PORSCHE

Technical Manual

911 Carrera (996)

Technical Information

Repair

Contents:

Group 4
Running gear

WKD 483 721

Foreword

The workshop documentation for the 911 Carrera (996) model has the designation

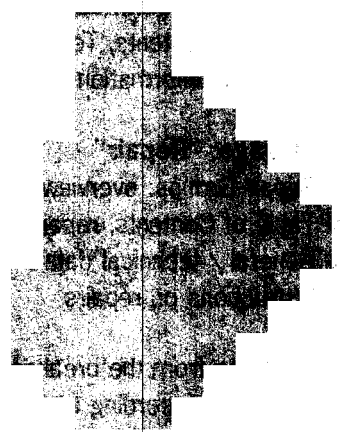
"911 Carrera (996)" Technical Manual

and contains **Technical Information** as well as instructions on **Repairs**.

The integration of the technical information published in the "911 Carrera (996)" Technical Manual with the instructions on repairs provides the user with a complex reference work that combines into one book associated or cross-referenced material of relevance to workshops and originating from various information media.

The "911 Carrera (996)" Technical Manual consists of 15 folders, subdivided into the following Groups

0	Entire vehicle – General
0	Diagnosis, part 1 (up to Repair Group 45) *1
0	Diagnosis, part 2 (as of Repair Group 61) *2
1	Engine, part 1 (up to Repair Group 13) *3
1	Engine, part 2 (as of Repair Group 15) *4
2	Fuel, exhaust, engine electronics
3	Transmission, manual transmission
3	Transmission, automatic transmission
4	Running gear
5	Body
6	Body equipment, exterior
7	Body equipment, interior
8 / 9	Air conditioning / Electrics
9	Circuit diagrams, part 1 (up to and including the '99 model) *5
9	Circuit diagrams, part 2 (as of the '00 model) *6



*1 The two folders with Group 0 are to be regarded as one folder; i.e. file the "Technical Information" notices only in front of the repair descriptions in the folder "Group 0 – Diagnosis, part 1" **(up to Repair Group 45)**.

*2 The **second folder** "Group 0 – Diagnosis, part 2" **(as of Repair Group 61)** includes the further Repair Groups belonging to Group 0.

*3 The two folders with Group 1 are to be regarded as one folder; i.e. file the "Technical Information" notices only in front of the repair descriptions in the folder "Group 1 – Engine, part 1" **(up to Repair Group 13)**.

*4 The **second folder** "Group 1 – Engine, part 2" **(as of Repair Group 15)** includes the further Repair Groups belonging to Group 1.

*5 The two folders with Group 9 are to be regarded as one folder; i.e. file the "Technical Information" notices only in front of the repair descriptions in the folder "Group 9 – Circuit diagrams, part 1" **(up to and including the '99 model)**.

*6 The **second folder** "Group 9 – Circuit diagrams, part 2" **(as of the '00 model)** includes the further circuit diagrams belonging to Group 9.

The "911 Carrera (996)" Technical Manual has the same structure in each folder, with the following breakdown for all Groups:

Title page: "911 Carrera (996)" Technical Manual
> Foreword

Title page: "Technical Information"
> Table of Contents, Technical information
> Technical information

Title page: "Repair"
> Repair Groups: overview
> Table of Contents, repairs
> General / technical data
> Instructions on repairs

As can be seen from the breakdown, the published Technical Information is in the front part of each folder – numbered according to the Groups. The Table of Contents assigned to each Group will be periodically updated.

Following the Technical Information, separated by a title page, the instructions on repairs – assigned according to the Groups or broken down into Repair Groups – are included in the folders.

The instructions on repairs will be extended and updated by means of supplements.

Note

Sheets that already exist in the "911 Carrera (996)" Technical Manual and are updated or revised and thereby exchanged by a supplement are designated "replacement sheet". Revisions or technical modifications on pages of these replacement sheets are identified for the user with a vertical bar at the margin.

*5 The two folders with Group 9 are to be regarded as one folder; i.e. file the "Technical Information" notices only in front of the repair descriptions in the folder "Group 9 – Circuit diagrams, part 1" **(up to and including the '99 model)**.

*6 The **second folder** "Group 9 – Circuit diagrams, part 2" **(as of the '00 model)** includes the further circuit diagrams belonging to Group 9.

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> Repair Groups: overview
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4 Running gear

48 Steering

4 Overview of 911 Carrera (996) running gear

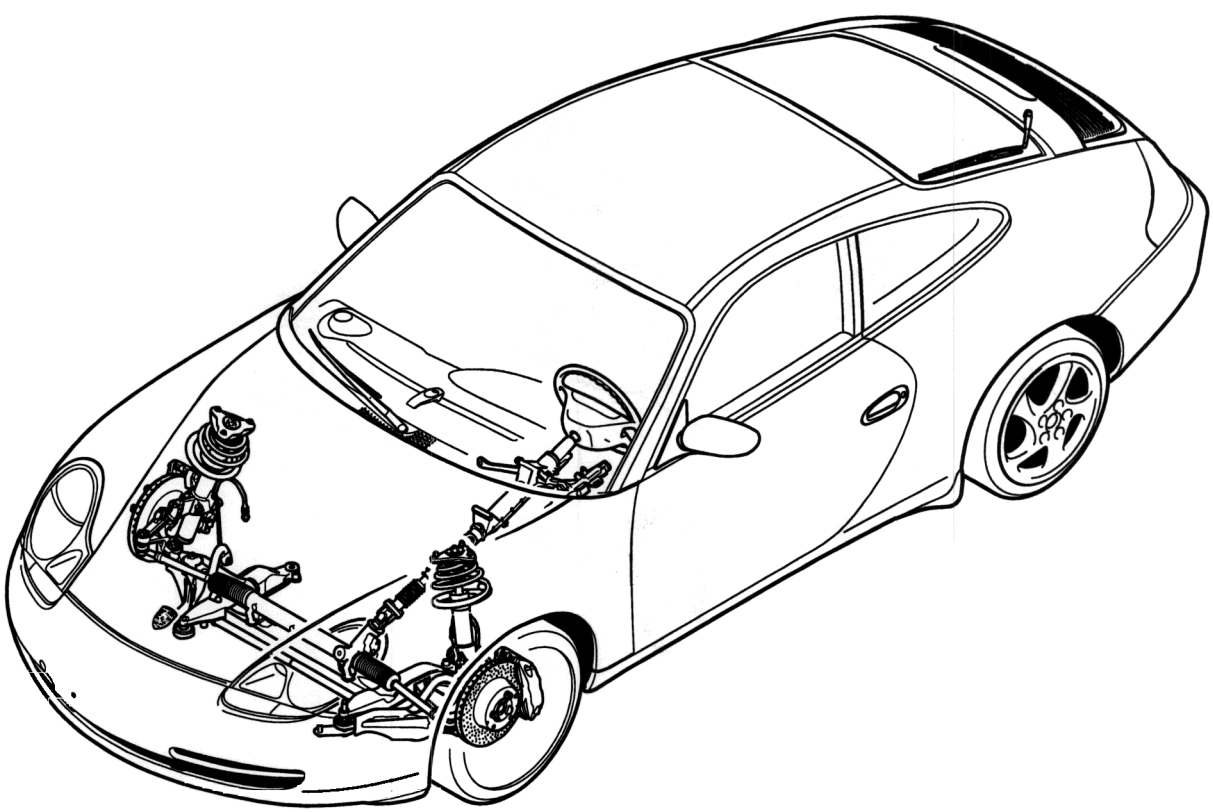
Front axle / steering

McPherson wheel suspension with offset spring. Twin-tube gas-filled shock absorbers in standard or sports version.

In order to obtain greater stiffness with reduced intrinsic weight as compared with steel, the following components have been made from aluminium:
Control arms, diagonal brace, track rod, wheel carrier and cross member / side member.

Rack-and-pinion steering gear (i = 16.9 : 1) with hydraulic assistance.
Steering wheel longitudinally adjustable (40 mm).

Further improvement of steering precision and reduction in the turning circle (10.6 m) as compared with the previous 911 Carrera (993).



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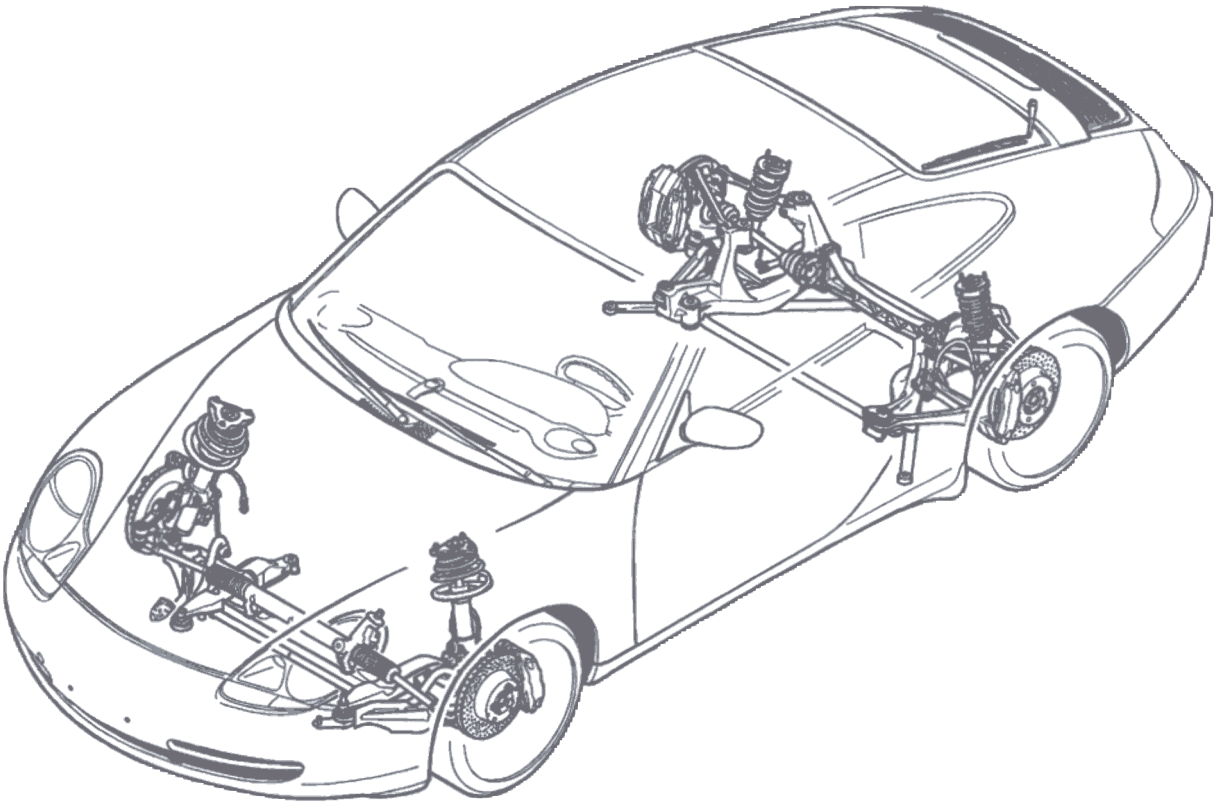
Printed in Germany, 1997 9964_1

Rear axle

The multi-link rear axle used in the 911 Carrera (993) served as the basis for the further development in the new 911 Carrera (996). Important considerations here were to achieve further weight reduction while preserving the familiar good vehicle dynamic properties.
The longer wheel base offered additional potential for improvements in driving comfort and handling.

The wheel suspension consists of **five aluminium control arms**, of which the **two upper control arms** are aluminium forgings.

Gas-filled shock absorbers in standard or sports version.



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Wheels and tyres

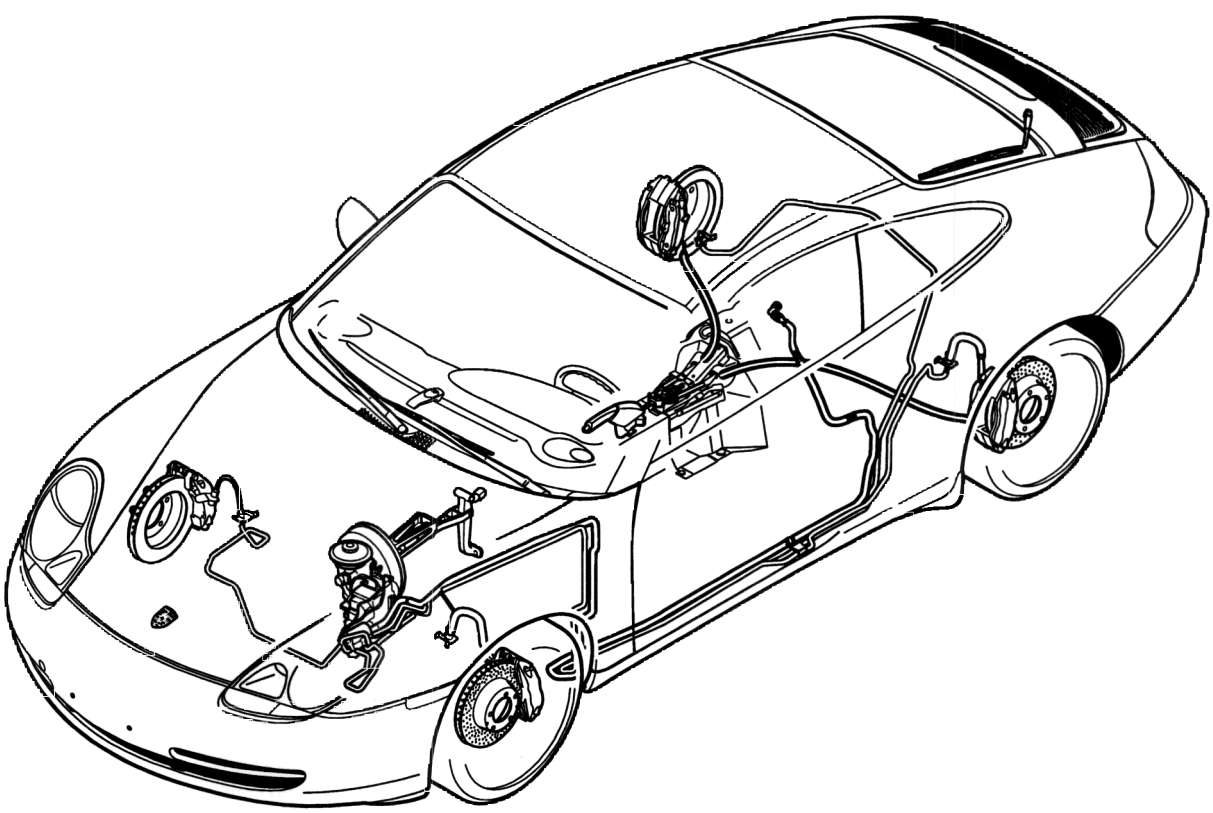
	Front	Rear
Standard		
Wheels:	7J X 17	9J X 17
Tyres:	205/50 R 17	255/40 R 17
Option		
Wheels:	7.5J X 18	10J X 18
Tyres:	225/40 R 18	265/35 R 18

Brakes

Hydraulic dual-circuit brake system with front-axle / rear-axle brake-circuit distribution.
Vacuum brake booster, internally ventilated and perforated brake discs with four-piston mono-bloc fixed caliper at front and rear axles.

ABS 5.3 (3-channel system) standard.
ABS/TC 5.3 (4-channel system) on request.
TC = Traction Control, consisting of ASR (anti-slip control) and ABD (Automatic Brake differential).

Parking brake (handbrake):
Drum brake acting mechanically on both rear wheels.



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4 Stabilizer allocation

Front axle

Version	Transmission type	Country allocation	Tube-type stabilizer ø in mm (ø in inch)	Index part No.
Coupe:				
– Series	Manual transmission	world-wide	23.1 x 3.4 (0.91 x 0.13)	09
– Sport	Manual transmission	world-wide	23.6 x 3.5 (0.93 x 0.14)	04*
– Series and Sport	Tiptronic	world-wide	23.6 x 3.5 (0.93 x 0.14)	04*
Cabriolet				
– Series and Sport	Manual transmission and Tiptronic	world-wide	23.6 x 3.5 (0.93 x 0.14)	04*

Stabilizer allocation for rear axle on Page 4 - 6

* Identical part at front axle

Printed in Germany - 7, 1998 9964_5

Stabilizer allocation

Rear axle

Version	Transmission type	Country allocation	Tube-type stabilizer ø in mm (ø in inch)	Index part No.
Coupe:				
– Sport	Manual transmission	world-wide	19.6 x 2.6 (0.77 x 0.10)	13
– Series	Manual transmission	world-wide	18.5 x 2.5 (0.73 x 0.1)	12*
– Series and Sport	Tiptronic	world-wide	18.5 x 2.5 (0.73 x 0.1)	12*
Cabriolet				
– Series and Sport	Manual transmission and Tiptronic	world-wide	18.5 x 2.5 (0.73 x 0.1)	12**

** Identical part at rear axle

4 Removing spring strut locking devices – Carrera and GT3

General

Spring strut locking devices are installed **on the front axle** of the **following** new vehicles in order to protect the vehicle during transport (e.g. driving on and off during lorry transport):

RoW new vehicles with the option **"Sports package"** P70 (manual transmission) or P71 (Tiptronic transmission)

911 GT3

This increases the ground clearance of the vehicle.

Tests have demonstrated that spring strut locking devices are not necessary at the **rear axle**.

The spring strut locking devices must be removed before a test drive and before the vehicle is handed over to the customer!

If the spring strut locking devices are not removed, this will seriously impair the handling behaviour and thus the driving safety.

Send the removed spring strut locking devices to the Porsche Warranty Test Office in Ludwigsburg.
Include the spring strut locking devices with the normal warranty goods consignment.

Removing spring strut locking devices

1. Lift the vehicle (wheels at the front axle must be free).
   The wheels need **not** be removed.

2. Remove spring strut locking devices from all spring struts. To do this, pull spring strut locking devices off the springs.

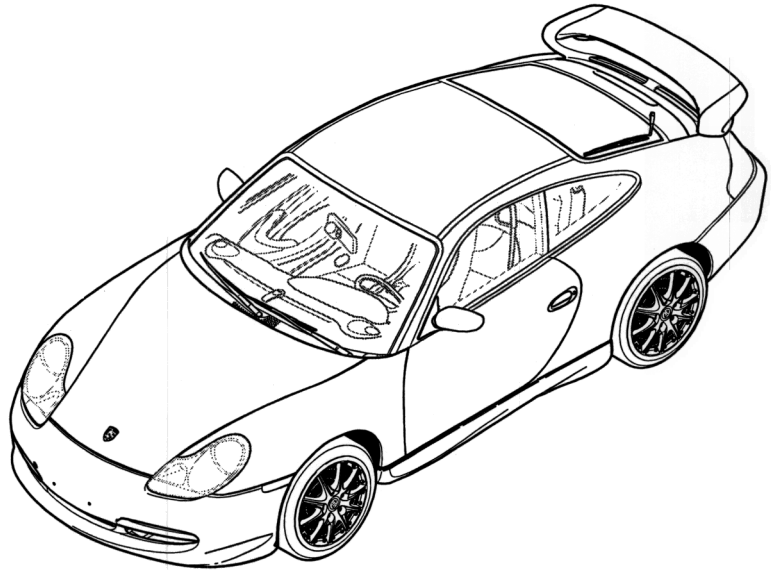
4 Running gear, general – GT3

General

The 911 GT3 is available in the **road version M002** and in a **Club Sport version M003**.
The vehicle height of both designs (M002 and M003) is **approx. 30 mm less** than the 911 Carrera (996).

The 911 GT3 (M 002 and M 003) can be **visually** distinguished by its red brake calipers and **Aerokit**, consisting of a front spoiler, side members and a large rear spoiler.
The large rear spoiler has an adjustable spoiler wing. The Club Sport design (M003) also has a removable roll cage.
The roll cage includes the spring strut supports on the rear axle for stability. This further improves precise guidance of the rear wheels.

Important: The adjustable spoiler is set to the lowest (horizontal) position for street use. Changes to the setting – to individually match the personal driving style – are intended only for the racing track. The spoiler wing **must** be moved to the lowest position for use in public traffic.



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4 Notes on repair instructions – GT3

General

The 911 Carrera (996), **and also the 911 GT3**, is the basic model covered by the repair, assembly and adjustment operations in the "911 Carrera (996)" Technical Manual.
Only the GT3-specific procedures which deviate from this are additionally described in this Technical Manual.

Tightening torques

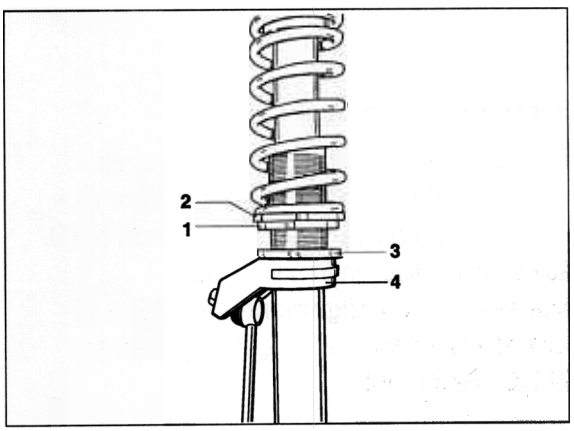
Tightening torques for the 911 Carrera (996) and 911 GT3 are almost the same.
Tightening torques that deviate or are additional are contained in the tables of the appropriate Repair Group for the 911 Carrera (996).

Adjustment work on the front and rear axle spring struts

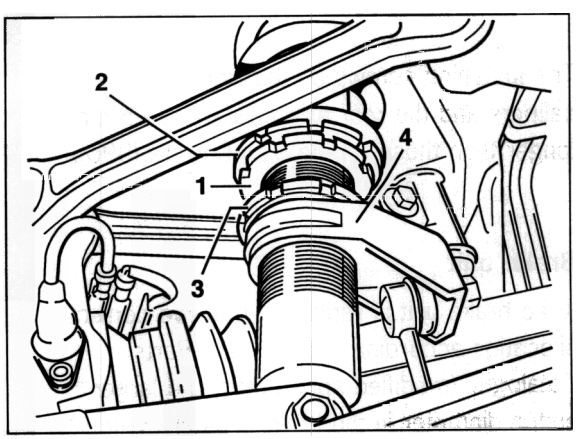
The front and rear axle spring strut has a thread and a height adjusting nut No. 2 for height adjustment.
The height adjusting nut No. 2 is secured against turning by the lock nut No. 1.

The stabilizer block - No. 4 - (mounting saddle for the stabilizer mount) is also fitted on the thread. The stabilizer block can be vertically adjusted and it is provided with a lock nut No. 3. **This adjustment possibility is only useful for racing.** It can be used to ensure that enough clearance is available for the stabilizer mount even for deviating vehicle heights (only for racing) and also that the stabilizer mount can be fitted free of tension.
The stabilizer block No. 4 **does not need to be adjusted** for the vehicle height prescribed for street use.

The stabilizer block is also adjusted for replacement dampers.



Front axle 76_99
1 – Lock nut
2 – Height adjusting nut
3 – Lock nut
4 – Stabilizer block



Rear axle 77_99
1 – Lock nut
2 – Height adjusting nut
3 – Lock nut
4 – Stabilizer block

Note

The special tool 9647 is required together with a torque wrench in order to adjust the vehicle height.
Description under 911 GT3 suspension alignment in Repair Group 44.

Suspension alignment

The adjustment procedures and values on the front and rear axle differ in a number of respects from those of the 911 Carrera (996).
Adjustment values in Repair Group 44.
The suspension alignment – 911 GT3 is located behind the suspension alignment for 911 Carrera (996).

Brakes – General

Bleeding and brake fluid change is the same as for 911 Carrera (996).
The GT3 is equipped with 3-channel ABS without TC (Traction Control).

The fastening screws on the front axle brake calipers and the rear axle calipers are 5 mm longer than those on the 911 Carrera (996).

Brake unit

If the brake unit is replaced, observe correct allocation according to the Spare Parts Catalogue (modified speed ratio and larger piston diameter in the brake master cylinder) **compared with** the 911 Carrera (996).
Important: Boost factor GT3 = 3.15 : 1.
911 Carrera (996) = 3.85 :1.

4 Tests / notes – GT3

Note

The tests and notes apply for the street version (base version) M002 and for the Club Sport version M003.

Lifting platforms / test stands

Ensure clearance of the spoiler(s) and side members when driving onto lifting platforms and wheel alignment platforms.

Wheel alignment platform

It is only possible to drive onto wheel alignment platforms if additional access ramps, for example 959 access aids, are used. A platform without a sloped position is unsuitable. Suspension alignment **911 GT3** see Repair Group 44.

Note on brake test

When driving onto the **brake test stand**, make sure to drive on as carefully as possible, especially during compression. This helps to prevent the vehicle from bottoming out.

Note on power test

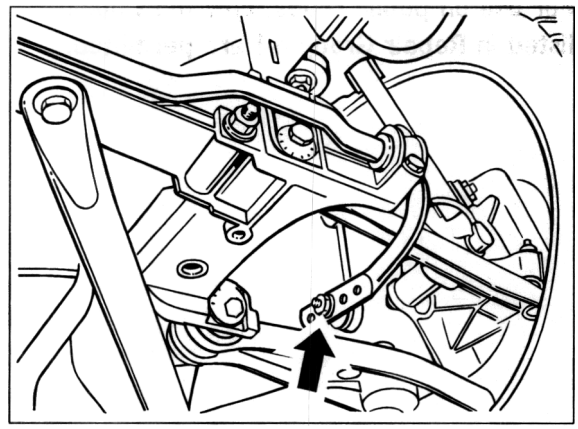
Power test stands can normally be driven onto without difficulty.

Front and rear stabilizer setting

The **front and rear** stabilizers can be individually adjusted, by means of 5 bores at the front and 4 bores at the rear.

The **front** stabilizer with 26.8 x 4 mm diameter is adjusted (fitted) to the centre position.

The **rear** stabilizer with 20.7 x 2.8 mm diameter is adjusted (fitted) to the **second softest position** (second bore / arrow).



– *Rear stabilizer*
– *Standard setting (arrow)*

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This standard setting must not be changed for use on public roads.
Important: Changes to the setting – to individually match the personal driving style – are only permitted for the racing track.

Spoiler setting

The spoiler wing is set to the lowest (horizontal) position for street use.
Changes to the setting are only intended for the racing track.
The spoiler wing must be moved to the lowest position for use on public roads.

Racing camber values

Front and rear racing camber values should only be adjusted for use on racing tracks.
For use on public roads, only the values listed in Repair Group 44 are permitted.

40 Tightening torques for front axle

Important: Do not grease screwed connections in **Dacromet finish** – aluminium colour.

Location	Thread	Tightening torque Nm (ftlb.)
Cross member/side member (1 component)		
Cross member/side member on body (front and rear)	M14 x 1.5	160 (118)
Corner plate on side member	M10 x 1.5	65 (48)
Corner plate on body	M12 x 1.5	100 (74)
Corner plate on body (with diagonal arm and side member)	M14 x 1.5	160 (118)
Diagonal brace		
Diagonal brace on body and side member	M12 x 1.5	100 (74)
Control arm		
Control arm on side member	M12 x 1.5	120 (89)
Control arm on diagonal arm	M14 x 1.5	160 (118)
Control arm on wheel carrier (ball joint)	M12 x 1.5	75 (55)
Basic camber setting on 2-part control arm **911 GT3**	M8	27 (20)

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Location		Thread	Tightening torque Nm (ftlb.)
Spring strut/wheel carrier			
Spring strut on wheel carrier (stabilizer mount)	**Carrera 2**	M12 x 1.5	85 (63)
(shock-absorber tube clamp)	**Carrera 4** **911 GT3**	M12 x 1.5	85 (63)
Spring seat clamp	**Carrera 4**	M6	10 (7.5)
Spring strut mount on body	 **911 GT3**	M8 M8	37 (27) 35 (26)
Spring-strut mount on piston rod	 **911 GT3**	M14 x 1.5 M14 x 1.5	80 (59) 80 (59)
Stabilizer mating bearing on spring strut (lock nut)	**911 GT3**	M52 x 1.5	50 (37)
Height adjustment on spring strut (lock nut)	**911 GT3**	M52 x 1.5	50 (37)
Brake cover plate on wheel carrier		M6	10 (7.5)
Brake disc on wheel hub		M6	10 (7.5)
Brake caliper on wheel carrier *		M12 x 1.5	85 (63)
Speed sensor on wheel carrier		M6	10 (7.5)
Combination coupling on wheel carrier		M6	10 (7.5)
Retainer plate for wheel bearing to wheel carrier		M8	37 (27)
Wheel hub on wheel carrier		M22 x 1.5	460 (340)

Replace screws – at front and rear axles – whenever they have been removed.

Location	Thread	Tightening torque Nm (ftlb.)
Front-axle final drive / drive shaft (911 Carrera 4)		
Front-axle drive shaft on transmission	M8	39 (29)
Front-axle drive shaft on wheel hub	M22 x 1.5	460 (340)
Rear front-axle transmission support on transmission mount	M10	65 (48)
Rear front-axle transmission support on body	M10	65 (48)
Front front-axle transmission support on front-axle cross member	M10	65 (48)
Stud on front-axle cross member	M8	20 (15)
Front-axle transmission support at front on transmission	M10	65 (48)
Tank strap on body	M8	23 (17)
Stabilizer		
On side member	M10 x 1.5	65 (48)
Stabilizer mount on stabilizer	M10	46 (34)
Stabilizer mount at shock-absorber tube and wheel carrier **Carrera 2**	M12 x 1.5	85 (63)
Stabilizer mount at spring strut **Carrera 4 / 911 GT3**	M10	46 (34)
Stabilizer mating bearing on spring strut (lock nut) **911 GT3**	M52 x 1.5	50 (37)

Location	Thread	Tightening torque Nm (ftlb.)
Steering		
(Unlisted values in Repair Group 48)		
Track rod (ball-joint pin) on steering arm	M12 x 1.5	75 (55)
Universal joint (steering shaft) on steering gear *	M8	23 (17)
Steering gear on cross member **	M 10 x 1.5	65 (48)
Wheel fastening		
Wheel to wheel hub ***	M14 x 1.5	130 (96)

Replace fit bolt whenever it has been removed.

Replace fastening screws whenever they have been removed.

*** Thinly grease thread, shank and under head (between screw head bearing surface and spherical cap ring) of the wheel bolts with Optimoly TA (aluminium paste). **Do not** grease bearing surface of the spherical cap facing the wheel. If heavily contaminated, clean bolts first with a lint-free cloth.

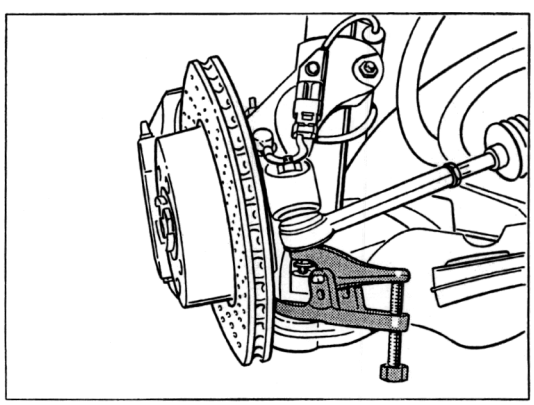
40 85 19 Removing and installing front spring strut

Removal

1. Lift the vehicle. Remove front wheel.

2. Loosen stabilizer mount at stabilizer (counter with open-ended wrench).

3. Loosen track rod and control arm at wheel carriers and press off the ball joints with special tool 9560.
When loosening fastening nuts, counter with special tool 9546 (Torx screwdriver) at the ball-joint pins.



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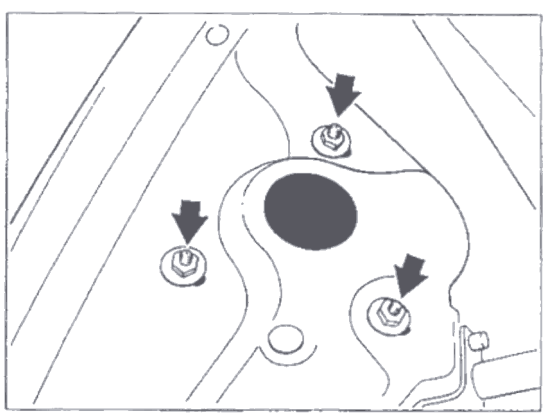
4. Disconnect plug connection at wheel carriers and pull out plugs.
Undo plug connection at wheel carrier and unclip the electrical wires at the spring strut.

5. Loosen holder for brake line/brake hose at wheel carrier.
Loosen brake caliper from wheel carrier and attach in wheel arch.

6. Loosen fastening nuts (3 ea. M8) at spring-strut mount.
Before doing this, mark the installed position of the spring strut mount (position of the three collar nuts).
Pull out spring strut with wheel carrier.



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7. Loosen clamped connection between spring strut/wheel carrier (ball joint of stabilizer mount). Counter with open-ended wrench.
Pull out spring strut from wheel carrier.

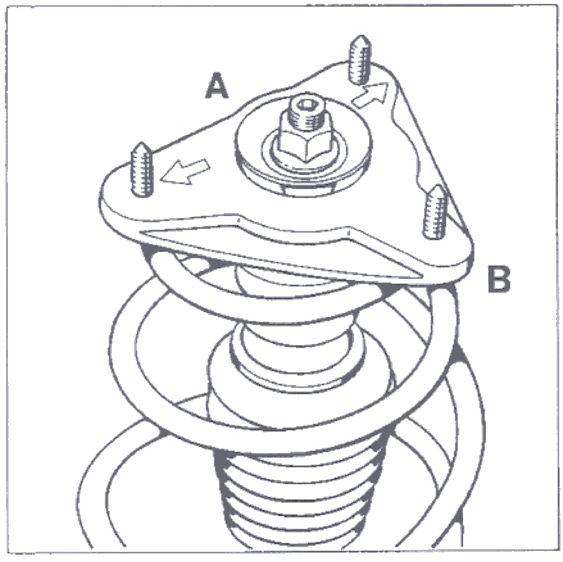
Installation

1. Install in reverse order. Before installing, give the parts a visual check. Replace brake caliper fastening screws.

2. Do not grease screwed connections in **Dacromet finish** – aluminium colour. **Use correct tightening torques.**

3. Insert spring strut into vehicle. Note the **installed position** of the spring strut mount. The arrow markings must point to the outer side of the vehicle (A). The shock-absorber piston rod is thereby shifted outwards. Use new fastening nuts.
   Before tightening the fastening nuts, adjust spring strut mount in accordance with the applied marking (position of the three collar nuts).
   Use correct tightening torque.

   A = Outer side B = Inner side



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4. Check and adjust steering-geometry values at the front axle.

Note

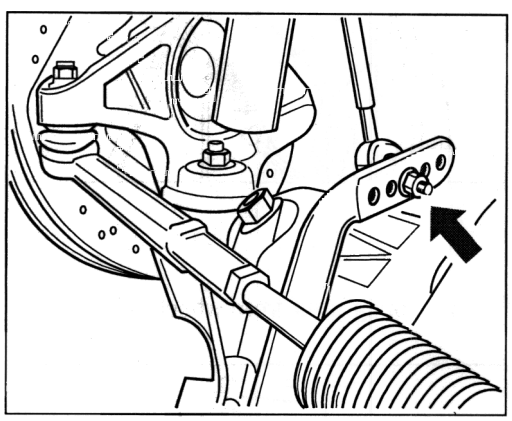
If assembly work was performed or parts replaced that affect the vehicle height, a complete wheel alignment is necessary.

40 85 19 Removing and installing front spring strut – GT3

Removal

1. Lift the vehicle. Remove front wheel.

2. Loosen stabilizer mount at stabilizer (counter with open-ended wrench).



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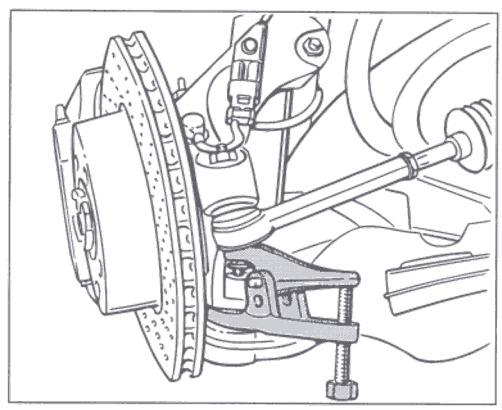
3. Loosen track rod and control arm at wheel carriers and press off the ball joints with special tool 9560.
   When loosening fastening nuts, counter with special tool 9546 (Torx screwdriver) at the ball-joint pins.



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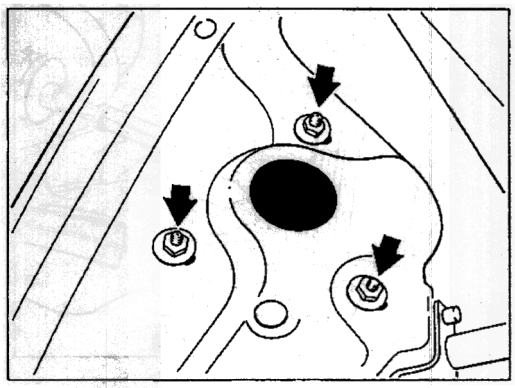
4. Disconnect plug connection at wheel carrier and pull out plugs.
   Undo plug connection at wheel carrier and unclip the electrical wires at the spring strut.

5. Loosen holder for brake line/brake hose at wheel carrier.
   Loosen brake caliper from wheel carrier and attach in wheel arch.

6. Loosen fastening nuts (3 ea. M8) at spring-strut mount (arrows). Before doing this, mark the installed position of the spring strut mount (position of the three collar nuts).



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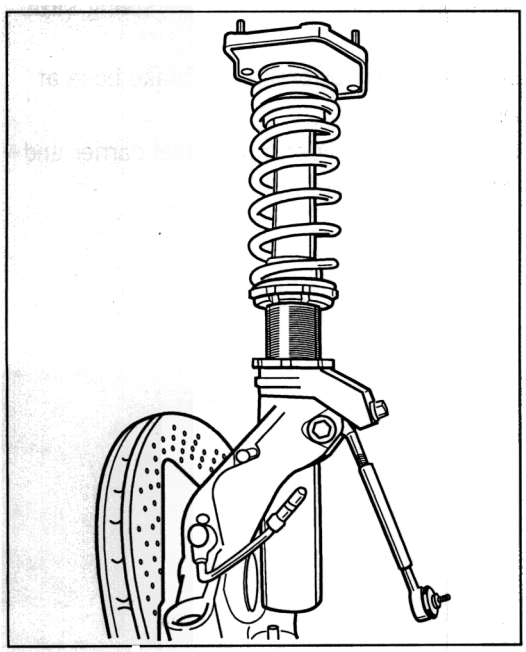
Pull out spring strut with wheel carrier.



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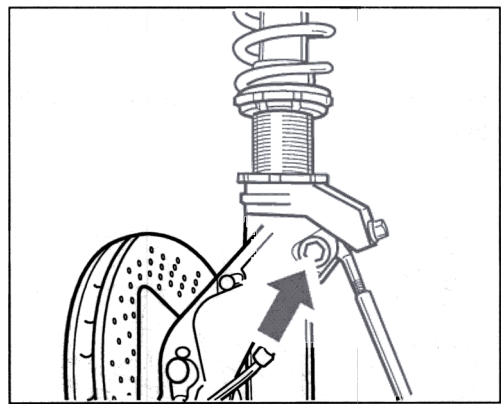
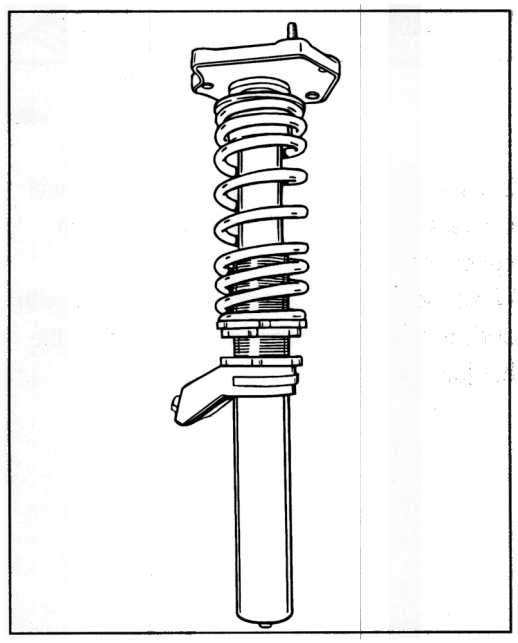
8. Loosen clamped connection between spring strut/wheel carrier (arrow).



40850017

9. Pull out spring strut from wheel carrier.



40850018

Installation

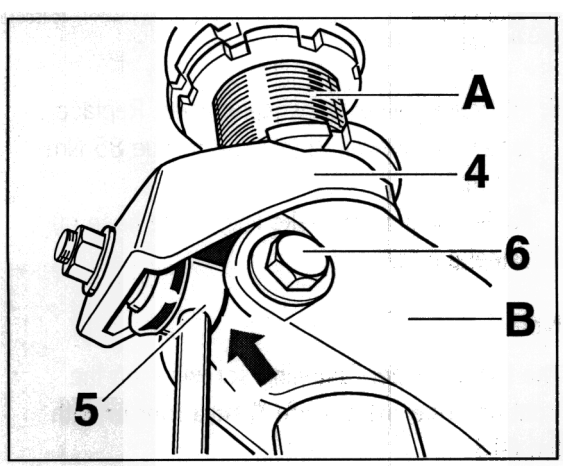
1. Install in reverse order. Before installing, give the parts a visual check. Replace brake caliper fastening screws.

2. Do not grease screwed connections in **Dacromet finish** – aluminium colour. **Use correct tightening torques.**

3.1 Insert spring strut (A) as far as it will go into the wheel carrier (B). Before tightening the fastening screw No. 6, twist (align) the spring strut (A) until the stablizer block is in the correct position with respect to the wheel carrier (B).
The correct position is described in Point 3.2.

Note

As the installation conditions are confined, the correct position (fitting) of these parts is a prerequisite for adequate clearance of the stabilizer mount in the area of the wheel carrier/stabilizer block.

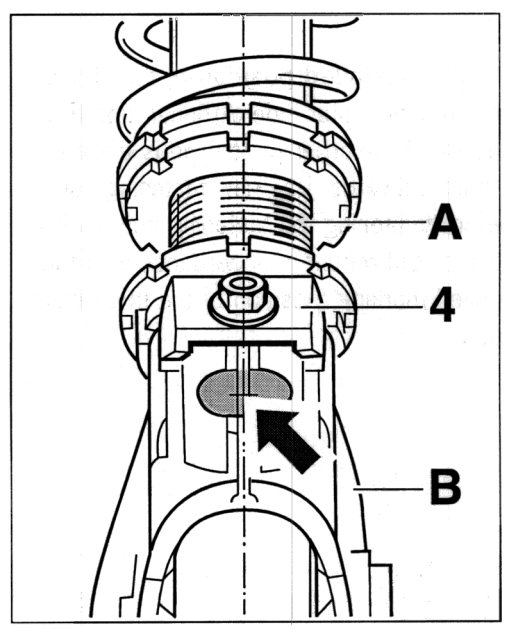


Arrow = cutout in the wheel carrier (clearance) for the stabilizer mount 40850020

3.2 Correct position with respect to the wheel carrier means:
The receiving bore for the stabilizer mount in the stabilizer block must be **centred** (aligned) with respect to the cutout of the wheel carrier (arrow).
This prevents the stabilizer mount from coming into contact with the wheel carrier when the wheels are turned completely to the right or left.

Note

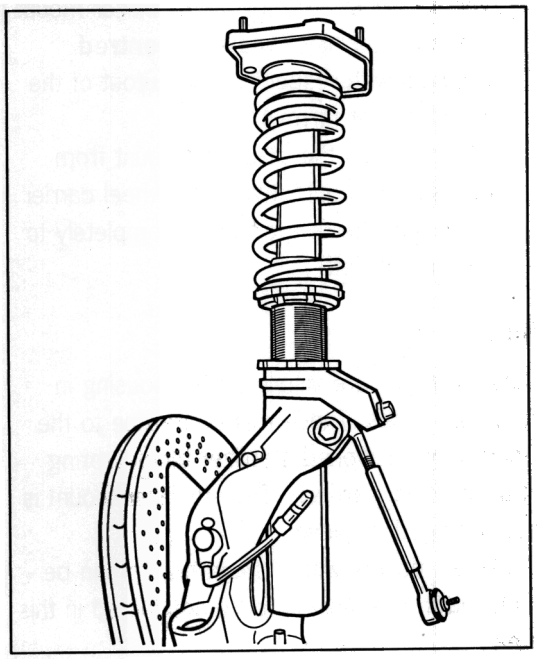
Contact marks are visible on the housing in individual cases. These marks are due to the incorrectly positioned stablizer block (spring strut to wheel carrier). The stabilizer mount is not damaged, however.
Stabilizer mounts with contact marks can be replaced if assembly is to be conducted in this area.



A = Spring strut 40850021
B = Wheel carrier
4 = Stabilizer block

Arrow = cutout in the wheel carrier (clearance) for the stabilizer mount

4. Place the wheel-carrier/spring-strut assembly into the vehicle.

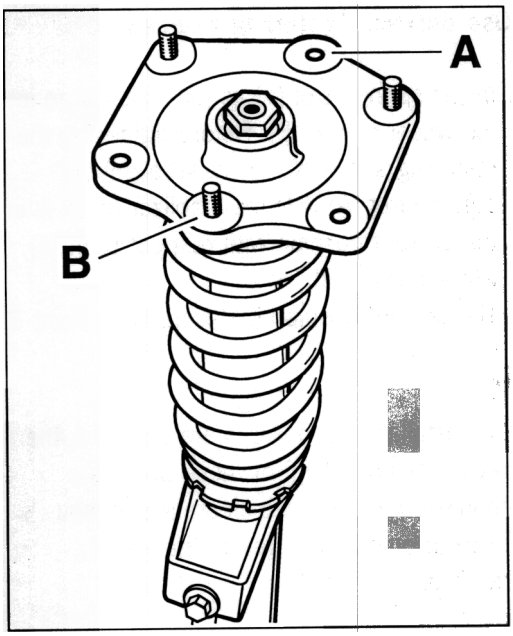


40850016

5. Note the **installed position** of the spring strut mount. Outer side (A)/inner side (B). The shock-absorber piston rod is thereby shifted outwards. Use new fastening nuts. Before tightening the fastening nuts, adjust spring strut mount in accordance with the applied marking (position of the three collar nuts).

Note

The three unused bores in the spring strut mount are intended only for driving on racing circuits. The three fastening bolts (M8) are fitted in these holes in this case. This increases the negative camber.



A - Outside of vehicle
B - Inside of vehicle

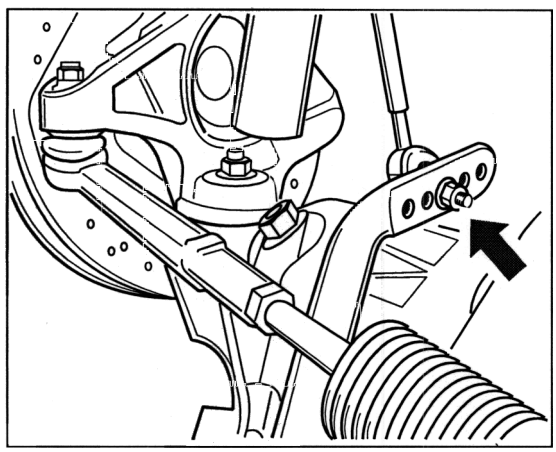
40850015

6. Fit brake caliper on wheel carrier. Replace fastening screws. Tightening torque 85 Nm (63 ftlb.).
Fasten holder for brake line/brake hose on wheel carrier.

Note

The brake caliper fastening screws – on the front and rear axles – are **5 mm longer** with the GT3.
The screws are also different colours.
911 GT3 = red (77 mm long)
911 Carrera (996) = silver (72 mm long)

7. Fit stabilizer mount in **centre position** (arrow) on the stabilizer.



40850019

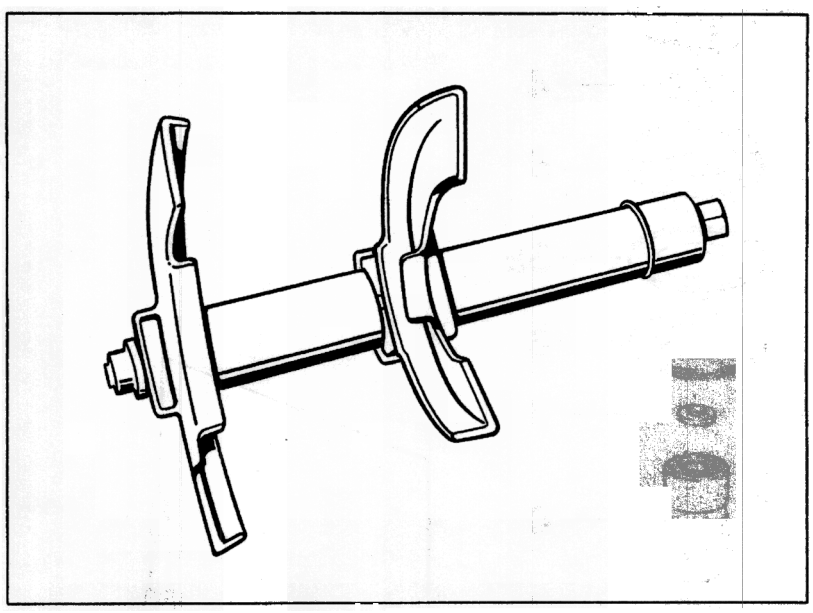
8. Check and adjust steering-geometry values at the front axle.

Note

If assembly work was performed or parts replaced that affect the vehicle height, a complete wheel alignment is necessary.

40 Disassembling and assembling front spring strut

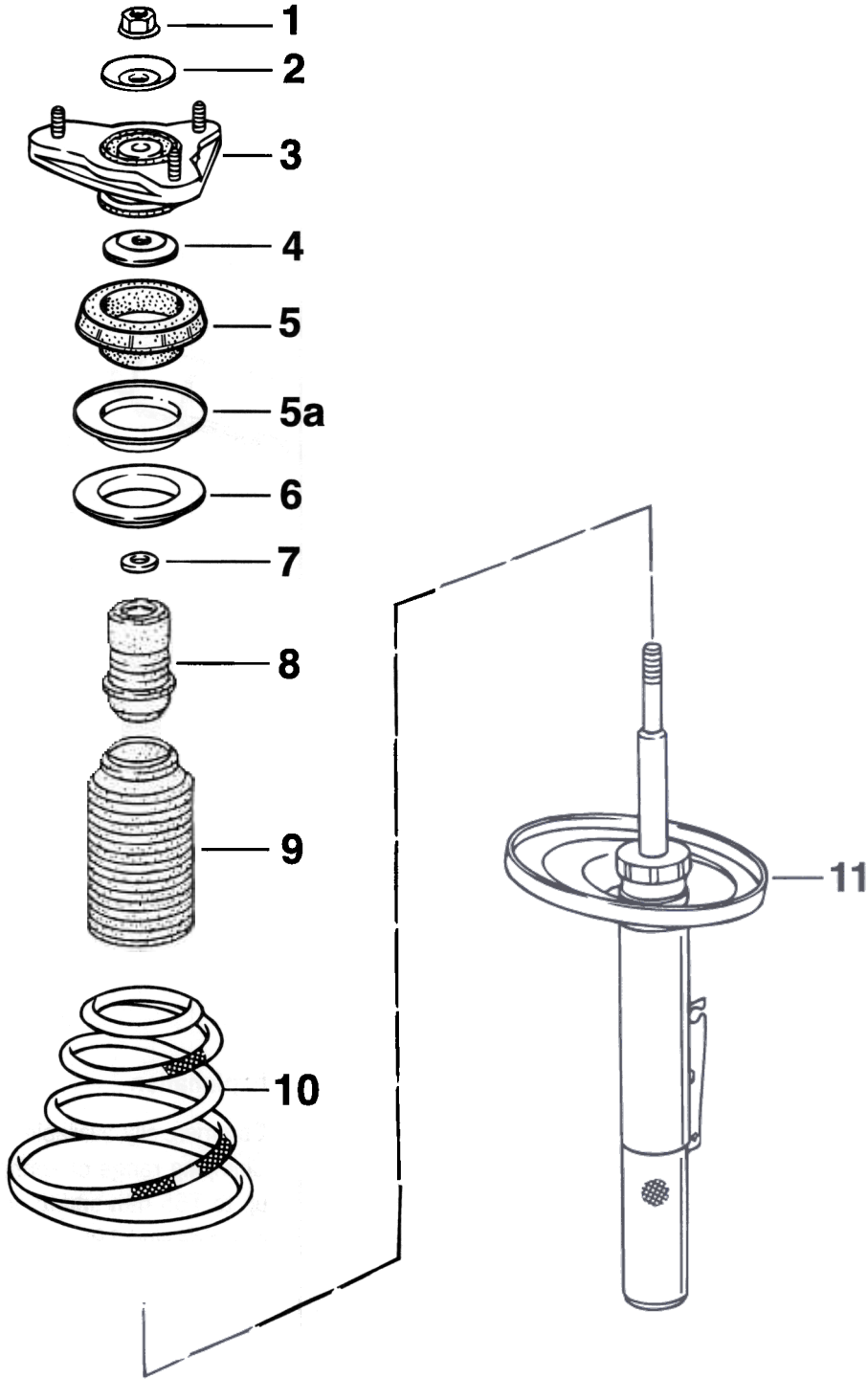
Tools



672_96

No.	Designation	Special tool	Explanation
	Spring clamp, e.g. from Klann, with spring holder		Commercially available Clamping range of spring holder up to 165 mm spring diameter on one side and 195 mm spring diameter on the other side

Disassembling and assembling front spring strut



661_96

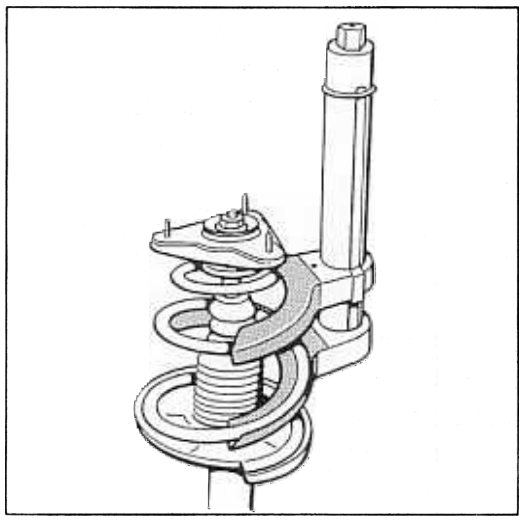
No.	Designation	Qty.	Removal / Installation Note:	Installation
1	Fastening nut M 14 x 1.5	1	Before loosening the fastening nut, tension coil spring with the spring clamp. Counter at the piston rod when loosening the nut	Use new fastening nut. Tighten to 80 Nm (59 ftlb.)
2	Stop plate	1		Mount in correct position (No. 2 and No. 4 are identical parts)
3	Spring strut mount	1		
4	Stop plate	1		Mount in correct position (No. 2 and No. 4 are identical parts)
5	Mount	1	Remove the mount from back-up ring No. 5a only when replacing the mount, otherwise the mount could come off	Make sure it is seated properly in the spring strut mount No 3
5a	Back-up ring	1		
6	Spring plate (compensation part)	1		Observe allocation (Page 40 - 11). Join in correct position with back-up ring
7	Cup washer	1		Mount in correct position
8	Additional spring	1		Mount on protective bellows (No. 9)
9	Protective bellows			
10	Coil spring	1		Observe allocation as per Spare Parts Catalogue
11	Vibration damper	1		Observe allocation as per Spare Parts Catalogue. The vibration dampers for the right and left sides are identical parts

Printed in Germany - 21, 1999 996407

Disassembly and assembly instructions

Disassembly

Tension the coil spring with the spring clamp until the piston rod is relieved.



374_96

To undo the connection (piston rod to spring strut mount) counter at the piston rod with special tool 9630 or a 7-mm Allen key.
Important: Never use an impact bolter to loosen or tighten the fastening nut.

Remove all parts from the piston rod.

Note

When installing new parts, observe the allocation according to the Spare Parts Catalogue.

Preliminary work and notes on assembly

Replace nut for fastening the piston rod on the spring strut mount.

It is recommended to replace the coil springs only in pairs.

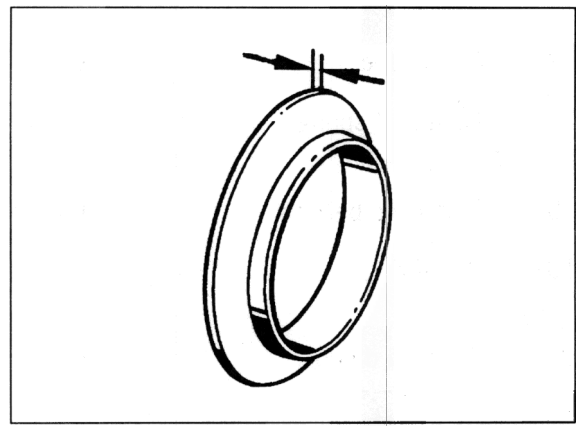
Note

If the coil springs are exchanged, it might be necessary to use a different spring plate than before.

The following spring plates (compensation parts) are available:
Allocation of the spring plate according to the coil spring tolerance group (see P. 40 - 11).

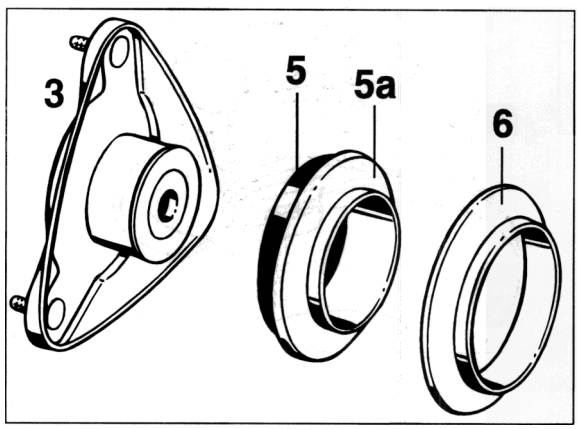
1 green line = 6.5 mm thick compensation part.

1 white line = 3.0 mm thick compensation part.



676_1_96

Press spring plate No. 6 (compensation part) into the assembly consisting of mount No. 5 and back-up ring No. 5a and complete with the spring strut mount No. 3.



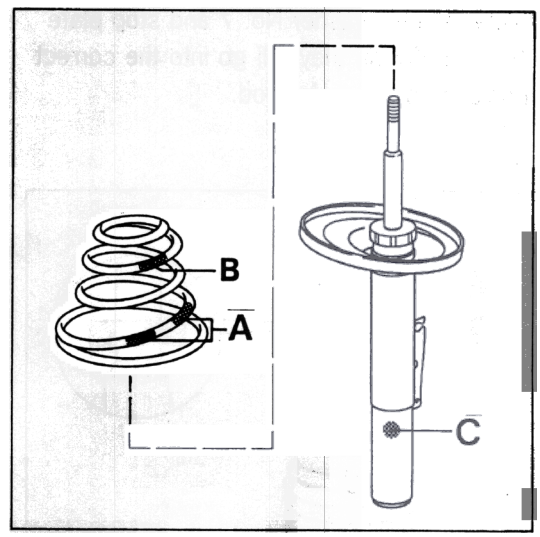
680_1_96

Fit protective bellows on additional spring.

Observe the correct allocation (running gear version) when installing new springs and/or dampers.

Tension coil spring with spring clamp.

Distinguishing feature of coil springs and dampers



685_1_96

A = Identification of the running gear version (spring constant/spring length) by two different coloured lines (for example, 1 x blue and 1 x white). Refer to the Parts Catalogue for the allocation.

B = Identification of the coil spring tolerance group (load group) for determination of the compensation part (spring plate) thickness.

1 **white** line = 3.0 mm thick compensation part.

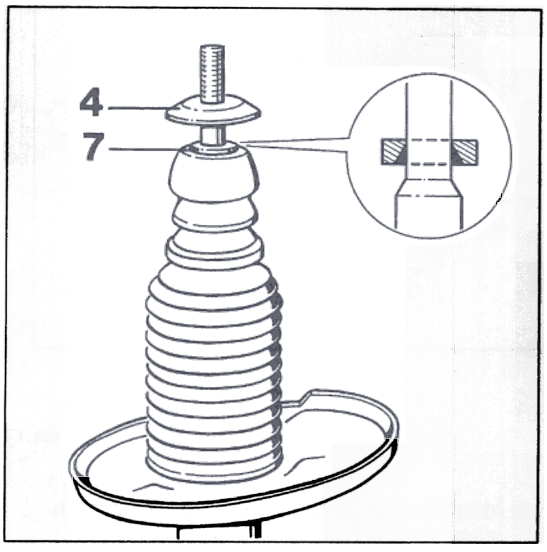
green line = 6.5 mm thick compensation part.

C = Colour dot (colour label) to differentiate the damper identifier.

White dot = Standard running gear RoW/USA
Green dot = Sport-type running gear RoW/USA

Assembly

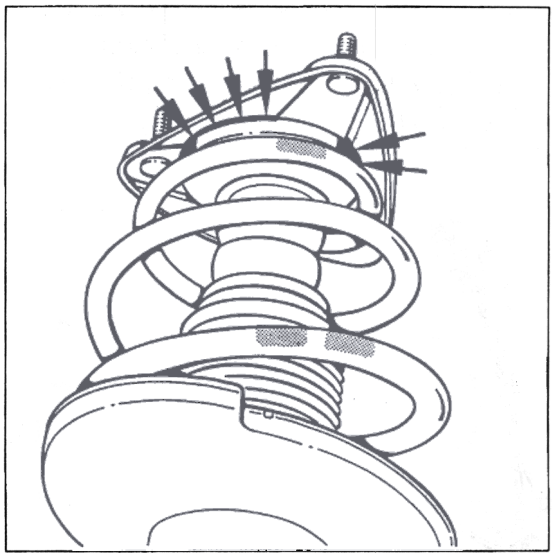
– Slide the protective tube/additional spring assembly on the piston rod.
Slide the cup washer No. 7 and stop plate No. 4 as far as they will go into the correct position on the piston rod.



675_1_96

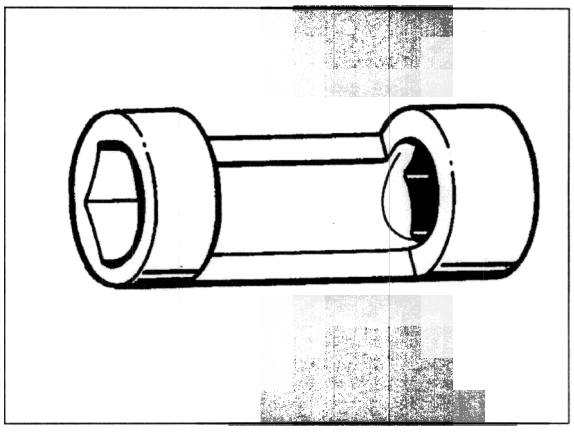
Push the pretensioned coil spring onto the vibration damper so that the end of the coil spring rests against the stop of the spring plate.

Place spring strut mount (assembly of mount/back-up ring/spring plate) onto the piston rod so that the end of the coil spring is located in the spring plate.
Place stop plate in the correct position on the spring strut mount and screw a new fastening nut onto the piston rod.
Make sure that the rubber part of the mount is properly seated in the recess in the spring strut mount (arrows).



679_1_96

Use a socket wrench insert open on one side to tighten the fastening nut on the spring strut mount.
In this way the specified tightening torque can be adhered to exactly. It is also possible to counter at the piston rod with special tool 9630 at the same time. Never use an impact bolter to tighten the fastening nut.



2047_40

40 Disassembling and assembling front spring strut – GT3

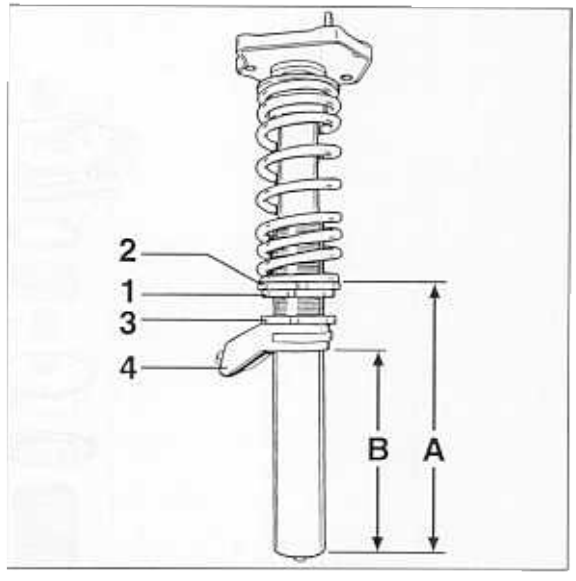
Notes about adjustment work on the spring struts

The spring strut has a thread and a height adjusting nut No. 2 for height adjustment. The height adjusting nut No. 2 is secured against turning by the lock nut No. 1.

The stabilizer block - No. 4 - (mounting saddle for the stabilizer mount) is also fitted on the thread. The stabilizer block can be vertically adjusted and it is provided with a lock nut No. 3. **This adjustment possibility is only useful for racing.** It can be used to ensure that enough clearance is available for the stabilizer mount even for deviating vehicle heights (only for racing) and also that the stabilizer mount can be fitted free of tension.

The stabilizer block No. 4 **does not need to be adjusted** for the vehicle height prescribed for street use.

The stabilizer block No. 4 – dimension B – is also set with replacement dampers.



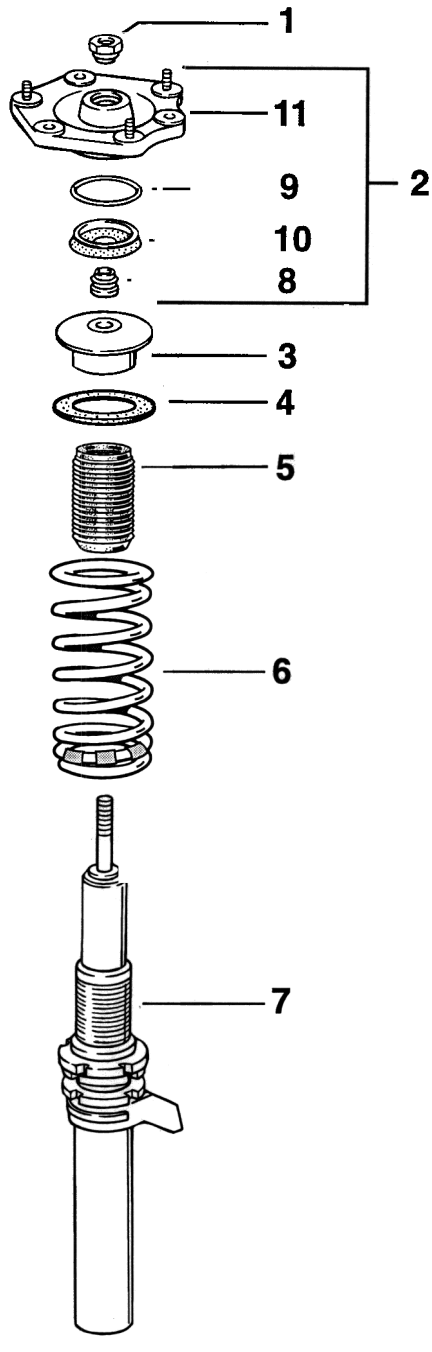
40850002

1 – Lock nut
2 – Height adjusting nut
3 – Lock nut
4 – Stabilizer block

Dimension A = pre-setting dimension for production (273 mm). The dimension may be different with the prescribed vehicle height. If the damper is replaced, the actual dimension must be transferred to the new damper.

Dimension B = 198 mm (plus/minus 0.5 mm)

Disassembling and assembling front spring strut – GT3



40850001

No.	Designation	Qty.	Note: Removal	Installation
	Fastening nut M 12 x 1.5	1	If necessary, pre-tension with the spring clamp before loosening the fastening nut. This depends on the adjustment (pre-tension) of the coil spring. Support at the piston rod with a 7-mm Allen key when loosening the nut.	Use new fastening nut. Grease thread of the piston rod with Optimoly HT (copper paste). Tighten to 80 Nm (59 ftlb.).
2	Assemble spring strut mount	1	Remove complete assembly (mount with No. 8., No. 9 and No. 10).	The spring strut mounts for the right and left sides are identical parts.
3	Spring mount			
4	Rubber support	1		
5	Bellows	1		
6	Coil spring	1		Available as spare part only in sets
7	Vibration damper	1		The vibration dampers for the right and left sides are identical parts.
8	Spacer sleeve			
9	Retainer spring	1		
10	Rubber bellows			
11	Spring strut mount	1		The spring strut mounts for the right and left sides are identical parts. In the case of used mounts, the bearing shell can be regreased with Autol Top 2000. Manufacturer: Autol-Werke Paradiesstr. 14 97080 Würzburg

Disassembly and assembly instructions

Disassembly

– If necessary, tension the coil spring with the spring clamp until the piston rod is relieved.

To undo the connection (piston rod to spring strut mount), counter at the piston rod with a 7-mm Allen key.
Important: Never use an impact bolter to loosen or tighten the fastening nut.

Remove all parts from the piston rod.

Preliminary work and notes on assembly

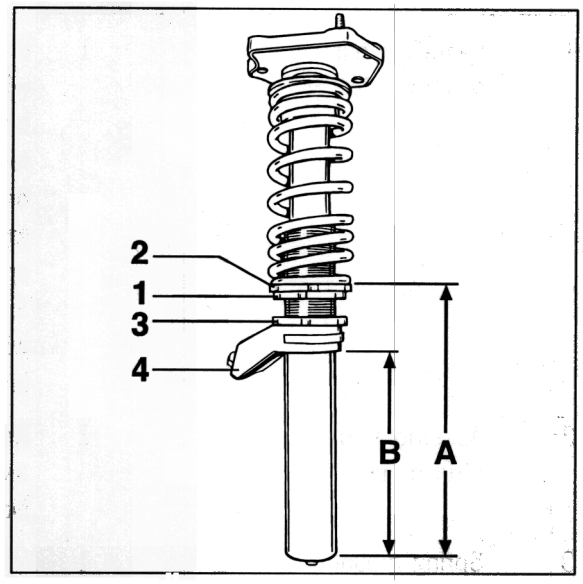
– Replace nut for fastening the piston rod on the spring strut mount.

Grease thread of the piston rod with Optimoly HT (copper grease/only at the front axle).

Note

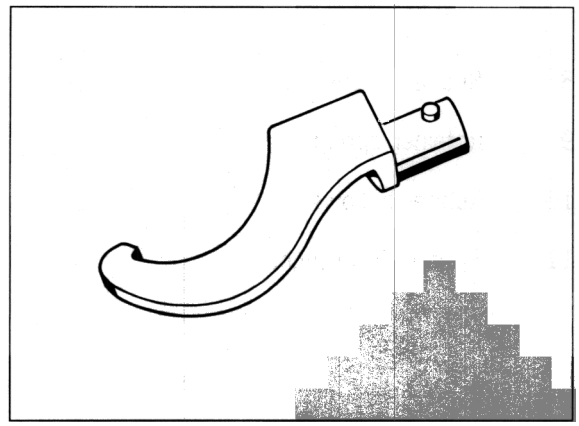
If the vibration damper is to be replaced, set the height adjusting nut No. 2 to the same position as on the old vibration damper (transfer the actual dimension A to the new vibration damper).

A hook wrench insert – special tool 9647 – is required **for this purpose**.
Special tool 9647 is required for changing the vehicle height (**dimension A**) and for adjusting the stabilizer mating bearing (**dimension B**).
The special tool is used together with a torque wrench to tighten the lock nuts (slotted nuts) on the spring struts. Tightening torques in Repair Group 40/42.



4 – Stabilizer block 40850002

Attention: The stabilizer block need not be adjusted for street use.
The stabilizer block – dimension B (198 mm plus/minus 0.5 mm) – is also set on replacement dampers.



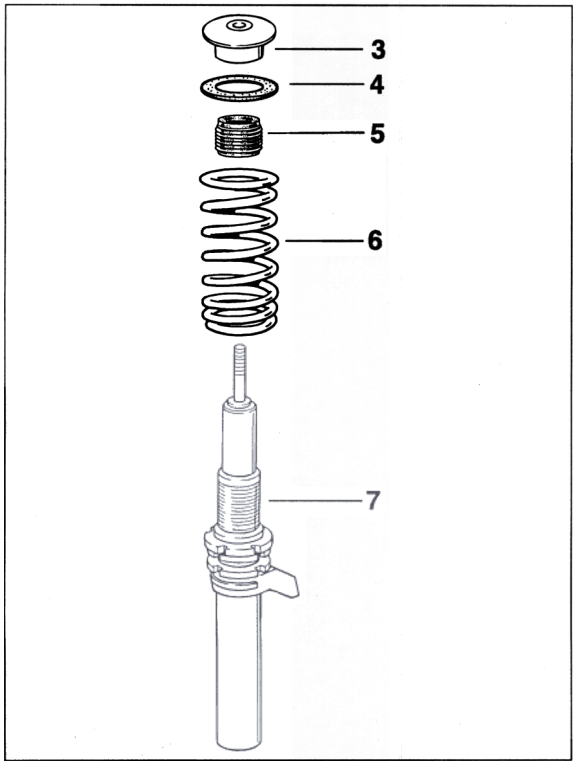
Special tool 9647 072_99

Assembly

– Put coil spring No. 6, spring plate No. 3 with rubber ring No. 4 and bellows No. 5 onto the vibration damper.

Note

The tighter winding of the coil spring must face down – toward the damper tube.
The coil spring is equipped with an approx. 50 mm-long protective sheath.
This protective sheath is not yet present on vehicles from the initial production run.

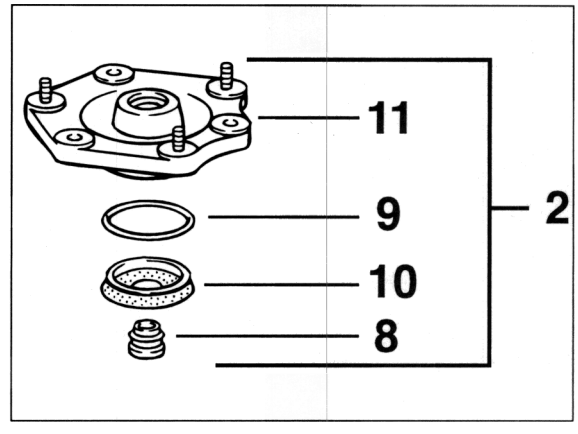


40850003

Push the spring strut and mount assembly, consisting of parts No. 8, No. 9, No. 10 and No. 11, onto the piston rod.

Note

The mounts for the right and left sides are identical parts.
In the case of used mounts, the bearing shell can be regreased with Autol Top 2000.
Manufacturer:
Autol-Werke
Paradiesstr. 14
97080 Würzburg

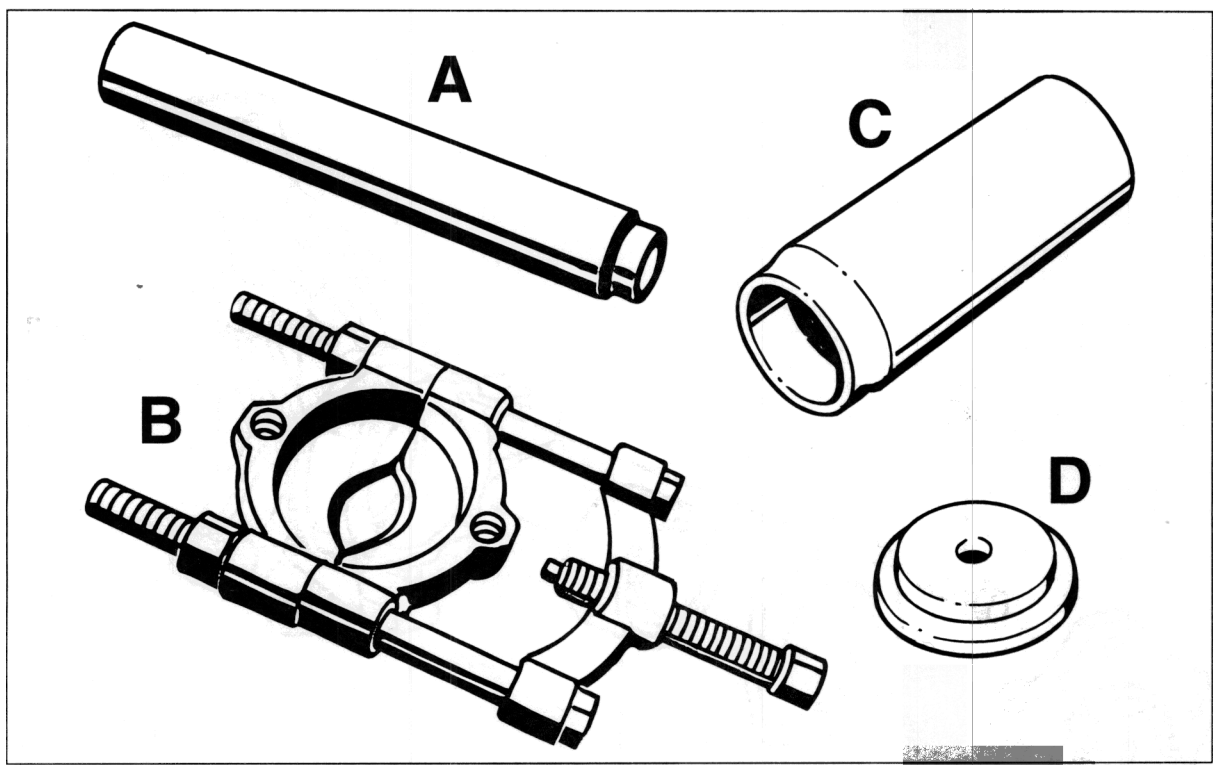


40880001

Fit new fastening nut and tighten it on the pushrod thread, which has been greased with Optimoly HT (copper paste).
Tightening torque 80 Nm (59 ftlb.).
When tightening the fastening nut, hold at the piston rod using a 7-mm Allen key.
Important: Never use an impact bolter to tighten the fastening nut.

40 57 19 Removing and installing front wheel bearing

Tools



422_97

Item	Designation	Special tool	Explanation
A	Pressure piece	P 297 A	For pressing out the wheel hub
B	Separator (12 – 115 mm Ø)	Commercially available; refer to Workshop Equipment Manual, Chapter 2.4, No. 111	Used as a support when pressing out the wheel hub and when pressing the wheel bearing inner race off the wheel hub
C	Tubular piece	VW 415 A	For pressing the wheel bearing out and in
D	Pressure piece	9247/4	Use in combination with tubular piece C to press in the wheel bearing

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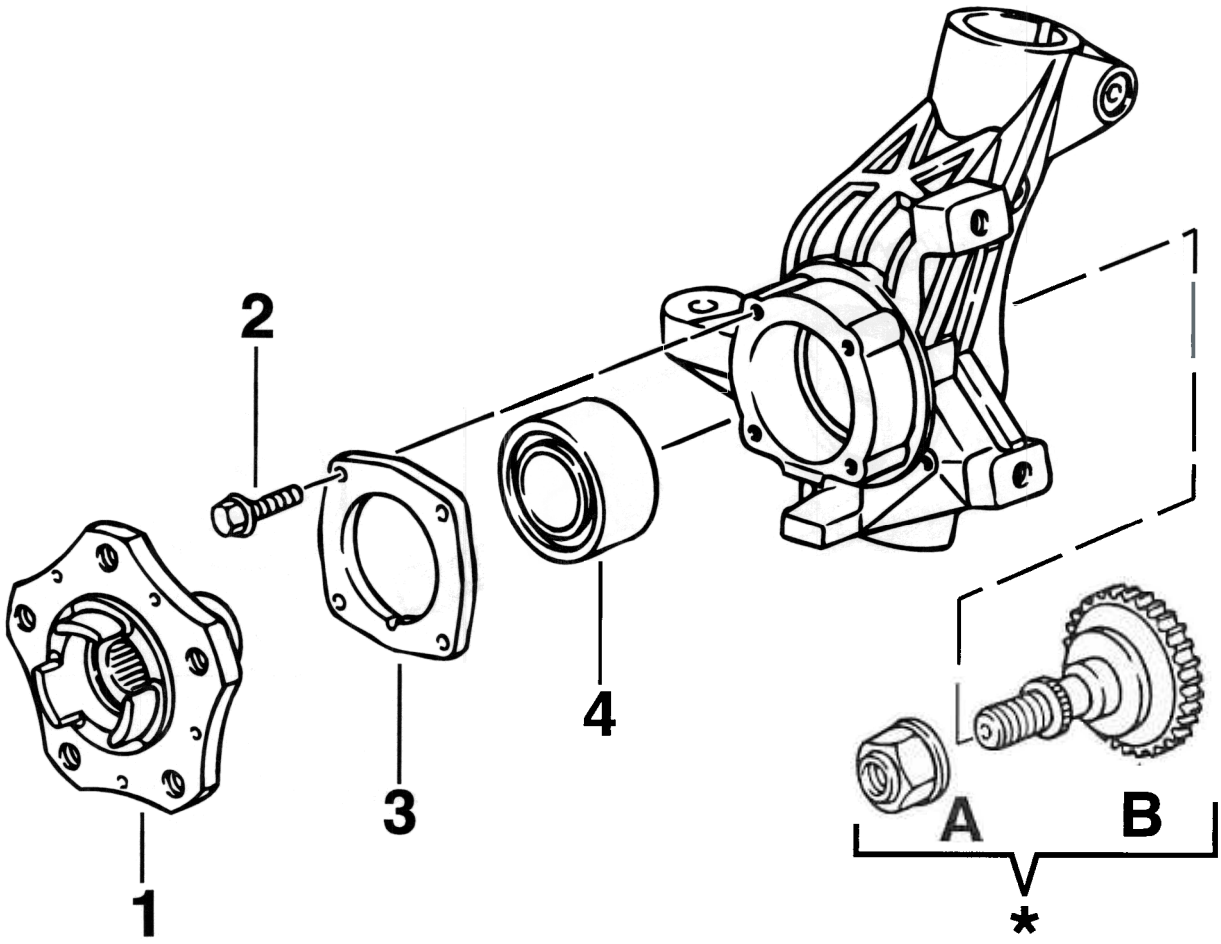
Removing and installing front wheel bearing



28_99

* Use a new fastening nut A after disassembling the wheel hub screw connection.
Observe tightening torque: 460 Nm (340 ftlb.)

No.	Designation	Qty.	Note: Removal	Installation
	Wheel hub	1	Press out with pressure piece P 297 A under a hydraulic press. For this purpose, use the separator and corresponding shims for support	Press in under a hydraulic press. To do this, place the wheel hub on the wheel centring device and press it on the **wheel bearing inner race** using pressure piece VW 415 A
2	Hexagon-head bolt (10.9)	4		Tighten to 37 Nm (27 ftlb.)
3	Lid	1		Fit in correct position (groove down)
4	Wheel bearing	1	Heat wheel bearing housing to approx. 100° C (max. 120° C). Press out wheel bearing with tubular piece VW 415 A (tool C)	Heat wheel bearing housing to approx. 100° C (max. 120° C) Insert **new** wheel bearing in correct position (inscription facing the wheel hub), and then press again **slightly** using pressure piece 9247/4 (tool D) and tubular piece VW 415 A (tool C)

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Notes on removal and installation

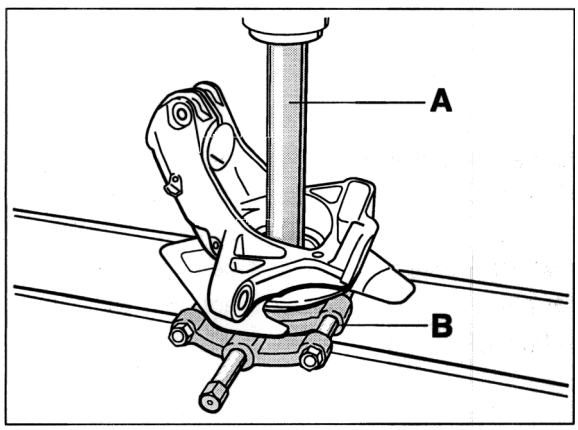
Note

The wheel bearing is removed and installed with the wheel bearing housing removed.

Removal

– Remove brake disc and speed sensor.

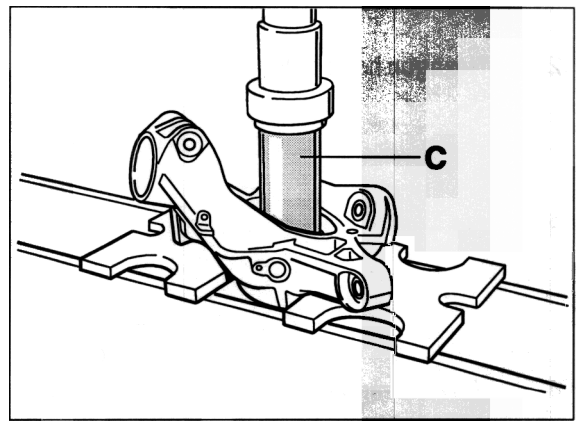
Press out wheel hub with pressure piece P 297 A (tool A).
Use the separator (tool B) for support.
If there is not enough space for the wheel hub between the press, appropriate shims will additionally be necessary.



24_99

Remove retainer plate (lid / four screws) and brake disc cover.

Heat wheel bearing housing to approx. 100° C (max. 120° C).
Press out wheel bearing with tubular piece VW 415 A (tool C).

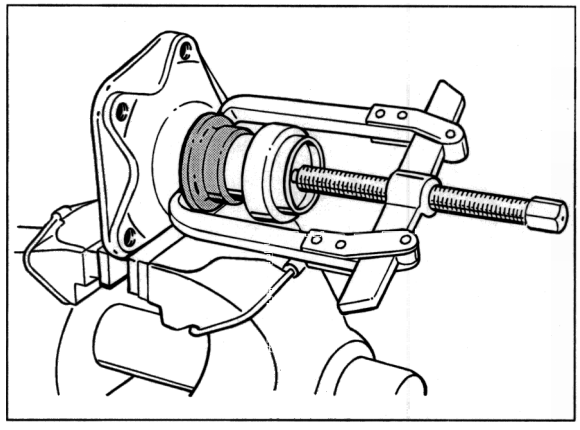


25_99

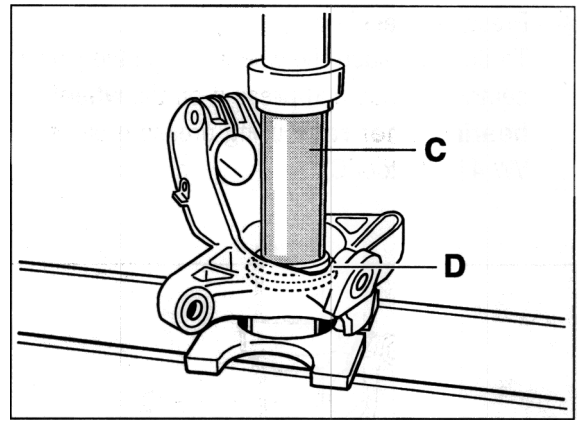
Press inner wheel bearing race off the wheel hub (Figure 426_97).
To do this, use pressure piece P 297 A (tool A) in combination with the separator (tool B).

Note

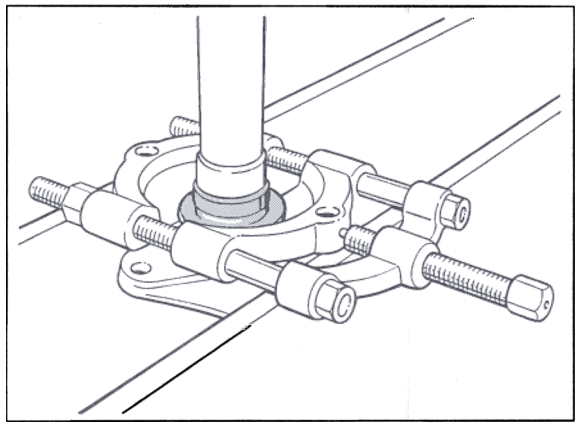
First pull the inner bearing race several millimetres off the wheel hub (Figure 741_97) so that the separator can be put into place.
For this purpose, use a two-claw puller in combination with a suitable pressure piece (e.g. VW 433).



741_97

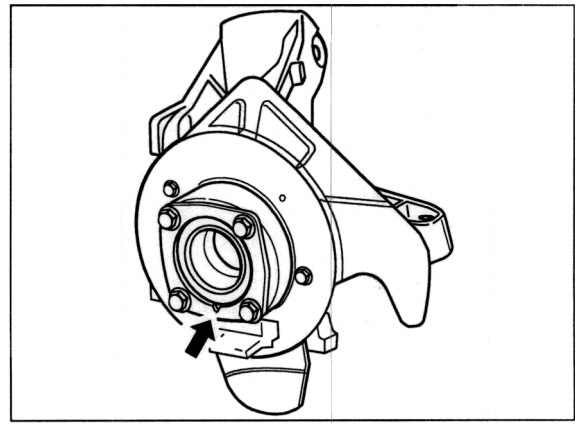


26_99



426_97

Fit brake disc cover and retainer plate (lid).
Unless there is a water drain on both sides, fit the water drain (arrow) in the correct position – i.e. facing downward.
Use correct tightening torques.
Brake disc cover = 10 Nm (7.5 ftlb.)
Retainer plate = 37 Nm (27 ftlb.)



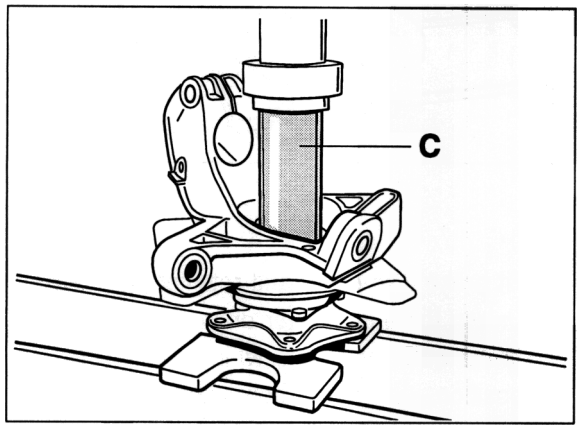
35_99

Installation

– Before installation, clean the bore in the wheel bearing housing and remove any surface irregularities with a polishing cloth.

  Heat wheel bearing housing to approx. 100° C (max. 120° C).
  Insert **new** wheel bearing, and then press again **slightly** using pressure piece 9247/4 (tool D) and tubular piece VW 415 A (tool C).

Press in wheel hub.
To do this, place the wheel hub on the wheel centring device and press it on the **wheel bearing inner race** using pressure piece VW 415 A (tool C).



29_99

40 19 23 Installing caster eccentric

Includes: Replacing series control arm by a service control arm with caster eccentric.

Note

The caster is not adjustable on **standard vehicles**.
A caster eccentric can be **retrofitted** in the case of after sales service if necessary*.

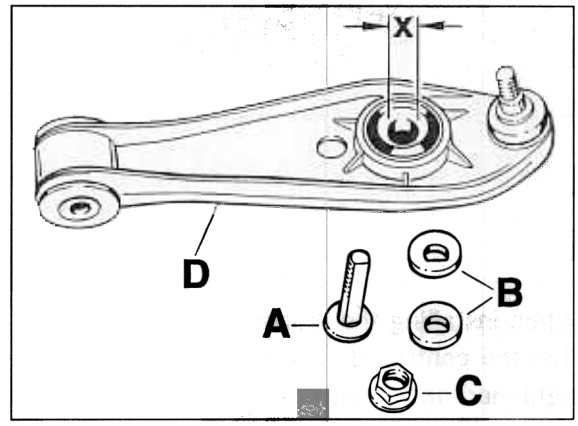
The series control arm must be replaced by an adjustable control arm (service control arm) for this purpose.
The installation of only one service control arm is permissible.

The service control arm is delivered with a caster adjusting facility (as a set).
Part No. for vehicles with automatic headlight beam adjustment = 996 341 941 01 (status: October 1999). It can also be used for vehicles without automatic headlight beam adjustment.
The set consists of a special screw (A), two eccentrics (B) and the fastening nut (C).
Only the fastening nut (C) is available as a single part.

Differences with respect to the series control arm

In order to realise caster adjustment, the service control arm is provided with a special bearing at the connecting point to the diagonal arm.

This special bearing has a larger bore with respect to the series control arm (dimension X). There are also corresponding bearing surfaces for the two eccentrics.



479_97

A = Special screw
B = 2 eccentrics
C = Fastening nut
D = Service control arm. Dimension X = 20 mm (dimension X on series control arm = 14 mm)

* **Requirement:** In the case of caster values lying outside the tolerance or excessive caster difference between the right and left sides, in combination with a complaint about the handling. Required values in Repair Group 44.
Prerequisite for installation: wheel suspension parts and body mounting points are in order.
The caster eccentric must never be used to compensate for **incorrect caster values** resulting from deformed parts.

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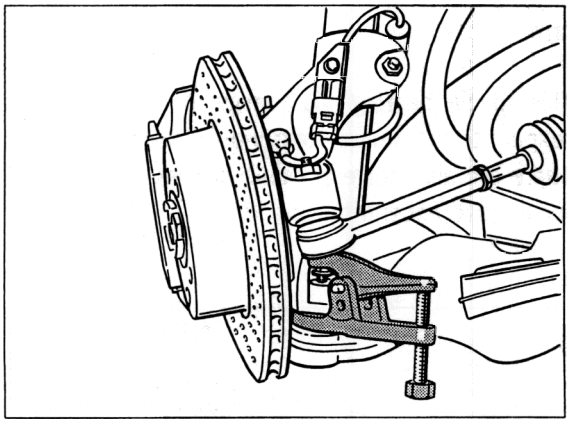
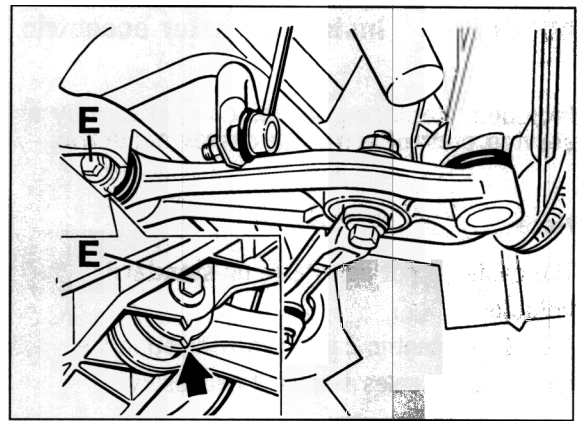
Installing caster eccentric

Replacing series control arm by the service control arm.
For pressing off from the ball joint, use special tool 9560.



37_97

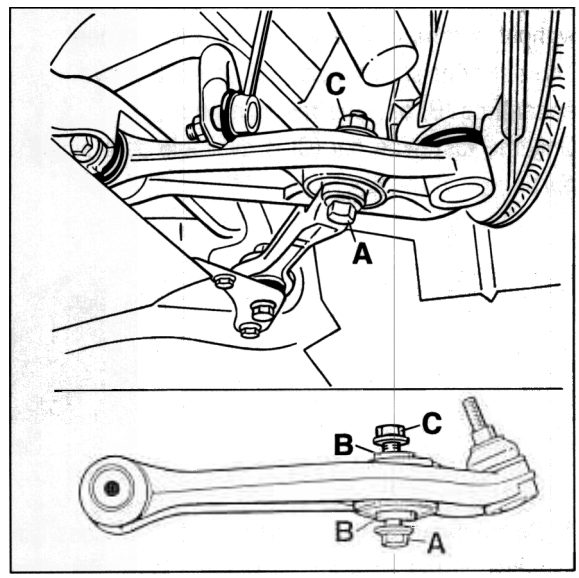
When installing the control arm, make sure that the control arm fastening screw (E) is tightened only in vehicle position (Figure 480_97).
Vehicle position means: Vehicle must be standing on its wheels, or the wheel suspension is lifted with a universal lift until the markings (arrow) line up.
Use correct tightening torques.



480_97

Adjusting caster

With the fastening nut (C) loosened, adjust the caster by turning the special screw (A).
Adjusting values and suspension alignment in Repair Group 44.
Tighten fastening nut (C) to 160 Nm (118 ftlb.



A = Special screw
B = 2 eccentrics
C = Fastening nut

481_97

42 Tightening torques for rear axle

Important: Do not grease screwed connections in **Dacromet finish** – aluminium colour.

Location	Thread	Tightening torque Nm (ftlb.)
Carrier side section/cross member		
Carrier side section to body	M12 x 1.5	110 (81)
Studs for carrier side section to body only screw-in torque	M12 x 1.5	46 (34)
Cross member at rear to carrier side section	M12 x 1.5	110 (81)
Cross member at front to carrier side section	M10 x 1.5	65 (48)
Brake hose holder to carrier side section	M6	10 (7.5)
Diagonal brace to body	M10 x 1.5	65 (48)
Diagonal brace to cross member	M12 x 1.5	110 (81)
Diagonal brace to carrier side section (collar nut)	M10 x 1.5	23 (17)
Axle strut		
Control arm 2 (toe control arm)		
to wheel carrier	M12 x 1.5	75 (56)
to cross member (toe eccentric)	M12 x 1.5	100 (74)
Control arm (lower control arm)		
to carrier side section (camber eccentric)	M12 x 1.5	100 (74)
to wheel carrier	M12 x 1.5	75 (56)
Diagonal control arm		
to control arm	M14 x 1.5	160 (118)
to carrier side section	M14 x 1.5	180 (133)
Control arm 3 and **control arm 4** (upper control arms)		
to carrier side section	M12 x 1.5	110 (81)
to wheel carrier	M12 x 1.5	110 (81)

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Location	Thread	Tightening torque Nm (ftlb.)
Wheel carrier		
Wheel bearing to wheel carrier (lid)	M8	37 (27)
Speed sensor to wheel carrier	M6	10 (7.5)
Brake cover plate to wheel carrier	M6	10 (7.5)
Brake disc to wheel hub	M6	10 (7.5)
Brake caliper to wheel carrier*	M12 x 1.5	85 (63)
Holder for combination wire to wheel carrier	M6	10 (7.5)
Spring strut		
to body	M10	46 (34)
911 GT3	M10 / 10.	46*** (34***)
to wheel carrier	M12 x 1.5	100 (74)
Shock absorber to mount (piston rod)	M12 x 1.5	58 (43)
911 GT3	M12 x 1.5	60 (44)
Stabilizer mating bearing on spring strut (lock nut) **911 GT3**	M52 x 1.5	50 (37)
Height adjustment on spring strut (lock nut) **911 GT3**	M52 x 1.5	50 (37)
Wheel fastening		
Wheel to wheel hub **	M14 x 1.5	130 (96)

Replace screws at front and rear axle whenever they have been removed.

Thinly grease thread, shank and under head (between screw head bearing surface and spherical cap ring) of the wheel bolts with Optimoly TA (aluminium paste). **Do not** grease bearing surface of the spherical cap facing the wheel. If heavily contaminated, clean bolts first with a lint-free cloth.

GT3 with roll-over bar: Carry out a test drive after performing assembly work on the roll-over bar/spring support on the body and then retighten the M10 fastening nuts (three per side) to the same torque.

Location	Thread	Tightening torque Nm (ftlb.)
Drive shaft		
to transmission	M10	81 (60)
to wheel hub	M22 x 1.5	460 (340)
Stabilizer		
to carrier side section	M8	23 (17)
Stabilizer mount to stabilizer and spring strut	M10	46 (34)
911 GT3	M10 / 10.	65 (48)
Stabilizer mating bearing on spring strut (lock nut)	M52 x 1.5	50 (37)
Ancillary equipment mounts		
Engine mount to body	M8	23 (17)
Engine carrier to engine	M10	46 (34)
911 GT3	M10	65 (48)
Engine mount to engine carrier	M12 x 1.5	85 (63)
Transmission support to body	M10 x 1.5	65 (48)
Stud for transmission support to body	M10	20 (15)
Longitudinal support to body	M10	65 (48)
Mount to longitudinal support	M10	65 (48)
Plug-in couplings for clutch and steering hydraulics		
Steering pressure line	Wrench size 15	30 (22)
Steering return line	Wrench size 19	40 (30)
Clutch line	Wrench size 15	30 (22)

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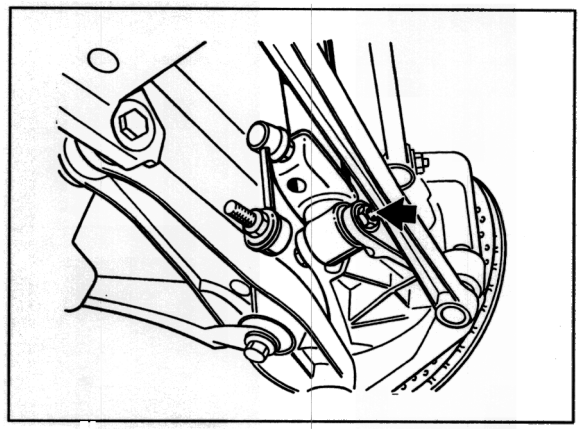
42 71 19 Removing and installing rear spring strut

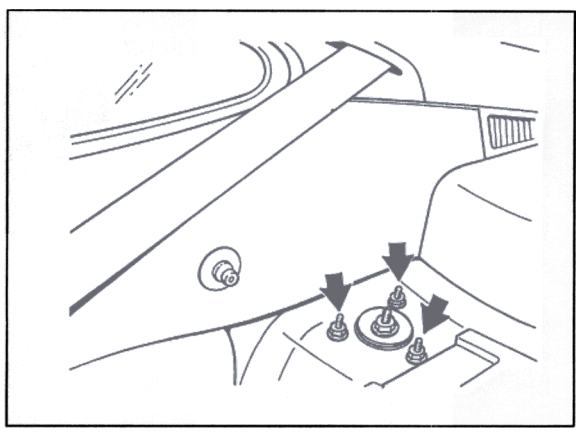
Removal

1. Raise vehicle, remove rear wheel.

2. Loosen fastening nuts M10 (3 ea. / arrows) from the spring strut mount in the vehicle interior.
   Before doing this, mark the installed position of the spring strut mount (position of the three collar nuts).



180 - 97



75 - 97

3. Loosen stabilizer mount at stabilizer (counter with open-ended wrench).

4. Loosen screw connection between spring strut/wheel carrier (arrow). Pull out (remove) spring strut.

Installation

1. Install in reverse order. Before installing, give the parts a visual check.
   Replace fastening nuts.

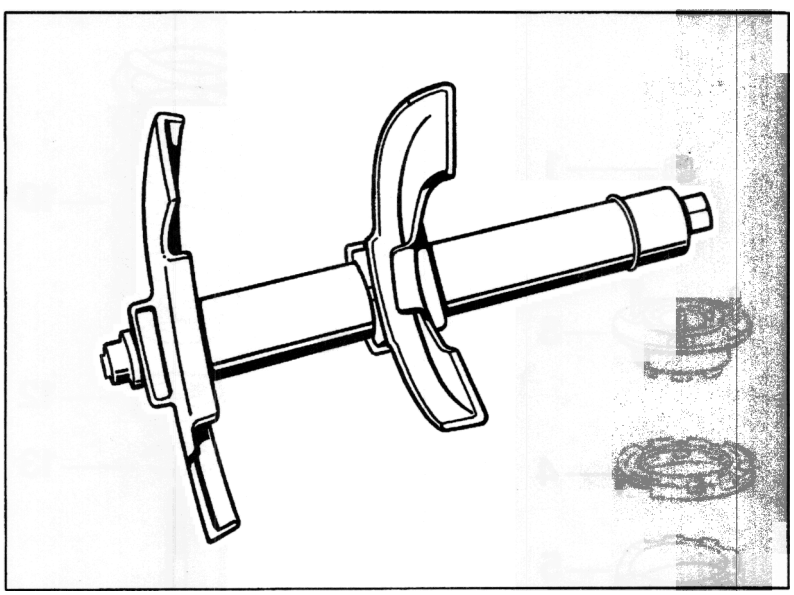
2. **Do not grease screwed connections in Dacromet finish – aluminium color.**
   Use correct tightening torques.

3. Insert spring strut into vehicle.
   Before tightening the fastening nuts, adjust spring strut mount in accordance with the applied marking (position of the three fastening nuts).
   Tightening torque: 46 Nm (34 ftlb.)

4. When new parts are installed that affect vehicle height, suspension alignment must be carried out.

42 Disassembling and assembling rear spring strut

Tools



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No.	Designation	Special tool	Explanation
	Spring clamp, e.g. from Klann, with spring holder		Commercially available Clamping range of spring holder up to 165 mm spring diameter

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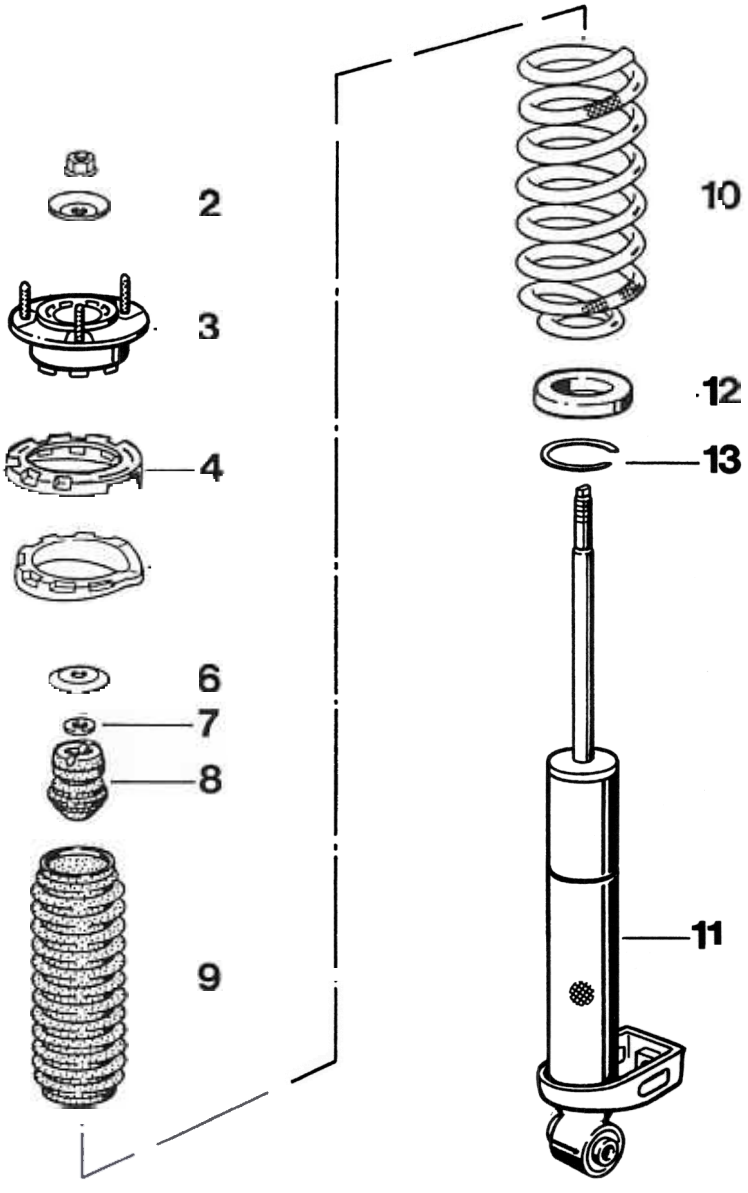
Disassembling and assembling spring strut



No.	Designation	Qty.	Note: Removal	Installation
1	Fastening nut M 12 x 1.5	1	Before loosening the fastening nut, tension coil spring with the spring clamp. Support at the piston rod with a 7-mm open-ended wrench when loosening the nut.	Use new fastening nut. Tighten to 58 Nm (43 ftlb.). **First** position the spring strut mount (No. 3) (Page 42 - 14).
2	Stop plate	1		Mount in correct position (No. 2 and No. 6 are identical parts).
3	Spring strut mount	1	Remove complete assembly (mount with intermediate part No. 9 and spring plate No. 10).	The mounts for the right and left sides are identical parts. Position the mount before tightening the fastening nut No. 1 (Page 42-14).
4	Intermediate part (compensation part)	1		Observe allocation (Page 42 - 11/12). **Join in correct position with spring plate No. 5**
5	Spring plate	1		
6	Stop plate	1		Mount in correct position (No. 2 and No. 6 are identical parts).
	Washer	1		
8	Additional spring	1		Mount on protective bellows (No. 9)
9	Protective bellows	1		
10	Coil spring	1		Observe allocation as per Spare Parts Catalogue.

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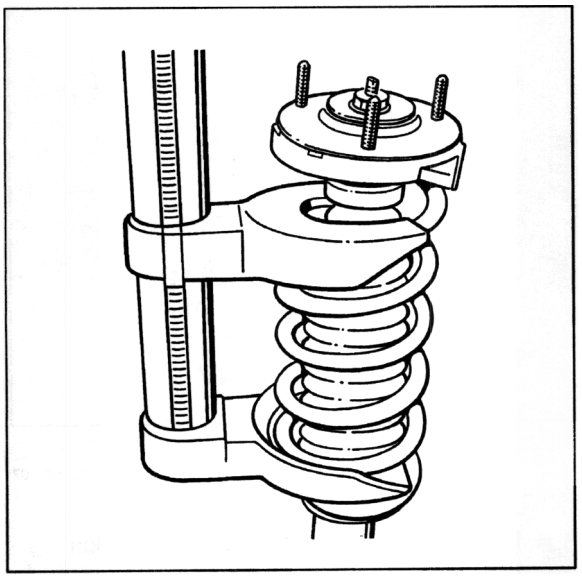
No.	Designation	Qty.	Removal	Note: Installation
11	Vibration damper	1		Observe allocation as per Spare Parts Catalogue. The vibration dampers for the right and left sides are identical parts.
12	Spring plate, bottom	1		Fit in correct position (groove facing snap ring).
13	Snap ring	1		Ensure perfect seating.

Disassembly and assembly instructions

Disassembly

– Tension the coil spring with the spring clamp until the piston rod is relieved.



151 - 97

To undo the connection between piston rod and spring strut mount: counter at the piston rod with a 7-mm open-ended wrench.
Caution: Never use an impact bolter to loosen or tighten the fastening nut.

Remove all parts from the piston rod.

Note

When installing new parts, observe the allocation according to the Spare Parts Catalogue.

Preliminary work and notes on assembly

Replace nut for fastening the piston rod on the spring strut mount.

It is recommended to replace the coil springs only in pairs.

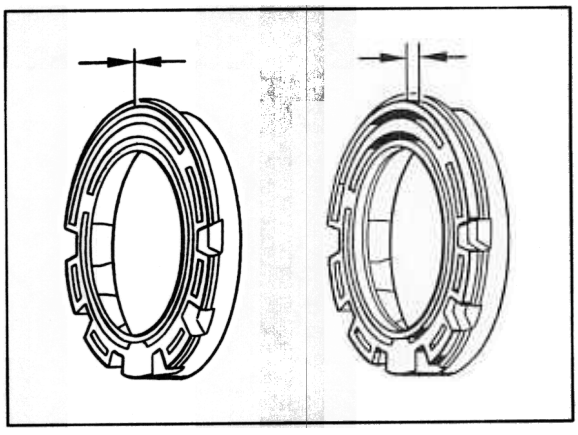
Note

If the coil springs are exchanged, it might be necessary to use a different spring plate than before.

The following spring plates (compensation parts) are available:
Allocation of the spring plate according to the coil spring tolerance group (see Page 42 - 12).

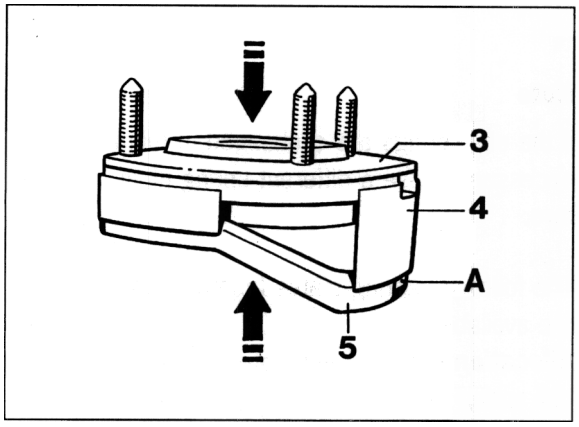
1 green line = 4.0 mm thick compensation part.

1 white line = 0.5 mm thick compensation part.



152 - 97

Press intermediate part (compensation part No. 4) into the spring plate (No. 5) in the correct position (not twisted) and complete with the mount (No. 3).
In the correct position means: None of the 7 cutouts (A) must be free on the spring plate (No. 5).

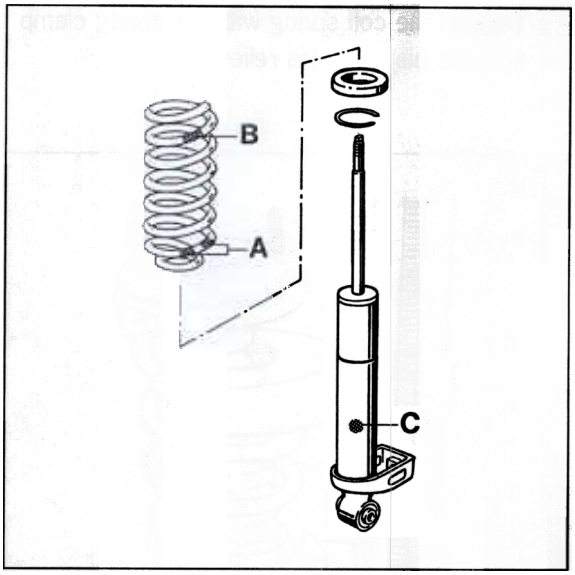


153 - 97

Fit protective bellows on additional spring.

Observe the correct allocation (running gear version) when installing new springs and/or dampers.

Distinguishing feature of coil springs and dampers



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A = Identification of the running gear version (spring constant/spring length) by two different colored lines (for example, 1 x brown and 1 x yellow).
Refer to the Parts Catalogue for the allocation.

B = Identification of the coil spring tolerance group (load group) for determination of the compensation part (spring plate) thickness.

1 white line = 0.5 mm thick compensation part.
1 green line = 4.0 mm thick compensation part.

C = Colour dot (colour label) to differentiate the damper identifier.

Brown dot = Standard running gear, RoW/USA
Green dot = Sport-type running gear, RoW
Grey dot = Sport-type running gear, USA

Tension coil spring with spring clamp.

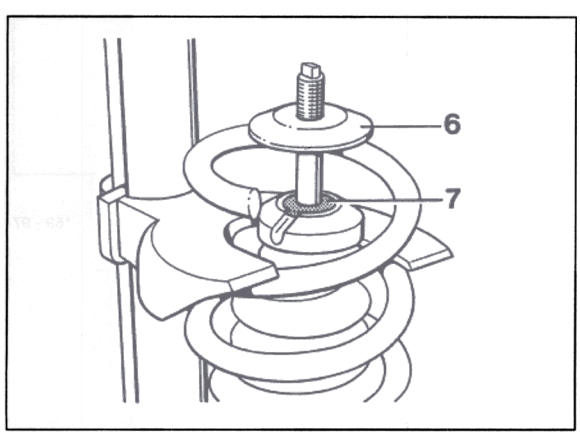
Clamp eye of vibration damper in the vise (use jaw liners).

Assembly

– Place pre-tensioned coil spring on the vibration damper.

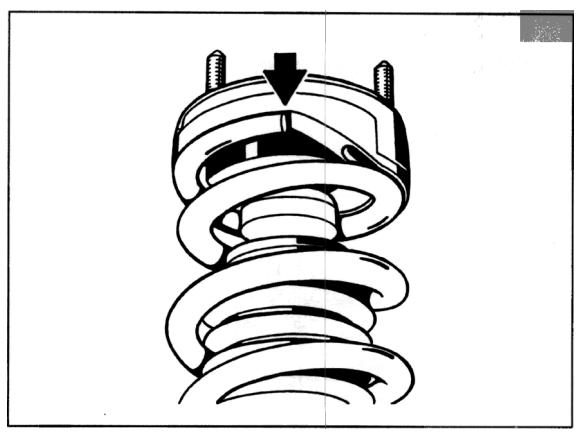
Slide the protective tube/additional spring assembly on the piston rod.

Slide the washer No. 7 and stop plate No. 6 (No. 6 in correct position) as far as they will go onto the piston rod.



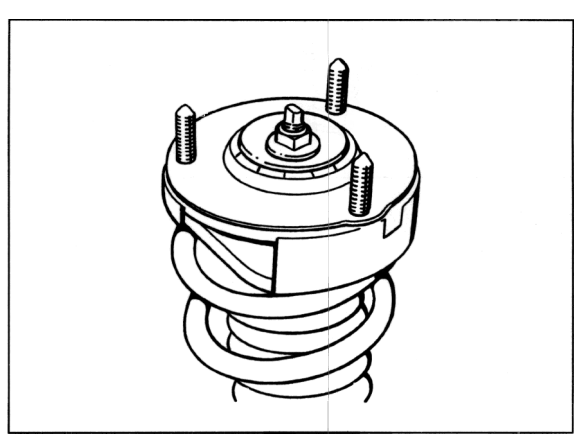
155 - 97

Place the spring strut mount (assembly of spring strut mount / intermediate part / spring plate) onto the piston rod so that the end of the coil spring lies against the stop of the spring plate.



156 - 97

Place stop plate in the correct position on the spring strut mount.
Screw new fastening nut onto the piston rod until approx. 1 to 2 threads are visible above the fastening nut.



157 - 97

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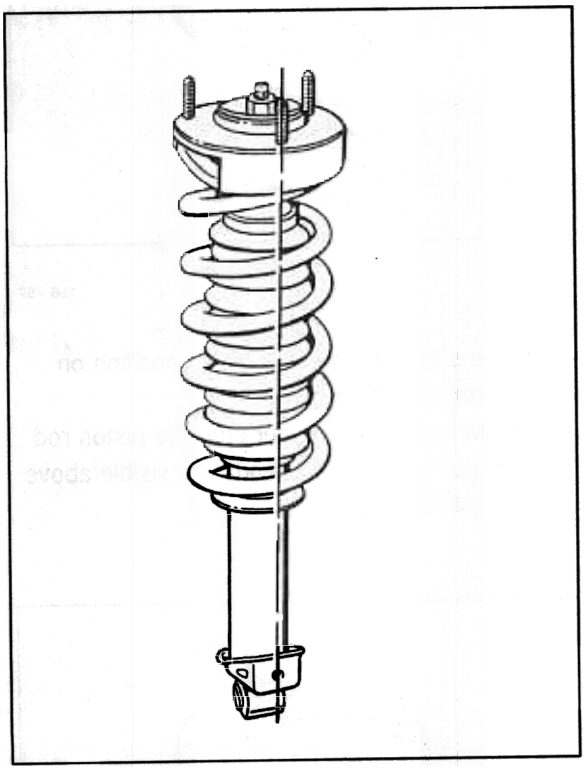
Position the spring strut mount for installation (correctly position spring strut mount with respect to the damper).
The mounts for the right and left sides are identical parts.

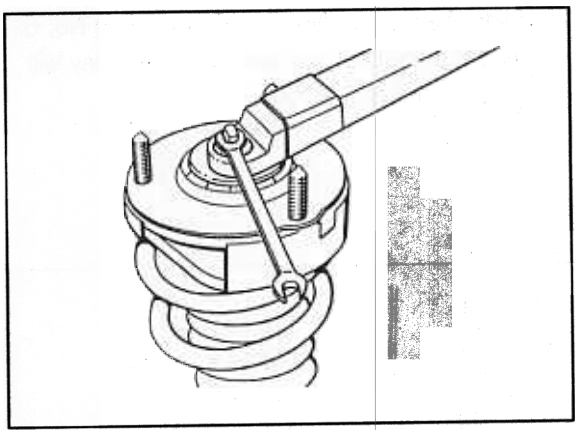
The mount is positioned correctly if **one** of the 3 fastening pins is aligned with the holder on the damper tube.



158 - 97

Tighten the fastening nut to **58 Nm (43 ftlb.)** once the mount has been correctly positioned and the coil spring lies properly against the stop. When tightening the fastening nut, hold at the piston rod using a 7-mm open-ended wrench.

Caution: Never use an impact bolter to tighten the fastening nut.



159 - 97

42 Disassembling and assembling rear spring strut – GT3

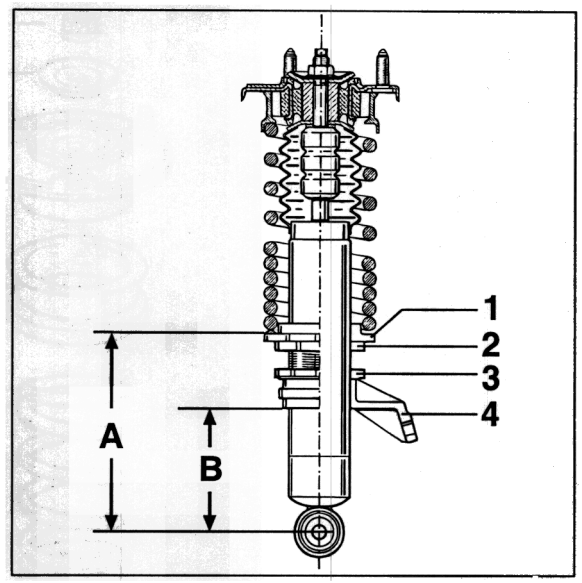
Notes about adjustment work on the spring struts

The spring strut has a thread and a height adjusting nut No. 2 for height adjustment. The height adjusting nut No. 2 is secured against turning by the lock nut No. 1.

The stabilizer block - No. 4 - (mounting saddle for the stabilizer mount) is also fitted on the thread. The stabilizer block can be vertically adjusted and it is provided with a lock nut No. 3. **This adjustment possibility is only useful for racing.** It can be used to ensure that enough clearance is available for the stabilizer mount even for deviating vehicle heights (only for racing) and also that the stabilizer mount can be fitted free of tension.

The stabilizer block No. 4 **does not need to be adjusted** for the vehicle height prescribed for street use.

The stabilizer block No. 4 – dimension B and dimension C – is also set with replacement dampers.

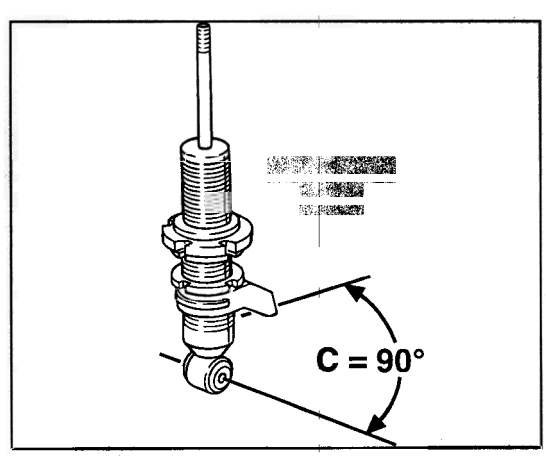


42710002

1 – Lock nut
2 – Height adjusting nut
3 – Lock nut
4 – Stabilizer block

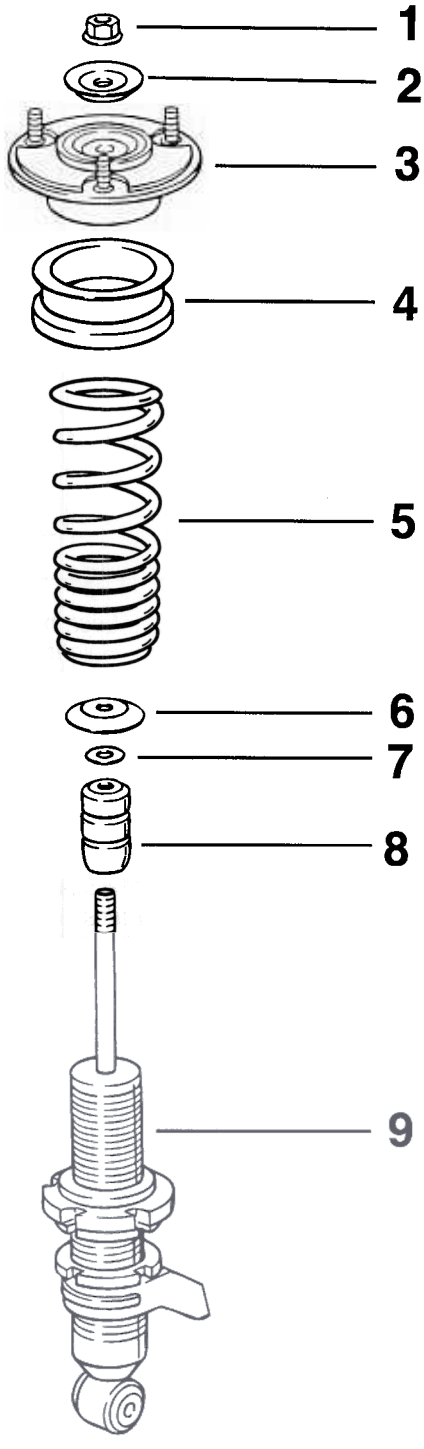
Dimension A = pre-setting dimension for production (185 mm). The dimension may be different with the prescribed vehicle height.

Dimension B = 105 mm (plus/minus 1 mm)
Dimension C = 90 degrees (see illustration 42930001)



42930001

Disassembling and assembling rear spring strut – GT3



42710001

No.	Designation	Qty.	Removal Note:	Installation
1	Fastening nut M 12 x 1.5	1	If necessary, pre-tension the coil spring with the spring clamp before loosening the fastening nut. This depends on the pre-tension of the coil spring. Support at the piston rod with a 7-mm open-ended wrench when loosening the nut.	Use new fastening nut. Tighten to 60 Nm (44 ftlb.). **First** position the spring strut mount (No. 3) (see under assembly instructions).
2	Disc (stop plate)	1		Mount in correct position (No. 2 and No. 6 are identical parts).
3	Spring strut mount	1		The mounts for the right and left sides are identical parts. Position the mount before tightening the fastening nut No. 1 (see under assembly instructions).
4	Spring plate	1		
5	Coil spring	1		
6	Disc (stop plate)	1		Mount in correct position (No. 2 and No. 6 are identical parts).
7	Washer	1		
8	Additional spring	1		
9	Vibration damper	1		The vibration dampers for the right and left sides are identical parts.

Disassembly and assembly instructions

Disassembly

– If necessary, tension the coil spring with the spring clamp until the piston rod is relieved.

To undo the connection (piston rod to spring strut mount), counter at the piston rod with a 7-mm open-ended wrench.
Important: Never use an impact bolter to loosen or tighten the fastening nut.

Remove all parts from the piston rod.

Preliminary work and notes on assembly

– Replace nut for fastening the piston rod on the spring strut mount.

It is recommended to replace the coil springs only in pairs.

Note

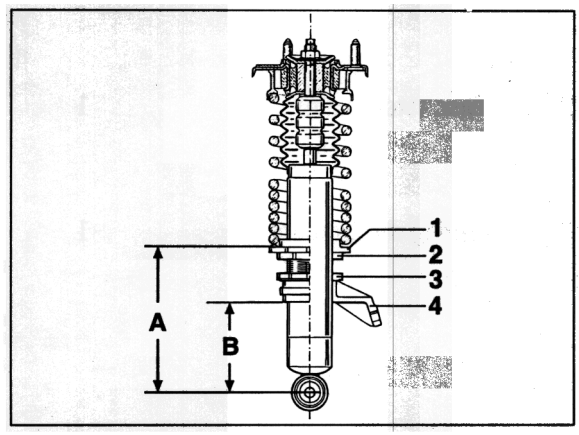
If the vibration damper is to be replaced, set the height adjusting nut No. 2 to the same position as on the old vibration damper (transfer the actual dimension A to the new vibration damper).

A hook wrench insert – special tool 9647 – is required **for this purpose**.

Special tool 9647 is required to change the vehicle height (dimension A) and to adjust the stabilizer mating bearing No. 4 – on the front and rear axles.

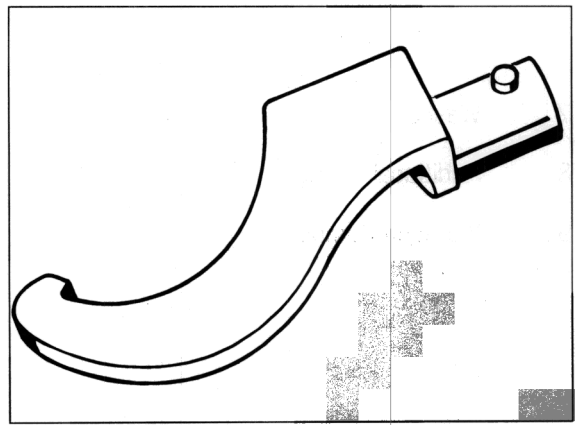
The special tool is used together with a torque wrench to tighten the lock nuts (slotted nuts) on the spring struts. Tightening torques in Repair Group 40/42.

Important: The stabilizer mating bearing (mounting saddle No.4) need not be adjusted for street use.



1 – Lock nut
2 – Height adjusting nut
3 – Lock nut
4 – Stabilizer mounting saddle

42710002



Special tool 9647

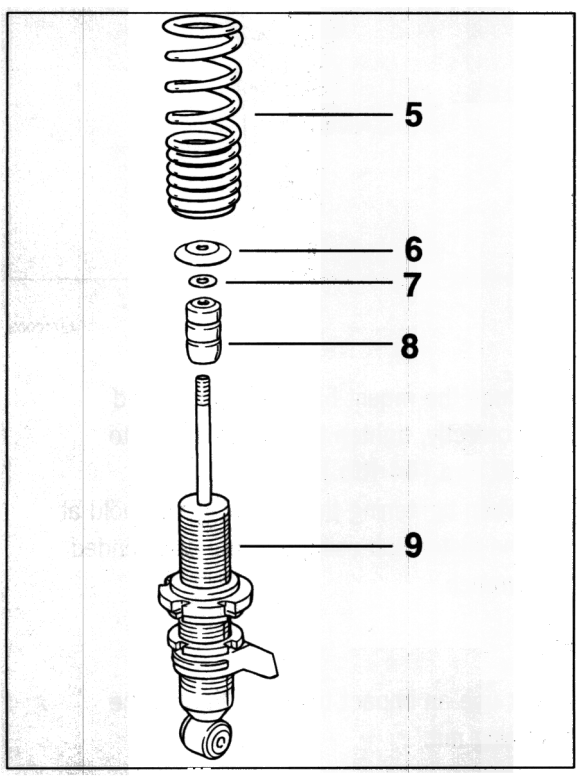
072_99

Assembly

– Push additional spring No. 8 onto the piston rod.

  Slide the disc No. 7 and stop plate No. 6 (stop plate No. 6 in correct position) as far as they will go onto the piston rod.

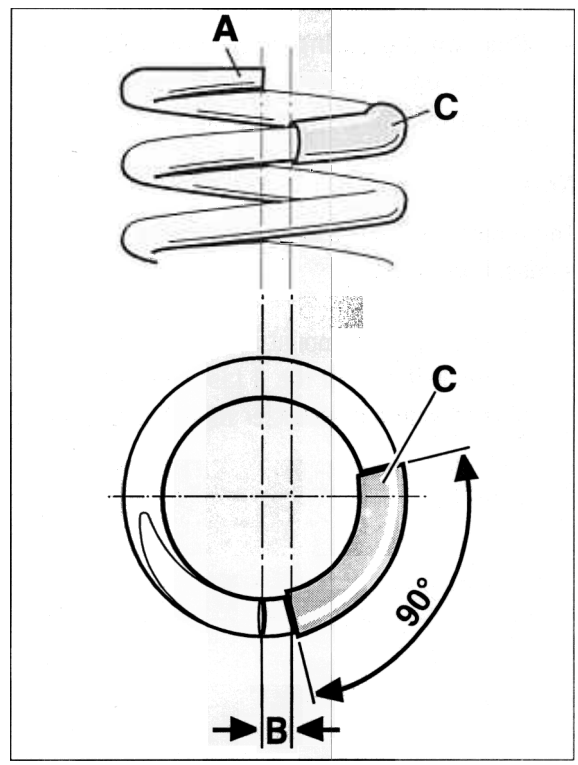
  Place coil spring in the correct position – tighter winding facing down – on the vibration damper.



42710004

Note

The coil spring is equipped with an approx. 50 mm-long protective sheath at the top. This protective sheath is not yet present on vehicles from the initial production run.



A - Top
B - 10 mm
C - Protective sheath approx. 50 mm long

42720001

Place spring plate on the coil spring.

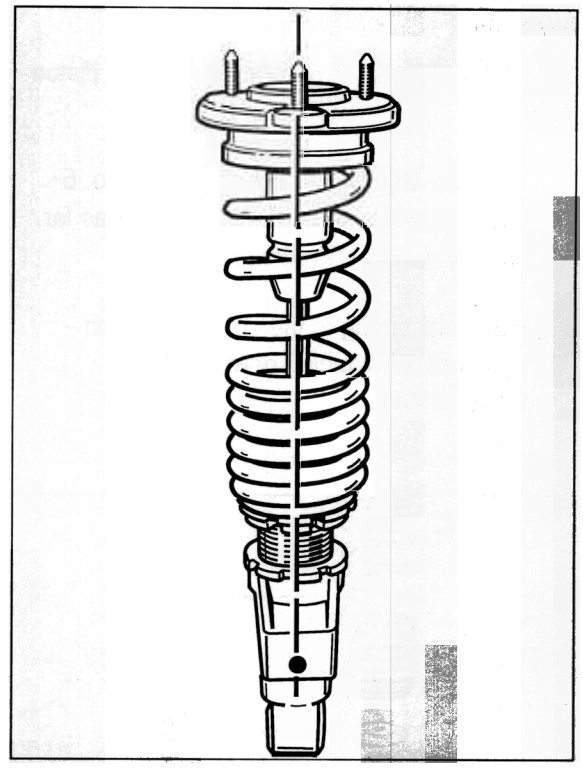
Place stop plate in the correct position on the spring strut mount.
Screw new fastening nut onto the piston rod until approx. 1 to 2 threads are visible above the fastening nut.

Position the spring strut mount for installation (correctly position spring strut mount with respect to the damper).

Note

The mounts for the right and left sides are identical parts.

The spring strut mount is positioned correctly if **one** of the 3 fastening pins is aligned with the stabilizer mounting saddle.



42710003

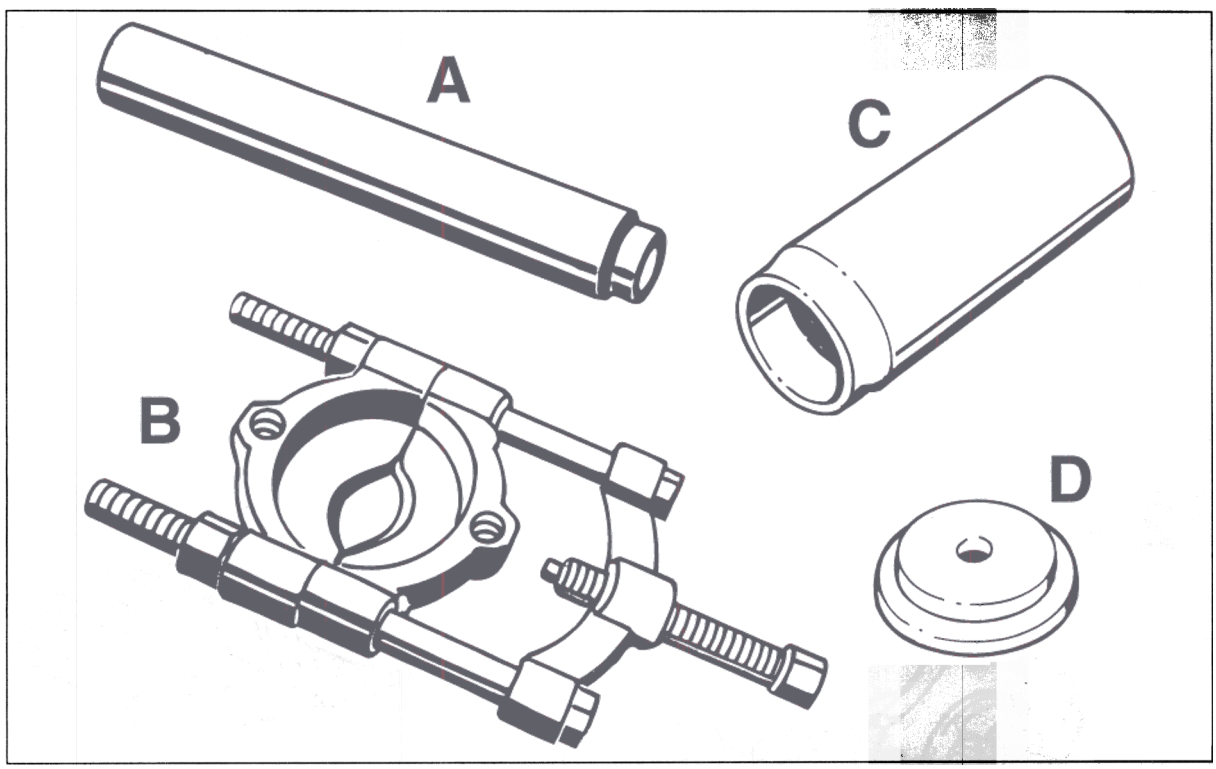
Once the mount has been positioned correctly, tighten the fastening nut to **60 Nm (44 ftlb.)**.
When tightening the fastening nut, hold at the piston rod using a 7-mm open-ended wrench.

Note

Never use an impact bolter to tighten the fastening nut.

42 58 19 Removing and installing rear wheel bearing

Tools



422_97

Item	Designation	Special tool	Explanation
A	Pressure piece	P 297 A	For pressing out the rear wheel hub
B	Separator (12 – 115 mm Ø)	Commercially available; refer to Workshop Equipment Manual, Chapter 2.4, No. 111	Used as a support when pressing out the rear wheel hub and when pressing the wheel bearing inner race off the wheel hub
C	Tubular piece	VW 415 A	For pressing the wheel bearing out and in
D	Pressure piece	9247/3	Use in combination with tubular piece C to press in the wheel bearing

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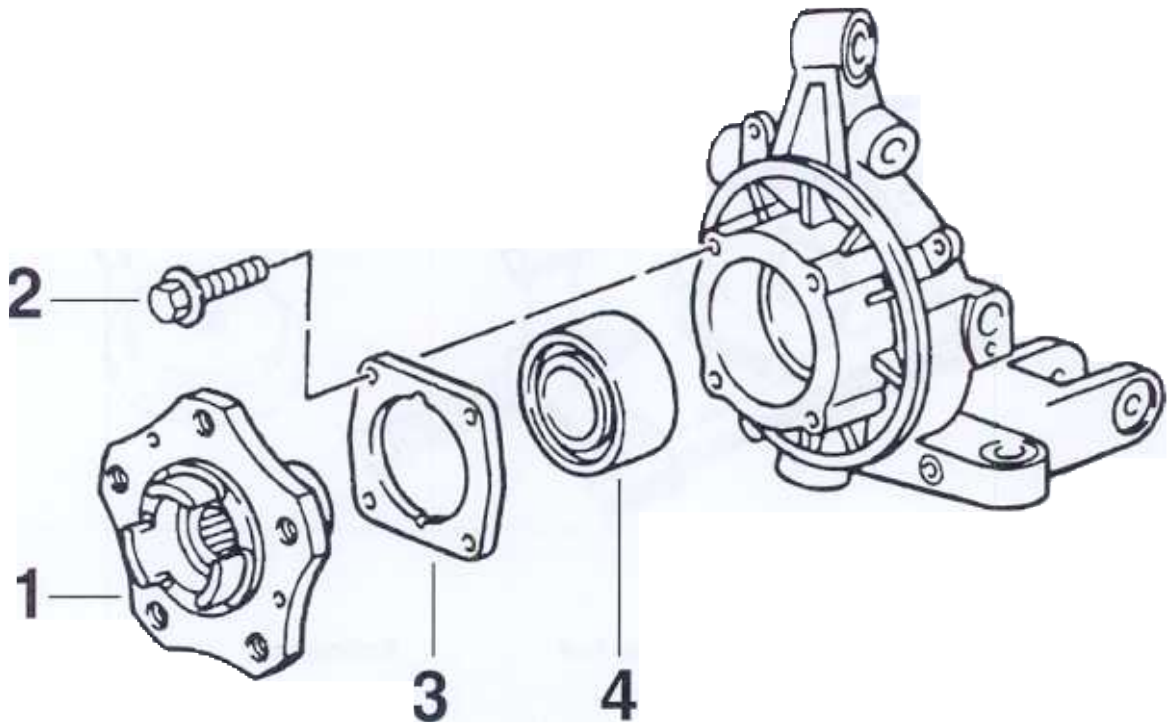
Removing and installing rear wheel bearing



742_97

No.	Designation	Qty.	Note: Removal	Installation
1	Wheel hub	1	Press out with pressure piece P 297 A under a hydraulic press. For this purpose, use the separator and corresponding shims for support	Press in under a hydraulic press. To do this, place the wheel hub on the wheel centring device and press it on the **wheel bearing inner race** using pressure piece VW 415 A
2	Hexagon-head bolt (10.9)	4		Tighten to 37 Nm (27 ftlb.)
3	Lid	1		Fit in correct position (groove down)
4	Wheel bearing	1	Heat wheel bearing housing to approx. 100° C (max. 120° C). Press out wheel bearing with tubular piece VW 415 A (tool C)	Heat wheel bearing housing to approx. 100° C (max. 120° C). Insert **new** wheel bearing in correct position (inscription facing the wheel hub), and then press again **slightly** using pressure piece 9247/3 (tool D) and tubular piece VW 415 A (tool C)

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Notes on removal and installation

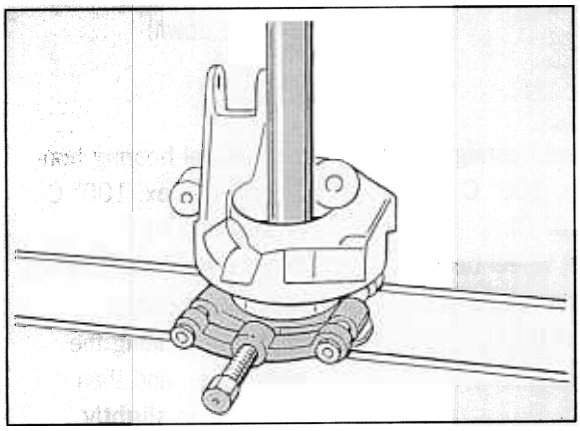
Note

The wheel bearing is removed and installed with the wheel bearing housing removed.

Removal

– Remove brake disc, parking brake shoes, brake disc cover and speed sensor.

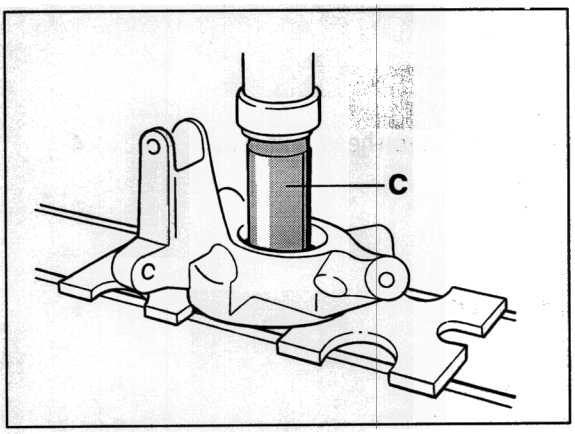
Press out rear-wheel hub with pressure piece P 297A (tool A).
Use the separator (tool B) for support.
If there is not enough space for the wheel hub between the press, appropriate shims will additionally be necessary.



423_97

Remove retainer plate (lid) (four screws).

Heat wheel bearing housing to approx. 100° C (max. 120° C).
Press out wheel bearing with tubular piece VW 415 A (tool C).

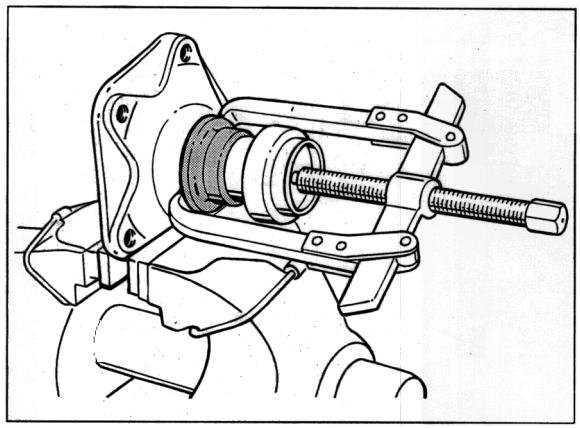


425_97

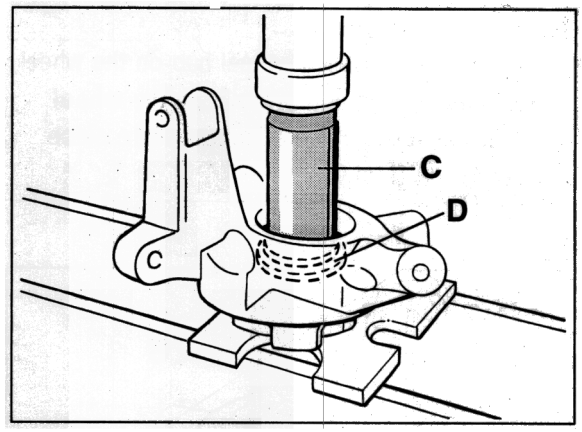
Press inner wheel bearing race off the wheel hub (Figure 426_97).
To do this, use pressure piece P 297A (tool A) in combination with the separator (tool B).

Note

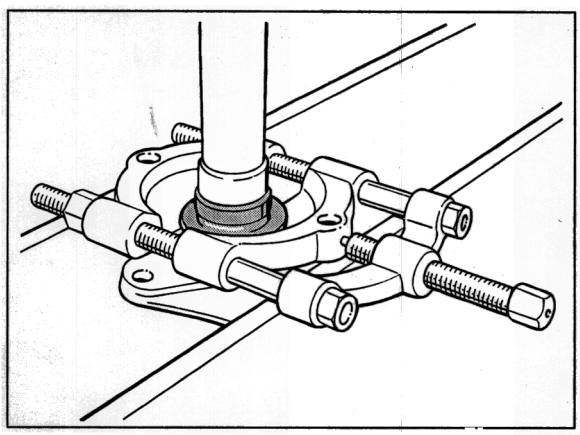
First pull the inner bearing race several millimetres off the wheel hub (Figure 741_97) so that the separator can be put into place.
For this purpose, use a two-claw puller in combination with a suitable pressure piece (e.g. VW 433).



741_97

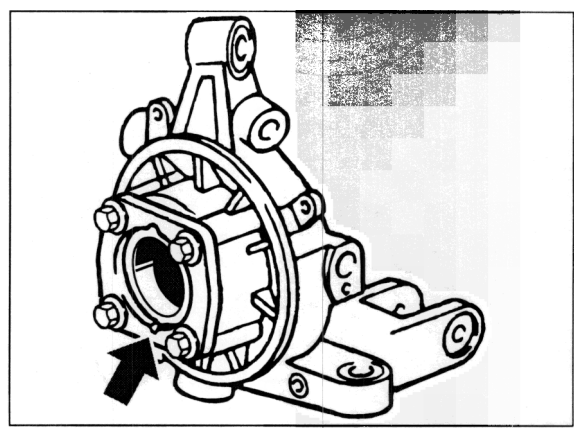


427_97



426_97

Fit retainer plate (lid). Unless there is a water drain on both sides, fit the water drain (arrow) in the correct position – i.e. facing downward.
Observe tightening torque: 37 Nm (27 ftlb.)



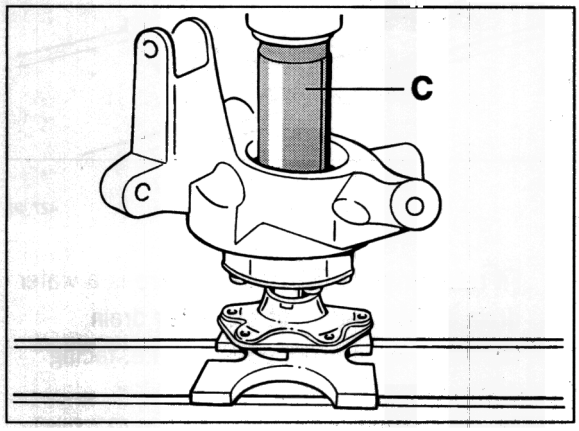
424_97

Installation

– Before installation, clean the bore in the wheel bearing housing and remove any surface irregularities with a polishing cloth.

  Heat wheel bearing housing to approx. 100° C (max. 120° C).
  Insert **new** wheel bearing, and then press again **slightly** using pressure piece 9247/3 (tool D) and tubular piece VW 415 A (tool C).

Press in wheel hub.
To do this, place the wheel hub on the wheel centring device and press it on the **wheel bearing inner race** using pressure piece VW 415 A (tool C).



428_97

42 09 19 Removing and installing rear tie rod (toe control arm)

Removal

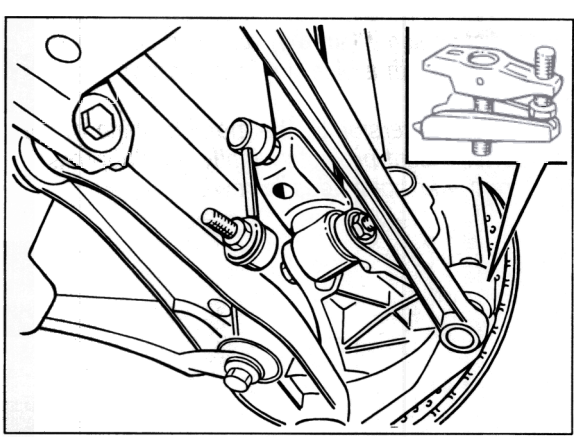
1. Raise vehicle and remove wheel.

2. Undo the stabilizer on the bearing block and the stabilizer mount. This is necessary for removal of the toe eccentric.
   Counter with an open-ended wrench when removing from the stabilizer mount.

3. Press off ball joint on the wheel carrier using a commercially available ball joint extractor (tie rod extractor) – refer to Workshop Equipment Manual, chapter 2.4, No. 113.
   When loosening the locknut, hold it with special tool 9546 (Torx screwdriver).

Note

Do not damage the boot of the ball joint when pressing off the ball joint. If necessary, coat the boot and the ball joint extractor with tyre mounting paste.



42090001

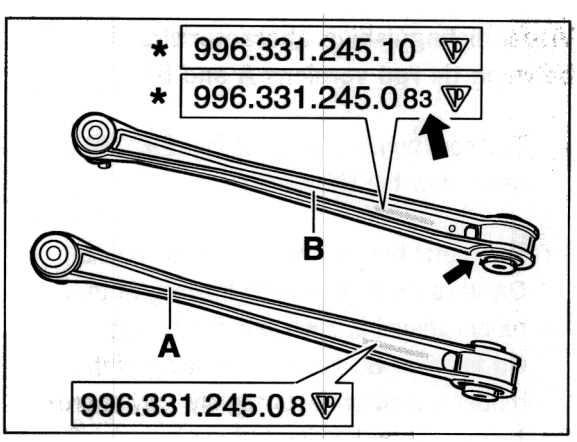
4. Mark the position of the toe eccentric for re-installation. Remove the toe eccentric and pull out the tie rod.

Installation

1. Install in reverse order. Before installing, give all parts a visual check.

Note

When replacing tie rods, pay close attention to the correct allocation.
Install only identical tie rods – version A or B – on a vehicle.
For a detailed explanation – distinguishing characteristics and Part No. – refer to "Tie rod replacement" (after installation).



292_99

2. Replace fastening nuts.
   Use correct tightening torques.

3. Perform a suspension alignment after installation.

Tie rod replacement

Only tie rods with **harder rubber mounts** (optimised tie rods with spherical mounts) – **version (B)** – are still available from the Parts Service.
Introduction of the optimised tie rods in the current model year 1999 (X) in some cases, but generally from model year 2000 (Y).

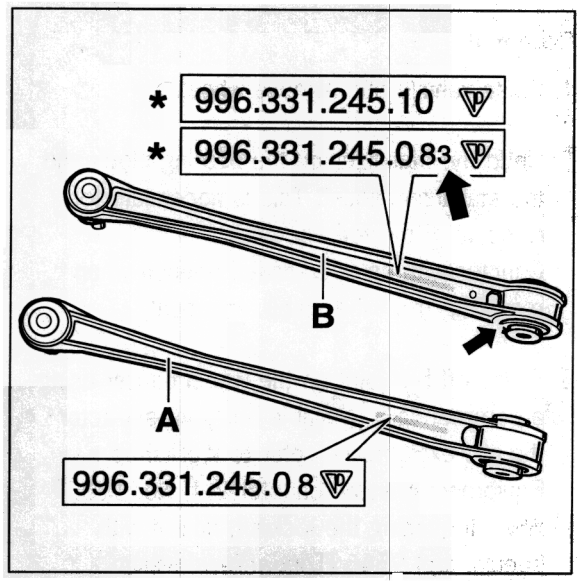
Part No. of the optimised tie rod:
996.331.045.10.
These tie rods may be retrofitted – but only in pairs.

In general, the following applies: Only tie rods (toe control arms) of the same version – A or B – may be installed in a vehicle. In the case of replacement, replace both tie rods if necessary (install version B).

Visual distinguishing characteristics between tie rod versions A and B:

The cast number (refer to Fig. 292_99 and text below the illustration).

The metal bushing of the rubber mount.
On version A, the metal bushing of the rubber mount is flush with the tie rod.
On version B, the metal bushing of the rubber mount projects slightly – by approx. 1 mm – at both sides (arrow).



292_99

A - Tie rods ***without*** *spherical mount*
Part No. 996.331.045.06 / 07 / 08
Cast No. 996.331.245.06 / 07 / 08

B - Tie rods ***with*** *the spherical mount (optimised tie rods with harder rubber mount).*
Part No. 996.331.045.10
*Cast No. * 996.331.245.10 (current)* **or**
*Cast No. * 996.331.245.08* **3** *(the 3 was stamped at the end of the cast number in order to distinguish it* **(arrow)** *and was additionally provided with a blue dot in this area).*

On tie rod version B, the metal bushing of the rubber mount projects slightly – by approx. 1 mm – at both sides (arrow).

42 52 19 Removing and installing wheel bearing housing (wheel carrier)

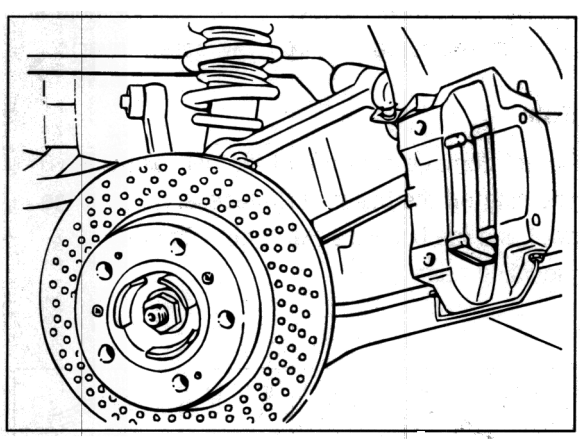
Removal

1. Raise vehicle and remove wheel.

2. Loosen and unscrew axle nut (wheel-side drive shaft fastening).

3. Open the plug connection on the wheel carrier and pull out the plug for the brake pad wear indicator and the speed sensor.
   Loosen plug housing on the wheel carrier.

4. Remove the brake caliper from the wheel carrier and suspend it in the wheel arch (do not open brake hydraulics).



47410001

5. Disengage the parking brake cable from the parking brake lever in the vehicle interior.
   Disengaging the parking brake cable includes

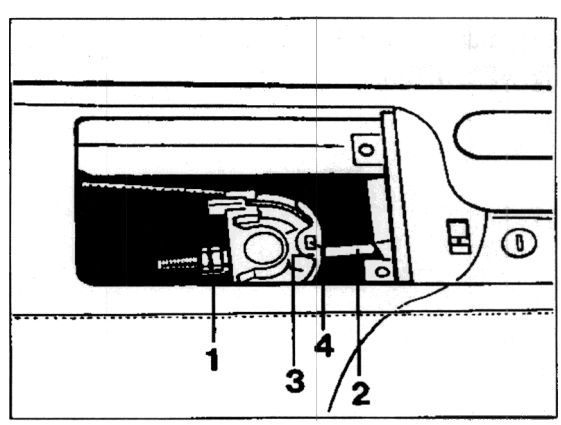
   Opening the oddments tray on the centre console, removing insert and base

   Disengaging tab washer of the turnbuckle from the retaining lug on the upper and lower sides.

   Disengaging the relevant parking brake cable from the turnbuckle.

Note

When replacing the wheel bearing, the wheel carrier or the wheel hub, the parking brake cable can remain fitted.
In that case, remove instead the brake disc and the parking brake system.



1 Lock nut and adjusting nut
2 Pull rod
3 Tab washer
4 Retaining lug

18_1_96

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6. In vehicles with automatic headlight beam adjustment, unscrew the strut from the angle sensor (on the left control arm (lower left arm)).
   Counter with a second open-ended wrench when doing this.

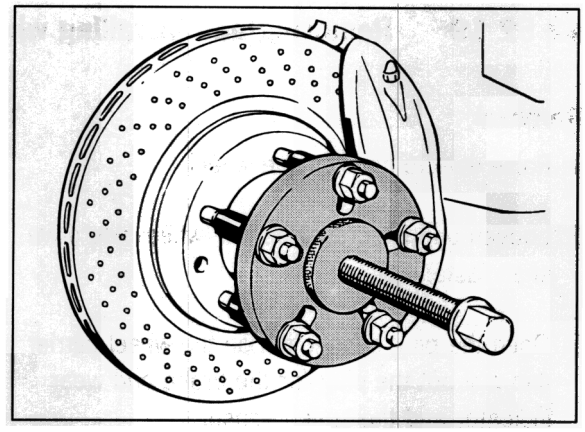
7. Undo stabilizer mount on the stabilizer.
   Counter with an open-ended wrench when removing from the stabilizer mount.

8. Push suitable protection over the drive shaft.
   Undo the drive shaft on the transmission.

9. Press drive shaft out of the wheel hub toothing.

Note

Since the drive shaft can be moved only using great force, loosen the shaft inwards with taps on a copper mandrel. Raise the shaft in the area of the inner joint (damage to the closure cap of the drive shaft possible).
For unfavourable tolerances, the drive shaft must be pressed out of the wheel hub toothing using a universal wheel hub extractor (Fig. 42210004).

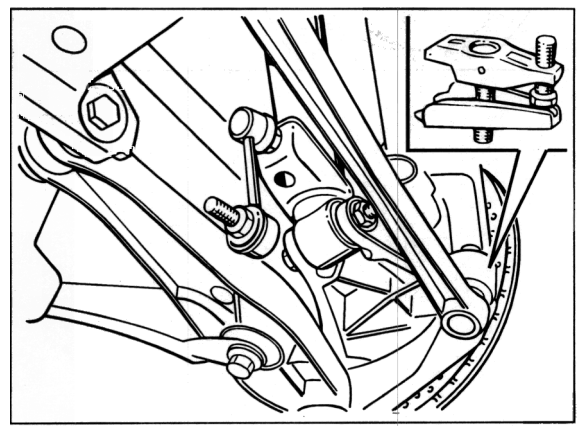


42210004

10. Press off tie rod ball joint on the wheel carrier using a commercially available ball joint extractor (tie rod extractor) – refer to Workshop Equipment Manual, Chapter 2.4, No. 113. When loosening the locknut, hold it with special tool 9546 (Torx screwdriver).

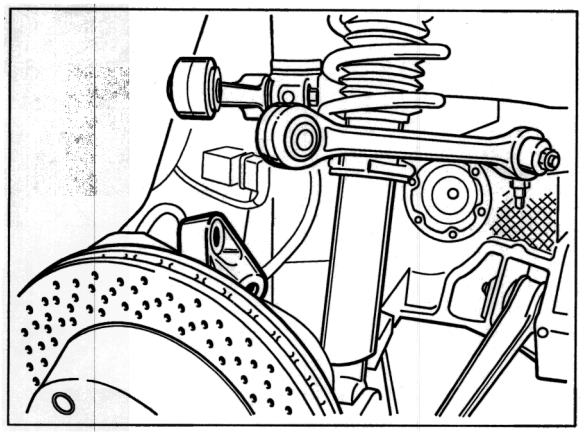
Note

Do not damage the boot of the ball joint when pressing off the ball joint. If necessary, coat the boot and the ball joint extractor with tyre mounting paste.



42090001

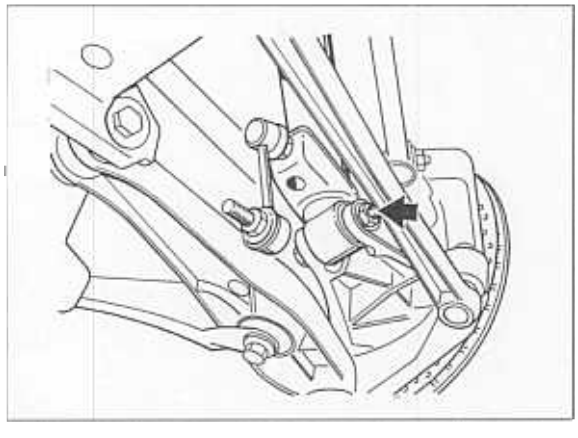
11. Loosen the outer ends of both upper arms and remove the screws.



42350001

12. Remove the ball joint from the control arm (lower arm).
For pressing off the ball joint, use special tool 9560.

13. Loosen the spring strut on the wheel carrier (arrow) and remove the wheel carrier.



180_97

Installation

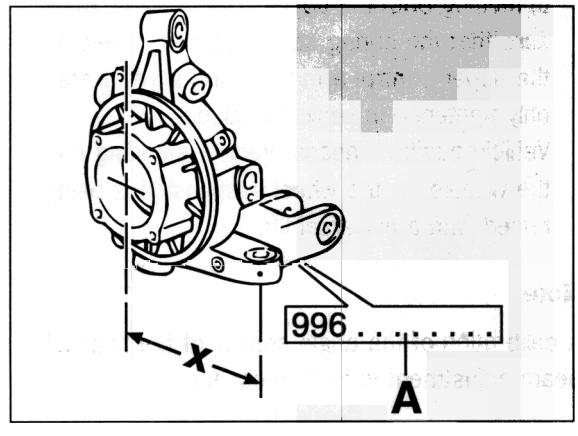
1. Install in reverse order. Before installing, visually inspect all parts.
Replace self-locking nuts.
Use correct tightening torques.

Note

When replacing wheel bearing housings (wheel carriers), **pay close attention to the correct allocation.**
It is only permissible to install identical wheel bearing housings (wheel carriers) – **short or long steering arm**
(dimension X = approx. 124 mm or approx. 147 mm) – on one vehicle!

Use of wheel carriers with the **long** steering arm – in production – partly in the current model year 1999 (X), but generally as of model year 2000 (Y).

Wheel carriers with a **long** steering arm – dimension X = approx. 147 mm – can be installed retroactively **in pairs.**
For a detailed explanation – for instance, parts which **must also be used** when converting a wheel carrier **with a long steering arm** – see under "Replacing wheel carriers (after installation)".

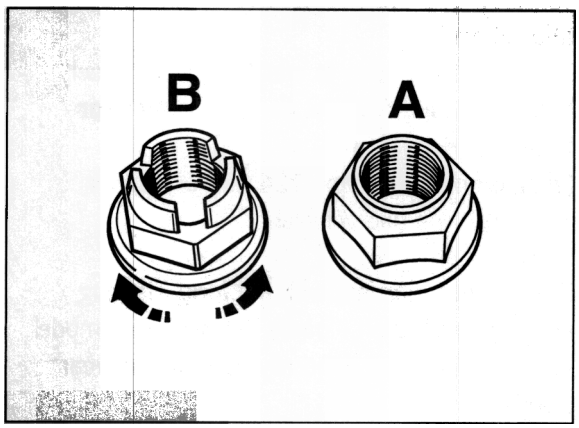


X - Length of the steering arm

2. Grease the toothing of the drive shaft with Optimoly HT.

Note

Only optimised axle nuts – **version B** – for drive shaft fastening are available from the Parts Service.



A - Single-part fastening nut 42210006

B - Two-part fastening nut (moveable washer/arrows) SP No. 999 084 640 02 (status 09/99)

3. Fit the brake caliper. Replace fastening screws.

4. When installing the wheel carrier and tightening both the upper control arms, make sure that the spring strut fastening screw and the upper control arm fastening screws are only tightened in vehicle position.
Vehicle position means: Vehicle standing on the wheels, or the wheel suspension is being raised with a universal lift.

Note

A calibration of the angle sensor of the headlight beam adjustment is not necessary.

5. Perform a suspension alignment after installation.

Replacing wheel bearing housings (wheel carriers)

Wheel carriers with a **short** steering arm (original version / dimension X = approx. 124 mm) and wheel carriers with a **long** steering arm (optimised wheel carriers) (dimension X = approx. 147 mm) are available from the Parts Service.

Use of wheel carriers with the **long** steering arm – in production – partly in the current model year 1999 (X), but generally as of model year 2000 (Y).

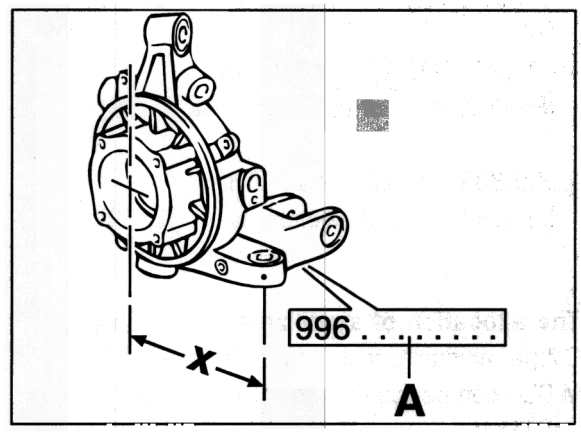
Wheel carriers with the short steering arm – dimension X = approx. 124 mm – will remain available.

The retroactive installation of wheel carriers with a **long** steering arm – **only in pairs** – is permissible!
When installing wheel carriers with a long steering arm for the first time, the following parts must be used:

1. A differently shaped stabilizer (for reasons of space).

2. Optimised tie rods (toe control arms) with harder rubber mount.

In general, the following applies: Only wheel carriers (wheel bearing housing) of the same version – long or short steering arm (dimension X) – may be installed on any one vehicle.



*A - stamped No. on the underside** 42520002
X - length of the steering arm

A – stamped No. on the underside of wheel carriers with **short** steering arm*
Dimension X = approx. 124 mm
996.331.611.05/ 996.331.612.05
SP No. 996.331.111.05 / 996.331.112.05

A – stamped No. on the underside of wheel carriers **with long** steering arm*
Dimension X = approx. 147 mm
996.331.611.06 / 996.331.612.06
SP No. 996.331.111.06 / 996.331.112.06

611 or 111 (7...9 figure of the no.) = left section
612 or 112 (7...9 figure of the no.) = right section

The stamped number is missing on the underside of some wheel carriers in the initial series.

Note

Distinguishing features and spare part numbers of further parts to be used in first installation of wheel carriers with a **long** steering arm can be found in the text below.

Replacing wheel bearing housings (wheel carriers)

1. Required stabilizer

The use of wheel carriers with a **long** steering arm is only permissible in conjunction with the following stabilizers:

- 996.333.701.**16** = ø 18.5 mm
  (Production as of calendar week 26/99)

- 996.333.701.**17** = ø 19.6 mm
  (Production as of calendar week 26/99)

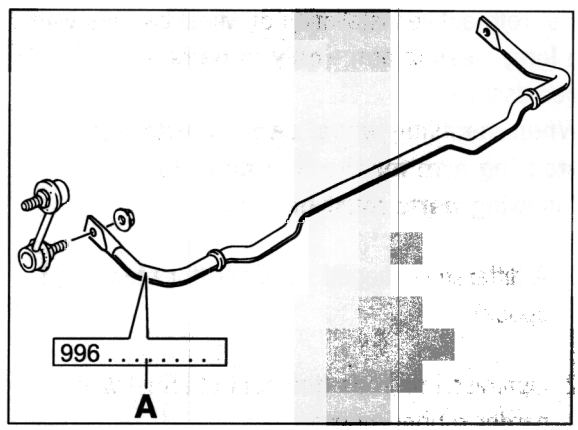
- 996.333.701.**20** = ø 20.7 mm
  (Production as of calendar week 36/99)

The allocation of stabilizers for the Coupe, Cabrio, manual transmission, Tiptronic, C4, M 030 can be found in the Spare Parts Catalogue.

Distinguishing feature/identification of the stabilizer models

1. Sticker (A) with the spare part number (SP No.)

2. Production date/calendar week (see text above) in conjunction with the outer diameter, insofar as the SP No. (sticker A) of the stabilizer is no longer legible.
   The production week (calendar week) is imprinted into one of the two flattened areas where the stabilizer mounts are fitted.
   Example: 26 9 imprinted.
   Corresponds to **26th** week 199**9** (week and year may also stand above each other).

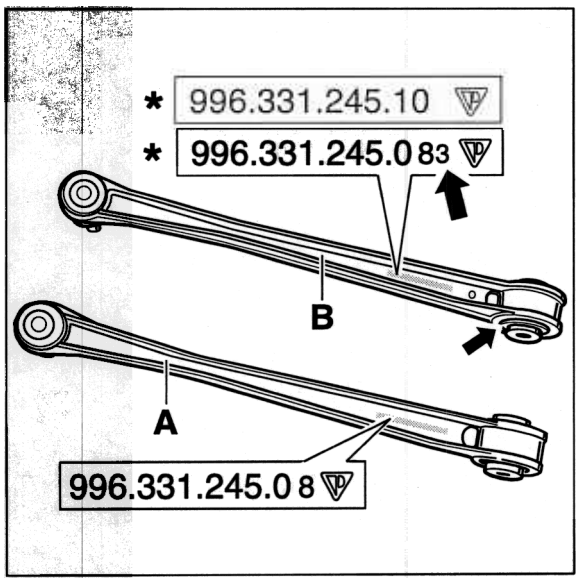


A - sticker with the spare part number (SP No.) 42900002

Replacing wheel bearing housings (wheel carriers)

2. Required tie rods (toe control arms)

The use of wheel carriers with a **long** steering arm is only **permissible** in conjunction with tie rods version **B** – SP No. 996.331.045.10.
It is only permissible to install these tie rods **in pairs**.



292_99

A - Tie rods ***without*** *spherical mount*
SP No. 996.331.045.06 / 07 / 08
Cast No. 996.331.245.06 / 07 / 08

B - Tie rods ***with*** *the spherical mount (optimised tie rods with harder rubber mount).*
SP No. 996.331.045.10
*Cast No. * 996.331.245.10 (current)* **or**
*Cast No. * 996.331.245.08* **3** *(the 3 was stamped at the end of the cast number in order to distinguish it* ***(arrow)*** *and was additionally provided with a blue dot in this area).*

On tie rod version B, the metal bushing of the rubber mount projects slightly – by approx. 1 mm – at both sides (arrow).

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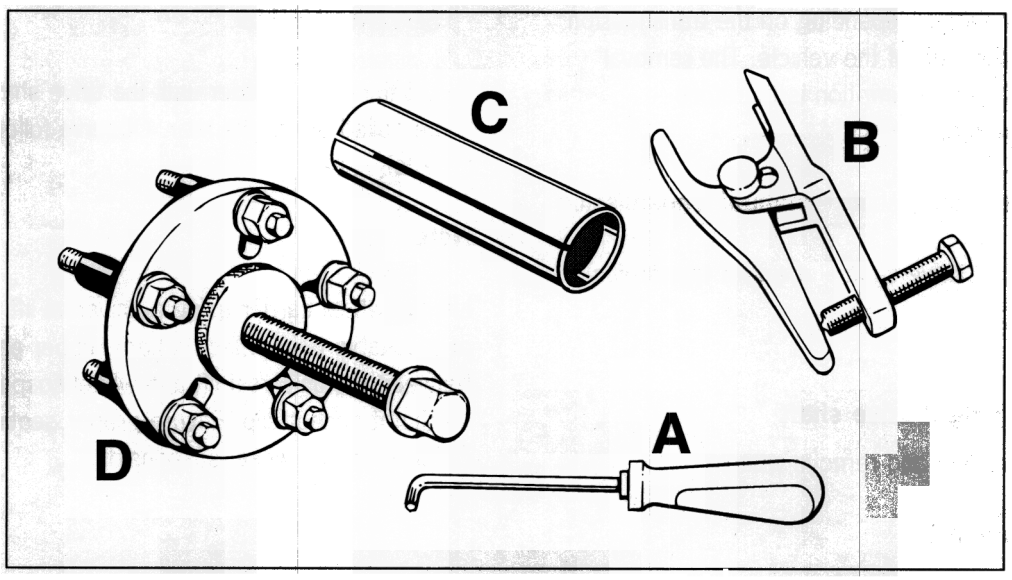
42 21 19 Removing and installing drive shaft (manual transmission)

Tools



42210007

Item	Designation	Special tool	Explanation
A	Torx screwdriver	9546	required only for Tiptronic vehicles
B	Press-out tool (ball joint extractor)	9560	required only for Tiptronic vehicles
C	Protective tube	Shop-made	For protecting the drive shaft Ø approx. 30 mm
D	Universal wheel hub extractor	Commercially available, refer to Technical Equipment Manual, Chapter 2.4, No. 87-1.	To press the drive shaft out of the wheel hub

Printed in Germany - 39, 2000 9964231

Removing and installing right drive shaft (manual transmission)

Note

The available space for drive shaft removal and installation varies depending on the transmission type and the side of the vehicle. The removal and installation description is therefore subdivided into:

Right drive shaft – **manual transmission**

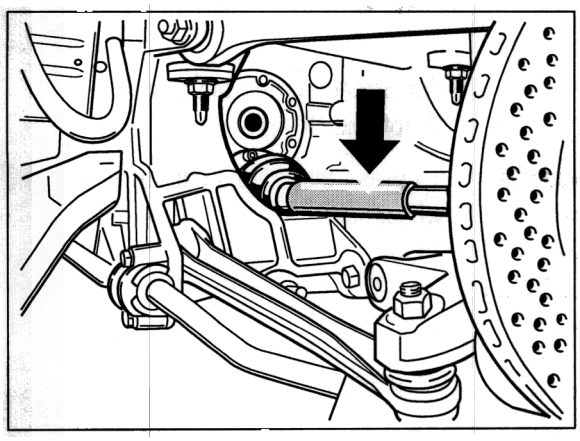
Left drive shaft – **manual transmission**

Removing right drive shaft

1. Raise vehicle and remove wheel.

2. Undo axle nut.

3. Slide a suitable protector (e.g. plastic tube, old coolant hose – Ø approx. 30 mm) over the drive shaft.
   Undo the drive shaft on the transmission flange.



42210008

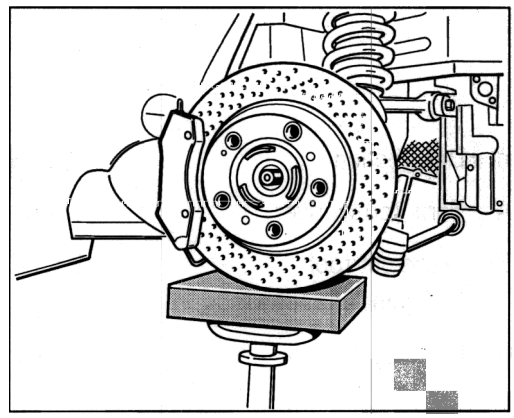
4. Remove stabilizer mount on the stabilizer.

5. Remove right spring strut, see Serv. No. 427119.

6. Lift the wheel carrier until the drive shaft can be pulled out to the rear. Observe following note!

Note

Lift the wheel carrier using a universal lift placed at a suitable point. Place a hard rubber pad between the universal lift and wheel suspension so that it cannot slip. Ensure proper seating and carefully lift the wheel suspension.

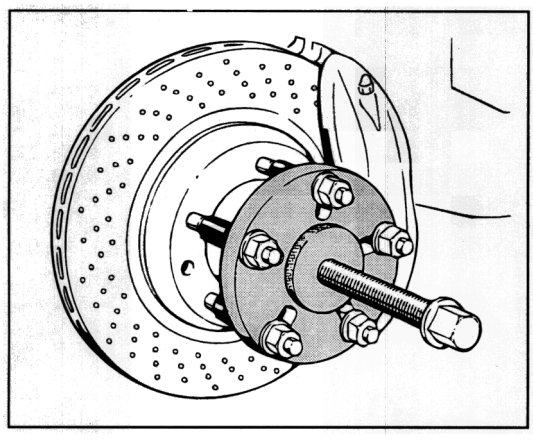


(Illustration shows the left side) 42520001

Press drive shaft out of the wheel hub toothing.

Note

Since the drive shaft can be moved only using great force, loosen the shaft inwards with taps on a copper mandrel. Lift up the shaft near the inner joint (possible damage to the closure cap of the drive shaft may occur).
For unfavourable tolerances, the drive shaft must be pressed out of the wheel-hub toothing using a universal wheel-hub extractor.
Always check the boots for damage if continuing to use the drive shaft!
Replace the boots if necessary.



42210004

8. Remove the drive shaft. To do this, take the drive shaft on the transmission out in **rearward and downward** direction.

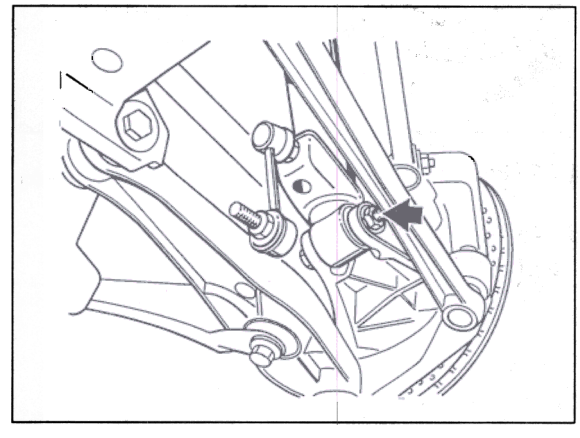
Installing right drive shaft

– Install in reverse order. Grease the toothing of the drive shaft with Optimoly HT.

Carry out a visual inspection of all parts.
Replace self-locking nuts.
Use correct tightening torques.

Note

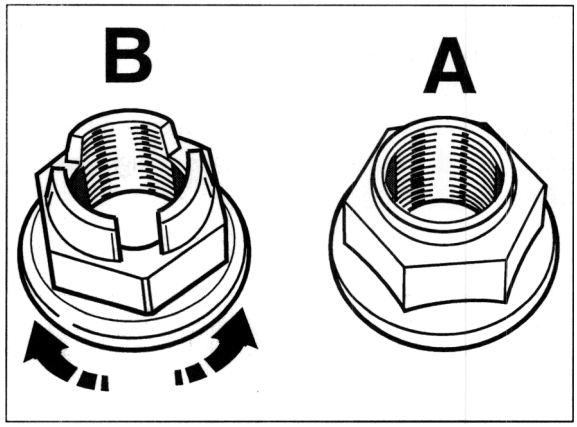
When installing the spring strut, make sure that the spring-strut fastening screw (arrow) is tightened only in vehicle position.
Vehicle position means: Vehicle standing on the wheels, or the wheel suspension is being raised with a universal lift.



180_97

Note

Only optimised axle nuts – **version B** – for drive-shaft fastening are available from the Parts Service.
These two-part fastening nuts (M22) have a moveable washer (arrows).
Retrofitting is possible for all 911 Carrera (996) vehicles and for all Boxsters.



A - Single-part fastening nut 42210006

B - Two-part fastening nut (moveable washer/arrows) SP No. 999 084 640 02 (status 04/00)

Removing and installing left drive shaft (manual transmission)

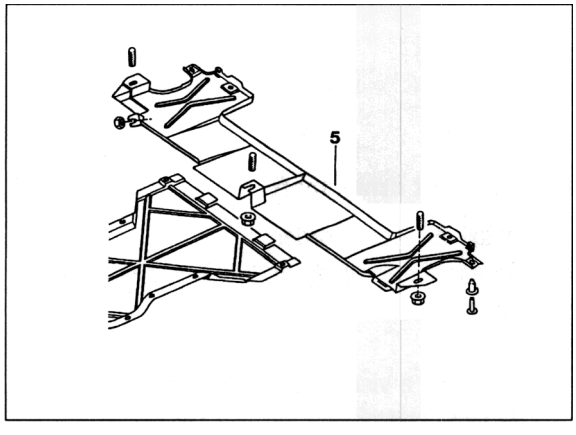
Removing left drive shaft

Raise vehicle and remove wheel.

2. Undo fastening nut at the outside of the drive shaft.

3. Slide a suitable protector (e.g. plastic tube, old coolant hose – Ø approx. 30 mm) over the drive shaft.
Undo the drive shaft on the transmission flange.

4. Remove the rear underbody cover (5).

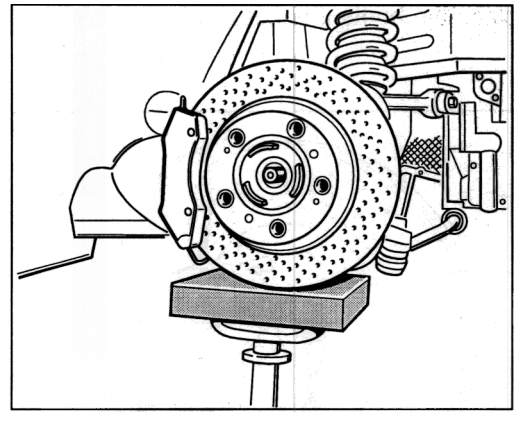


691_96

5. Compress the wheel carrier (50...60 mm).

Note

Lift the wheel carrier using a universal lift placed at a suitable point.
Place a hard rubber pad between the universal lift and wheel suspension so that it cannot slip.
Ensure proper seating and carefully lift the wheel suspension.

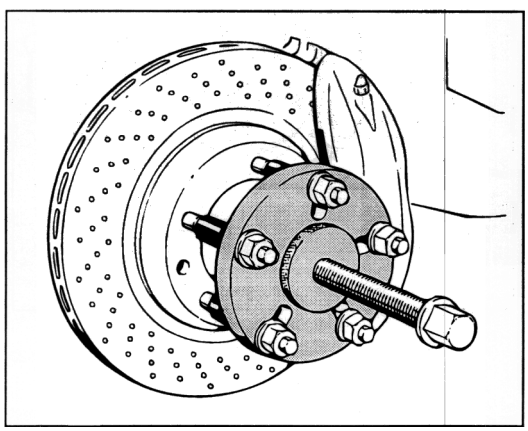


42520001

6. Press drive shaft out of the wheel-hub toothing.

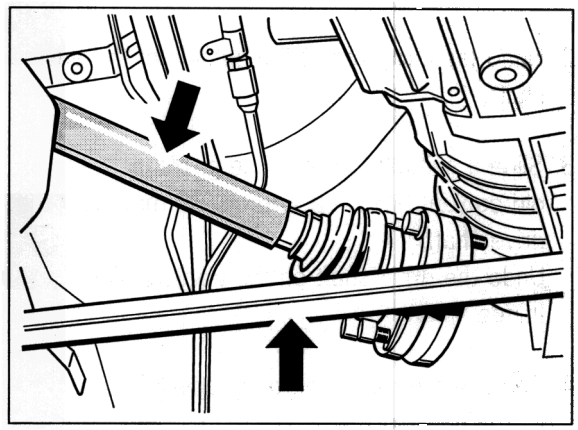
Note

Since the drive shaft can be moved only using great force, loosen the shaft inwards with taps on a copper mandrel. Lift up the shaft near the inner joint (possible damage to the closure cap of the drive shaft may occur).
For unfavourable tolerances, the drive shaft must be pressed out of the wheel-hub toothing using a universal wheel-hub extractor (Fig. 42210004).
Always check the boots for damage if continuing to use the drive shaft!
Replace the boots if necessary.



(Figure shows the right-hand side) 42210004

7. Remove drive shaft. To do this, pull out the drive shaft over the transverse strut to the **front and downward** (arrows).



42210009

Installing left drive shaft

– Install in reverse order.
Grease the toothing of the drive shaft with Optimoly HT.

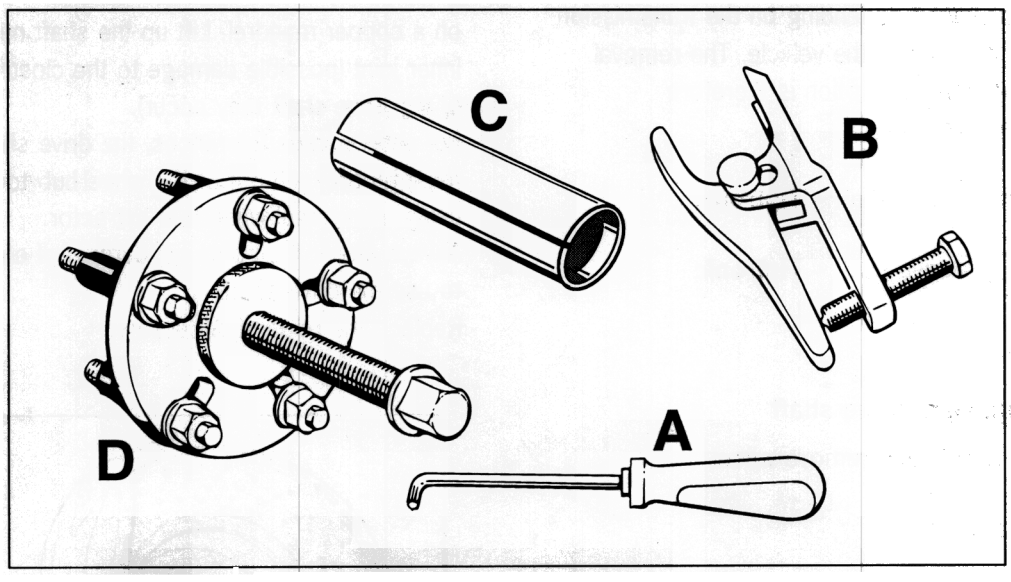
Carry out a visual inspection of all parts.
Replace self-locking nuts.
Use correct tightening torques.

Note

Only optimised axle nuts for drive-shaft fastening are available from the Parts Service.
Pictures and text can be found under the installation instructions for the right drive shaft.

42 21 19 Removing and installing drive shaft (Tiptronic transmission)

Tools



42210007

Item	Designation	Special tool	Explanation
A	Torx screwdriver	9546	To counter the ball joint when assembling and disassembling the fastening nuts.
B	Press-out tool (ball joint extractor)	9560	To press out the ball joints on the wheel carrier.
C	Protective tube	Shop-made	For protecting the drive shaft Ø approx. 30 mm
D	Universal wheel-hub extractor	Commercially available, refer to the Workshop Equipment Manual, Chapter 2.4, No. 87-1	To press the drive shaft out of the wheel hub

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Removing and installing right drive shaft (Tiptronic transmission)

Note

The available space for drive shaft removal and installation varies depending on the transmission type and the side of the vehicle. The removal and installation description is therefore subdivided into:

Right drive shaft – **Tiptronic**

Left drive shaft – **Tiptronic**

Removing right drive shaft

1. Raise vehicle and remove wheel.

2. Undo axle nut.

3. Slide a suitable protector (e.g. plastic tube, old coolant hose – Ø approx. 30 mm) over the drive shaft.
   Undo the drive shaft on the transmission flange.

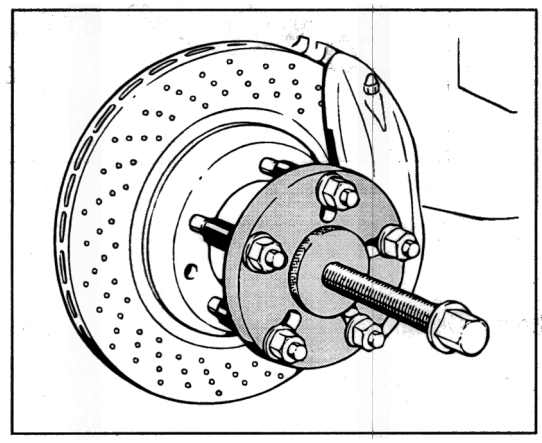
4. Remove stabilizer mount on the stabilizer.

5. Remove right spring strut, see Serv. No. 42 71 19.

6. Press drive shaft out of the wheel-hub toothing.

Note

Since the drive shaft can be moved only using great force, loosen the shaft inwards with taps on a copper mandrel. Lift up the shaft near the inner joint (possible damage to the closure cap of the drive shaft may occur).
For unfavourable tolerances, the drive shaft must be pressed out of the wheel-hub toothing using a universal wheel-hub extractor.
Always check the boots for damage if continuing to use the drive shaft!
Replace the boots if necessary.



42210004

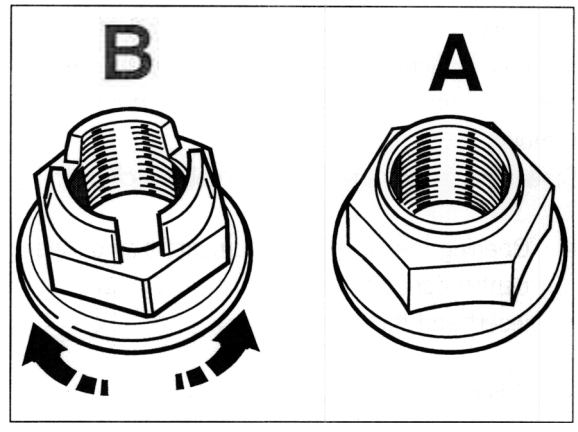
7. Remove drive shaft. To do this, push the drive shaft on the transmission **to the rear and upward** until the drive toothing can be pulled out of the wheel carrier. Pull shaft out to the front.

Installing right drive shaft

Install in reverse order.
Grease the toothing of the drive shaft with Optimoly HT.

Carry out a visual inspection of all parts.
Replace self-locking nuts.
Use correct tightening torques.

When installing the spring strut, make sure that the spring-strut fastening screw – on the wheel carrier – is tightened only in vehicle position.
Vehicle position means: Vehicle standing on the wheels, or the wheel suspension is being raised with a universal lift.



A - Single-part fastening nut 42210006

B - Two-part fastening nut (moveable washer/arrow) Part No. 999 084 640 02 (status 04/00)

Note

Only optimised axle nuts **– version B –** for drive shaft fastening are available from the Parts Service.
These two-part fastening nuts (M22) have a moveable washer (arrows).
Retrofitting is possible for all 911 Carrera (996) vehicles and for all Boxsters.

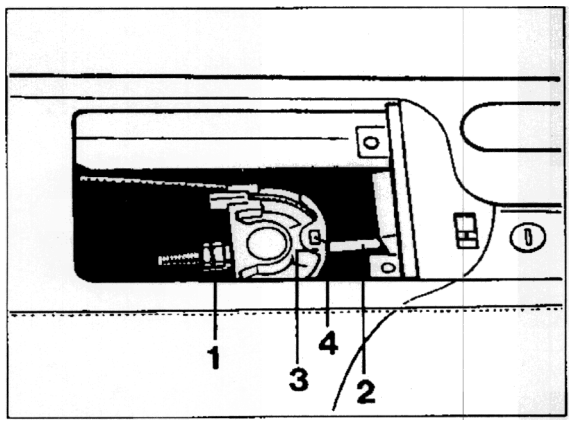
Removing and installing left drive shaft (Tiptronic transmission)

The parking brake cable must be disengaged from the parking brake lever in the passenger compartment before the left drive shaft can be removed.
Disengaging the parking brake cable includes:

Opening the lid of the oddments tray on the centre console and removing the rubber insert and the holder.

Disengaging tab washer of the turnbuckle from the retaining lug on the upper and lower sides.

Disengaging the relevant parking brake cable from the turnbuckle.



1 Lock nut and adjusting nut 18_1_96
2 Pull rod
3 Tab washer
4 Retaining lug

Removing left drive shaft

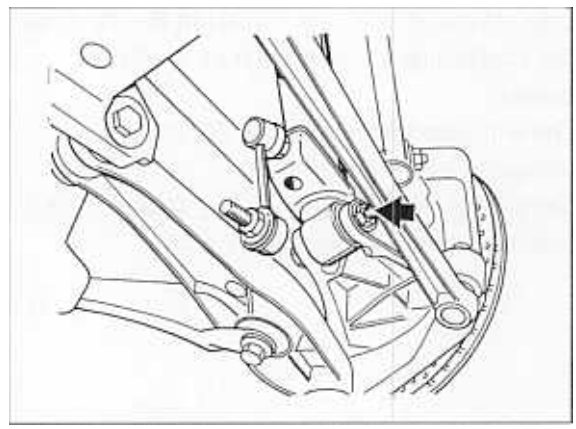
1. Raise vehicle and remove wheel.

2. Undo axle nut.

3. Slide a suitable protector (e.g. plastic tube, old coolant hose – Ø approx. 30 mm) over the drive shaft.
   Undo the drive shaft on the transmission flange.

4. Remove stabilizer mount on the stabilizer.

5. Loosen but do not remove the spring strut screw (arrow).



(Illustration shows the right side) 180_97

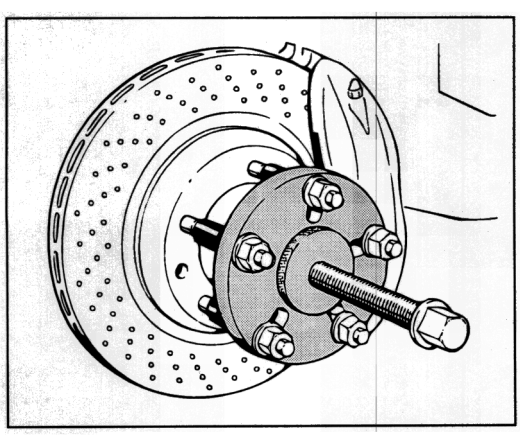
6. Pull sensor cable (brake pad thickness monitoring) out of the holder on the body and on the brake caliper.

7. Unscrew strut of the headlight beam adjustment system on the lower control arm. Counter with a second open-ended wrench when doing this.

8. Press drive shaft out of the wheel hub toothing.

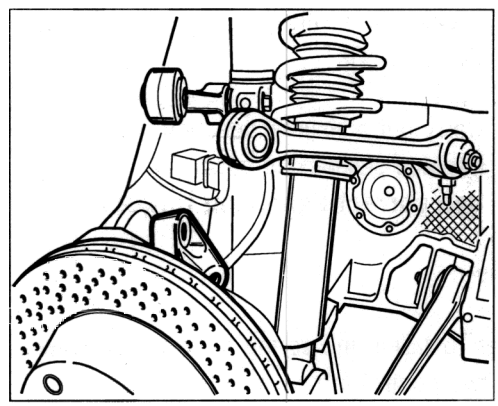
Note

Since the drive shaft can be moved only using great force, loosen the shaft inwards with taps on a copper mandrel. Lift up the shaft near the inner joint (possible damage to the closure cap of the drive shaft may occur).
For unfavourable tolerances, the drive shaft must be pressed out of the wheel-hub toothing using a universal wheel-hub extractor.
Always check the boots for damage if continuing to use the drive shaft!
Replace the boots if necessary.



42210004

9. Loosen the two upper control arms on the wheel carrier and remove the screws.



42350001

10. Press off the tie-rod ball joint on the wheel carrier with a press-out tool (ball joint extractor) – special tool 9560.
When loosening the locknut, hold it with special tool 9546 (Torx screwdriver).

Note

Do not damage the boot of the ball joint when pressing off the ball joint. If necessary, coat the boot and the ball joint extractor with tyre mounting paste.

11. Remove drive shaft. To do this, push the drive shaft on the transmission **rearward and upward**. Simultaneously fold the wheel carrier outward until the drive toothing can be pulled out of the wheel carrier. Pull the shaft out to the front (2nd fitter required).

Installing left drive shaft

Install in reverse order

Grease the toothing of the drive shaft with Optimoly HT.

Carry out a visual inspection of all parts.
Replace self-locking nuts.
Use correct tightening torques.

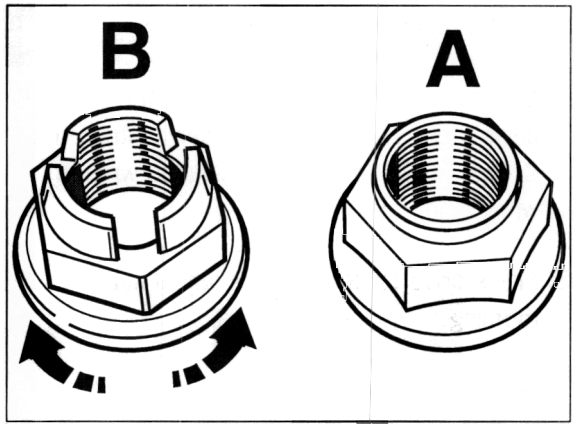
Note

When installing the spring strut and tightening the two control arms, make sure that the spring-strut fastening screw (on the wheel carrier) and the control arm fastening screws are only tightened in vehicle position.
Vehicle position means: Vehicle standing on the wheels, or the wheel suspension is being raised with a universal lift.

A calibration of the sensor of the headlight beam adjustment is not necessary.

Note

Only optimised axle nuts – **version B** – for drive-shaft fastening are available from the Parts Service.
These two-part fastening nuts (M22) have a moveable washer (arrows).
Retrofitting is possible for all 911 Carrera (996) vehicles and for all Boxsters.



A - Single-part fastening nut 42210006

B - Two-part fastening nut (moveable washer/arrow) Part No. 999 084 640 02 (status 04/00)

Check wheel-alignment values.
This step is necessary due to removal of the upper control arms on the wheel carrier.

44 Wheels and tyres

Tyre condition / tyre pressure

Tyres are a safety element which fulfil the demands placed on them only if they have the correct air pressure and a sufficient tread depth.

The stated air pressures are minimum pressures and must never be fallen below, since in addition to the unfavourable driving performance, this would bring about a risk of serious tire damage.

Valve caps protect the valve from dust and dirt and therefore from leaks. Always screw caps tight and replace any missing caps.

For reasons of safety, besides a check on air pressure a visual check should be made for sufficient tread depth, foreign bodies, punctures, cuts, cracks and bulges in the sidewall (ply breakage).

Cold tyre pressures (at approx. 20° C)

911 Carrera / 911 Carrera 4

17-inch wheels with summer tyres

front	2.5 bar overpressure
rear	2.5 bar overpressure

17-inch wheels with winter tyres

front	2.5 bar overpressure
rear	2.5 bar overpressure
(rear	2.8 bar overpressure)*

*2.8 bar at rear – **only for winter tyres 225/45 R 17** – after introduction of the cabriolet.
Also valid for coupe as from this time.
This tyre pressure can also be used for coupe vehicles before this time.

18-inch wheels

front	2.5 bar overpressure
rear	3.0 bar overpressure

Spare wheel

front/rear	4.2 bar overpressure

Collapsible wheel (for 911 Carrera 4)

front/rear	2.5 bar overpressure

911 GT3 M002 (street version) / 911 GT3 M003 (Club Sport version)

18-inch wheels (summer and winter tyres)

front	2.2 bar overpressure
rear	2.7 bar overpressure

Spare wheel / collapsible wheel

No spare wheel / collapsible wheel available. However there is a tyre repair kit in the luggage compartment which can be used to repair the damaged tyre in the event of damage.

For procedure in the event of damage (repair), see Tyre failure/tyre sealant 911 GT3 in Repair Group 44

Overview of tyres and wheels

The chart of tyres and wheels for summer and winter should be taken from Technical Information (TI) Group 4.
When replacing summer tyres, pay close attention to the tyre specification number. The specification characters N1, N2, N3 or N0 distinguish the summer tyres specially authorised by Porsche from other models of the same tyre type and size.

Notes on mounting tyres

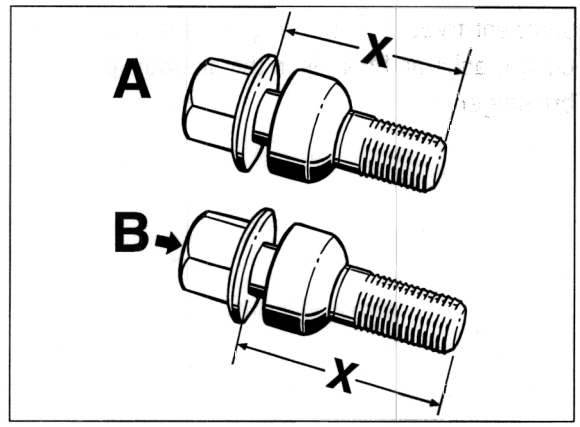
When fitting tyres, the direction of rotation and the inner and outer sides should be noted.

Mounting wheel on vehicle

The wheel bolt consists of **two parts that are permanently joined together.**
Other wheel bolts must not be used.
Mounting specification: see Page 44-19.

Note

There are 5 mm spacer washers (identical parts) fitted to the front and rear axles on the **911 GT3.**
The wheel bolts are 5 mm longer because of the spacer washers.
The **longer** wheel bolts are marked with **GT** or with a **red colour** (arrow) on the face surface of the bolt head. The colour of the spherical cap is also red from now on.



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A = Standard wheel bolt dimension X approx. 45 mm
B = GT3 wheel bolt dimension X approx. 50 mm marked with GT or red colour (arrow)

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44 Adjustment values for suspension alignment

The following values relate to the empty weight. This means: full fuel tank, vehicle with spare wheel (not GT3) and tools, but without driver and without additional weights.

911 GT3 M002 = street version
911 GT3 M003 = Club Sport version

Vehicle height

		Carrera 2/4 USA: Series and Sport	Carrera 2/4 RoW: Series	Carrera 2/4 RoW: Sport	GT3 M002 and GT3 M003
Front-axle height					
with 17-inch wheels	**mm**	157 ± 10	147 ± 10	137 ± 10	
with 18-inch wheels	**mm**	158 ± 10	148 ± 10	138 ± 10	112 - 10 (**112** to 102)
From road contact surface to lower edge of hexagon-head bolt (a/f 18) of the tension-strut screw connection to the body. Figure – measuring point Page 44 - 12 (as with Boxster)					
Rear-axle height					
with 17-inch wheels	**mm**	157 ± 10	157 ± 10	147 ± 10	
with 18-inch wheels	**mm**	163 ± 10	163 ± 10	153 ± 10	125 + 10 (**125** to 135)
From road contact surface to locating bore in rear axle side section (between toe and camber eccentrics). Figure – measuring point Page 44 - 12					

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Wheel alignment values

The following values relate to the empty weight. This means: full fuel tank, vehicle with spare wheel (not GT3) and tools, but without driver and without additional weights.

The steering angle sensor must be calibrated if the previous wheel alignment values for vehicles with PSM (Porsche Stability Management) were changed!
The steering angle sensor actual value must be checked after a suspension alignment which resulted in no changes being made to the wheel alignment values.
The Porsche System Tester 2 is necessary to calibrate the steering angle sensor and to check the steering angle sensor actual value. See description in 911 Carrera 4, Serv. No. 45 60 (Rep. Gr. 45).

911 GT3 M002 = street version / 911 GT3 M003 = Club Sport version

Front axle

	Carrera 2/4 USA: Series and Sport	Carrera 2/4 RoW: Series	Carrera 2/4 RoW: Sport	GT3 M002 and GT3 M003
Toe unpressed (total)	+ 5' ± 5'	+ 5' ± 5'	+ 5' ± 5'	+ 5' ± 5'
Toe difference angle** at 20° lock	– 1° 20' ± 30'	– 1° 50' ± 30'	– 2° 20' ± 30'	– 1° 30' ± 30'
Camber (with wheels straight ahead)	0° ± 15'	– 15' ± 15'	– 15' ± 15'	– 1° ± 10'
max. difference, left to right	20'	20'	20'	10'
Caster	8° ± 30'	8° ± 30'	8° ± 30'	8° ± 30'
max. difference, left to right	40'	40'	40'	40'

* A caster adjustment is normally not necessary and is therefore not present as standard.
In the event of repairs, a caster adjustment facility can be installed if necessary (as with the Boxster).
Refer to serv. No. 40 19 23 (in repair group 40) for the description.

** The toe-difference angle value is also influenced by the vehicle height. For this reason the measured result must be evaluated accordingly. No action is necessary in the case of small deviations from the toe-difference angle required value, as long as the value to the right and the left is almost the same.

Wheel alignment values

The following values relate to the empty weight. This means: full fuel tank, vehicle with spare wheel (not GT3) and tools, but without driver and without additional weights.

The steering angle sensor must be calibrated if the previous wheel alignment values for vehicles with PSM (Porsche Stability Management) were changed!
The steering angle sensor actual value must be checked after a suspension alignment which resulted in no changes being made to the wheel alignment values.
The Porsche System Tester 2 is necessary to calibrate the steering angle sensor and to check the steering angle sensor actual value. See description in 911 Carrera 4, Serv. No. 45 60 (Rep. Gr. 45).

911 GT3 M002 = street version
911 GT3 M003 = Club Sport version

Rear axle

	Carrera 2/4 USA: Series and Sport	**Carrera 2/4 RoW: Series**	**Carrera 2/4 RoW: Sport**	**GT3 M002 GT3 M003**
Toe per wheel	+10' ± 5' *	+ 10' ± 5' *	+ 10' ± 5' *	+10' + 5'
max. difference, left to right	10'	10'	10'	10'
Camber	– 1°10' ± 15' *	– 1°10' ± 15' *	– 1°10' ± 15' *	– 1°50' ± 10'
max. difference, left to right	20'	20'	20'	10'

Altered values which are also valid **retroactively – from start of production.**
Previous values: Toe per wheel = + 5' ± 5' / camber = – 1°25' ± 15'

44 Alignment cards for Carrera (996) and GT3

Important notes

Since mainly electronic wheel-alignment testers in conjunction with printers are used, a specimen alignment card is rarely required nowadays.

So that measured results can be documented in individual cases, however, a copy of the alignment cards shown on the following pages can be used.

The alignment cards can be used for **all 911 Carrera (996) vehicles** – USA (series / sport), RoW series and RoW sport **and 911 GT3**.

In practice this means the following:

Alignment cards cannot be ordered for **the 911 Carrera (996) and 911 GT3**.

Prepare copies of the corresponding alignment card shown.

Before measurement, enter the general data, vehicle model and the missing nominal values into the copied alignment card.
Actual values that are equal for all designs have already been entered.
Enter the appropriate version, e.g. USA, RoW series or RoW sport, in the **Model** column.

Carry out **incoming measurement** (actual state) and enter the values in the alignment card.

After adjustments (if any were necessary), enter the current values in the column **Outgoing measurement**.

996446 Printed in Germany - 33, 1999

Porsche suspension alignment 911 Carrera (996)

Customer:		Rep. Order No.:	
Street:		Vehicle Ident No.:	
Place:		License number:	
Tel.		Date of first registration:	
		Odometer reading:	km/miles
Measurement made by:		Date/Signature:	

Vehicle: 911 Carrera (996) **Model:** [redacted]

Measurement precondition (vehicle weight): empty weight as in DIN 70020.
This means: full fuel tank, vehicle with spare wheel and tools.

Reason for measurement:

Make of tyres: Size/model: front rear

	front left	front right		rear right
Tyre pressure (cold tyres) bar				
Tyre/wheel (any damage) Tyres – tread depth (mm)				

			Incoming measurement	Nominal values max. difference L /R	Outgoing measurement
Vehicle height	Front height (mm)	left right			
	Rear height (mm)	left right			
Rear axle	Camber	left right		- 1°25'/ +0°15' - 0°15' 20'	
	Toe	left right		+0°05'/ +0°05' - 0°05'	
		total		+0°10'/ +0°10' - 0°10'	
	Drive-axle angle			+0°00'/ +0°10' - 0°10'	
Front axle	Caster	left right		+8°/ +0°30' - 0°30' 40'	
	Toe-difference angle	left right			
	Camber	left right		20'	
	Toe	left right		+0°03'/ +0°03' - 0°03'	
		total		+ 0°05'/ + 0°05' - 0°05'	

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Porsche suspension alignment 911 GT3

Customer:	Rep. Order No.:
Street:	Vehicle Ident No.:
Place:	License number:
Tel.	Date
	Odometer reading: km/miles
Measurement made by:	Date of last alignment:

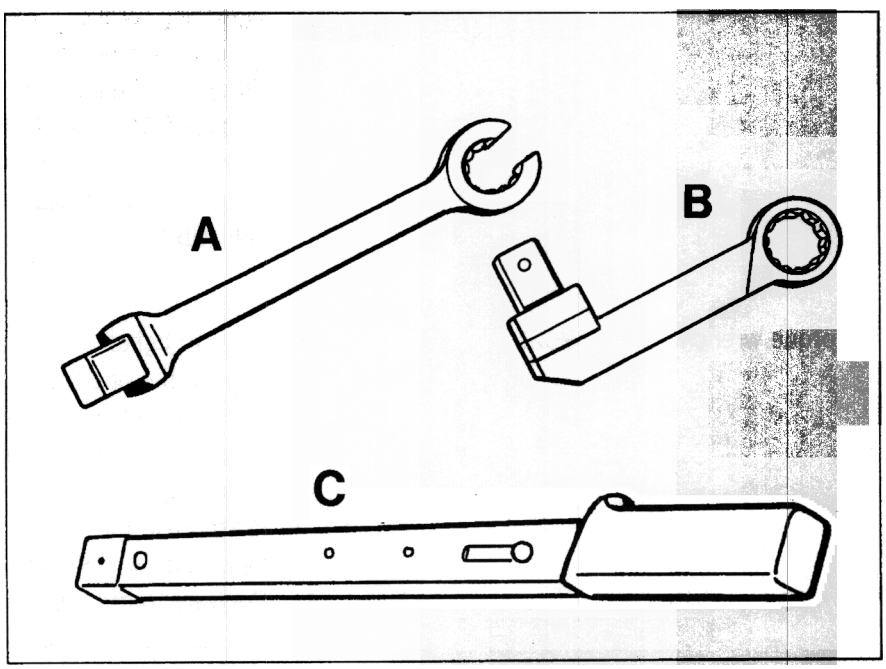
Vehicle: 911 GT3 M002 / 911 GT3 M003
Measurement precondition (vehicle weight): empty weight as in DIN 70020.
This means: full fuel tank and vehicle with tools.
Reason for measurement:
Make of tyres: Size/model: front rear

	front left	front right	rear left	rear right
Tyre pressure (cold tyres) bar				
Tyre/wheel (any damage) Tyres – tread depth (mm)				

			Incoming measurement	Nominal values max. difference L /R	Outgoing measurement
Vehicle height	Front height/wheel load (mm / kg)	left right	/ /	112 mm/ - 10 mm 5 mm/15 kg	/ /
	Rear height/wheel load (mm / kg)	left right	/ /	125 mm/ + 10 mm 5 mm/15 kg	/ /
Rear axle	Camber	left right		- 1°50'/ +0°10' - 0°10' 10'	
	Toe	left right		+0°10'/ +0°05' - 0°00'	
		total		+0°20'/ +0°10' - 0°00'	
	Drive-axle angle			+0°00'/ +0°10' - 0°10'	
Front axle	Caster	left right		+8°/ +0°30' - 0°30' 40'	
	Toe-difference angle	left right			
	Camber	left right		- 1° / +0°10' - 0°10' 10'	
	Toe	left right		+0°03'/ +0°03' - 0°03'	
		total		+ 0°05'/ + 0°05' - 0°05'	

44 Suspension alignment, complete

Tools



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Tools

No.	Designation	Special tool	Explanation
A	Insert for torque wrench	9625	Used to tighten the lock nut(s) at the front track bar(s) to the specified tightening torque. It can also be used for loosening. The prescribed lock-nut tightening torque of **50 Nm (37 ftlb.)** corresponds to a setting on the torque wrench **of approx. 35 Nm (26 ftlb.)**.
B	Insert for torque wrench	9626	Used to tighten the fastening nuts of the camber and toe eccentrics at the rear axle to the specified tightening torque. It can also be used for loosening. Prescribed tightening torque of the lock nut(s) = **100 Nm (74 ftlb.)**. Contrary to previous specifications, this also corresponds to a setting on the torque wrench of 100 Nm (74 ftlb.).
C	Torque wrench covering the range between 35 Nm (26 ftlb.) and 85 Nm (63 ftlb.		Commercially available; use in combination with tools A and B. **Important: Observe the changed tightening torque when using the inserts A (special tool 9625).**

Suspension alignment, complete

Important notes

Suspension alignment on the new 911 Carrera (996) differs in a number of respects from that of the previous 911 Carrera suspension alignment procedures. This involves the vehicle height adjustment, the wheel-load difference from left to right, special tools and corrections to wheel alignment.

Vehicle height/wheel load

There is no facility for adjusting the vehicle height. This applies to both the front and the rear axles.
The varying thickness of pads between coil springs and spring seats on the right and left spring struts on the front and rear axles is not intended for changing the vehicle height but for compensating for differences in coil-spring load groups.
Since the vehicle height can no longer be adjusted, **there is no need for adjustment** (fine adjustment) of the wheel-load difference between left and right at the front and rear axles. Because of the different equipment versions (additional equipment), a **greater** wheel-load difference between the left and right is permissible than previously was the case in Porsche suspension alignment (over 20 kg is possible; max. was previously 20 kg).
This is partly the result of heavier components compared with standard equipment and partly results from additional components that are asymmetrically arranged.

Wheel-alignment corrections

Rear axle: The kinematic toe-in is not adjustable. Camber and toe can be adjusted via eccentrics.

Front axle: The caster is not adjustable on standard vehicles. In the event of repairs, a caster adjustment facility can be installed if necessary (as with the Boxster).
The camber is adjusted by moving the spring strut transversely. For this purpose, loosen the three fastening nuts of the spring-strut mount.
After adjusting the toe, **the lock nuts** on the track rods must be tightened to the prescribed tightening torque **of 50 Nm (37 ftlb.)**.

The steering angle sensor must be calibrated if the previous wheel alignment values for vehicles with PSM (Porsche Stability Management) were changed!
The steering angle sensor actual value must be checked after a suspension alignment which resulted in no changes being made to the wheel alignment values.
The Porsche System Tester 2 is necessary to calibrate the steering angle sensor and to check the steering angle sensor actual value. See description in 911 Carrera 4, Serv. No. 45 60 (Rep. Gr. 45).

Special tools

Description on Page 44 - 9 / 44 - 10.

Printed in Germany - 34, 1999 996449

General procedure for wheel alignment

Carry out suspension alignment with an optical or electronic wheel alignment tester.
The measurement procedures should be taken from the operating instructions for the wheel alignment tester involved.
In order to exclude erroneous measurements, the following preconditions must be met before alignment and the following points should be given special attention:

Empty weight of vehicle in accordance with DIN 70020, i.e. car ready for the road, with full fuel tank, spare wheel and tools.

Ball-joint and wheel-bearing play in order (wheel-bearing play cannot be adjusted).

Tyre pressure in accordance with regulations, fairly uniform tyre tread.

Quick-clamping holder with adapter (for the measured-value pickups) correctly secured to the wheels.

Receiving surfaces for the quick-clamping holder **on the wheels** and the adapter surfaces **must be clean and flat**. Always check the levelling surface on the wheels precisely in particular before fitting the quick-clamping holders.

Strictly comply with maintenance intervals for measuring equipment and measuring platform. If the levelling of the measuring platform or of the measuring area is done in-house, levelling equipment is required. A hose level is inadequate.

Skilled handling of measuring equipment and measuring platform.

Sliding plates with transverse motion (rotary motion) at the rear axle are advisable.

Observe the Technical Literature of PAG, the manufacturer of the measuring equipment and the manufacturer of the measuring platform.

Do not treat measured values as a whole, but **very critically** in regard to driving dynamics, high-speed strength of the tyres, tyre wear and cost/benefit effects (time required for correction of insubstantial deviations). The **toe values** are of decisive significance for **driving dynamics and tyre wear**.

If the vehicle is measured front and rear, check and adjust the **wheel alignment values at the rear axle first**. Camber values at the front axle apply for the straight-ahead position of the wheels. Steering wheel and steering gear in centre position when toe is being adjusted.

Before wheel alignment values are adjusted at front and rear axles, it is recommended that the vehicle height be checked at the DIN empty weight. Conclusions can then be drawn about wheel alignment values in the event of any suspension alignment that becomes necessary later.

Vehicle height (height check)

General

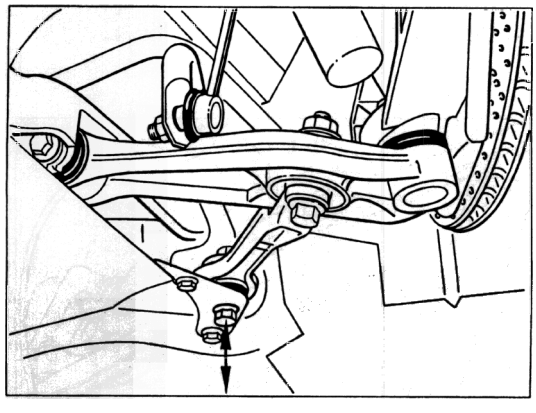
The vehicle height at front and rear axle is **not** adjustable.

Preliminary work

For the **height check**, place the vehicle on a level surface or on the measuring platform (ready to drive, with a full tank, spare wheel and tools). Compress vehicle at front and rear by approximately 25 mm 2-3 times and allow it to spring back freely.

Front axle

Measure from road contact surface to the lower edge of the hexagon-head bolt of the tension-strut screw connection to the body. Nominal values for front and rear axles are given on Page 44 - 3.



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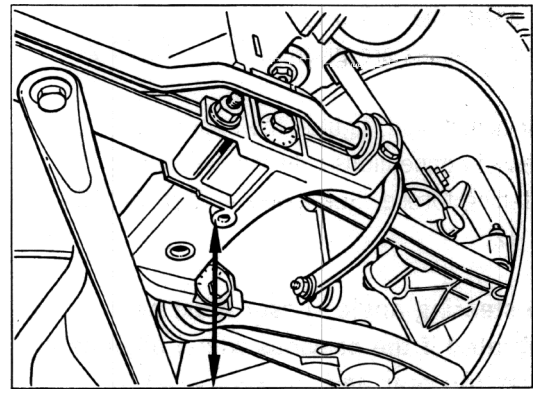
Rear axle

Measure from wheel contact surface to the locating bore in the rear-axle side section (between toe and camber eccentrics).



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Wheel alignment

Notes

Only check or adjust wheel-alignment values when prescribed preconditions are met (Page 44 - 12).

If the vehicle is measured front and rear, check and adjust the rear axle first.
Nominal values are given on Page 44 - 4 / 44 - 5.
After adjustment, tighten the appropriate screwed connections with the prescribed tightening torque. See tables in Rep. Gr. 40 and 42.

The steering angle sensor must be calibrated if the previous wheel alignment values (on rear and/or front axle) for vehicles with PSM were changed! See description in 911 Carrera 4, Serv. No. 45 60 (Rep. Gr. 45).

Important!
Malfunctions in the PSM control range if the steering angle sensor is not calibrated or is calibrated incorrectly.

> Calibrate the steering angle sensor with the wheels in straight-ahead position.

Rear axle

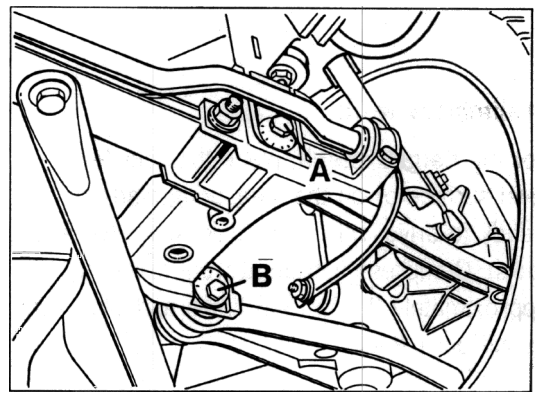
Prepare vehicle for checking and/or adjustment of wheel alignment values. Place front wheels on rotary table and rear wheels on rotary / sliding plates. Compress vehicle at front and rear by approximately 25 mm 2-3 times and allow it to spring back freely.

Adjusting toe

After loosening the lock nut, turn eccentric A appropriately.

Adjusting camber

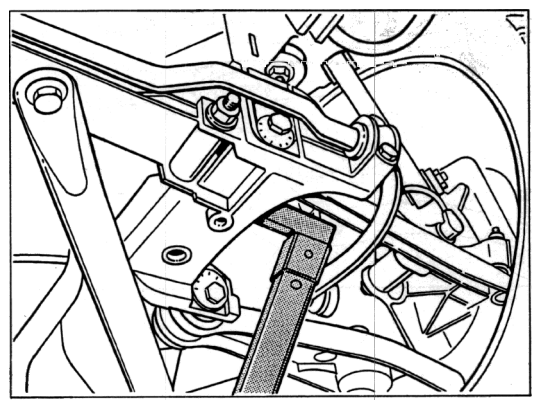
After loosening the lock nut, turn eccentric B appropriately.



4_2_97

Note

Use **special tool 9626** in combination with a torque wrench to loosen and tighten the fastening nuts of the toe and camber eccentrics. The prescribed lock-nut tightening torque of **100 Nm (74 ftlb.)** also corresponds to a setting on the torque wrench of approx. 100 Nm (74 ftlb.).

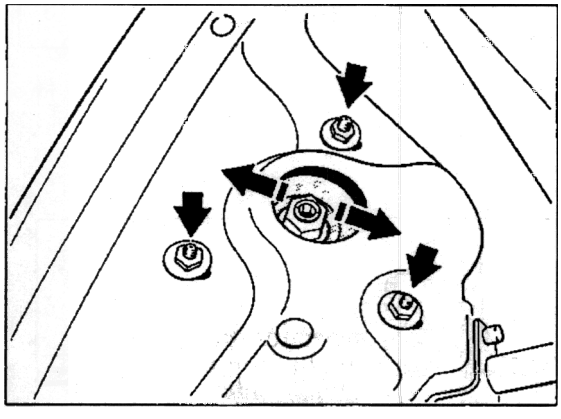


6_97

Front axle

Adjusting camber*

The camber is adjusted by moving the spring strut transversely. For this purpose, loosen the three fastening nuts on the spring-strut mount and, to move the spring strut, remove the covering cap on the piston rod.



16_96

Adjusting caster*

The caster is not adjustable on standard vehicles. In the event of repairs, a caster adjustment facility can be installed if necessary (as with the Boxster).
Refer to Serv. No. 40 19 23 (in repair group 40) for a description and for requirements.

*** The steering angle sensor must be calibrated if the previous wheel alignment values for vehicles with PSM (Porsche Stability Management) were changed!**

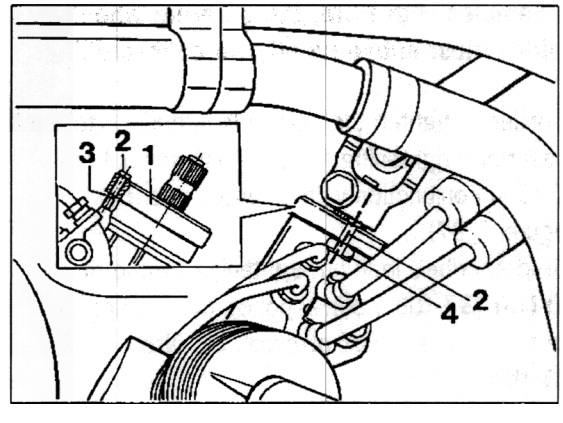
Adjusting toe*

Preliminary work: Check whether the steering wheel is displaced with respect to the steering gear. To do this, centre the steering gear as described below.

Turn wheels to the straight-ahead position.

Then readjust the front wheel alignment, if necessary, until pin No. 2 in driver No. 1 and the lug on the steering gear housing No. 4 line up.
No. 3 is the desired breaking point for pins **in new steering gears**. (New) pin No. 2 is inserted into driver No. 1 and lies with its underside within the recess of lug No. 4. This locks the steering gear in the centre position.
After installation of a new steering gear, the lower part of the pin is sheared off (at the desired breaking point No. 3) by turning the steering wheel. The upper part of the pin remains in the driver.

If necessary, reposition the steering wheel. When doing this, seek the best position.

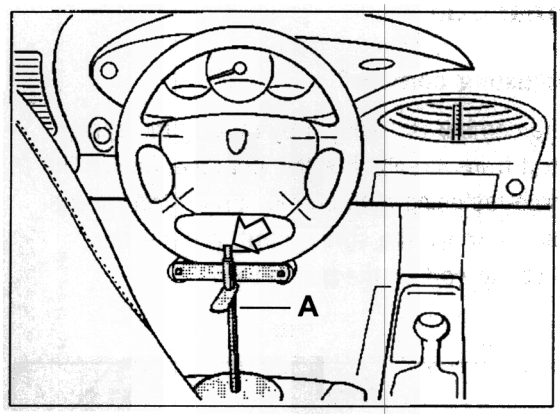


19_1_96

Warning!
A triggering of the airbag (malfunction in the airbag system) caused by improper work on airbag components cannot be ruled out!
In the case of such a malfunction, an unsuitable steering wheel holder could cause injury or damage!

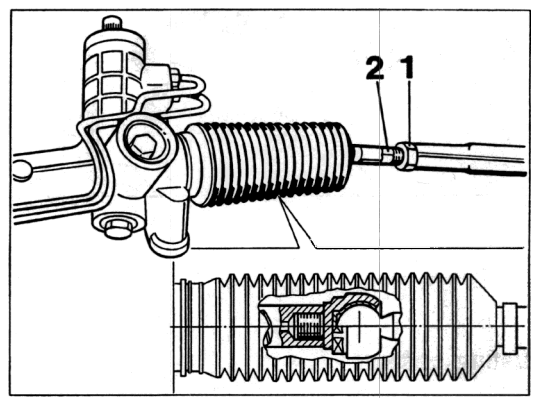
> Use only steering wheel holders which **do not** project into the area of the airbag unit!

> Observe safety regulations when working with airbag vehicles (see in Repair Group 69)!



106_96

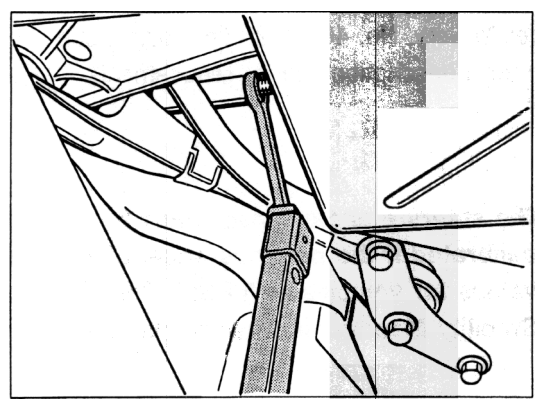
Clamp steering wheel **in centre position with steering wheel holder** (Figure 106_96).
Use only steering wheel holders which **do not** project into the area of the airbag unit! If necessary, shorten the guide rod (A) at top (arrow).



133_1_96

Then adjust **toe** at hexagon No. 2 of the track rod(s) after loosening the lock nut(s) No. 1 (Figure 133_1_96).
In vehicles with PSM, the steering wheel holder must subsequently be calibrated!

In order to tighten the tie rod lock nut(s) – to the prescribed tightening torque – use special tool 9625 in conjunction with a torque wrench (Figure 7_97).
The prescribed lock nut tightening torque of **50 Nm (37 ftlb.)** corresponds to a setting on the torque wrench **of approx. 35 Nm (26 ftlb.)**.



Special tool 9625 7_97

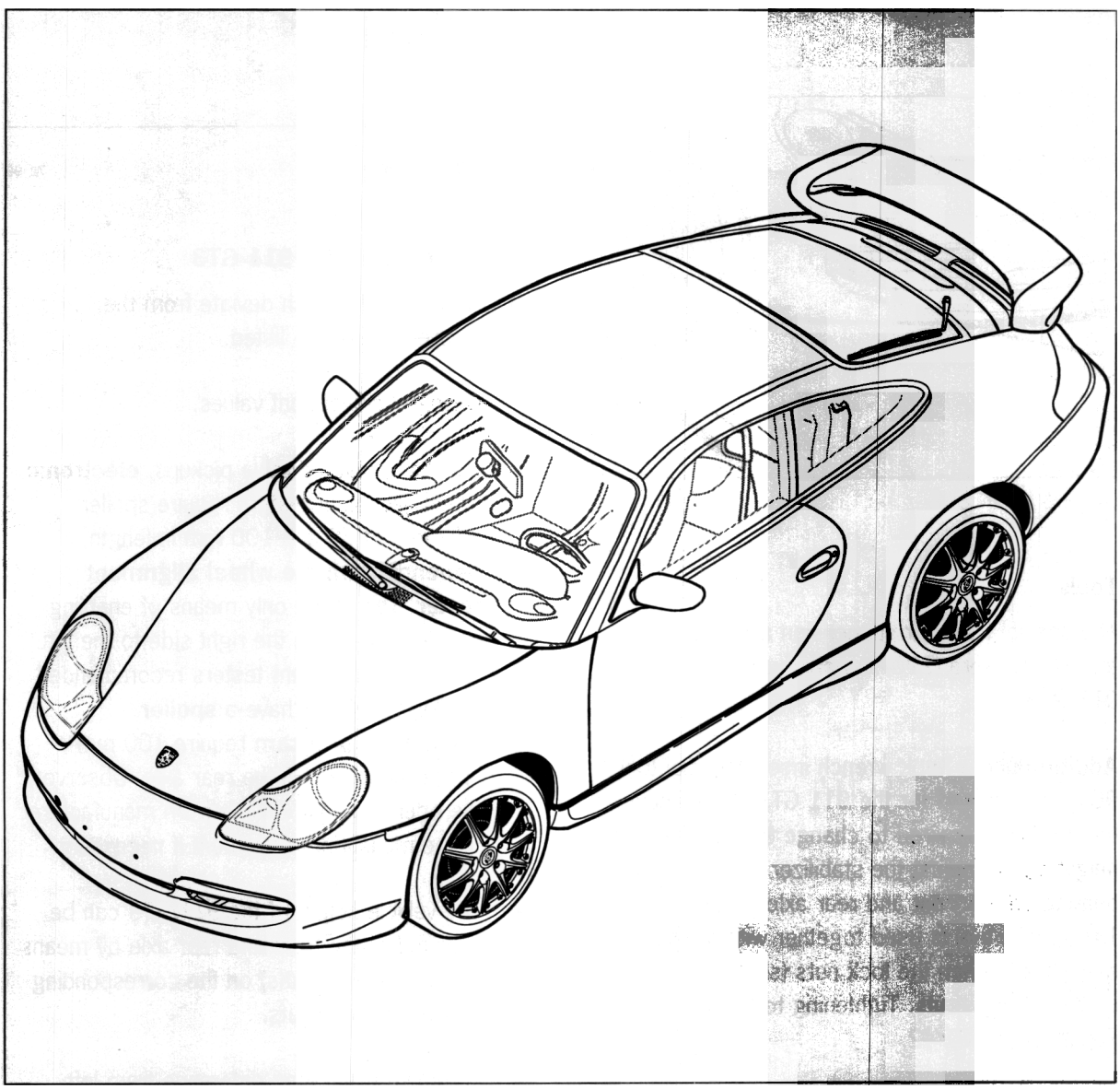
Toe-difference angle

The toe-difference angle is not adjustable.

44 Suspension alignment – GT3

Note

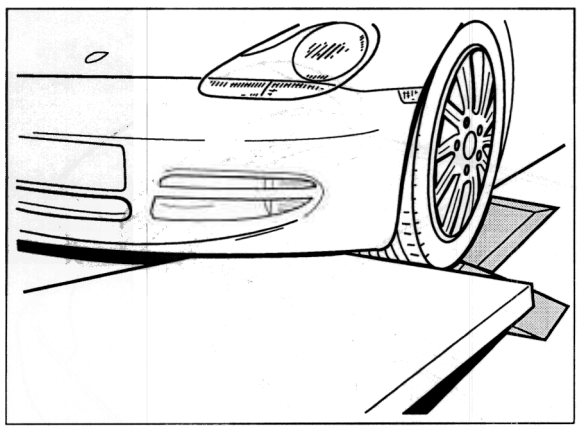
The **911 GT3** suspension alignment contains only those procedures which deviate from those for the 911 Carrera (996) suspension alignment.



62_99

Driving onto measuring platform

Due to the reduced vehicle height, additional access ramps, for example 959 access aids, are required to drive the vehicle onto the measuring platform. Otherwise the front spoiler would bottom on the platform.
A measuring platform without a sloped position is unsuitable.



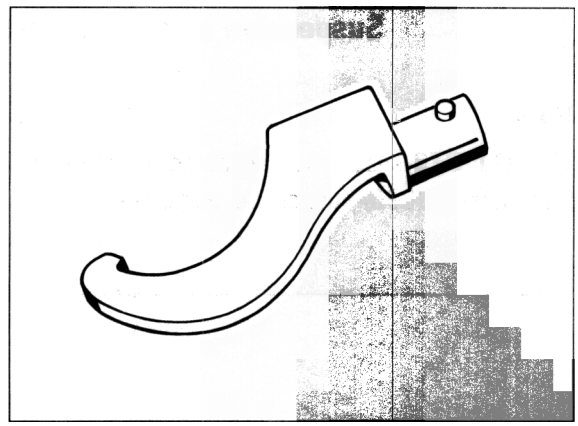
71_99

Tools

The special tools for suspension alignment of the 911 Carrera (996) are also used for the 911 GT3.

Additionally, a hook wrench insert (special tool 9647) is required for the 911 GT3. The special tool 9647 is required to change the vehicle height and to adjust the stabilizer mating bearing on the front and rear axle.
The special tool is used together with a torque wrench to tighten the lock nuts (slotted nuts) on the spring struts. Tightening torques in Repair Group 40/42.

Important: The stabilizer mating bearing must not be adjusted for street use.



Special tool 9647 72_99

Deviating points for 911 GT3

Only those points which deviate from the 911 Carrera (996) are listed.

Changed adjustment values.

For the measured-value pickups, **electronic** wheel alignment testers require spoiler adapters of 50 and 100 mm in length, **depending on the wheel alignment tester**. This is the only means of enabling data transfer from the right side to the left. The wheel alignment testers recommended by Porsche which have a **spoiler measuring program** require 100 mm spoiler adapters on the rear axle. Observe the operating instructions from manufacturer of the measuring instrument if necessary.

The vehicle height of the 911 GT3 can be adjusted at the front and rear axle by means of the adjusting nut(s) on the corresponding spring strut or struts.

Maximum wheel-load difference from left to right on front and rear axle 15 kg.

Adjustment of wheel alignment values on front and rear axle: as for 911 Carrera (996).

Notes on front axle camber

Front axle basic camber adjustment is carried out at the factory on the lower 2-part control arm. Further notes on this topic are provided in the following text under Wheel alignment values. **Camber adjustment** (fine adjustment) is carried out at the spring strut mount as for the 911 Carrera (996).

Check all wheels for clearance after adjustment and assembly work.

Important instructions for suspension alignment work – GT3

The following must be observed during suspension alignment of the 911 GT3:

Height adjustment/wheel-load change

A one-sided height change causes a wheel-load change at the same time. **A wheel-load change on one wheel also alters the wheel loads of the other wheels.**

A one-sided increase in the installed spring preload (raising vehicle) increases the wheel load.

A one-sided decrease in the installed spring preload (lowering vehicle) decreases the wheel load.

A change in the wheel-load is always transferred diagonally onto the other axle side. This means that if the wheel load on one wheel is decreased or increased, the same occurs on the diagonally opposite wheel.

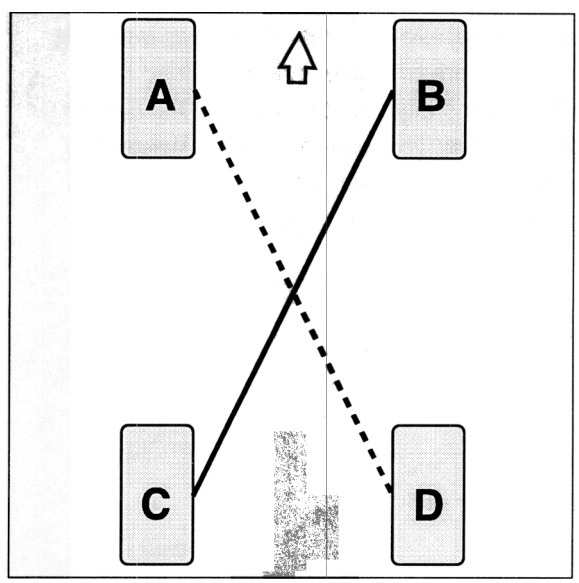
Example

Rear left spring preload C is increased.

In this way the wheel load:

rear left C and front right B
increases ————

rear right D and front left A
decreases – – – – – –



144_99

The wheel-load difference from left to right on front and rear axle should be as small as possible (under 15 kg if possible).

Vehicle height 911 GT3

General

The vehicle height on the front and rear axle of the 911 GT3 can be adjusted.

Before wheel alignment values are adjusted at front and rear axles, it is recommended or necessary* that the height adjustment be checked at the DIN empty weight. The height adjustment possibility allows the wheel-load difference from right to left to be kept as small as possible, provided that wheel load weighing machines are available. The wheel-load difference is adjusted by changing the vehicle height within the height tolerance. The priority is to achieve the smallest possible wheel-load difference from left to right.

Note

The height adjustment possibility allows:

1. Differing wheel loads on left and right to be corrected. At the correct height the wheel-load differences lie within a permissible range, provided that the coil springs have the same installation position (installed spring preload) on each axle. Tolerance ± 1 mm.
   Wheel-load differences can be kept as low as possible in conjunction with wheel-load weighing machines. Tolerance from right to left on front and rear axle under 15 kg.

2. Any impermissible height differences – front axle to rear axle – can be balanced out (only within the permissible tolerance).

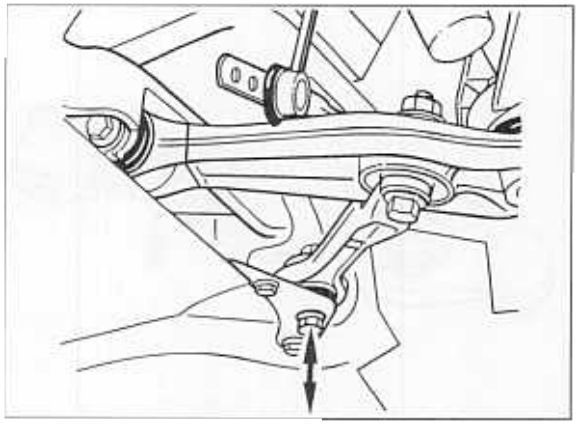
Preliminary work

For the **height check** of the ready-to-drive vehicle (full tank and tools), place the vehicle on a level surface or on the measuring platform.

Front axle

Measure from wheel contact surface to the lower edge of the hexagon-head bolt of the tension-strut screw connection to the body (Figure 74_99).
Measuring point as for 911 Carrera (996).
Required values for front and rear axle in Repair Group 44.

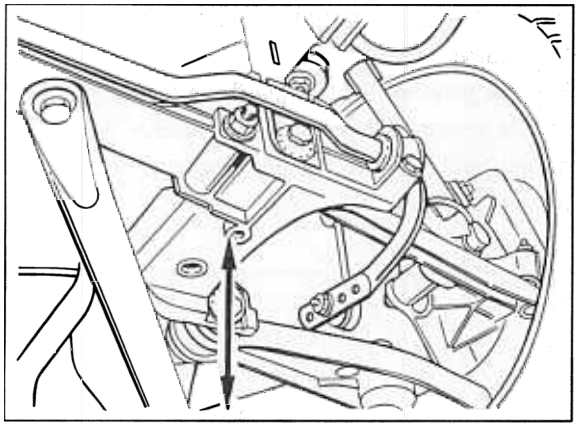
* after work which causes a change in height or in the event of an incorrect height



74_99

Rear axle

Measure from wheel contact surface to the locating bore in the rear-axle side section (between toe and camber eccentrics).

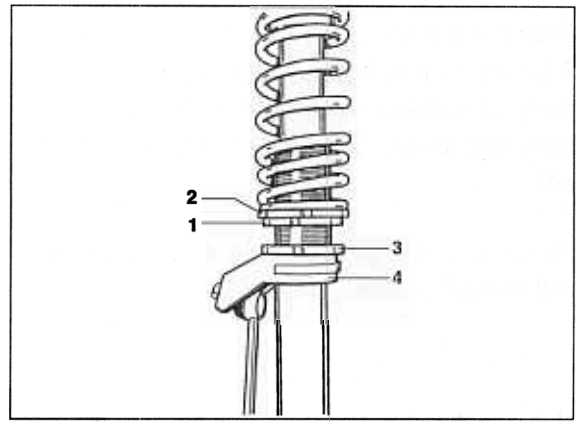


75_99

The vehicle height on the front and rear axle is adjusted by turning the adjusting nut No. 2. The lock nut No. 1 must first be loosened. Use a hook wrench or special tool 9647 (hook wrench insert) for this purpose.

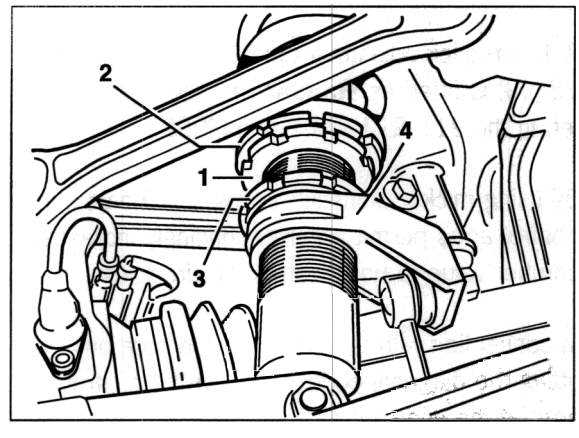
Adjusting nut No. 2
– turn to the right = vehicle higher
– turn to the left = vehicle lower

After adjustment of the lock nut(s) (No. 1) on the front and rear axle, tighten with special tool 9647 in conjunction with a torque wrench. Tightening torque No. 1 = 50 Nm (37 ftlb.).



Front axle
1 – Lock nut(s)
2 – Height adjusting nut

76_99



Rear axle
1 – Lock nut(s)
2 – Height adjusting nut

77_99

Wheel alignment

Notes

Adjustment of wheel alignment values on front and rear axle: as for 911 Carrera (996). Observe note on front axle camber adjustment (see following text).

If the vehicle is measured front and rear, check and adjust the rear axle first. Nominal values in Repair Group 44.
After adjustment, tighten the appropriate screwed connections with the prescribed tightening torque. See tables in Rep. Gr. 40 and 42.

Check all wheels for clearance after adjustment and assembly work.

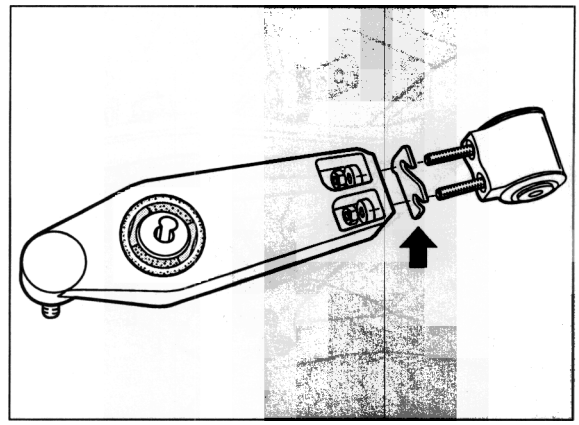
Note on front axle camber adjustment

Unlike the 911 Carrera (996), a **basic camber adjustment** is made by means of two intermediate plates on the 2-part control arm of the front axle for the 911 GT3.

A 1 mm thick adjustment plate (arrow / Figure 78_99) is fitted as **standard** on the right and left in the 911 GT3 M002 and M003.

By using thicker adjusting shims, the 2-part control arms permit a correspondingly increased camber value to be obtained for circuit use.

In connection with this, observe the note on fitting the diagonal control arm on the control arm (at the end of the GT3 suspension alignment section).

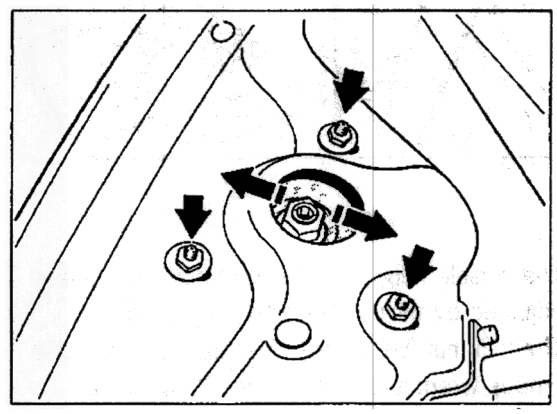


– *Basic camber adjustment with adjustment plates (arrow)*
– *Standard = a 1 mm thick adjustment plate*

78_99

Camber fine adjustment

The camber (the fine adjustment) is adjusted by moving the spring strut transversely (as for 911 Carrera 996).
For this purpose, loosen the three fastening nuts on the spring-strut mount and, to move the spring strut, remove the covering cap on the piston rod.

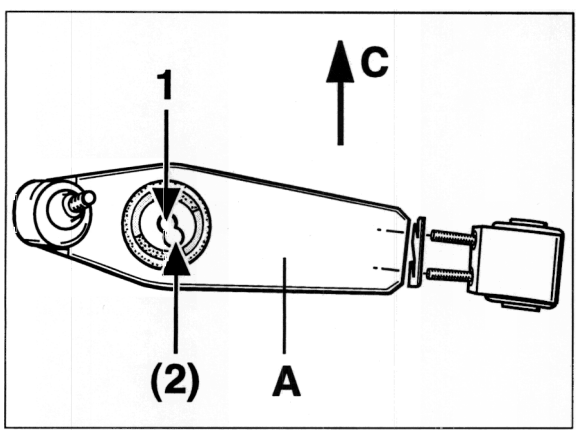


16_96

Instructions for fitting diagonal control arm on control arm – GT3

In the case of the road version of the GT3 (M002 and M003), the diagonal control arm must be fitted at the centre bore (No. 1) of the control arm.

Left control arm (A)



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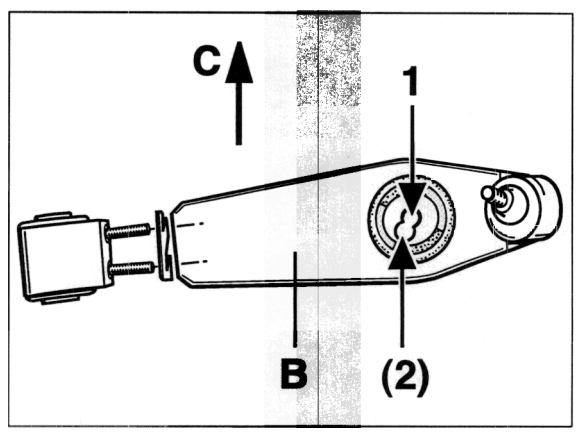
A - Left control arm
C - Direction of travel
1 - Centre bore for road GT3
2 - Rear bore only for Cup vehicle. (with racing circuit camber values)

Right control arm (B)



40170005

B - Right control arm
C - Direction of travel
1 - Centre bore for road GT3
2 - Rear bore only for Cup vehicle (with racing circuit camber values)

44 General tire mounting instructions

General

Always use new rubber valves when changing tires!

Caution: When mounting tires, observe the direction of rotation or inside/outside identification.

When mounting tubeless tires, check the sealing surface of the tire and the disc wheel for cleanliness and any signs of damage. Bear in mind here that the bead base performs the sealing function on tubeless tires. If the bead edge has to perform the sealing function, air can escape when the vehicle is driven aggressively (rabbit starts, hard cornering, etc.).

When mounting the tire beads, use only the tire mounting pastes specified below.
The following can occur if an unsuitable mounting paste is used:
Turning of the tire on the wheel, fracture of the bead core when the tire is mounted and damage to the wheel surface by aggressive substances.

Caution: Use only TIP TOP Universal, order No. 593 0601 (3.5 kg bucket) or Contifix as the mounting paste.

If Contifix is used, apply sparingly to the tire beads (due to risk of the tire turning on the wheel). If possible, the vehicle should not be driven for 24 hours after tire mounting or matching.

In order to prevent the tire from turning on the wheel when the vehicle is driven, also inform your customers that they should avoid extreme driving manoeuvres (acceleration, braking) during the first 100 to 200 km **with new or recently mounted tires**. Mark the relative positions of the tire and wheel for reference if necessary.

The absolute limit on how far the tire can turn on the wheel must be regarded as 20mm. An optimum balancing result will be worsened in this case.

In order to optimise smoothness of rolling, it is expedient - and necessary in individual cases - to mount the tire in a favourable position with respect to the wheel (matching).
Matching **(uncontrolled and controlled)** is explained below.

Uncontrolled matching: Turning the tire on the wheel by 90° or 180° if necessary in order to achieve an acceptable value with regard to rolling smoothness (true running, imbalance and distribution of balance weights).

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Controlled matching: With a balancing machine with matching program. In most cases, this produces an even better result with regard to the rolling smoothness (true running, imbalance and distribution of the balance weights) than can be achieved with uncontrolled matching.

Maximum permissible radial runout and lateral runout of the light alloy wheels = 0.7 mm
Maximum permissible radial runout and lateral runout of the wheel with tire = 1.25 mm
Values less than 1.0 mm – better around 0.5 mm – are desirable.

After mounting the tubeless tires, inflate them without valve insert to approximately 3 bar gauge pressure in order to ensure that they are seated properly on the wheel.
At the latest when the pressure reaches 3.0 bar, the tire beads must pop out of the deep bed and over the hump of the wheel shoulder in order to avoid fractures of the bead core. If necessary, interrupt the process and coat all necessary surfaces with lubricant (tire mounting paste) again. Then repeat the process. Screw in the valve insert and set the prescribed tire pressure (Page 44 - 1).

If new tires are to be mounted or the tires of one axle are to be replaced, tires of the same make and with the same specification code must always be used on each of the two axles. If tires are replaced on one axle only, the different tread depth than on the other axle can cause a noticeable change in the familiar handling.
This is especially the case if new tires are mounted on the rear axle. This effect decreases with increasing tire milage.

If a tire is damaged and it cannot be determined with absolute certainty that there is no ply damage – with all of its consequences – or if the tire was thermally or mechanically overloaded due to a loss of pressure or other prior damage, we recommend replacement of the tire in question for safety reasons.

When replacing a tire on an axle, make sure that the tread depth of the new tire does not differ from that of the other tire by more than 30 %.

Repairs on "ZR" tires are impermissible, as is the use of inner tubes in tubeless tires.

The overview of summer and winter tires is included in Technical Information (TI), Group 4. Always observe the tire specification code when replacing summer tires. The specification code N1, N2, N3 or N0 distinguishes summer tires expressly approved by Porsche from other versions of the same tire type and size.

Tire age

High-speed ZR tires in particular should not be too old – **never older than 6 years**.
The age of the tire can be determined via the manufacturer's code, which is listed behind the DOT code on the tire sidewall. The date of manufacture (the last three digits) is located at the end of the code.

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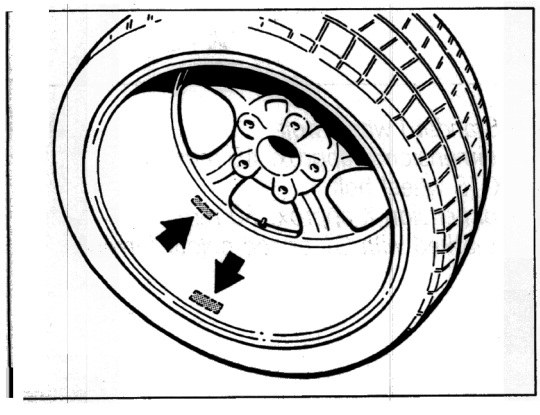
The date of manufacture (the last three digits) is located at the end of the code.
For the years 1990 to 1999, the 3-digit code is sometimes supplemented by a **"triangle suffix"** (distinguishing feature).

Example:
DOT DM CP 05 Y **067**
06 = Production week 6
7 = Production year 1997

Balancing weights

Type of balancing weights: Adhesive weights as used previously (no special version necessary). See Spare Parts catalogue.

Arrangement: Affix both weights on the inner side (arrows).*



693_96

* Observe program selection and operating instructions of the balancing machine.

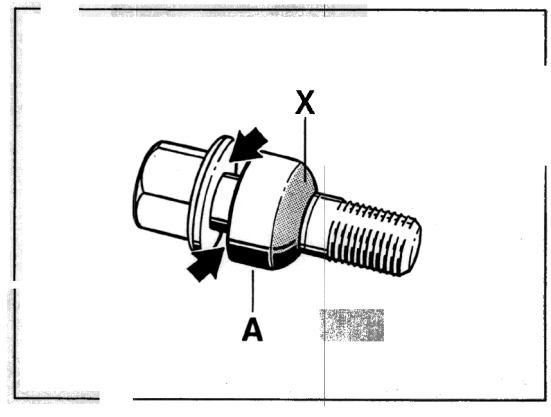
Mounting wheel on vehicle

The wheels are mounted using M 14 x 1.5 wheel bolts. The wheel bolt consists of **two parts that are permanently joined together. Other wheel bolts must not be used.**

Use suitable commercially available tools (wrench size 19 mm). **Never use an impact bolter to tighten the wheel bolts.**

Always apply a **thin coat of Optimoly TA** (aluminium paste) on the thread of the wheel bolts, on the shank and between the bolt head bearing surface and spherical cap ring (under the head) (see arrows).
Do not grease the spherical cap bearing surface of the wheel bolts that faces the wheel (X).

In the case of heavy soiling, first clean the wheel bolt and the concavities in the wheel with a lint-free cloth.



8_1_97

A = Spherical cap ring (permanently connected with the wheel bolt)
X = Do **not** grease bearing surface of spherical cap ring facing the wheel

Damaged wheel bolts must always be replaced. This damage includes mechanical damage to the thread, the spherical cap and damage resulting from **seizure** of the bolt head bearing surface and spherical cap ring. It must be possible to rotate the spherical cap ring on the bolt shank and move it in axial direction.

Rework on wheel bolts is impermissible.

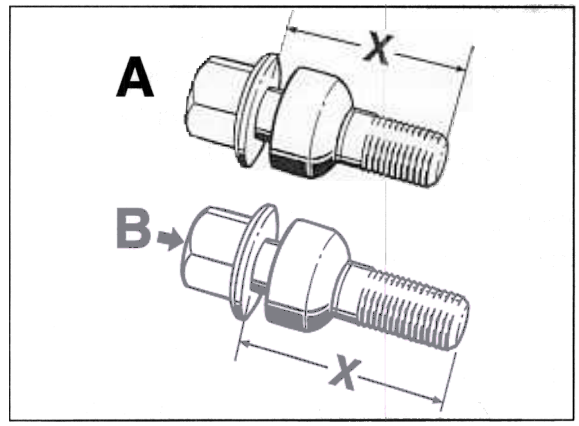
Screw in wheel bolts by hand and then tighten evenly. Start at the top when tightening. Always observe the specified tightening torque of **130 Nm (96 ftlb.)**.

Note

Before the wheel is placed on the wheel hub, regrease the centering surface of the wheel hub (if required) as necessary with a very thin coat of **Optimoly TA** (aluminium paste).

Note for GT3

There are 5 mm spacer washers (identical parts) fitted to the front and rear axles on the **911 GT3**.
The wheel bolts are 5 mm longer because of the spacer washers.
The **longer** wheel bolts are marked with **GT** or with a **red colour** (arrow) on the face surface of the bolt head. The colour of the spherical cap is also red from now on.



577_98

A = Standard wheel bolt
dimension X approx. 45 mm
B = GT3 wheel bolt
dimension X approx. 50 mm
marked with GT or red colour (arrow)

44 12 01 Checking disc wheels

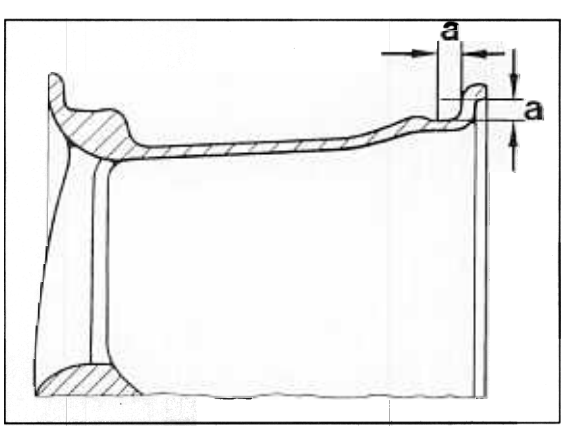
Checking the radial and lateral runout

The measuring points for radial and lateral runout on the inside of the wheel are given on the following drawing (dimension "a").

Maximum permissible radial runout and lateral runout of the **light alloy wheels = 0.7 mm.**

Maximum permissible radial runout and lateral runout of the **wheel with tyre = 1.25 mm.** Values less than 1.0 mm – better around 0.5 mm – are desirable.
Also see Page 44-17/44-18.

Important: Straightening and welding work on light alloy wheels is not permissible.

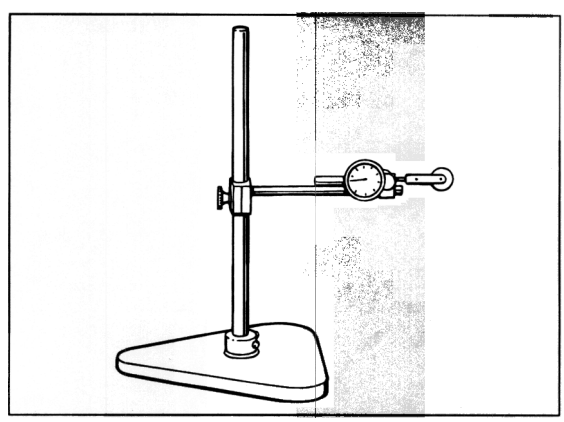


2273_44

Dimension "a" = 8 mm

Note

Use a tyre measuring gauge – e.g. V.A.G. 1435 – to measure wheels without tyres and wheels with tyres.



2272_44

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44 Identifying size for 18-inch Turbo wheels

General

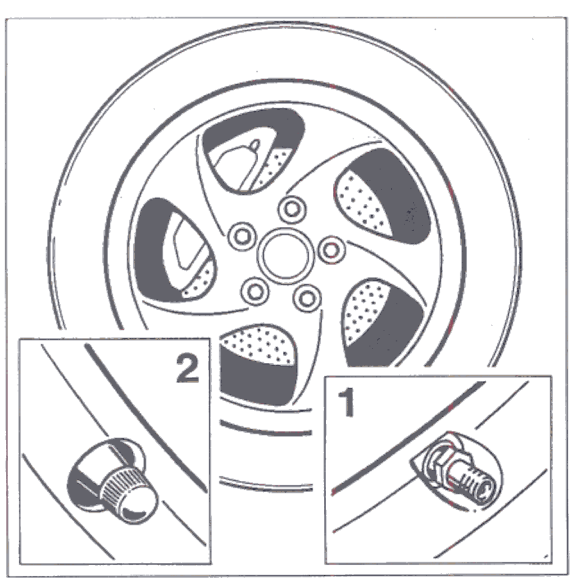
Identifying **18-inch Turbo wheels** (Technologie wheels / hollow spoke wheels) with the dimensions **9J x 18 RO 52** and **10J x 18 RO 65** (RO = Rim Offset) is only possible when the wheels are disassembled.

These wheels can also be fitted on the 911 Carrera (993) and the Boxster. Refer to the Technical Information, Group 4, Wheels and tyres overview, for the respective wheel alignment.

The basic difference between **Turbo wheels** (Technologie wheels / hollow spoke wheels) and **Turbo Look wheels** (Turbolook Design wheels) is their valves:

Turbo wheel: screwed-in steel valve

Turbo Look wheel: rubber valve



453_98

1 - screwed-in steel valve
2 - rubber valve

Identifying the wheel size:

Markings on the inner side of the wheels identify **18-inch Turbo wheels** with the sizes **9J x 18 RO 52** and **10J x 18 RO 65.**

The sizes together with the rim offset (RO) and spare part number are marked with A or B. The correct version for the model is marked with an X which is struck into the **"A"** or **"B"** boxes provided.

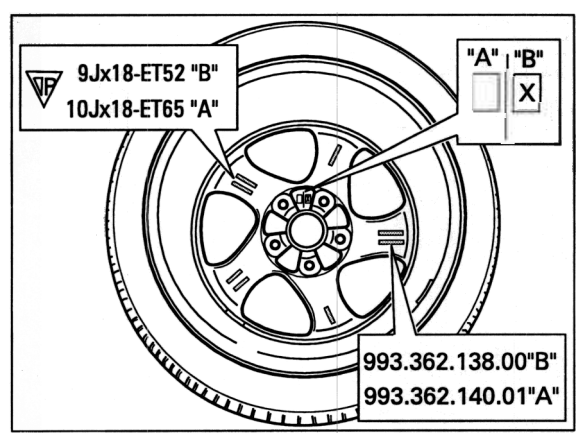


Figure shows model "B". 448_98

Marking "A"

18-inch Turbo wheel: **10 J x 18 - RO 65**
Spare Part No. 993 362 140 01.

Marking "B"

18-inch Turbo wheel: **9 J x 18 - RO 52**
Spare Part No. 993 362 138 00.

Printed in Germany - 17, 1998 9964423

44 Tyre failure/tyre sealant – GT3

Note

– The 911 GT3 is supplied with a tyre repair kit. A spare wheel is not available. The tyre repair kit (Tire Mobility System), a compressor and a pressure tester are located in the luggage compartment (position analogous to spare wheel 996 C4)

It is essential to observe the safety and operating instructions on the sealant bottle and on the compressor.

Sealing the tyre **with the tyre repair kit is only an emergency repair.** Even if the tyre is sealed, it may only be used for short journeys in the event of an emergency and must be replaced by a professional workshop immediately.
Avoid sharp acceleration and high speed on bends. The highest permissible speed is 80 km/h.

Repair procedure

1. Take out sealant bottle and compressor. Shake sealant bottle well.

2. Screw the accompanying filler hose onto the bottle. The foil on the closure cap is automatically punctured.

3. Remove the valve cap from the tyre valve and unscrew the valve insert with the accompanying value insert driver and set it aside on a clean surface.

4. Remove the sealing plug from the filler hose, push the hose onto the tyre valve.

5. Hold the both with its base upwards and empty the entire contents of the bottle into the tyre. Then remove the hose and screw the valve insert tightly into the tyre valve again.

6. Screw the filler hose of the compressor onto the tyre valve, insert the plug into the cigarette lighter. Pump tyre to 2.0 - 2.5 bar (read off pressure on pressure gauge).
Do not operate the compressor for longer than 6 minutes! Danger of overheating!
If this air pressure cannot be reached, drive approx. 10 metres forward or backward with the vehicle, so that the sealant can distribute itself in the tyre. Repeat pumping procedure.

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Note

If the required air pressure still cannot be reached, the tyre is too badly damaged. In this case, Tirefit cannot provide the required sealing.

7. Affix the accompanying sticker in the driver's field of view.

8. Continue the journey immediately with care at max. 80 km/h.

9. Check the tyre pressure after driving for 10 minutes (use service station or pressure gauge of the compressor).

Note

If the tyre pressure has fallen to below 1.3 bar, do not travel any further. It is not possible to seal the tyre with Tirefit since the tyre is too badly damaged. Danger of accident! If more than 1.3 bar is measured, adjust the air pressure to the correct value again if necessary (see sticker in the filler flap) and continue the journey as far as the next workshop.

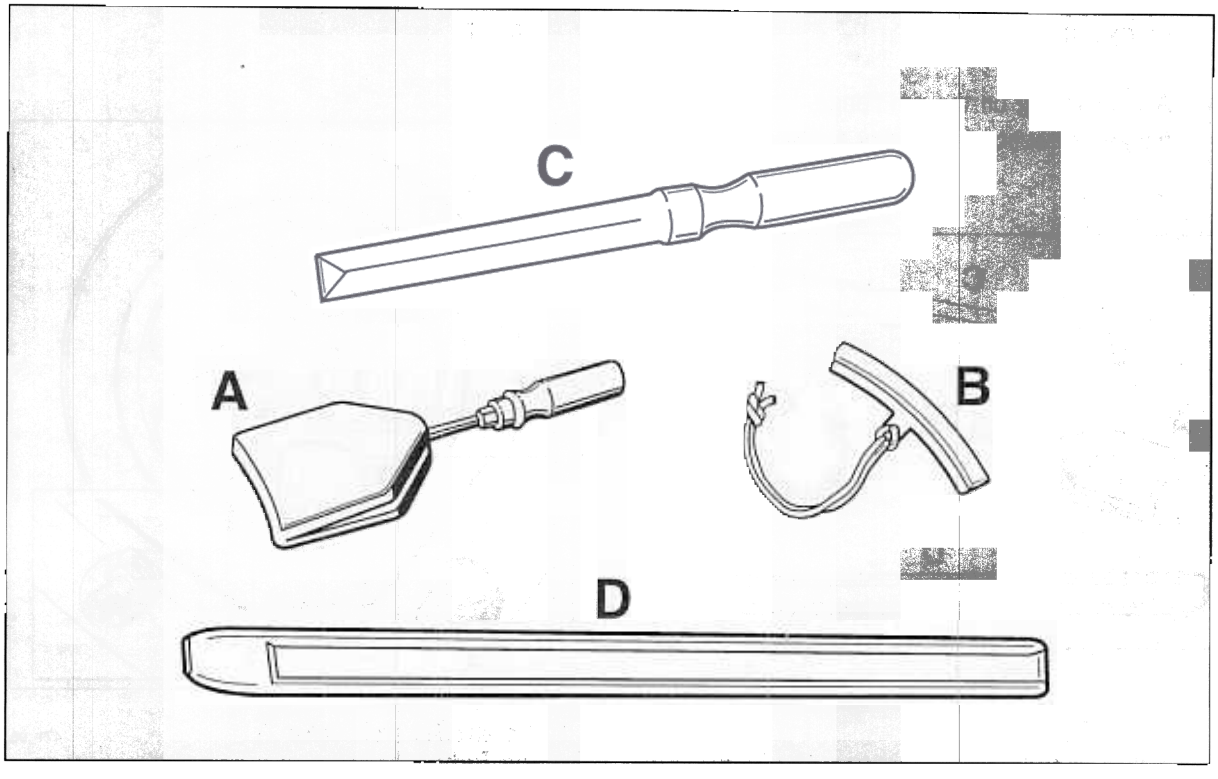
9964425 Printed in Germany - 25, 1999

44 Tyre mounting for critical wheels/tyre pairs

Note

The mounting machine described here is particularly suitable for difficult tyre constellations. All parts in contact with the wheel and the tyres are made of plastic. No large point load for wheel and tyres.

Tools



434_99

Item	Designation	Special tool	Explanation
A	Holding-down device	9539	To hold down the tyre bead
B	Assembly aid	Commercially available; refer to Workshop Equipment Manual, Chapter 2.5	As protection for the rim flange
C	Adhesive weight remover	Commercially available	
D	Mounting lever	Commercially available	

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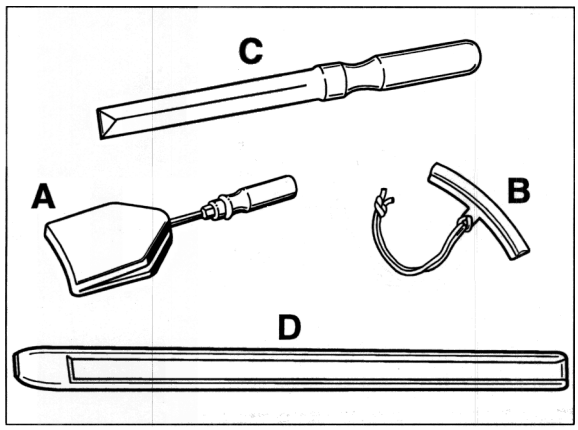
Notes on removing/mounting tyres

Use "TIP TOP Universal" tyre paste, order No. 593 0601 or "Contifix" for fitting.

Ensure that no damage (scoring, soiling) is caused to the assembly head of the fitting machine during fitting. Such damage may result in paint damage and pressure marks on the rim flange.

Avoid slipping on the rim flange. Use rim flange protection (assembly aid B).

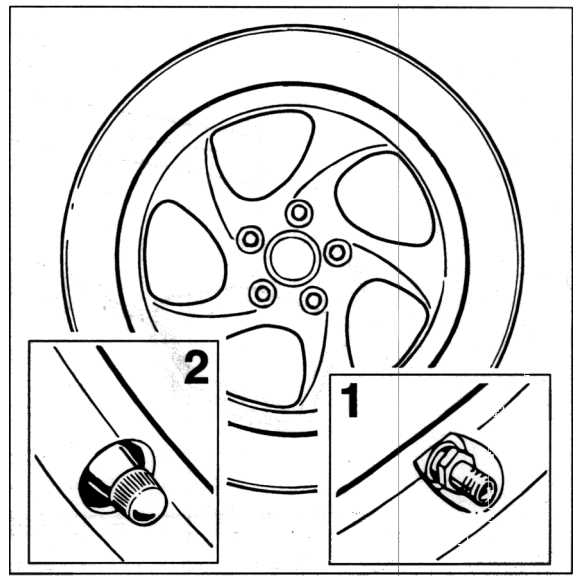


434_99

Adhesive tape can be used to protect the rim flange in individual cases, in order to prevent any paint damage during fitting. The mounting lever can also be covered with adhesive tape in order to avoid damaging the area around the spokes during removal.

The rubber valves must always be replaced.

Steel valves – for 18-inch Turbo wheels – do not usually need to be replaced when a tyre change is necessary. The steel valves should, however, be replaced after every second tyre change or after 3 years at the latest.



1 - Screwed-in steel valve (on Turbo wheel)
2 - Rubber valve (on Turbo Look wheel)

471_98

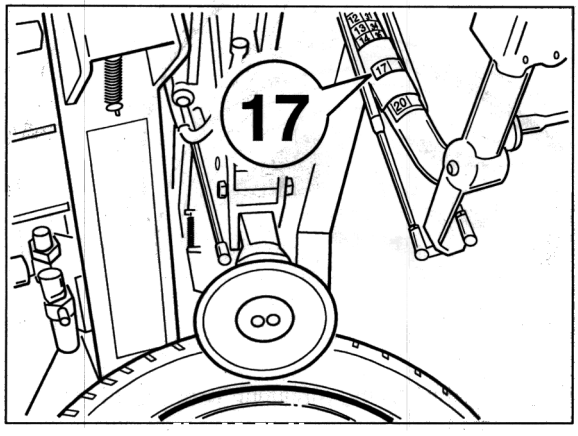
Check the wheel for damage.

Observe the running direction or the inside and outside of the tyre.

Removal

1. Clamp wheel.

2. When pushing off the tyre, ensure that the bead press-off tool is set to the exact inch graduation. If this is not the case, the rim flange may be damaged by the press-off rollers.



435_99

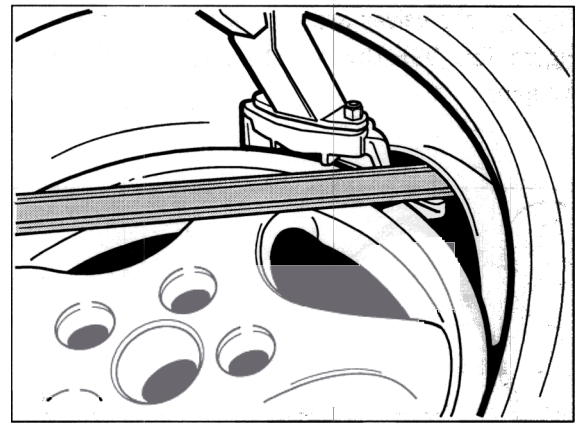
3. The wheel must be turned anti-clockwise when pressing the tyre off the rim. Otherwise, excessive forces occur on the fastening bolts of the machine which can lead to bolt breakage.
   The tyre beads can be pressed off at the same time or individually.

4. Before removing the tyre, coat the tyre bead with mounting paste to facilitate removal.

5. Put the assembly head on the rim flange. Position the assembly aid. The mounting lever is pushed into the deep bed underneath the first tyre bead, and then guided over the assembly shoe and pushed down.

Note

The mounting lever must be kept at a safe distance from the rim. This prevents damage (scratches, pressure marks) to the rim spokes.



436_99

6. Lift the tyre bead out of the rim bed by **turning** the wheel **to the right**.

7. Position the assembly aid for the **second** tyre bead. Pull the tyre upwards and push it into the rim bed underneath the second tyre bead using the mounting lever.
   Make sure that the mounting lever is guided correctly (see Point 5).
   Turn the wheel **to the right** and remove the tyre.

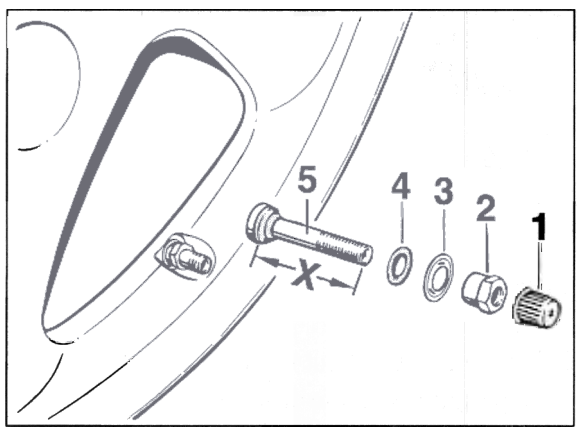
Fitting

1. Free the wheel from the abraded rubber particles and check for damage.

2. A new rubber valve must always be fitted. For wheels with steel valves (Turbo wheels), the valves can be reused if they are not damaged. The valves should, however, be replaced after every second tyre change or after 3 years at the latest.

Note

Do not use commercially available steel valves. The Porsche valves are shorter (dimension X, Figure 460_99). The Porsche version measures 43 mm.

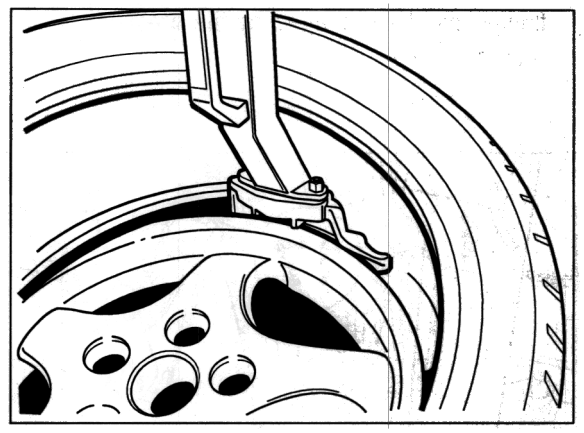


460_99

3. Coat the wheel and tyre with tyre mounting paste - TIP TOP Universal, order No. 593 0601 or Contifix.

4. Place the tyre in the correct position on the wheel.
Push in mounting arm and position on top of the rim flange.

5. Guide the tyre bead through the assembly head. Fit the tyre bead in the deep bed by turning the wheel to the right.

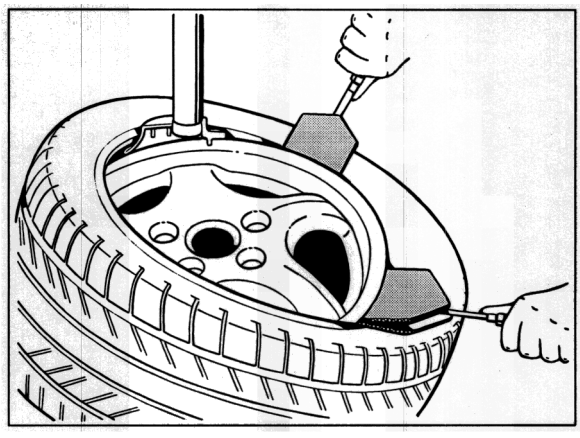


437_99

6. At the start of the mounting process of the second tyre bead, the mounting arm should be positioned opposite to the valve. This prevents damage to the valve.

7. Press the second tyre bead onto the wheel as flat as possible and guide through the assembly head.

8. Insert first holding-down device and position the second holding-down device offset by 90°- 120°. Fit tyre bead in deep bed by turning to the right.



438_99

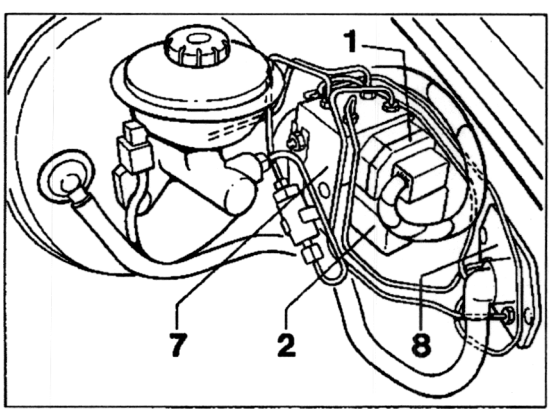
9. Fill tyre with compressed air.
   At approx. 4.0 bar, the beads should pop over the hump. Coat the tyre beads with mounting paste again if necessary so that they can pop over easily and gently.

45 Important information about ABS 5.3 and ABS/TC 5.3

General

The 911 Carrera (996) is fitted **as standard** with an anti-lock brake system (ABS 5.3).
"**Traction Control (TC)**" is available on **special request** on the basis of ABS 5.3.
Traction Control (TC) is a combination of anti-slip control (ASR) and Automatic Brake Differential (ABD).
TC is a further system for increasing driving safety.

ABS 5.3 is optimized with regard to installed volume and weight **compared with** the **ABS 5**. Control module (No. 1), hydraulic unit (No. 7), pump-motor relay and valve relay (No. 2) of ABS 5.3 and ABS/TC 5.3 **form a unit** that is located next to the brake master cylinder.



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Diagnosis and system checks on both systems are carried out with the **Porsche System Tester 2**.

Differences between ABS 5.3 and ABS/TC 5.3

ABS 5.3 = **3**-channel system
(diagram: see Page 45 - 3).

ABS/TC 5.3 = **4**-channel system
(diagram: see Page 45 - 5).

The essential **distinguishing features** between ABS and ABS/TC **are:**

Number of brake lines at intermediate piece (No. 8 / Figure 181 - 96):
ABS 5.3 = 3 brake lines
ABS/TC 5.3 = 4 brake lines

TC OFF switch for switching driving stability control on and off is not available on vehicles with Solo ABS (ABS 5.3).

TC (ASR/ABD) warning light and
TC (ASR/ABD) function light
(information light) in vehicles **with ABS/TC.**
These lights light up when the ignition is switched on (lamp check).
In vehicles **with ABS 5.3** (Solo ABS) these lights are **not fitted** in the instrument cluster.
A figure showing the warning lights and the function light is shown on Page 45-6.

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45 ABS 5.3 (3-channel system) system description

ABS operation

The ABS control module receives a signal from the brake-light switch and the AC voltage signals from the four speed sensors. These signals are converted into digital wheel-speed signals independently of each other by two microprocessors. The wheel slip (approximately proportional to the computed vehicle reference speed) is formed from these wheel-speed signals.

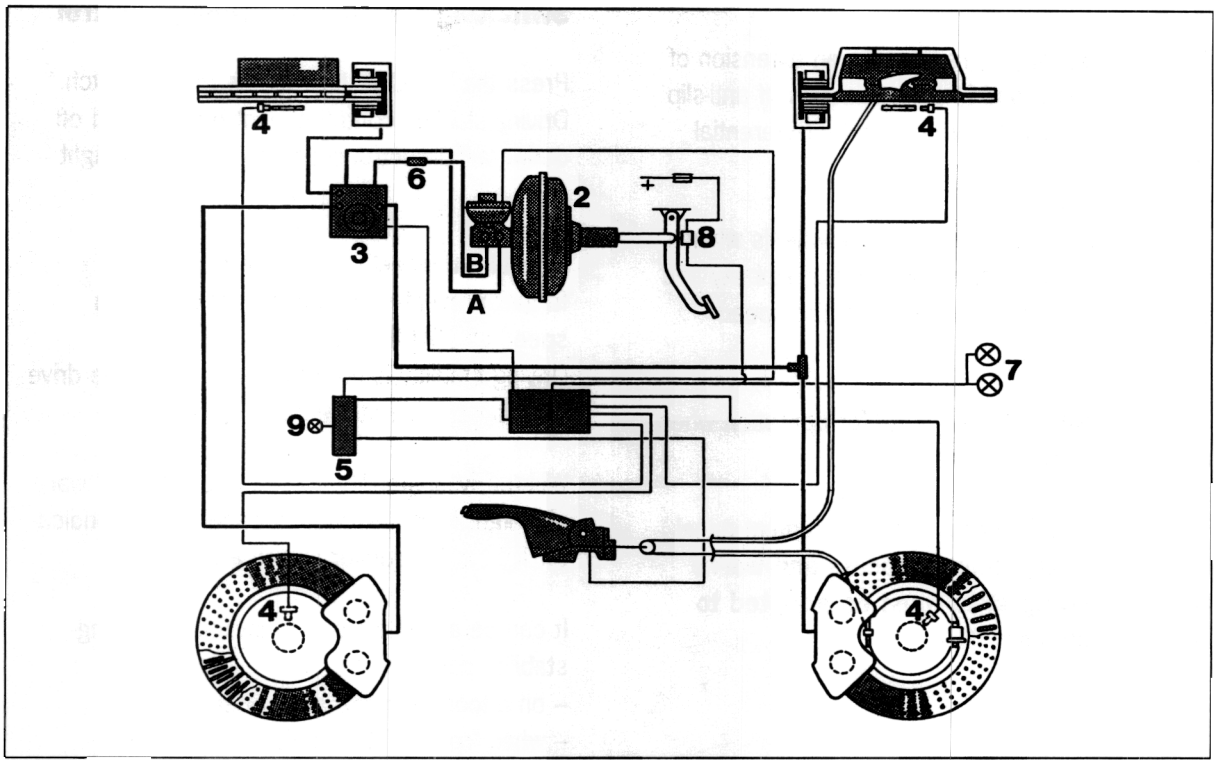
If vehicle deceleration and excess slip at a wheel are detected, the pressure-holding phase is initiated, i.e. the inlet valve for the relevant wheel is closed to prevent a further increase in pressure. If in spite of the pressure being held constant the wheel tends to continue to lock up, the pressure in the wheel cylinder is reduced. For this purpose, the outlet valve is opened and the brake fluid is pumped back to the brake master cylinder via the return pump (pressure-reduction phase) until the wheel turns again. Then, depending on the control cycle, further appropriate cycles are initiated.

This function and the input signals are continuously monitored. If a fault is detected, the control module switches the ABS function off, switches on the ABS warning light and stores the fault in a non-volatile memory in the control module.

In addition, whenever a journey is begun and a speed of 6 km/h is exceeded, a test programme is started. The solenoid valves and the pump motor are electrically actuated and checked. If a fault is detected, the control module switches the ABS function off, the ABS warning light is switched on and the fault is stored.

Function of the individual components on Page 45 - 7.

Diagram: ABS 5.3 (3-channel system)



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1 – ABS control module *

2 – Brake unit (brake booster with tandem brake master cylinder)

3 – ABS hydraulic unit * (**3** hydraulic outputs)

4 – ABS speed sensors

5 – Instrument cluster

6 – Brake proportioning valve **(1x)**

7 – Brake light

8 – Brake-light switch

9 – ABS warning light (yellow)

A = Front-axle braking circuit

B = Rear-axle braking circuit

Control module, hydraulic unit, pump-motor relay and valve relay **form a unit**, which is located next to the brake master cylinder.

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45 ABS / TC 5.3 (4-channel system) system description

Note

Traction Control (TC) represents an extension of the ABS system and is a combination of anti-slip control (ASR) and Automatic Brake Differential (ABD).

TC prevents spinning of the drive wheels when moving off and accelerating. Driving stability and traction are improved over the entire speed range.

Traction Control (TC) is ready for operation whenever the engine is started.

The TC information light in the instrument panel lights up during a control process **and warns that the driving style must be adapted to road conditions.**

Function

Driving-stability control:
If Traction Control (TC) detects that a certain speed difference between the wheels has been exceeded (wheel spin), engine power is automatically reduced.

Brake control:
In addition to reducing the engine power (driving-stability control), the TC (via the ABD) brakes the drive wheel that is spinning.
Since this control requires the drive wheels to be individually controlled, the **ABS/TC system is a 4-channel system.**

Switching off driving-stability control*

Press the "TC OFF" logo of the rocker switch.* Driving-stability control cannot be switched off during a TC control process (information light on).

One-sided wheel spin on the drive axle is further prevented by brake control up to a speed of **100 km/h.**
Driving stability is not monitored, since the drive wheels can spin at the same rpm (slip).

When driving-stability control is off, the TC warning light in the instrument panel and the indicator light in the rocker switch are lit.

It can be advantageous to switch off driving-stability control:
– on a loose surface and in deep snow
– when "rocking" the vehicle free
– when using snow chains.

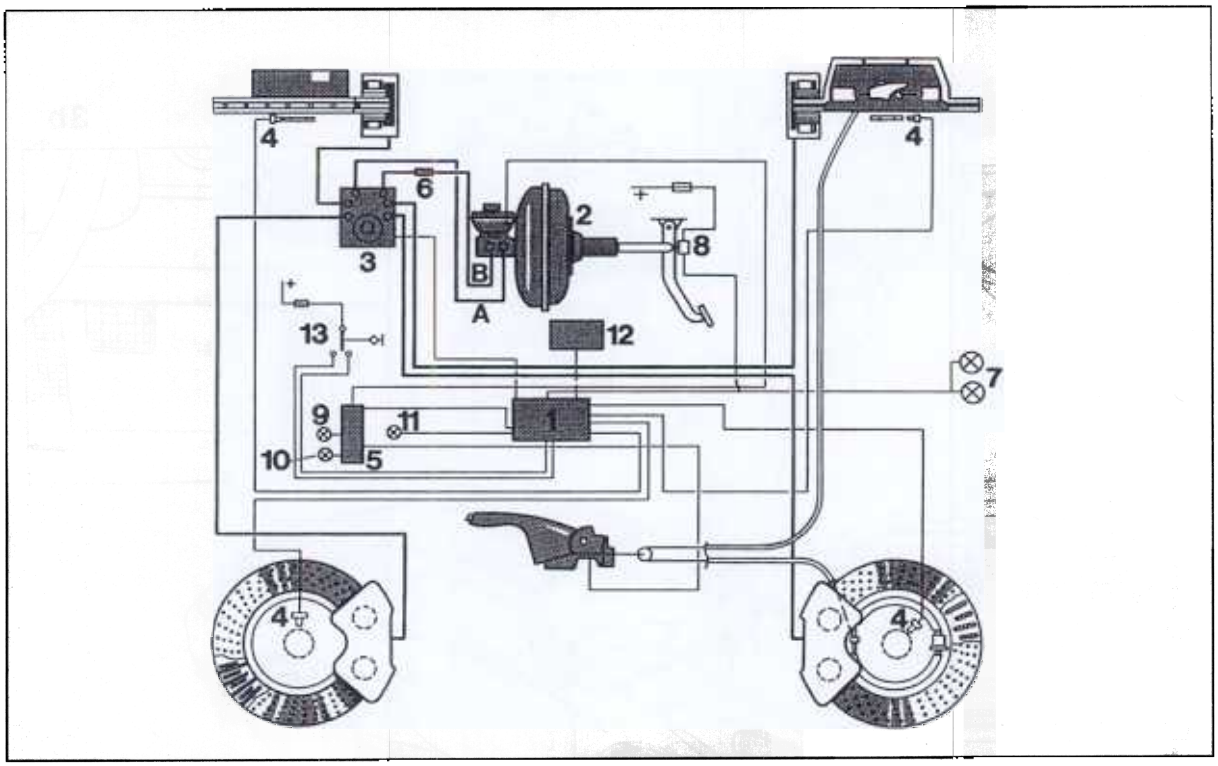
Switching driving-stability control back on*

Press the indicator light in the rocker switch.*

Driving-stability control cannot be switched on again during a TC control process (information light on).

Press the switch for at least 0.1 second. Then wait another 0.3 second until the routine has been completed. Only then is driving stability control switched off or on.

Diagram: ABS / TC 5.3 (4-channel system)



108 - 97

1 – **ABS/TC** control module *

2 – Brake unit (brake booster with tandem brake master cylinder)

3 – **ABS/TC** hydraulic unit * (**4** hydraulic outputs)

4 – ABS speed sensors

5 – Instrument cluster

6 – Brake proportioning valve **(1x)**

7 – Brake light

8 – Brake-light switch

9 – **ABS warning light** (yellow)

10 – **TC warning light** (TC/yellow)

11 – **TC function light** (yellow; green in some vehicles of the initial production run)

12 – **DME contol module**

13 – TC rocker switch (see Page 45 - 6)

A = Front-axle braking circuit

B = Rear-axle braking circuit

Control module, hydraulic unit, pump-motor relay and valve relay form a unit, which is located next to the brake master cylinder.

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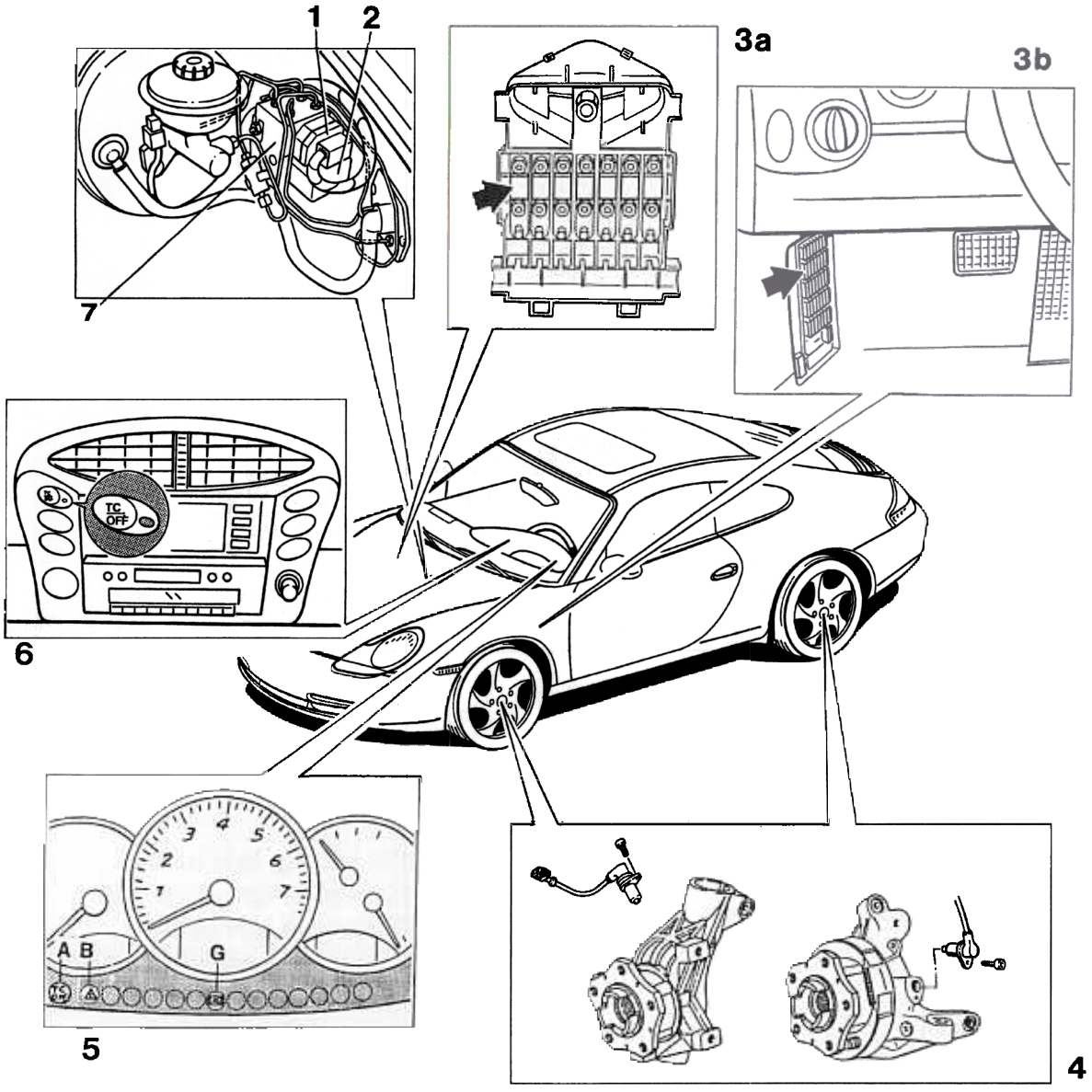
45 Component arrangement (ABS 5.3 and ABS/TC 5.3)



106 - 97

45 Function of individual components

1. Control module (ABS 5.3 and ABS / TC 5.3)

This unit processes incoming signals and actuates the solenoid valves and/or the return pump in the hydraulic unit when wheel slip is excessive (see also System description).
If the ABS or ABS/TC switches off when detecting a system fault, it actuates the warning light and stores the fault in a non-volatile memory.

Note

Control module and relay are not supplied individually. In the event of replacement, the complete hydraulic unit must be replaced.

2. Relay

The solenoid valve relay is actuated by the control module (closes) as soon as the control module receives voltage from the generator (D+ / terminal 61).
As soon as the relay has closed (picked up), battery + (terminal 30) is applied to the valve coils of all solenoid valves of the hydraulic unit.

If the ABS or the TC (ABD) begins controlling, the control module applies negative potential to the appropriate valve coil of the valve to be controlled at the appropriate wheel.

The return pump relay is actuated (with a negative potential) by the control module if required, and closes.
As soon as the relay has closed / picked up, battery + (terminal 30) is applied to the return pump, which then runs.

Note

The relays cannot be exchanged.
When replacement is necessary, the complete hydraulic unit must be replaced.

3. Fuses

3a. A 50-A fuse **in the current distributor (F1 / arrow)** protects the return pump and the solenoid valves.
The current distributor is located under the instrument panel. The fastening points are accessible from the luggage-compartment side.

3b. The 15-A fuse **B 9** (fuse holder B / fuse No. 9) on the **central electrical board** protects the control module's electrical supply (ABS and ABS/TC).
The arrow points to **fuse holder B** (field 2).

On vehicles with Traction Control (TC), the 15-A fuse **B 2/1 (fuse holder B / fuse No. 1)** on the central electrical board protects the supply to the "TC OFF" rocker switch (switch for switching driving-stability control on and off).

4. Speed sensors

The speed sensors provide wheel speed information (speed information of each wheel) to the control module. These speed sensors operate according to the inductive principle, in which sinusoidal alternating voltages are generated in accordance with the number of teeth on a pulse wheel and at a frequency that is a measure of the wheel speed.

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5. Warning and information lights

Note

B = TC information light (see Page 45 - 6)
A = TC warning light (see Page 45 - 6)
G = ABS warning light (see Page 45 - 6)

Information light for TC (B)

– Lights for a lamp check when ignition is switched on

  Indicates control process (even when driving-stability control is switched off).

Warning light for TC (A)

– Lights in combination with the indicator light in the rocker switch (TC OFF) for a lamp check when the ignition is switched on.

  In combination with the indicator light in the rocker switch, indicates that driving-stability control is **off**

  Indicates defect: TC is out of order

  Lights together with the ABS warning light if there is an **ABS fault**.

Warning light for ABS (G)

– Lights for a lamp check when ignition is switched on

  If the ABS warning light lights up **with the engine running**, the ABS has switched off due to a fault.

6. TC (OFF) rocker switch with light

For switching driving-stability control on and off.
The rocker switch has one contact for switching off and another for switching on.

To switch off, press the "TC OFF" logo on the rocker switch. This applies a positive voltage to the control module while the switch is operated. This causes driving-stability control to be switched off.
Driving-stability control cannot be switched off during a TC control process (information light on).

When driving-stability control is off, the TC warning light in the instrument panel and the indicator light in the rocker switch are lit.

To switch driving-stability control **on**, press the indicator light in the rocker switch. This applies a positive voltage to the control module while the switch is operated. This causes driving-stability control to be switched on.
Driving-stability control cannot be switched back on during a TC control process (information light on).

Driving-stability control is ready for operation, i.e. is switched on automatically, whenever the engine is started.

System description on Page 45-4

7. Hydraulic unit

The hydraulic unit essentially consists of fast-switching electromagnetic valves and a return pump. Regardless of the pressure in the brake master cylinder, the hydraulic unit can change the fluid pressure to the wheel brake cylinders (holding or reducing pressure). Increasing the pressure above that of the brake master cylinder is not possible, however.

The ABS 5.3 hydraulic unit has three hydraulic outputs (3-channel system) and six electromagnetic valves (three inlet and three outlet valves).

The ABS / TC 5.3 hydraulic unit has four hydraulic outputs (4-channel system) and ten electromagnetic valves (four inlet valves / four outlet valves, one switch-over valve and one intake valve).
The intake and switch-over valves are required so that the return pump can perform **two tasks**:

I. Return flow to the brake master cylinder (pressure reduction) for ABS control.
II. Supply (pressure increase) to the right or left rear-wheel brake cylinder for **TC control (ABD control).**

In the case of **ABS control** at the rear axle, the solenoid valves for both rear wheels are actuated in parallel (joint control as in Solo ABS control (3-channel system)).

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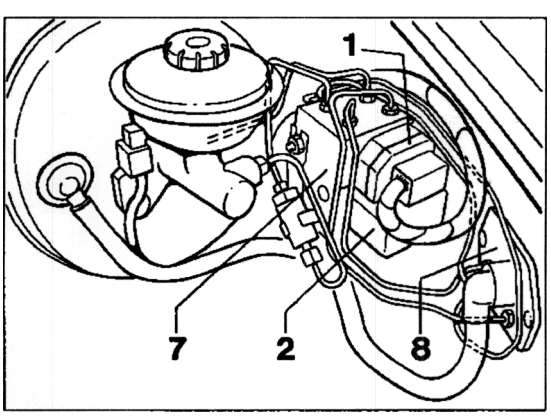
45 ABS check with Porsche System Tester 2

Important instructions for ABS and ABS/TC

1. If work has been done on the hydraulic unit No. 7, the speed sensors and the cable harness or if the hydraulic unit is replaced, a **system check (functional check)** must be performed with the **Porsche System Tester 2**. This is the case, for example, after accident repairs. This prevents any confusion of electrical or hydraulic lines and ensures **faultless operation of the system**.

   If certain brake lines are replaced, e.g. at the intermediate piece in the front-left wheel housing (No. 8), **a system check also must be** performed. The hydraulic allocation could be incorrect in spite of the different threads (M12 x 1 and M 10 x 1), due to unintentional bending of the brake lines.



181-96

2. If there is a fault indication during operation (when no assembly work was carried out beforehand), **diagnosis and troubleshooting** are also carried out with the **Porsche System Tester 2**.
   To do this, select the ABS or ABS/TC system and read out the fault memory there.
   The fault can then be localized using the appropriate menus (Drive links/Actual values).

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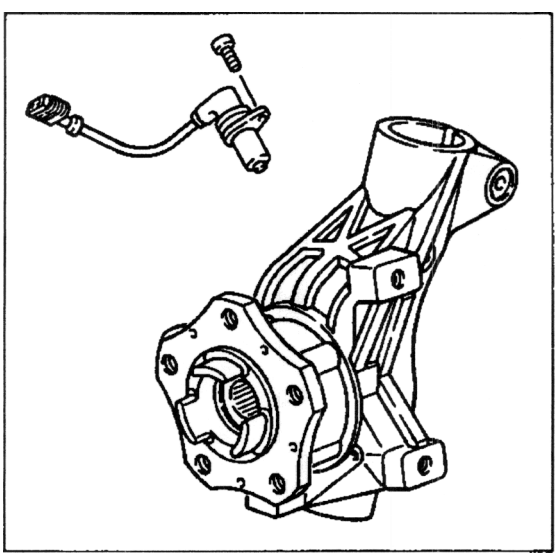
45 11 19 Removing and installing front speed sensors

Removal

1. With ignition switched off, open the combination plug connection at the spring strut and pull out the plug for the speed sensor.

2. Loosen fastening screw (hexagon socket head bolt) and remove the speed sensor.



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Important notes

Before installation, ensure that there are no metal chips at the magnetic edge of the speed sensor.

The gap between speed sensor and pulse wheel is determined by the design and cannot be adjusted.

Installation

1. Coat speed sensor and the bore in the wheel carrier with Molykote Longterm 2.

Note

There is no O-ring between speed sensor and wheel carrier.
The speed sensors at front and rear axles are the same.

2. Without using excessive force, insert speed sensor into wheel carrier and tighten the hexagon socket head bolt to 10 Nm (7.5 ftlb.

3. If the speed sensor has been removed or replaced due to an ABS fault or Traction Contol fault, or because of accident repairs, a functional check should be carried out with the Porsche System Tester 2 – via the Actua Values menu, Speed submenu.

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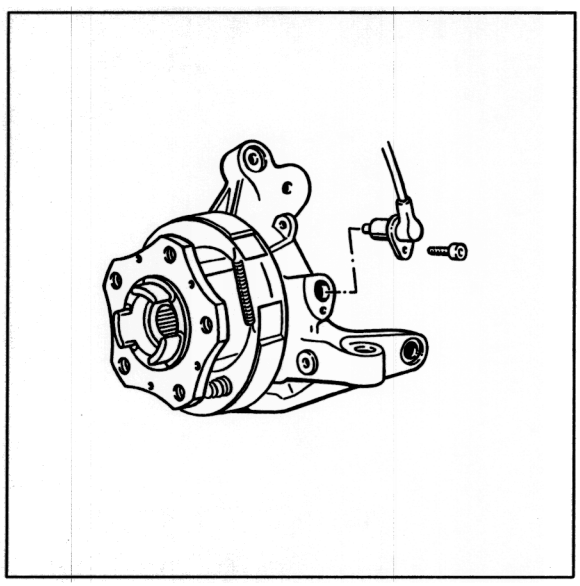
45 15 19 Removing and installing rear speed sensors

Removal

1. With ignition switched off, open the combination plug connection at the spring strut and pull out the plug for the speed sensor.

2. Loosen fastening screw (hexagon socket head bolt) and remove the speed sensor.



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Important notes

Before installation, ensure that there are no metal chips at the magnetic edge of the speed sensor.

The gap between speed sensor and pulse wheel is determined by the design and cannot be adjusted.

Installation

1. Coat speed sensor and the bore in the wheel carrier with Molykote Longterm 2.

Note

There is no O-ring between speed sensor and wheel carrier.
The speed sensors at front and rear axles are the same.

2. Insert speed sensor into wheel carrier without using excessive force and tighten the hexagon socket head bolt to 10 Nm (7.5 ftlb.).

3. If the speed sensor has been removed or replaced due to an ABS fault or Traction Contol fault, or because of accident repairs, a functional check should be carriedd out with the Porsche System Tester 2 – via the Actual Values menu, Speed submenu.

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46 Tightening torques for mechanical brake

Location	Thread	Tightening torque Nm (ftlb.)
Brake caliper* on front and rear axles	M12 x 1.5	85 (63)*
Brake disc on wheel hub (front and rear axles)	M6	10 (7.5)
Brake cover plate on front and rear axles	M6	10 (7.5)
Speed sensor on front and rear axles	M6	10 (7.5)
Brake unit on body (aluminium interm. part)	M8	23 (17)
Brake unit support on body	M8	23 (17)
Parking brake console on body	M8	23 (17)
Bracket for hydraulic unit on body	M6	10 (7.5)
Hydraulic unit on holder	M8	12 (9.0)
Booster pump **for PSM** on holder	M6	7 (5.0)
Booster pump **for PSM** on body at front	M6	4 (3.0)
Wheel on wheel hub	M14 x 1.5	130** (96**)

Replace the brake caliper fastening screws on the front and rear axles every time they are removed.

Thinly grease thread, shank and under head (between screw head bearing surface and spherical cap ring) of the wheel bolts with Optimoly TA (aluminium paste). Do **not** grease bearing surface of the spherical cap facing the wheel. If heavily contaminated, clean bolts first with a lint-free cloth.

46 Technical data

Designation	Notes, dimensions		Wear limit
Operating brake (foot brake)	Hydraulic dual-circuit brake system with front axle-rear axle brake circuit distribution. Vacuum brake booster, internally ventilated and perforated brake discs with four-piston monobloc fixed caliper at front and rear axles. ABS as standard, optionally with traction control (TC).*		
Brake booster (vacuum) ø	10 inches		
Boost factor	3.85		
Brake master cylinder	ø front	23.81 mm	
	ø rear	23.81 mm	
	travel	18/18 mm	
Brake booster**			
Switching pressure reduction factor	55 bar - 0.46		
Identification	5/55		
Brake discs	ø front	318 mm	
	ø rear	299 mm	
Effective brake disc	ø front	261.8 mm	
	ø rear	247.4 mm	
Piston ø in brake caliper	front	2 x 40 + 2 x 36 mm	
	rear	2 x 30 + 2 x 28 mm	
Brake pad area	front	254 cm^2	
	rear	196 cm^2	
Total brake pad area	450 cm^2		

Description, Traction Control (TC) in Repair Group 45
Vehicles with ABS and vehicles with ABS/TC = 1 brake proportioning valve

Designation		Notes, dimensions	Wear limit
Pad thickness	front	approx. 12.0 mm	2 mm
	rear	approx. 10.5 mm	2 mm
Brake disc thickness **new**	front	28 mm	
	rear	24 mm	
Brake discs Mininimum thickness * **after machining**	front	26.6 mm	26.0 mm
	rear	22.6 mm	22.0 mm
Thickness tolerance of the brake disc, max.		0.02 mm	
Lateral runout of the brake disc, max.		0.03 mm	
Lateral runout of the wheel hub, max.		0.03 mm	
Lateral runout of the brake disc when installed, max.		0.06 mm	
Peak-to-valley surface roughness of the brake disc after machining, max.		0.006 mm	
Pushrod play (measured at the brake pedal plate)		approx. 1 mm	
Parking brake (hand brake)		Drum brake acting mechanically on both rear wheels	
Parking brake drum ø		180 mm	181 mm
Brake shoe width		25 mm	
Brake lining thickness		4.5 mm	2 mm

The brake disc may be reworked only symmetrically, i.e. from both sides evenly.

46 Technical data – GT3

Designation		Notes, dimensions	Wear limit
Operating brake (foot brake)		Hydraulic dual-circuit brake system with front axle-rear axle brake circuit distribution. Vacuum brake booster, internally ventilated and perforated brake discs with four-piston monobloc fixed caliper at front and rear axles. The brake calipers are painted red for visual differentiation. ABS 5.3 without Traction Control (3-channel system).	
Brake booster (vacuum)	ø	10 inches Boost factor 3.15 (marked with cup 3.15)	
Brake master cylinder	ø front ø rear travel	25.4 mm 25.4 mm 18/18 mm	
Brake proportioning valve		without	
Brake discs	ø front ø rear	330 mm 330 mm	
Effective brake disc	ø front ø rear	267.8 mm 271.2 mm	
Piston ø in brake caliper	front rear	2 x 44 + 2 x 36 mm 2 x 30 + 2 x 28 mm	
Brake pad area	front rear	314 cm^2 254 cm^2	
Total brake pad area		568 cm^2	

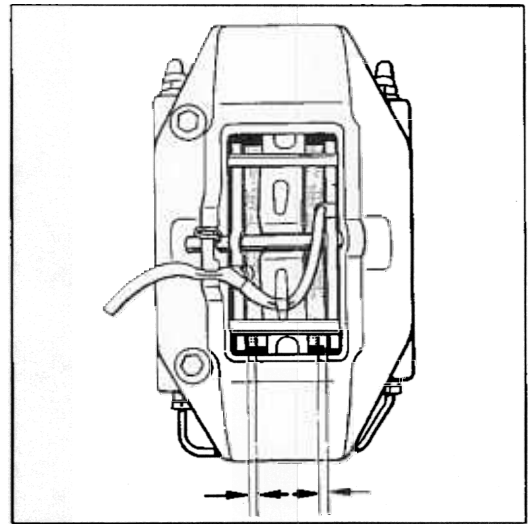
Designation		Notes, dimensions	Wear limit
Pad thickness	front	approx. 12.0 mm	2 mm
	rear	approx. 12.0 mm	2 mm
Brake disc thickness **new**	front	34 mm	
	rear	28 mm	
Brake discs minimum thickness	front		32.0 mm
	rear		26.0 mm
Thickness tolerance of the brake disc, max.		0.02 mm	
Lateral runout of the brake disc, max.		0.03 mm	
Lateral runout of the wheel hub, max.		0.03 mm	
Lateral runout of the brake disc when installed, max.		0.06 mm	
Peak-to-valley surface roughness of the brake disc after machining, max.		0.006 mm	
Pushrod play (measured at the brakepedal plate)		approx. 1 mm	
Parking brake (hand brake)		Drum brake acting mechanically on both rear wheels	
Parking brake drum ø		180 mm	181 mm
Brake shoe width		25 mm	
Brake lining thickness		4.5 mm	2 mm

46 Checking the thickness of the disc brake pads

Note

The brake pads must be replaced (both sets of pads per axle) if the brake pad warning indicator lights up, but no later than when there is a residual pad thickness of 2 mm.

If brake pad wear is indicated by the warning light, the warning contact (sender including wire and plug connection) must also be replaced. Replacing the warning contact can be avoided by replacing the brake pads no later than when the pad thickness is 2.5 mm. Warning contacts with a worn wire core must be replaced. However, if only the plastic part of the warning contact is worn, replacement is not necessary.



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1. To check the brake pads, remove the **wheels**.

2. Visually inspect the brake pads for wear.

The wear limit is reached when the pad has a residual thickness of 2 mm.

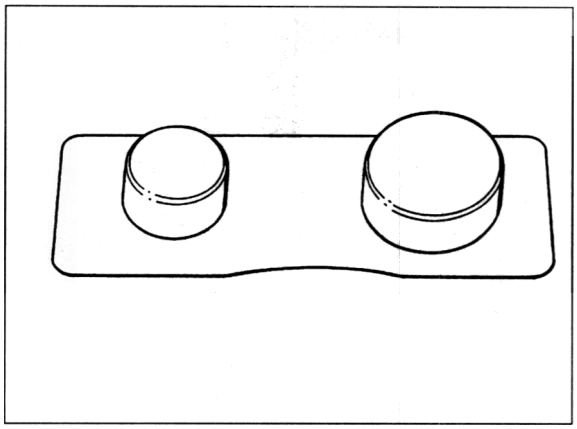
46 36 20 Removing and installing the front disc brake pads

Note

It is essential to observe the following points when changing brake pads:

Use brake pads of the correct quality (in accordance with spare parts catalogue).

Replace vibration dampers each time the pads are changed.



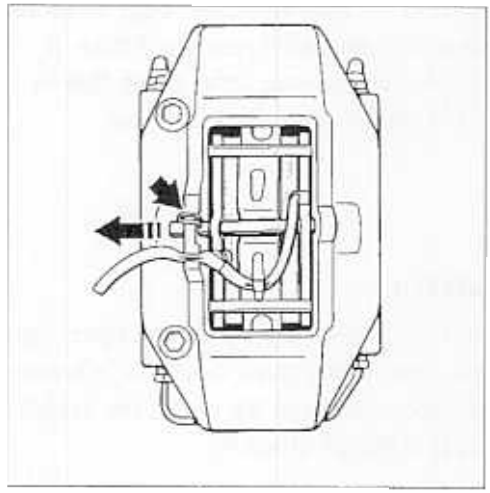
181_97

The **vibration dampers** (damper plates with integrated compensating masses) have an adhesive protective film. The protective film must be pulled off before installation.

The pad backing plates (rear side of the brake pads) must not be greased.

Removal

– Remove the retainer (arrow) and extract the retainer pin inwards.



21_96

Pull out the warning contact wire on the brake caliper and remove the warning contacts from the brake pad plates.

Note

Replace warning contacts if the core of the wire is worn or worn through. The warning contact can continue to be used if there are only scrape marks on the plastic part of the warning contact.

Remove brake pads with a brake pad puller. It is essential to observe the following notes:

Pull out brake pads together with the **vibration dampers**. If this is not possible (depending on wear of the brake pads), use a spatula to detach the vibration dampers from the brake pad plate before removing the pads. In both cases, first set back the brake pads as far as possible with the piston resetting fixture. If necessary, first remove some brake fluid by suction from the brake fluid reservoir.

Installation

– Before installation of the brake pads, check the wear of the brake discs. For minimum thickness of the brake discs, see Technical data in Repair Group 46.

If necessary, turn back the piston to its original position using the resetting fixture.

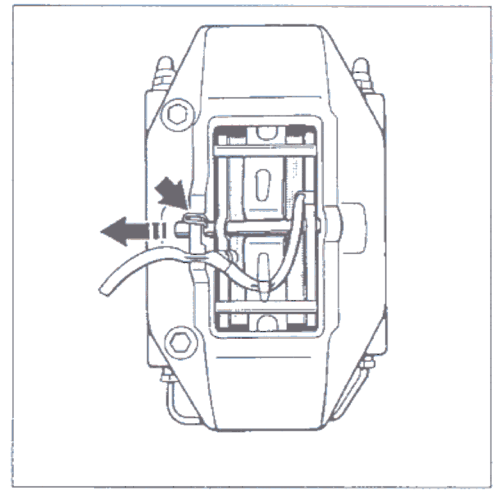
Fit new vibration dampers in the pistons. Remove protective film from the vibration dampers before installation.

Insert the brake pads. **Ensure correct brake pad quality.**

Note

The brake pad quality on the front and rear axles is identical.
The pad backing plates (rear side of the brake pads) must not be greased.

Fit **new** expanding spring, **new** retaining pin and **new retainer (safety bracket)** (arrow). **These parts are available as a repair set and must be "renewed" each time the pads are changed.**



21_96

Insert the warning contact wire and warning contacts.

Firmly press the brake pedal several times with the vehicle stationary so that the brake pads assume their fit in accordance with the operating state.
Next, check and, if necessary, correct the brake fluid level.

Bedding in the brake pads

New brake pads require a bedding-in period of approx. 200 km. Not until then do they achieve their best friction and wear coefficient. During this period, the brakes should be subjected to full stress when travelling at high speed only in emergencies.

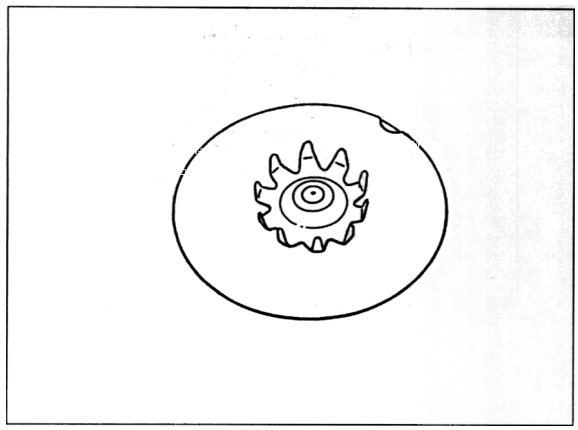
46 38 20 Removing and installing the rear disc brake pads

Note

It is essential to observe the following points when changing brake pads:

Use brake pads of the correct quality (in accordance with spare parts catalogue).

Replace vibration dampers each time the pads are changed.



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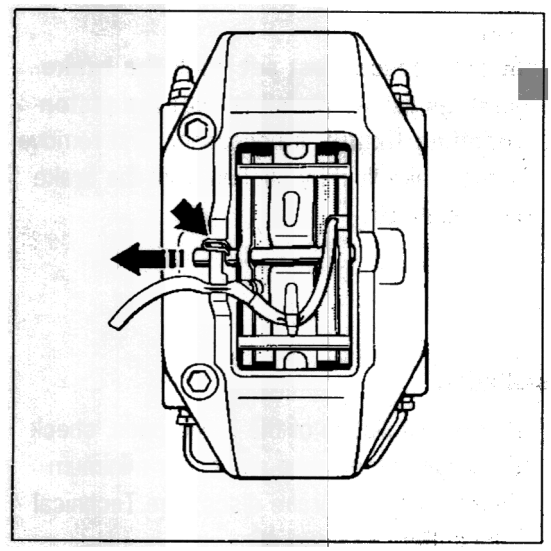
The damper plates have an adhesive protective film.
The protective film must be pulled off before installation.

The pad backing plates (rear side of the brake pads) must not be greased.

Removal

– Remove the retainer (arrow) and extract the retainer pin inwards.



21_96

Pull out the warning contact wire on the brake caliper and remove the warning contacts from the brake pad plates.

Note

Replace warning contacts if the core of the wire is worn or worn through. The warning contact can continue to be used if there are only scrape marks on the plastic part of the warning contact.

Remove brake pads with a brake pad puller. It is **essential** to observe the following notes:

Pull out brake pads together with the **damper plates**. If this is not possible (depending on wear of the brake pads), use a spatula to detach the damper plates from the brake pad plate before removing the pads.
In both cases, first set back the brake pads as far as possible with the piston resetting fixture. If necessary, first remove some brake fluid by suction from the brake fluid reservoir.

Installation

– Before installation of the brake pads, check the wear of the brake discs. For minimum thickness of the brake discs, see Technical data in Repair Group 46.

If necessary, press the piston back to its original position using the resetting fixture.

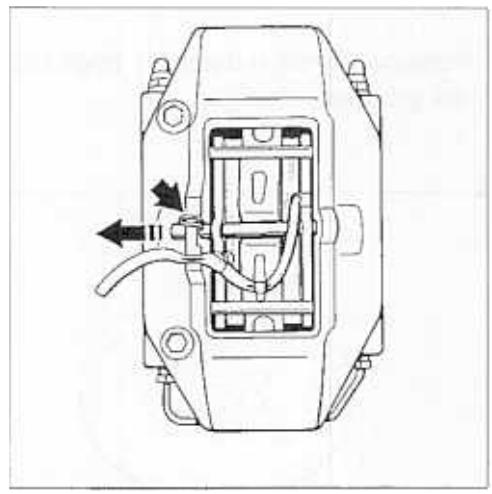
Fit **new damper plates** in the pistons. **Remove protective film** from the damper plates before installation.

Insert the brake pads. **Ensure correct brake pad quality.**

Note

The brake pad quality on the front and rear axles is identical. The pad backing plates (rear side of the brake pads) must not be greased.

Fit **new** expanding spring, **new** retaining pin and **new retainer (safety bracket)** (arrow). **These parts are available as a repair set and must be "renewed" each time the pads are changed.**



21_96

Insert the warning contact wire and warning contacts.

Firmly press the brake pedal several times with the vehicle stationary so that the brake pads assume their fit in accordance with the operating state.
Next, check and, if necessary, correct the brake fluid level.

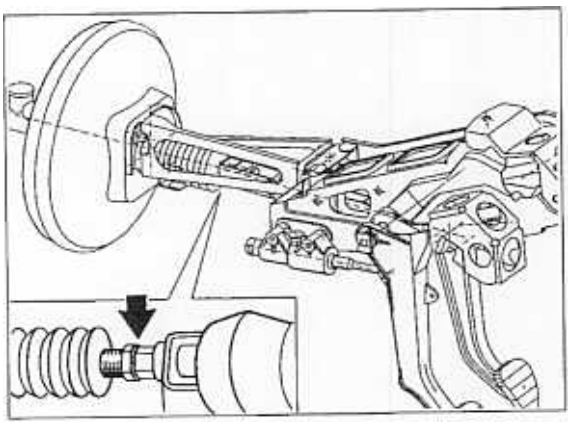
Bedding in the brake pads

New brake pads require a bedding-in period of approx. 200 km. Not until then do they achieve their best friction and wear coefficient. During this period, the brakes should be subjected to full stress when travelling at high speed only in emergencies.

46 11 15 Adjusting the brake pushrod

The brake pedal has no stop. Since, when the brake pushrod is correctly set, the brake pedal has no support possibility in its original position, the permanently set free play in the brake unit is guaranteed. As a result a pushrod play of **approx. 1 mm is noticeable** by manual actuation on the pedal plate of the brake pedal.

Adjusting the pushrod length changes the position of the brake pedal. To do this, undo the lock nut and turn the pushrod accordingly at the hexagon (arrow).



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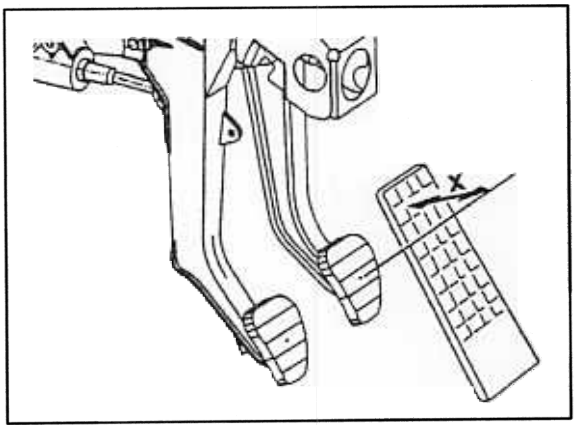
The brake pushrod is correctly set if the **dimension X is 45 + 5 mm**. Perform measurement between the center of the brake pedal plate and the accelerator.



327 - 96

Note

Check adjustment of the brake light switch if brake pushrod is adjusted.

46 Checking brake light switch setting

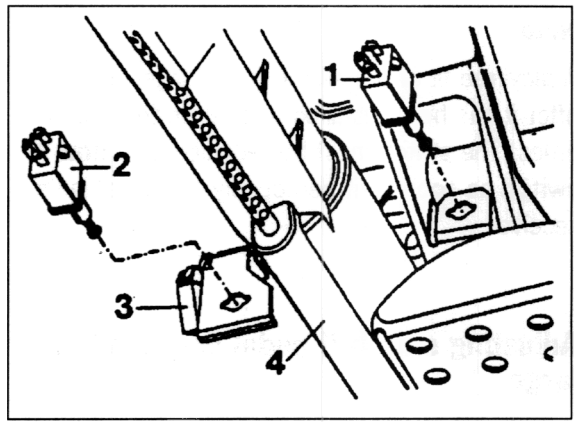
Brake light switch setting

The switch travel of the brake light switch is designed so that the brake light lights up before braking pressure builds up. The switches **are self-adjusting** and are mounted in a bayonett lock in the pedal block by turning them through 90°. **By way of its self-adjustment function**, the switch compensates for the tolerances in the pedals during initial assembly. However, if the switch is **"overpressed"** during work on the pedals or on the brake unit, the switch travel or pedal travel up to the switching point is lost.

The consequence: The brake lights are always on or flicker when travelling over bumps. In vehicles with cruise control, the cruise control can be deactivated as a result of vehicle vibrations under certain circumstances. Therefore, the switches must be **readjusted** after any work in which the brake pedal is moved out of its "normal" position (for example, work on the pedals or on the brake unit).

Checking brake light switch setting (No. 1)

The pedal must move a perceptible distance of approx. 5 to 10 mm before the brake light lights up.
At the same time, check (make sure) that the brake light lights up before the pedal meets perceptible resistance or before brake pressure builds up.



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Adjusting switch if pedal travel is too small

There are two possibilities to adjust the switch if the pedal travel to the switching point is too **small**.

1st possibility:

Press the brake pedal and pull out the switch plunger.

Release the pedal. Check adjustment.

2nd possibility:

Release switch by turning it 90° and pull it out of the installation opening.

Pull operating plunger out of the switch as far as it will go.

Reinstall the switch.
When installing the switch for the first time, it is essential to press it vertically against the bearing surface. It will otherwise not be possible to lock the switch (90° turn), even if great force is exerted.

Note

A play-free fit of the switch is no longer ensured after it has been installed and removed several times. The switch must be replaced by a **new switch** as soon as it perceptibly "wobbles" in its receiver.

Adjusting switch if pedal travel is too large

Press pedal and press plunger into the switch by one notch (audible click).
The pedal travel **to the switching point** then decreases by approx. 3... 4 mm.
Then check setting again.

46 83 16 Adjusting the parking brake shoes

Includes: Adjusting the parking brake shoes and parking brake cables

Checking the free play of the parking brake lever

The parking brake has asbestos-free brake linings. The parking brake with asbestos-free brake linings must **never** be adjusted in such a way that the lining must "grind down" during operation.

The parking brake must be adjusted if the parking brake lever can be pulled up by more than 4 teeth with medium force application without a braking effect being apparent.

Adjusting the parking brake

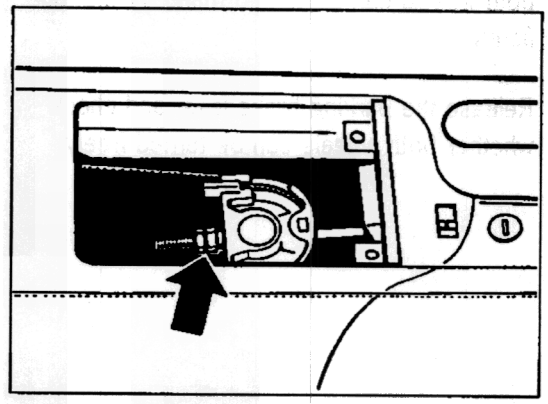
1. Remove the rear wheels.

2. Release the parking brake lever and push back the brake pads of the rear axle until the brake disc can be turned freely.

3. Undo the adjustment nuts on the turnbuckle (arrow) until the cables are without pretension.

Note

To make the turnbuckle accessible, open the cover of the tray behind the parking brake lever and remove the rubber inlay and also the insert.



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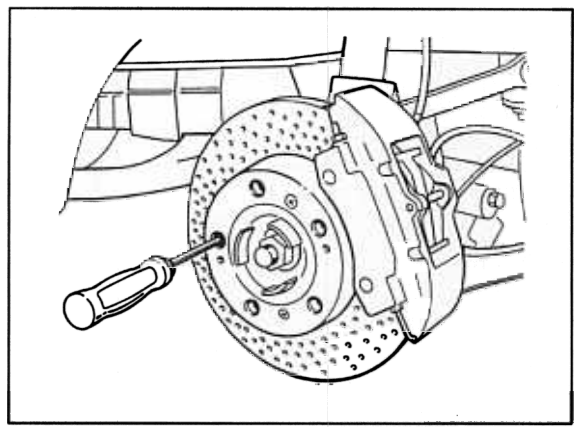
4. With a screwdriver, adjust the adjustment fixture through a threaded wheel bolt hole until the wheel can no longer be turned. Next, turn back the adjustment fixture through 5 notches again (release approx. 3 notches until the wheel can be turned freely, then release another 2 notches).
   Repeat the procedure on the other wheel.



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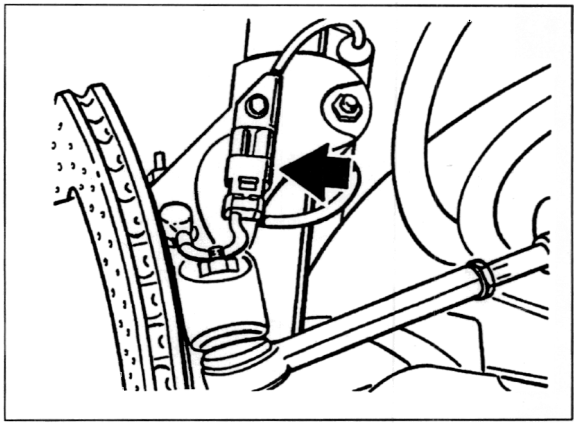
5. Pull up the parking brake lever by 2 teeth and turn the adjustment nut of the turnbuckle until both wheels can be turned manually with difficulty.

6. Release the parking brake lever and check whether both wheels can be turned freely.

46 50 19 Removing and installing the front brake disc

Removal

1. Remove front wheel.
   Open the plug connection on the wheel carrier (arrow) and pull out the plug for the brake pad wear indicator. Unclip the electrical wire on the spring strut.



364_1_96

2. Undo the holder for the brake hose/brake line on the wheel carrier.
   Undo the brake caliper on the wheel carrier and place or secure it in a suitable place.
   (Do not open the brake hydraulics.)

3. Take off the brake disc after removing the countersunk screws. If a stuck brake disc cannot be removed by gentle tapping with a plastic hammer, evenly screw hexagon-head bolts into the two M8 threads of the brake disc, thereby pressing off the disc.

Installation

1. Check that all parts are in perfect condition and replace them if necessary.

2. Clean the levelling and centering surfaces on the brake disc and wheel hub. Then apply a very thin coat of Optimoly TA to the centering surface on the wheel hub.

3. Fit the brake disc

Note

Do not confuse right and left brake discs during assembly.
Distinguishing characteristic: Involute shape and spare part number (SP No.).
The flat surface of the brake discs is marked with **R** = right or **L** = left (Figure 140_99).

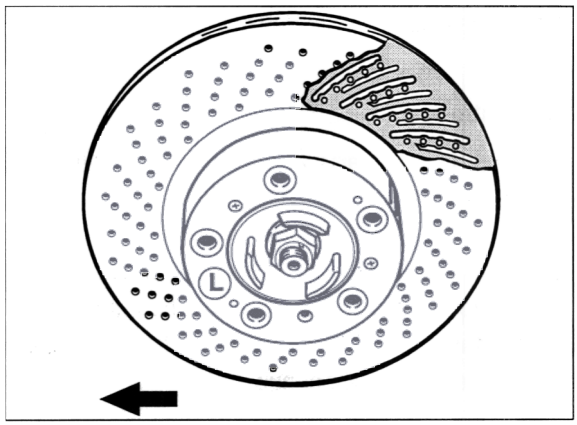
Spare part on left-hand side
third group number is odd

Spare part on right-hand side -
third group number is even

Example:

SP No. Left brake disc:
996.351.**405**.01

SP No. Right brake disc
996.351.**406**.01



L = left brake disc 140_99

4. Fit the brake caliper.
   Tighten the **new** screws of the brake caliper with 85 Nm (63 ftlb.). Ensure that the brake hose and brake line are in a perfect position.

Note

Replace the brake caliper fastening screws after each removal.

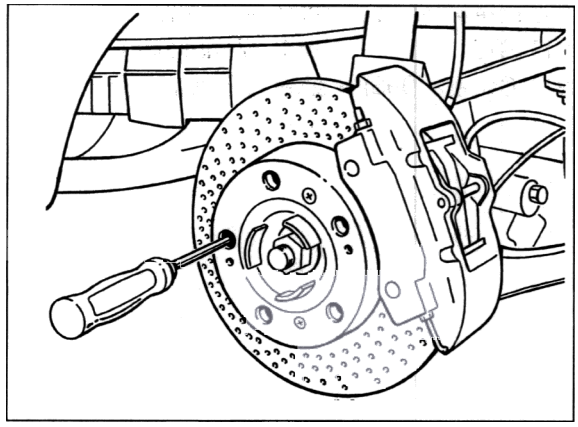
On the 911 GT3, the brake caliper fastening screws on the front and rear axle are **5 mm longer** than on the 911 Carrera (996).
The screws are also different colours.
911 GT3 = red (77 mm long)
911 Carrera (996) = silver (72 mm long).

46 53 19 Removing and installing the rear brake disc

Removal

1. Remove the rear wheel.
   Open the plug connection on the wheel carrier and pull out the plug for the brake pad wear indicator.

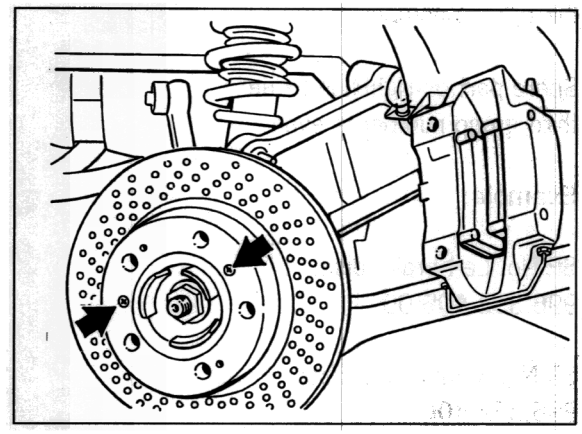
2. With a screwdriver, turn the adjustment device towards "release" through a wheel bolt threaded hole.



58_97

3. Remove the brake caliper from the wheel carrier and suspend it in the wheel arch (do not open brake hydraulics).
   First, pull out the electrical wires on the brake caliper holder and the brake pad wear wire on the wheel carrier holder.

4. Take off the brake disc after removing the countersunk screws (arrows). If a stuck brake disc cannot be removed by gentle tapping with a plastic hammer, evenly screw hexagon-head bolts into the two M8 threads of the brake disc, thereby pressing off the disc.



59_97

Installation

1. Clean the levelling and centering surfaces on the brake disc and wheel hub. Then, apply a very thin coat of Optimoly TA to the centering surface on the wheel hub.

2. Fit the brake disc (right and left brake discs are the same part / exception GT3).

Notes only for 911 GT3

Do not confuse right and left brake discs during assembly.
Distinguishing characteristic: Involute shape and spare part number (SP No.).
The flat surface of the brake discs is marked with **R** = right or **L** = left.

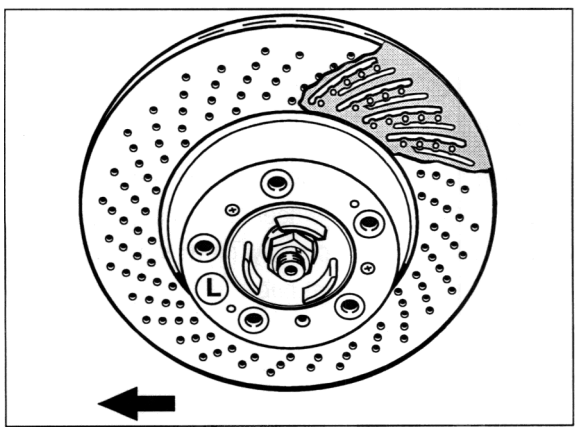
Spare part on left-hand side -
third group number is odd

Spare part on right-hand side -
third group number is even

Example:

SP No. Left brake disc:
996.352.**405**.00

SP No. Right brake disc:
996.352.**406**.00



139_99

– 911 GT3 brake disc
– L = left-hand side

3. Adjust the parking brake shoes and the parking brake cables (Page 46 - 15).
Fit the brake caliper. Tighten the new screws of the brake caliper with 85 Nm (63 ftlb.).
Ensure that the brake hose and brake line are in a perfect position.

Note

Replace the brake caliper fastening screws after each removal.

On the 911 GT3, the brake caliper fastening screws on the front and rear axle are **5 mm longer** than on the 911 Carrera (996).
The screws are also different colours.
911 GT3 = red (77 mm long)
911 Carrera (996) = silver (72 mm long).

46 83 20 Removing and installing the parking brake shoes

Note

The following illustrations show the **right-hand** side of the vehicle.

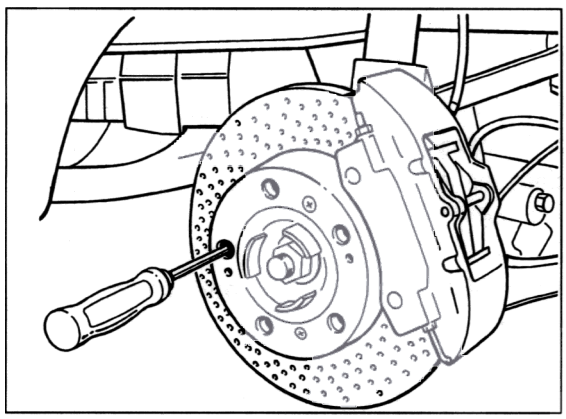
Removal

1. Remove the rear wheel.
   Open the plug connection on the wheel carrier and pull out the plug for the brake pad wear indicator.

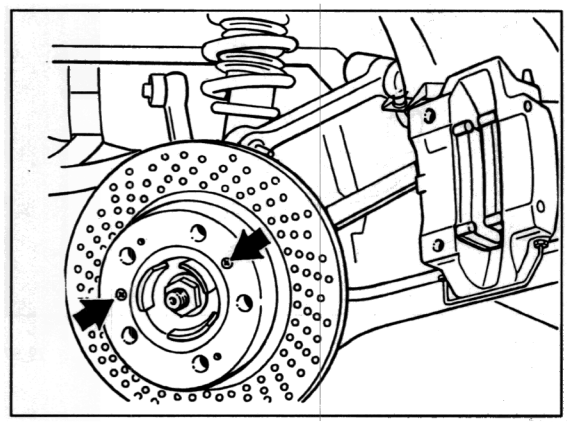
2. With a screwdriver, turn the adjustment device towards "release" through a wheel bolt threaded hole.

3. Remove the brake caliper from the wheel carrier and suspend it in the wheel arch (do not open brake hydraulics).
   First, pull out the electrical wires on the brake caliper holder and the brake pad wear wire on the wheel carrier holder.

4. Take off the brake disc after removing the countersunk screws (arrows). If a stuck brake disc cannot be removed by gentle tapping with a plastic hammer, evenly screw hexagon-head bolts into the two M8 threads of the brake disc, thereby pressing off the disc.

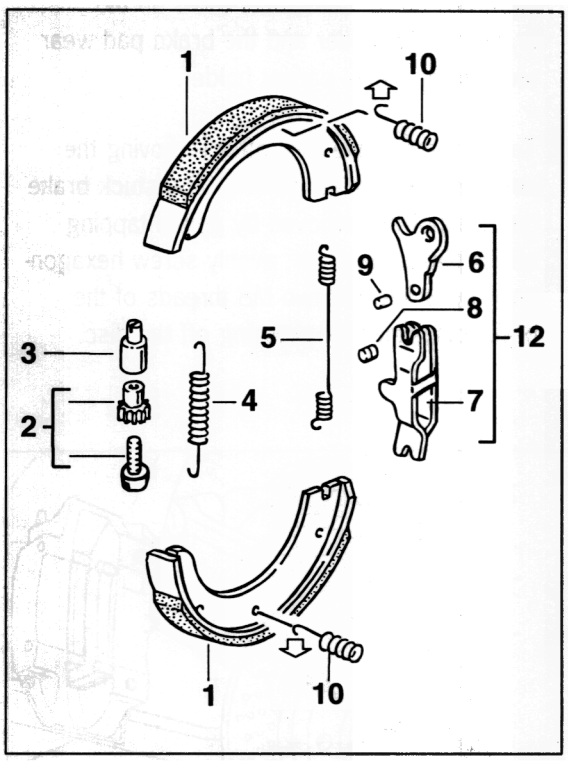


58_97



59_97

5. Remove compression springs (No. 10), adjustment device (No. 2) and return spring (No. 4). Remove parking brake shoes and return spring (No. 5).



79_97

Installation

1. Lightly grease the adjustment device (No. 2), pins (No. 8/No. 9.) on the actuating lever (spreading lever) and the sliding surfaces of the parking brake shoes.

2. Install the actuating lever (spreading lever) (No. 12), brake shoes, return springs, compression springs and adjustment device. The spreading lever (No. 12) is a 1-part assembly that cannot be disassembled. This assembly consists of part Nos. 6, 7 and 8.

Note

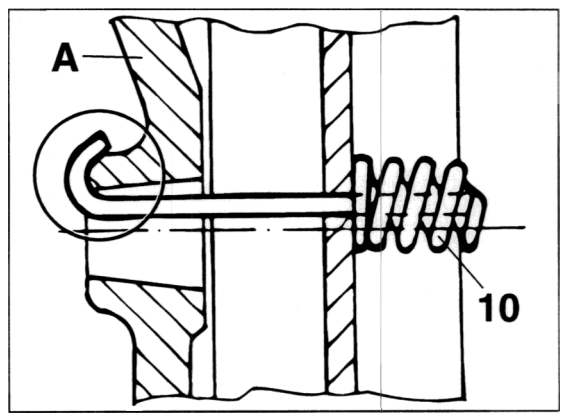
The hook (the curved end of the spring) of compression spring (No. 10) must point **upward** on the **upper** brake shoe and **downward** on the **lower** brake shoe (arrows / Figure 79_97).

3. Again check to ensure that the parking brake shoes, adjustment device, return springs, compression springs and spreading lever are positioned correctly, and adjust if necessary.

Note

Ensure that the hooks (curved spring ends) of the compression springs (No. 10) correctly clasp the wheel carrier A (if necessary, check with the aid of a mirror).

Figure 586_97 shows the **upper** compression spring.



586_97

4. Clean the levelling and centering surfaces on the brake disc and wheel hub. Then apply a very thin coat of Optimoly TA to the centering surface on the wheel hub.

5. Fit the brake disc (right and left brake discs are the same part / exception GT3).

Notes only for 911 GT3

Do not confuse right and left brake discs during assembly.
Distinguishing characteristic: Involute shape and spare part number (SP No.).
The flat surface of the brake discs is marked with **R** = right or **L** = left.

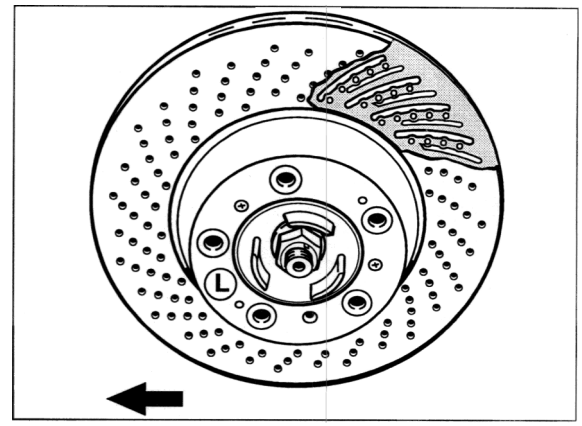
Spare part on left-hand side
third group number is odd

Spare part on right-hand side -
third group number is even

Example:

SP No. Left brake disc:
996.352.**405**.00

SP No. Right brake disc:
996.352.**406**.00



– *911 GT3 brake disc*
– *L = left-hand side*

139_99

6. Adjust the parking brake shoes and the parking brake cables (Page 46 - 15).
Fit the brake caliper. Tightening torque of the fastening screws: 85 Nm (63 ftlb.).
Ensure that the brake hose and brake line are in a perfect position.

Note

Replace the brake caliper fastening screws after each removal.

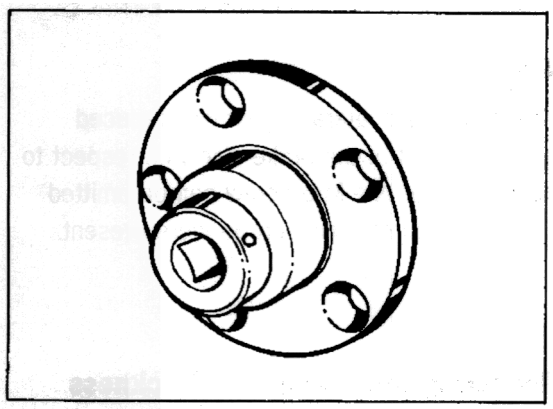
On the 911 GT3, the brake caliper fastening screws on the front and rear axle are **5 mm longer** than on the 911 Carrera (996).
The screws are also different colours.
911 GT3 = red (77 mm long)
911 Carrera (996) = silver (72 mm long).

46 50 04 Measuring the front brake disc lateral runout

Includes: **Measuring the brake disc thickness tolerance**

1. Precondition for measurement: No tilt play at the wheel.

2. Fit the adapter plate (special tool 9510/1) **to the wheel hub**. Tightening torque of the wheel bolts (fastening screws) 130 Nm (96 ftlb.).



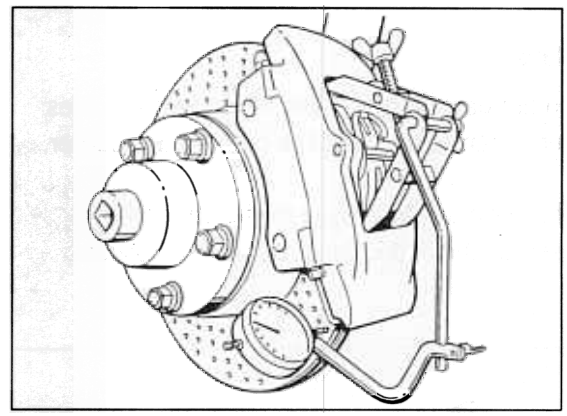
1035-46-

3. Insert dial gauge holder, e.g. Ate order No. 03.9314 - 5500.3/01, into the brake caliper, align it and secure it by turning the clamping wing screw.
If the brake disc cannot be turned freely, set the brake pads back a little.
Do not damage the expanding spring when fitting the dial gauge holder.

Note

If necessary, provide the dial gauge holder with the Ate conversion set, order No. 03.9314 - 5510.3/01 (longer clamping wing screw and, possibly, also a bracket for the dial gauge).

4. Secure the dial gauge with some preload. Put the measuring tip against the largest diameter of the braking surface.



60_97

5. Turn the brake disc and, when doing so, read off the lateral runout at the dial gauge.
The permissible lateral runout of the installed brake disc is **max. 0.06 mm**.

Note

Lateral runout of the removed brake disc:	**max. 0.03 mm.**
Wheel hub lateral runout:	**max. 0.03 mm.**

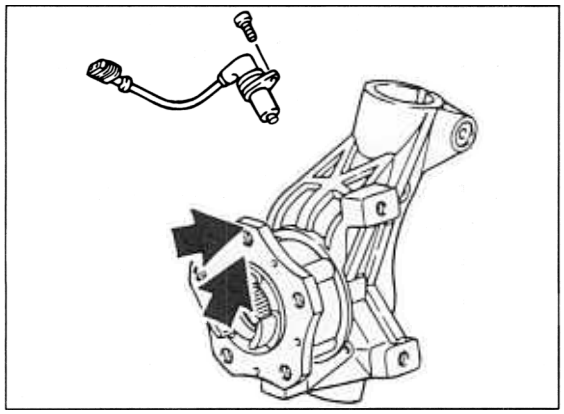
6. If the brake disc lateral runout exceeds 0.06 mm, remove the brake disc and check the wheel hub lateral runout. First mark the position with respect to the wheel hub.

7. Check the wheel hub lateral runout as described below:
   Measure 1 x outside (arrow) and 1 x inside (arrow) of the wheel bolt area **(5-point measuring procedure)** on the front face of the wheel hub. Fasten the dial gauge using a commercially available universal dial gauge holder (refer to Workshop Equipment Manual 2.4, No. 147-1).

Note

Do not damage the brake hoses or brake lines during removal/installation of the brake caliper.

The universal dial guage holder can also be used to check the brake disc lateral runout.



357_96

8. **Wheel hub lateral runout is too large:**
   Replace the wheel hub.
   Wheel hub lateral runout OK:

[redacted]

Note

If the brake disc lateral runout was reduced by radial offset of the brake disc with respect to the wheel hub, one M 6 screw can be omitted if two M 6 countersunk screws were present.

Measuring the brake disc thickness tolerance

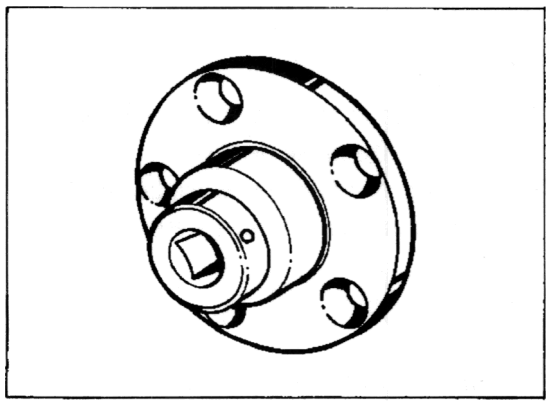
Measure the brake disc thickness deviation within the braking surface at approx. 8 points by using the micrometer. Thickness tolerance of the brake disc **max. 0.02 mm** (new condition: max. 0.01 mm).

46 53 04 Measuring the rear brake disc lateral runout

Includes: **Measuring the brake disc thickness tolerance**

1. Precondition for measurement: No tilt play at the wheel.

2. Fit the adapter plate (special tool 9510/1) **to the wheel hub**. Tightening torque of the wheel bolts (fastening screws) 130 Nm (96 ftlb.).



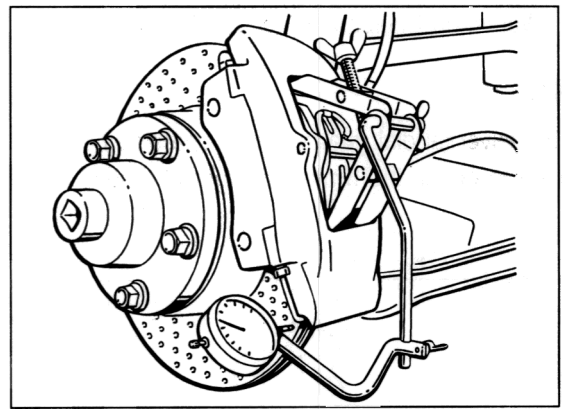
1035-46

3. Insert dial gauge holder, e.g. Ate order No. 03.9314 - 5500.3/01, into the brake caliper, align it and secure it by turning the clamping wing screw. If the brake disc cannot be turned freely, set the brake pads back a little. Do not damage the expanding spring when fitting the dial gauge holder.

Note

If necessary, provide the dial gauge holder with the Ate conversion set, order No. 03.9314 - 5510.3/01 (longer clamping wing screw and, possibly, also a bracket for the dial gauge).

4. Secure the dial gauge with some preload. ositi- on the measuring tip outside the perforation on the largest diameter of the braking surface.



583_97

5. Turn the brake disc and, when doing so, read off the lateral runout at the dial gauge. The permissible lateral runout of the installed brake disc is **max. 0.06 mm**.

Note

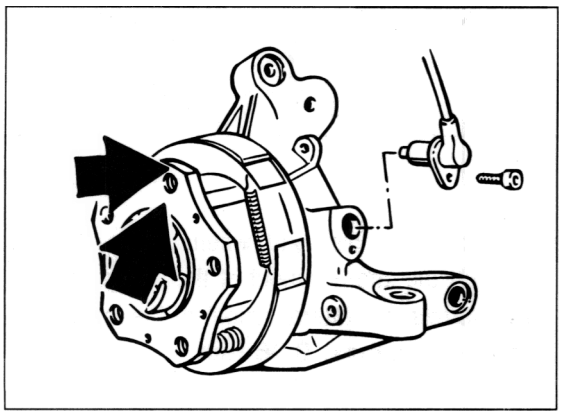
Lateral runout of the removed brake disc:	**max. 0.03 mm.**
Wheel hub lateral runout:	**max. 0.03 mm.**

6. If the brake disc lateral runout exceeds 0.06 mm, remove the brake disc and check the wheel hub lateral runout. First mark the position with respect to the wheel hub.

7. Check the wheel hub lateral runout as described below:
   Measure 1 x outside (arrow) and 1 x inside (arrow) of the wheel bolt area **(5-point measuring procedure)** on the front face of the wheel hub.
   Fasten the dial gauge using a commercially available universal dial gauge holder (refer to Workshop Equipment Manual 2.4, No. 147-1).

Note

The universal dial guage holder can also be used to check the brake disc lateral runout.



582_97

8. **Wheel hub lateral runout is too large:**
   Replace the wheel hub.
   Wheel hub lateral runout OK:
   Clean the levelling and centring surfaces on the brake disc and wheel hub. Next, apply a thin coat of Optimoly TA to the centring surface on the wheel hub.
   Fasten brake disc on the wheel hub in a different position than before – radially offset with respect to the wheel hub.
   Repeat measurement with fitted adapter plate – special tool 9510/1.
   If the lateral runout is still greater than 0.06 mm, replace the brake disc.

Note

If the brake disc lateral runout was reduced by radial offset of the brake disc with respect to the wheel hub, one M 6 screw can be omitted if two M 6 countersunk screws were present.

Measuring the brake disc thickness tolerance

Measure the brake disc thickness within the braking surface at approx. 8 points by using the micrometer.
Thickness tolerance of the brake disc **max. 0.02 mm** (new condition: max. 0.01 mm).

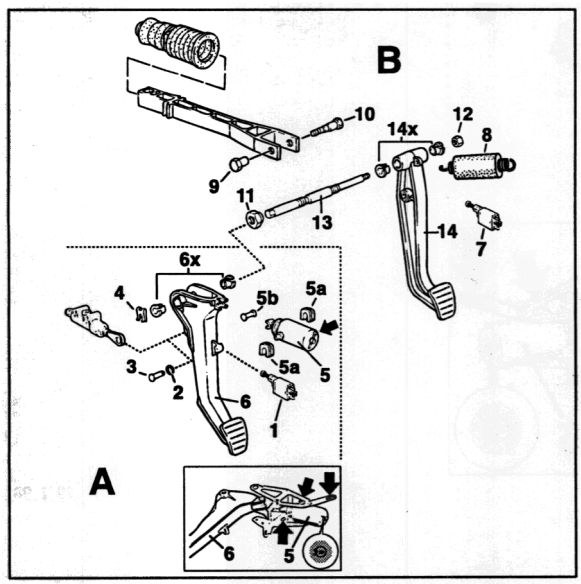
46 05 19 Removing and installing brake pedal

Important notes

The description below applies to left-hand drive vehicles with manual transmission or Tiptronic. On Tiptronic vehicles, start removal with No. 7 (stop light switch/area B). Pedal bearing axle (No. 13) is shorter because there is no clutch pedal lever.

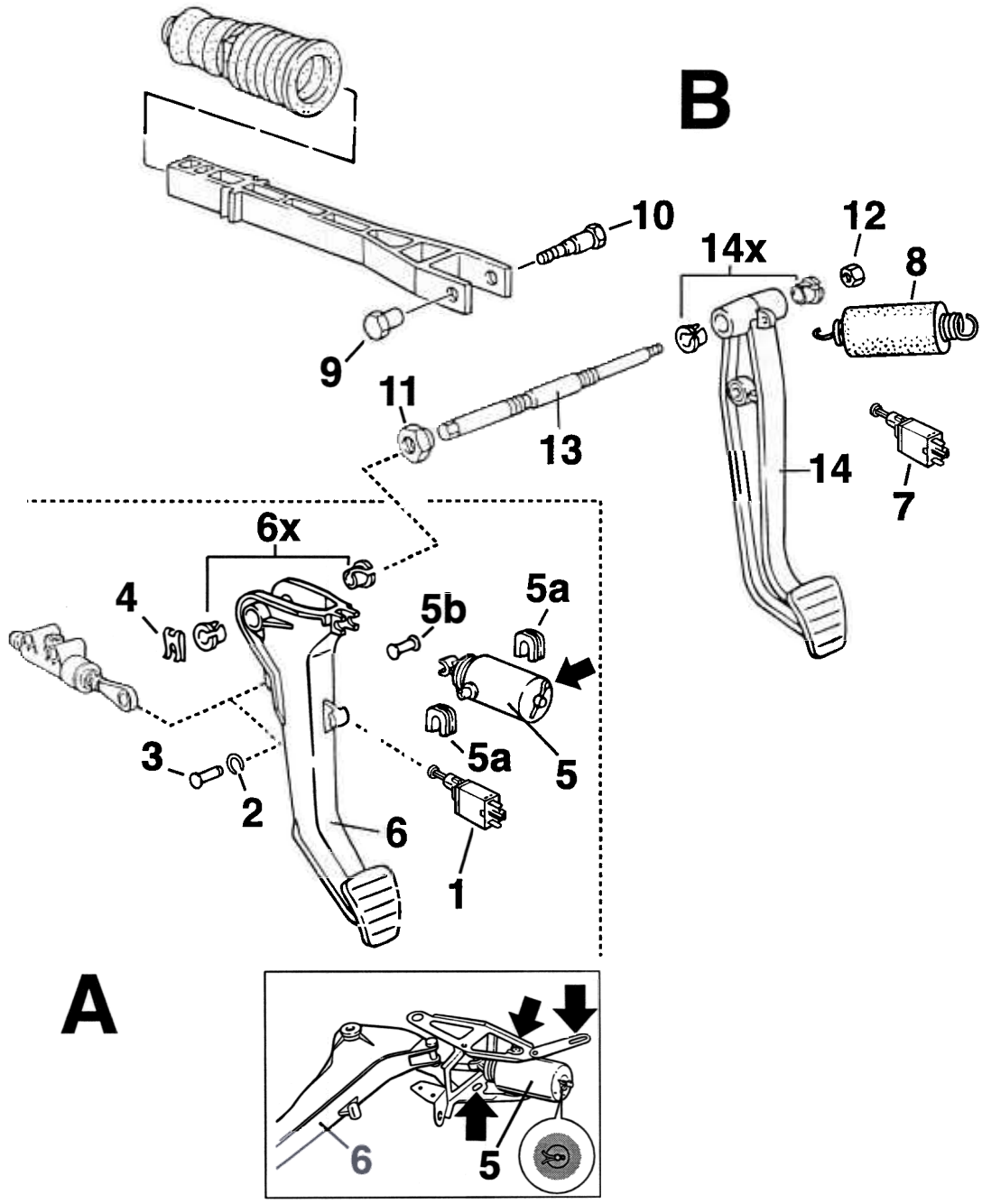
On right-hand drive vehicles, the clutch pedal lever is located directly next to the brake pedal (separated by the steering outer tube in the case of left-hand drive vehicles). Assembly/disassembly for right-hand drive vehicles is similar to the procedure for left-hand drive vehicles.

Before the start of disassembly work on the pedals, **the clutch boost spring must be fixed with a cotter pin (arrow at No. 5)** in the case of vehicles with manual transmission. Important: secure the cotter pin (bend it over).



29_1_98

Removing and installing brake pedal



A = Clutch pedal area
B = Brake pedal area

A = Clutch pedal area

No.	Designation	Qty.	Removal	Note: Installation
1	Switch	1	Release by turning 90°, and pull out of the installation opening	Before installation, pull operating plunger out of the switch as far as it will go
2	Retaining clip	1		Replace if necessary
3	Pin	1		
4	Clamp	1		Replace
5	Boost spring with bracket	1	Secure boost spring with cotter pin (arrow at No. 5) Insert the cotter pin (ø 3 mm) into the assembly bore and bend over ends. Then undo the three fastening nuts of the bracket (arrows) and remove the boost spring together with bracket and clutch pedal lever (No. 6)	Install the assembly consisting of bracket, boost spring and clutch pedal lever. Ensure correct allocation when replacing the boost spring.** Observe assembly and adjustment specification for the bracket (assembly instructions under Installation, step 4)
5a	Boost spring bearing	2		Replace if necessary. It is important to note instructions regarding grease**
5b	Pin	1		It is important to note instructions regarding grease**
6	Clutch pedal lever	1	Remove together with boost spring No. 5 and bracket	
6X	Bushings	2	Remain in the clutch pedal lever	Check, replace if necessary. Lubricate. Use specified grease*

* Lubricate the bushings of the clutch and brake pedals (6X and 14X) with "Optimol, Optitemp LG 2" grease, Part No.: 000.043.203.37 (delivery quantity: 80 g tube).

**Please refer to Repair Group 30 – Service No. 30 Clutch boost spring: allocation and grease specification. To see when lubrication of the boost spring bearing points is not permitted, please also refer to the assembly instructions for installation, steps 3.1 and 3.2.

B = Brake pedal area

No.	Designation	Qty.	Removal	Note: Installation
7	Stop light switch	1	Release by turning 90°, and pull out of the installation opening	Adjust stop light switch if necessary; refer to Repair Group 46 in the passage describing stop light adjustment
8	Return spring	1	Disengage at body	Fit a sleeve (protective sheath) on return springs without one
9	Threaded bushing	1		Tighten to 10 Nm (7.5 ftlb)
10	Pin	1		
11	Lock nut	1		Tighten to 20 Nm (15 ftlb.)
12	Hexagon nut M8	1		Replace; tighten to 10 Nm (7.5 ftlb.)
13	Pedal bearing axle	1	Unscrew at hexagon	Grease in area of the bearing bushings 6X and 14X,* and tighten to 8 ... 10 Nm (6.0 ... 7.5 ftlb.)
14	Brake pedal	1	Pull out; to do this, turn the brake pedal and/or push rod accordingly if necessary	
14X	Bushings	2	Remain in the brake pedal	Check, replace if necessary. Lubricate. Use specified grease*

* Lubricate the bushings of the clutch and brake pedals (6X and 14X) with "Optimol, Optitemp LG 2" grease, Part No.: 000.043.203.37 (delivery quantity: 80 g tube). Any residues of the previous grease need not be removed.

Notes on removal and installation

Removal

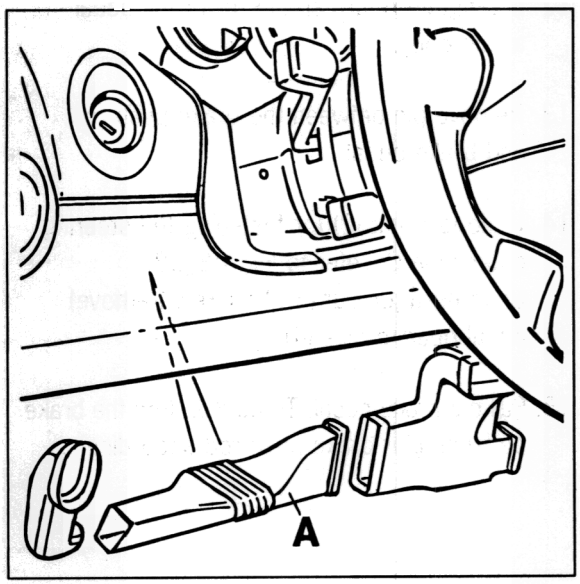
Warning
Danger of injury and/or damage during disassembly and assembly work!
The clutch boost spring can become detached on its own.

> Before the start of disassembly work in the area of the clutch pedal lever in vehicles with manual transmission (exception: clutch pedal switch), the clutch boost spring must be fixed with a cotter pin (Figure 478_98).

1. Disconnect battery ground cable.

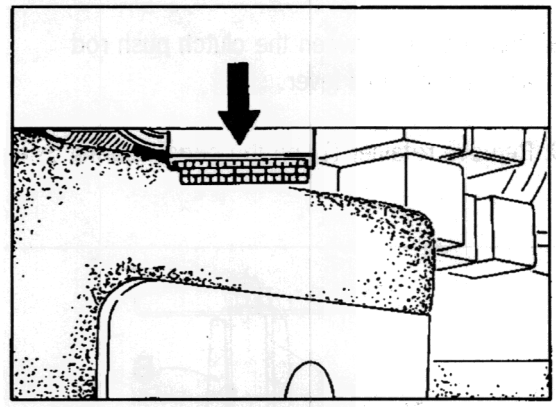
2. Remove driver's seat (to facilitate work).

3. Remove air duct (A).
   The air duct is plugged in.



290_1_97

4. Detach diagnostic socket.

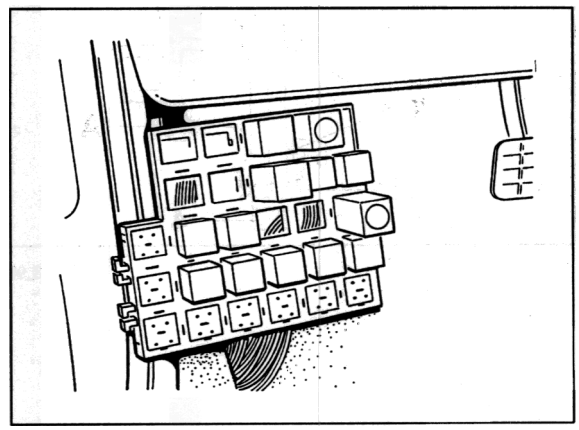


12_96

5. Detach relay carrier, unclip and lower into the footwell.

Note

Continue with Step 11 for Tiptronic vehicles.



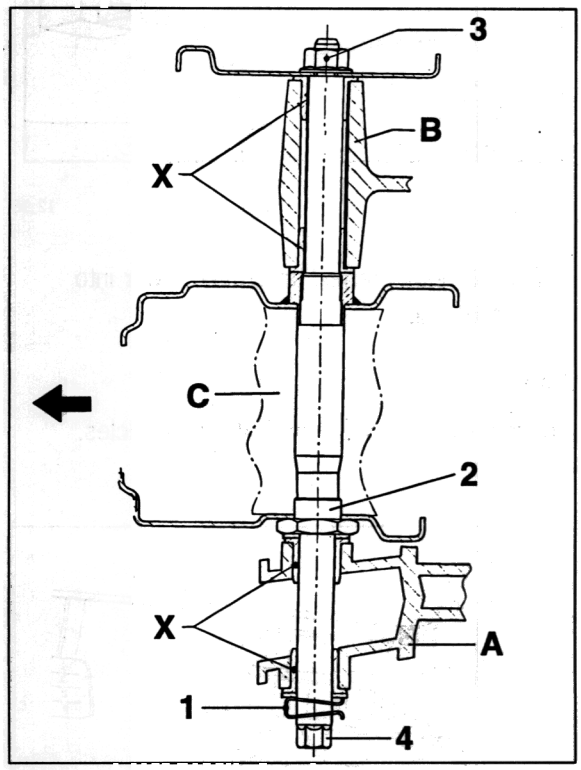
86_98

6. Release clutch pedal switch by turning it 90° and pull it out of the installation opening.

7. There is an assembly bore in the guide rod for the clutch boost spring. Insert a 3 mm ø cotter pin in this bore, and bend over the ends (securing: refer to Figure 478_98).

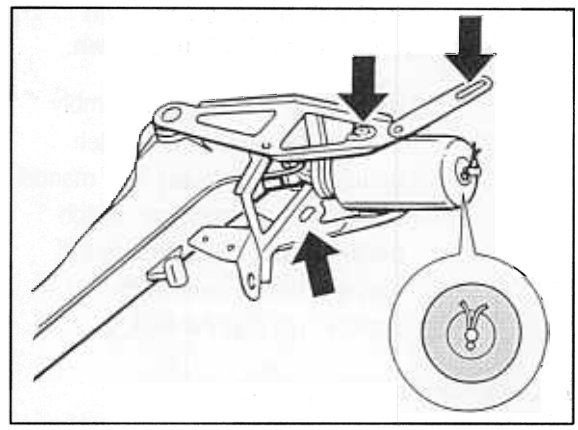
8. Remove pin between the clutch push rod and clutch pedal lever.

9. Remove retainer (1) on the pedal bearing axle.



48_98

10. Undo fastening nuts from boost spring bracket (arrows).
Requirement: Boost spring secured with a cotter pin.
Remove clutch pedal lever together with boost spring and bracket.



478_98

11. Release stop light switch by turning it 90° and pull it out of the installation opening.

12. Disengage return spring for brake pedal at the body.

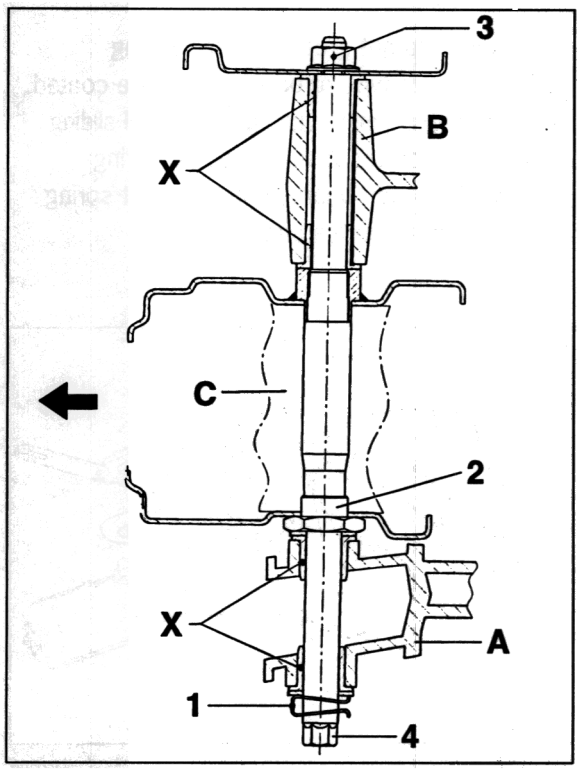
13. Remove pin between the brake push rod and brake pedal.

14. Undo lock nut (2) for fastening the steering outer tube C; refer to Fig. 48_98.
Undo hexagon nut (3). Unscrew (remove) pedal bearing axle (4).

15. Pull out brake pedal. To do this, turn the brake pedal and/or brake push rod accordingly.

Installation

1. Inspect all bearing bushings X for clutch pedal lever and brake pedal and replace them if necessary. Lubricate sliding surfaces of the bearing bushings X and the pedal bearing axle with Optimol, Optitemp LG 2, part No. 000.043.203.37.



48_98

A – Clutch pedal lever
B – Brake pedal
C – Steering outer tube
X – Bearing bushings

1 – Retainer
2 – Lock nut
3 – Hexagon nut
4 – Pedal bearing axle
(1...4) – Removal sequence

2. Fit brake pedal and stop light switch.
   Tightening sequence of the pedal bearing axle (refer to Fig. 48_98):
   No. 4 = Pedal bearing axle (8...10 Nm (6.0...7.5 ftlb.))
   No. 3 = Hexagon nut (10 Nm (7.5 ftlb.))
   No. 2 = Lock nut for steering outer tube (20 Nm (15 ftlb.))

Note

Stop light switch installation and stop light switch adjustment: refer to Repair Group 46, "Checking stop light switch setting".

3. Assemble boost spring, bracket and clutch pedal lever.
   Description under step 3.1 or 3.2.
   3.1 Carrera Mod. '98 / some Mod. '99
   3.2 Carrera as of current Mod. '99.

Note

In the 911 Carrera (996), different boost springs may be fitted.
Observe proper allocation when replacing the boost spring and/or the bracket.

In some cases, a modified (optimised) clutch pedal must also be used when replacing the boost spring.

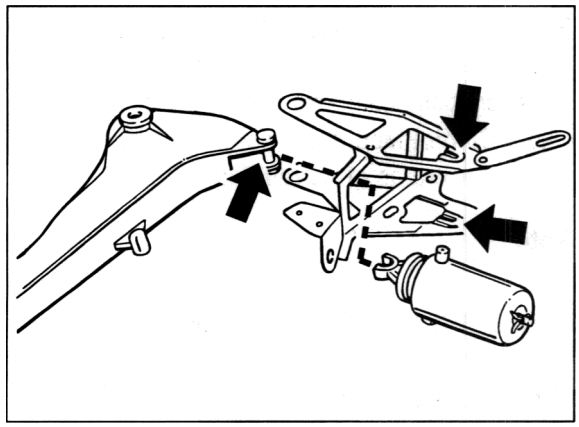
Greasing of the boost spring bearing points is partly necessary and partly not permitted (depending upon the type of boost spring used).

Please refer to the Technical Manual – Repair Group 30, Service No. 30 Clutch boost spring: allocation and grease specification.

3.1 Carrera Mod. '98 / some Mod. '99

Identification/differentiation:
Push rod of boost spring open on one side, boost spring parts not coated.

Grease pin for boost spring (arrow) with mating bearing on the boost spring push rod, the boost spring bearing (arrows) and the bearing pins on the boost spring with Optimol, Optitemp LG 2, Part No. 000.043.203.37.
First remove old grease with solvent naphtha.



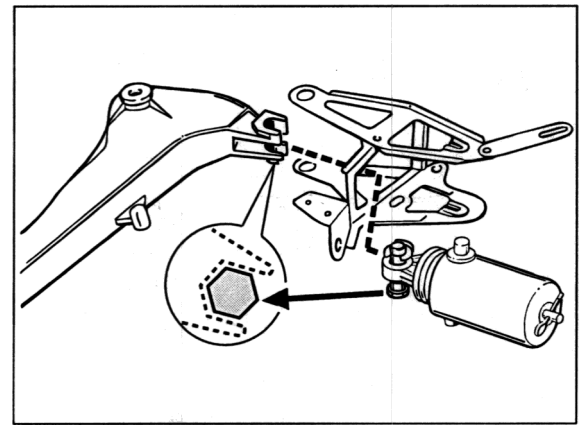
Greasing necessary (arrows) 31_1_98

3.2 Carrera as of current Mod. '99

Identification/differentiation:
Push rod closed / boost spring parts coated.
The date of introduction for this boost spring is contained in the Parts Catalogue.

Engage the hexagon bolt of the boost spring in the hexagon on the clutch pedal (arrow)

Important: Do not grease, as the sliding surfaces of this type of boost spring are coated. This non-greasing instruction applies to all sliding surfaces (pin of boost spring, boost spring bearing in bracket, bearing pin on boost spring and boost spring in the shell).



Do not grease (not permitted) 467_98

Note

Gold-coloured bracket (996.423.571.00) and boost spring with **purple** marking (996.423.081.**09** Mod. '98 / some Mod. '99 or 996.423.081.**11** as of current Mod. '99) must be used only in this combination and installed only in the 911 Carrera (996).

4. Installation and adjustment specification for boost spring bracket.
   Install preassembled boost spring bracket with clutch pedal lever.

To do this:

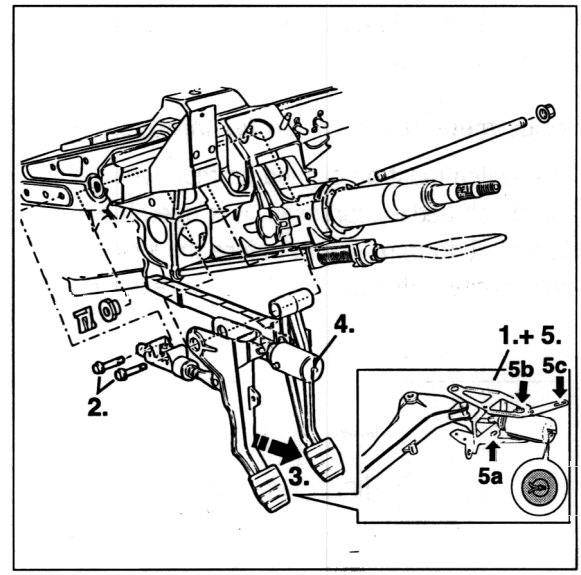
Step 1:
Tighten the three fastening nuts (arrows) only slightly (the bracket must still be movable).

Step 2:
Tighten the clutch master cylinder to 10 Nm (7.5 ftlb.) (if the clutch master cylinder was detached).

Step 3:
Press the clutch pedal against the direction of travel until the pull stop in the clutch master cylinder is reached.

Step 4:
Remove cotter pin (retaining pin) on the spring cup so that the clutch pedal is pressed against the rubber stop in the boost spring bracket.

Step 5:
The bracket is screwed down with the clutch pedal pressed back (to make full use of the slots). Tighten hexagon nuts (arrows) in the prescribed sequence. Tightening torque: 7.5 Nm (5.5 ftlb.).
Sequence: 5a / 5b / 5c



32_98

Note

The push rod of the clutch save cylinder should **not** be lubricated in general (for all versions).

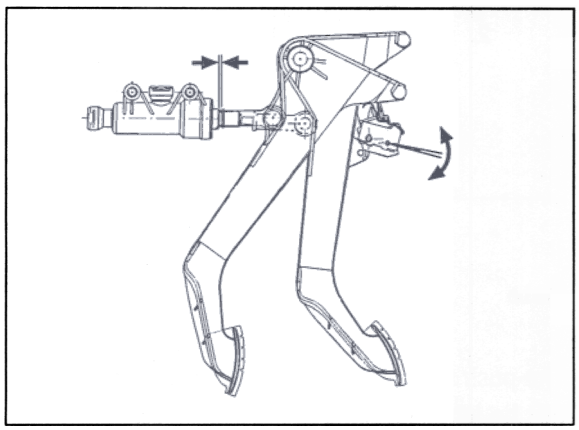
5. Fit new retainer on the pedal bearing axle and subsequently secure the retainer by wedging it with a mandrel.

6. Install clutch pedal switch.
   First pull operating plunger out of the switch as far as it will go.
   By means of its self-adjustment function, the switch then compensates for tolerances in the pedals.

7. Check the interlock switch adjustment on vehicles with interlock.

Adjustment specification for interlock switch:

The switch must be aligned so that, with the clutch pedal depressed, it is operated approx. 1 to max. 2 mm before the limit stop of the clutch slave cylinder is reached.



49_98

8. Install relay carrier, diagnostic socket and air duct.

9. Perform a function test on clutch and brake operation.

47 Tightening torques for brake hydraulics

Location	Thread	Tightening torque Nm (ftlb.)
Brake master cylinder circuits / hydraulic unit		
Brake pressure line on brake master cylinder, brake hose, distributor, brake caliper and hydraulic unit	M10 x 1 M12 x 1	12 - 14 (9.0 - 10.5) 20 (15)
Brake proportioning valve on brake pipe	M10 x 1	14 (10.5)
Hydraulic unit on holder	M8	12 (9.0)
Hydraulic unit on body	M6	10 (7.5)
Booster pump for PSM		
Booster pump on holder Booster pump on body at front	M6 M6	7 (5.0) 4 (3.0)
Brake caliper		
Connecting line on brake caliper	M10 x 1	12 (9.0)
Bleeder screw on brake caliper	M10 x 1	8 - 12 (6.0 - 9.0)
Brake pressure line on brake caliper	M10 x 1	12 - 14 (9.0 - 10.5)
Brake unit		
Brake unit on body	M8	23 (17)
Brake unit support on body	M8	23 (17)
Brake master cylinder on brake booster	M14	49 (36)

47 01 07 Bleeding the brakes

Important notes

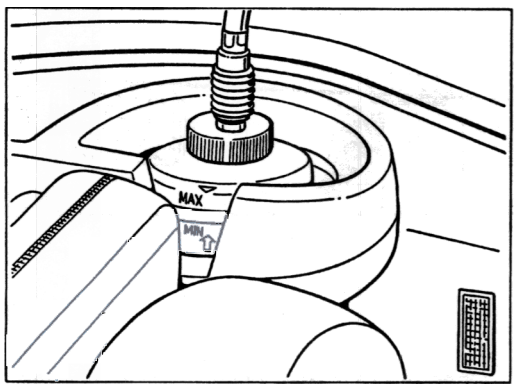
Use only new DOT 4 brake fluid. **Observe brake-fluid quality.**

The brake-fluid change interval using Super DOT 4 brake fluid is two years. This brake fluid is available under the following part number:

Container volume **1** litre = 000.043.203.**66**
Container volume **30** litres = 000.043.203.**67**.

Procedure for bleeding

– Fill reservoir to its top edge with new brake fluid. **Attach bleeding device to reservoir.** Switch bleeding device on. Bleed pressure approximately 1.5 bar.



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Continue bleeding at the brake calipers in the sequence: rear right / rear left / front right / front left.
Open each bleeder valve until clear, bubble-free brake fluid emerges. Take care to bleed at each brake caliper and at both bleeder valves. Bleed the outer bleeder valve first.

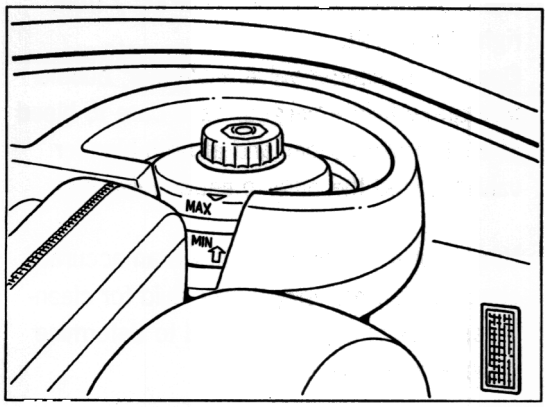
Use a collecting bottle to make an accurate check on the escaping brake fluid for cleanliness, lack of air bubbles and to determine the brake fluid used.

After installing a new brake master cylinder and/or a new hydraulic unit, do the following while bleeding: **open the right** rear bleeder valves, then fully depress the brake pedal several times. Hold for 2 - 3 seconds after each depression, then release slowly.
Repeat this procedure in the sequence **rear left / front right / front left**. This will remove all air bubbles (from the primary circuit).

Note

Also carry out this procedure if the brake hydraulics was largely empty or if after bleeding residual air can be detected by excessive brake-pedal travel.
Caution: In vehicles with high mileage or in old vehicles, double the pumping cycles and use only half the brake master cylinder stroke (damage to the brake master cylinder could occur / primary boot damage).

Switch off and disconnect bleeder device.
Correct brake fluid level if necessary.



189A - 96

Note

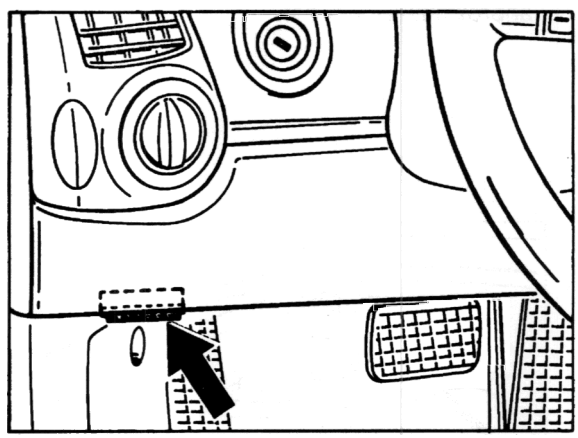
On vehicles with Traction Control (TC) consisting of ASR and ABD (4-channel system), the ABD circuit (in the hydraulic control unit) must be additionally bled **when the hydraulic control unit is replaced or removed** (see following text).

Bleeding the ABD circuit (secondary circuit) on vehicles with Traction Control (TC)

Preliminary work: Bleed brakes as usual (Page 47 - 3/4).

To bleed the ABD circuit, the bleeding device remains connected (switched on).
Bleed pressure approximately 1.5...2.0 bar.

Connect the **Porsche System Tester 2** to the diagnostic socket.
The diagnostic socket is located in the driver's footwell (left-hand drive vehicles) or passenger's footwell (right-hand drive vehicles) near the fuse box.



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Open the rear right bleeder valve (use collecting bottle).

Press the Start button on the System Tester. This initiates certain functions in the hydraulic control unit (return pump, switch-off and switch-over valves are actuated).
Bleed until clear, bubble-free brake fluid emerges.
In addition (throughout bleeding operation) fully depress (pump) brake pedal as far as the stop at least ten times.
Caution: In vehicles with high mileage or in old vehicles, double the pumping cycles and use only half the brake master cylinder stroke (damage to the brake master cylinder could result / primary boot damage).

Close the right rear bleeder valve. Then immediately press Stop button on the System Tester.

Switch ignition off and disconnect System Tester.

Switch off and disconnect bleeder device.
Correct brake fluid level if necessary.

47 08 55 Changing brake fluid

Important notes

Use only new DOT 4 brake fluid. **Observe the change interval and the brake fluid quality.**
Total brake fluid change quantity
approx. 1 litre.

The brake-fluid change interval using Super DOT 4 brake fluid is two years.
This brake fluid is **available under the following part numbers**:
Container volume 1 litre = 000.043.203.**66**
Container volume 30 litres = 000.043.203.**67**

Procedure for brake-fluid change

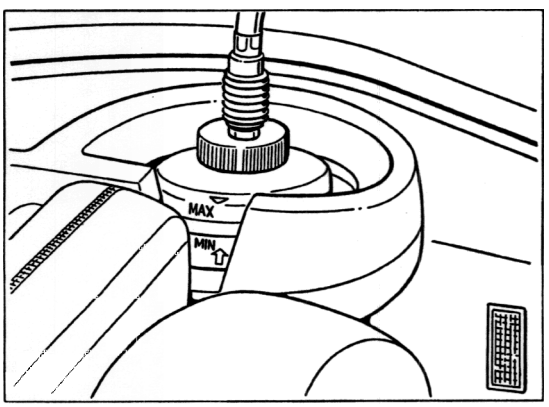
– Fill reservoir to its top edge with new brake fluid. **Attach bleeding device to reservoir.** Switch bleeding device on. Bleed pressure approximately 1.5 bar.

Continue bleeding at the brake calipers (no special sequence).
Open each bleeder valve until clear, bubble-free brake fluid emerges or the appropriate change quantity per brake caliper has been reached (approximately 250 cm^3). Make sure that brake fluid is drained **at both** bleeder valves on each brake caliper.

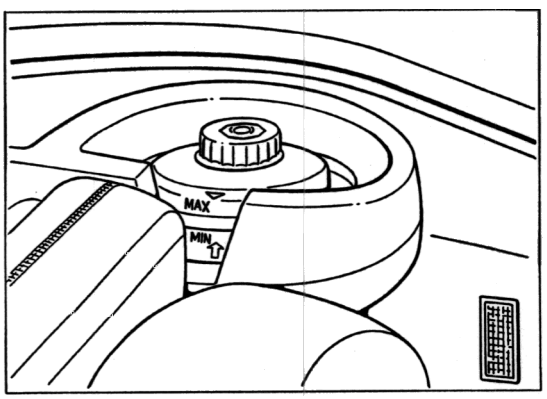
Use a collecting bottle to make an accurate check on the escaping brake fluid for cleanliness, lack of air bubbles and to determine the brake fluid used.

Also bleed some brake fluid (approx. 50 cm^3) at the bleeder valve of the clutch slave cylinder.

Switch off and disconnect bleeder device. Correct brake fluid level if necessary.



682A - 96



189A - 96

48 Tightening torques for steering

Location	Thread	Tightening torque Nm (ftlb.)
Steering gear to cross member*	M10/10.9	65 (48)*
Track rod (ball joint) to steering arm	M12 x 1.5/10	75 (55)
Universal joint (steering shaft) to steering gear**	M8	23 (17)**
Track rod to ball joint (lock nut)	M14 x 1.5	50 (37)
Track rod to steering rack	M16 x 1.5	80 (59)
Steering wheel to steering shaft	M16 x 1.5	46
Steering outer tube to pedal bearing block, top	M10 x 1.5	46 (34)
Steering outer tube to pedal bearing block, bottom	M16	30 (22)
Steering lock to steering outer tube	M6	13 (10.0)
Transverse support to steering outer tube	M8	23 (17)
Transverse support to support frame	M8	23 (17)
Pressure and return lines to steering gear	M10 x 1.5	20 (15)
Plug-in couplings for steering hydraulics	a/f 15*** a/f 19***	30 (22) 40 (30)

Replace screws whenever removed.
Replace fit bolt whenever it has been removed.
a/f = width across flats or wrench size (a/f 15 pressure line / a/f 19 return line).

48 Test and assembly work on power-assisted steering

General

Damage to power-assisted steering results from lack of oil in the hydraulic system. Because of the high oil pressure in the hydraulic circuit, even small leaks can cause loss of fluid and damage the servo pump.

Grinding noises when the steering is on lock or the formation of foam in the reservoir indicates lack of oil and/or the sucking in of air. Before filling the reservoir, any existing leaks must be eliminated on the suction side. Alternatively, the defective part on the pressure side should be replaced.

Only **Pentosin CHF 11 S** may be filled into the reservoir. Pentosin CHF 11 S can be ordered with the following part number:
Quantity supplied **1 litre** = 000.043.203.33.

Important note

Rack-and-pinion steering gear and servo pump must not be repaired or dismantled.

Servo-pump drive belt

The drive-belt pretension cannot be adjusted.

Checking the steering system for leaks (visual check)

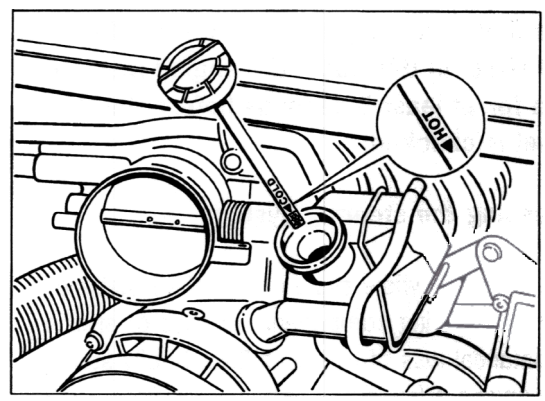
With engine idling, turn steering wheel as far as the stop and hold still. The maximum possible line pressure results in this way.

In this position, check all pipe connections for leaks and retighten if necessary.

Perform the check for a maximum of ten seconds. A longer check should always be interrupted by a brief pause after approximately ten seconds.

Checking Pentosin CHF 11 S hydraulic fluid in the power-steering system

The reservoir is located in the engine compartment. There are two marks on the dipstick located on the reservoir cap. One side bears the mark "Cold" for a cold engine (approximately 20° C) and the other "Hot" for a hot engine (approximately 80° C).



84-97

48 10 19 Removing and installing steering wheel (airbag)

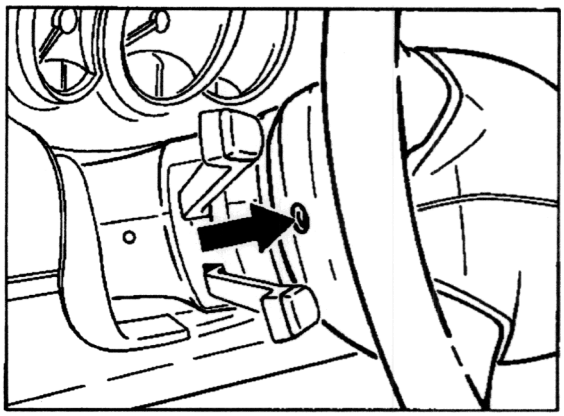
Removal

1. Disconnect the battery and cover terminal or battery.

2. Remove driver's airbag unit. For this purpose, loosen the two fastening screws with a screwdriver for internal Torx T 30. Disconnect plug connection at airbag unit and at steering wheel (for horn).

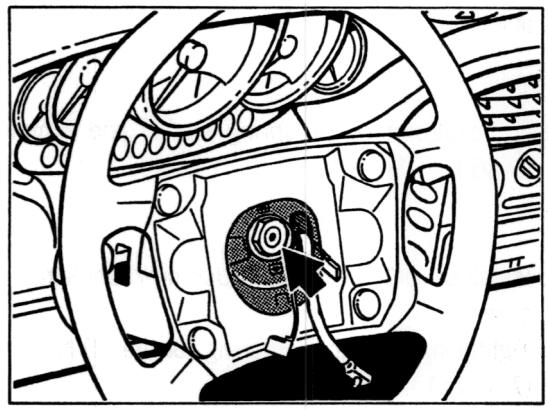
Note

Replace fastening screws whenever they have been loosened.
The airbag unit must always be set down so that the cushioned side faces upwards.
If removed for an extended period, the airbag unit must be kept in a locked place. Observe the safety regulations.



28-96

3. Loosen hexagon nut and remove together with spring washer.



125-97

4. Turn wheels to straight-ahead position. Then mark the position of the steering wheel with respect to the steering shaft (for refitting). Remove steering wheel (in straight-ahead position).

Note

To prevent **unintended rotation of the contact unit (KE)** when the steering wheel has been removed, the contact unit locks itself when the steering wheel is pulled back. Likewise, the contact unit unlocks automatically when the steering wheel is refitted.

Installation

1. Refit the steering wheel with the wheels in the straight-ahead position or in accordance with the marking so that the upper spokes of the steering wheel are horizontal.
   Caution: Do not trap the cable of the contact unit.

2. Fit hexagon nut with spring washer and tighten to 46 Nm (34 ftlb).

3. Install driver's airbag unit. Use new fastening screws.
   Tightening torque: Tightening torque 10 Nm (7.5 ftlb.)

4. Check horn for operation.

48 Replacement of steering after accident damage

A. Fundamentals

Various kinds of damage can be caused to the steering gear in the event of accidents or **driving conditions resembling accidents. In cases where the steering gear shows no external damage** it can be difficult and costly to detect damage. Nevertheless, this damage represents an unacceptable risk for the vehicle, since it could lead to failure of the steering system.

Since a comprehensive check on all individual parts of the steering gear would not make sense, as a rule, and is not possible using the ordinary means of a workshop, **instead** the condition of other components that are easier to check should be considered.

The following guidelines (section B) serve for a decision on whether the steering gear of a vehicle involved in an accident should be replaced or may continue to be used.

B. Assessment of the steering of a vehicle involved in an accident

The steering gear **can** remain in the vehicle **if all the following conditions are met:**

No visible damage to such front-axle parts as wheel rims, spring struts, wheel carriers, control arms, steering arms, track rods, front-axle cross member, front-axle side members, the steering shaft or to the points on the body where wheel suspension parts are bolted on.

No impermissible rise in torque and no jamming or catching when the steering gear is turned from stop to stop. When the steering is turned, the front wheels must be free (front axle raised) and, in addition, the engine must be switched off (pump of power steering undriven).

The permissible tolerances for wheel alignment must not be exceeded.

The steering gear **must be repaired or replaced if one of the following points applies:**

Visible or detectable damage to the steering gear.

Fire damage (e.g. steering bellows burnt).

Permanent deformation or breakage of:

Steering-gear mounts

Track rods

Steering arms

Spring struts

Wheel carriers

Control arms

Front-axle side members

Front-axle cross members

If the listed criteria are **insufficient** for a decision, we recommend that the steering gear be repaired or replaced.

C. Exceptional regulation/order handling

If a workshop's **intended exchange of steering gear** is refused by a customer or insurer for reasons of costs, an expert or – if this is impossible abroad, the importer – should be called in at the cost of the refusing party. If the decision contradicts the guideline, we recommend that a memorandum be drawn up on the point and that it be countersigned by the expert.

Externally undamaged power-assisted steering gear that has to be exchanged **are obtainable as an exchange part**.

48 90 19 Removing and installing power-steering gear

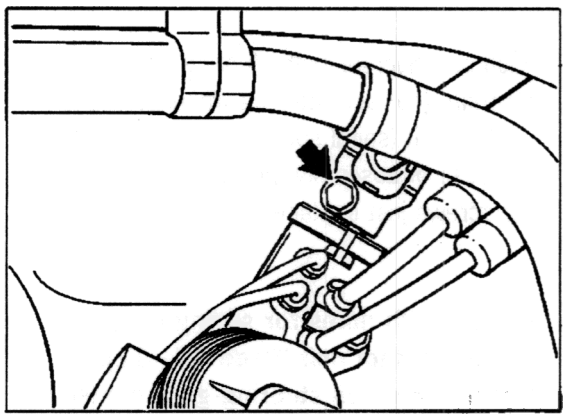
Removal

1. Remove underside panel.

2. Loosen universal joint (steering shaft) at steering gear. For this purpose, take out the clamping screw and slide the joint upwards.

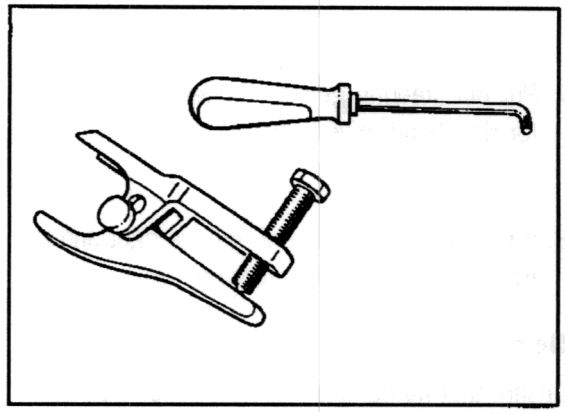
Note

First fix the steering wheel with the wheels in straight-ahead position or remove the steering wheel with the wheels in straight-ahead position. If this is not done, the airbag contact unit will have to be put in centre position after installation of the stearing gear (Page 48 - 12).



19-96

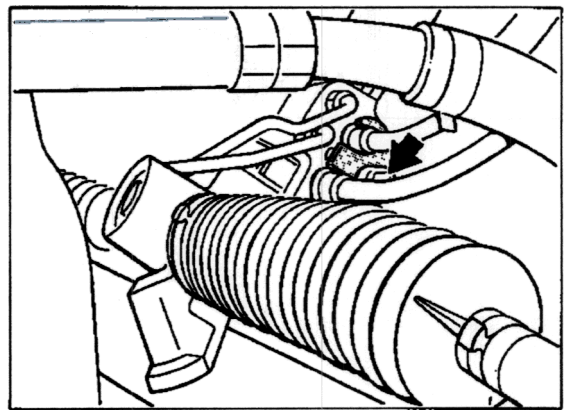
3. Press out track-rod ball joint from steering arm. Use special tool 9560 (ball-joint extractor).
   When loosening the locknut, hold it with special tool 9546 (Torx screwdriver).



1842/1-42

4. Repeat procedure on the other side.

5. Loosen feed and return lines at the steering gear. For this purpose, loosen the hexagon socket head bolt (arrow) and remove the retainer plate. Plug lines or use collecting container. Cover lines if necessary (danger of soiling).



20-96

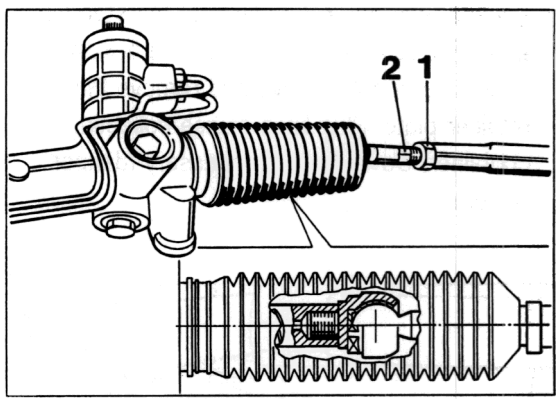
6. Loosen the two steering-gear fastening screws (on the underside of the cross member).

7. Pull out steering gear to the left (to the right for right-hand drive vehicles).

8. If necessary, loosen and remove right and left track rods at steering gear (arrow).

Note

Ensure that no damage (scoring) is caused to the steering rack.
To loosen and tighten the track rods, secure the steering gear on a suitable plate.



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Installation

Install in reverse order. It is essential to **observe** the following points while doing so:

- **Replace steering-gear fastening screws and the fit bolt of the steering shaft whenever they have been removed.** Screw threads must be clean and free of grease.

- **Ensure that no damage (scoring) is caused to the steering rack.**

- Mount the track rods on the steering gear (Figure 133-96).
  Then secure the respective bellows with new clamping rings.

- Push on universal joint (steering shaft) with the steering gear and steering wheel or airbag contact unit (spiral spring) in center position.
  For ease of assembly, put steering-gear fastening screws just in place.

- **Comply with notes for sliding piece and airbag contact unit (Page 48 - 12).**
  Observe note on steering-gear center position in the section describing front track adjustment in Repair Group 44.

After fitting the pressure lines, **fill** steering hydraulics with Pentosin CHF 11S **and bleed steering system.**

Important notes

When topping up or filling in Pentosin, make sure that it does not come into contact with the coolant hoses!
Observe the specifications in order to avoid overfilling and thus overflowing.

If coolant hoses come into contact with Pentosin, thoroughly clean them with water IMMEDIATELY!

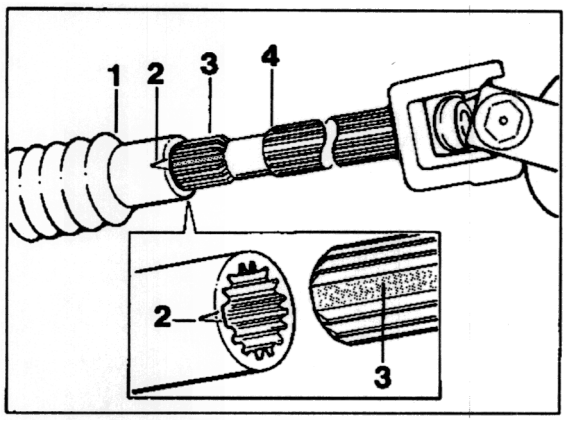
Replace visibly swollen coolant hoses!

– Tighten all screw connections with the prescribed tightening torque values.

– Check and/or adjust track.

Notes for sliding piece and airbag contact unit

1. If sliding piece No. 1 was pulled off steering shaft No. 4, notch No. 2 must point to the tooth gap (No. 3) on assembly.

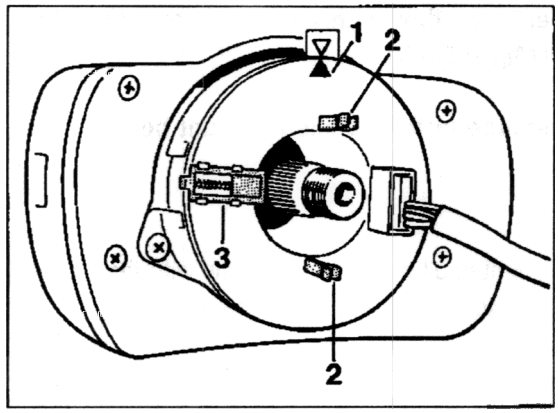


134-96

2. If the steering wheel was **not fixed before** the steering gear was removed, **the position of the contact unit (spiral spring) may no longer be correct.**
   In this event, remove steering wheel and move contact unit to center position.

If this is not done, the spiral spring may be damaged.

Center position: First move contact unit against the end stop. Turn contact unit two revolutions back from the end stop and then continue turning as far as the center position mark. The exact center position is indicated by the two arrows (No. 1).
Turn front wheels to straight-ahead position before fitting the steering wheel (steering shaft mounted on steering gear).



1741-48

1 = Center position mark (arrows)

2 = Drivers that engage in the steering wheel

3 = Locking (securing against turning), which becomes effective after removal of the steering wheel.

48 Plug-in couplings for steering hydraulic system

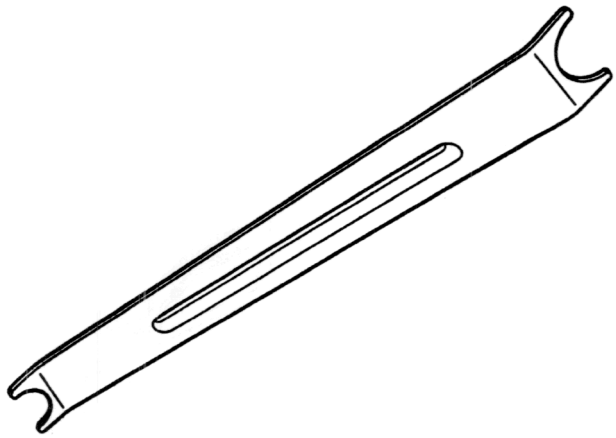
Important notes

The principle of the plug-in couplings for the pressure and return lines is the same. It is the diameters of the plug-in coupling and of the pipelines that differ (return line = large diameter / pressure line = small diameter).

Plug-in couplings are components that permit simple, fast and precise connection of pipelines.
These precision components must be handled carefully during repairs. Excess force during assembly work, damage to the sealing surface and soiling can cause leakage.

Perform preparations carefully when handling plug-in couplings - e.g. cleaning and fitting the plugs - **as repairs are possible only by replacing the affected line in most cases.** Only the threaded part A (with fitted O-rings) and the holder C are available as individual parts for the plug-in coupling (see Page 48 - 14).

Tools



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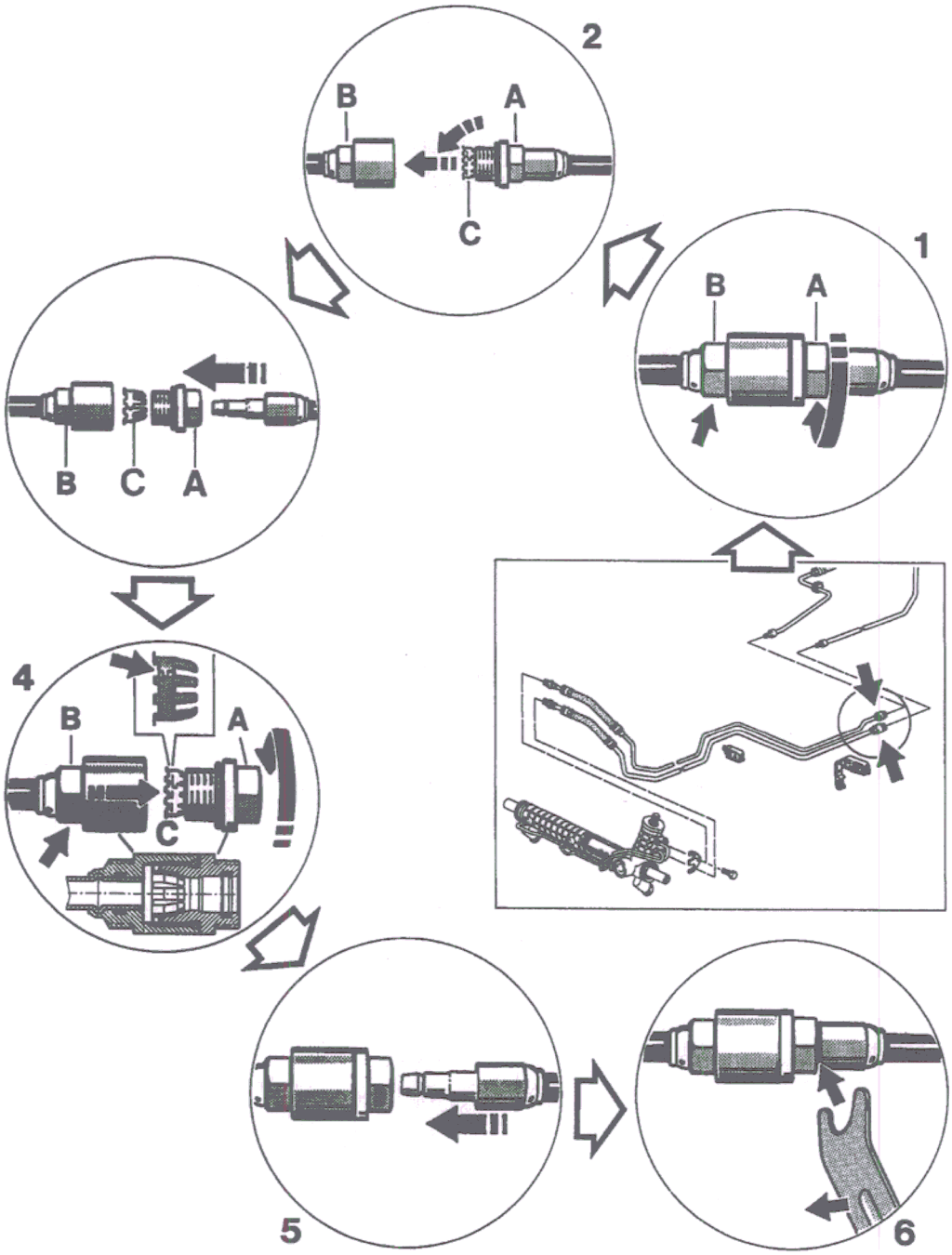
No.	Designation	Special tool	Explanation
	Testing tool for plug-in couplings	9623	Used to check whether the plug-in couplings are seated properly. Suitable for pressure and return lines (nominal diameter 6 and nominal diameter 10)

Plug-i couplings for steering hydraulic system



663

Plug-in couplings for steering hydraulic system

Note

– Pressure and return lines have different dimensions.
Pressure line = nominal diameter 6, return line = nominal diameter 10.

The plug-in coupling is **opened** by unscrewing.
It is **joined** by plugging together.

Join the plug-in connection only in a straight line. Never use excess force.

After separating the plug and socket piece, carefully protect them against dirt and scratches with caps.

Correct engagement must be checked with a gentle pull. Use special tool 9623 for this purpose.

No.	Procedure	Instructions
	Open plug-in coupling.	Turn at threaded part A to open the plug-in coupling. When doing so, counter at plug-in coupling B.
	Open corresponding retainers on the body.	Carefully disengage clip and fold down.
2	Remove holder C.	Tilt holder C on one side and simultaneously pull to disengage.
3	Pull threaded part A from the plug.	Detach threaded part A by pulling it off the plug.
4	Screw together plug-in coupling.	Close holder C (arrow / dovetail system). Screw threaded part A with fitted holder C into plug-in coupling B and tighten. Counter when tightening. Replace holder C and threaded part A if necessary in order to ensure that the plug-in connection functions properly (holding function and tightness).

No.	Procedure	Instructions
5	Join plug-in coupling.	Insert the plug (line with plug) into the plug-in coupling in a straight line. The plug must audibly engage in the holder.
6	Use special tool 9263 to check whether the plug-in coupling was engaged properly.	Insert special tool 9263 into the groove (arrow) and apply **slight pressure** on the special tool **to check whether the connection is securely locked (holder is seated properly).** **The plug must not slide out.** If the special tool cannot be inserted in the groove of the plug, shift the plug in the plug-in coupling (pull on plug without using excess force). **Note** The plug-in connection is designed so that the plug can be shifted in the plug-in coupling by approx. 1 mm in axial direction by slightly pulling or pressing.
	Close corresponding retainers on the body.	Carefully fold the clip up and engage.

Spare parts set plug-in couplings

Note

An assembly, consisting of a threaded part (complete with O-rings), holder and a mounting plug, is available as a spare part for the plug-in coupling.

This spare part is available for the **pressure line** (small pipe outer diameter) under the No. 999.230.539.10.
This spare part is available for the **return line** (large pipe outer diameter) under the No. 999.230.540.10.
These spare parts are listed under 4 03 01 in the Parts Catalogue.

Pages 48-13 to 48-16 have to be revised due to the introduction of these spare part sets.
This will take place in a future Supplement. This page will also be supplemented.

48 07 19 Removing and installing lock barrel

Removal

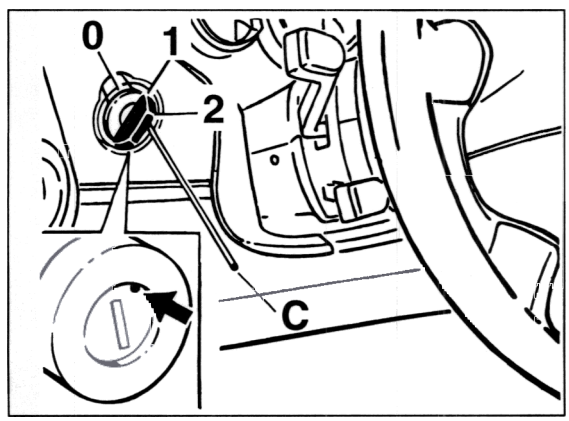
1. Disconnect battery ground cable.

2. Pull cover (collar) off the steering lock.

3. Insert ignition key and turn to **position 1** (ignition on).
   Insert a steel wire (C) with a diameter of approx. 1.3 mm (max. 1.5 mm Ø) into the bore next to the ignition key (arrow) as far as it will go.
   Pull the lock barrel with induction coil out of the steering lock housing.

Note

Inserting the steel wire (C) unlocks the lock barrel in the steering lock housing.



527_97

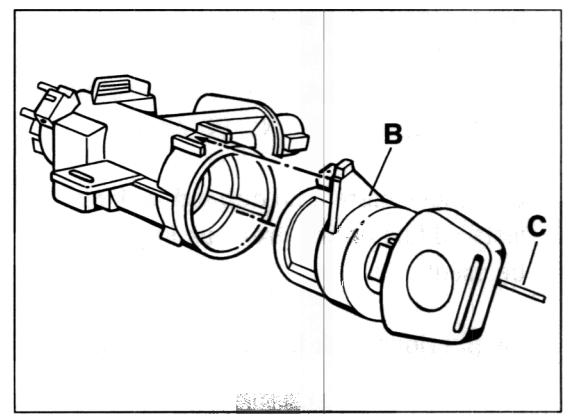
4. Carefully unlock and separate the plug connection on the lock barrel (at the induction coil for the immobilizer).

Installation

1. Ignition lock with the pawl depressed must be in position 1 (ignition on).

2. Press on the pawl of the lock barrel (locking pawl). Insert the ignition key and turn the key as far as it will go to **position 1** (ignition on). In this position, insert the steel wire (C) that was used for removal.

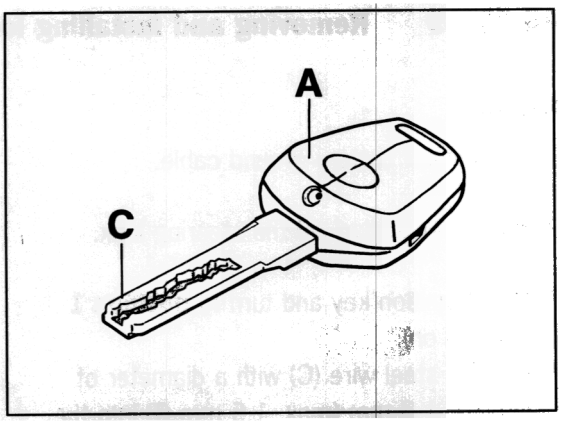
3. Plug connector onto the ignition coil (B).
   Position the induction coil (B) and push the lock barrel all the way into the housing. Turn the ignition key correspondingly, if necessary, until the lock barrel has been pushed in fully. Pull out the steel wire (C) in this position so that lock engages.



540_97

4. Connect battery ground cable.
   Perform function test.

5. If a **new transponder** (new lock barrel with new key) is used, the new key must be taught. Refer to Service No. 90 01 in the Technical Manual (in diagnosis section).



634_97

Note

The **transponder** is located in the **key head**.
The **new transponder** is taught with the **Porsche System Tester 2.**
A new transponder can be adapted to the vehicle in the system "Alarm system", menu "Learning functions" / submenu "Check key".
Access to **IPAS** is necessary in order to teach the transponder.

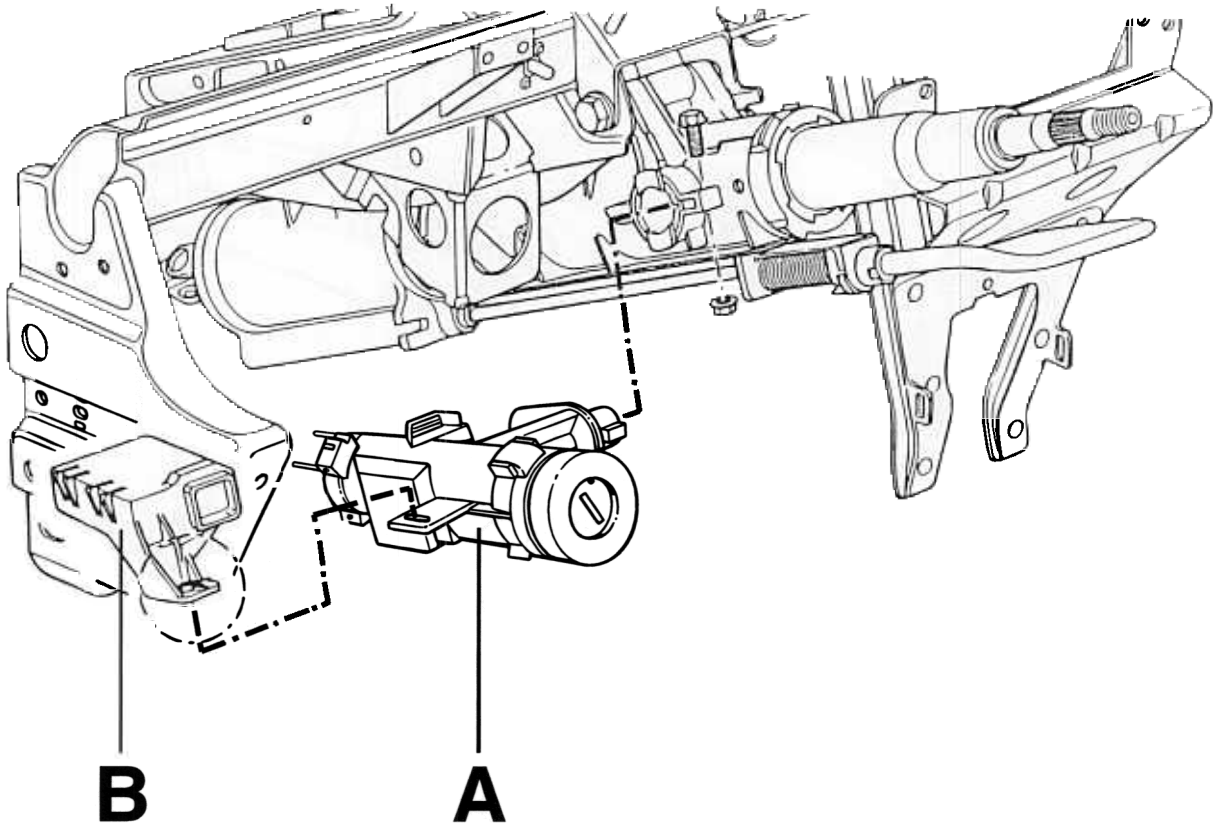
The transponder **does not have to be taught if:**

the **previous key head A (handheld transmitter)** is fitted **on the new key C.** (Disassembling and assembling handheld transmitter – Service No. 90 73 37)

a new lock barrel with **defined locking** is installed (the **entire previous key** can thus be used).

the **previous lock barrel with key** is used.

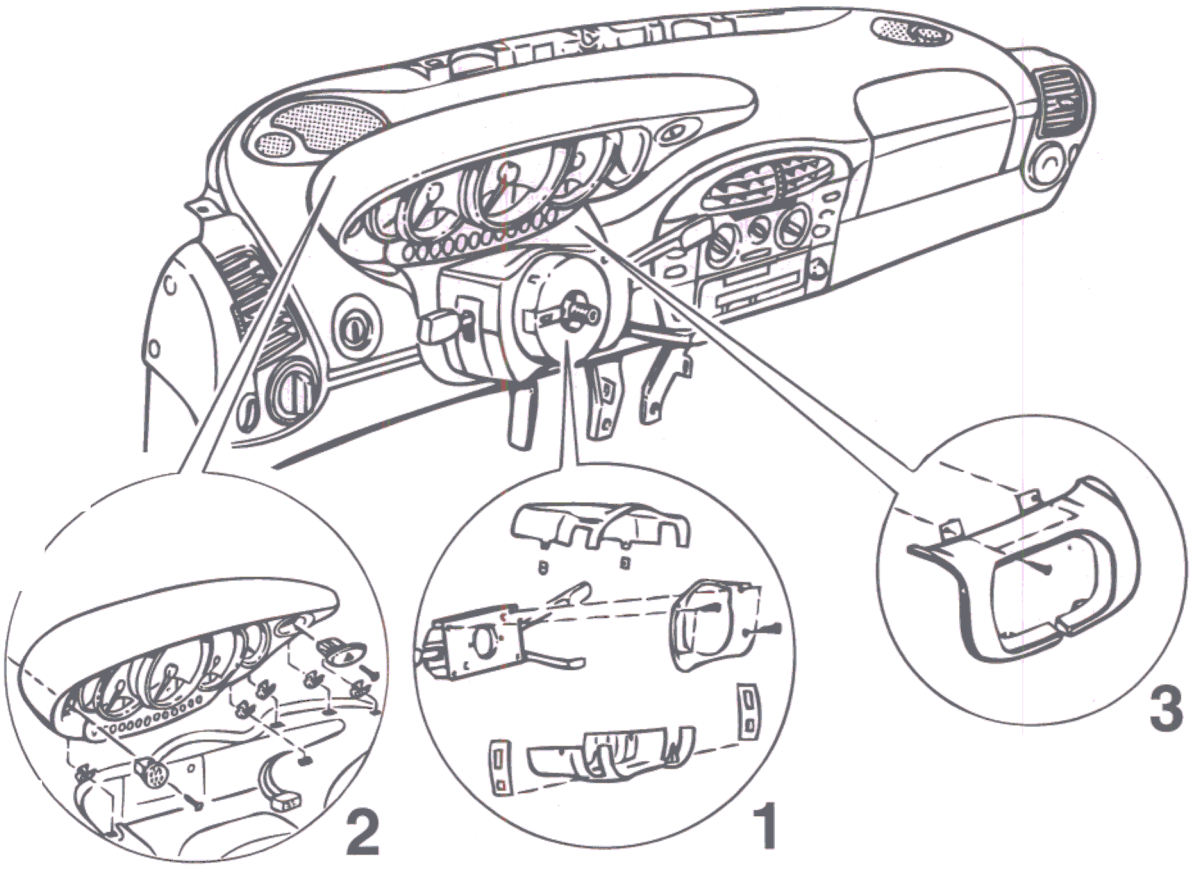
48 08 55 Replacing steering lock



587_97

A – Steering lock
B – Signal converter

Replacing steering lock



588_

Overview of dashboard components that must be removed before removal and installation of the steering lock.

1 Steering column switch with the associated covers

2 Instrument cluster (instrument mount)

3 Steering column cover

Note

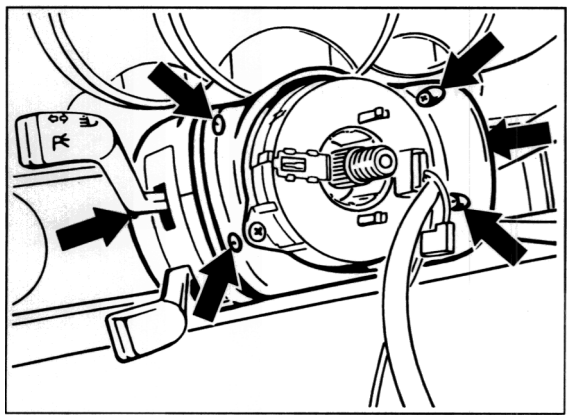
The steering wheel must be removed before components 1 - 3 can be removed, refer to Serv. No. 48 10 19 (Page 48 - 5).

Removing steering lock

Disconnect battery ground cable.

2. Remove steering wheel, refer to Serv. No. 48 10 19 (Page 48 - 5). Observe the safety regulations for handling airbag units.

3. Undo and remove the panels.

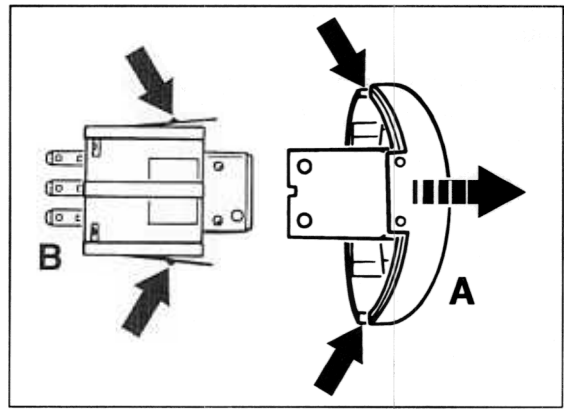


96-030

4. Remove steering column switch
To do this, undo the central screw on the clamp of the steering column switch. Disconnect electrical plug connection and remove steering column switch with airbag contact unit.

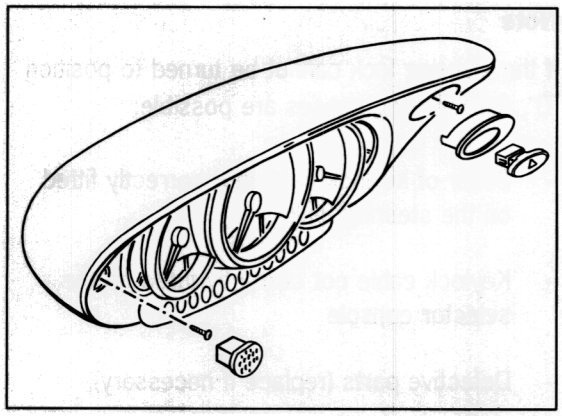
5. Remove instrument cluster (instrument mount). To do this:

switch on the the hazard warning light switch (button comes out).
There are small openings on the sides of the button which now project over the instrument cowl. Insert two small screwdrivers into the openings and use them to pull off the button (A) toward the front.

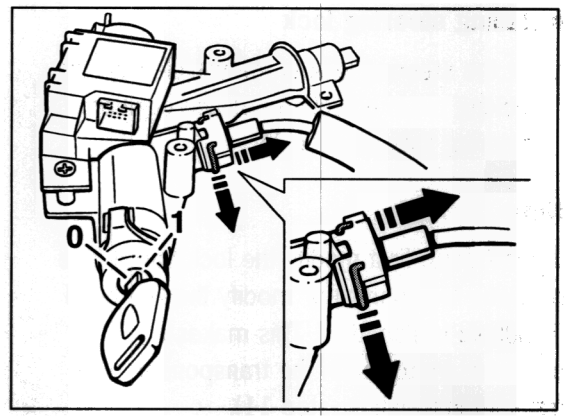


96-507

Unclip collar on the hazard warning light switch. The hazard warning light switch (B) is held in the instrument bridge by two locking hooks. Press the right locking hook toward the switch, grip the button holder with a pair of pliers and pull out the switch toward the front.
Pull off plug on the left side and undo the 5.0 x 22 Torx screws. Lift the instrument cluster at the left and right and unclip; disconnect electrical plug connections.
If the vehicle is equipped with a "handsfree telephone", disconnect the microphone plug connection instead of the dummy plug.



97-092



612_1_97

6. Pull cover (collar) off the steering lock.

7. Remove steering coloum switch cover (undo Torx screws, unclip the cover and lift it off).

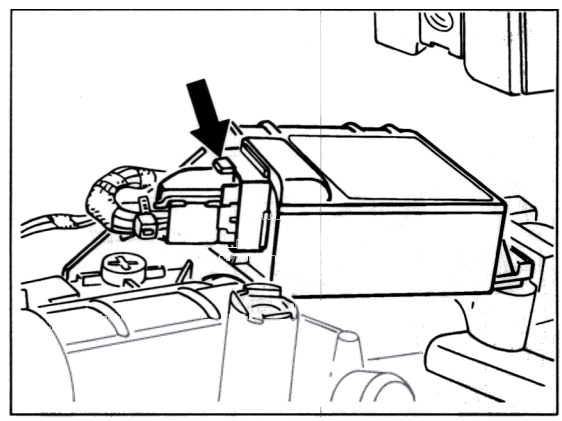
8. Detach support of steering lock on the assembly. The support is fastened with a screw.
The side nozzle must be removed to allow access to this screw.
This procedure is almost identical to the procecure – "Removing and installing main light switch" – refer to Serv. No. 94 05 19 (P. 94 -7).
The difference is that the electrical plug connection of the main light switch does not need to be disconnected.

9. Undo steering lock fastening screw. Unlock steering lock on the steering column (press spring-loaded pin with a scriber) and simultaneously pull the steering lock out of the steering column.

10. On Tiptronic vehicles, remove (disengage) the keylock cable on the steering lock housing. First turn ignition key to position "1" (ignition on).

11. Pull plug off ignition switch. Carefully unlock and separate the plug connection on the lock barrel (at the induction coil for the immobilizer).

12. Unlock the electrical plug connection on the signal converter from above and disconnect. Unclip the electrical wire on the steering lock housing.



96-529

13. Remove steering lock from the vehicle.

Installing steering lock

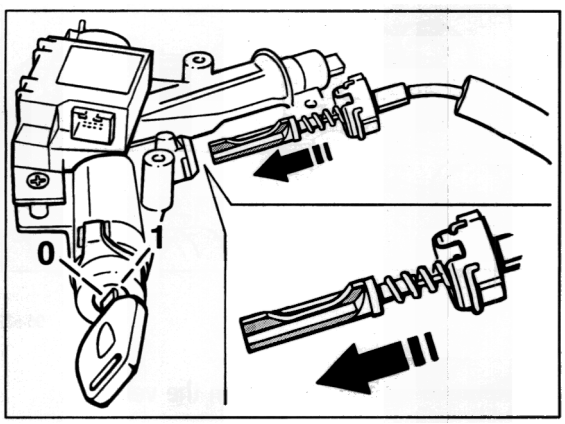
1. Fit the steering lock in the vehicle with the locking pin in unlocked position (ignition steering lock position 1)

Note

If necessary, first modify the lock barrel (use previous lock barrel) or modify the key head (handheld transmitter). This makes it unnecessary to teach the transponder (refer to Installation, step 11).

2. Align steering lock housing; the peg of the steering lock must engage easily. Tighten fastening screws.

3. On Tiptronic vehicles, join the keylock cable with the steering lock (in steering lock position 1).
   To do this, line up the slider on the keylock cable with the steering lock and insert (press in) in this position until the connection nipple engages on the steering lock housing.
   (Selector lever **not** in position "P".)
   Then select position "P" and subsequently turn steering lock to position "0".



612_2_97

Note

If the steering lock cannot be turned to position "0", the following causes are possible:

Slider of keylock cable not correctly fitted on the steering lock

Keylock cable not correctly fitted on the selector console

Defective parts (replace if necessary).

The keylock cable is not adjustable. However, the following procedure (mounting specification) must be followed when mounting on the selector console.

Specification for mounting keylock cable on the selector lever

– Turn ignition key to position "1" (ignition on) and move selector lever to position "D".

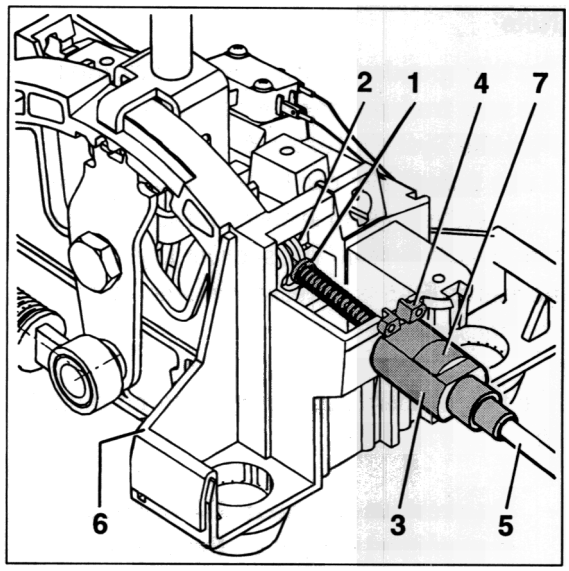
Engage nipple (1) of the cable on the keylock lever (2) of the selector console.

Insert housing adjustment device (3) on the selector console housing until the clip (4) engages.

Press cable sleeve (5) toward the selector console (6).

Release cable and press locking button (7) until it engages.

Check keylock function:
Insert ignition key to and turn to position 1 (ignition on). Move selector lever from "P" to "D". Turn ignition key counterclockwise.
It must not be possible to reach the pull-out position. Then release key again and move selector lever to position "P".
In this position, it must be possible to remove the ignition key and the selector lever button must be locked.

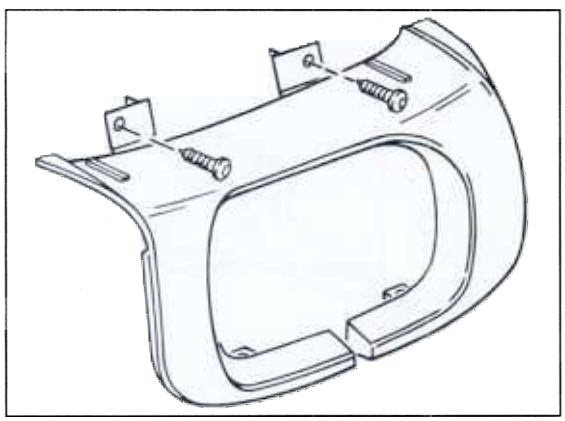


613_97

4. Push plugs onto induction coil, lock barrel, ignition starting switch and onto the signal converter.

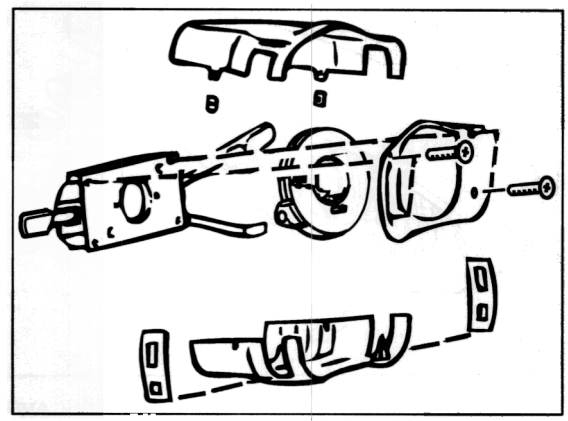
5. Steering lock function (perform locking pin function and keylock function tests).

6. Insert steering column cover from below, position and fasten (with Torx screws).



97-046

7. Install steering column switch and airbag contact unit with the associated covers. Position the steering column switch before tightening the fastening screw.
To do this, measure with a depth gauge between the end of the steering shaft and the sheetmetal cover of the steering column switch (refer to Figure 115-96).
Adjusting distance 55 ± 0.5 mm
The adjusting dimension 55 ± 0.5 mm can also be adjusted or measured with the airbag contact unit fitted.



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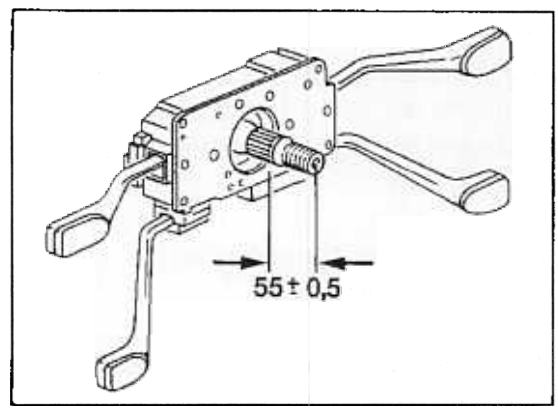
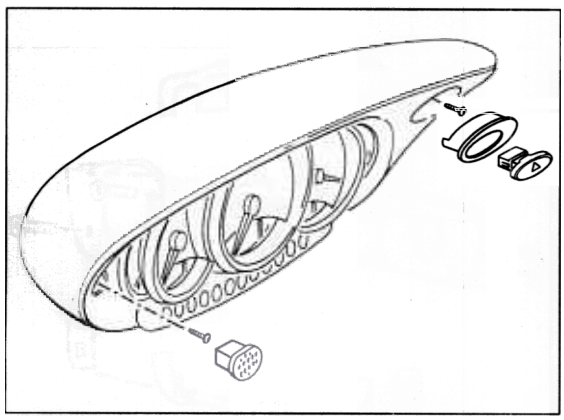


115-96

8. Install the instrument cluster.
   Connect the electrical plug connection on the instrument cluster. Push in the instrument cluster at the left and right and clip into place; fasten it with the Torx screws 5.0 x 22. Press in the hazard warning light switch and fit the plug on the left side. On the "telephone with handsfree unit" variant, plug in the microphone plug instead and engage the microphone in position.



97-092

9. Install side nozzle and main light switch, refer to Serv. No. 94 05 19 (Page 94 - 7 / 94 - 8).

10. Install steering wheel and airbag unit, refer to Serv. No. 48 10 19 (Page 48 - 5). Observe the safety regulations for handling airbag units.

11. Connect battery ground cable.
    Perform function test.

12. If a **new transponder** (new lock barrel with new key) is used, the new key must be taught. Refer to Service No. 90 01 in the Technical Manual (in diagnosis section).

Note

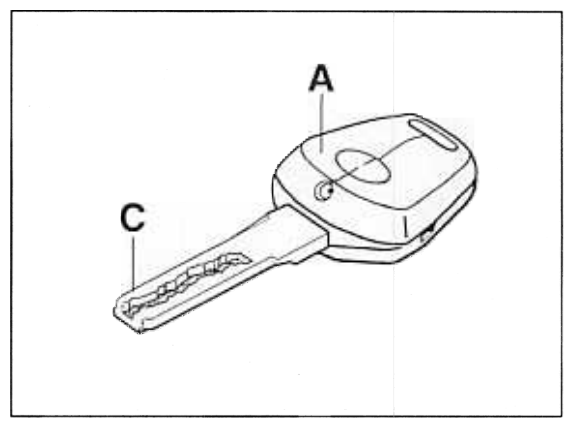
The **transponder** is located in the **key head**.
The **new transponder** is taught with the **Porsche System Tester 2.**
A new transponder can be taught to the vehicle in the system "Alarm system", menu "Teaching functions"/submenu "Transponder key".
Access to **IPAS** is necessary in order to teach the transponder.

The transponder **does not have to be taught if:**

the **previous key head A (handheld transmitter)** is fitted **on the new key C**. (Disassembling and assembling handheld transmitter – Service No. 90 73 37)

a new lock barrel with **defined locking** is installed (the **entire previous key** can thus be used).

the **previous lock barrel with key** is used. Removing and installing lock barrel, refer to Service No. 48 07 19.

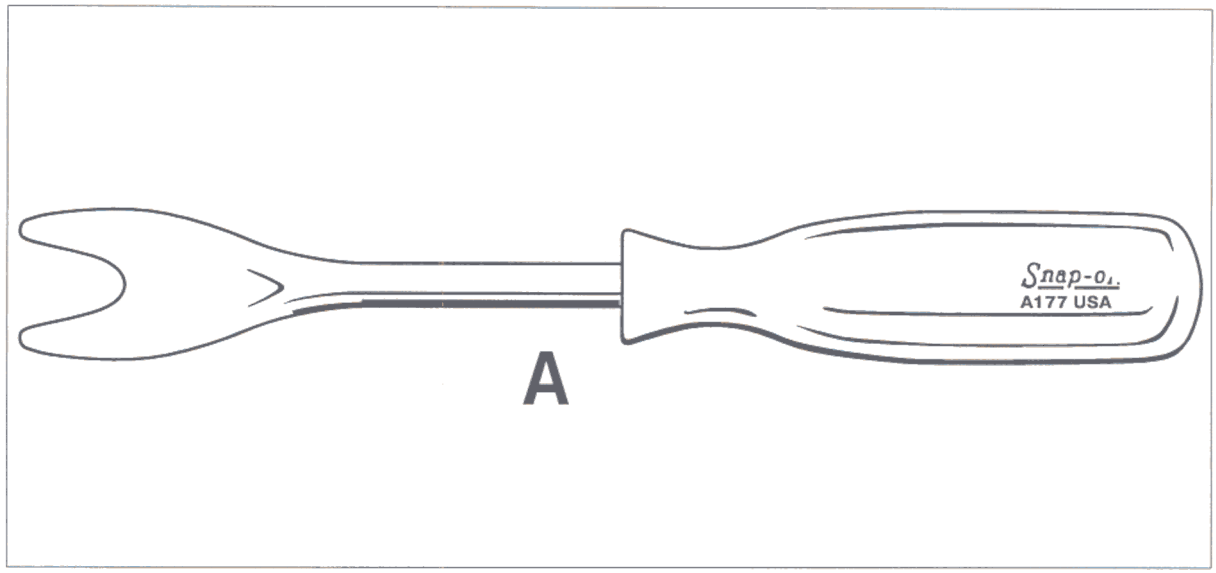


634_97

48 98 19 Removing and installing hydraulic pump

Engine installed

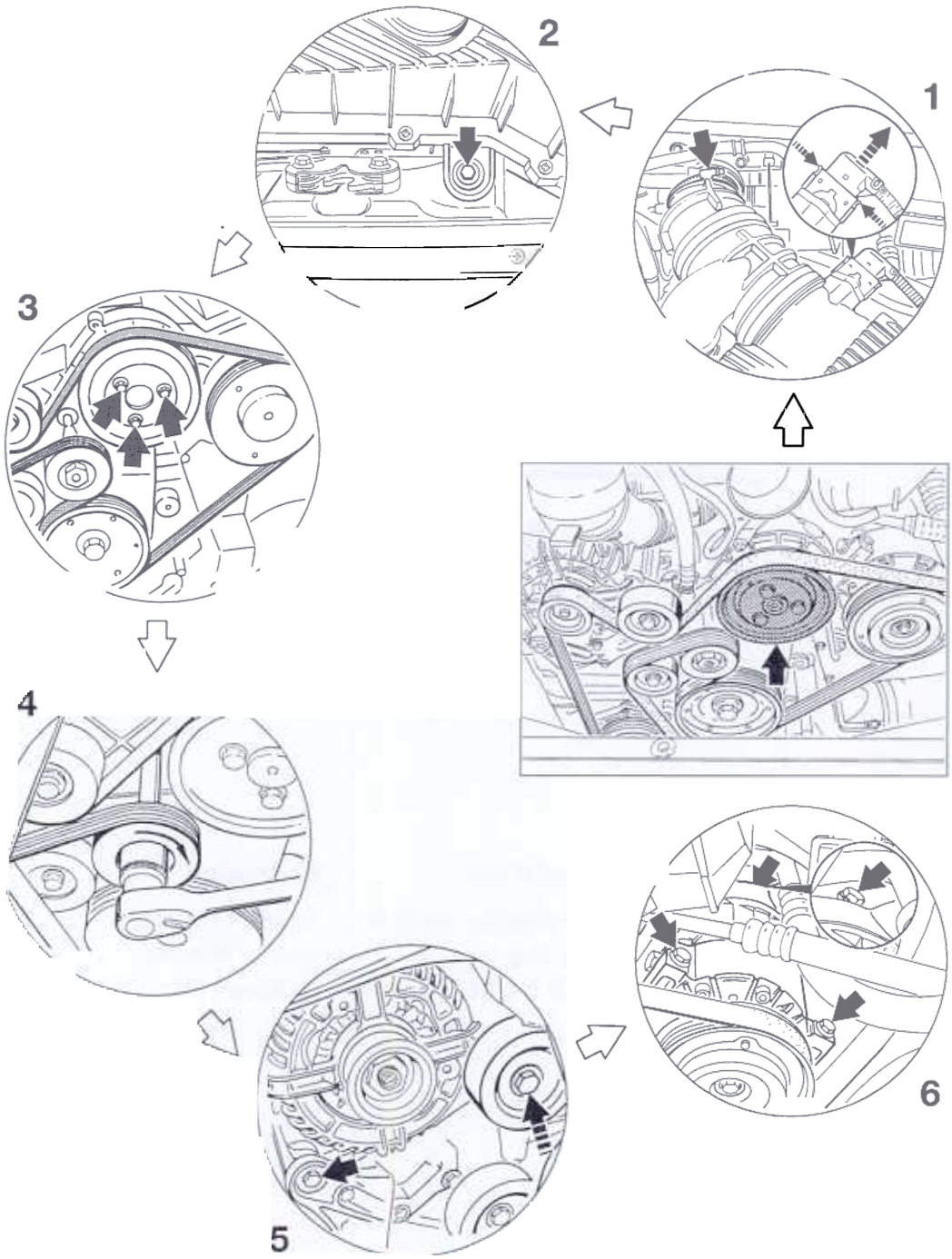
Tools



342_97

Item	Designation	Special tool	Explanation
A	Removal tool	Commercially available, e.g. Snap-on, order No. A177A	Supplier's address: refer to Workshop Equipment Manual

Removing hydraulic pump



Removal overview of the components

1 Removing air cleaner assembly

2 Removing air cleaner assembly

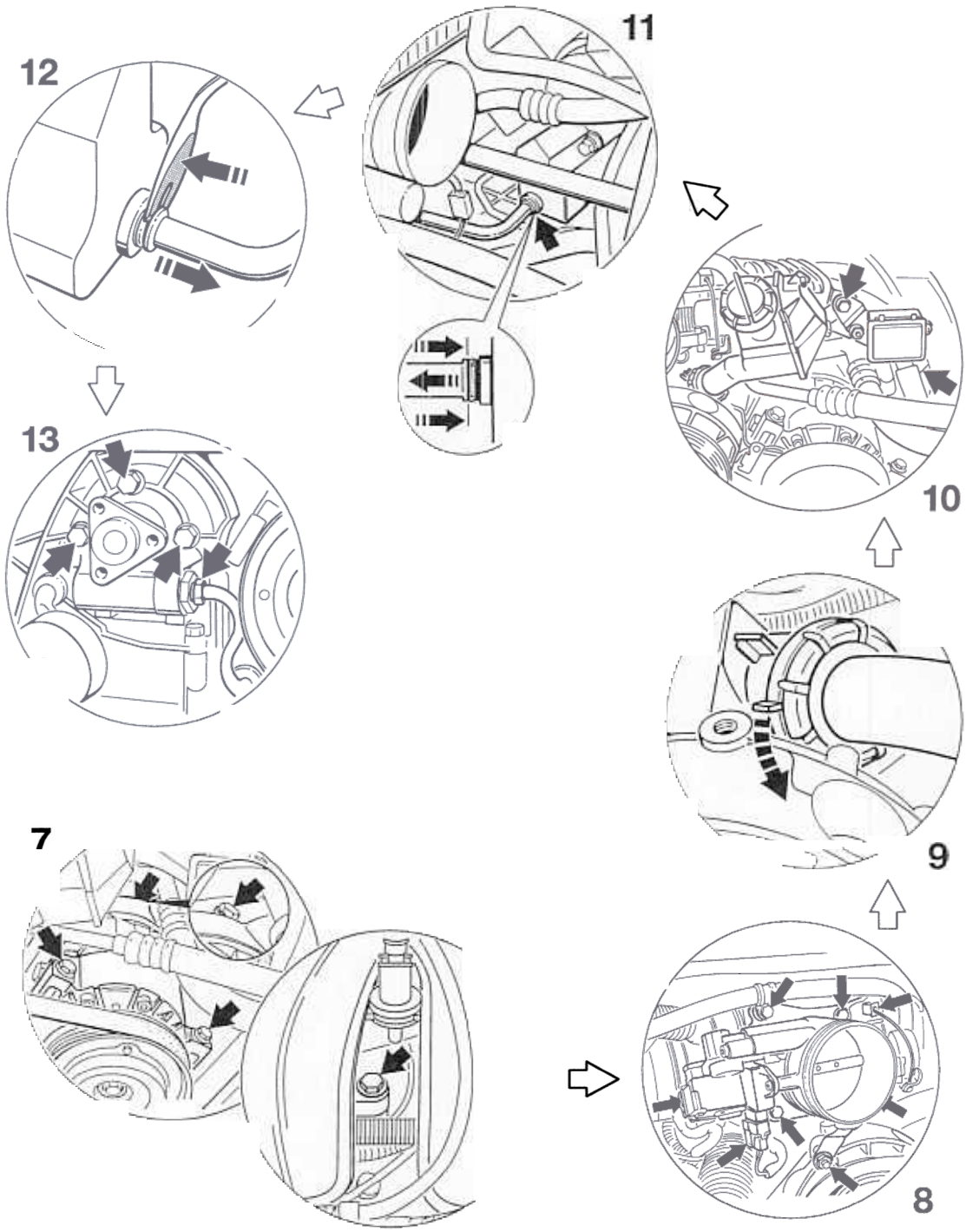
3 Loosening belt pulley of the hydraulic pump

4 Relieving and removing drive belt

5 Loosening three-phase generator

6 Loosening air-conditioning compressor

Removing hydraulic pump



Removal overview of the components

7 Loosening air-conditioning compressor

8 Removing throttle body

9 Removing supply tank of the power steering system

10 Removing supply tank of the power steering system

11 Detaching steering return line

12 Detaching steering return line from the supply tank with tool

13 Detaching hydraulic pump and steering supply line

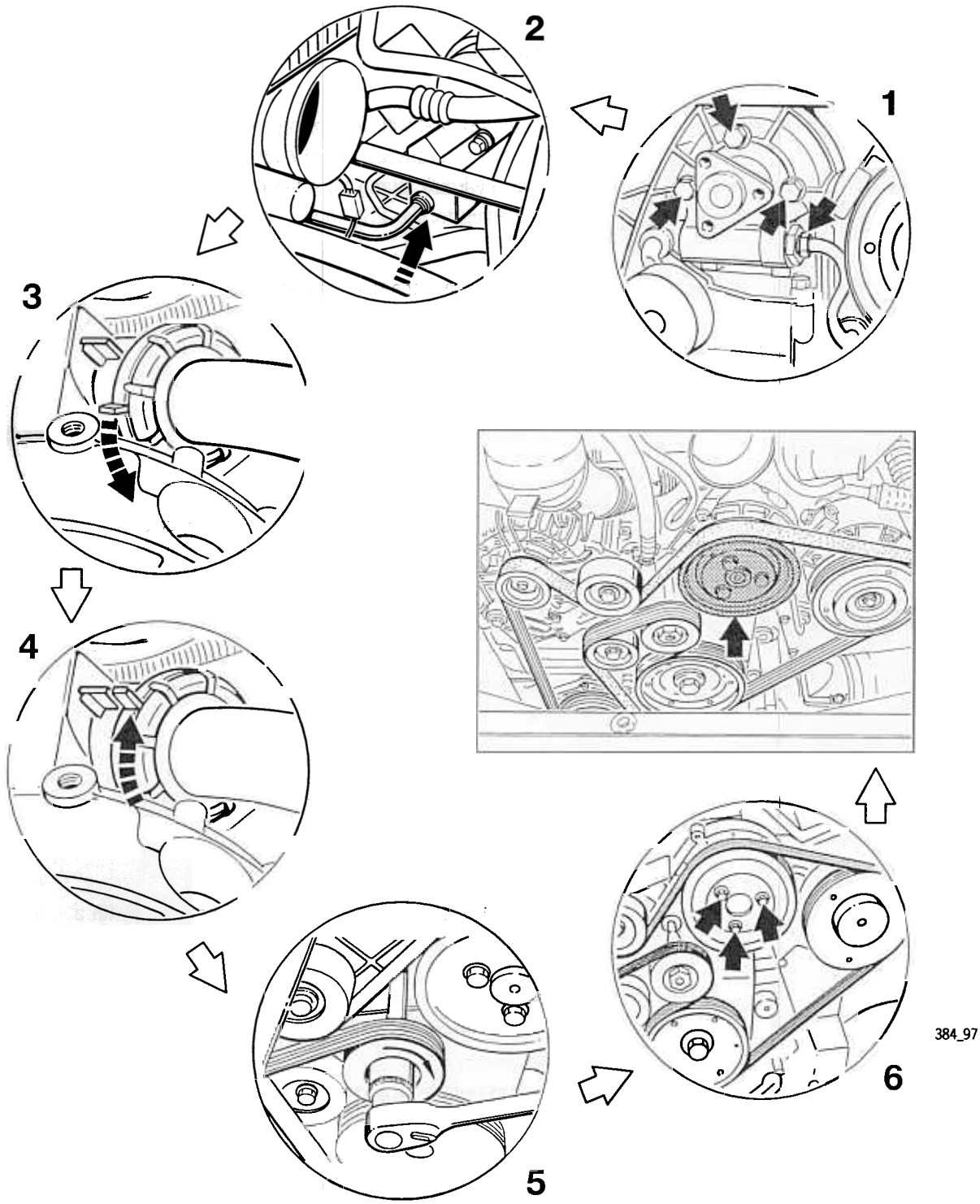
Removing hydraulic pump

No.	Procedure	Instructions
1	Removing air cleaner assembly	Undo the hose clamp on the throttle body. Remove connector from hot film mass air flow meter. Unclip electrical lead on throttle body.
2	Removing air cleaner assembly	Unclip oil filler neck. Undo hexagon-head bolt M6 x 20 and remove entire air cleaner assembly.
3	Loosening belt pulley	Undo three hexagon-head bolts (M8 x 12) by approx. one half turn. **Note** The belt pulley can also be loosened with a restraining strap after removal of the drive belt.
4	Removing drive belt	Mark belt travel direction with a coloured pen. Slacken belt by turning the tensioning pulley (wrench size 24 mm) clockwise, hold still and simultaneously take the belt off the drive pulleys.
5	Loosening three-phase generator	Undo right-hand fastening screw (in direction of travel) and unscrew. Undo left-hand fastening screw (with deflection roller) by three turns. A gentle tap on the fastening screw loosens the threaded bushing in the generator arm (use aluminium mandrel).
6	Loosening air-conditioning compressor	Undo front compressor fastening screws (2 ea.) and disconnect electrical plug connection.

No.	Procedure	Instructions
		Lift generator up and out of the slotted generator bracket. Unscrew fastening screw and remove with deflection roller.
		Note
		Do not disconnect electrical connections or plug connection.
7	Loosening air-conditioning compressor	Undo compressor fastening screw between the intake pipes of cylinders 4 and 5.
8	Removing throttle body	Disengage accelerator cable and remove throttle body. Pull off vacuum check valve.
9	Removing supply tank of the power steering system	Suck fluid out of the upper supply tank until the level is below the joint. Turn bayonet lock ring anti-clockwise.
10	Removing supply tank	Detach bracket from supply tank and B+ disconnection point and set aside. Pull supply tank up and off. Suck off fluid level of the lower supply tank and then immediately close the opening with a suitable plug (ø 30).
11	Detaching steering return line	In order to detach the line from the supply tank, **push the red unlocking ring forward (arrows)** and **simultaneously** pull out the line. Use two plastic spatulas to press the unlocking ring.

No.	Procedure	Instructions
12	Detaching steering return line from the supply tank **with tool**	The line can also be detached using a commercially available tool. The removal tool from Messrs. Snap-On, for example, is recommendable. Insert tool between line and the red unlocking ring and unlock. Pull line to the rear and simultaneously press the tool against the red ring. Carefully protect the line against dirt and scratches with a cap.
13	Detaching hydraulic pump and steering supply line	Undo steering supply line (wrench size 17); simultaneously counter at the body (wrench size 27). Undo three hexagon-head bolts (M8 x 12) and remove hydraulic pump to the rear. **Note** If coolant hoses come into contact with Pentosin, clean them thoroughly without delay.
	Removing bracket with tensioning element	Undo flange for oil filler neck at the left rear bracket fastening screw. Immediately seal bore on the crankcase. Undo four hexagon-head bolts and remove bracket with tensioning element.

Installing hydraulic pump



Installing hydraulic pump

No.	Procedure	Instructions
	Installing hydraulic pump	Fasten bracket with tensioning element on the crankcase. Tightening torque 23 Nm (17 ftlb.). Insert hydraulic pump from the rear and fasten. Tightening torque 23 Nm (17 ftlb.).
2	Fitting steering return line	Insert line into the plug-in coupling in a straight line. Then pull slightly to ensure that the connection is properly locked.
3	Fitting supply tank for power steering system	Turn bayonet lock to its initial position.
4	Fitting supply tank for power steering system	Remove plug. Position tank (observe markings). Lock bayonet lock.
5	Fitting drive belt	Fit belt pulley of the hydraulic pump and screw in hexagon-head bolts. Fit drive belt. Assembly instructions on Page 13-1
6	Fastening belt pulley for hydraulic pump	Tighten three hexagon-head bolts. Tightening torque 23 Nm (17 ftlb.). **Note** The belt pulley can also be held and tightened with a restraining strap before the drive belt is fitted. Fasten air-conditioning compressor. Tightening torque 28 Nm (21 ftlb.). Fasten generator. Fit throttle body and air cleaner assembly.

PORSCHE

Technical Manual

911 Carrera 4 (996)

Repair

Group 4
Running gear

4 Running gear – all wheel drive

* See Service Information (Technical description of the running gear with PSM)

4 Notes on repair instructions

General

The 911 Carrera (996 rear-wheel drive) is the basic model covered by the repair, assembly and adjustment operations described. This means that in the Technical Manual (Repair) "911 Carrera 4" (after the separation sheet), **only procedures involving the 911 Carrera 4** are described.

Tightening torques

Tightening torques for the 911 Carrera (996) and 911 Carrera 4 (996) are almost the same. Tightening torques that deviate or are additional are contained in the tables of the appropriate Repair Group for the 911 Carrera (996 rear-wheel drive).

Suspension alignment (Rep. Gr. 44)

The adjustment procedures and values on the front and rear axle are the same as for the 911 Carrera (996 rear-wheel drive).
The following is new:
After a wheel alignment adjustment the steering angle sensor must be calibrated with the Porsche System Tester 2.
This is required because the Porsche Stability Management (PSM) is standard in the 911 Carrera (996). PSM is an automatic control system to stabilise the vehicle in extreme driving situations.

Anti-lock brake system (Rep. Gr. 45)

PSM is standard in the 911 Carrera 4 (996). The anti-lock brake system (ABS) is a component of the entire PSM control system (Porsche Stability Management). Therefore the labour operations relevant to PSM are described in the Rep. Gr. 45 – after the separation sheet / for the 911 Carrera 4.

Brake hydraulics (Rep. Gr. 47)

Bleeding the brakes is described in the 911 Carrera 4 since the PSM is standard for the 911 Carrera 4 (996). Serv. No. 41 01 07 / Bleeding the brakes (vehicle with PSM).

4 Tests/notes for all-wheel drive

Balancing wheels on vehicle

When fine balancing wheels on the vehicle, all four wheels must be raised and must be able to turn freely.
If a fault occurs in PSM (Porsche Stability Management), read out fault memory before fine balancing.
After fine balancing, the fault memory of the PSM control unit must be erased.

Power test

Power tests can only be carried out on 4 roller-type test stands.

Brake test

Brake tests can only be carried out on roller-type test stands or plate test stands.
If no all-wheel drive test stand (roller-type test stand) is available, the following limit values must not be exceeded for conventional roller-type test stands:

Test speed max. 7.5 km/h
Test duration max. 20 seconds

Towing manual transmission vehicles

If vehicle is towed with raised front or rear axle, the wheels of the raised axle must be able to turn freely.
The ignition must be switched off and the shift lever must be in neutral.

Towing Tiptronic vehicles

With engine not running, sufficient lubrication of the transmission is not ensured. Therefore the following points must be observed:

Select position **N**. Switch off ignition

Do not exceed top speed of 50 km/h

Maximum towing distance 50 km

For longer towing distances the vehicle must be raised at the rear axle or transported on a trailer.

Printed in Germany - 15, 1998 C4_4_101

4 Stabilizer allocation

Front axle

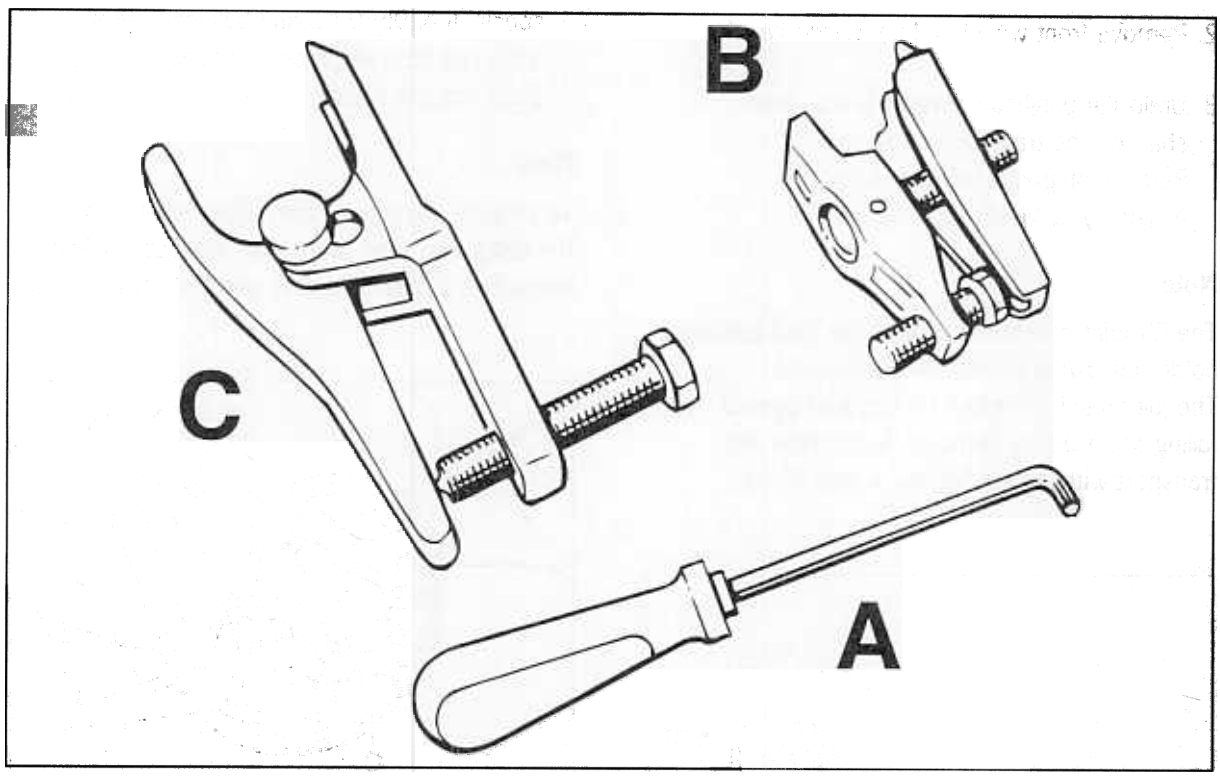
Version	Transmission type	Country allocation	Tube-type stabilizer ø in mm (ø in inch)	Part No.
Coupé and Cabrio				
– Series	Manual transmission and Tiptronic	world-wide	22.5 x 3.5 (0.89 x 0.14)	996 343 **703 00**
– Sport	Manual transmission and Tiptronic	world-wide	23.6 x 3.5 (0.93 x 0.14)	996 343 **703 02**

Rear axle

Version	Transmission type	Country allocation	Tube-type stabilizer ø in mm (ø in inch)	Index Part No.
Coupé				
– Series	Manual transmission and Tiptronic	world-wide	19.6 x 2.6 (0.77 x 0.10)	**13**
– Sport	Manual transmission and Tiptronic	world-wide	20.7 x 2.85 (0.81 x 0.11)	**15**
Cabrio				
Series	Manual transmission and Tiptronic	world-wide	18.5 x 2.5 (0.73 x 0.1)	**12**
– Sport	Manual transmission and Tiptronic	world-wide	19.6 x 2.6 (0.77 x 0.10)	**13**

40 41 19 Removing and installing the front drive shaft

Tools



204_99

Item	Designation	Special tool	Explanation
A	Torx screwdriver	9546	To counter the ball joints (track rod and joint mount) during assembly and disassembly.
B	Ball joint extractor (track rod extractor)	Commercially available; refer to Workshop Equipment Manual, Chapter 2.4, No. 113.	
C	Press-out tool (ball joint extractor)	9560	To press out the ball joint on the wheel carrier.

Removal

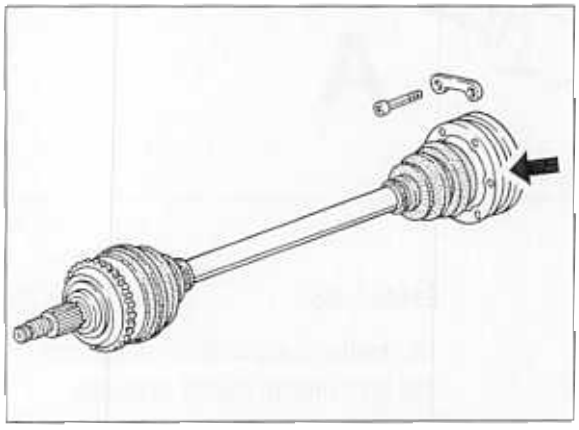
1. Before raising the vehicle, undo the drive shaft fastening at the wheel side.
   Actuate the brake while doing this.

2. Remove front wheel and underside panel

3. Undo the pan-head screws of the drive shaft on the transmission flange.
   Remove diagonal brace to facilitate assembly (2 M 12 screws).

Note

The CV joint can come apart if the dust bellows holder (arrow) is removed or damaged.
The joint must therefore be secured against falling apart during removal, installation and transport with 8 mm screws + nuts (2 ea.).



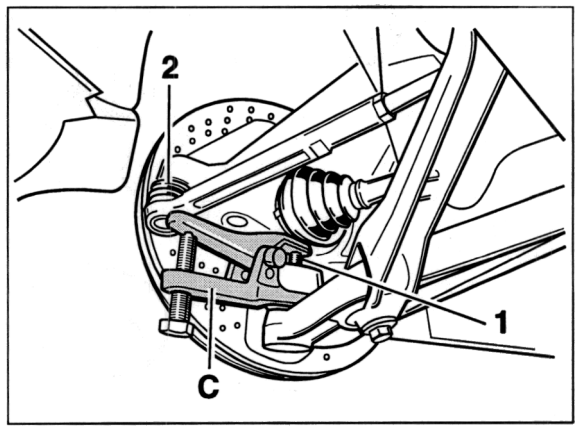
203_99

4. Disengage air guide on control arm.
   Loosen stabilizer mount at stabilizer (counter with open-ended wrench).

5. Undo track rod and control arm on wheel carrier. When loosening the fastening nuts, counter with special tool 9546 (Torx screwdriver).
   Press ball joint off of control arm (1) with special tool 9560 (C) and ball joint off of track rod (2) using a commercially available track rod extractor.

Note

To prevent damage to the rubber sleeves of the ball joints, coat the rubber sleeves and the extractors in this area with tyre mounting paste.



205_99

6. Push protective tube (shop-made) onto the drive shaft (profile shaft).

7. Swivel (pull) spring strut outwards without using excess force and extend drive shaft.
Important: Do not damage the boots of the ball joints. Push a transport protective cap onto the joint if necessary.

Note

Since the drive shaft moves in the wheel hub toothing only with great use of force, undo the drive shaft using a copper mandrel (driving mandrel).
For unfavourable tolerances, the drive shaft must be pressed out of the wheel hub toothing using a suitable wheel hub extractor.

Installation

1. Install in reverse order. Before installing, give the parts a visual check.
Replace fastening nuts.
Use correct tightening torques.

2. Grease the toothing of the drive shaft with Optimoly HT.

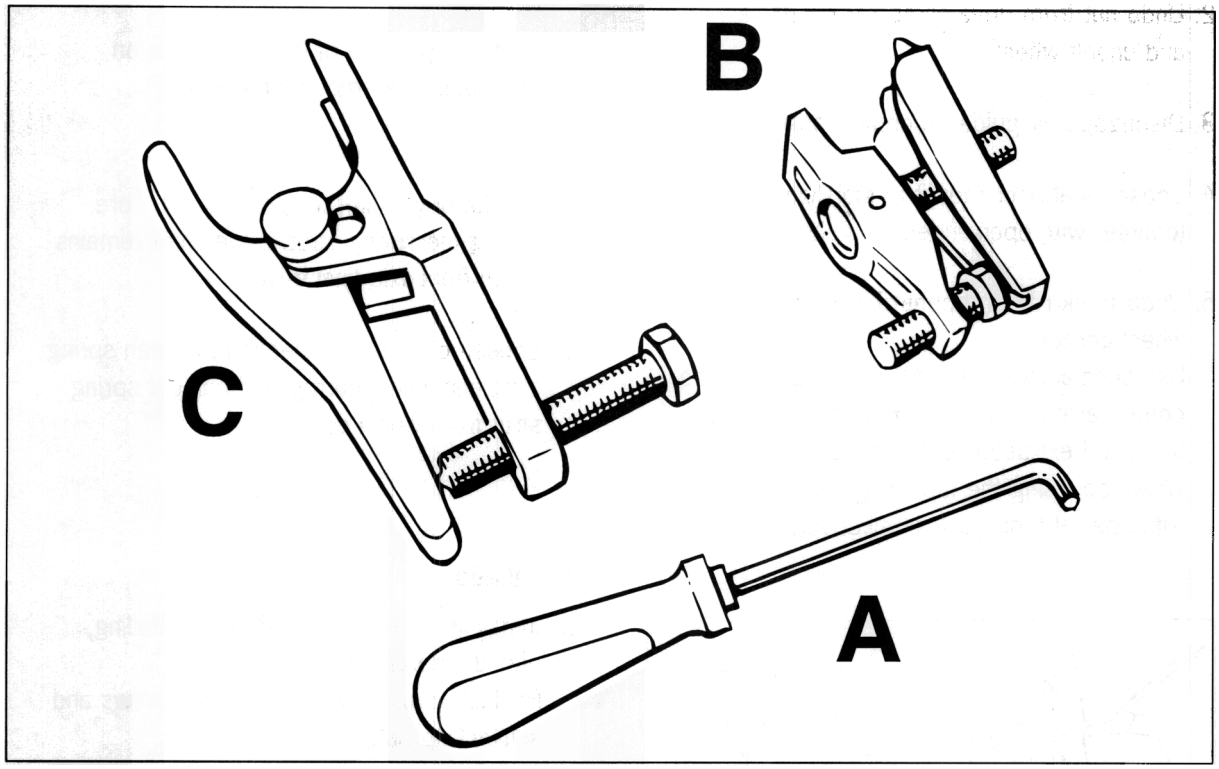
3. Swivel spring strut outwards and insert drive shaft into the vehicle.

4. Insert pan-head screws with shim plates into the halfshaft flange. Insert drive shaft and fit pan-head screws.
Fit new fastening nut M22 x 1.5.

5. Fit ball joints on wheel carrier.
Taper of ball joint and wheel carrier free of grease when doing this.
When tightening the fastening nuts, counter with special tool 9546 (Torx screwdriver).

40 85 19 Removing and installing front spring strut – Carrera 4

Tools



204_99

Item	Designation	Special tool	Explanation
A	Torx screwdriver	9546	To counter the ball joints (track rod and joint mount) during assembly and disassembly.
B	Ball joint extractor (track rod extractor)	Commercially available; refer to Workshop Equipment Manual, Chapter 2.4, No. 113	
C	Press-out tool (ball joint extractor)	9560	To press out the ball joint on the wheel carrier.

Removal

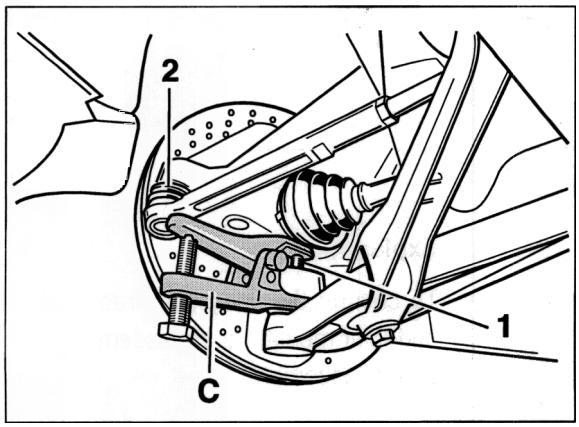
1. Open bonnet, remove battery cover and the respective cover (right or left).

2. Undo nut from drive shaft, raise vehicle and unbolt wheel.

3. Disengage air guide on control arm.

4. Loosen stabilizer mount at stabilizer (counter with open-ended wrench).

5. Undo track rod and control arm on wheel carrier.
   Use special tool 9560 (C) to press off of the control arm (1) and a commercially available track rod extractor for the track rod (2).
   When loosening the fastening nuts, counter with special tool (Torx screwdriver).



205_99

6. Open plug connection on wheel carrier. Pull out the plugs and disconnect the plug connections on the spring strut.

7. Loosen holder for brake lines/brake hose at wheel carrier. Loosen brake caliper from wheel carrier and attach in wheel arch.

8. Mark the position of the collar nuts on the spring strut mount and undo.

Note

Cover the drive shaft for protection before removing the spring strut. Drive shaft remains fitted on front-axle final drive.

9. Loosen clamped connection between spring strut and wheel carrier and pull out spring strut from wheel carrier.

Installation

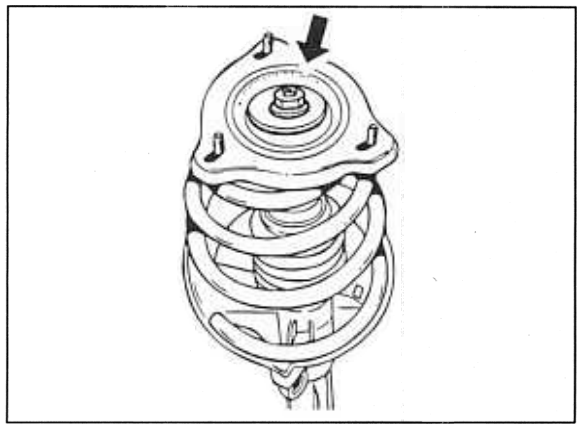
1. Install in reverse order. Before installing, give the parts a visual check.
   Replace brake caliper fastening screws and self-locking nuts.

2. Do not grease screws in Dacromet finish – aluminium colour.
   Use correct tightening torques.

Note

Make sure that the spring strut is pushed into the wheel carrier as far as it will go.

3. Insert the drive shaft into the toothing of the wheel hub. Insert wheel carrier with spring strut into the vehicle.
   The installation side "RE" (right) or "LI" (left) is stamped on the spring strut mount.
   Note the installed position of the spring strut mount. The arrow markings must point in the direction of travel.



343_1_99

Note

If the vibration damper was replaced, check the following after the spring strut is installed:
The stabilizer mount must not be braced at complete right and left stops (ball heads still movable)!
Loosen spring seats if necessary and centre accordingly (see Disassembling and assembling front spring strut – Carrera 4).

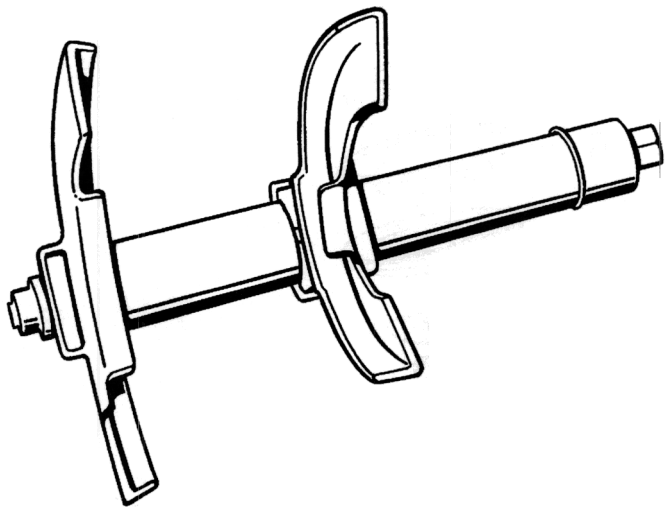
4. Check wheel alignment values at the front axle and adjust if necessary.

Note

If assembly work was performed or parts replaced that affect the vehicle height, a complete wheel alignment is necessary.

40 Disassembling and assembling front spring strut – Carrera 4

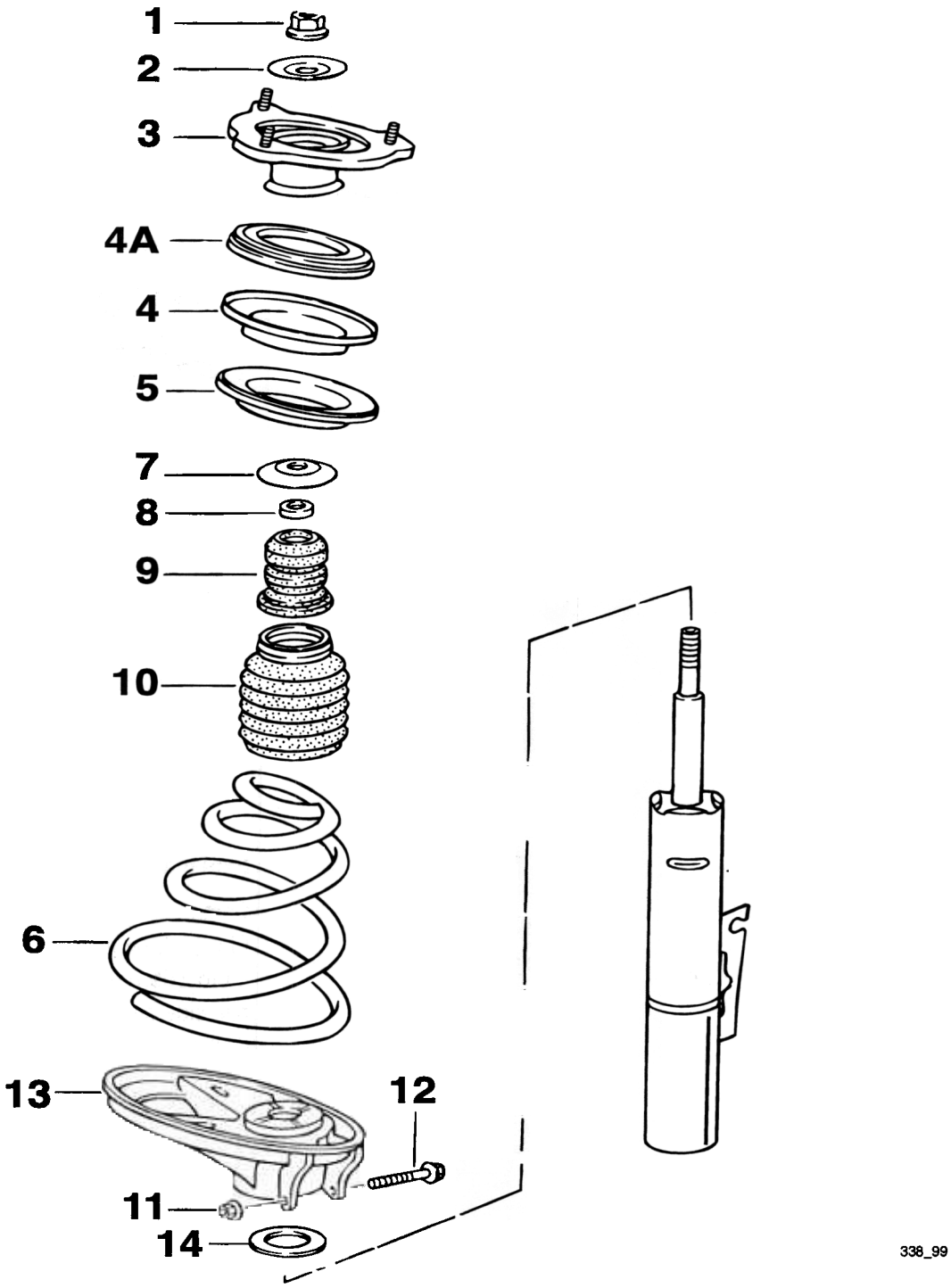
Tools



672_96

Item	Designation	Special tool	Explanation
	Spring clamp – e.g. from Klann – with spring holder		Commercially available. Clamping range of spring holder up to 165 mm spring diameter on one side and 195 mm spring diameter on the other side.

Disassembling and assembling front spring strut – Carrera 4



No.	Designation	Qty.	Removal	Note: Installation
	Fastening nut M 14 x 1.5	1	Before loosening the fastening nut, tension coil spring with the spring clamp. Counter at the piston rod when loosening the nut.	Use new fastening nut. Tighten to 80 Nm (59 ftlb.).
2	Stop plate	1		Mount in correct position (No. 2 and No. 7 are identical parts).
3	Spring strut mount	1		The "RE" or "LI" code for the right or left side respectively is stamped on the top of the spring strut.
4	Back-up ring			
4A	Mount	1	Remove the mount from back-up ring No. 4 only when replacing the mount (lever out mount with a small screwdriver).	Make sure it is seated properly in the back-up ring No. 4.
5	Spring plate (compensation part)	1		Observe allocation as per Spare Parts Catalogue.
6	Coil spring	1		Observe allocation as per Spare Parts Catalogue.
7	Stop plate	1		Mount in correct position (No. 7 and No. 2 are identical parts).
8	Cup washer	1		Mount in correct position.
9	Additional spring	1		Mount on protective bellows (No. 10).
10	Protective bellows	1		
11	Nut	1		Tighten to 10 Nm (7.5 ftlb.).

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No.	Designation	Qty.	Removal	Note: Installation
12	Screw	1		The screw must be fitted in the direction of travel.
13	Spring seat	1	Loosen spring seat from the vibration damper only when replacing it.	Right and left side are different (the cast number is stamped on the bottom of the spring seat). A cast lug is located on the left spring seat. The spring seat must be centred on the vibration damper (see also Assembly instructions/Assembly).
14	Washer	1	The washer is inserted in the spring seat.	The washer must be fitted flush in the spring seat.
15	Vibration damper	1		Observe allocation as per Spare Parts Catalogue.

Disassembly and assembly instructions

Disassembly

– Tension the coil spring with the spring clamp until the piston rod is relieved.

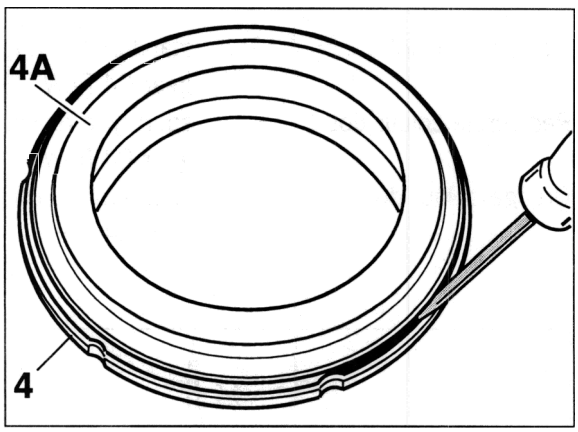
To undo the connection (piston rod to spring strut mount) counter at the piston rod with special tool 9630 or a 7 mm Allen key.
Important: Never use an impact bolter to loosen or tighten the fastening nut.

Remove all parts from the piston rod.

Note

When installing new parts, observe the allocation according to the Spare Parts Catalogue.

Disassemble back-up ring no. 4 and mount no. 4A only in the case of replacement.
Lever out the mount with a small screwdriver.



342_99

Preliminary work and notes on assembly

– Replace nut for fastening the piston rod on the spring strut mount.

It is recommended to replace the coil springs only in pairs.

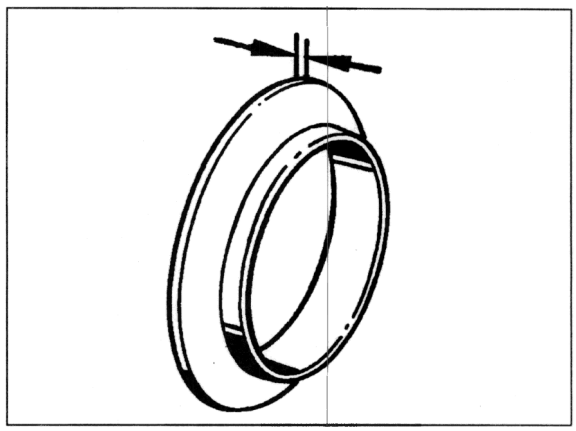
Note

If the coil springs are exchanged, it might be necessary to use a different spring plate than before.

The following spring plates (compensation parts) are available:
Allocation of the spring plate according to the coil spring tolerance group (Code B on the coil spring / Fig. 352_99).

1 green line = 6.5 mm thick compensation part.

1 white line = 3.0 mm thick compensation part.



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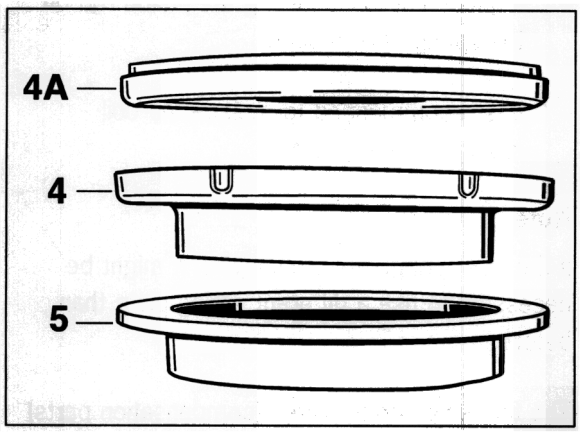
Complete mount No. 4A, back-up ring No. 4 and spring plate No. 5 (compensation part).



340_99

Fit protective bellows on additional spring.

Observe the correct allocation (running gear version) when installing new springs and/or dampers.

Tension coil spring with spring clamp.

Distinguishing feature of coil springs and dampers

Example:

A = Identification of the running gear version (spring constant/spring length) by two different coloured lines (for example, 1 x silver and 1 x purple).
Refer to the Parts Catalogue for the allocation.

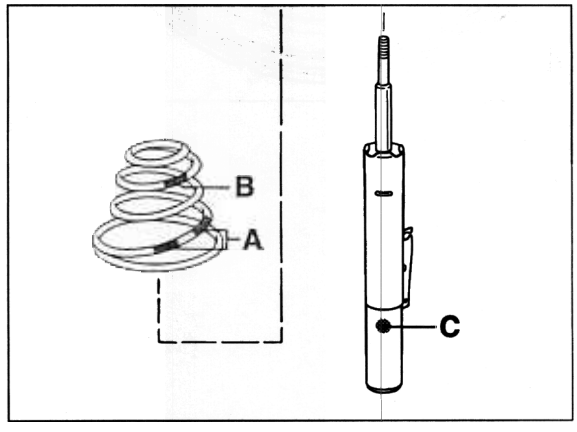
B = Identification of the coil spring tolerance group (load group) for determination of the compensation part (spring plate) thickness.

1 **white** line = 3.0 mm thick compensation part.

1 **green** line = 6.5 mm thick compensation part.

C = Colour dot (colour label) to differentiate the damper identifier.

Violet colour dot	=	standard running gear C4 RoW/USA
Red-purple colour dot	=	sport-type running gear C4 RoW
Orange colour dot	=	sport-type running gear C4 USA



352_99

Assembly

If the vibration damper has been replaced or the spring seat loosened, align the appropriate spring seat in the centre before tightening.
The spring seat fastening screw must be installed in the direction of travel when doing this.

After the spring strut is installed, the position of the spring seat must then be rechecked and minor corrections may possibly be made (see Serv. No. 40 85 19/Removing and installing spring strut – Carrera 4).
Space constraints and the position of the stabilizer mount are decisive factors.
The stabilizer mount must be free of tension at complete right and left stops (ball heads still movable).

Note

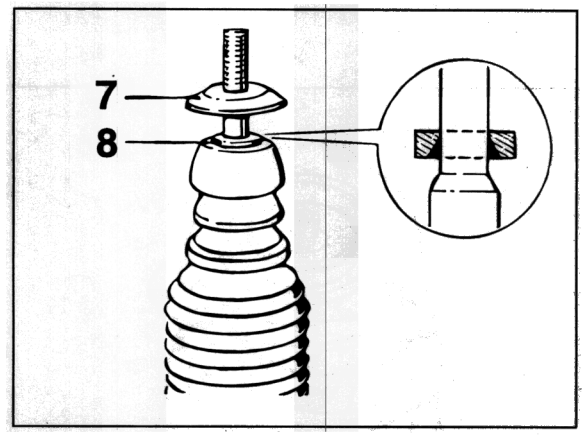
Spring seats for the right and left sides are different.
The distinguishing feature of the spring seat is a cast lug on the left spring seat.
Also, a different cast number is stamped on the bottom of the spring seat.

Example:

996 343 **508** 02 even number for **right side.**

996 343 **507** 02 odd number for **left side.**

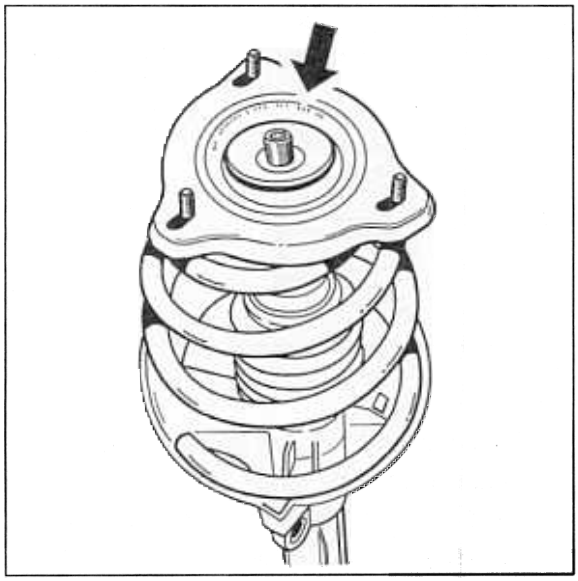
Slide the protective tube/additional spring assembly on the piston rod.
Slide the cup washer No. 8 and stop plate No. 7 as far as they will go into the correct position on the piston rod.



339 99

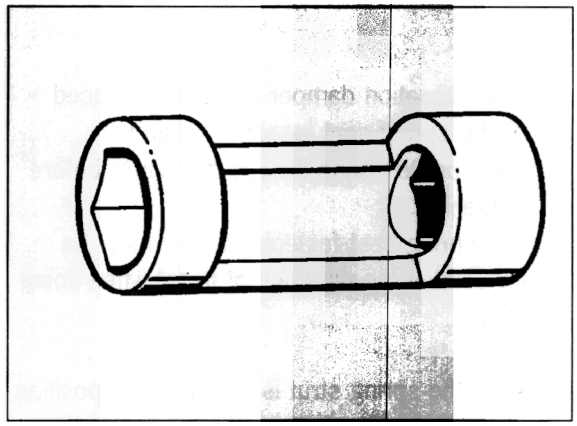
Place pre-tensioned coil spring on the vibration damper.
Place the mount/back-up ring/spring plate assembly on the coil spring.

Place the left or right spring strut mount on the left or right section accordingly.
The "RE" or "LI" code and a positioning arrow for installation in the correct position in the vehicle are stamped on the top of the spring strut
Place stop plate in the correct position on the spring strut mount and screw a new fastening nut onto the piston rod.



Arrow – "RE" (right) or "LI" (left) code 343_99

Use a socket wrench insert open on one side to tighten the fastening nut on the spring strut mount.
In this way the specified tightening torque can be adhered to exactly. It is also possible to counter at the piston rod with special tool 9630 at the same time.
Never use an impact bolter to tighten the fastening nut!



2047_40

45 Overview of PSM references

PSM (Porsche Stability Management) is standard in the 911 Carrera 4 (996).
PSM is an automatic control system to stabilise the vehicle in extreme driving situations.
PSM includes the functions ABS, Traction Control (TC), ABD, MSR (engine drag torque control), FZR (vehicle regulator) and EBV (electronic brake distributor).
Passive switching possibility for TC, FZR and MSR with a switch (PSM button) in the centre console.

	Driver's Manual 911 Carrera (996) Vehicle with four-wheel drive	**Service Information** 911 Carrera 4 (996)	**Technical Manual Repair** 911 Carrera 4 (996)
PSM system description (comprehensive description)		X	
PSM system description (customer oriented)	X		
Display – lamp strategy	X	X	
PSM component arrangement		X	X Rep. Gr. 45
Removing and installing PSM components			X Rep. Gr. 45
Calibrating steering angle sensor			X Rep. Gr. 45
Specification for bleeding			X Rep. Gr. 47

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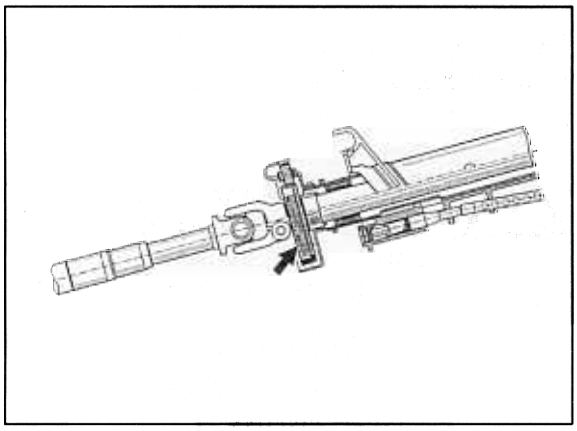
	Driver's Manual 911 Carrera (996) Vehicle with four-wheel drive	**Service Information** 911 Carrera 4 (996)	**Technical Manual Repair** 911 Carrera 4 (996)
PSM system description (comprehensive description)		X	
PSM system description (customer oriented)	X		
Display – lamp strategy	X	X	
PSM component arrangement		X	X Rep. Gr. 45
Calibrating steering angle sensor			X Rep. Gr. 45
Specification for bleeding			X Rep. Gr. 47

45 60 Calibrating steering angle sensor

Important notes

A steering angle sensor (arrow) is attached to the steering column/steering shaft in the 911 Carrera (996) with PSM (Porsche Stability Management).
PSM is standard in the 911 Carrera 4 (996).

The steering angle sensor (arrow) supplies information about the slip angle of the front wheels to the PSM control unit (intention of driver in relation to direction of travel).



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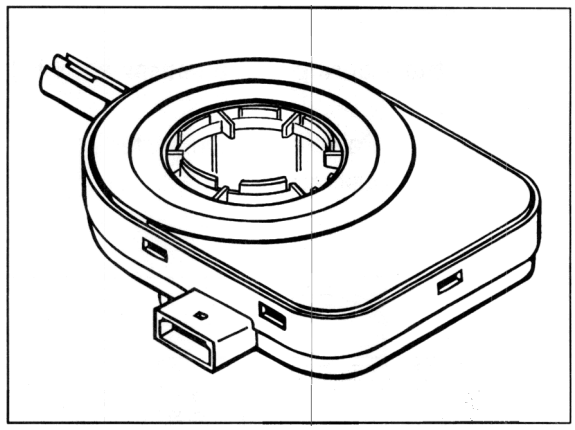
Steering angle sensor position

The angle steering sensor has **no defined zero position when new.** The position for "straight ahead" direction of travel must be programmed. This is done by calibrating with the Porsche System Tester 2 with the wheels in straight-ahead position.

Important: Malfunctions in the PSM control range if the steering angle sensor is not calibrated or is calibrated incorrectly.



368_98

The steering angle sensor must be calibrated after:

- A new steering angle sensor has been installed.

  The PSM control device has been exchanged.

  The steering gear and / or components which change the zero position of the steering angle sensor have been exchanged.

  Accident repairs

  Suspension alignment procedures during which the previous wheel alignment values were changed.

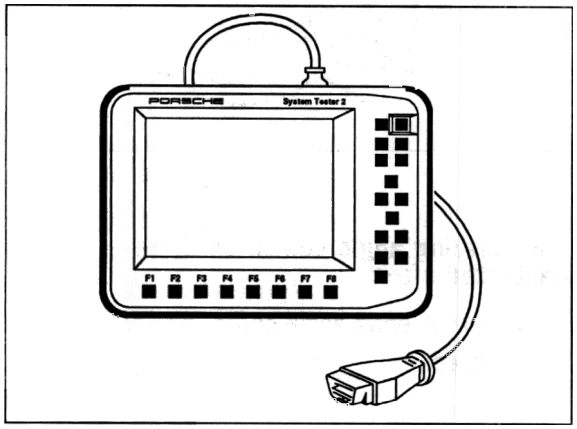
The steering angle sensor actual value must be checked:

- After a suspension alignment which resulted in **no** changes being made to the wheel alignment values.

  As a check after steering angle sensor calibration.

Checking the steering angle sensor actual value

- Connect the Porsche System Tester 2 to the diagnostic socket (arrow).



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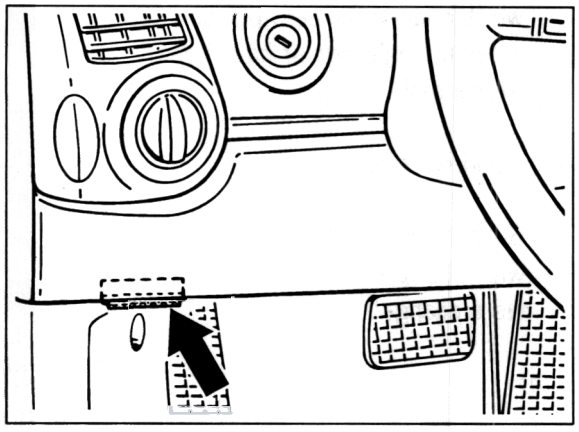

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Select vehicle type and then enter PSM system. Entry takes place through the ABS system (automatic status change after PSM).

Select steering angle sensor in the Actual values menu.

Required display in the Tester display with wheels in straight-ahead position 0° ± 3°.

If the steering angle sensor actual value deviates or is doubtful, recalibrate the steering angle sensor on the measuring platform.

Calibrating steering angle sensor

See previous text (pages 45 - 103) for information on when calibration is to be carried out.

Important:
Malfunctions in the PSM control range if the steering angle sensor is not calibrated or is calibrated incorrectly.

> Calibrate steering angle sensor with wheels in straight-ahead position on measuring platform.

Check the **steering angle sensor actual value** with wheels in straight-ahead position before calibrating the steering angle sensor! Only recalibrate the steering angle sensor on the measuring platform if the steering angle actual value lies outside the tolerance or is doubtful.

Drive vehicle onto measuring platform. Affix measured-value pickups to all wheels.
Check wheel alignment values and adjust if necessary.
If the wheel alignment values on the front and rear axles are correct, calibrate the steering angle sensor with the front wheels in straight-ahead position.
Calibration description in following text.

Select the **"Calibrate steering angle sensor" menu** with the Porsche System Tester 2 in the PSM system.
Entry to the PSM system takes place through the ABS system (automatic tatus change after PSM).

Confirm calibration start.
The procedure can also be interrupted.

Ensure that the wheels of the vehicle are in straight-ahead position.

Then proceed (continue).

The PST 2 now requests the 4 digit safety code.

Note

This safety code must be retrieved in the Actual values menu, Safety code submenu. This safety code changes automatically each time provided that PSM is called up **again**.

Enter the 4 digit safety code with the cursor keys (4 keys centre right).
Then proceed with the Next key (>>).

Confirm safety code input.
Important: The final possibility to interrupt the calibration is not to confirm the safety code input. To do this, press the appropriate function key for no.
Display in the Tester display after the safety code input has been confirmed: Steering angle sensor is being calibrated.

Note

The calibration procedure will be interrupted if an incorrect safety code is entered.
This time-consuming procedure ensures that the steering angle sensor **is not calibrated unintentionally**.

For safety reasons, read out the current steering angle sensor actual value after calibration. To do this, leave the PSM system. Then call up PSM again and select the steering angle sensor in the **Actual values menu.**
Required display in the Tester display: **0° ± 3°** when the wheels are in straight-ahead position.

Repeat the calibration if the value is not correct.

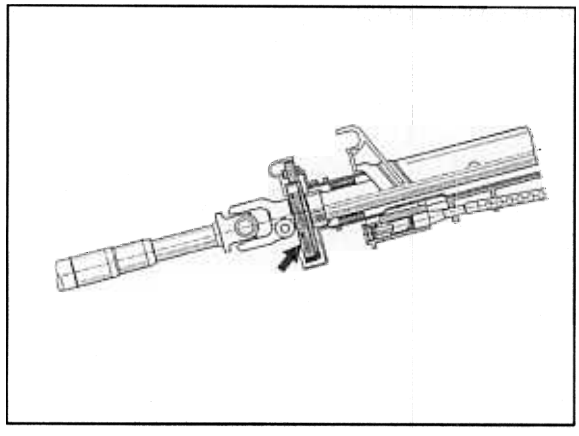
Note

The steering angle sensor can be calibrated several times. The value (the zero position) is stored in the steering angle sensor itself.

45 PSM component arrangement

Steering angle sensor (Serv. No. 4560)

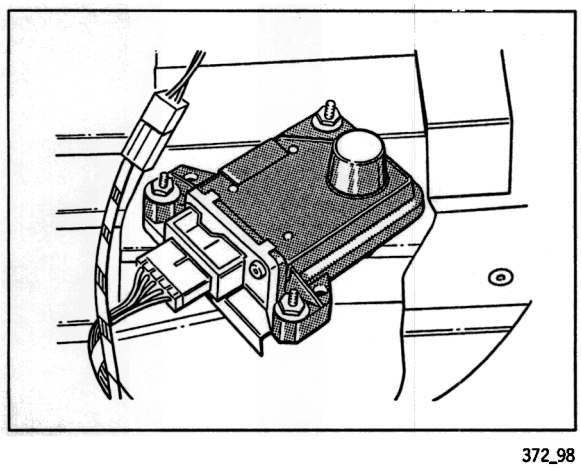
The steering angle sensor is attached to the steering column in front of the intermediate steering shaft (arrow).



369_98

Rotation rate sensor (Serv. No. 4559)

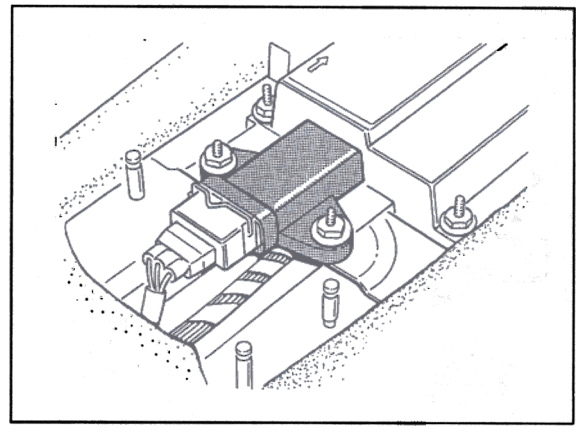
The rotation rate sensor is installed underneath the seat on the right.



372_98

Lateral acceleration sensor (Serv. No. 4558)

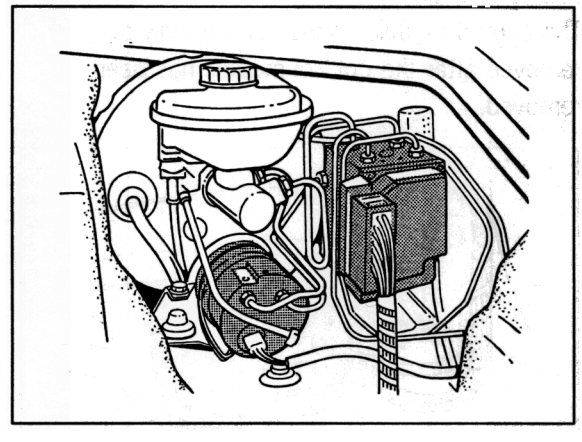
The lateral acceleration sensor is installed on the centre tunnel in front of the centre console.



371_98

Booster pump (Serv. No. 4564)

The booster pump is located in front of the brake booster.



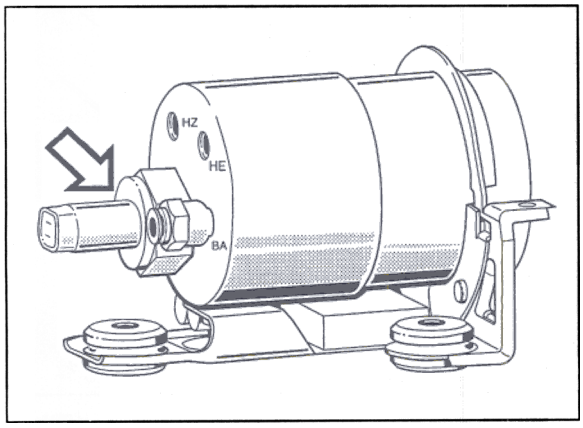
367_98

Hydraulic unit (Serv. No. 4530)

Near the brake booster (see Fig. 367_98). Same position as the ABS hydraulic unit in the 911 Carrera (996).

Brake pressure sensor

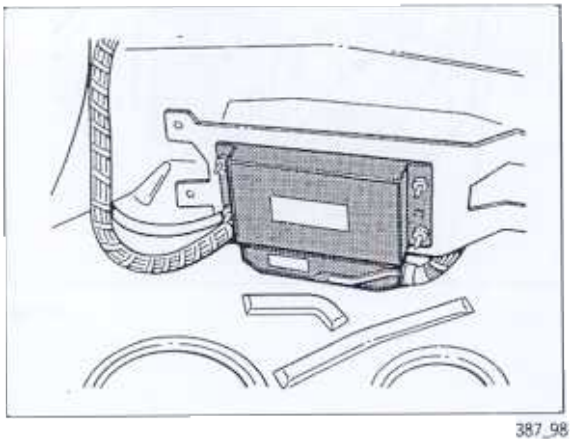
Is screwed in/integrated into the booster pump.



388_98

PSM control module (Serv. No. 4562)

The PSM control module is installed underneath a cover in the front-left area of the luggage compartment.
The control module connector can only be removed after the control module has been removed.



387_98

Relay (Serv. No. 4552/4554)

The pump relay and the solenoid valve relay are attached to a holder behind the PSM control module.

Switch for PSM (Serv. No. 4563)

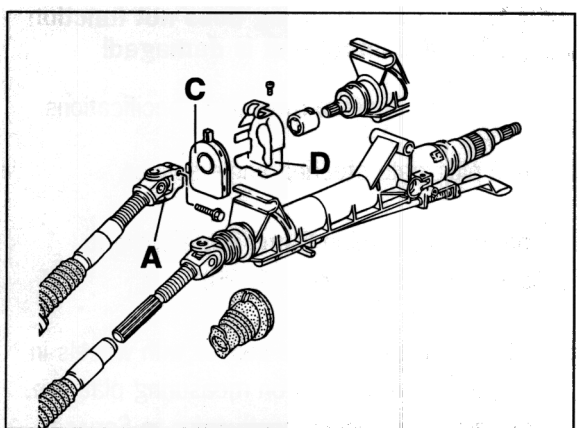
The PSM OFF switch (rocker switch) – to switch PSM to passive/active mode – is located in the centre console.

45 60 19 Removing and installing steering angle sensor

Note

A steering angle sensor (C) is attached to the steering column/steering shaft in the 911 Carrera (996) with PSM (Porsche Stability Management).

The cover (D) remains fitted during removal and installation of the steering angle sensor (C).



A = Universal joint of steering shaft 301_99
C = Steering angle sensor
D = Cover

Important note on steering wheel position for removal and installation

Turn front wheels to straight-ahead position. Lock the steering wheel and the front wheels in this position and ensure that this position is maintained for reinstallation.
The universal joint A can now be detached from the upper steering shaft and and refitted in the same position during installation.

If this is not done, the airbag contact unit (spiral spring) can be damaged.
Also, the steering wheel can be crooked with the front wheels in straight-ahead position after installation of the steering angle sensor!

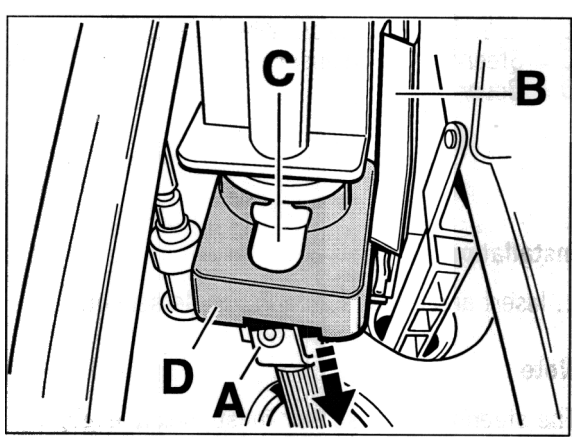
Removal

1. Remove driver's seat.

2. Disconnect battery ground cable.

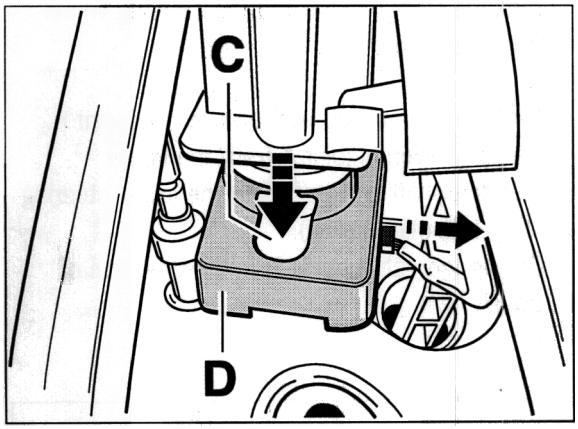
3. Turn front wheels to straight-ahead position. Affix the front wheels and the steering wheel in this position.

4. Undo hexagon-head bolt on universal joint A. Detach universal joint A from the upper steering shaft and push into the lower steering shaft (direction arrow).
Disengage cable guide B in the direction of travel.



A = Universal joint of steering shaft 302_99
B = Cable guide
C = Steering angle sensor
D = Cover

5. Pull plug off of steering angle sensor (direction arrow).
   Important: Pull at the plug housing only.
   Never pull the electrical connections.
   Disengage steering angle sensor C forwards.
   To do this, press the sensor carefully through the opening in the cover D (direction arrow).



C = Steering angle sensor
D = Cover
303_99

Installation

1. Insert and engage steering angle sensor.

Note

The steering angle sensor must audibly engage.

2. Fasten steering shaft (universal joint) in the correct position on the upper steering shaft (the same position as before removal).
   In the correct position means: front wheels, steering wheel and airbag contact unit in the same position as before removal.
   Use new fastening screw.
   Use correct tightening torque.

Note

If the steering wheel was **not fixed before** the steering angle sensor was removed, **the position of the contact unit** (spiral spring) may no longer be correct.
In this event, remove steering wheel and move contact unit to center position.

If this is not done, the spiral spring can be damaged.

Important:
Driver's airbag does not function if contact unit is damaged!

> Observe mounting specifications.

3. Push plug onto steering angle sensor.

4. Engage cable guide B and route cable to cable guide B (Figure 302_99).

5. Calibrate steering angle sensor with wheels in straight-ahead position on measuring platform. For calibration (adjustment), refer to Service No. 45 60.

Note on steering angle sensor position

The steering angle sensor has **no defined zero position when new.** The position for "straight ahead" direction of travel must be programmed. This is done by calibrating with the Porsche System Tester 2 with the wheels in straight-ahead position.

Important:
Malfunctions in the PSM control range if the steering angle sensor is not calibrated or is calibrated incorrectly!

> Calibrate steering angle sensor with wheels in straight-ahead position on measuring platform.

45 62 19 Removing and installing control module – PSM 5.3

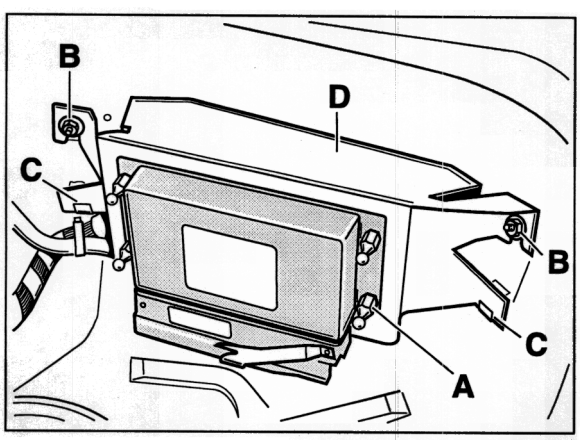
Removal

1. Remove ignition key.

2. Open luggage compartment lid and remove luggage compartment floor lid.

3. Pull control module cover up and off.

4. Unscrew fastening nuts (A).



300_99

5. Remove control module from the holder (D). Open locking clip and pull the control module connector off.

Installation

1. Engage control module connector in the guide of the control module. Then push the connector onto the connector strip and lock.

2. Fasten the control module.

3. Fit the covers.

4. Read out the fault memory with the Porsche System Tester 2 and erase the fault memory if necessary.

Note

If a **new** control module is installed, the steering angle sensor must be calibrated (see Serv. No. 45 60).

45 52 19 Removing and installing relay for solenoid valves – PSM 5.3

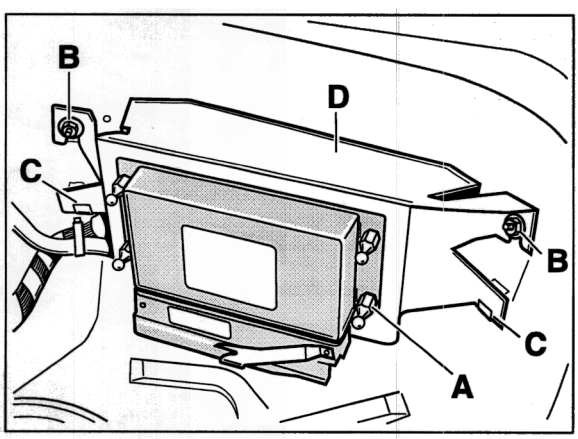
Removal

1. Remove ignition key. Open luggage compartment lid, remove luggage compartment floor lid, collapsible wheel and luggage compartment mat.

2. Undo hexagon-head nuts (B).
Pull control module holder (D) upwards out of the retaining clips (C).

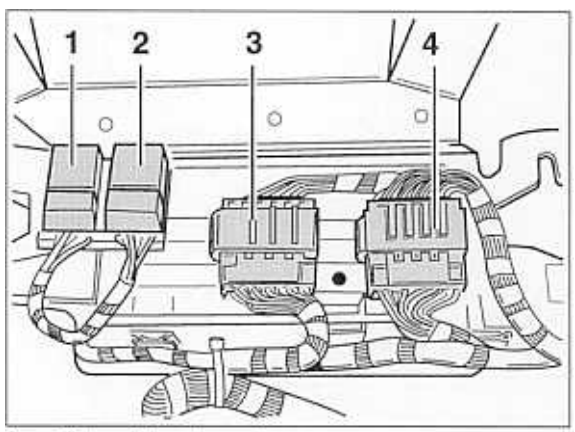
Note

The PSM control module remains fitted on the holder (D).



300_99

3. Pull off solenoid valve relay (1) on the back of the control module holder with special tool 9235.



1 = Solenoid valve relay
2 = Return pump relay

224_99

Installation

Install in reverse order

45 54 19 Removing and installing relay for return pump – PSM 5.3

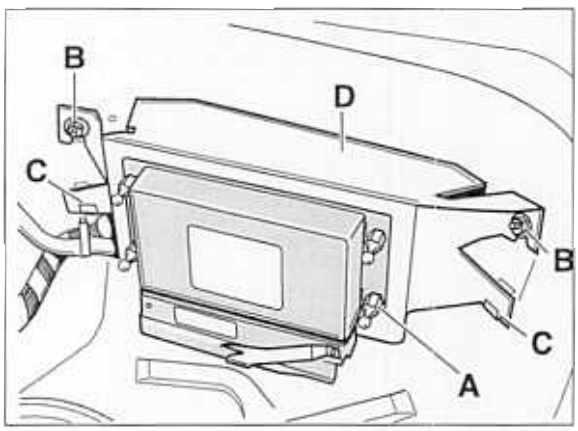
Removal

1. Remove ignition key. Open luggage compartment lid, remove luggage compartment floor lid, collapsible wheel and luggage compartment mat.

2. Undo hexagon-head nuts (B).
   Pull control module holder (D) upwards out of the retaining clips (C).

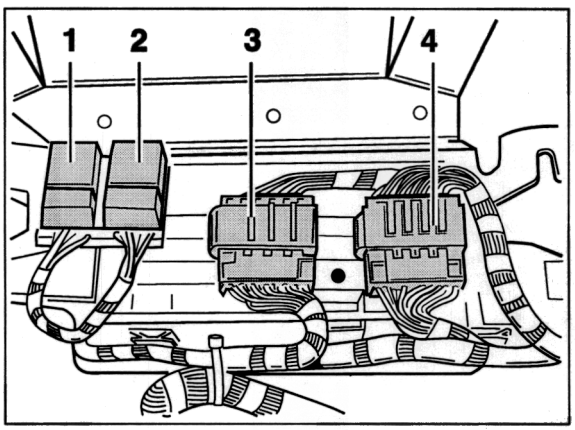
Note

The PSM control module remains fitted on the holder (D).



300_99

3. Pull off return pump relay (2) on the back of the control module holder with special tool 9235.



1 = Solenoid valve relay
2 = Return pump relay
224_99

Installation

Install in reverse order.

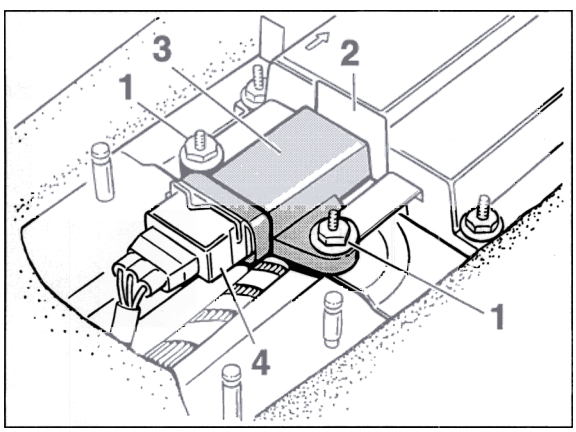
45 58 19 Removing and installing transverse acceleration sensor

Removal

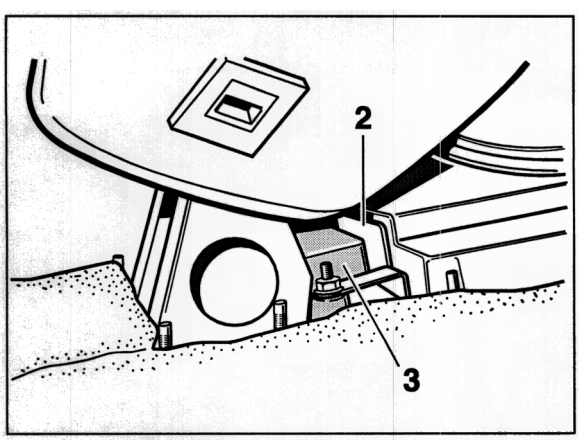
1. Move the front seats into the rear seat position.

2. Unclip the left and right side panel lining **in front of** the centre console.

3. Remove nuts from the transverse acceleration sensor No. 1. Remove shield No. 2 and transverse acceleration sensor No. 3.



306_99



337_99

Note

If the carpet is laid over the transverse acceleration sensor, cut out the carpet in this area.

4. Extend transverse acceleration sensor and pull off plug with the ignition switched off. Do not pull the cable when doing this.

Installation

1. Install in reverse order.

2. After installation, the transverse acceleration sensor must be checked with the Porsche System Tester 2 (Serv. No. 45 58 01).

45 58 01 Checking transverse acceleration sensor

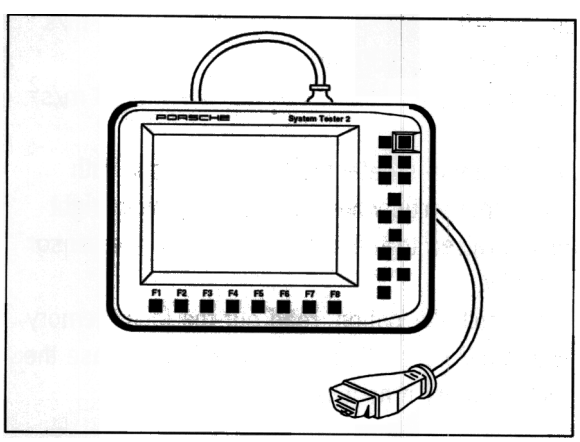
Notes on the test

The purpose of the test is to ensure the following points:

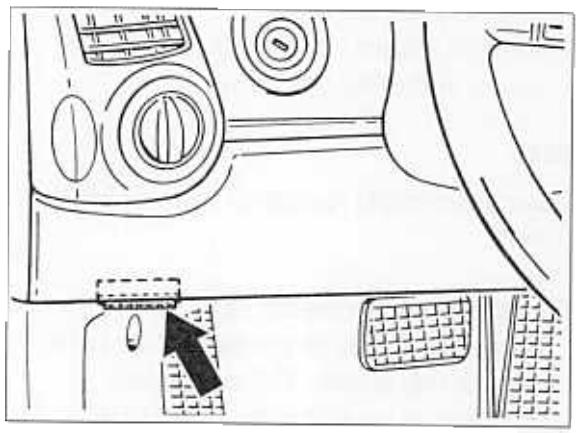
correct installation position of the sensor

functioning of the sensor

Connect Porsche System Tester 2.
The diagnostic socket (arrow/Figure 625_96) to which the Porsche System Tester 2 is connected is located in the driver's footwell (left-hand drive vehicles) or passenger's footwell (right-hand drive vehicles) near the fuse box.



547_96



625_96

2. Select the **"Actual values" menu/ "Transverse accel. sensor" sub-menu** with the Porsche System Tester 2 in the PSM system.
   Entry to the PSM system takes place through the ABS system (automatic status change after PSM).

3. Check and note or store the value of the transverse acceleration sensor in the normal position of the vehicle.
   Nominal value: 0.0 m/s^2 ± 0.4 m/s^2.

Note

Normal position means: Vehicle on level surface. If the vehicle was raised beforehand, relieve the wheel suspensions if necessary (move the vehicle a few meters as well as rocking it up and down at the front and rear a few times).
If a value other than the nominal value is displayed, an open circuit is present in the lead route or the transverse acceleration sensor is faulty.

4. Raise vehicle on the **left** at the jacking points until approx. 100 mm ground clearance is present at the left wheels.
   Read off and note or store the value of the sensor in the PST 2 display.

Note

Observe the safety regulations when raising the vehicle.

5. Lower vehicle on the left again.
   Then raise vehicle on the **right** in the same manner until approx. 100 mm ground clearance is present at the right wheels.
   Read off and note or store the value of the sensor in the PST 2 display.

6. Carry out evaluation according to the following text. Eliminate faults present if necessary.

Nominal value:

Raised on left approx. 100 mm =
0.55 m/s^2 or greater

Raised on right approx. 100 mm =
– 0.55 m/s^2 or greater

Sensor function

To check the vehicle, raise it once on the left and once on the right, approx. 100 mm each time.

An exactly defined change from the transverse acceleration value must take place.
The output value is used as a reference value for vehicles placed on a level surface.

Nominal display

Raising the vehicle on the left must result in a positive value while raising it on the right must result in a negative value, both with respect to the output value.
Nominal value: 0.55 m/s^2 or greater.

Example:

Output value	= 0.00 m/s^2
raised approx. 100 mm on the left	= 0.58 m/s^2
raised approx. 100 mm on the right	= – 0.58 m/s^2

If no change is detected by comparison with the output value when raising the vehicle (right or left raised to the same level), then the sensor is faulty.
After fault elimination, read out the fault memory with the Porsche System Tester 2 and erase the fault memory if necessary.

45 59 19 Removing and installing rate-of-turn sensor – PSM 5.3

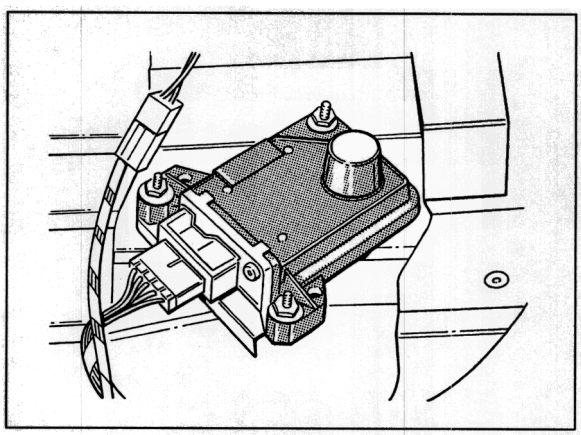
Removal

1. Remove passenger's seat.

2. Remove cover of rate-of-turn sensor.

3. Disconnect the plug on the rate-of-turn sensor with the ignition switched off, and pull off.

4. Undo rate-of-turn sensor at body (3 nuts).



372_98

Installation

Install in reverse order.

46 Technical data

Designation		Notes, dimensions	Wear limit
Operating brake (foot brake)		Hydraulic dual-circuit brake system with front axle-rear axle brake circuit distribution. Vacuum brake booster, internally ventilated and perforated brake discs with four-piston monobloc fixed caliper at front and rear axles. PSM* (Porsche Stability Management) standard.	
Brake booster (vacuum)	ø	10 inches	
Boost factor		3.85	
Brake master cylinder	ø front	23.81 mm	
	ø rear	23.81 mm	
	travel	18/18 mm	
Brake proportioning control**		EBV*	
Brake discs	ø front	318 mm	
	ø rear	299 mm	
Effective brake disc	ø front	261.8 mm	
	ø rear	247.4 mm	
Piston ø in brake caliper	front	2 x 40 + 2 x 36 mm	
	rear	2 x 30 + 2 x 28 mm	
Brake pad area	front	254 cm^2	
	rear	196 cm^2	
Total brake pad area		450 cm^2	

Standard Porsche Stability Management (PSM) with ABS, Traction Control (TC), ABD, MSR (engine drag torque control), FZR (vehicle regulator) and EBV (electronic brake distributor) functions. Passive switching possibility for TC, FZR and MSR.

EBV = electronic brake distributor (brake proportioning control). As a result, **no** screw-in brake proportioning valves are required.

Designation		Notes, dimensions	Wear limit
Pad thickness	front	approx. 12.0 mm	2 mm
	rear	approx. 10.5 mm	2 mm
Brake disc thickness **new**	front	28 mm	
	rear	24 mm	
Brake discs			
Minimum thickness * **after machining**	front	26.6 mm	26.0 mm
	rear	22.6 mm	22.0 mm
Thickness tolerance of the brake disc, max.		0.02 mm	
Lateral runout of the brake disc, max.		0.03 mm	
Lateral runout of the wheel hub, max.		0.03 mm	
Lateral runout of the brake disc when installed, max.		0.06 mm	
Peak-to-valley surface roughness of the brake disc after machining, max.		0.006 mm	
Pushrod play (measured at the brake pedal plate)		approx. 1 mm	
Parking brake (hand brake)		Drum brake acting mechanically on both rear wheels	
Parking brake drum ø		180 mm	181 mm
Brake shoe width		25 mm	
Brake lining thickness		4.5 mm	2 mm

* The brake disc must be reworked only symmetrically, i.e. from both sides evenly.

47 01 07 Bleeding brakes (vehicle with PSM)

PSM (Porsche Stability Management) is standard in 911 the Carrera 4 (996).

Important notes

Use only new DOT 4 brake fluid.
Observe brake-fluid quality.

The brake-fluid change interval using Super DOT 4 brake fluid is two years. This brake fluid is available under the following part numbers:

Container volume **1** litre = 000.043.203.**66**
Container volume **30** litres = 000.043.203.**67**.

Procedure for bleeding

1st step: Bleed brakes as usual.

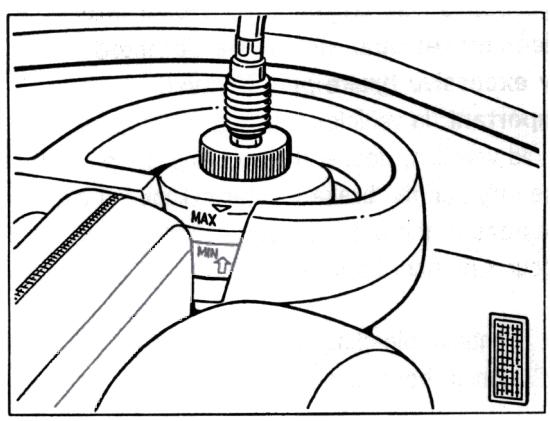
2nd step: Then bleed at front on right with running booster pump.

Note

This procedure is generally required for bleeding.

1st step: Bleed brakes as usual

Fill reservoir to its top edge with new brake fluid. **Connect a bleeding device to the brake fluid reservoir.**
Switch on the bleeding device. Bleeding pressure approximately 2.0 bar.



682_a_96

Continue bleeding at the brake calipers in the sequence: **Rear right / rear left / front left / front right.**
Open each bleeder valve until clear, bubble-free brake fluid emerges.
It must be noted that bleeding takes place at both bleeder valves on each caliper. Bleed the outer bleeder valve first.

Use a collecting bottle to make an accurate check on the escaping brake fluid for cleanliness, lack of air bubbles and to determine the brake fluid used.

After installing a new brake master cylinder and/or a new hydraulic unit, do the following while bleeding: **Open the right rear** bleeder valves, then fully depress the brake pedal several times. Hold for 2 - 3 seconds after each depression, then release slowly. Repeat this procedure in the sequence **rear left / front left / front right**. This will remove all air bubbles.

Note

Also carry out this procedure if the brake hydraulics was largely empty or if after bleeding residual air can be detected by excessive brake-pedal travel.
Important: In vehicles with high mileage or in old vehicles, double the pumping cycles and use only half the brake master cylinder stroke (damage to the brake master cylinder could occur / primary boot damage).

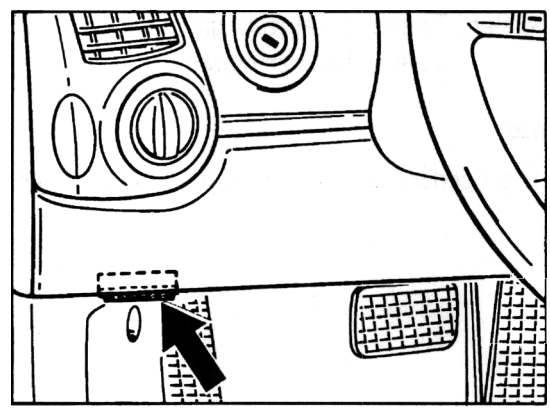
Continue bleeding at front on right with running booster pump (Step 2).

2nd step: Bleeding at front on right with running booster pump

Preliminary work: Bleed brakes as usual (Page 47 - 101/102).
Booster pump activation cannot be carried out with the Porsche System Tester 2 until after this has been done. Otherwise damage to the booster pump can occur.

To bleed at front on right with running booster pump the bleeding device remains connected (switched on).
Bleeding pressure approximately 2.0 bar.

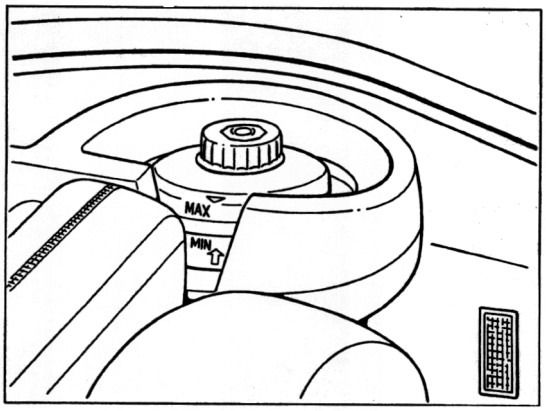
Connect the **Porsche System Tester 2** to the diagnostic socket.
Switch ignition on. Select the "Bleed" menu in the PSM system. Entry takes place through the ABS system (automatic status change after PSM).



625_96

Open the front right bleeder valve (use collecting bottle).

Press the Start button on the System Tester. In this way the booster pump is activated. Bleed until clear, bubble-free brake fluid emerges.
In addition (throughout bleeding operation) fully depress (pump) brake pedal as far as the stop at least ten times.
Important: In vehicles with high mileage or in old vehicles, double the pumping cycles and use only half the brake master cylinder stroke (damage to the brake master cylinder could result / primary boot damage).



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Note

After a certain period of time has elapsed, the Tester switches off automatically (leaves the menu).
If necessary, continue the procedure after a certain waiting time (select Bleed menu again.)

Close the right front bleeder valve. Then immediately press the Stop button on the System Tester. In this way pump operation is ended.

Switch ignition off and disconnect System Tester.

Switch off and disconnect the bleeding device.
Correct the brake fluid level if necessary.

47 08 55 Changing brake fluid (vehicle with PSM)

Important notes

Use only new DOT 4 brake fluid.
Observe the change interval and the brake fluid quality.
Total brake fluid change quantity **approx. 1 litre.**

The brake-fluid change interval is 2 years in conjunction with the Super DOT 4 brake fluid.
This brake fluid is available under the **following part numbers**:
Container volume 1 litre = 000.043.203.**66**
Container volume 30 litres = 000.043.203.**67**

Procedure for changing brake fluid

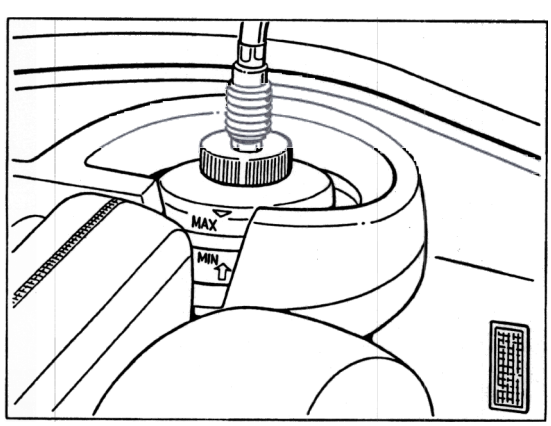
– Fill reservoir to its top edge with new brake fluid. **Connect a bleeding device to the brake fluid reservoir.**
Switch on the bleeding device. Bleeding pressure approximately 2.0 bar.

Continue bleeding at the brake calipers (no special sequence).
Open each bleeder valve until clear, bubble-free brake fluid emerges or the appropriate change quantity per brake caliper has been reached (approximately 250 cm^3). Make sure that brake fluid is drained **at both** bleeder valves on each brake caliper.

Use a collecting bottle to accurately check the escaping brake fluid for cleanliness, lack of air bubbles and to determine the brake fluid used.

Some brake fluid is also drained off at the bleeder valve of the clutch slave cylinder (approx. 50 cm^3).

Switch off and disconnect the bleeding device. Correct the brake fluid level if necessary.



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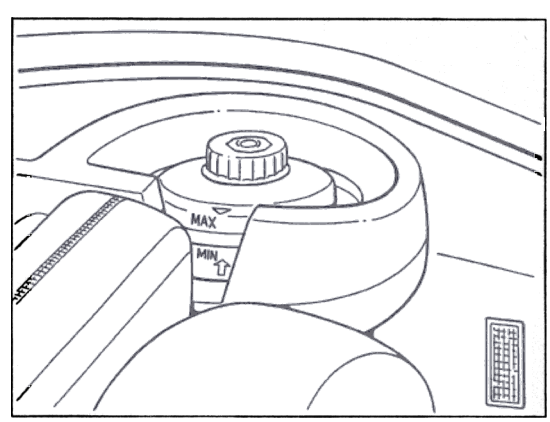

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