and pulse rotor for damage - Replace pulse rotor/speed sensor -G45- ⇒ page 45-60 and 45-65
00285 Front right wheel speed sensor -G45 Mechanical fault ¹⁾	◆ Air gap between speed sensor -G45- and pulse rotor too large (signal not o.k.) ◆ Outlet valves in hydraulic unit -N55- faulty	- Inspect installation of speed sensor -G45- and pulse rotor ⇒ page 45-60 and 45-65 - Read measured value block ⇒ page 45-24, display group number 002 - Perform final control diagnosis ⇒ page 45-29 If the fault occurs once again: - Replace hydraulic unit -N55- ⇒ page 45-57

¹⁾ Fault type cannot be detected until speed more than 20 km/h (conduct road test).

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00287 Rear right wheel speed sensor -G44	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G44- and control unit -J104 ◆ Damage to pulse rotor or speed sensor -G44 ◆ Coil of speed sensor -G44- faulty ◆ ABS control unit -J104- faulty	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41 - Inspect speed sensor -G44- and pulse rotor for damage - Replace pulse rotor/speed sensor -G44- ⇒ page 45-60 and 45-65 If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-57
00287 Rear right wheel speed sensor -G44 Signal not to tolerance ¹⁾	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G44- and control unit -J104 ◆ Electrical interference because of external sources (high-frequency interference, e.g. ignition cable not insulated) ◆ Damage to pulse rotor or speed sensor -G44 ◆ Air gap between speed sensor -G44- and pulse rotor too large (signal not o.k.)	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41 - Read measured value block ⇒ page 45-24, display group number 001 - Inspect speed sensor -G44- and pulse rotor for damage - Replace pulse rotor/speed sensor -G45- ⇒ page 45-60 and 45-65
00287 Rear right wheel speed sensor -G44 Mechanical fault ¹⁾	◆ Air gap between speed sensor -G44- and pulse rotor too large (signal not o.k.) ◆ Outlet valves in hydraulic unit -N55- faulty	- Inspect installation of speed sensor -G44- and pulse rotor ⇒ page 45-60 and 45-65 - Read measured value block ⇒ page 45-24, display group number 002 - Perform final control diagnosis ⇒ page 45-29 If the fault occurs once again: - Replace hydraulic unit -N55- ⇒ page 45-57

¹⁾ Fault type cannot be detected until speed more than 20 km/h (conduct road test).

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00290 Rear left wheel speed sensor -G46	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G46- and control unit -J104 ◆ Damage to pulse rotor or speed sensor -G46 ◆ Coil of speed sensor -G46- faulty ◆ ABS control unit -J104- faulty	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41 - Inspect speed sensor -G46- and pulse rotor for damage - Replace pulse rotor/speed sensor -G46- ⇒ page 45-60 and 45-65 If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-57
00290 Rear left wheel speed sensor -G46 Signal not to tolerance ¹⁾	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G46- and control unit -J104 ◆ Electrical interference because of external sources (high-frequency interference, e.g. ignition cable not insulated) ◆ Damage to pulse rotor or speed sensor -G46 ◆ Air gap between speed sensor -G46- and pulse rotor too large (signal not o.k.)	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41 - Read measured value block ⇒ page 45-24, display group number 001 - Inspect speed sensor -G46- and pulse rotor for damage - Replace pulse rotor/speed sensor -G46- ⇒ page 45-60 and 45-65
00290 Rear left wheel speed sensor -G46 Mechanical fault ¹⁾	◆ Air gap between speed sensor -G46- and pulse rotor too large (signal not o.k.) ◆ Outlet valves in hydraulic unit -N55- faulty	- Inspect installation of speed sensor -G46- and pulse rotor ⇒ page 45-60 and 45-65 - Read measured value block ⇒ page 45-24, display group number 002 - Perform final control diagnosis ⇒ page 45-29 If the fault occurs once again: - Replace hydraulic unit -N55- ⇒ page 45-57

¹⁾ Fault type cannot be detected until speed more than 20 km/h (conduct road test).

Coding table

Engine identification letters	Engine	ABS variant	Model year code number		
			1997	1998	1999
AMD	1.4 l/44 kW	ABS	—	—	03604
AMD	1.4 l/44 kW	ABS/EDS	—	—	03604
AEE	1.6 l/55 kW	ABS	03604	03604	03604
AEE	1.6 l/55 kW	ABS/EDS	03604	03604	03604
AEH	1.6 l/74 kW	ABS	03604	03504	03504
AEH	1.6 l/74 kW	ABS/EDS	03604	13504	13504
AGN	1.8 l/92 kW	ABS	03604	03504	03504
AGN	1.8 l/92 kW	ABS/EDS	03604	13504	13504
AGU	1.8 l/110 kW	ABS	—	03504	03504
AGU	1.8 l/110 kW	ABS/EDS	—	13504	13504
AGP	1.9 l/50 kW	ABS	03604	03604	03304
AGP	1.9 l/50 kW	ABS/EDS	03604	03604	03304
AGR	1.9 l/66 kW	ABS	03604	03504	03304
AGR	1.9 l/66 kW	ABS/EDS	03604	13504	13304
AHF	1.9 l/81 kW	ABS	03604	03504	03304
AHF	1.9 l/81 kW	ABS/EDS	03604	13504	13304

1J0 907 379A ABS/EDS ITTAE 20 GI V00 →
Coding 03604 WSC XXXXX

◀ The control unit coding is shown in the display, e.g. 03604:

- Press → key.

Test of vehicle systems
Select function XX HELP

◀ Readout in display:

- Press the keys 0 and 6 for the function „End output“ and confirm entry with the key Q.

Notes:

- ◆ *If the control unit is incorrectly coded, the ABS warning lamp (K47) and the handbrake/brake fluid level warning lamp -K14/33- come on and remain on.*
- ◆ *At the same time a fault is entered into the fault memory ⇒ page 45-12, Interrogating fault memory (02).*
- ◆ *If the coding is accepted, no fault is entered into the fault memory and the ABS warning lamp does not flash.*
- ◆ *If the control unit is not coded (code 00000), the ABS warning lamp (K47) and the handbrake/brake fluid level warning lamp -K14/33- flash (once a second).*

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00668 System voltage terminal 30 Signal out of tolerance	◆ Open circuit, short circuit to positive or to earth in wiring	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41
01044 Control unit incorrectly coded	◆ Control unit -J104- incorrectly coded ◆ Bridge in multipin connector to control unit -J104- from contact 3 to contact 14 open circuit or short circuit	- Check coding of control unit -J104- ⇒ page 45-22. - Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41
01130 ABS operation Implausible signal ¹⁾	◆ Electrical interference caused by external sources (high-frequency interference, e.g. ignition cables not insulated) ◆ Open circuit, short circuit to positive or to earth in wiring ◆ ABS control unit -J104- faulty	- Erase fault memory - Conduct road test at more than 20 km/h - Once again interrogate fault memory - Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41 If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-57
01276 ABS hydraulic pump -V64 Signal out of tolerance ¹⁾	◆ Plug connection of el. motor to control unit ◆ Open circuit, short circuit to positive or to earth in wiring ◆ Hydraulic pump -V64- faulty ◆ ABS control unit -J104- faulty	- Perform final control diagnosis ⇒ page 45-29 - Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41 - If hydraulic pump -V64- starts properly when conducting test step 18 in electrical test ⇒ page 45-41, replace control unit -J104- - Replace control unit -J104- ⇒ page 45-57

¹⁾ Fault type cannot be detected until speed more than 20 km/h (conduct road test).

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
01312 Data BUS drive defective ¹⁾ or: Data BUS drive defective ¹⁾ sporadically	◆ ABS control unit -J104- incorrectly coded ◆ Engine control unit incorrectly coded ◆ Open circuit, short circuit to positive or to earth in wiring	- Check coding of control unit -J104- ⇒ page 45-22 - Check coding of engine control unit ⇒ Repair Group 01 of relevant engine - Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41
	◆ Ignition/starter switch rotates too slowly	- Erase fault memory ⇒ page 45-21 - No further measures necessary - Inform customer
01314 Engine control unit no communication	◆ Open circuit, short circuit to positive or to earth in data BUS wiring	- Test wiring and plug connections of data BUS cables according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41
01315 Gearbox control unit ²⁾ no communication	◆ Open circuit, short circuit to positive or to earth in data BUS wiring	- Test wiring and plug connections of data BUS cables according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41
01316 Brake control unit no communication	◆ Open circuit, short circuit to positive or to earth in data BUS wiring	- Test wiring and plug connections of data BUS cables according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-41

¹⁾ The fault „Data BUS drive defective“ does not cause the ABS warning light -K47- or the handbrake/brake fluid level warning light -K14/33- to come on. The full ABS function is retained in this case.

²⁾ Only on models fitted with automatic gearbox.

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
18256 Please read fault memory of engine ECU	♦ Fault entered in engine control unit	- Read fault memory of the engine control unit ⇒ Repair Group 01 of relevant engine
65535 Control unit defective	♦ ABS control unit -J104- faulty	- Replace control unit -J104- ⇒ page 45-57

Erasing fault memory

Requirement:

- Fault memory has been interrogated.
- Press → key.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- Press keys 0 and 5 for the function „Erase fault memory“ and confirm the entry with the key Q.

Test of vehicle systems
Fault memory is erased!

→

◀ Readout in display:

- Press → key.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

Notes:

- ◀ ♦ *If this readout appears in the display, then the test sequence was incorrect.*
- ♦ *Follow the test sequence exactly:
First of all, interrogate fault memory and then erase it.*

Attention!
Fault memory was not interrogated

Ending output

- Press keys 0 and 6 for the function „End output“ and confirm the entry with the key Q.

Test of vehicle systems
Enter address word XX

HELP

◀ Readout in display:

- Switch off ignition.
- Separate plug connection to the vehicle system tester.
- Switch on ignition.

ABS warning light (K47) and handbrake/brake fluid level warning light (K14/33) must go out after about 2 seconds.

Coding control unit

Special tools, testers and aids required

- ♦ Vehicle system tester V.A.G 1552
- ♦ Diagnosis cable V.A.G 1551/3

The control unit fitted to the vehicle is coded. New control units supplied through the Parts Sector are not coded and must be re-coded after being installed.

Requirement for coding

Coding is only possible if the workshop code (WSC) is entered in V.A.G 1552.

Procedure

- Determine the engine code letter and the type of ABS hydraulic control unit fitted to the vehicle.
- Connect vehicle system tester V.A.G 1552 and select brake electronics control unit (address word 03) ⇒ page 45-9; ignition switched on for this step.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- Press the keys 0 and 7 for the function „Code control unit“ and confirm the entry with the key Q.

Code the control unit
Enter code number XXXXX

Q
(0-32767)

◀ Read out on display

- Enter the relevant code number of the vehicle and confirm entry with Q button.

Table of codes ⇒ page 45-23.

Table of codes

Engine code letters	Engine	Variant ABS	Code number - Model year				
			1997	1998	1999	2000	2001 ▶
AMD	1.4 l/44 kW	ABS	—	—	03604	03604	—
AMD	1.4 l/44 kW	ABS/EDS	—	—	03604	03604	—
AEE	1.6 l/55 kW	ABS	03604	03604	03604	03604	—
AEE	1.6 l/55 kW	ABS/EDS	03604	03604	03604	03604	—
AEH	1.6 l/74 kW	ABS	03604	03504	03504	03504	—
AEH	1.6 l/74 kW	ABS/EDS	03604	13504	13504	13504	—
AGN	1.8 l/92 kW	ABS	03604	03504	03504	—	—
AGN	1.8 l/92 kW	ABS/EDS	03604	13504	13504	—	—
AGU	1.8 l/110 kW	ABS	—	03504	03504	03504	—
AGU	1.8 l/110 kW	ABS/EDS	—	13504	13504	13504	—
AGP	1.9 l/50 kW	ABS	03604	03604	03304	03304	—
AGP	1.9 l/50 kW	ABS/EDS	03604	03604	03304	03304	—
AGR	1.9 l/66 kW	ABS	03604	03504	03304	03304	—
AGR	1.9 l/66 kW	ABS/EDS	03604	13504	13304	13304	—
AHF	1.9 l/81 kW	ABS	03604	03504	03304	03304	—
AHF	1.9 l/81 kW	ABS/EDS	03604	13504	13304	13304	—
AQY	2.0 l/85 kW	ABS	—	—	—	03404	—
AQY	2.0 l/85 kW	ABS/EDS	—	—	—	13504	—
ARX	1.8 l/110 kW	4x4	—	—	—	—	13504
AGR	1.9 l/66 kW	4x4	—	—	—	13504	13504
ATD	1.9 l/74 kW	4x4	—	—	—	—	13504
AZJ	2.0 l/85 kW	4x4	—	—	—	—	13504

Vehicles without CAN-BUS

1J0907379 A ABS/EDS ITT AE 20GI V00 →
Coding 03604 WSC XXXXX

◀ The control unit coding is shown on the display, for example 03604:

Vehicles with CAN-BUS

1J0907379 H ABS/EDS 20 IE CAN 0001 →
Coding 13504 WSC XXXXX

◀ The control unit coding is shown on the display, for example 13504:

Test of vehicle systems
Select function XX

HELP

Continued for all models

- Press → key.

◀ Readout in display:

- Press keys 0 and 6 for the function „End output“ and confirm the entry with the key Q.

Notes:

- ♦ *If the control unit is incorrectly coded, the ABS warning light (K47) and the handbrake/brake fluid level warning light (K14/33) come on and remain on.*
- ♦ *At the same time, an entry is made in the fault memory ⇒ page 45-12, Interrogating fault memory (02).*
- ♦ *If the control unit is coded with an approved code, no fault entry is made in the fault memory and the ABS warning light does not flash.*
- ♦ *If the control unit is not coded (code 00000), the ABS warning light (K47) and the handbrake/brake fluid level warning light (K14/33) flash (once a second). No entry is made in the fault memory in this case.*

Reading measured value block

Special tools, testers and aids required

- ♦ Vehicle system tester V.A.G 1552
- ♦ Diagnosis cable V.A.G 1551/3

The control unit is able to transmit a large number of measured values. These measured values supply information regarding the operating state of the system or of the sensors connected. In many cases, the measured values transmitted can be used for assisting fault finding and rectification of faults. As it is not possible to assess all of these measured values at the same time, they are combined into individual display groups which can be selected by means of display group numbers.

Safety precautions

If it is necessary to use test and measuring equipment during a road test, pay attention to the following procedure:

- ◆ The test and measuring equipment should always be attached to the rear seat and operated from that point by a second person.
- ◆ If the test and measuring equipment were operated from the front passenger seat, this could result in injury to the person occupying that seat in the event of an accident if the front passenger airbag is deployed.

Test procedure and test tables with measured values

- Connect vehicle system tester V.A.G 1552 and select brake electronics control unit (address word 03) ⇒ page 45-9; ignition switched on for this step.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- Press keys 0 and 8 for the function „Read measured value block“ and confirm the entry with the key Q.

Testing wheel speed sensor assignment

Display group number 001:

Read measured value block
Enter display group number XXX

◀ Readout in display:

- Press keys 0 and 1 for „Display group number 01“ and confirm the entry with the key Q.

Read measured value block 1 →

→ 1 → 2 → 3 → 4

- ◀ - The measured value block is always composed of 4 display blocks -arrows- 1 to 4.

Read measured value block				1 →
0 km/h	0 km/h	0 km/h	0 km/h	

◀ Readout in display (vehicle stationary):

The momentary wheel speeds are displayed. They are used for checking the assignment of the wheel speed sensors to the wheels. (The vehicle must be raised for this purpose and the wheel rotated by hand).

Example:

Read measured value block				1 →
0 km/h	4 km/h	0 km/h	0 km/h	

◀ Readout in display (wheel rotated):

The momentary speed of the front right wheel is displayed.

The vehicle must be raised for this purpose and the wheel rotated by hand by a second person.

Display block	Designation	Readout on V.A.G 1552
1	Front left wheel speed (km/h)	0...255
2	Front right wheel speed (km/h)	0...255
3	Rear left wheel speed (km/h)	0...255
4	Rear right wheel speed (km/h)	0...255

- Press key C.

If the → key is pressed, it is then necessary after this to once again press keys 0 and 8 to return to the procedure „Read measured value block“.

Test of wheel speed sensors**Display group number 002:**

Read measured value block	
Enter display group number XXX	

◀ Readout in display:

- Press keys 0 and 2 for the „Display group number 02“ and confirm the entry with the key Q.

The ABS control unit stores the first analysable voltage signals from the wheel speed sensor when starting off and displays these as fixed values in the measured value block.

Read measured value block				2 →
→ 1	→ 2	→ 3	→ 4	

◀ - The measured value block is always composed of 4 display blocks -arrows- 1 to 4.

The readouts which appear in display blocks 1 and 2 must on no account be more than 6 km/h.

The readouts which appear in display blocks 3 and 4 must not be more than 2 km/h.

If the readouts are above these figures, there may be a fault relating to the installation of the wheel speed sensor.

Possible causes of fault:

- ◆ Gap between wheel speed sensor and pulse rotor too large
 - Check whether the wheel speed sensor is correctly attached to the wheel bearing housing.
- ◆ External damage to wheel speed sensor or pulse rotor.
 - Replace the damaged component.

Display block	Designation	Readout on V.A.G 1552
1	Front left wheel speed (km/h)	0...255
2	Front right wheel speed (km/h)	0...255
3	Rear left wheel speed (km/h)	0...255
4	Rear right wheel speed (km/h)	0...255

Read measured value block	2 →
255 km/h 255 km/h 255 km/h 255 km/h	

◀ Readout in display (vehicle stationary):

- Start off slowly until the readouts appear in the display of V.A.G 1552.

Differences of up to 6 km/h between display blocks 1 and 2 are o.k. (see example).

Differences of up to 2 km/h between display blocks 3 and 4 are o.k. (see example).

Example:

Read measured value block	2 →
3 km/h 6 km/h 2 km/h 1 km/h	

◀ Readout in display (starting off slowly):

- Press key C.

If the → key is pressed, it is then necessary after this to once again press keys 0 and 8 to return to the procedure „Read measured value block“.

Testing the brake light switch for the ABS and ABS/EDL function

Display group number 003

Read measured value block
Enter display group number XXX

◀ Readout in display:

- Press keys 0 and 3 for „Display group number 03“ and confirm the entry with the key Q.

Read measured value block 3 →
→ 1 → 2 → 3 → 4

- ◀ - There are always 4 display blocks -arrows- 1 to 4 in the measured value block.

Read measured value block 3 →
0

◀ Readout in display:

Display block	Test conditions	Readout on V.A.G 1552
1	♦ Brake pedal not operated ♦ Brake pedal operated	not op. operated
2	not assigned	—
3	not assigned	—
4	not assigned	—

If the readout in V.A.G 1552 is -0- although the footbrake is operated, or -1- although the footbrake is not operated:

- Perform electrical test ⇒ from page 45-41.

It is also possible that the brake light switch is not correctly set ⇒ page 45-69.

- Press the keys 0 and 6 for the function „End output“ and confirm the entry with the key Q.

Final control diagnosis

Special tools, testers and aids required

- ◆ Vehicle system tester V.A.G 1552
- ◆ Diagnosis cable V.A.G 1551/3

Final control diagnosis is part of the electrical test. Final control diagnosis is used for testing the pump motor and also to check correct operation of the hydraulic circuits (assignment of brake pressure lines to the wheel brakes, and also operation of the valves) to ensure they are correctly connected and are not leaking.

Notes:

- ◆ *The vehicle must be raised so that the wheels are clear of the ground (2nd person required for rotating the wheels).*
- ◆ *It is possible to quit the test procedure at any time by pressing the key C.*
- ◆ *After depressing the brake pedal several times, the vacuum in the brake servo unit is reduced. Greater effort is then required to operate the brake pedal in order to achieve the same fluid pressure in the brake system, as with vacuum assistance.*
- ◆ *Once the vacuum in the brake servo unit has been reduced, it is possible that the wheels do not lock ⇒ start engine in order to build up vacuum in the brake servo unit.*
- ◆ **Operate** vehicle system tester by referring to the **Readout in the display**.

Example:

Readout in display of V.A.G 1552 during final control diagnosis

(e.g. front left wheel, fl)

Final control diagnosis	- →
IFL: VBAT OFL: 0V	Wheel FL locked

IFL = Inlet valve front left

VBAT = Battery voltage; voltage present at valve

OFL = Exhaust valve front left

0V = 0 volts; no voltage exists at valve

locked/free = Wheel status; has to be checked by a 2nd person

Final control diagnosis - →
EDL valves / Hydr p : V BAT Wheel FL/FR lock

Hydr p = Hydraulic pump

Performing final control diagnosis

- Connect vehicle system tester V.A.G 1552 and select brake electronics control unit (address word 03) ⇒ page 45-9; ignition switched on for this step.
- Release handbrake.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- Press keys 0 and 3 for the function „Final control diagnosis“.

Test of vehicle systems
03 - Final control diagnosis

Q

◀ Readout in display:

- Confirm the entry with the key Q.

ABS hydraulic pump -V64- must run.

Note:

During the next steps the ABS warning light flashes twice a second and the handbrake/brake fluid warning light 4 times a second.

Final control diagnosis
ABS hydraulic pump -V64

- →

◀ Readout in display:

- Press → key within the next 60 seconds.

Final control diagnosis
Operate brake

- →

◀ Readout in display:

- Operate the brake pedal.
- Press → key.

Final control diagnosis		- →
IFL: 0V	OFL: 0V	Wheel FL locked

◀ Readout in display:

- Instruct the 2nd person to rotate the relevant wheel by hand.

*If the wheel does **not** block, it is possible that there is a fault in the mechanical/hydraulic part of the brake system.*

- Press → key.

Final control diagnosis		- →
IFL: VBAT	OFL: 0V	Wheel FL locked

◀ Readout in display:

- Press → key.

ABS hydraulic pump -V64- must run.

Brake pedal must not yield.

If the brake pedal **yields**, there is a fault in the hydraulic unit. In this case, replace the hydraulic unit ⇒ page 45-57.

Final control diagnosis		- →
IFL: VBAT	OFL: VBAT	Wheel fl free

◀ Readout in display:

- Instruct the 2nd person to rotate the relevant wheel by hand.

*If the wheel **blocks**, it is possible that the brake pressure lines to the wheel brakes are wrongly connected.*

- Press → key.

ABS hydraulic pump -V64- no longer runs.

Final control diagnosis		- →
IFL: VBAT	OFL: 0V	Wheel FL free

◀ Readout in display:

- Press → key.

Brake pedal must be felt to yield.

If the brake pedal does **not** yield, there is a fault in the hydraulic unit. In this case, replace hydraulic unit ⇒ page 45-57.

Final control diagnosis		- →
IFL: 0V	OFL: 0V	Wheel FL locked

◀ Readout in display:

- Instruct the 2nd person to rotate the relevant wheel by hand.

*If the wheel does **not** block, it is possible that there is a fault in the mechanical/hydraulic part of the brake system.*

- Press → key.

Final control diagnosis
Release brake

- →

◀ Readout in display:

- Take your foot off the brake pedal.
- Press → key.

Final control diagnosis
Operate brake

- →

◀ Readout in display:

- Operate the brake pedal.
- Press → key.

Final control diagnosis
IFR: 0V OFR: 0V

- →

Wheel FR locked

◀ Readout in display:

- Instruct the 2nd person to rotate the relevant wheel by hand.

*If the wheel does **not** block, it is possible that there is a fault in the mechanical/hydraulic part of the brake system.*

- Press → key.

Final control diagnosis
IFR: VBAT OFR: 0V

- →

Wheel FR locked

◀ Readout in display:

- Press → key.

ABS hydraulic pump -V64- must run.

Brake pedal must not yield.

If the brake pedal **yields**, there is a fault in the hydraulic unit. In this case, replace the hydraulic unit ⇒ page 45-57.

Final control diagnosis
IFR: VBAT OFR: VBAT

- →

Wheel FR free

◀ Readout in display:

- Instruct the 2nd person to rotate the relevant wheel by hand.

*If the wheel **blocks**, it is possible that the brake pressure lines to the wheel brakes are wrongly connected.*

- Press → key.

ABS hydraulic pump -V64- no longer runs.

Final control diagnosis
IFR: VBAT OFR: 0V

- →

Wheel FR free

◀ Readout in display:

- Press → key.

Brake pedal must be felt to yield.

If the brake pedal does **not** yield, there is a fault in the hydraulic unit. In this case, replace hydraulic unit ⇒ page 45-57.

Final control diagnosis	- →
IFR: 0V OFR: 0V Wheel FR locked	

◀ Readout in display:

- Instruct the 2nd person to rotate the relevant wheel by hand.

*If the wheel does **not** block, it is possible that there is a fault in the mechanical/hydraulic part of the brake system.*

- Press → key.

Final control diagnosis	- →
Release brake	

◀ Readout in display:

- Take your foot off the brake pedal.
- Press → key.

Final control diagnosis	- →
Operate brake	

◀ Readout in display:

- Operate the brake pedal.
- Press → key.

Final control diagnosis	- →
IRL: 0V ORL: 0V Wheel RL locked	

◀ Readout in display:

- Instruct the 2nd person to rotate the relevant wheel by hand.

*If the wheel does **not** block, it is possible that there is a fault in the mechanical/hydraulic part of the brake system.*

- Press → key.

Final control diagnosis	- →
IRL: VBAT ORL: 0V Wheel RL locked	

◀ Readout in display:

- Press → key.

ABS hydraulic pump -V64- must run.

Brake pedal must not yield.

If the brake pedal **yields**, there is a fault in the hydraulic unit. In this case, replace the hydraulic unit ⇒ page 45-57.

Final control diagnosis	- →
IRL: VBAT ORL: VBAT Wheel RL free	

◀ Readout in display:

- Instruct the 2nd person to rotate the relevant wheel by hand.

*If the wheel **locks**, it is possible that the brake pressure lines to the wheel brakes are wrongly connected.*

- Press → key.

ABS hydraulic pump -V64- no longer runs.

Final control diagnosis	- →
IRL: VBAT ORL: 0V Wheel RL free	

◀ Readout in display:

- Press → key.

Brake pedal must be felt to yield.

If the brake pedal does **not** yield, there is a fault in the hydraulic unit. In this case, replace hydraulic unit ⇒ page 45-57.

Final control diagnosis	- →
IRL: 0V ORL: 0V Wheel RL locked	

◀ Readout in display:

- Instruct the 2nd person to rotate the relevant wheel by hand.

*If the wheel does **not** block, it is possible that there is a fault in the mechanical/hydraulic part of the brake system.*

- Press → key.

Final control diagnosis	- →
Release brake	

◀ Readout in display:

- Take your foot off the brake pedal.
- Press → key.

Final control diagnosis	- →
Operate brake	

◀ Readout in display:

- Operate the brake pedal.
- Press → key.

Final control diagnosis	- →
IRR: 0V ORR: 0V Wheel RR locked	

◀ Readout in display:

- Instruct the 2nd person to rotate the relevant wheel by hand.

*If the wheel does **not** lock, it is possible that there is a fault in the mechanical/hydraulic part of the brake system.*

- Press → key.

Final control diagnosis	- →
IRR: VBAT ORR: 0V Wheel RR locked	

◀ Readout in display:

- Press → key.

ABS hydraulic pump -V64- must run.

Brake pedal must not yield.

If the brake pedal **yields**, there is a fault in the hydraulic unit. In this case, replace the hydraulic unit ⇒ page 45-57.

Final control diagnosis	- →
IRR: VBAT ORR: VBAT Wheel RR free	

◀ Readout in display:

- Instruct the 2nd person to rotate the relevant wheel by hand.

*If the wheel **blocks**, it is possible that the brake pressure lines to the wheel brakes are wrongly connected.*

- Press → key.

ABS hydraulic pump -V64- no longer runs.

Final control diagnosis	- →
IRR: VBAT ORR: 0V Wheel RR free	

◀ Readout in display:

- Press → key.

Brake pedal must be felt to yield.

If the brake pedal does **not** yield, there is a fault in the hydraulic unit. In this case, replace hydraulic unit ⇒ page 45-57.

Final control diagnosis	- →
IRR: 0V ORR: 0V Wheel RR locked	

◀ Readout in display:

- Instruct the 2nd person to rotate the relevant wheel by hand.

*If the wheel does **not** lock, it is possible that there is a fault in the mechanical/hydraulic part of the brake system.*

- Press → key.

Final control diagnosis	- →
Release brake	

◀ Readout in display:

- Take your foot off the brake pedal.
- Press → key.

Final control diagnosis	- →
EDL valves/Hydr p: VBAT Wheel FL/FR lock	

◀ Readout in display (applies to models with EDL)

- Instruct the 2nd person to rotate the relevant wheel by hand.

If the wheels do **not** lock, there is a fault in the hydraulic part of the ABS system. In this case, replace the hydraulic unit ⇒ page 45-57.

- Press → key.

The ABS warning light -K47- goes out.

Function is unknown or cannot be carried out at the moment →

◀ Readout in display:

Final control diagnosis is ended.

- Press → key.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

Notes:

- ♦ *If the ABS warning light does not go out, there is a fault in the system.*
- ♦ *Carry out the test sequence exactly:
First of all, interrogate fault memory, then erase it.*
- End output ⇒ page 45-22.

Initiating basic setting

Special tools, testers and aids required

- ♦ Vehicle system tester V.A.G 1552
- ♦ Diagnostic cable V.A.G 1551/3
- ♦ Brake filling and bleeding appliance, e.g. ROMESS S15
- ♦ Brake fluid ⇒ page 00-8

On models fitted with EDL, the basic setting is used for bleeding the hydraulic unit.

It is only necessary to carry out the basic setting if at least one chamber of the brake fluid reservoir has run completely empty (e.g. because of a leak in the brake system).

Note:

Operate vehicle system tester referring to the **Readout in the display**.

Warning!

When replenishing brake fluid with a brake filling and bleeding appliance, e.g. ROMESS S15, it is important to ensure that the filling pressure of 0.1 MPa (1 bar) is not exceeded.

If the filling pressure of 0.1 MPa (1 bar) is exceeded, proper bleeding of the hydraulic unit is no longer assured.

- Connect brake filling and bleeding appliance, e.g. ROMESS S15.
- Connect vehicle system tester V.A.G 1552 and select brake electronics control unit (address word 03) ⇒ page 45-9; ignition switched on for this step.

Test of vehicle systems Select function XX	HELP	◀ Readout in display:
		- Press keys 0 and 4 for the function „Initiate basic setting“.
Test of vehicle systems 04 - Basic setting	Q	◀ Readout in display:
		- Confirm the entry with the key Q.
Basic setting Enter display group number XXX	HELP	◀ Readout in display:
		- Press keys 0, 0 and 1.
		- Confirm the entry with the key Q.
System in basic setting Depress pedal and hold...	1	◀ Readout in display:
		♦ Pedal yields
		♦ Hydraulic pump starts running
		♦ Pedal moves back
System in basic setting Rel. pedal; FR+FL bleeder screws OPEN <↑>	1	◀ Readout in display:
		- Press ↑ key.
		Note:
		<i>If you are using V.A.G 1551, a <3> appears in place of <↑>.</i>
System in basic setting please wait . . . (10 sec.)	2	◀ Readout in display:
		♦ Hydraulic pump starts running
System in basic setting Dep. pedal x10; bleeder screws CLOSED <↑>	2	◀ Readout in display:
		- Press ↑ key.

System in basic setting Depress pedal and hold...	3	◀ Readout in display:	◆ Pedal yields ◆ Hydraulic pump starts running ◆ Pedal moves back
System in basic setting Rel. pedal; FR+FL bleeder screws OPEN <↑>	3	◀ Readout in display:	- Press ↑ key.
System in basic setting please wait . . . (10 sec.)	4	◀ Readout in display:	◆ Hydraulic pump starts running
System in basic setting Dep. pedal x10; bleeder screws CLOSED <↑>	4	◀ Readout in display:	- Press ↑ key.
System in basic setting Depress pedal and hold...	5	◀ Readout in display:	◆ Pedal yields ◆ Hydraulic pump starts running ◆ Pedal moves back
System in basic setting Rel. pedal; FR+FL bleeder screws OPEN <↑>	5	◀ Readout in display:	- Press ↑ key.
System in basic setting please wait . . . (10 sec.)	6	◀ Readout in display:	◆ Hydraulic pump starts running
System in basic setting Dep. pedal x10; bleeder screws CLOSED <↑>	6	◀ Readout in display:	- Press ↑ key.
System in basic setting Depress pedal and hold...	7	◀ Readout in display:	◆ Pedal yields ◆ Hydraulic pump starts running ◆ Pedal moves back
System in basic setting Rel. pedal; FR+FL bleeder screws OPEN <↑>	7	◀ Readout in display:	- Press ↑ key.

System in basic setting please wait . . . (10 sec.)	8	◀ Readout in display: ◆ Hydraulic pump starts running
System in basic setting Dep. pedal x10; bleeder screws CLOSED <↑>	8	◀ Readout in display: - Press ↑ key.
System in basic setting Depress pedal and hold...	9	◀ Readout in display: ◆ Pedal yields ◆ Hydraulic pump starts running ◆ Pedal moves back
System in basic setting Rel. pedal; FR+FL bleeder screws OPEN <↑>	9	◀ Readout in display: - Press ↑ key.
System in basic setting please wait . . . (10 sec.)	10	◀ Readout in display: ◆ Hydraulic pump starts running
System in basic setting Dep. pedal x10; bleeder screws CLOSED <↑>	10	◀ Readout in display: - Press ↑ key.
System in basic setting Depress pedal and hold...	11	◀ Readout in display: ◆ Pedal yields ◆ Hydraulic pump starts running ◆ Pedal moves back
System in basic setting Rel. pedal; FR+FL bleeder screws OPEN <↑>	11	◀ Readout in display: - Press ↑ key.
System in basic setting please wait . . . (10 sec.)	12	◀ Readout in display: ◆ Hydraulic pump starts running
System in basic setting Dep. pedal x10; bleeder screws CLOSED <↑>	12	◀ Readout in display: - Press ↑ key.
System in basic setting Depress pedal and hold...	13	◀ Readout in display: ◆ Pedal yields ◆ Hydraulic pump starts running ◆ Pedal moves back

System in basic setting Rel. pedal; FR+FL bleeder screws OPEN <↑>	13	◀ Readout in display: - Press ↑ key.
System in basic setting please wait . . . (10 sec.)	14	◀ Readout in display: ♦ Hydraulic pump starts running
System in basic setting Dep. pedal x10; bleeder screws CLOSED <↑>	14	◀ Readout in display: - Press ↑ key.
System in basic setting Depress pedal and hold...	15	◀ Readout in display: ♦ Pedal yields ♦ Hydraulic pump starts running ♦ Pedal moves back
System in basic setting Rel. pedal; FR+FL bleeder screws OPEN <↑>	15	◀ Readout in display: - Press ↑ key.
System in basic setting please wait . . . (10 sec.)	16	◀ Readout in display: ♦ Hydraulic pump starts running
System in basic setting Dep. pedal x10; bleeder screws CLOSED <↑>	16	◀ Readout in display: - Press ↑ key.
System in basic setting Part bleeding ended...	17	◀ Readout in display: - Press → key.
Test of vehicle systems Select function XX	HELP	◀ Readout in display: - Press keys 0 and 6 for the function „End output“.
Test of vehicle systems 06 - End output	Q	◀ Readout in display: - Confirm the entry with the key Q.
Test of vehicle systems Enter address word XX	HELP	◀ Readout in display: - Switch off ignition. - Separate plug connection to V.A.G 1552. - Bleed brake system ⇒ page 47-18.

Electrical test of ABS and ABS/EDL ITT Mark 20 IE

Special tools, testers and aids required

- ◆ Test box V.A.G 1598/21
- ◆ Adapter cable set 1594/A
- ◆ Hand-held multimeter, e.g. V.A.G 1526 A

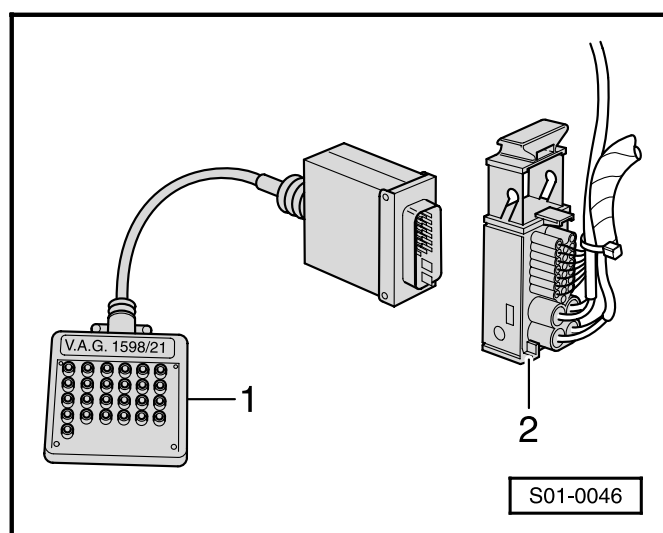
Test steps from page 45-44 apply to:

- ◆ Models on which the self-diagnosis does not provide any indication of the source of the fault. In this case, work through the complete electrical test.
- ◆ Models on which the self-diagnosis provides a direct indication of the source of the fault. In this case, work through only the test step recommended in the fault table (specific fault finding).

Test requirements

- Fuses according to current flow diagram must be in proper order.
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
As a check, remove fuse from the fuse holder on the battery and on the left fuse holder on the dash panel.
- Before commencing the test, switch off ignition and electrical components (head-lights, lighting, fan etc.).
- Separate multi-pin connector from control unit (J104) and connect test box V.A.G 1598/21 -1- to the connector of the wiring loom -2-.

The specifications are matched to V.A.G 1526 A and do not necessarily apply to other test equipment.

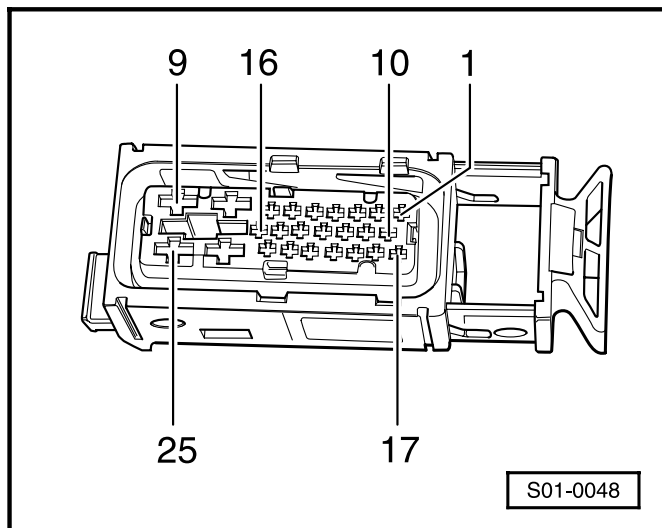


Multi-pin connectors with contact assignment

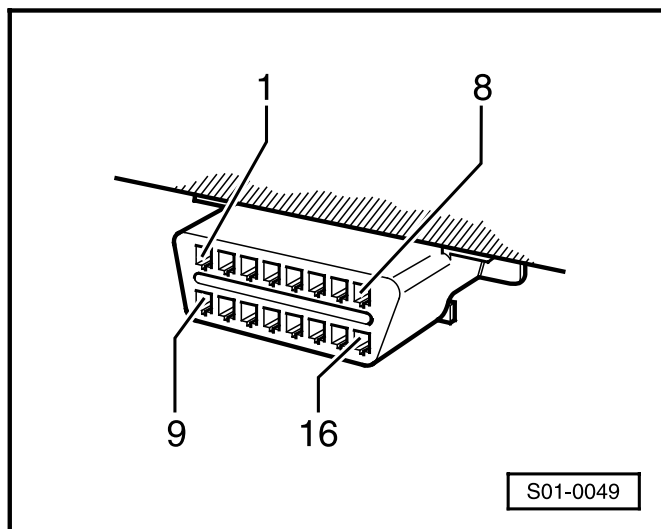
Note:

Not all of the contacts listed are presently assigned and must on no account be connected to other components!

◀ Contact assignment of plug connection T25a wiring loom/control unit -J104



Contact	Cable connection to component ...
1	⇒ Front left wheel speed sensor -G47
2	⇒ Front left wheel speed sensor -G47
3	⇒ Coding bridge to contact 14
4	⇒ Voltage supply terminal 15
5	⇒ Rear left wheel speed sensor -G46
6	⇒ Rear left wheel speed sensor -G46
7	⇒ Plug connection T16a/7 K wire
8	⇒ Earth terminal 31
9	⇒ Voltage supply of battery +
10	⇒ Data BUS line (CAN-L) ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
11	⇒ Data BUS line (CAN-H) ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
14	⇒ Coding bridge for contact 3
16	⇒ ABS warning light
18	⇒ Brake light switch -F-
19	⇒ Front right wheel speed sensor -G45
20	⇒ Front right wheel speed sensor -G45
22	⇒ Rear right wheel speed sensor -G44
23	⇒ Rear right wheel speed sensor -G44
24	⇒ Earth point on left below battery
25	⇒ Voltage supply of battery +



◀ **Contact assignment of plug connections for voltage supply and self-diagnosis with vehicle system tester V.A.G 1552**

Contact 4	= Earth (terminal 31)
Contact 5	= Earth (terminal 31)
Contact 16	= Positive (terminal 30)
Contact 7	= K wire through cable connection - diagnosis - to control unit (J104) contact 7

Summary of test steps

Component to be tested	Test steps from test table ⇒ page 45-44
Voltage supply for hydraulic pump -V64- to control unit -J104	- Perform test step 1
Voltage supply of valves in hydraulic unit -N55- to control unit -J104	- Perform test step 2
Voltage supply (terminal 15) to control unit -J104	- Perform test step 3
Operation of brake light switch -F	- Perform test step 4
Resistance of front right wheel speed sensor -G45	- Perform test step 5
Resistance of front left wheel speed sensor -G47	- Perform test step 6
Resistance of rear right wheel speed sensor -G44	- Perform test step 7
Resistance of rear left wheel speed sensor -G46	- Perform test step 8
Voltage signal of front right wheel speed sensor -G45	- Perform test step 9
Voltage signal of front left wheel speed sensor -G47	- Perform test step 10
Voltage signal of rear right wheel speed sensor -G44	- Perform test step 11
Voltage signal of rear left wheel speed sensor -G46	- Perform test step 12
Coding bridge	- Perform test step 13
Voltage supply for V.A.G 1552, plug connection T16	- Perform test step 14
Resistance of K wire for V.A.G 1552, plug connection T16	- Perform test step 15
Operation of ABS warning light -K47	- Perform test step 16
Operation of handbrake/brake fluid level warning light -K14/33	- Perform test step 17
Operation of hydraulic pump -V64	- Perform test step 18
Test of data BUS lines	- Perform test step 19

Test table

- ♦ The socket assignments of the test box V.A.G 1598/21 are identical with contact designations of the control unit (J104) in the current flow diagram.
⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
- ♦ If the measurements obtained differ from the specifications, carry out measurements for rectifying faults in the right-hand part of the table.
- ♦ If the specifications are achieved, additionally test the cables for short circuit to positive and to earth.
- ♦ Use the adapter cable set V.A.G 1594 A for conducting continuity test (bridges).
- ♦ If the measurements obtained differ only slightly from the specifications, clean sockets and connectors of the test equipment and test cables (e.g. with contact spray) and repeat test. Before replacing the relevant components, test cables and connections and, particularly for specifications of less than 10 ohms, repeat the resistance measurement at the component.

Switch on measuring range: Voltage measurement (20 V =)					
Test step	V.A.G 1598/21 Sockets	Test of	• Test conditions - Additional operations	Specifi- cation	Measures if readout differs from specification
1	8 + 25	Voltage supply for hydraulic pump -V64- to control unit -J104-	• Ignition switched off	10.0 - 14.5 V	- Test cable from contact 8 to earth. - Test cable from contact 25 through fuse to battery +. ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
2	9 + 24	Voltage supply for valves in hydraulic -N55- to control unit -J104-	• Ignition switched off	10.0 - 14.5 V	- Test cable from contact 24 to earth. - Test cable from contact 9 through fuse to battery +. ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
3	4 + 8	Voltage supply (terminal 15) to control unit -J104-	• Ignition switched on	10.0 - 14.5 V	- Test cable from contact 8 to earth. - Test cable from contact 4 to connection of terminal 15 (relay plate).
4	8 + 18	Operation of brake light switch -F-	• Ignition switched off • Brake pedal not depressed - Depress brake pedal	0.0 - 0.5 V approx. battery voltage	- Test fuse. - Test brake light switch -F- and read measured value block ⇒ page 45-24, display group number 003. - Test cable from contact 8 to earth. - Test cable from contact 18 to brake light switch. ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder - Test brake light switch -F- ⇒ page 45-69.

Switch on measuring range: Resistance measurement (2 kΩ)					
Test step	V.A.G 1598/21 Sockets	Test of	• Test conditions - Additional operations	Specifi- cation	Measures if readout differs from specification
5	19 + 20	Resistance of front right wheel speed sensor -G45-	• Ignition switched off	1.0...1.3 kΩ	- Separate plug connection at wheel speed sensor -G45-. - Test wiring according to CFD ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder - Move cables during test (loose contact) If no fault is found in the wiring: - Replace wheel speed sensor -G45- ⇒ page 45-60.
6	1 + 2	Resistance of front left wheel speed sensor -G47-	• Ignition switched off	1.0...1.3 kΩ	- Separate plug connection at wheel speed sensor -G47-. - Test wiring according to CFD ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder - Move cables during test (loose contact) If no fault is found in the wiring: - Replace wheel speed sensor -G47- ⇒ page 45-60.
7	22 + 23	Resistance of rear right wheel speed sensor -G44-)	• Ignition switched off	1.0...1.3 kΩ	- Separate plug connection at wheel speed sensor -G44-. - Test wiring according to CFD ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder - Move cables during test (loose contact) If no fault is found in the wiring: - Replace wheel speed sensor -G44- ⇒ page 45-65.

Switch on measuring range: Resistance measurement (2 kΩ)					
Test step	V.A.G 1598/21 Sockets	Test of	- Test conditions - Additional operations	Specification	Measures if readout differs from specification
8	5 + 6	Resistance of rear left wheel speed sensor -G46-	Ignition switched off	1.0...1.3 kΩ	- Separate plug connection at wheel speed sensor -G46-. - Test wiring according to CFD ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder - Move cables during test (loose contact) If no fault is found in the wiring: - Replace wheel speed sensor -G46- ⇒ page 45-65.
Switch on measuring range: Voltage measurement (20 V ≈)					
Test step	V.A.G 1598/21 Sockets	Test of	- Test conditions - Additional operations	Specification	Measures if readout differs from specification
9	19 + 20	Voltage signal of front right wheel speed sensor -G45-	- Vehicle raised - Ignition switched off - Rotate front right wheel at approx. 1 rev/s	min. 65 mV alternating voltage	- Check installation of wheel speed sensor -G45- and of pulse rotor. - Check correct connection of wheel speed sensor -G45- ⇒ page 45-24, Reading measured value block, display group number 001.
10	1 + 2	Voltage signal of front left wheel speed sensor -G47-	- Vehicle raised - Ignition switched off - Rotate front left wheel at approx. 1 rev/s	min. 65 mV alternating voltage	- Check installation of wheel speed sensor -G47- and of pulse rotor. - Check correct connection of wheel speed sensor -G47- ⇒ page 45-24, Reading measured value block, display group number 001.

Switch on measuring range: Voltage measurement (20 V ≈)					
Test step	V.A.G 1598/21 Sockets	Test of	• Test conditions - Additional operations	Specifi- cation	Measures if readout differs from specification
11	22 + 23	Voltage signal of rear right wheel speed sensor -G44-	- Vehicle raised - Ignition switched off - Rotate rear right wheel at approx. 1 rev/s	min. 190 mV alternating voltage	- Check installation of wheel speed sensor -G44- and of pulse rotor. - Check correct connection of wheel speed sensor -G44- ⇒ page 45-24, Reading measured value block, display group number 001.
12	5 + 6	Voltage signal of rear left wheel speed sensor -G46-	- Vehicle raised - Ignition switched off - Rotate rear left wheel at approx. 1 rev/s	min. 190 mV alternating voltage	- Check installation of wheel speed sensor -G46- and of pulse rotor. - Check correct connection of wheel speed sensor -G46- ⇒ page 45-24, Reading measured value block, display group number 001.
Switch on measuring range: Resistance measurement (200 Ω)					
Test step	V.A.G 1598/21 Sockets	Test of	• Test conditions - Additional operations	Specifi- cation	Measures if readout differs from specification
13	3 + 14	Coding bridge	Ignition switched off	0.0 -1.0 Ω	- Test cable and contacts in connector. ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder - If readout differs from specification: - Replace coding bridge.
Switch on measuring range: Voltage measurement (20 V ≈)					
Test step	V.A.G 1598 Sockets	Test of	• Test conditions - Additional operations	Specifi- cation	Measures if readout differs from specification
14	-	Voltage supply for V.A.G 1552, plug connection T16a ¹⁾	- Ignition switched off - Connect hand-held multimeter V.A.G 1526 A with adapter cable set V.A.G 1594 A to T16a ¹⁾: - Contact 4 - earth - Contact 16 - positive	10.0 -14.5 V	- Test cable from T16a/4 to earth. - Test cable from T16a/16 through fuse to terminal 30. ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder

¹⁾ ⇒ page 45-43, Contact assignment of plug connection for voltage supply and self-diagnosis using vehicle system tester V.A.G 1552.

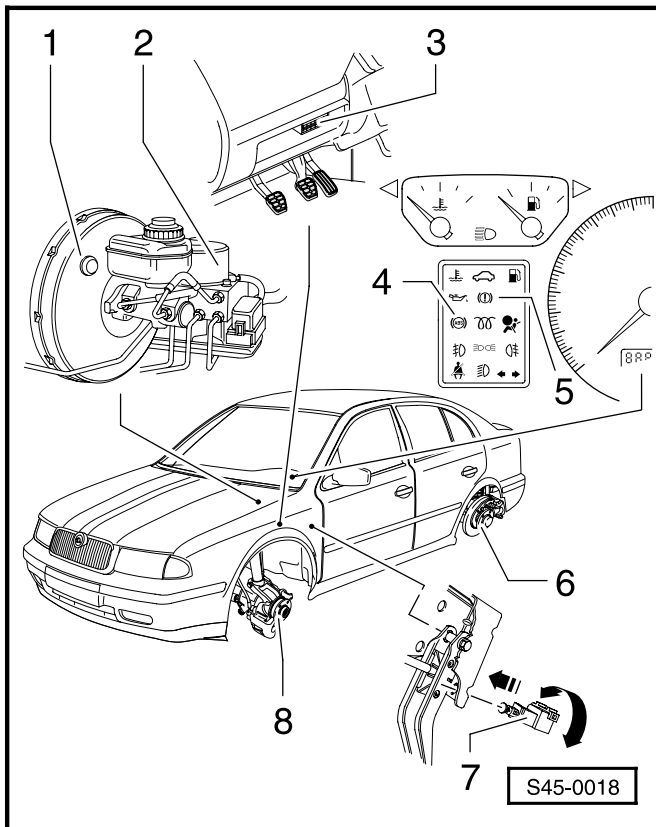
Switch on measuring range: Resistance measurement (200 Ω)					
Test step	V.A.G 1598/21 Sockets	Test of	- Test conditions - Additional operations	Specification	Measures if readout differs from specification
15	-	Resistance of K wire for V.A.G 1552, plug connection T16a ¹⁾	- Ignition switched off - Separate multi-pin connector from control unit -J104- - Connect test box V.A.G 1598/21 - Connect hand-held multimeter V.A.G 1526 with adapter cable set V.A.G 1594 to contacts T16/7¹⁾ and T25/7 of multi-pin connector of control unit -J104-	max. 1.5 Ω	- Test cable from T16/7 through cable connection - diagnosis - to contact 7. ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
Operational test: ABS warning light (K47)					
Test step	V.A.G 1598 Sockets	Test of	- Test conditions - Additional operations	Specification	Measures if readout differs from specification
16	-	Operation of ABS warning light -K47-	Ignition switched on	Warning light -K47- comes on for about 2 seconds and goes out again	- Test cable from contacts 7 and 9 of blue connector at dash panel insert to earth. - Test cable from contact 19 of blue connector at dash panel insert to contact 16 of ABS connector. ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder - Test dash panel insert, fault in dash panel insert: ⇒ Electrical System; Repair Group 90; Dash panel insert

¹⁾ ⇒ page 45-43, Contact assignment of plug connection for voltage supply and self-diagnosis using vehicle system tester V.A.G 1552.

Operational test: Handbrake/brake fluid level warning light (K14/33)					
Test step	V.A.G 1598 Sockets	Test of	• Test conditions - Additional operations	Specifi- cation	Measures if readout differs from specification
17	-	Operation of handbrake/brake fluid level warning light -K14/33-	• Brake fluid at correct level • Ignition switched on	Warning light -K14/33- comes on for about 2 seconds and goes out again	- Test cable from contacts 7 and 9 of blue connector at dash panel insert to earth. - Test cable from contact 29 of blue connector at dash panel insert to brake fluid level warning contact -F34-. - Test cable from contact 13 of green connector at dash panel insert to handbrake indicator switch -F9-. - Test brake fluid level warning contact -F34- in cap. ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder - Test dash panel insert, fault in dash panel insert: ⇒ Electrical System; Repair Group 90; Dash panel insert - Replace handbrake indicator switch -F9- ⇒ page 46-18.
Operational test: Hydraulic pump -V64					
Test step	V.A.G 1598 Sockets	Test of	• Test conditions - Additional operations	Specifi- cation	Measures if readout differs from specification
18	-	Operation of hydraulic pump -V64-	• Ignition switched off - Separate plug connection T2 of hydraulic pump -V64- at control unit -J104- - Apply earth to plug connection of hydraulic pump T2/1 and battery voltage to T2/2	Hydraulic pump runs properly (max. 10 sec.) Hydraulic pump does not run	- ⇒ page 45-29, Perform final control diagnosis. - Replace control unit -J104- ⇒ page 45-57. - Replace hydraulic unit -N55- ⇒ page 45-57.

Switch on measuring range: Resistance measurement (200 Ω /20 M Ω)					
Test step	V.A.G 1598 Sockets	Test of	- Test conditions - Additional operations	Specification	Measures if readout differs from specification
19	11 + 10	Databus lines	- Ignition switched off 200 Ω range set - Separate multi-pin connectors of control units connected to a databus line - Connect test box V.A.G 1598/21 - Test databus lines for open circuit	max. 1.5 Ω	- Test wiring according to CFD ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
			20 MΩ range set - Remove fuse - Test cables for short circuit to positive or to earth	∞ Ω	- Test wiring according to CFD ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

Electrical/electronic components and fitting locations ABS, ABS/EDL Mark 20



All the components marked with ¹⁾ are tested by the self-diagnosis.

1 - Brake servo unit with brake master cylinder and brake fluid reservoir

- ♦ assembly overview ⇒ page 47-1

2 - Hydraulic control unit ¹⁾

- ♦ fitting location: in left of engine compartment
- ♦ removing and installing ⇒ page 45-52
- ♦ servicing ⇒ page 45-57

3 - Diagnostic connection

- ♦ fitting location: in stowage compartment driver side

4 - ABS warning light (K47)

- ♦ fitting location: in dash panel insert
 - Function:
 - ♦ ABS warning light comes on:
 - for about 2 seconds after ignition is switched on and/or engine start
 - if fault is detected (e.g. open circuit to wheel speed sensor)
- ⇒ page 45-7

5 - Handbrake/brake fluid level warning light (K14/33)

- ♦ fitting location: in dash panel insert
 - Function:
 - ♦ The handbrake/brake fluid warning light comes on:
 - when handbrake applied
 - if brake fluid level is low
 - for about 2 seconds after ignition is switched on
 - if the electronic brake force distribution fails, i.e. if the ABS warning light comes on
- ⇒ page 45-7

6 - Parts of ABS system at rear axle

(illustration shows only disc brakes)

- ♦ rear right and left wheel speed sensor -G44/G46 ¹⁾
- removing and installing ⇒ page 45-65
- installing wheel speed sensor cables ⇒ page 45-67
- ♦ rear right and left pulse rotor for wheel speed sensor
- testing ⇒ page 45-66
- removing and installing: the pulse rotor should be replaced together with the wheel hub ⇒ page 42-23 and 42-28

7 - Brake light switch -F-

- ♦ is open in off position
- adjusting ⇒ page 45-69
- remove by turning 90° to left ⇒ page 45-69
- install by turning 90° to right ⇒ page 45-69
- ♦ must be tested in measured value block ⇒ page 45-24

8 - Parts of ABS system at front axle

- ♦ front right and left wheel speed sensor -G45/G47 ¹⁾
- removing and installing ⇒ page 45-60
- installing wheel speed sensor cables ⇒ page 45-62
- ♦ front right and left pulse rotor for wheel speed sensor
- testing ⇒ page 45-61
- removing and installing: the pulse rotor should be replaced together with the wheel hub ⇒ page 40-13

Removing and installing hydraulic control unit and bracket

Note:

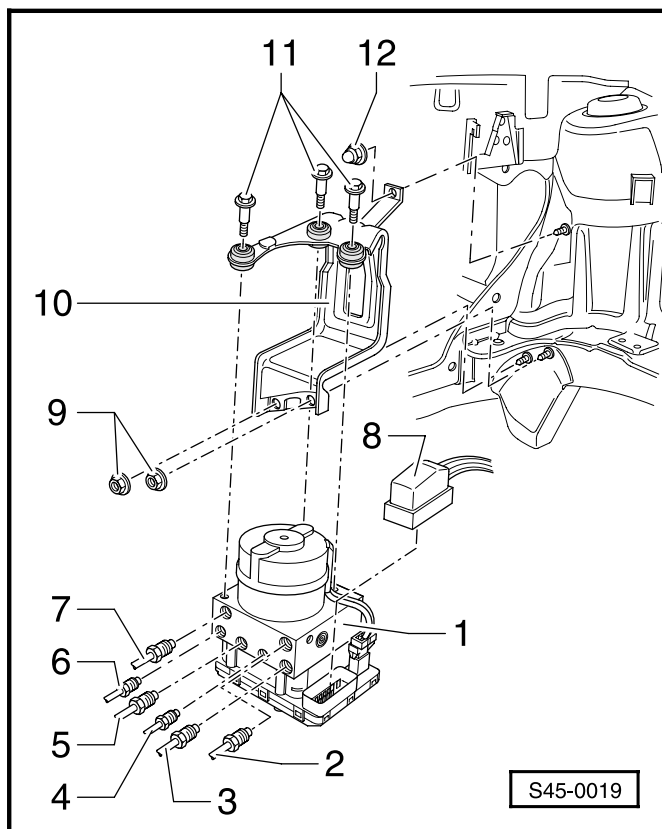
As a general rule, always ensure that no brake fluid gets into the connector housing of the control unit.

This can result in corrosion to the contacts and thus in a failure of the system.

If the plug housing is soiled, it should be carefully cleaned with compressed air.

Special tools, testers and aids required

- ◆ Vehicle system tester V.A.G 1552
- ◆ Diagnostic cable V.A.G 1551/3
- ◆ Brake pedal depressor, e.g. V.A.G 1238/B
- ◆ Caps from repair kit Part No. 1HO 698 311 A
- ◆ Brake filling and bleeding appliance, e.g. ROMESS S15
- ◆ Bleeder bottle (commercially available)
- ◆ Brake fluid ⇒ page 00-8



1 - Hydraulic control unit

- ◆ The hydraulic pump -V64-, the hydraulic unit -N55- and the control unit -J104- together form the hydraulic control unit.
- ◆ The hydraulic control unit should be removed and installed as a complete unit ⇒ page 45-53.
- ◆ Servicing ⇒ page 45-57

2 - Brake line, 14 Nm

- ◆ Between brake master cylinder/ floating piston circuit and hydraulic unit

3 - Brake line, 14 Nm

- ◆ Hydraulic unit to front left brake caliper

4 - Brake line, 14 Nm

- ◆ Hydraulic unit to rear right wheel cylinder/brake caliper

5 - Brake line, 14 Nm

- ◆ Hydraulic unit to rear left wheel cylinder/brake caliper

6 - Brake line, 14 Nm

- ◆ Hydraulic unit to front right brake caliper

7 - Brake line, 14 Nm

- ◆ Between brake master cylinder/pushrod piston circuit and hydraulic unit

8 - Multipin connector of control unit

- ◆ 25-pin
- ◆ Do not separate plug connection before self-diagnosis is completed. Switch off ignition before separating the plug connection.

9 - Hexagon nut, self-locking, 20 Nm**10 - Bracket****11 - Fit bolt, 8 Nm****12 - Cap nut, 25 Nm****Removing hydraulic control unit****Notes:**

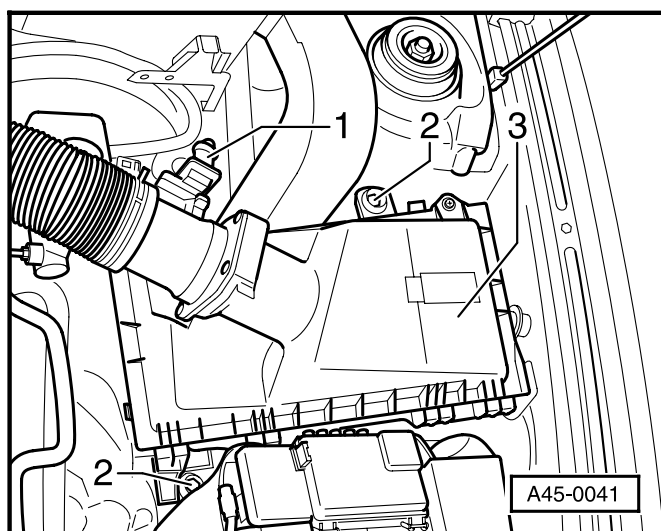
- ◆ Before disconnecting the battery, determine the code of radio set fitted with anti-theft coding.
 - ◆ When the battery is re-connected, please check the vehicle equipment:
 - Enter radio code
 - Re-set clock
 - Initialise power windows.
- ⇒ Inspection and Maintenance

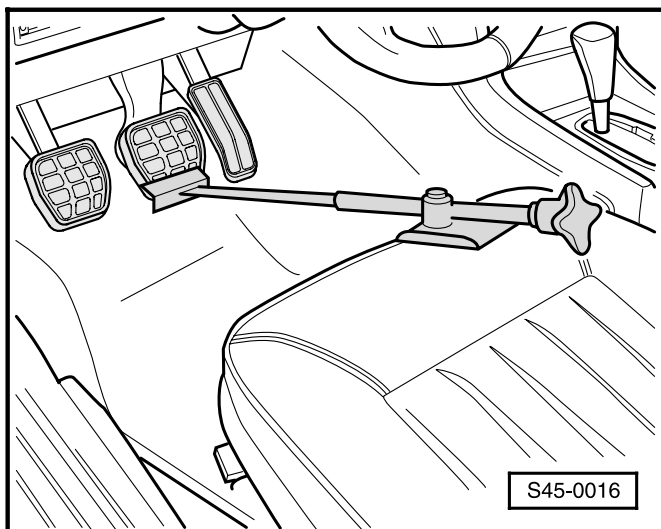
- Disconnect battery.

Note:

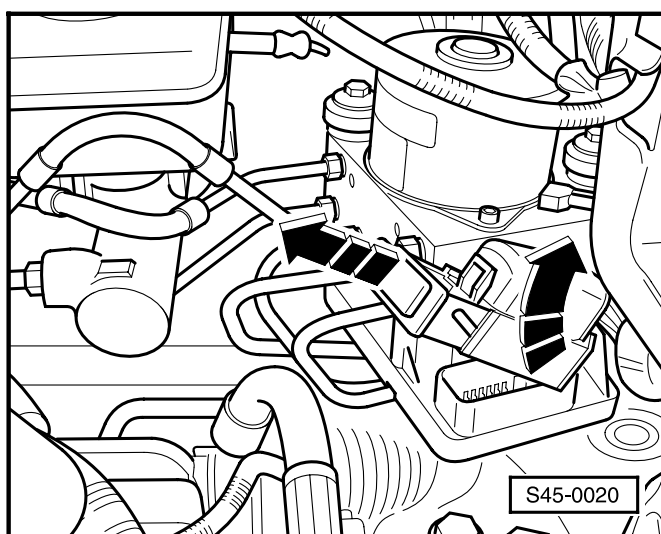
The following 2 steps do not apply to the 1.6-ltr./55 kW engine:

- ◀ - Unplug the connector -1- of the air mass meter at the air guide pipe of the air filter.
- Take out the bolts -2- at the air filter -3- and place filter to the side.
- On diesel engines, remove relay carrier above brake servo unit.
- Extract as much brake fluid as possible from the brake fluid reservoir with a bleeder bottle.





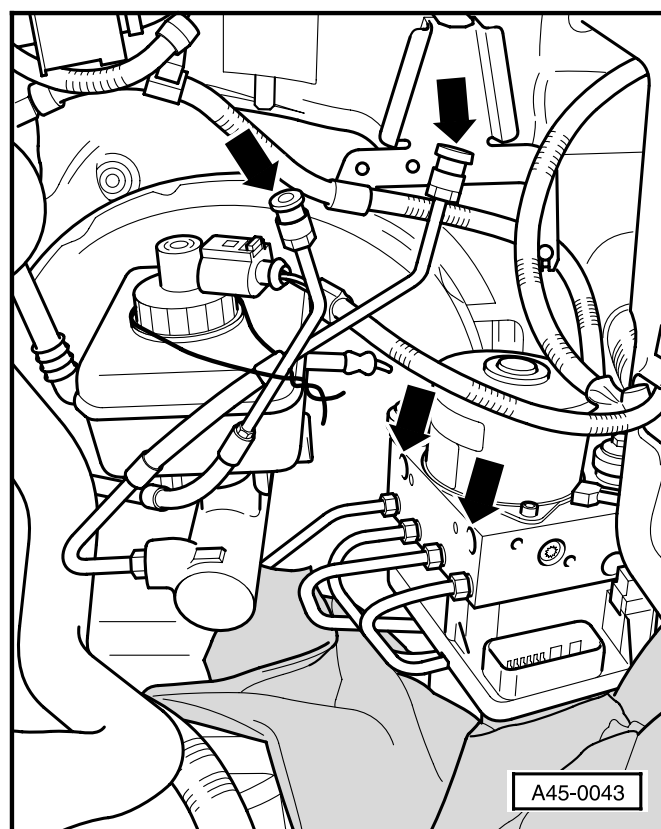
- ◀ - Depress brake pedal and lock in position with brake pedal depressor, e.g. V.A.G 1238/B.
- Fit the bleeder hose of the bleeder bottle onto the bleeder screw of the front left brake caliper and open bleeder screw.
- After brake fluid has flowed out, close bleeder screw.
- Detach bleeder hose from the bleeder screw.



- ◀ - Release multi-pin connector and unplug from control unit.

Note:

Ensure that no brake fluid gets onto the contacts.

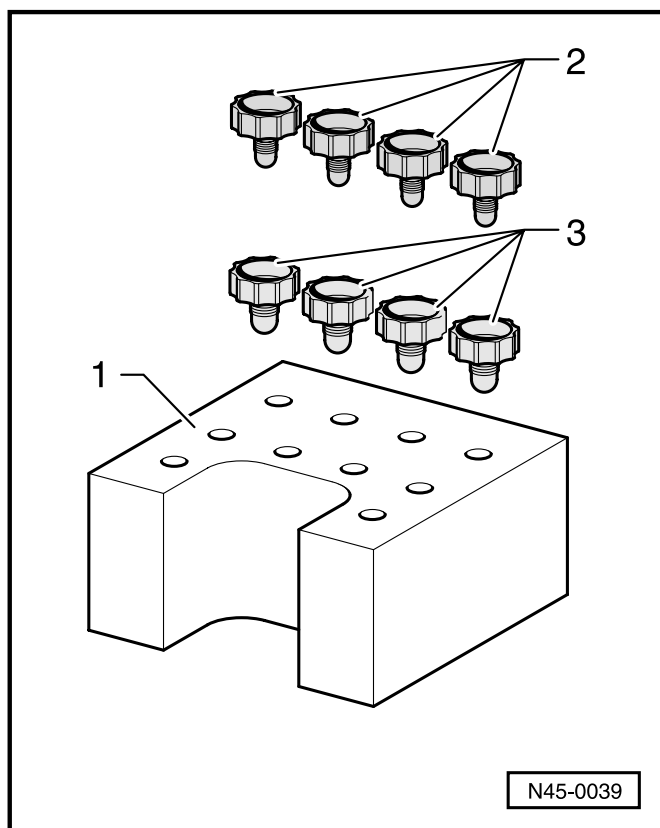


- ◀ - Place an absorbent mat below the hydraulic control unit to absorb the brake fluid.

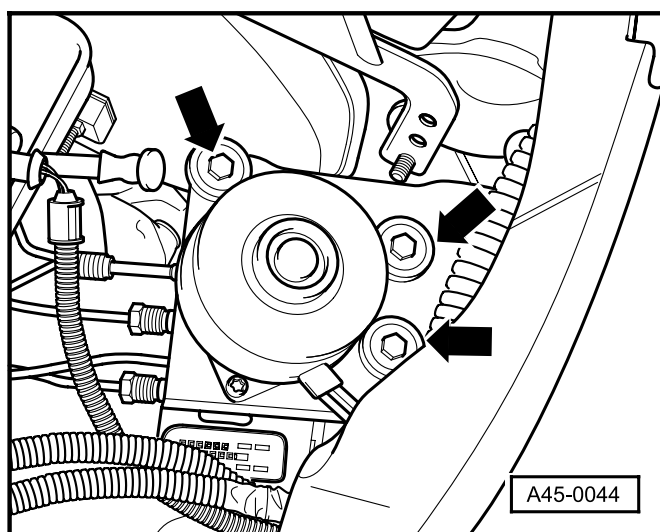
Note:

Brake lines in the area of the hydraulic unit must not be bent.

- Detach the brake lines from the brake master cylinder to hydraulic unit, see arrows, and fit on caps from repair kit Part No. 1H0 698 311 A to protect them from dirt.
- On models with left-hand steering, tie up the detached brake lines with a welding wire as high up as possible so that the ends of the lines project above the fluid level in the brake fluid reservoir -arrows-.
- Detach the remaining brake lines from the hydraulic unit.



- ◀ - Seal the connections of the hydraulic lines at the hydraulic unit with the plugs -item 2- and -item 3- from repair kit Part No. 1H0 698 311 A.
- Item 1- Transport protection for valve domes (foam)



- ◀ - Remove bolts -arrows- at the bracket of the hydraulic control unit.
- Take out hydraulic control unit.

Installing hydraulic control unit

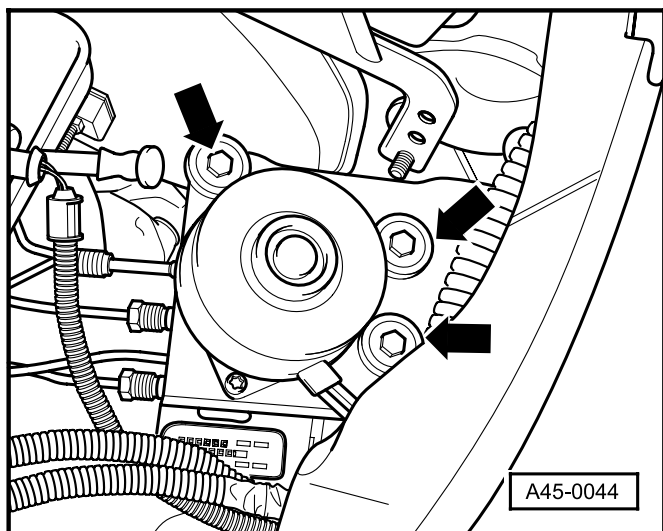
Notes:

- ◆ Do not remove plugs at the hydraulic unit until the appropriate brake line is fitted on.
- ◆ If the plugs are removed sooner from the hydraulic unit, brake fluid may flow out with the result that the system is no longer properly filled and bled.

- Bolt hydraulic control unit onto bracket.

Note:

Do not fully tighten bolts. This makes it easier to connect the individual brake lines to the hydraulic control unit.



- Attach brake lines to the hydraulic unit and tighten fully ⇒ page 45-52.

◀ - Bolt hydraulic control unit tight -arrow-.

- Plug multipin connector into the control unit and lock.

The remaining installation is carried out in the reverse order.

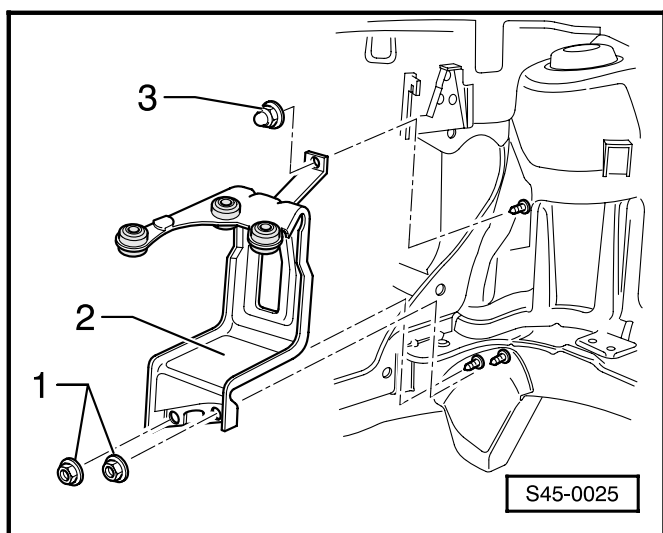
- Connect battery.

- Bleed brake system ⇒ page 47-18.

- Code control unit ⇒ page 45-22.

- Interrogate fault memory ⇒ page 45-12.

- Erase fault memory ⇒ page 45-21.



Removing and installing bracket

Removing

- Remove hydraulic control unit ⇒ page 45-53.

◀ - Unscrew hexagon nuts -1- and cap nut -3-.

- Take off bracket -2-.

Installing

Installation is carried out in the reverse order.

Tightening torques:

Hexagon nuts to body 20 Nm
Always fit new nuts!

Cap nut to body 25 Nm

Servicing hydraulic control unit

Special tools, testers and aids required

- ◆ Caps from repair kit Part No. 1H0 698 311 A

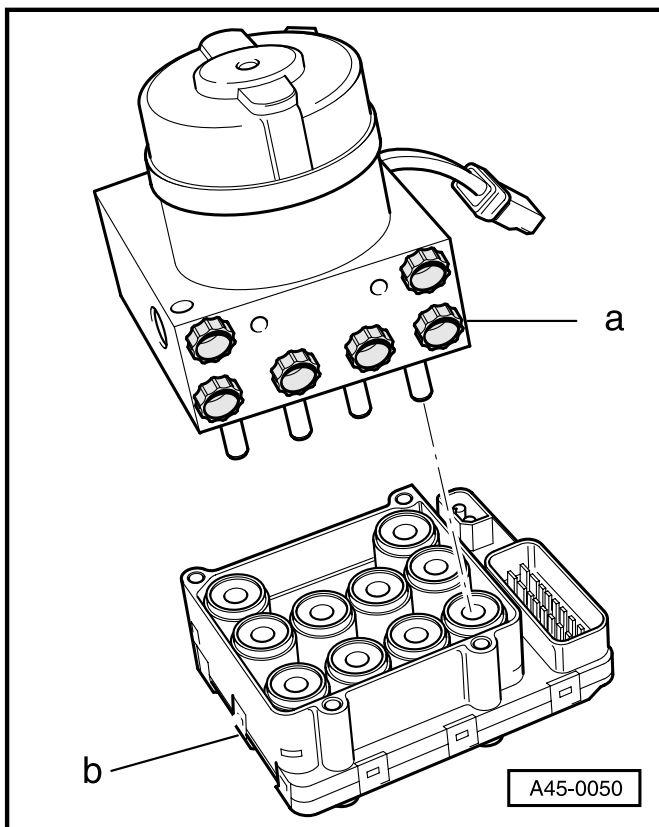
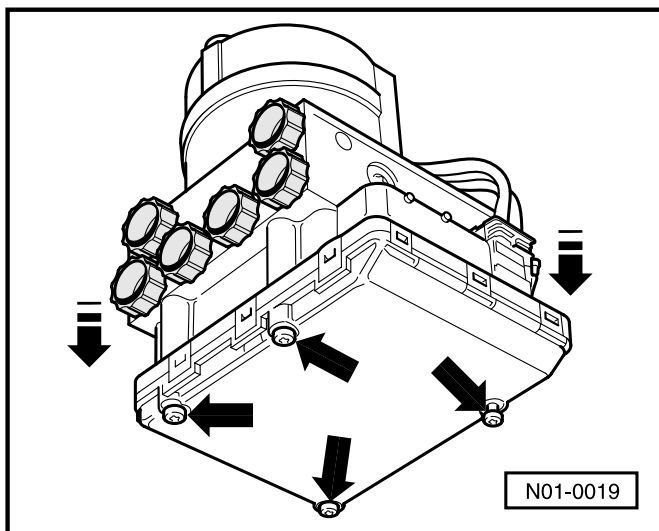
Disassembly and assembly of the hydraulic control unit is described at an ABS unit.

The procedure for the other versions of the ABS ITT Mark 20 IE is identical ⇒ page 45-4.

The hydraulic control unit is serviced by separating the control unit -J104- from the hydraulic unit -N55-, which is connected to the hydraulic pump -V64-. The faulty component is replaced.

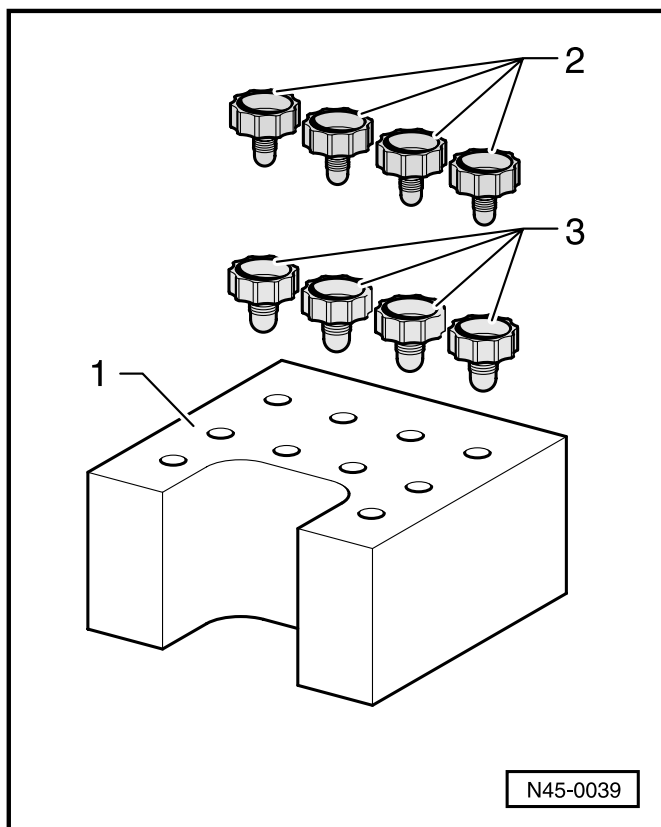
Disassembling hydraulic control unit

- Unplug connector for hydraulic pump motor from control unit.
- ◀ - Remove screws from control unit -arrows- and pull off control unit.



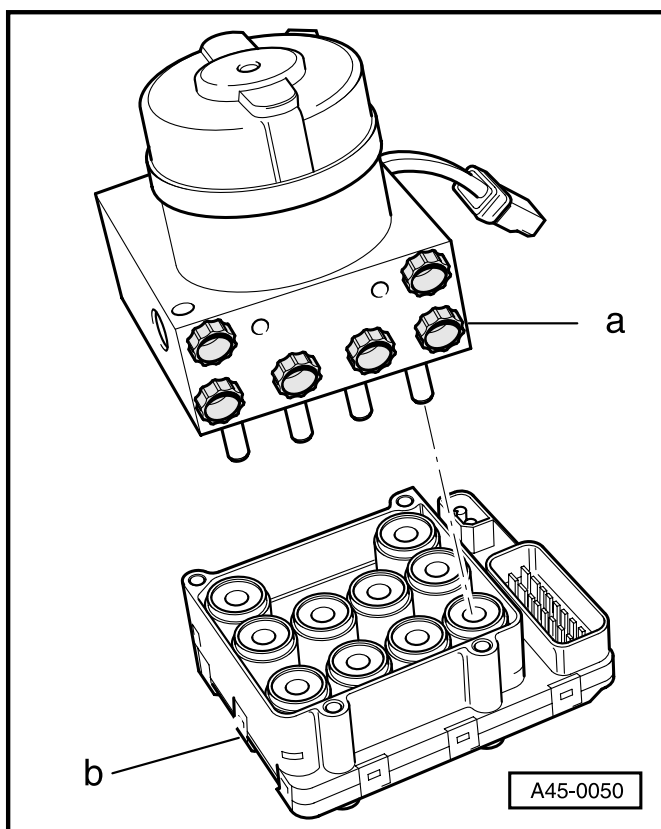
Note:

- ◀ When pulling off the control unit -b-, ensure that the valve domes of the hydraulic unit -a- are not twisted with the magnetic coils of the control unit.
- Cover over coils of control unit with non-fluffing cloths.



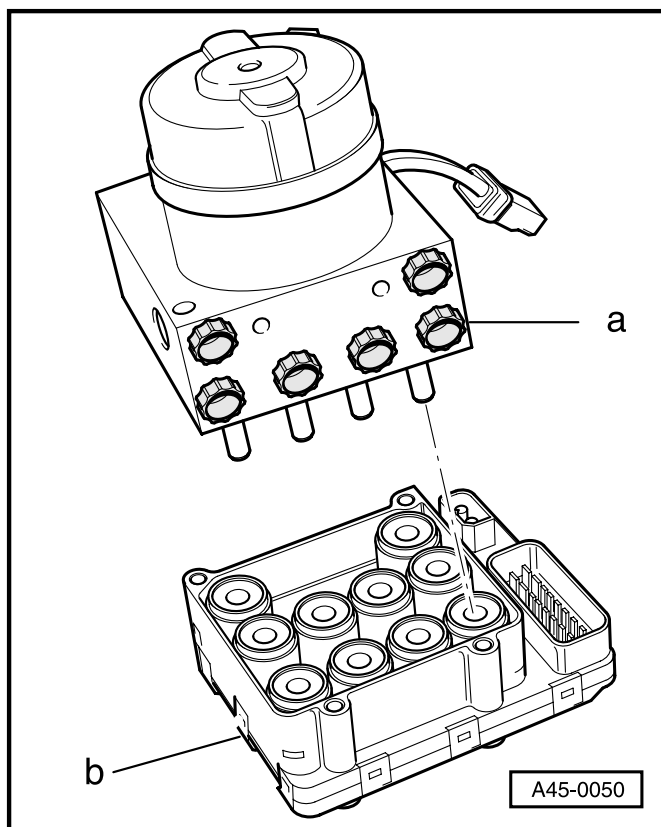
- ◀ - After separating the hydraulic unit from the control unit, fit transport protection -1- from the repair kit Part No. 1H0 698 311 A onto the valve domes.

This is a condition for any warranty claims.



◀ **Hydraulic unit (N55) and hydraulic pump (V64) -a-:**

- ♦ Hydraulic unit: The valve block contains the control valves.
- ♦ Hydraulic pump -V64- and hydraulic unit -N55- must not be separated from each other.
- ♦ If the hydraulic unit is replaced, fit the transport protection for valve domes ⇒ Fig. N45-0039, (item 1) onto the old part and seal the old part with the plugs (page Fig. N45-0039, (items 2 and 3). This is a condition for any warranty claims.



◀ **ABS control unit (J104) -b-:**

⇒ page 45-42, Contact assignment

⇒ page 45-41, Test requirements

Assembling hydraulic control unit

Notes:

- ◆ *It is essential that the area of the control unit-valve block is clean.*
- ◆ *When assembling control unit and hydraulic unit, ensure that the valve domes of the hydraulic unit are not tilted with the coils of the control unit.*
- Attach control unit to hydraulic unit. Max. tightening torque 4 Nm (always use the screws supplied).
- Plug in connector of the hydraulic pump motor.

Testing/removing and installing parts of ABS system at front wheels

Special tools, testers and aids required

- ♦ Wiring loom repair kit, e.g. Škoda Service Case, order No. S 504 500 V
- ♦ Solid lubricating paste G 000 650

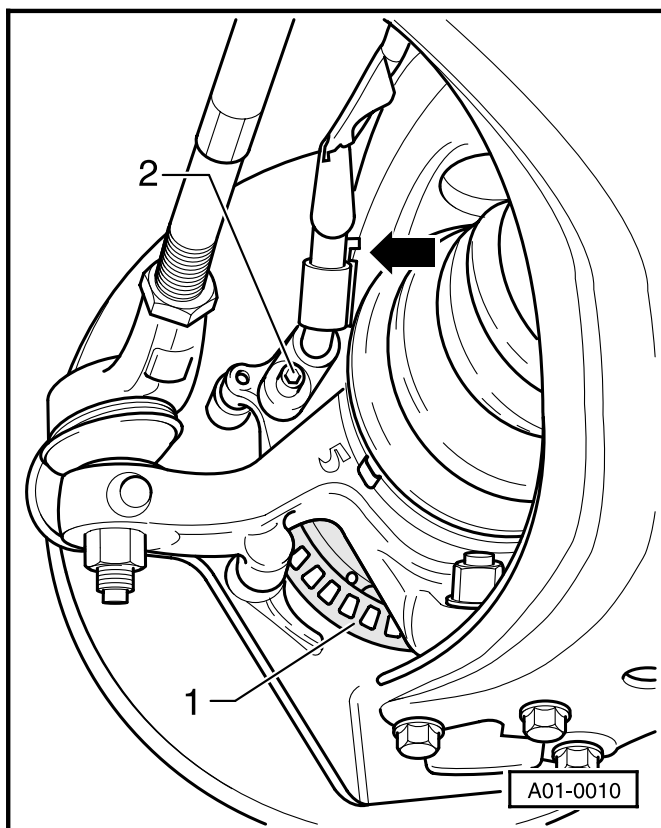
Removing and installing wheel speed sensors

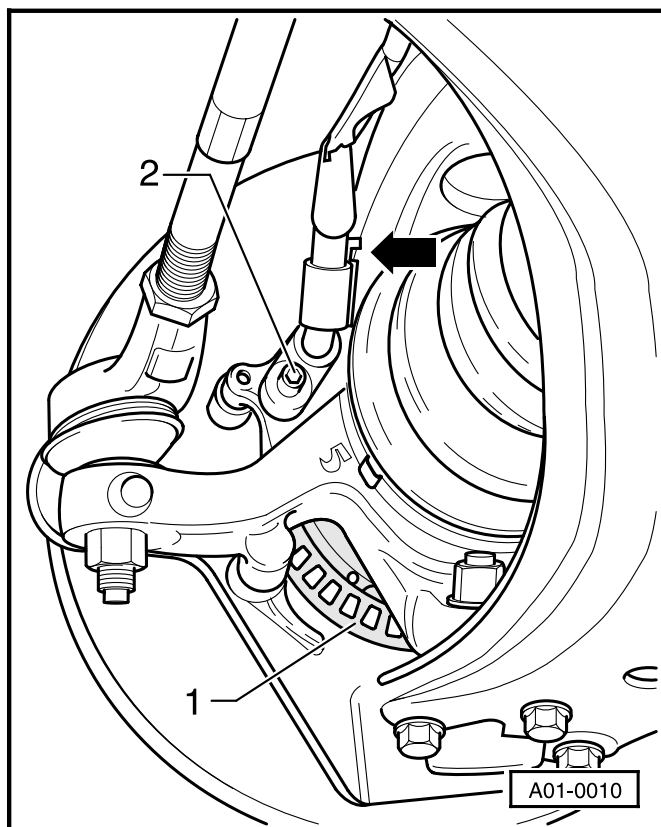
Removing

- Raise vehicle.
- ◀ - Separate plug connection of wheel speed sensor - wheel speed sensor cable -arrow-.
- Remove hexagon socket screw -2-.
- Pull wheel speed sensor -G45/G47- out of wheel bearing housing.

Installing

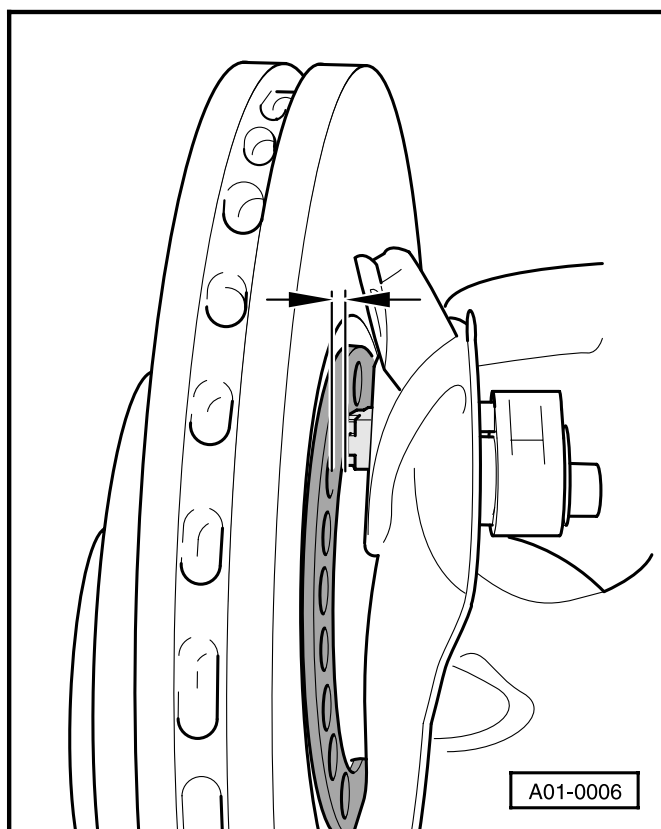
- Before inserting the wheel speed sensor, clean the inner surface of the hole and coat with solid lubricating paste G 000 650.
- Insert wheel speed sensor into the hole of the wheel bearing housing and tighten hexagon socket screw to a final torque of 8 Nm.
- Fit together plug connection of speed sensor cable - wheel speed sensor.
- Turn steering to full left and then to full right and check clearance of wheel speed sensor cable.
- Lower vehicle.





Testing pulse rotor/removing and installing

- Raise vehicle.
- Take off wheel.
- ◀ - Inspect pulse rotor -1- for dirt and damage by turning the brake disc.
- If the recesses of the pulse rotor are clogged by dirt, it is important to clean the rotor.
- If the pulse rotor is damaged, replace wheel hub and pulse rotor ⇒ page 40-13.
- Fit on wheel.
- Lower vehicle.



Inspecting lateral runout of pulse rotor

- Raise vehicle.
- Take off wheel.
- ◀ - Rotate wheel hub and check that clearance between pulse rotor and wheel speed sensor is even (runout tolerance). The wheel bearing play should also be checked at the same time.
- The runout tolerance of the pulse rotor is 0.3 mm.
- If the runout tolerance is not to specification, replace pulse rotor together with wheel hub ⇒ page 40-13.
- Fit on wheel.
- Lower vehicle.

Removing and installing front wheel speed sensor cables

Removing

Notes:

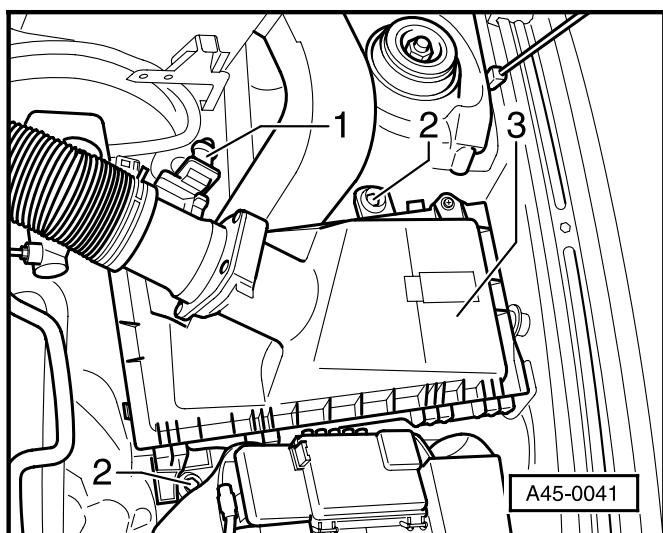
- ◆ It is prohibited to carry out repairs to screened cables of the ABS system.
 - ◆ Before disconnecting the battery, determine the code of radio sets fitted with anti-theft coding.
 - ◆ When the battery is re-connected, please check the vehicle equipment:
 - Enter radio code
 - Re-set clock
 - Initialise power windows.
- ⇒ Inspection and Maintenance

- Disconnect battery.

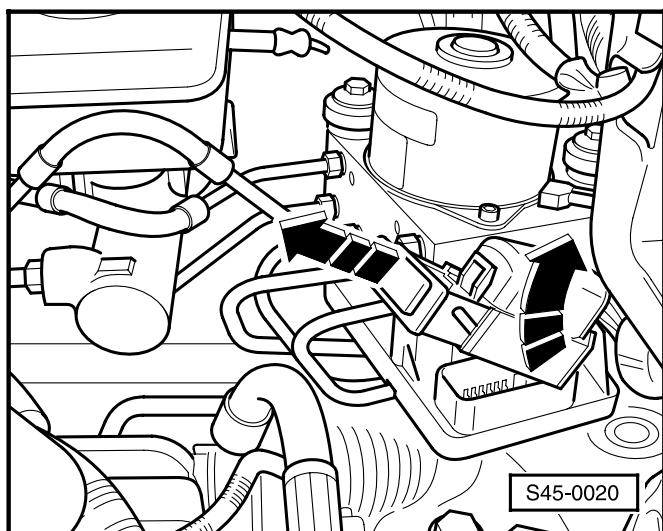
Note:

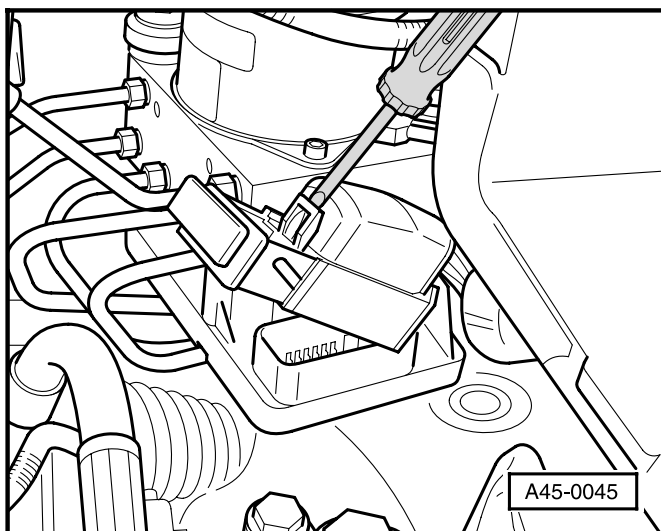
The following 2 steps do not apply to the 1.6-ltr./55 kW engine:

- ◀ - Unplug connector of the air mass meter -1- from the air guide pipe of the air filter.
- Remove screws -2- at the air filter -3- and place filter to the side.
- On diesel engines, remove relay carrier above brake servo unit.

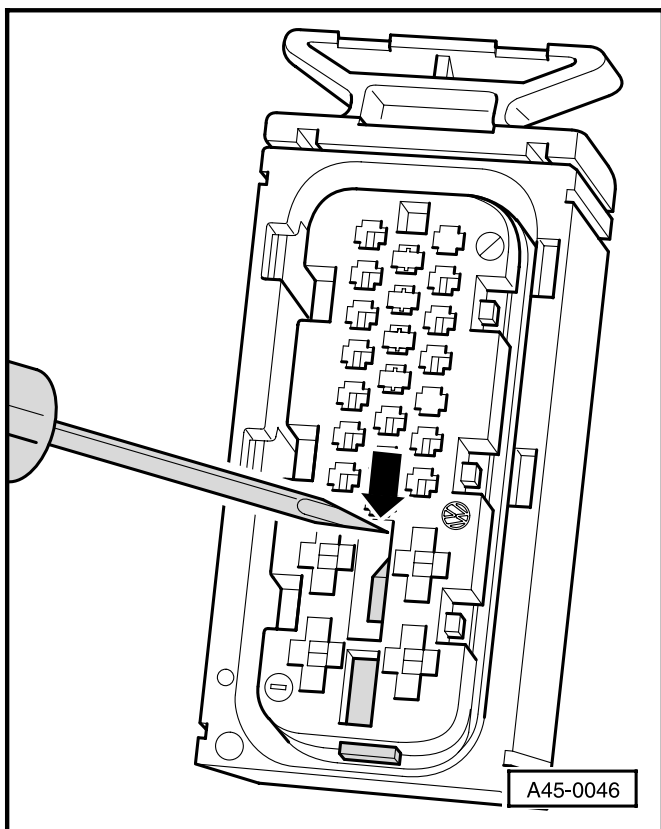


- ◀ - Release multi-pin connector and unplug from the control unit.

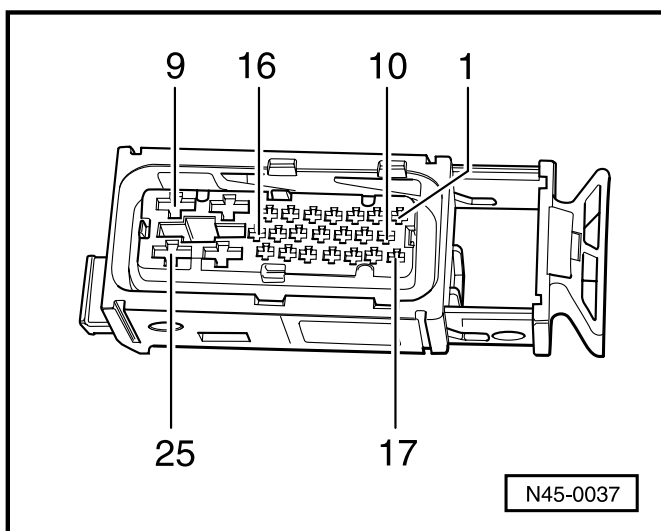




- ◀ - Use a screwdriver to detach cap of multi-pin connector and take off.

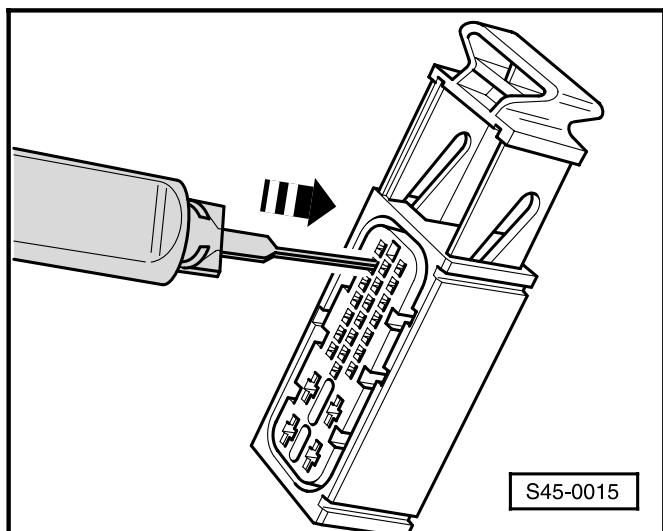


- ◀ - Use a small screwdriver to release secondary lock (purple) in direction of arrow.



- ◀ **Contact assignment of plug connection of wiring loom/control unit -J104**

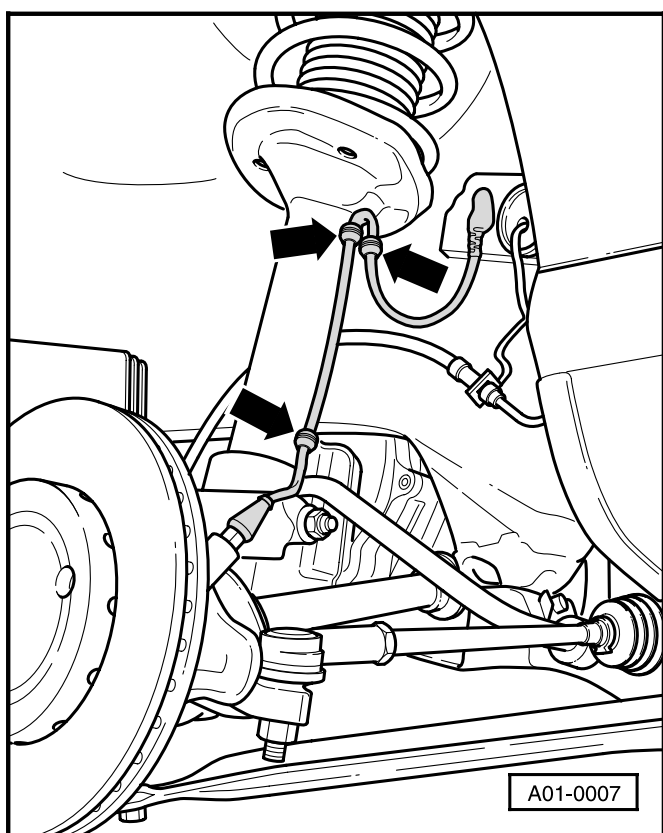
Contact	Cable connection to component ...
19 + 20	Front right wheel speed sensor -G45
1 + 2	Front left wheel speed sensor -G47
22 + 23	Rear right wheel speed sensor -G44
5 + 6	Rear left wheel speed sensor -G46



- ◀ - Use a suitable ejection tool from the wiring loom repair kit to knock out the appropriate contacts.
- Release connector at wheel speed sensor and separate plug connection.
- Remove faulty wheel speed sensor cable.

Installing

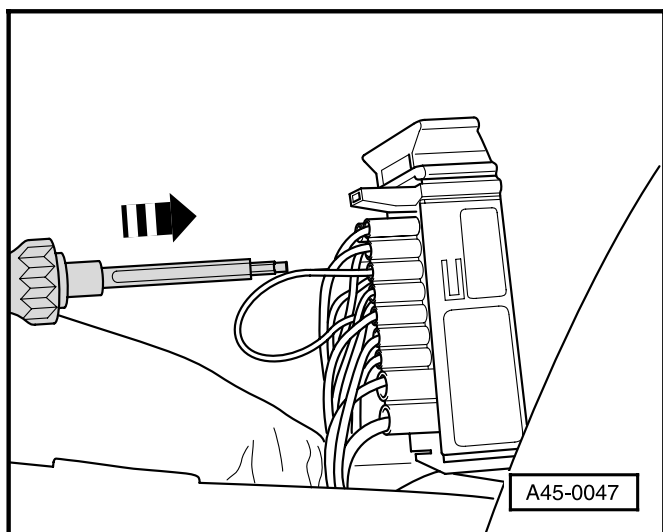
- Pull in new wheel speed sensor cable.
- Connect wheel speed sensor cable to wheel speed sensor.



- ◀ - Clip wheel speed sensor cable in place -arrows-.

Note:

When installing the wheel speed sensor cable, ensure that it is fitted free of twisting in the wheelhouse.



- ◀ - Insert contact into the plug housing and use a suitable insertion tool from the wiring loom repair kit to push in the single-wire seal as far as the stop.
- Secure the contacts with the secondary lock and fit the cap of the multi-pin connector onto it.
- Connect battery ⇒ page 45-62.
- Interrogate fault memory ⇒ page 45-12.
- Erase fault memory ⇒ page 45-21.

Testing/removing and installing parts of the ABS system at rear wheels (disc and drum brakes) - front-wheel drive models

Special tools, testers and aids required

- ◆ Wiring loom repair set, e.g. Škoda Service Case, order No. S 504 500 V
- ◆ Solid lubricating paste G 000 650

Removing and installing wheel speed sensors (disc brakes - FWD models)

Removing

- Raise vehicle.
- ◀ - Separate plug connection -1- of wheel speed sensor - wheel speed sensor cable -arrow-.
- Remove hexagon socket screw -2-.
- Pull wheel speed sensor -G44/G46- out of wheel bearing housing.

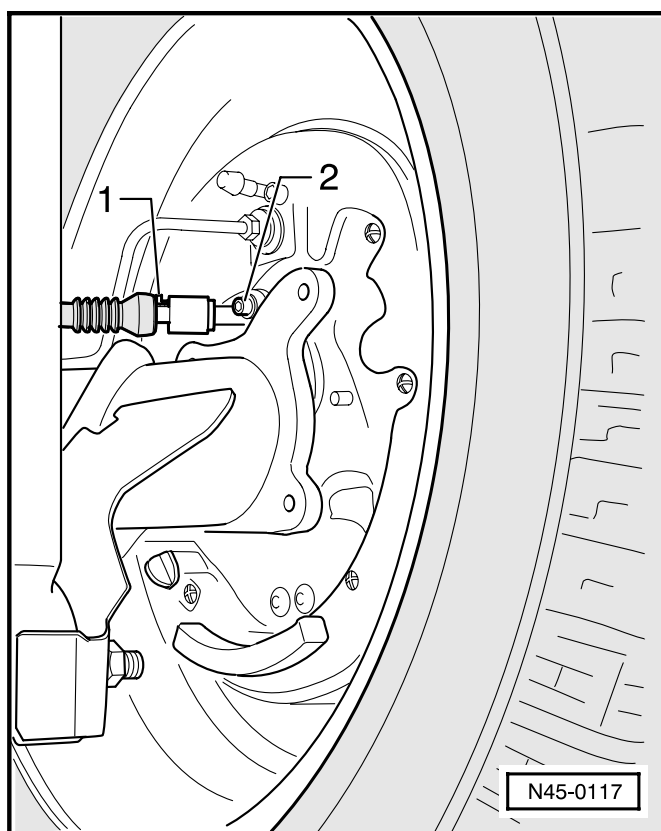
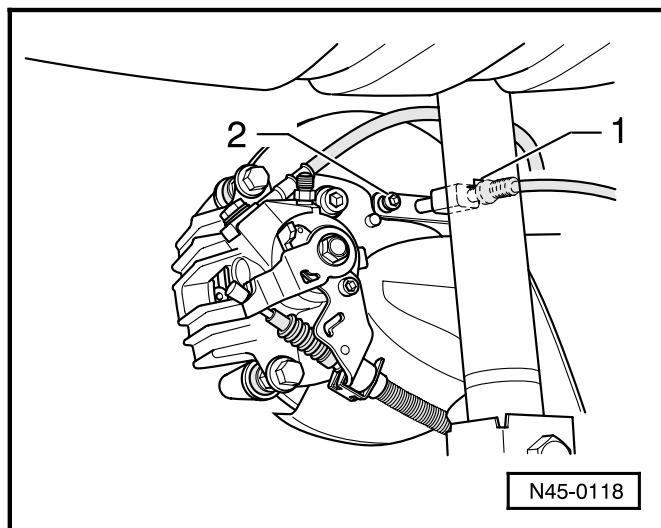
Installing

- Before inserting the wheel speed sensor, clean the inner surface of the hole and coat with solid lubricating paste G 000 650.
- ◀ - Insert wheel speed sensor into the hole of the wheel bearing housing and tighten hexagon socket screw -2- to a final torque of 8 Nm.
- Fit together plug connection -1- of speed sensor cable - wheel speed sensor.

Removing and installing wheel speed sensors (drum brakes)

Removal and installation of the wheel speed sensor is performed in the same way as for the models with disc brakes - front-wheel drive ⇒ page 45-65.

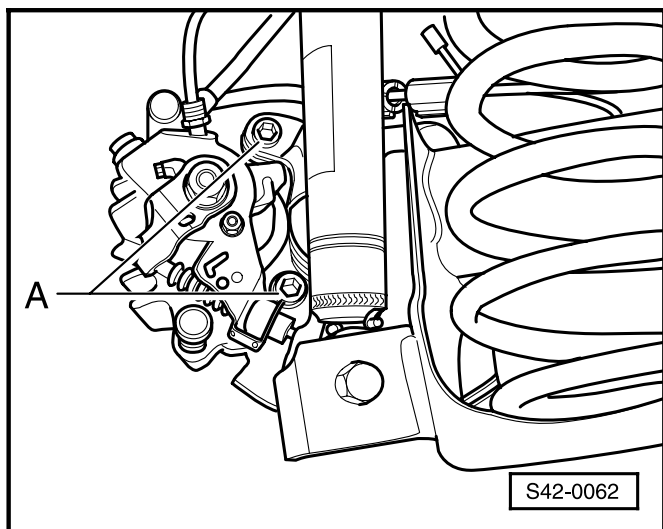
- 1 - Plug connection of speed sensor cable - wheel speed sensor
- 2 - Hexagon socket screw for attaching wheel speed sensor



Testing/removing and installing pulse rotor (disc and drum brakes)

Notes:

- ♦ The illustrations show only the rear wheel with disc brake.
- ♦ Parts of ABS system at rear wheel with drum brake is similar to version with disc brake.



- Raise vehicle.
- Take off wheel.

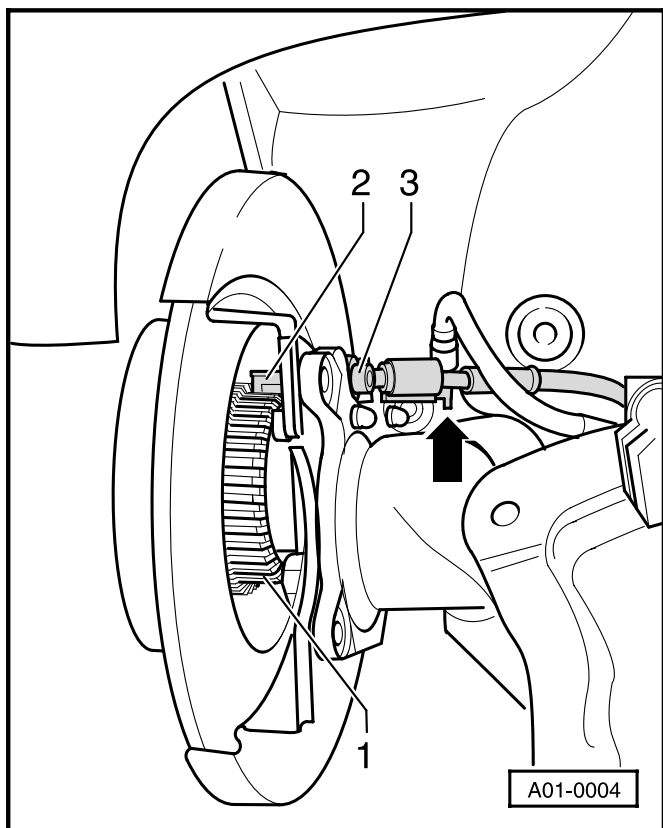
Models with disc brakes:

- ◀ - Remove screw -A-, take off brake caliper and tie up with wire or similar.

Brake line must not be tensioned.

Models with drum brakes:

- Remove brake drum ⇒ page 46-6.



All models:

- ◀ - Inspect pulse rotor -1- for dirt by turning the brake disc, or wheel hub as appropriate.

2 - Wheel speed sensor G44/G46

3 - Hexagon socket screw of wheel speed sensor

Arrow - Plug connection of wheel speed sensor - wheel speed sensor cable

- If the recesses of the pulse rotor are blocked by dirt, it is essential to clean the pulse rotor.
- If the pulse rotor is damaged, replace the wheel hub with pulse rotor.

Models with drum brakes ⇒ page 42-23.

Models with disc brakes ⇒ page 42-28.

- Fit on wheel.
- Lower vehicle.

Removing and installing rear wheel speed sensor cables

Notes:

- ◆ It is prohibited to carry out repairs to screened cables of the ABS system.
- ◆ Before disconnecting the battery, determine the code of radio sets fitted with anti-theft coding.
- ◆ When the battery is re-connected, please check the vehicle equipment:
 - Enter radio code
 - Re-set clock
 - Initialise power windows.

⇒ Inspection and Maintenance

- ◆ The illustrations show only the rear wheel with disc brake.
- ◆ Parts of the ABS system at rear wheel with drum brake are similar to version with disc brake.

- Disconnect battery.

- Raise vehicle.

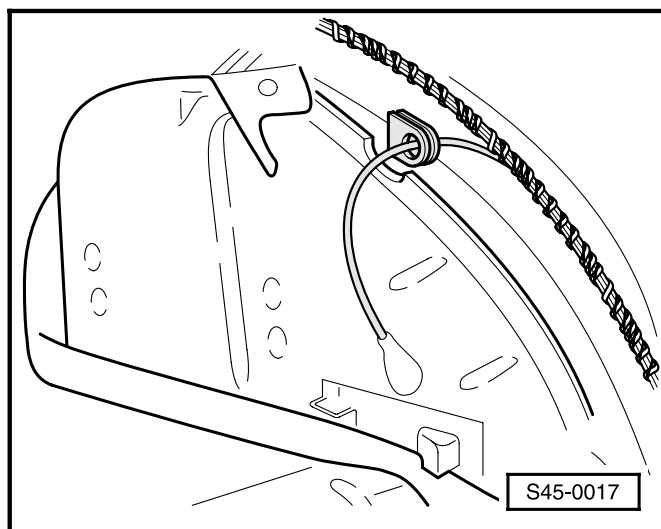
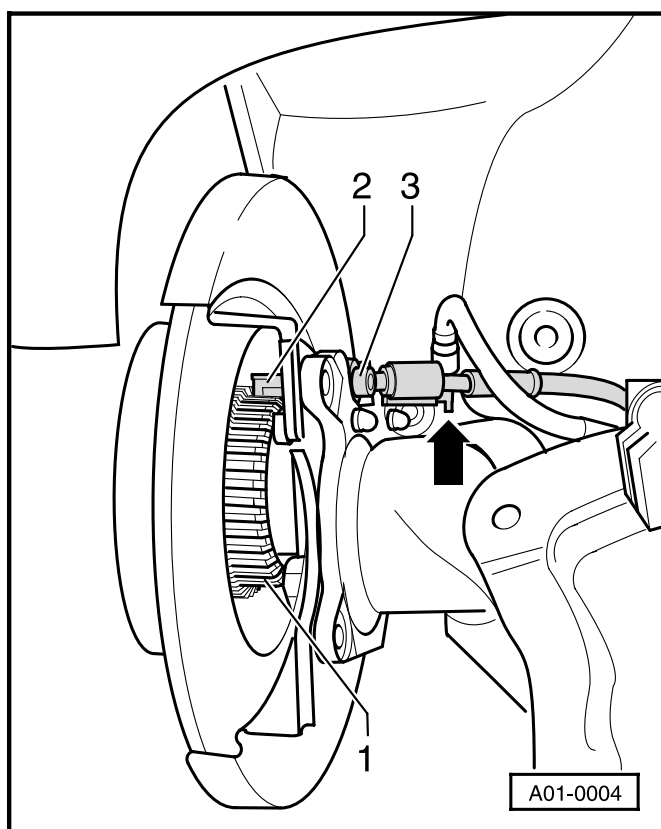
- Take off wheel.

◀ - Release connector at wheel speed sensor and separate plug connection -arrow-.

1 - Pulse rotor

2 - Wheel speed sensor

3 - Hexagon socket screw for wheel speed sensor

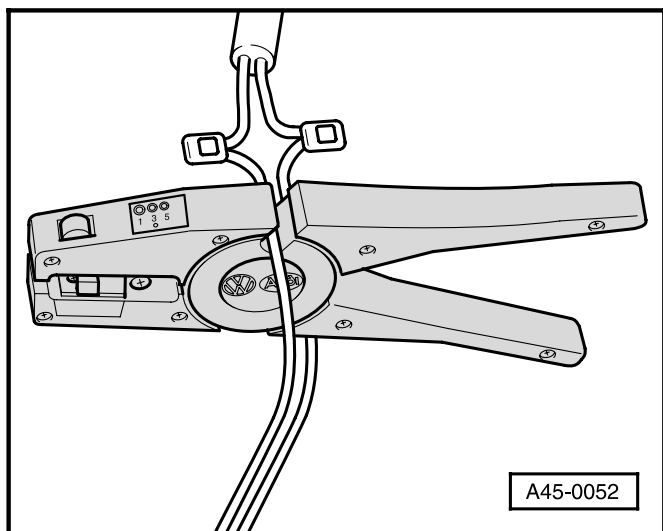


- Remove side luggage compartment trim panel.

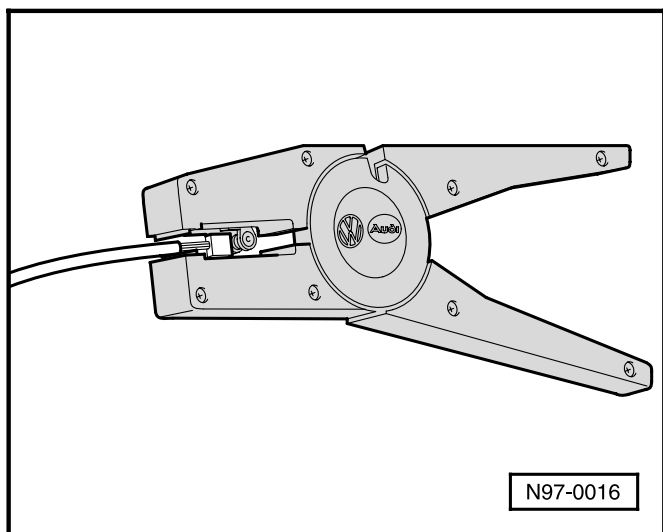
⇒ Body Fitting Work; Repair Group 70; Trim panel of cargo area and luggage compartment

◀ - Pinpoint welded connection at wheel speed sensor cable.

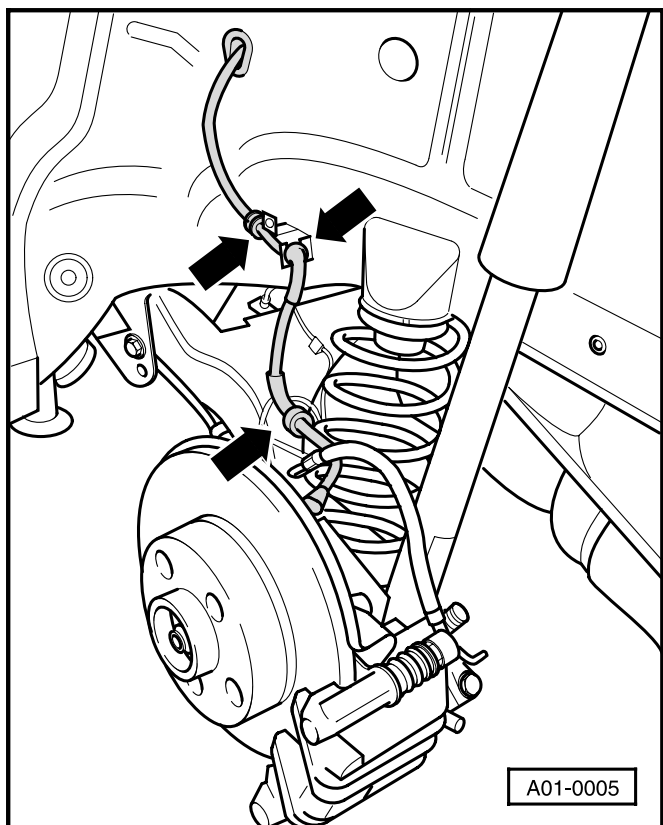
- Pull off insulating grommet of welded connection.



- ◀ - Use insulation stripping pliers from wiring loom repair kit to separate wheel speed sensor cable ahead of welded connection and remove the faulty section of cable.



- ◀ - Strip off insulation 15 mm from end of cable with insulation stripper and bend over half of stripped cable.



- Draw in new wheel speed sensor cable.
- Fit together plug connection of wheel speed sensor cable - wheel speed sensor.
- ◀ - Clip wheel speed sensor cable in place -arrows-.

Notes:

When installing the wheel speed sensor, ensure the wheel speed sensor cable is fitted free of twisting in the wheelhouse.

- Use stripping pliers to cut off two-pin connector, if fitted, at new wheel speed sensor cable, strip insulation 15 mm from cable end and turn over half of stripped cable.
- Use a suitable crimp connector from the wiring loom repair kit to connect the wheel speed sensor cable in place of the weld point.
- Install side trim panel of luggage compartment.
- ⇒ Body Fitting Work; Repair Group 70; Trim panels of cargo area and luggage compartment
- Fit on wheel.

- Connect battery ⇒ page 45-67.
- Interrogate fault memory ⇒ page 45-12.
- Erase fault memory ⇒ page 45-21.

Removing and installing, and also setting brake light switch, up to MY 1999

Special tools, testers and aids required

- ◆ Poly resin grease -G 052 142 A2-

Note:

The brake light switch must be removed for setting.

- Remove trim in driver footwell.
⇒ Body Fitting Work; Repair Group 68; Storage compartments, covers and trim panels
- Unplug connector from brake light switch.
- ◀ - Remove brake light switch -1- by turning 90° to the left.
- Pull out plunger -2- of brake light switch for setting.

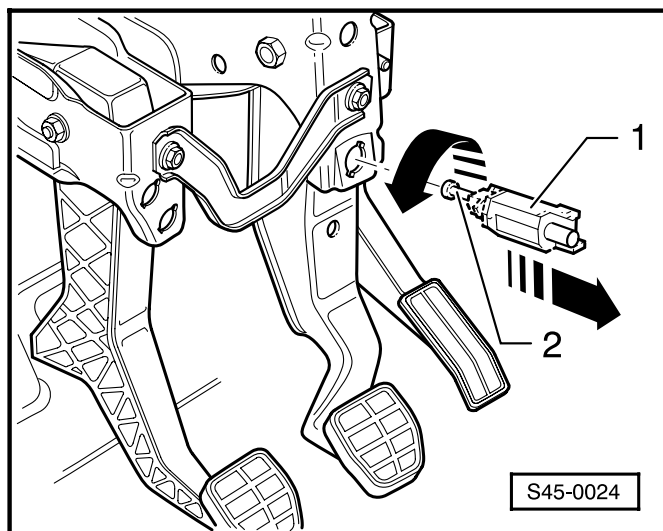
Note:

Before installing the brake light switch, grease contact surface of plunger and brake pedal with poly resin grease -G 052 142 A2-.

- Depress brake pedal as far as possible with your hand.
- Guide brake light switch through the assembly opening and install by turning 90° to the right.
- Release brake pedal.
- Plug connector into brake light switch.
- Install footwell trim on driver side.
⇒ Body Fitting Work; Repair Group 68; Storage compartments, covers and trim panels
- Check operation of brake lights.

Depress brake pedal ⇒ all the brake lights come on.

Release brake pedal ⇒ all the brake lights go off.



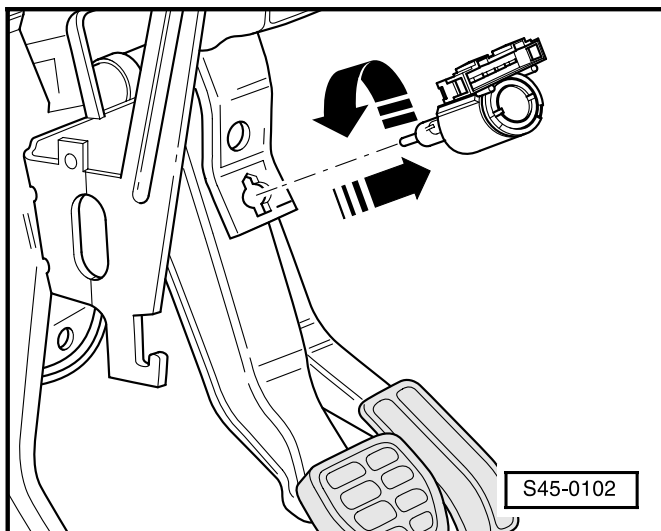
Removing and installing, as well as setting brake light switch, from MY 2000

Special tools, testers and aids required

- ◆ Poly resin grease -G 052 142 A2-

Note:

The brake light switch must be removed for setting.



- Unplug connector from brake light switch.
- ◀ - Remove brake light switch by turning 45° to the left.
- Pull out plunger fully for setting. When the brake light switch is installed, the plunger adjusts automatically.

Note:

Before installing the brake light switch, coat contact surface of plunger and brake pedal with poly resin grease -G 052 142 A2-.

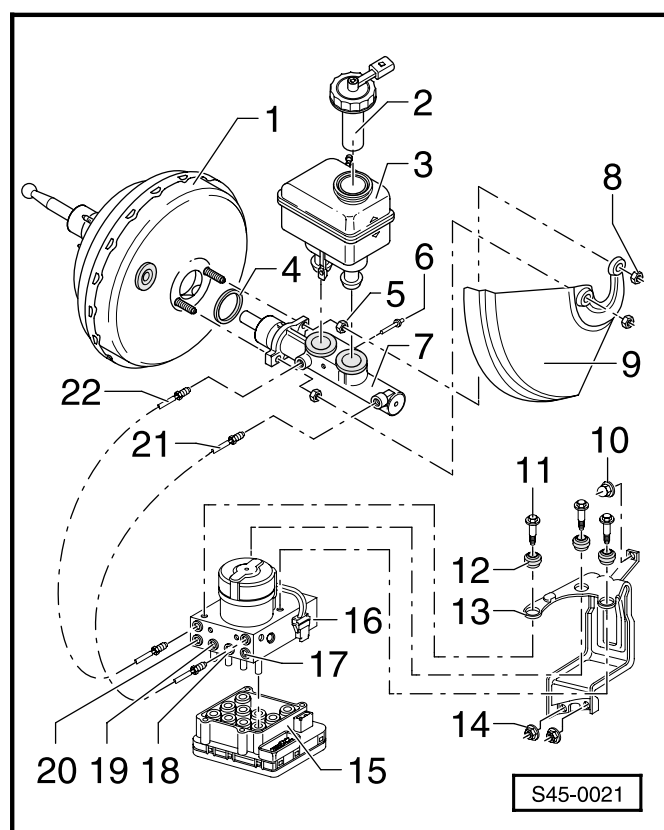
- Guide switch through assembly opening, press against the pedal and attach by turning 45° to the right.

Brake pedal always remains in off position during this step (**do not depress!**).

- Plug in connector of brake light switch.
- Check operation of brake lights.

After installing the brake light switch, check whether the brake pedal is in the end position (release position).

Assembly overview of hydraulic control unit, brake servo unit/brake master cylinder for models with ABS, ABS/EDL Mark 20



Notes:

- ♦ The hydraulic control unit should be removed and installed complete ⇒ from page 45-52.
- ♦ Servicing ⇒ from page 45-57.
- ♦ Connections of brake lines should be tightened as a general rule to a torque of 14 Nm.

1 - Brake servo unit

- ♦ operational check ⇒ page 47-4
- ♦ removing and installing ⇒ page 47-4.1

2 - Cap

- ♦ with integrated brake fluid level warning contact -F34-

3 - Brake fluid reservoir

4 - Seal

- ♦ replace

5 - Self-locking hexagon nut, 20 Nm

6 - Retaining pin

7 - Brake master cylinder

- ♦ cannot be serviced; replace complete if fault exists
- ♦ removing and installing ⇒ page 47-2

8 - Self-locking hexagon nut, 20 Nm

- ♦ only on models with 74 kW, 92 kW and 110 kW engine

9 - Heat shield

- ♦ only on models with 74 kW, 92 kW and 110 kW engine

10 - Cap nut, 25 Nm

11 - Fit bolt, 8 Nm

12 - Rubber shock absorber

13 - Bracket

14 - Self-locking hexagon nut, 20 Nm

15 - ABS or ABS/EDL control unit

16 - ABS or ABS/EDL hydraulic unit

17 - Brake line connection

- ♦ hydraulic unit to front left brake caliper

18 - Brake line connection

- ♦ hydraulic unit to rear right wheel cylinder/brake caliper

19 - Brake line connection

- ♦ hydraulic unit to rear left wheel cylinder/brake caliper

20 - Brake line connection

- ♦ hydraulic unit to front right brake caliper

21 - Brake line

- ♦ brake master cylinder/floating piston circuit to hydraulic unit

22 - Brake line

- ♦ brake master cylinder/pushrod piston circuit to hydraulic unit

Self-diagnosis of ABS/EDL for 4x4 models with Haldex coupling

Self-diagnosis for 4x4 models fitted with the Haldex coupling is practically identical to models fitted with ABS/EDL.

Note:

Only the differences in the self-diagnosis to the standard ABS/EDL system are described.

Special feature in the case of 4x4 models fitted with Haldex coupling

A longitudinal acceleration sender -G251- is installed in the ABS system.

♦ Fitting location ⇒ page 45-81

♦ Fault table ⇒ page 45-72

The longitudinal acceleration sender -G251- must be switched off for testing the brake system on a roller dynamometer, ⇒ page 45-76, Initiating basic setting, display group number 040.

The longitudinal acceleration sender -G251- is re-activated by switching ignition off and on once.

All 4x4 models with Haldex coupling are equipped with the EDL „electronic differential lock“.

Interrogating control unit version

Connect vehicle system tester V.A.G 1552
⇒ page 45-9.

Interrogating control unit version ⇒ page 45-10.

1J0 907 379 L ABS/EDL 20 IE CAN V006 → Coding 13504 WSC XXXXX
--

◀ Readout in display (example):

What is displayed is:

- ♦ the control unit identification number,
e.g. 1J0 907 379 L
- ♦ the system designation,
e.g. ABS/EDL 20 IE
- ♦ Data BUS: CAN

- ◆ the number of the version, e.g. V006
 - ◆ the code No. of the control unit, e.g. 13504
 - ◆ the workshop code (WSC)
- ⇒ Operating instructions of vehicle system tester V.A.G 1552

Assignment of control unit
⇒ Parts List

Coding control unit ⇒ page 45-22.

Interrogating fault memory ⇒ page 45-12.

Fault table for ABS/EDL for 4x4 models fitted with Haldex coupling

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
01279 Longitudinal acceleration sender -G251- electrical fault in circuit	◆ Open circuit, short circuit to positive or to ground in the wiring ◆ Installation position of longitudinal acceleration sender -G251- is not correct ◆ Longitudinal acceleration sender -G251- faulty	- Read measured value block ⇒ page 45-74, display group number 006 - Test wiring and plug connections according to current flow diagram - Perform electrical test ⇒ page 45-79 - Check installation position of longitudinal acceleration sender -G251- - Replace longitudinal acceleration sender -G251- ⇒ page 45-82 - Carry out zero adjustment: - Initiate basic setting ⇒ page 45-76, display group number 069

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
01279 Longitudinal acceleration sender -G251- implausible signal	◆ Installation position of longitudinal acceleration sender -G251- is not correct ◆ Longitudinal acceleration sender -G251- faulty	- Read measured value block ⇒ page 45-74, display group number 006 - Check installation position of longitudinal acceleration sender -G251- - Replace longitudinal acceleration sender -G251- ⇒ page 45-82 - Carry out zero adjustment: - Initiate basic setting ⇒ page 45-76, display group number 069
01324 4x4 control unit -J492- no communication	◆ Open circuit, short circuit to positive or to ground in data BUS cables	- Read measured value block ⇒ page 45-75, display group number 125 - Test cables and plug connections of data BUS cables according to current flow diagram - Perform electrical test ⇒ page 45-41

Coding control unit

Code number for ABS/EDL 4x4 models fitted with Haldex coupling ⇒ page 45-23.

Coding control unit ⇒ page 45-22.

Reading measured value block

⇒ page 45-24

Testing longitudinal acceleration sender -G251

Read measured value block ⇒ page 45-24

Display group number 006

Read measured value block
Enter display group number XXX

◀ Readout in display:

- Press the keys 0, 0 and 6 for „Display group number 006“ and confirm the entry with the key Q.

Read measured value block 6 →
0.00 m/s²

◀ Readout in display:

Display block	Test conditions	Readout in V.A.G 1552
1	Longitudinal acceleration sender ♦ Specification vehicle stationary: ♦ Specification forward: ♦ Specification reverse:	± 0.5 m/s ² Readout rises constantly Readout rises constantly with negative sign (-)
2	not assigned	—
3	not assigned	—
4	not assigned	—

If the readout differs from the specifications:

- Perform electrical test ⇒ page 45-79.

Testing data BUS lines

Read measured value block ⇒ page 45-24

Display group number 125

Read measured value block
Enter display group number XXX

◀ Readout in display:

- Press the keys 1, 2 and 5 for „Display group number 125“ and confirm the entry with the key Q.

Read measured value block 125 →
Engine 1 AWD1 Gearbox 1

◀ Readout in display: (vehicle stationary)

Display block	Test conditions	Readout in V.A.G 1552
1	Data BUS to engine control unit ♦ connection exists ♦ no connection	1 0
2	Data BUS to 4x4 control unit ♦ connection exists ♦ no connection	1 0
3	Data BUS to automatic gearbox control unit ♦ connection exists ♦ no connection	1 0
4	not assigned	—

If the readout differs from the specifications:

- Read the fault memories of the control units connected to the data BUS.
 - ♦ Engine control unit
 - ♦ Gearbox control unit (only in the case of automatic gearbox)
 - ♦ 4x4 control unit
 - Test the wiring according to the current flow diagram.
- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

Initiating basic setting

Function 04 "Initiating basic setting" is enlarged on 4x4 models with Haldex clutch by two display group numbers:

- ◆ Display group number 040 is required for switching off the longitudinal acceleration sender -G251-, e.g. for checking the brake system on a chassis dynamometer ⇒ page 45-76.
- ◆ Display group number 069 is required for the zero adjustment of the longitudinal acceleration sender -G251- ⇒ page 45-77.

Note:

The longitudinal acceleration sender -G251- is reactivated by switching the ignition off and on once.

- Initiating basic setting ⇒ page 45-36.

Switching off longitudinal acceleration sender -G251-

Note:

No "Login procedure" is carried out for switching off the longitudinal acceleration sender.

Display group number: 040

Basic setting

Enter display group number XXX

HELP

◀ Readout in display:

- Press keys 0, 4 and 0 for "display group number 040" and confirm the entry with the key Q.
- The ABS warning light flashes.

System in basic setting

40

◀ Readout in display:

- The longitudinal acceleration sender -G251- is now switched off.
- After completing the check, the longitudinal acceleration sender -G251- must be reactivated by switching the ignition off and on once.

Zero adjustment of longitudinal acceleration sender -G251-

Note:

The „login procedure“ must first of all be carried out before the zero adjustment. To do this, first of all enter the workshop code in the vehicle system tester V.A.G 1552.

Display group number: 069

Test of vehicle systems Select function XX	HELP	◀ Readout in display:	- Press the key 1 twice for the function „login procedure“ and confirm the entry with the key Q.
Login procedure Enter code number XXXXX		◀ Readout in display:	- Enter code number 40168 and confirm entry with the key Q.
Test of vehicle systems Select function XX	HELP	◀ Readout in display:	- Press the keys 0 and 4 for function „Initiate basic setting“ and confirm the entry with the key Q.
Basic setting Enter display group number XXX	HELP	◀ Readout in display:	- Press the keys 0, 6 and 9 for „display group number 069“ and confirm the entry with the key Q. - The ABS warning light flashes.
System in basic setting Adjustment o.k.	69 0.3 m/s ²	◀ Readout in display:	Adjustment is thus completed. The readout does not move back exactly to 0.00 m/s ² .
Function is unknown or cannot be performed at the moment	- →	◀ If this readout appears in the display, the login procedure was not successfully performed.	- Repeat login procedure.
System in basic setting Adjustment n. possible	69 5.0 m/s ²	◀ If this readout appears in the display, the measured values are not within a tolerance range permitted for the zero adjustment.	

1. Interrogate fault memory (function 02)
 2. Erase fault memory (function 05)
 3. End output (function 06)
 4. Switch ignition off.
 5. Switch ignition on.
 6. Carry out the zero adjustment once again.
- Press the → key.

Test of vehicle systems
Select function XX

HELP

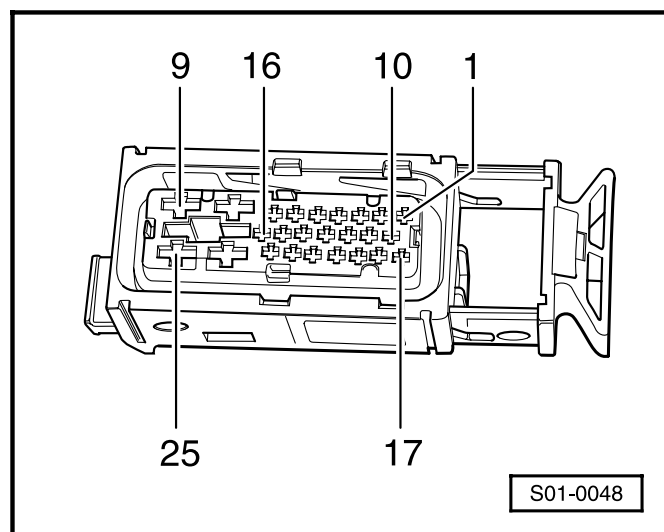
◀ Readout in display:

- Press the keys 0 and 6 in order to end the output.
- ABS warning light comes on for about 2 seconds.

Electrical test of ABS/EDL for 4x4 models fitted with Haldex coupling

Electrical test of ABS/EDL ⇒ page 45-41.

Multipin connectors with contact assignment ⇒ page 45-42.



◀ Additional contact assignment of plug connection T25a of wiring loom of control unit -J104-

Contact	Cable connection to component ...
13	⇒ Longitudinal acceleration sender -G251-
15	⇒ Longitudinal acceleration sender -G251-
17	⇒ Longitudinal acceleration sender -G251-

List of additional test steps (test steps ⇒ page 45-43)

Component to be tested	Test steps from test table ⇒ page 45-79
Actuation of longitudinal acceleration sender -G251-	- Perform test step 20

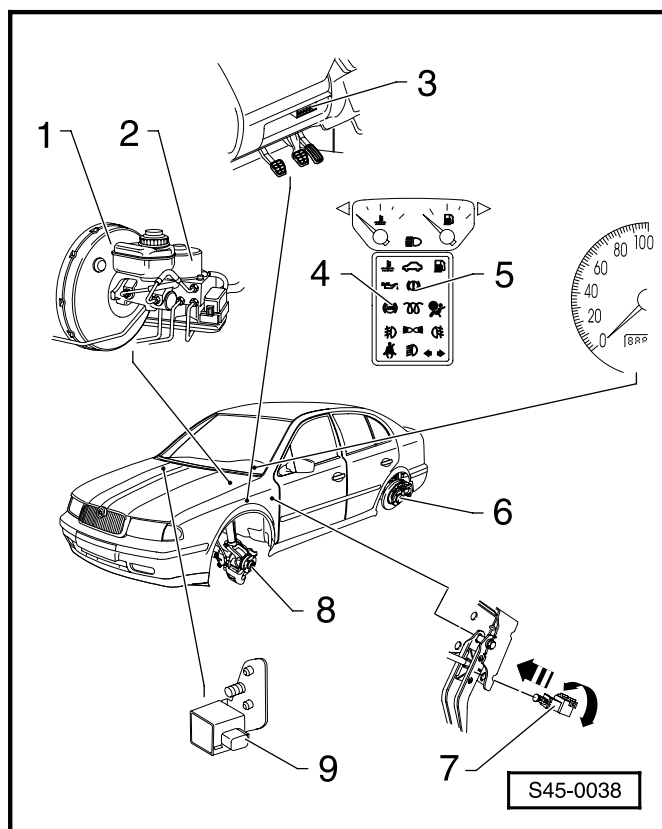
Test table

Test steps 1 to 19 ⇒ page 45-44

- ◆ The socket designations of test box V.A.G 1598/21 are identical with contact designations of the control unit (J104) in the current flow diagram.
- ⇒ "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
- ◆ If the measurements obtained differ from the specifications, carry out measures for rectifying faults stated in the right-hand column of the table.
- ◆ If the specifications are achieved, additionally test the cables for short circuit to positive and to earth.
- ◆ Perform continuity tests with adapter cable set V.A.G 1594 A (bridges).
- ◆ If the measurements obtained differ only slightly from the specifications, clean sockets and connectors of the test equipment and test cables (e.g. with contact spray) and repeat test. Before replacing the relevant components, inspect cables and connections, and repeat the resistance measurement at the component, particularly in the case for specifications of less than 10 ohms.

Switch on measuring range: Resistance measurement (200 Ω /20 M Ω)					
Test step	V.A.G 1598/21 Sockets	Test of	- Test conditions - Additional operations	Specifica- tion	Measures if readout differs from specification
20	-	Cables for longitudinal acceleration sender -G251	- Ignition switched off - Set measuring range 200 Ω - Separate plug connection from longitudinal acceleration sender -G251- - Separate multipin connector T25a from control unit -J104- - Connect test box V.A.G 1598/21 - Test cables between multipin connector of longitudinal acceleration sender -G251- and multipin connector of control unit -J104- for open circuit	max. 1.5 Ω	- Test wiring according to CFD ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
			- Set measuring range 20 MΩ - Remove fuse S9 - Test wiring for short circuit to positive or earth		- Test wiring according to CFD ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

Electrical/electronic components and fitting locations (4x4 models)



All the components marked with ¹⁾ are covered by the self-diagnosis.

1 - Brake master cylinder and brake servo unit

2 - Hydraulic control unit ¹⁾

- ◆ Fitting location: in left of engine compartment
- ◆ Removing and installing
⇒ page 45-52
- ◆ Servicing ⇒ page 45-57

3 - Diagnostic connection

- ◆ Fitting location: in shelf on driver side

4 - ABS warning light (K47)

- ◆ Fitting location: in dash panel insert
 - Function:
 - ◆ The ABS warning light comes on:
 - For about 2 seconds after ignition is switched on and/or engine start
 - If fault detected (e.g. open circuit to wheel speed sensor)
- ⇒ page 45-7

5 - Handbrake/brake fluid level warning light (K14/33)

- ◆ Fitting location: in dash panel insert
 - Function:
 - ◆ The handbrake/brake fluid level warning light comes on:
 - if handbrake is applied
 - if brake fluid level is low
 - for about 2 seconds after ignition switched on
 - if electronic brake pressure distribution fails, i.e. if ABS warning light comes on
- ⇒ page 45-7

6 - Parts of ABS system at rear suspension

(illustration shows only disc brakes)

- ◆ Rear right and left wheel speed sensor -G44/G46 ¹⁾
 - Removing and installing
⇒ page 45-82
 - Installing wheel sensor cables
⇒ page 45-85
- ◆ Pulse rotor for rear right and left wheel speed sensors
 - Testing ⇒ page 45-84
 - Removing and installing: the pulse rotor is replaced together with the wheel hub ⇒ page 42-44.

7 - Brake light switch -F-

- ◆ Is open in off position
 - Setting ⇒ page 45-69
 - Remove by turning 90° to the left
⇒ page 45-69
 - Install by turning 90° to the right
⇒ page 45-69
- ◆ Must be tested in measured value block ⇒ page 45-24

8 - Parts of ABS system at front suspension

- ◆ Front right and left wheel speed sensor -G45/G47 ¹⁾
 - Removing and installing
⇒ page 45-60
 - Installing wheel sensor cables
⇒ page 45-62
- ◆ Pulse rotor for front right and left wheel speed sensors
 - Testing ⇒ page 45-61
 - Removing and installing: the pulse rotor is replaced together with the wheel hub ⇒ page 42-13.

9 - Longitudinal acceleration sender -G251-¹⁾

- ◆ Fitting location: at central tube on right, close to right A pillar
- ◆ Removing and installing
⇒ page 45-82

Removing and installing longitudinal acceleration sender -G251-

Removing

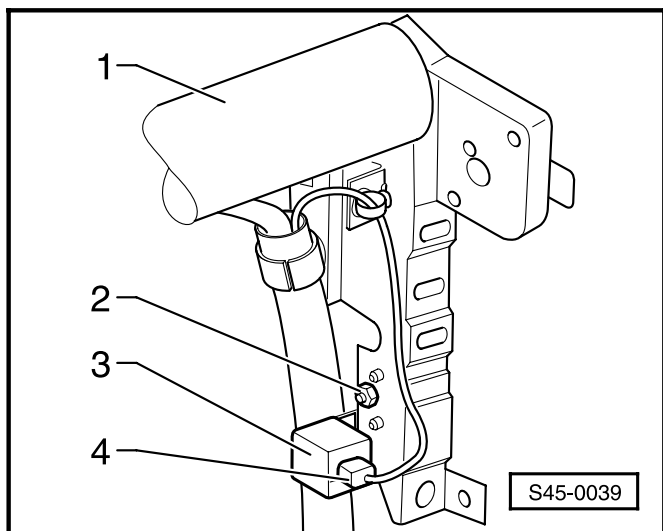
- Remove the glove box.
⇒ Body Fitting Work; Repair Group 70; Removing and installing dash panel

◀ The longitudinal acceleration sender is located on the right at the central tube -1-.

- Separate the plug connection -4-.
- Unscrew hexagon nut -2- (20 Nm) and take off longitudinal acceleration sender -3-.

Installing

- Installation is carried out in the reverse order.



Testing/removing and installing parts of ABS system at rear suspension (disc brake) - 4x4 models

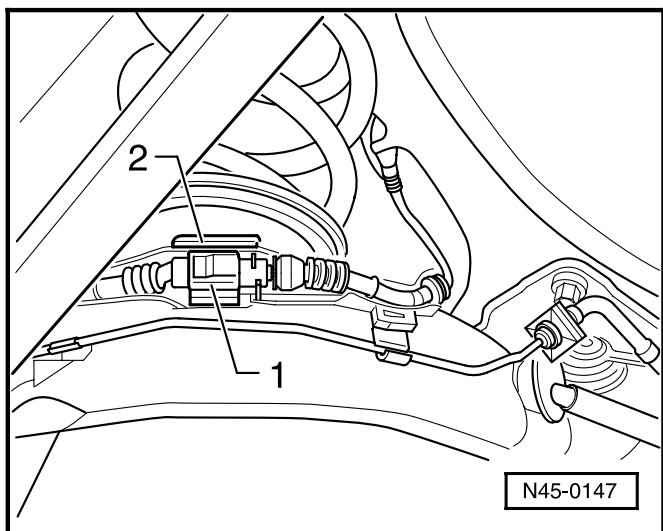
Special tools, testers and aids required

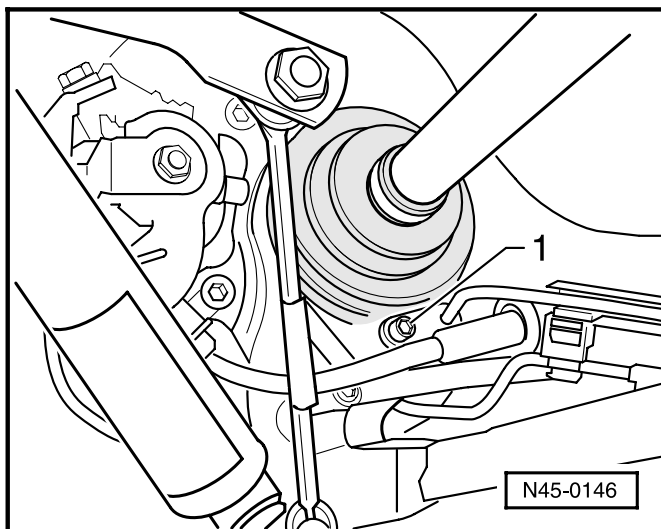
- ♦ Wiring harness repair kit, e.g. Škoda service case, order No. S 504 550 V
- ♦ Solid lubricating paste G 000 650

Removing and installing wheel speed sensors at rear wheels (disc brake) - 4x4 models

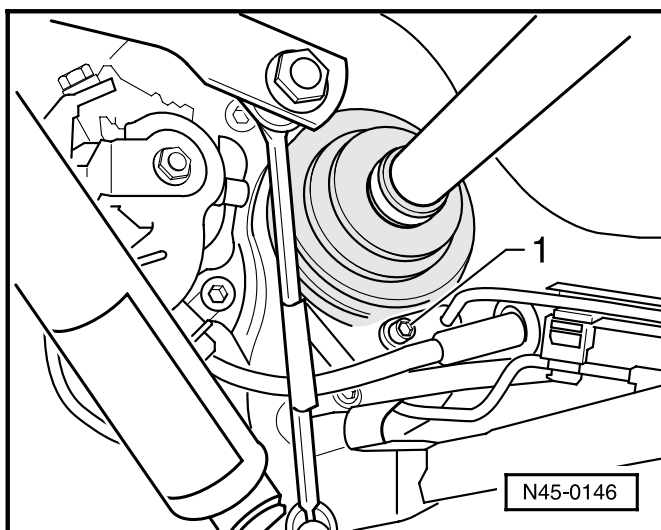
Removing

- Raise vehicle.
- ◀ Open cover -2- of plug connection -1-.
- Separate plug connection -1- of wheel speed sensor cable - wheel speed sensor.



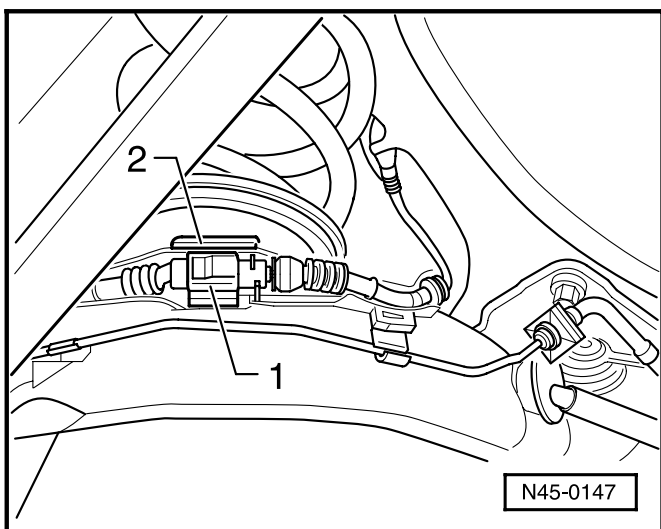


- ◀ - Remove hexagon socket bolt -1-.
- Pull wheel speed sensors -G44/G46- out of trailing arm.

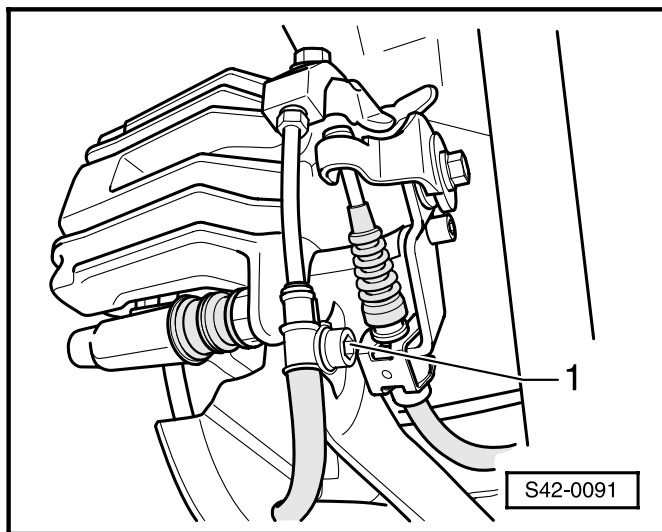


Installing

- Before installing the wheel speed sensor, clean the inner surface of the hole and coat wheel speed sensor all round with solid lubricating paste G 000 650.
- ◀ - Insert sensor into the hole of the trailing arm and tighten hexagon socket bolt -1- fully to 8 Nm.



- ◀ - Connect the wheel speed sensor to the sensor cable and close the cover -2- of the plug connection -1-.



Testing/removing and installing pulse rotor (4x4 models)

- Raise vehicle.
- Take off wheel.
- ◀ - Unscrew bolts -1- attaching brake carrier and take brake carrier off together with brake caliper.

Note:

Top bolt attaching brake carrier is concealed.

- Suspend the brake caliper at the body.

Brake line must not be subjected to pulling stresses.

- Inspect pulse rotor for dirt and damage by rotating the brake disc.
- If the openings of the pulse rotor are clogged by dirt, clean the rotor.
- If the pulse rotor is damaged, replace wheel hub and pulse rotor ⇒ page 42-44.
- Install brake caliper.
- Fit on wheel.
- Lower vehicle.

Tightening torques:

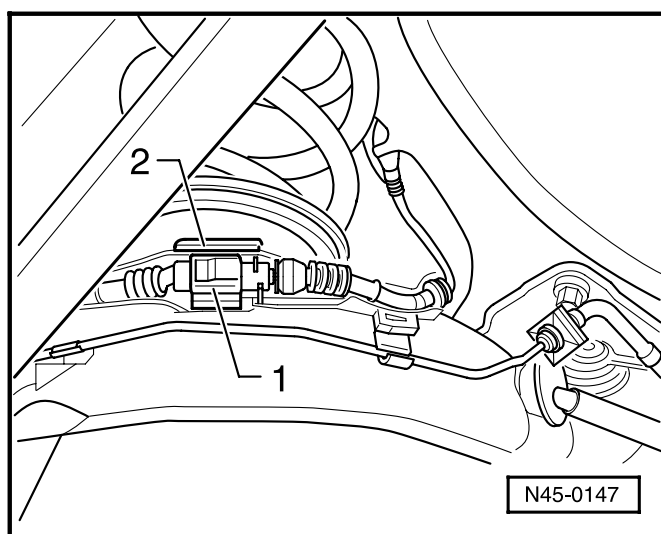
Brake carrier with brake caliper to trailing arm	65 Nm
Wheel bolt	120 Nm

Removing and installing rear wheel speed sensor cables (4x4 models)

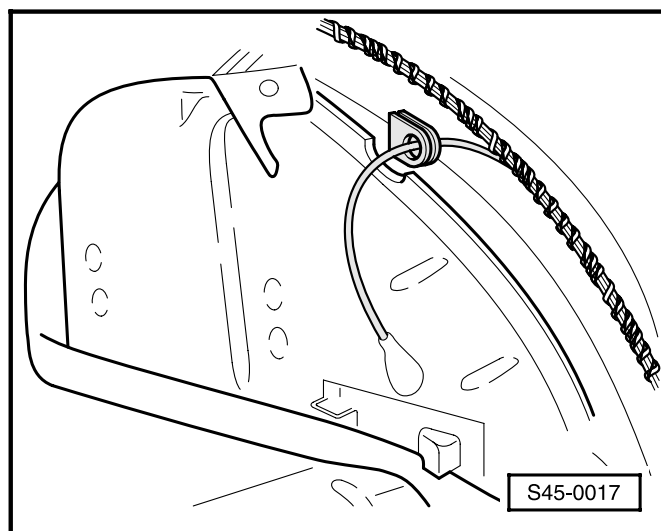
Notes:

- ◆ *It is prohibited to carry out any repairs on shielded cables of the ABS system.*
- ◆ *Before disconnecting the battery, determine the coding of radio sets fitted with anti-theft code.*
- ◆ *When the battery is re-connected, check the vehicle equipment:*
 - *encode radio,*
 - *re-set clock,*
 - *initialise power windows.*

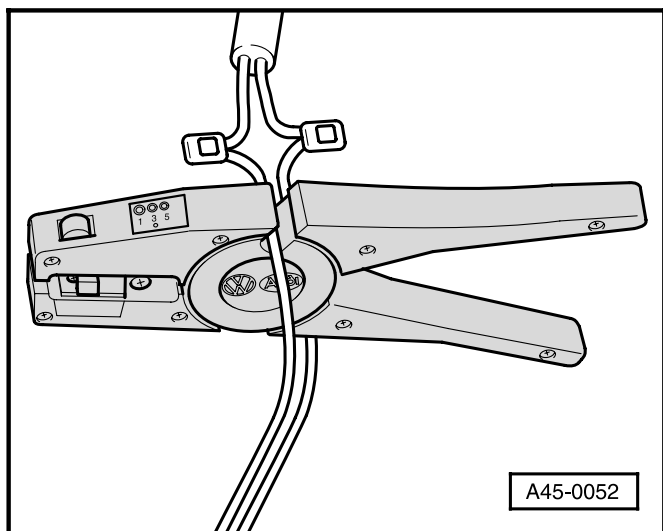
⇒ Inspection and Maintenance



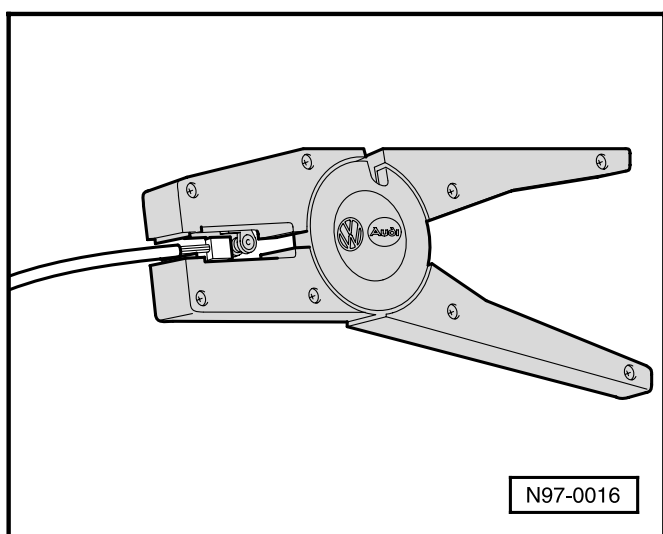
- Disconnect battery.
- Raise vehicle.
- Take off wheel.
- ◀ - Open cover -2- of plug connection -1-.
- Separate plug connection -1- of wheel speed sensor cable - wheel speed sensor.



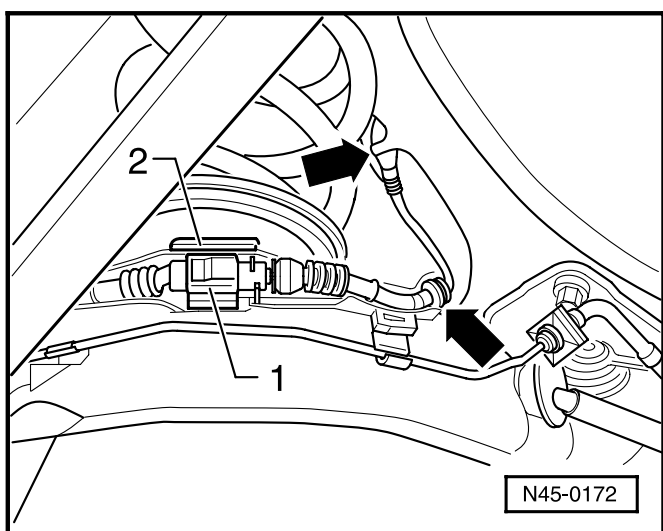
- Remove side trim panel of luggage compartment.
- ⇒ Body Fitting Work; Repair Group 70; Trim panels of cargo area and luggage compartment
- ◀ - Locate weld connection at wheel speed sensor cable.
- Pull insulating grommet off the welded connection.



- ◀ - Use cable insulation stripping pliers from the wiring harness repair kit to separate wheel speed sensor cable ahead of the welded connection and remove the faulty section of cable.



- ◀ - Bare end of cable over 15 mm with the insulation stripping pliers and turn over the bared end of the cable halfway.
- Draw in new wheel speed sensor cable.



- ◀ - Fit together plug connection of wheel speed sensor cable - wheel speed sensor -1- and close cover -2-.
- Clip wheel speed sensor cable in place -arrows-.

Note:

When installing the wheel speed sensors, ensure that the wheel speed sensor cable in the wheelhouse is installed free of twists.

- Use cable insulation stripping pliers to cut off two-pin connector at new wheel speed sensor cable, if fitted, bare end of cable over 15 mm and turn over bared cable halfway.

- Use a suitable crimp connector of wiring harness repair kit to connect the wheel speed sensor cable in place of the weld spot.

- Install side trim panel of luggage compartment.

⇒ Body Fitting Work; Repair Group 70; Trim panels of cargo area and luggage compartment

- Fit on wheel.

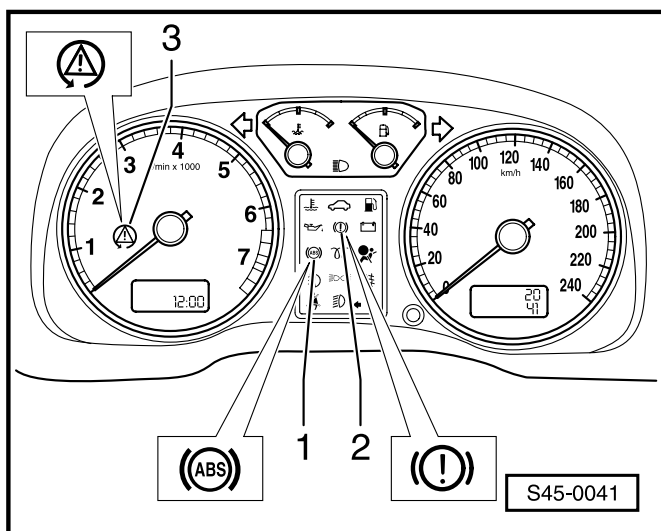
- Connect battery ⇒ page 45-85.

- Interrogate fault memory ⇒ page 45-12.

- Erase fault memory ⇒ page 45-21.

Antilock brake system ABS/ EDL/ESP Mark 20

Safety measures, basic information regarding fault finding and repairs



- ◆ The ABS/EDL/ESP is a vehicle safety system; work on this system requires system knowledge.
- ◆ Indication of faults by the warning lights for:
 - ABS (K47) -1-
 - Handbrake/brake fluid level (K14/33) -2-
 - Electronic stability programme (K155) -3-
 ⇒ page 45-92.
- ◆ Certain faults are not detected until the vehicle speed is more than 20 km/h (conduct a road test).
- ◆ If the ABS warning light -K47- and the handbrake/brake fluid level warning light -K14/33- do not come on and the brake system is nevertheless not fully operational, look for the fault in the conventional brake system ⇒ from page 46-1 and from page 47-26.
- ◆ Information on rectifying current faults
 - ⇒ Service Technical Handbook and
 - ⇒ "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Information on performing repairs on ABS/EDL/ESP Mark 20

The same information applies to repair operations on the ABS/EDL/ESP Mark 20 as to the ABS Mark 20 and to the ABS/EDL Mark 20 ⇒ page 45-1.

Technical information required

- ◆ "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
- ◆ Service Technical Handbook
- ◆ Self Study Programme 26: "Vehicle Safety - New Technical Information"
- ◆ Self Study Programme 28: "Electronic Stability Programme, Fundamentals, Design, Operation"

Distinguishing features of the ABS/EDL ITT Mark 20 IE and of the ABS/EDL/ESP ITT Mark 20 IE

General information

The ABS prevents the wheels locking during a brake application initiated by the driver.

The electronic differential lock, EDL, is a start-ing-off aid. A supporting torque is created for the differential by electronically controlling the braking of the driven wheel which is slipping. The engine power is thus available for the gripping wheel with the better adhesion. This also applies when reversing.

You can find a description of the design and operation of the ABS and EDL in Self Study Programme No. 26.

The electronic stability programme -ESP- detects critical driving situations and stabilises the vehicle by braking individual wheels and intervening in the engine management system. This happens independently of the operation of the brake or of the accelerator pedal.

The ESP operates throughout the entire speed range of the vehicle. If the ESP is in the control mode, the ESP warning light flashes three times a second.

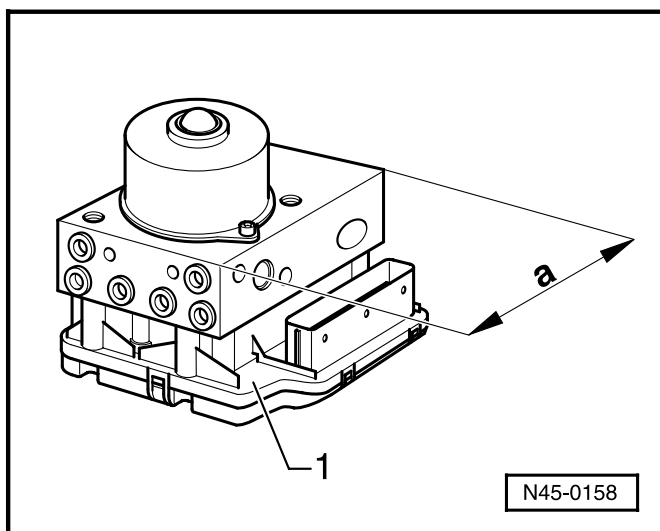
You can find a description of the design and operation of the ESP in the Self Study Programme No. 28.

The brake system is split diagonally. Brake servo assistance is provided pneumatically by the vacuum brake servo unit.

Models fitted with ABS/EDL/ESP ITT Mark 20 IE do not have a mechanical brake pressure regulator. Specifically matched software in the control unit, the electronic brake pressure distribution, EBD, regulates the brake pressure at the rear wheels.

The hydraulic pump -V64-, the hydraulic unit -N55- and the control unit -J104- form the hydraulic control unit. Repairs can only be carried out when the parts are removed.

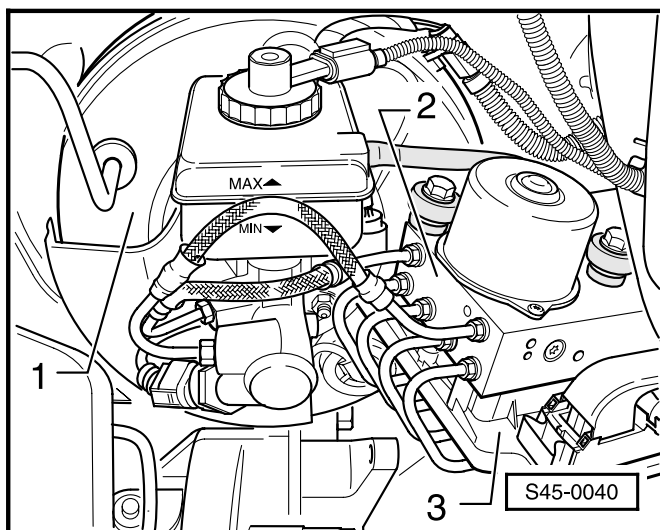
New control units supplied through the Parts Sector are not coded. They require to be coded after being installed.



ABS/EDL/ESP ITT Mark 20 IE

◀ Distinguishing features:

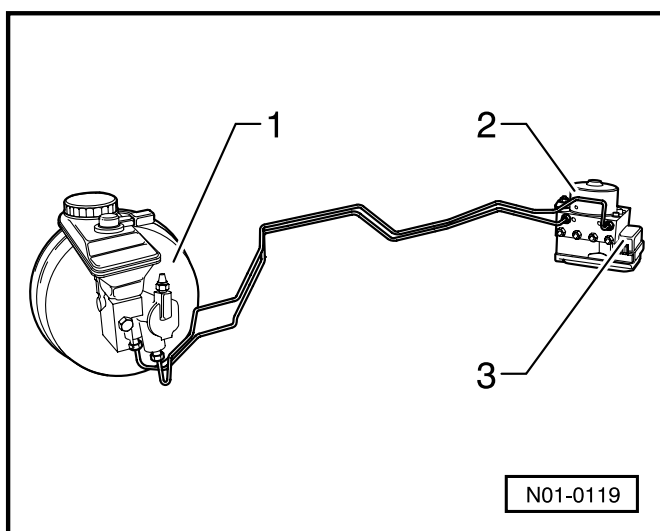
- ◆ Dimension A: 135 mm
- ◆ Internal electrical plug connection between hydraulic unit and control unit.
- ◆ 12 valve domes: The protective sleeves for the valves are visible if the control unit is separated from the hydraulic unit ⇒ page 45-163.
1 - Control unit, 47-pin
- ◆ Control unit identification
The control unit version appears in the display of V.A.G 1552. Select function 01 „Interrogating control unit version“ for this purpose ⇒ page 45-10.
- ◆ List of available functions ⇒ page 45-100.



Fitting location of ABS/EDL/ESP ITT Mark 20 IE

◀ LHD models

- 1 - Brake servo unit 10"
- 2 - Hydraulic unit
- 3 - Control unit, 47-pin, bolted to hydraulic unit



◀ RHD models

- 1 - Brake servo unit 7"/8"
- 2 - Hydraulic unit
- 3 - Control unit, 47-pin, bolted to hydraulic unit

Self-diagnosis of ABS/EDL/TCS/ESP Mark 20

Function

In view of the control units which are all interlinked by a databus line, always interrogate the contents of the fault memories of the control units fitted in the vehicle at the start of fault finding.

This is done with the "Automatic test sequence" which is activated with the key function 00.

What is checked here is whether any faults which might affect the ABS system, are stored.

Self-diagnosis relates to the electrical/electronic part of the ABS, in other words only faults relating to the electrical connection to the control unit (e.g. open circuit in wiring of a wheel speed sensor) are detected.

The 47-pin ABS control unit -J104-, together with the hydraulic unit, forms a compact unit. This unit is located in the left of the engine compartment. The control unit is equipped with a fault memory. The connection for self-diagnosis is located in the storage compartment on the driver side.

The control unit detects faults during operation of the vehicle and stores them in a permanent memory. This information is retained even if the battery voltage is disconnected.

Faults which occur sporadically (occasionally), are likewise detected and stored. If, however, faults relating to the databus system are no longer detected during 15 vehicle starts and moving-off operations, or other faults are no longer detected during 50 vehicle starts and moving-off operations, the fault is then erased in the fault memory with the exception of the fault "Control unit defective" (fault delete counter).

After the ignition is switched on and/or the engine is started, the ABS warning light -K47-, the red handbrake/brake fluid level warning light -K14/33- and the electronic stability programme warning light -K155- come on for about 2 seconds.

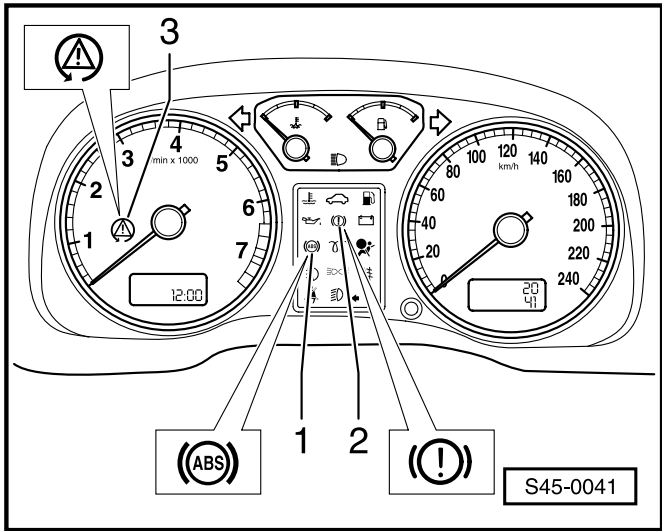
During this time a test procedure (self-check) with the following functions is performed in the control unit:

- ◆ Test of supply voltage at least 10.0 V.
- ◆ Test of control unit including valve coils.
- ◆ Test of coding of control unit.
- ◆ Static test of wheel speed sensors (without wheel speed signal).
- ◆ If it is found, after starting off and once a speed of about 20 km/h has been reached, that the wheel speed signal is not o.k., the ABS warning light -K47- comes on again.

Always start fault finding by initiating self-diagnosis with the vehicle system tester V.A.G 1552 or with the fault reader V.A.G 1551.

Notes:

- ◆ The description which follows relates only to the vehicle system tester V.A.G 1552 using the up-to-date programme card.
- ◆ Use of the fault reader V.A.G 1551 with integrated printer is similar. Slight variations are possible in the readouts in the display.
- ◆ To end self-diagnosis or to switch to another address word, select function 06 "End output".
- ◆ The faults displayed can be identified by referring to the fault table, and the fault can then be rectified.



Indication of faults by warning lights K47, K14/33 and K155

◀ Position of warning lights

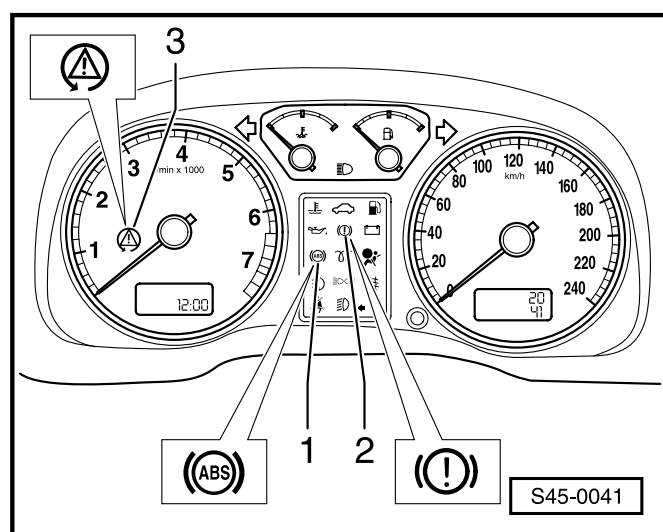
Item	Designation
1	ABS warning light -K47-
2	Handbrake/brake fluid level warning light -K14/33-
3	Electronic stability programme warning light -K155-

Warning!

After the ABS warning light -K47- and the handbrake/brake fluid level warning light -K14/33- come on, the rear wheels may lock even during a slight brake application.

Overview

Explanation	ABS warning light -K47-	Handbrake/brake fluid level warning light -K14/33-	Electronic stability programme warning light -K155-
Ignition on (if systems o.k., lights go out after about 3 s)	on	on	on
ESP failure or ESP deactivated by pushbutton; ABS, EDL and EBD active	off	off	on
Systems o.k.	off	off	off
ESP control cycle	off	off	flashes
ABS/EDL/ESP failure; EBD remains active (e.g. a wheel speed sensor faulty)	on	off	on
ABS/EDL/ESP/EBD failure; (e.g. a wheel speed sensor faulty)	on	on	on
Brake fluid level too low; all systems o.k.	off	on	off



◀ ABS warning light -K47-

- ◆ If the ABS warning light (K47) -1- does not go out after the ignition is switched on and after completion of the self-check, the causes of the fault may be the following:

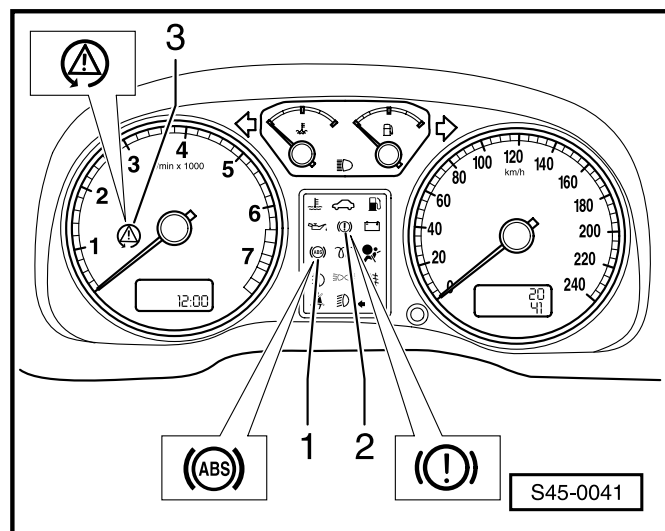
-a- voltage supply is less than 10 V

-b- there is a fault in the ABS

If there is a fault in the ABS -b-, the antilock brake system is switched off. The EBD (electronic brake force distribution) function remains active, and in this case the conventional brake system remains fully operational. Interrogate fault memory ⇒ page 45-101.

-c- there was a sporadic wheel speed sensor fault after vehicle last started.

If there was a wheel speed sensor fault -c-, the ABS warning light -K47- goes out automatically after vehicle is again started and a speed of more than 20 km/h is reached.



-d- cable from ABS control unit -J104- for operating the ABS warning light -K47- in the dash panel insert -J218- has an open circuit.

⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

-e- the dash panel insert is faulty.

◀ Warning lights -K47- and -K14/33

- ◆ If the ABS warning light (K47) -1- goes out, but the handbrake/brake fluid level warning light (K14/33) -2- remains on, and 3 warning signals are heard, the causes of the fault may be:

-a- the brake fluid level is too low.

-b- the handbrake is applied.

-c- switch -F9- for the warning light -K14/33- is faulty or incorrectly set.

-d- there is a fault in the operation of the handbrake/brake fluid level warning light -K14/33-.

⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

- ◆ If the ABS warning light (K47) -1- and the handbrake/brake fluid level warning light (K14/33) -2- come on, this indicates that the ABS system and the EBD (electronic brake force distribution) are not operating.

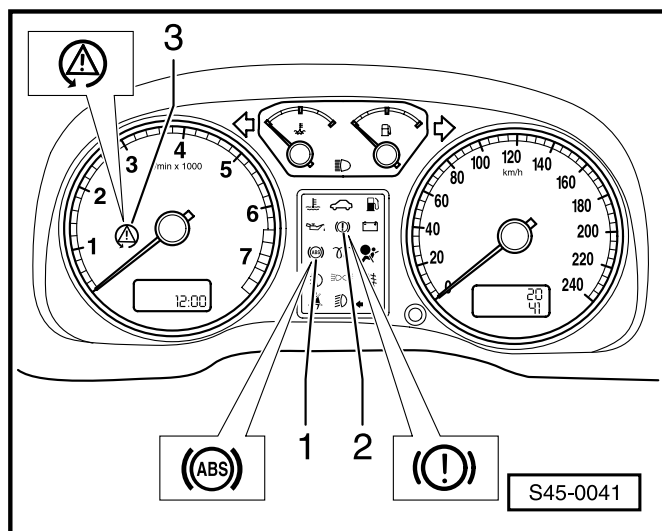
- ◆ If the ABS warning light (K47) -1- and the handbrake/brake fluid level warning light (K14/33) -2- come on and 3 warning signals are heard, this indicates that the ABS system and the EBD (electronic brake force distribution) are not operating.

Note:

The handbrake/brake fluid level warning light (K14/33) -2- does not come on until vehicle speed has exceeded 10 km/h once or engine speed 2000 rpm.

Warning!

After the ABS warning light -K47- and the handbrake/brake fluid level warning light -K14/33- come on, the rear wheels may already lock during a slight application of the brakes.



◀ Electronic stability programme warning light -K155-

- ◆ If the electronic stability programme warning light (K155) -3- does not go out after the ignition is switched on and after completion of the self-check, the causes of the fault may be the following:

There is a fault which affects only the ESP safety system. The ABS/EDL and EBD safety systems of the vehicle remain fully operational.

Interrogate fault memory ⇒ page 45-101.

-a- short to positive in ESP pushbutton -E256-.

-b- short to earth in operation of electronic stability programme warning light -K155-.

-c- open circuit in cable for operating electronic stability programme warning light -K155-.

⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

-d- the ESP system was switched off by the ESP pushbutton -E256-.

If the electronic stability programme warning light -K155- comes on for 100 milliseconds after the ignition is switched on, a coding without ESP control has been entered.

Code control unit ⇒ page 45-114.

If the electronic stability programme warning light -K155- flashes when driving, the ESP system is in the control mode.

Warning lights -K47-, -K14/33- and -K155-

- ◆ If the ABS warning light (K47) -1-, the handbrake/brake fluid level warning light (K14/33) -2- and the electronic stability programme warning light (K155) -3- flash continuously, the control unit is not yet coded.

Code control unit ⇒ page 45-114.

**Models fitted with ABS/EDL/ESP -
EDL does not operate****Special tools, testers and aids required**

- ◆ Vehicle system tester V.A.G 1552
- ◆ Diagnostic cable V.A.G 1551/3 or
V.A.G 1551/3 A

**Complaint: „EDL system of vehicle does not
operate“**

When dealing with such a complaint, a possible cause of the fault may be that the brake light switch is incorrectly set or not operating ⇒ page 45-116, Reading measured value block, display group number 003 and ⇒ page 45-69, Setting brake light switch.

Performing self-diagnosis

Test requirements

- Approved size of tyres fitted to all wheels; tyres inflated to the specified inflation pressure.
- Mechanical/hydraulic part of brake system together with brake light switch and brake lights o.k.
- No leaks in hydraulic connections and lines (visual inspection at hydraulic unit, brake calipers, wheel brake cylinders, tandem brake master cylinder).
- Wheel bearings and wheel bearing play o.k.
- Control unit -J104- correctly bolted to hydraulic unit -N55-.
- Plug connection at control unit (J104) correctly inserted (lock is engaged).
- Plug contacts of ABS components free of damage and correctly installed.
- All fuses according to CFD o.k. (as a check, remove fuses from fuse holder).
- Supply voltage o.k. (at least 10.0 V).

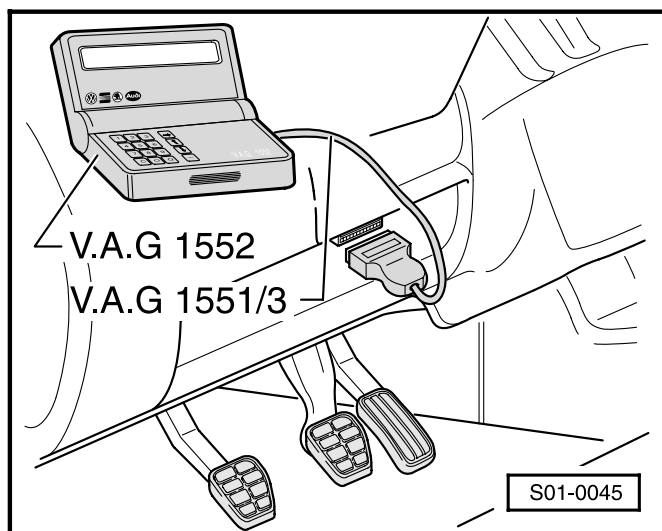
Connecting vehicle system tester V.A.G 1552 and selecting function

Special tools, testers and aids required

- ◆ Vehicle system tester V.A.G 1552
- ◆ Diagnostic cable V.A.G 1551/3 or V.A.G 1551/3 A, respectively

Notes:

- ◆ *The ABS function in the control unit is switched off during self-diagnosis.*
- ◆ *The ABS warning light -K47-, the electronic stability programme warning light -K155- and the handbrake/brake fluid level warning light -K14/33- come on and remain on.*



- ◆ The fault memory can be erased after completing repairs and interrogating memory.

- ◀ - Switch off ignition (if not already off) and connect vehicle system tester V.A.G 1552 with diagnostic cable V.A.G 1551/3 or with V.A.G 1551/3 A to the diagnosis connection.

Interrogating control unit version

Test of vehicle systems
Enter address word XX

HELP

- ◀ Readout in display:

If no readout appears in the display, inspect plug connection for self-diagnosis, Electrical Test ⇒ from page 45-133, test steps 27 and 28.

Notes:

- ◆ Depending on the programme, additional user information can be displayed by pressing the **HELP** key of V.A.G 1552.
- ◆ The **→** key is used for moving forward within the test programme.
- Switch on ignition.

Test of vehicle systems
Enter address word XX

HELP

- ◀ Readout in display:

- Press keys 0 and 3 for the address word „Brake electronics“ and confirm the entry with the key Q.

1J0 907 379 ESP 20 CAN V002 →
Coding 18945 WSC XXXXX

- ◀ The following readout then appears (example):

What is displayed is:

- ◆ the control unit identification number, e.g. 1J0907379
- ◆ the system designation, e.g. ESP 20
- ◆ Databus present (CAN)
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
- ◆ the number of the version, e.g. V002
- ◆ the code No. of the control unit, e.g. 18945
- ◆ the workshop code (WSC)
⇒ Operating instructions of vehicle system tester V.A.G 1552

Assignment of control unit

⇒ Parts List

Coding control unit ⇒ page 45-114

If the control unit identification number does not appear ⇒ page 45-100, List of available functions.

- Press → key.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

Note:

A list of the possible functions is displayed after pressing the HELP key:

Test of vehicle systems
Select function XX

HELP

◀ Readout in display; (function selection, e.g. 02 - Interrogating fault memory)

Note:

♦ *If one of the fault messages shown opposite appears in the display, the possible causes of the fault can be displayed by pressing the HELP key.*

Test of vehicle systems
Control unit does not answer!

HELP

◀ A possible cause of the fault are the fuses of the inlet/outlet valves S13, S162, S163.

Test of vehicle systems
K wire not switching to positive!

HELP

◀ Check whether ignition is switched on.

Test of vehicle systems
No signal from control unit!

→

◀ Faults occurred when interrogating the control unit identification (also external sources of interference).

- Test diagnostic cable and also voltage supply and earth connection for ABS (J104) ⇒ page 45-133, Electrical test.

- After rectifying the possible causes of the faults, once again enter address word 03 for „Brake Electronics“ and confirm the entry with the key Q.

Test of vehicle systems
Tester sends address word 03

◀ Readout in display after entering address word 03

1J0 907 379 ESP 20 CAN V005 →
Coding 18945 WSC XXXXX

◀ and the following readout then appears:

- Press → key.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

Automatic test sequence

Note:

All the contents of the fault memories of the control units are interrogated with the automatic test sequence.

- Switch on ignition.

◀ Readout in display:

- Press key 0 twice for the function „Automatic test sequence“ and confirm the entry with the key Q.

◀ The control unit identification appears in the display.

After this, all the control unit identifications with any entries from the fault memories appear in the display.

- End output (function 06) ⇒ page 45-114.

List of available functions

	Page
00 - Automatic test sequence	45-100
01 - Interrogating control unit version	45-10
02 - Interrogating fault memory	45-101
03 - Final control diagnosis	45-29
04 - Basic setting ¹⁾	45-36
04 - Basic setting ²⁾	45-124
05 - Erasing fault memory	45-113
06 - Ending output	45-114
07 - Coding control unit	45-114
08 - Reading measured value block	45-116

¹⁾ Is required only for bleeding hydraulic unit on vehicles with EDL system.

²⁾ Is required for zeroing of steering angle sensor, lateral acceleration sensor and brake pressure sensors, and also for operational check of solenoid for brake pressure and of brake recognition switch.

Test of vehicle systems
Select function XX

HELP

1J0 907 379 ESP 20 CAN V005 →
Coding 18945 WSC XXXXX

Interrogating fault memory

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- Press keys 0 and 2 for the function „Interrogate fault memory“ and confirm the entry with the key Q.

X faults recognised!

◀ The number of stored faults or „No fault recognised“ appears in the display.

No fault recognised!

→

- Press → key.

The faults stored are displayed one after the other.

- Use the fault message displayed to refer to the fault table ⇒ page 45-102.

If „No fault recognised“ appears, the programme returns to the initial position after pressing the → key:

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- End output (function 06) ⇒ page 45-114.
- Switch off ignition and separate diagnosis plug connection.

Notes:

If a fault was detected:

- ◆ 1. Rectify fault (repair)
- ◆ 2. Interrogate fault memory (function 02)
- ◆ 3. Erase fault memory (function 05)
- ◆ 4. End output (function 06)
- ◆ 5. Road test
- ◆ 6. Once again interrogate fault memory.

Fault table

Notes:

- ◆ In view of the control units which are interlinked over a databus line, always commence fault finding by initiating the „Automatic test sequence“ with the key function 0 and 0 at all the control units fitted to the vehicle. This interrogates the control unit fitted to the vehicle and any faults which may be stored in them.
 - ◆ All the possible faults which can be detected by the ABS control unit (J104) and displayed on V.A.G 1552, are listed below according to the 5-digit fault code.
 - ◆ If faults occur only occasionally or if the fault memory was not erased after rectifying faults, these faults are displayed for a defined period as „sporadically occurring faults“ -SP- ⇒ page 45-91, Fault recognition of ABS control unit.
 - ◆ In addition, the fault type may also be indicated in the fault table.
 - ◆ Reference is made in the column „Rectifying fault“ to individual test steps of the electrical test.
 - ◆ Before replacing components indicated as faulty, test the appropriate plug connections, cables and earth connections according to the current flow diagram.
- ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
- ◆ After completing repairs, always once again interrogate and then erase the fault memory with the vehicle system tester V.A.G 1552, and conduct a road test (at a speed of more than 20 km/h).
 - ◆ After conducting the road test, once again interrogate the fault memory.

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
No fault recognised	If „no fault recognised“ appears after completing repairs, self-diagnosis is ended. If the ABS/EDL/ESP does not operate properly although „no fault recognised“ is displayed, then proceed as described below: 1. Conduct a road test at a speed of more than 20 km/h. 2. Once again interrogate the fault memory; if no fault is again stored. 3. Continue fault finding without self-diagnosis and work through the electrical test in full ⇒ page 45-133.	
00283 Front left wheel speed sensor -G47	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G47- and control unit -J104 ◆ Damage to pulse rotor or speed sensor -G47 ◆ Coil of speed sensor -G47- faulty ◆ ABS control unit -J104- faulty	- Test wiring, plug connections and wheel speed sensors - Read measured value block ⇒ page 45-116, display group number 001 - Perform electrical test ⇒ page 45-133, test steps 8 and 12 - Inspect wheel speed sensor -G47- and pulse rotor for damage - Replace pulse rotor/speed sensor -G47- ⇒ page 45-60 and 45-65 If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-163

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00283 Front left wheel speed sensor -G47 Signal not to tolerance ¹⁾	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G47- and control unit -J104 ◆ Electrical interference because of external sources (high-frequency interference, e.g. ignition cable not insulated) ◆ Damage to pulse rotor or speed sensor -G47 ◆ Air gap between speed sensor -G47- and pulse rotor too large (signal not o.k.)	- Test wiring, plug connections and wheel speed sensors - Perform electrical test ⇒ page 45-133, test steps 8 and 12 - Read measured value block ⇒ page 45-116, display group number 001 - Inspect speed sensor -G47- and pulse rotor for damage - Replace pulse rotor/speed sensor -G47- ⇒ page 45-60 and 45-65
00283 Front left wheel speed sensor -G47 Mechanical fault ¹⁾	◆ Air gap between speed sensor -G47- and pulse rotor too large (signal not o.k.) ◆ Outlet valves in hydraulic unit -N55- faulty	- Inspect installation of speed sensor -G47- and pulse rotor ⇒ page 45-60 and 45-65 - Read measured value block ⇒ page 45-116, display group number 002 - Perform final control diagnosis ⇒ page 45-29 If the fault occurs once again: - Replace hydraulic unit -N55- ⇒ page 45-163

¹⁾ Fault type cannot be detected until speed more than 20 km/h (conduct road test).

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00285 Front right wheel speed sensor -G45	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G45- and control unit -J104 ◆ Damage to pulse rotor or speed sensor -G45 ◆ Coil of speed sensor -G45- faulty ◆ ABS control unit -J104- faulty	- Test wiring, plug connections and wheel speed sensors - Read measured value block ⇒ page 45-116, display group number 001 - Perform electrical test ⇒ page 45-133, test steps 7 and 11 - Inspect speed sensor -G45- and pulse rotor for damage - Replace pulse rotor/speed sensor -G45- ⇒ page 45-60 and 45-65 If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-163
00285 Front right wheel speed sensor -G45 Signal not to tolerance ¹⁾	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G45- and control unit -J104 ◆ Electrical interference because of external sources (high-frequency interference, e.g. ignition cable not insulated) ◆ Damage to pulse rotor or speed sensor -G45 ◆ Air gap between speed sensor -G45- and pulse rotor too large (signal not o.k.)	- Test wiring, plug connections and wheel speed sensors - Perform electrical test ⇒ page 45-133, test steps 7 and 11 - Read measured value block ⇒ page 45-116, display group number 001 - Inspect speed sensor -G45- and pulse rotor for damage - Replace pulse rotor/speed sensor -G45- ⇒ page 45-60 and 45-65
00285 Front right wheel speed sensor -G45 Mechanical fault ¹⁾	◆ Air gap between speed sensor -G45- and pulse rotor too large (signal not o.k.) ◆ Outlet valves in hydraulic unit -N55- faulty	- Inspect installation of speed sensor -G45- and pulse rotor ⇒ page 45-60 and 45-65 - Read measured value block ⇒ page 45-116, display group number 002 - Perform final control diagnosis ⇒ page 45-29 If the fault occurs once again: - Replace hydraulic unit -N55- ⇒ page 45-163

¹⁾ Fault type cannot be detected until speed more than 20 km/h (conduct road test).

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00287 Rear right wheel speed sensor -G44	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G44- and control unit -J104 ◆ Damage to pulse rotor or speed sensor -G44 ◆ Coil of speed sensor -G44- faulty ◆ ABS control unit -J104- faulty	- Test wiring, plug connections and wheel speed sensors - Read measured value block ⇒ page 45-116, display group number 001 - Perform electrical test ⇒ page 45-133, test steps 9 and 13 - Inspect speed sensor -G44- and pulse rotor for damage - Replace pulse rotor/speed sensor -G44- ⇒ page 45-60 and 45-65 If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-163
00287 Rear right wheel speed sensor -G44 Signal not to tolerance ¹⁾	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G44- and control unit -J104 ◆ Electrical interference because of external sources (high-frequency interference, e.g. ignition cable not insulated) ◆ Damage to pulse rotor or speed sensor -G44 ◆ Air gap between speed sensor -G44- and pulse rotor too large (signal not o.k.)	- Test wiring, plug connections and wheel speed sensors - Perform electrical test ⇒ page 45-133, test steps 9 and 13 - Read measured value block ⇒ page 45-116, display group number 001 - Inspect speed sensor -G44- and pulse rotor for damage - Replace pulse rotor/speed sensor -G44- ⇒ page 45-60 and 45-65
00287 Rear right wheel speed sensor -G44 Mechanical fault ¹⁾	◆ Air gap between speed sensor -G44- and pulse rotor too large (signal not o.k.) ◆ Outlet valves in hydraulic unit -N55- faulty	- Inspect installation of speed sensor -G44- and pulse rotor ⇒ page 45-60 and 45-65 - Read measured value block ⇒ page 45-116, display group number 002 - Perform final control diagnosis ⇒ page 45-29 If the fault occurs once again: - Replace hydraulic unit -N55- ⇒ page 45-163

¹⁾ Fault type cannot be detected until speed more than 20 km/h (conduct road test).

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00290 Rear left wheel speed sensor -G46	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G46- and control unit -J104 ◆ Damage to pulse rotor or speed sensor -G46 ◆ Coil of speed sensor -G46- faulty ◆ ABS control unit -J104- faulty	- Test wiring, plug connections and wheel speed sensors - Read measured value block ⇒ page 45-116, display group number 001 - Perform electrical test ⇒ page 45-133, test steps 10 and 14 - Inspect speed sensor -G46- and pulse rotor for damage - Replace pulse rotor/speed sensor -G46- ⇒ page 45-60 and 45-65 If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-163
00290 Rear left wheel speed sensor -G46 Signal not to tolerance ¹⁾	◆ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G46- and control unit -J104 ◆ Electrical interference because of external sources (high-frequency interference, e.g. ignition cable not insulated) ◆ Damage to pulse rotor or speed sensor -G46 ◆ Air gap between speed sensor -G46- and pulse rotor too large (signal not o.k.)	- Test wiring, plug connections and wheel speed sensors - Perform electrical test ⇒ page 45-133, test steps 10 and 14 - Read measured value block ⇒ page 45-116, display group number 001 - Inspect speed sensor -G46- and pulse rotor for damage - Replace pulse rotor/speed sensor -G46- ⇒ page 45-60 and 45-65
00290 Rear left wheel speed sensor -G46 Mechanical fault ¹⁾	◆ Air gap between speed sensor -G46- and pulse rotor too large (signal not o.k.) ◆ Outlet valves in hydraulic unit -N55- faulty	- Inspect installation of speed sensor -G46- and pulse rotor ⇒ page 45-60 and 45-65 - Read measured value block ⇒ page 45-116, display group number 002 - Perform final control diagnosis ⇒ page 45-29 If the fault occurs once again: - Replace hydraulic unit -N55- ⇒ page 45-163

¹⁾ Fault type cannot be detected until speed more than 20 km/h (conduct road test).

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00538 Reference voltage	◆ Open circuit, short circuit to positive or earth in wiring of - Yaw rate sensor -G202- - Lateral acceleration sensor -G200- - Brake pressure sensor 1 -G201 - Brake pressure sensor 2 -G214	- Test fuses, cables, plug connections and also voltage supply to control unit: ⇒ page 45-133, Electrical Test, test steps 20, 21, 22 and 23
00668 System voltage terminal 30 Signal out of tolerance	◆ Open circuit, short circuit to positive or to earth in wiring ◆ Fuses S162 and S163 faulty	- Test fuses, cables, plug connections and also voltage supply to control unit: ⇒ page 45-133, Electrical Test, test steps 1 and 2
00778 Steering angle sensor -G85 No communication ¹⁾	◆ Open circuit or loose contact in databus lines between steering angle sensor -G85 and control unit -J104 ◆ Incorrect specification from steering angle sensor -G85 ◆ Steering angle sensor -G85 faulty	- Test fuses, cables, plug connections and also voltage supply to control unit: ⇒ page 45-133, Electrical Test, test step 19 - Read measured value block ⇒ page 45-116, display group number 004 - Replace steering angle sensor -G85- ⇒ page 45-174 - Perform zeroing: ⇒ page 45-124, Basic setting, display group number 060
00778 Steering angle sensor -G85 ¹⁾ No or incorrect setting	◆ Steering angle sensor -G85 transmits incorrect settings or no settings at all	- Perform zeroing: ⇒ page 45-124, Basic setting, display group number 060
00778 Steering angle sensor -G85 ¹⁾ Mechanical fault	◆ Installation position of steering angle sensor -G85 is incorrect ◆ Chassis geometry is not correct ◆ Steering wheel was removed and no zeroing carried out when re-fitted	- Check installation position of steering angle sensor -G85- ⇒ page 45-174 - Check chassis alignment ⇒ Repair Group 44 - Perform zeroing: ⇒ page 45-124, Basic setting, display group number 060

¹⁾ Data between the control unit -J104 and steering angle sensor -G85 is transferred over the CAN databus.

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00778 Steering angle sensor -G85 Implausible signal ¹⁾	◆ Installation position of steering angle sensor -G85 is incorrect ◆ Chassis geometry is not correct ◆ Impermissible vibrations in steering because of wear	- Check installation position of steering angle sensor -G85- ⇒ page 45-174 - Check chassis alignment ⇒ Repair Group 44 - Perform zeroing: ⇒ page 45-124, Basic setting, display group number 060
00778 Steering angle sensor -G85 Defective ¹⁾	◆ Steering angle sensor -G85 faulty	- Replace steering angle sensor -G85- ⇒ page 45-174 - Perform zeroing: ⇒ page 45-124, Basic setting, display group number 060
00810 Sensor 1/2 for brake pressure Implausible signal Sensor 1 -G201 Sensor 2 -G214	◆ Earth connection to sensor for brake pressure 1 or 2 interrupted ◆ Short circuit in signal cable to sensor for brake pressure 1 or 2 ◆ Sensor 1 -G201- or sensor 2 -G214- for brake pressure faulty ◆ A hydraulic brake circuit has failed	- Test fuses, cables, plug connections and also voltage supply to control unit: ⇒ page 45-133, Electrical Test, test steps 22 and 23 - Read measured value block ⇒ page 45-116, display group number 005 - Replace sensor 1 -G201- or sensor 2 -G214- for brake pressure ⇒ page 47-28 - Perform zeroing: ⇒ page 45-124, Basic setting, display group number 060 - Check brake system ⇒ Repair Group 47

¹⁾ Data between the control unit -J104 and steering angle sensor -G85 is transferred over the CAN databus.

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00812 Release switch f. solenoid f. brake pressure -F84 ¹⁾	◆ Open circuit, short circuit to positive or to earth in wiring to brake recognition switch -F83 ◆ Test brake recognition switch -F83 ◆ Brake servo unit faulty	- Test cables, plug connections and also earth cables according to current flow diagram: ⇒ page 45-133, Electrical Test, test step 25 - Perform operational check ⇒ page 45-124, Basic setting, display group number 031 If the fault occurs once again: - Replace brake servo unit ⇒ page 47-32
00813 Sensor 2 for brake pressure -G214 Electr. fault in circuit	◆ Open circuit or loose contact in wiring between brake pressure sensor 2 -G214 and control unit -J104 ◆ Brake pressure sensor 2 -G214 faulty	- Test fuses, cables, plug connections and also voltage supply to control unit ⇒ page 45-133, Electrical Test, test step 23 - Read measured value block ⇒ page 45-116, display group number 005 - Replace brake pressure sensor 2 -G214- ⇒ page 47-28 - Perform zeroing: ⇒ page 45-124, Basic setting, display group number 066
00814 Brake pressure solenoid -N247	◆ Open circuit or loose contact in wiring between brake pressure solenoid -N247 and control unit -J104 ◆ Brake pressure solenoid -N247 faulty ◆ Brake servo unit faulty ◆ Output stage in control unit faulty	- Test fuses, cables, plug connections and also voltage supply to control unit ⇒ page 45-133, Electrical Test, test step 24 - Conduct operational check ⇒ page 45-124, Basic setting, display group number 031 If the fault occurs once again: - Replace brake servo unit ⇒ page 47-32 If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-163 - Check coding of control unit ⇒ page 45-114 - Perform zeroing: ⇒ page 45-124, Basic setting, display group number 060, 063 and 066

¹⁾ The release switch for brake pressure solenoid -F84- is identical with the ESP brake recognition switch -F83-.

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
01044 Control unit incorrectly coded	◆ An incorrect code number was entered with V.A.G 1552	- Check coding of control unit ⇒ page 45-114.
01130 ABS operation Implausible signal ¹⁾	◆ Electrical interference caused by external sources (high-frequency interference, e.g. ignition cables not insulated) ◆ Open circuit, short circuit to positive or to earth or loose contact in wiring ◆ ABS control unit -J104- faulty	- Test all cables, plug connections for short circuit to positive or to earth ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Erase fault memory - Conduct road test at more than 20 km/h - Once again interrogate fault memory If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-163
01276 ABS hydraulic pump -V64 Signal out of tolerance ¹⁾	◆ Internal connection of el. motor to control unit ◆ Short circuit to positive or to earth or open circuit ◆ Control unit faulty ◆ Pump motor faulty	- Test cables, plug connections and also earth cables according to current flow diagram ⇒ page 45-133, Electrical Test, test step 1 - Perform an operational check ⇒ page 45-29, Final control diagnosis - If hydraulic pump does not start during final control diagnosis, replace control unit -J104-, as a check If the fault occurs once again: - Replace hydraulic unit -N55- ⇒ page 45-163
01312 Drive databus defective ²⁾	◆ Open circuit, short circuit to positive or to earth or loose contact in databus line	- Test databus line for open circuit or short circuit according to current flow diagram ⇒ page 45-133, Electrical Test, test step 26

¹⁾ Fault type cannot be detected until speed more than 20 km/h (conduct road test).

²⁾ Occurs in the case of ESP only together with the fault: steering angle sensor -G85- no communication.

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
01314 Engine control unit	♦ Fault in engine control unit	- Read out fault memory of engine control unit:
01314 Engine control unit No communication	♦ Open circuit, short circuit to positive or to earth in the databus lines	- Test databus lines for open circuit or short circuit according to current flow diagram ⇒ page 45-133, Electrical Test, test step 26
01315 Gearbox control unit ¹⁾ No communication	♦ Open circuit, short circuit to positive or to earth in the databus lines	- Test databus lines for open circuit or short circuit according to current flow diagram ⇒ page 45-133, Electrical Test, test step 26
01423 Lateral acceleration sensor -G200 Electr. fault in circuit	♦ Open circuit, short circuit to positive or to earth or loose contact in wiring between lateral acceleration sensor -G200- and control unit -J104 ♦ Lateral acceleration sensor -G200- not correctly installed ♦ Lateral acceleration sensor -G200- faulty	- Test lateral acceleration sensor -G200- - Read measured value block ⇒ page 45-116, display group number 004 - Test wiring, plug connections and also earth cables according to current flow diagram ⇒ page 45-133, Electrical Test, test step 20 - Inspect installation position of lateral acceleration sensor -G200- ⇒ page 45-171 - Replace lateral acceleration sensor -G200- ⇒ page 45-172 - Perform zeroing: ⇒ page 45-124, Basic setting, display group number 063
01423 Lateral acceleration sensor -G200 Implausible signal	♦ Lateral acceleration sensor -G200- not correctly installed ♦ Lateral acceleration sensor -G200- faulty	- Test lateral acceleration sensor -G200- - Read measured value block ⇒ page 45-116, display group number 004 - Inspect installation position of lateral acceleration sensor -G200- ⇒ page 45-171 - Replace lateral acceleration sensor -G200- ⇒ page 45-172 - Perform zeroing: ⇒ page 45-124, Basic setting, display group number 063

¹⁾ Only on vehicles fitted with automatic gearbox.

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
01435 Sensor 1 for brake pressure -G201 Electr. fault in circuit	◆ Open circuit or loose contact in wiring between sensor 1 for brake pressure -G201 and control unit -J104 ◆ Sensor 1 for brake pressure -G201- faulty	- Test sensor 1 for brake pressure -G201- - Read measured value block ⇒ page 45-116, display group number 005 - Test fuses, wiring, plug connections and also voltage supply to control unit: ⇒ page 45-133, Electrical Test, test step 22 - Replace sensor 1 for brake pressure -G201- ⇒ page 47-28 - Perform zeroing: ⇒ page 45-124, Basic setting, display group number 066
01542 Yaw rate sensor -G202 Implausible signal	◆ Open circuit in earth connection to yaw rate sensor -G202 ◆ Yaw rate sensor -G202- not correctly installed ◆ Yaw rate sensor -G202- faulty	- Test yaw rate sensor -G202- - Read measured value block ⇒ page 45-116, display group number 004 - Test wiring, plug connections to control unit ⇒ page 45-133, Electrical Test, test step 21 - Inspect installation position of yaw rate sensor ⇒ page 45-171 - Replace yaw rate sensor -G202- ⇒ page 45-172
01542 Yaw rate sensor -G202 Electr. fault in circuit	◆ Open circuit or loose contact in wiring between yaw rate sensor -G202 and control unit -J104 ◆ Yaw rate sensor -G202- faulty	- Test yaw rate sensor -G202- - Read measured value block ⇒ page 45-116, display group number 004 - Test fuses, wiring, plug connections and also voltage supply to control unit ⇒ page 45-133, Electrical Test, test step 21 - Replace yaw rate sensor -G202- ⇒ page 47-172

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
65535 Control unit defective	♦ Control unit faulty	- Replace control unit -J104- ⇒ page 45-163 - Perform zeroing: ⇒ page 45-124, Basic setting, display group number 060, 063 and 066

Erasing fault memory

Requirement:

- Fault memory has been interrogated.
- Press → key.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- Press keys 0 and 5 for the function „Erase fault memory“ and confirm the entry with the key Q.

Test of vehicle systems
Fault memory is erased!

→

◀ Readout in display:

- Press → key.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

Notes:

- ◀ ♦ *If this readout appears in the display, then the test sequence was incorrect.*
- ♦ *Follow the test sequence exactly:
First of all, interrogate fault memory and then erase it.*

Ending output

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- Press keys 0 and 6 for the function "End output" and confirm the entry with the key Q.

Test of vehicle systems
Enter address word XX

HELP

◀ Readout in display:

- Switch ignition off.
- Separate plug connection to the vehicle system tester.
- Switch ignition on.

ABS warning light (K47), handbrake/brake fluid level warning light (K14/33) and electronic stability programme warning light (K155) must go out after about 2 seconds.

Coding control unit

Special tools, testers and aids required

- ♦ Vehicle system tester V.A.G 1552
- ♦ Diagnostic cable V.A.G 1551/3 or V.A.G 1551/3 A, respectively

The control unit installed in the vehicle is coded. New control units supplied from the Parts Store are not coded and must be coded after being installed.

Requirement for coding

Coding is only possible if the workshop code (WSC) has been entered in V.A.G 1552.

Test procedure

- Determine the engine code letters and the type of ESP hydraulic control unit fitted to the vehicle.
- Connect vehicle system tester V.A.G 1552 and select brake electronics control unit (address word 03) ⇒ page 45-97; ignition is switched on for this step.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- Press keys 0 and 7 for the function "Code control unit" and confirm the entry with the key Q.

Code control unit
Enter code number XXXXX

Q
(0-32767)

◀ Readout in display:

- Enter the correct code number of the vehicle and confirm the entry with the key Q.

1J0 907 379 ESP 20 CAN V005 →
Coding 18945 WSC XXXXX

◀ The control unit identification appears in the display of the vehicle system tester V.A.G 1552 (example):

Table of codes

Engine code letters	Model Engine	ABS version	Year code number			
			2000			
ARZ	1.8-ltr./110 kW	ABS/EDL/ESP	18945			
ASV	1.9-ltr./81 kW	ABS/EDL/ESP	18945			

Note:

If a code is entered which does not match the engine code letters, the code is accepted by the control unit, but must always be corrected.

- Press → key.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- End output (function 06) ⇒ page 45-114.

Note:

If a code is entered in the control unit which does not match the vehicle model:

Error
Coding XXXXX not accepted →

◀ Readout in display:

If the control unit is coded with code 00000, the ABS warning light (K47) and the handbrake/brake fluid level warning light (K14/33) flash, while the electronic stability programme warning light (K155) comes on and remains on.

If the electronic stability programme warning light (K155) comes on for only 100 milliseconds after the ignition is switched on, a code without TCS/ESP control has been entered.

Reading measured value block

Special tools, testers and aids required

- ◆ Vehicle system tester V.A.G 1552
- ◆ Diagnostic cable V.A.G 1551/3

The control unit is able to transmit a large number of measured values. These measured values supply information regarding the operating state of the system or of the sensors connected. In many cases, the measured values transmitted can be used for assisting fault finding and rectification of faults. As it is not possible to assess all of these measured values at the same time, they are combined into individual display groups which can be selected by means of display group numbers.

No ABS or ESP control takes place when conducting a road test with vehicle system tester V.A.G 1552 connected and in the diagnosis or reading measured value block mode. The ABS or ESP warning lights do not come on in this case.

Safety precautions

If it is necessary to use test and measuring equipment during a road test, pay attention to the following procedure:

- ◆ The test and measuring equipment should always be attached to the rear seat and operated from that point by a second person.
- ◆ If the test and measuring equipment were operated from the front passenger seat, this could result in injury to the person occupying that seat in the event of an accident if the front passenger airbag is deployed.

Test procedure and test tables with measured values

- Connect vehicle system tester V.A.G 1552 and select brake electronics control unit (address word 03) ⇒ page 45-97; ignition switched on for this step.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- Press keys 0 and 8 for the function „Read measured value block“ and confirm the entry with the key Q.
- Enter display group number ⇒ page 45-117, List of available display group numbers.

List of available display group numbers

Display group number	Display block	Designation
001	1	Wheel speed at front left speed sensor -G47- (km/h)
	2	Wheel speed at front right speed sensor -G45- (km/h)
	3	Wheel speed at rear left speed sensor -G46- (km/h)
	4	Wheel speed at rear right speed sensor -G44- (km/h)
002	1	Starting speed at front left speed sensor -G47- (km/h)
	2	Starting speed at front right speed sensor -G45- (km/h)
	3	Starting speed at rear left speed sensor -G46- (km/h)
	4	Starting speed at rear right speed sensor -G44- (km/h)
003	1	Brake light switch -F-
	2	ESP brake recognition switch -F83-
	3	Not assigned
	4	Not assigned
004	1	Steering angle sensor -G85-
	2	Lateral acceleration sensor -G200-
	3	Yaw rate sensor -G202-
	4	Not assigned
005	1	Brake pressure sensor -G201- or -G214-
	2	Brake pressure sensor -G201- or -G214-
	3	Not assigned
	4	Not assigned
125	1	Engine databus
	2	Steering angle databus ¹⁾
	3	Not assigned
	4	Gearbox databus ²⁾

¹⁾ Only on vehicles fitted with ABS/EDL/ESP.

²⁾ Only on vehicles fitted with automatic gearbox.

Testing wheel speed sensor assignment -G44-, -G45-, -G46-, -G47-

Display group number 001

- Press keys 0, 0 and 1 and confirm entry with the key Q.

Read measured value block			1	→
→ 1	→ 2	→ 3	→ 4	

- ◀ - The measured value block is always composed of 4 display blocks -arrows-. Refer to the test table below for the explanation of the readouts 1 to 4 in the individual display blocks.

Read measured value block			1	→
0 km/h	0 km/h	0 km/h	0 km/h	

- ◀ Readout in display (vehicle stationary):

Pay attention to the following aspects regarding display group number 001:

What is displayed are the wheel speeds at that moment. They are used for checking the wheel speed sensor assignment to the wheel. (The vehicle must be raised for this purpose and the wheel rotated by hand by a 2nd person).

Read measured value block				1 →	Display group number: 001
0 km/h	4 km/h	0 km/h	0 km/h		◀ Readout in display: (example)
					Wheel speed at rear right wheel speed sensor ♦ (0...255 km/h)
					Wheel speed at rear left wheel speed sensor ♦ (0...255 km/h)
					Wheel speed at front right wheel speed sensor ♦ (0...255 km/h)
					Wheel speed at front left wheel speed sensor ♦ (0...255 km/h)

The next higher display group number 002 can be selected with the ↑ key.

Press key C for entering the next display group number.

If the → key is pressed, it is necessary in this case to once again press the keys 0 and 8 in order to re-enter the procedure „Reading measured value block“.

Test of wheel speed sensors -G44-, -G45-, -G46-, -G47-

Display group number 002

- Press keys 0, 0 and 2 and confirm the entry with the key Q.

Read measured value block	2	→
→ 1	→ 2	→ 3
	→ 4	

- ◀ - The measured value block is always composed of 4 display blocks -arrows-. Refer to the test table below for the explanation of the readouts 1 to 4 in the individual display blocks.

Read measured value block			2	→
255 km/h	255 km/h	255 km/h	255 km/h	

- ◀ Readout in display (vehicle stationary):

Pay attention to the following aspects regarding display group number 001:

The variations in the readouts in display blocks 1 and 2 must on no account be more than 6 km/h, and in the case of display blocks 3 and 4, on no account more than 2 km/h.

Read measured value block	2	→	Display group number: 002	
3 km/h ¹⁾	6 km/h ¹⁾	2 km/h ²⁾	1 km/h ²⁾	◀ Readout in display: (starting off slowly)
Wheel speed at rear right wheel speed sensor ♦ (0...255 km/h)				
Wheel speed at rear left wheel speed sensor ♦ (0...255 km/h)				
Wheel speed at front right wheel speed sensor ♦ (0...255 km/h)				
Wheel speed at front left wheel speed sensor ♦ (0...255 km/h)				

- 1) If the variations in display blocks 1 and 2 are greater than 6 km/h, the causes of the fault may be the following:
 - 2) If the variations in display blocks 3 and 4 are greater than 2 km/h, the causes of the fault may be the following:
- ♦ *Gap between wheel speed sensor and pulse rotor too large.*
 - *Check whether the wheel speed sensor is correctly attached to the wheel bearing housing.*
 - ♦ *External damage to wheel speed sensor or pulse rotor.*
 - *Replace the damaged component.*

The next lower display group number can be selected consecutively in turn with the ↓ key, and the next higher number 002 with the ↑ key.

Press key C for entering the next display group number.

If the → key is pressed, it is necessary in this case to once again press the keys 0 and 8 in order to re-enter the procedure „Reading measured value block“.