Workshop Manual
OCTAVIA

Running Gear

Service Department. Technical Information

S00.5103.50.20 Edition 08.96

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List of Supplements to OCTAVIA Workshop Manual

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Chassis

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Supplement	Edition	Subject	Article Number
	08.96	Basic Edition of Workshop Manual	S00.5103.50.20
1	09.96	Supplement to Basic Edition	S00.5103.51.20
2	03.97	Supplement to Repair Group 40 and 42; Repair Group 44, 45 and 48	S00.5103.52.20
3	11.97	Engine 1.9 l/81 kW TDI	S00.5103.53.20
4	10.98	Engine 1.8 l/110 kW; Octavia Estate	S00.5103.54.20
5	12.98	Drive shafts, vehicle measurement, Brake FN-3	S00.5103.55.20
6	06.99	Modifications to steering system, brakes, rear axle, ABS; Engine 1.4 l/44 kW	S00.5103.56.20
7	11.99	4 wheel drive (4 x 4)	S00.5103.57.20
8	04.00	Vehicles with ABS/EDS/ESP	S00.5103.58.20
9	11.00	Anti-lock brake system MK60	S00.5103.59.20
10	02.01	Anti-lock brake system MK60 ESP	S00.5103.60.20
11	05.01	Mechanical brake assistant, Brake FN-3	S00.5103.61.20
12	08.01	Text modifications to Repair Group 00, 40, 42 and 45	S00.5103.62.20
13	01.02	Text modifications to Repair Group 45	S00.5103.63.20
14	06.02	Text modifications to Repair Group 00, 40, 44, 45 and 46	S00.5103.64.20
15	11.02	Engine 1.9 l/96 kW PD, Supplement to Repair Group 00, 40, 42 and 45	S00.5103.65.20
16	04.03	Text modifications to Repair Group 40, 45 and 46	S00.5103.66.20
17	05.04	Text modifications to Repair Group 00, 40 and 44	S00.5103.67.20
18	06.05	Text modifications to Repair Group 00, 40, 42 and 45	S00.5103.68.20
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Technical Data

Chassis

Nominal values front axle

	Spring strut axle (Front and 4 Wheel Drive)		
	Standard suspension[7)]	**Sport suspension**	**Rough road suspension**
Chassis	G06 G20 1GA G12 G30 1GG G13 G31 1GE G14 G32 1GH G15 G33	G35 G85	G04 1GB G07 1GW G34 G39 G40
	Explanation concerning this PR No. see page 00-4		
Overall track[2)]	0° ± 10'	0° ± 10'	0° ± 10'
Track for 14"[7)] (mm)[2)] wheels Measuring point: 184 mm from wheel centre	0 ± 1	-	0 ± 1
Track for 15" (mm)[2)] wheels Measuring point: 196 mm from wheel centre	0° ± 1.1	-	0° ± 1.1
Track for 16"[7)] (mm)[2)] wheels Measuring point: 209 mm from wheel centre	0 ± 1.2	0 ± 1.2	0 ± 1.2
Track for 17"[8)] (mm)[2)] wheels Measuring point: 225 mm from wheel centre	-	0 ± 1.3	-
Toe difference angle on turns of 20° of inside wheels[1)]	- 1° 30' ± 20'	- 1° 31' ± 20'	- 1° 27' ± 20'
Toe difference angle on turns at full lock of inside wheel[1)]	- 6° 35'	- 6° 40'	- 6° 35'
Max. wheel lock angle[1)]	40°	39° 45'	40° 45'
Continued table ⇒ page 00-2			

Comment: Technical data apply for the unladen weight of the vehicle ready for driving (full fuel tank and water reservoir for the windscreen wiper washer system, spare wheels, tool kit, jack and without driver).

1) Not adjustable, depending on design

2) Adjustable

7) Not valid for Octavia 4 x 4

8) Only Octavia RS (1.8 l/32 kW)

Continuation of table „Nominal values of front axle“ of page 00-1			
	Spring strut axle (Front and 4-Wheel Drive)		
	Standard suspension[7)]	**Sport suspension**	**Rough road suspension**
Camber[3)]	-30’ ± 30’	-33’ ± 30’	-16’ ± 30’
	-0° 25’ ± 30’[4)6)]	-	-
	-0° 28’ ± 30’[5)]	-	-
Max. difference between left and right side	30’		30’
Caster angle[1)]	7° 40’ ± 30’[8)]	7° 50’ ± 30’[8)]	7° 15’ ± 30’[8)]
	7° 40’ +30’, -60’[9)]	7° 50’ +30’, -60’[9)]	7° 15’ +30’, -60’[9)]
	8° 23’ ± 30’[4)]	-	-
	8° ± 30’[5)6)]	-	-
Max. difference of caster angle between left and right side	30’		30’

Comment:
Technical data apply for the unladen weight of the vehicle ready for driving (full fuel tank and water reservoir for the windscreen wiper washer system, spare wheels, tool kit, jack and without driver).

1) Not adjustable, depending on design

3) The camber can be changed marginally, by moving the assembly carrier.
Pay attention to: Always replace the screws and washers of the assembly carrier!
After carrying out corrections of steering geometry, inspect position of steering wheel and alter to correct position, if necessary.

4) Only Service Mobil (Octavia 1.9 l/66 kW SLX, Octavia 1.8 l/92 kW SLX)

5) Only Service Mobil (Octavia Estate 1.9 l/81 kW SLX)

6) Only Service Mobil (Octavia 1.9 l/66 kW GLX

7) Not valid for Octavia 4 x 4

8) up to MY 2000

9) as of MY 2001

Nominal values rear axle

	Twist-beam rear axle[8]		
	Standard suspension	**Sport suspension**	**Rough road suspension**
Chassis	—	—	—
	PR No. is not displayed on the vehicle data sticker. The allocation of the adjusting values to the relevant running gear occurs via the PR No. of the front axle damping.		
Overall track[1]	20' ± 10'	34' ± 10'[9]	10' ± 10'/- 7'
	30' ± 15'[4]	30 ± 10'[10]	-
	25' ± 15'[5]	-	-
Track for 14" (mm)[2] wheels Measuring point: 184 mm from wheel centre	2.1 ± 1	-	2.1 ± 1
Track for 15" (mm)[2] wheels Measuring point: 196 mm from wheel centre	2.3 ± 1.1	-	2.3 ± 1.1
Track for 16" (mm)[2] wheels Measuring point: 209 mm from wheel centre	2.4 ± 1.2	4.1 ± 1,2[9] 3.6 ± 1,2[10]	2.4 ± 1.2
Track for 17" (mm)[2] wheels Measuring point: 223 mm from wheel centre	-	4.4 ± 1.3[9]	-
Camber[1]	1° 36' ± 10'[6]	-	1° 36' ± 10'[6]
	- 1° 27' ± 10'[7]	- 1° 27' ± 10'	- 1° 27' ± 10'[7]
	- 1° 43' ± 15'[4]	-	-
	- 1° 35' ± 15'[5]	-	-
Max. difference between left and right side	30'	30'	30'
Max. misalignment of the rear axle[3]	20'	20'	20'

Comment: Technical data apply for the unladen weight of the vehicle ready for driving (full fuel tank and water reservoir for the windscreen wiper washer system, spare wheels, tool kit, jack and without driver).

1) Not adjustable, depending on design

2) It is only possible to evenly average the individual tracking values by shifting the bearing brackets

3) It is only possible to evenly average the misalignment by shifting the rear axle body

4) Only Service Mobil (Octavia 1.9 l/66 kW SLX, Octavia 1.8 l/92 kW SLX)

5) Only Service Mobil (Octavia 1.9 l/66 kW GLX, Octavia Estate 1.9 l/81 kW SLX)

6) ➤ 11.96

7) 12.96 ➤

8) Not valid for Octavia 4 x4

9) Only for Octavia RS

10) Only for Octavia Estate RS

Rear axle - Nominal values

	Longitudinal/double suspension arm axle[3]		
	—	—	Rough road suspension
Chassis	—	—	—
	PR No. is not displayed on the vehicle data sticker. The allocation of the adjusting values to the relevant chassis occurs via the PR No. of the front axle damping.		
Overall track[1]			15’ ± 10’
Track for 15” (mm) wheels[2] Measuring point: 196 mm from wheel centre			2.3 ± 1.1
Camber[1]			-30’ ± 20’
Max. difference between left and right side			30’
Max. misalignment of the rear axle[2]			20’

Comment: Technical data applies for the unladen weight of the vehicle ready for driving (full fuel tank and water reservoir for the windscreen wiper washer system, spare wheels, tool kit, jack and without driver).

1) Not adjustable, depending on design

2) The individual tracking values can be adjusted and the running direction of the rear axle can be corrected by shifting the bearing brackets.

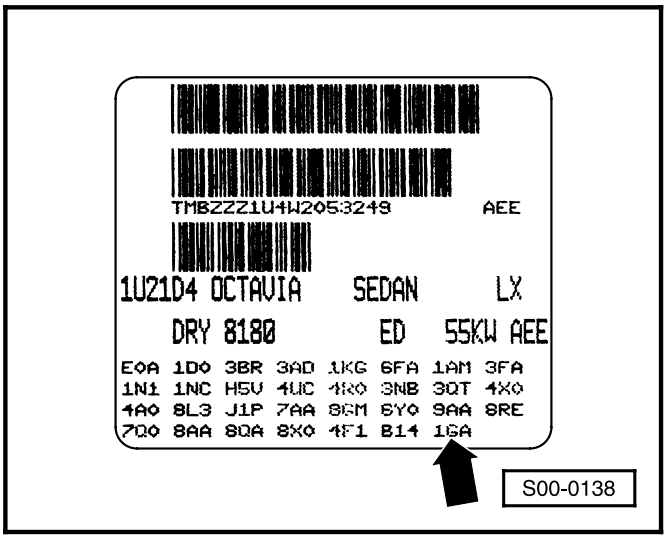
3) Only for Octavia 4x4

Chassis designations with PR numbers

A variety of chassis can be installed depending on the engine used and the equipment fitted. These all designated with a PR number.

The chassis which is installed in the vehicle is documented by the PR number for the front axle recorded on the vehicle data carrier.

The vehicle data carrier is located at the rear on the left of the base of the luggage compartment and in the service plan.



◄ **Example of a vehicle data carrier**

This example shows that the vehicle is fitted with a standard chassis 1GA -arrow-.

The table below shows a listing of the various chassis PR numbers which are decisive for the allocation of nominal values to the vehicle ⇒ Page 00-1

Front axis			
PR No.	**Engine installed / gearbox design**	**PR No.**	**Engine installed / gearbox design**
1GA	♦ All petrol engines up to 74 kW with a manual gearbox	**1GE**	♦ All petrol engines up to 74 kW with a manual or an automatic gearbox ♦ All diesel engines over 66 kW with a manual gearbox
1GG	♦ All petrol engines up to 74 kW with an automatic gearbox ♦ All diesel engines over 66 kW with a manual gearbox	**1GB**	♦ All petrol and diesel engines with a manual or an automatic gearbox ♦ Octavia 4 x 4

Rear axis			
PR No.	**Engine installed / gearbox design**	**PR No.**	**Engine installed / gearbox design**
1JD	♦ Only a sedan ♦ All petrol and diesel engines with a manual or an automatic gearbox other than the 1.8-ltr./110 kW engine	**1JB**	♦ All petrol and diesel engines with a manual or an automatic gearbox
1JH	♦ Only estate cars ♦ All petrol and diesel engines with a manual or an automatic gearbox other than the 1.6-ltr./55 kW engine	**1JW**	♦ Octavia 4 x 4

Steering

Model	All
Steering type	Rack and pinion type steering system
Steering gear	Power-steering gear
Steering-wheel turns from stop to stop	3.04
Steering-wheel diameter (mm)	370
Total ratio of steering	15.60
Lubricant for gear racks	Steering gear-flow grease TL 733 N 052 733 00 Part No.: AOF 063 000 04 (e.g. DEA ORNA F6 EPO)
Filling weight (g)	23...27
Maximum clearance between pressure plate and cover (mm)	0.05...0.1
Authorised axial force for the displacement of the gear rack (N)	250
Rotating force of the track rods from rest position (N)	1...3.5
Hydraulic oil designation	Hydraulic oil TL 52 146 N 052 146 00 Part No.: G 002 000 (e.g. PENTOSIN CHF 11S)
Hydraulic oil amount in the system (l)	0.7...0.9 l

Brakes

Engine	l/kW	1.4/44; 1.4/55		1.6/55		1.6/74;1.6/75		1.9/50 SDI	
S = (Manual) shift gearbox A = Automatic gearbox		S	-	S	-	S	A	S	-
Brake master cylinder ∅	mm	23.81							
Brake servo unit ∅	Inch	LHD models with and without ABS: 10“ RHD models with and without ABS: 7“/8“ tandem							
Front disc brakes									
Front brake calliper		**FS-III** [3]							
Front brake caliper, piston ∅	mm	54.0							
Front brake disc ∅	mm	256.0							
Brake disc, thickness	mm	22.0							
Brake disc, minimum thickness	mm	19.0							
Pad thickness with supporting plate	mm	19.5							
Minimum thickness without supporting plate	mm	2.0							
Rear disc brakes									
Rear brake caliper, piston ∅	mm	-				41.0		-	
Rear brake disc ∅	mm	-				239.0		-	
Brake disc, thickness	mm	-				9.0		-	
Brake disc, minimum thickness	mm	-				7.0		-	
Pad thickness with supporting plate	mm	-				17.0		-	
Minimum thickness without supporting plate	mm	-				2.0		-	
Rear drum brakes									
Brake drum ∅	mm	230.0							
Brake drum - maximum diameter	mm	231.0							
Wheel brake cylinder[1] ∅	mm	20.64	-	20.64	-	20.64	19.05	19.05[4]	-
Wheel brake cylinder[2] ∅	mm	20.64	-	20.64	-	20.64	20.64	20.64	-
Brake lining, width	mm	32.0							
Lining thickness without supporting shoe	mm	5.5							
Minimum thickness without supporting shoe	mm	2.5							

1) Models without ABS

2) Models with ABS

3) Not for taxi models (designation F4E)

4) For Octavia Combi: 20.64

Engine	l/kW	1.8/132		1.9/74		1.9/96			
M = Manual gearbox A = Automatic gearbox		M	-	M	-	M	-		
Master brake cylinder - ∅	mm	23.81							
Brake booster - ∅	Inch	Left-hand drive with and without ABS: 10" Right-hand drive with and without ABS: 7"/8" - Tandem							
Front brake disc									
Front brake caliper		**FN-3**		**FS-III**		**FN-3**			
Front brake caliper, piston - ∅	mm	54.0		54.0		54.0			
Front brake disc - ∅	mm	312,0		280,0		288,0			
Brake disc, thickness	mm	25,0		22,0		25,0			
Brake disc, minimum thickness	mm	23,0		19,0		23,0			
Pad thickness with supporting plate	mm	19,5		19,5		19,5			
Minimum thickness without supporting plate	mm	2,0		2,0		2,0			
Rear disc brake									
Rear brake caliper, piston - ∅	mm	38,0		41,0		41,0			
Rear brake disc - ∅	mm	256,0		239,0		232,0			
Brake disc, thickness	mm	22,0		9,0		9,0			
Brake disc, minimum thickness	mm	20,0		7,0		7,0			
Pad thickness with supporting plate	mm	17,37		17,37		17,0			
Minimum thickness without supporting plate	mm	2,0		2,0		2,0			
Drum brake									
Brake drum - ∅	mm	-							
Brake drum - maximum diameter	mm	-							
Wheel brake cylinder[1] - ∅	mm	-							
Wheel brake cylinder[2] - ∅		-							
Pad thickness	mm	-							
Pad thickness without supporting plate	mm	-							
Minimum thickness without supporting plate	mm	-							

[1] Vehicles without ABS

[2] Vehicles with ABS

Engine	l/kW	1.9/66 TDI		1.9/81 TDI		1.8/92; 2.0/85 (82)		1.8/110	
M = Manual gearbox A = Automatic gearbox		M	A	M	-	M	A	M	A
Master brake cylinder - ∅	mm	23.81							
Brake booster - ∅	Inch	Left-hand drive with and without ABS: 10“ Right-hand drive with and without ABS: 7“/8“ - Tandem							
Front brake disc									
Front brake caliper		**FN-III[3)5)]**						**FN-3[4)]**	
Front brake caliper, piston - ∅	mm	54.0						54.0	
Front brake disc - ∅	mm	280.0						288.0	
Brake disc, thickness	mm	22.0						25.0	
Brake disc, minimum thickness	mm	19.0						23.0	
Pad thickness with supporting plate	mm	19.5						19.5	
Minimum thickness without supporting plate	mm	2.0						2.0	
Rear disc brake									
Rear brake caliper, piston - ∅	mm	38.0[8)] 41.0[9)]							
Rear brake disc - ∅	mm	232.0[6)] 239.0[7)]		232.0 239.0[7)]					
Brake disc, thickness	mm	9.0							
Brake disc, minimum thickness	mm	7.0							
Pad thickness with supporting plate	mm	17.0							
Minimum thickness without supporting plate	mm	2.0							
Drum brake									
Brake drum - ∅	mm	230.0		—					
Brake drum - maximum diameter	mm	231.0		—					
Wheel brake cylinder[1)] - ∅	mm	20.64	—	—	—	—	—	—	—
Wheel brake cylinder[2)] - ∅	mm	20.64	20.64	—	—	—	—	—	—
Pad thickness, width	mm	32.0		—					
Pad thickness without supporting plate	mm	5.5		—					
Minimum thickness without supporting plate	mm	2.5		—					

1) Vehicles without ABS

2) Vehicles with ABS

3) Not valid for Taxi vehicles (identification F4E)

4) For Taxi vehicles (F4E) also 1.9/66; 2.0/85; 1.9/81

5) For Taxi vehicles (F4E) also 1.4/44; 1.4/55; 1.6/55; 1.6/74; 1.6/75; 1.9/50

6) Vehicles with ESP

7) Four-wheel drive vehicles

8) up to 07.98

9) as of 08.98

Brake fluid

Classification		Brake fluid N 052 766 US standard FMVSS 571. 116 DOT[4)] Part No.: B 000 700 A.. (A1.....M8 - Package size)
Contents of brake fluid	l	0.49 Vehicles with rear drum brakes, without ABS 0.53 Vehicles with rear drum brakes, with ABS 0.57 Vehicles with rear disc brakes, with ABS
Brake fluid change	-	every 2 years

Wheels, Tyres

Rims:

- Bolt-hole circle diameter: 100 mm
- Center hole diameter: 57 mm
- 5-hole fixing

Engine	**Tyre size[1)]**	**Light alloy rim**	**Steel rim**	**Offset (mm)**	**Snow chains Permitted**	
					yes	**no**
1.4 l/44 kW	175/80 R14 88 T, H	-	6J x 14 H2	38	X	-
1.4 l/55 kW	195/65 R15 91 T, H, V	6J x 15 H2	6J x 15 H2		X	-
1.6 l/55 kW	205/60 R15 91 H	$6^1/_2$J x 15 H2	-	43	-	X
1.9 l/50 kW	205/55 R16 91 H	$6^1/_2$J x 16 H2	-	42	-	X
	205/55 R16 91 W	$5^1/_2$J x 16 H2	-	36	X	-
1.6 l/74 kW	175/80 R14 88 H	-	6J x 14 H2	38	X	-
1.6 l/75 kW	195/65 R15 91 H, V	6J x 15 H2	6J x 15 H2		X	-
	205/60 R15 91 H	$6^1/_2$J x 15 H2	-	43	-	X
	205/55 R16 91 H	$6^1/_2$J x 16 H2	-	42	-	X
	205/55 R16 91 W	$5^1/_2$J x 16 H2	-	36	X	-
2.0 l/85 kW	195/65 R15 91 H, V	6J x 15 H2	6J x 15 H2	38	X	-
	205/60 R15 91 H	$6^1/_2$J x 15 H2		43	-	X
	205/55 R16 91 H	$6^1/_2$J x 16 H2		42	-	X
	205/55 R16 91 W	$5^1/_2$J x 16 H2		36	X	-

Continued table ⇒ page 00-9

1) Tyre inflation pressure
⇒ Inspection and Maintenance;
as well as sticker on vehicle

Engine	Tyre size[1)]	Light alloy rim	Steel rim	Offset (mm)	Snow chains Permitted	
					yes	no
1,8 l/92 kW	195/65 R15 91 H, V	6J x 15 H2	6J x 15 H2	38	X	-
	205/60 R15 91 H, V	6 1/2 J x 15 H2	-	43	-	X
	205/55 R16 91 H, V, W	6 1/2 J x 16 H2	-	42	-	X
	205/55 R16 91 W	5 1/2 J x 16 H2	-	36	X	-
1,8 l/110 kW	195/65 R15 91 V	6J x 15 H2	6J x 15 H2	38	X	-
	205/55 R16 91 V, W	6 1/2 J x 16 H2	-	42	-	X
	205/60 R15 91 V	6 1/2 J x 15 H2	-	43	-	X
	205/55 R16 91 W	5 1/2 J x 16 H2	-	36	X	-
1,8 l/132 kW	205/55 R16 91 W	6 1/2 J x 16 H2	6 1/2 J x 16 H2	42	-	X
	205/55 R16 91 W	5 1/2 J x 16 H2	-	36	X	-
	205/50 R17 89 W[2)]	7J x 17 H2	-	38	X	-
1,9 l/66 kW TDI	195/65 R15 91 T, H, V	6J x 15 H2	6J x 15 H2	38	X	-
	205/60 R15 91 H	6 1/2 J x 15 H2	-	43	-	X
	205/55 R16 91 H	6 1/2 J x 16 H2	-	42	-	X
	205/55 R16 91 W	5 1/2 J x 16 H2	-	36	X	-
1,9 l/74 kW PDi	195/65 R15 91 V	6J x 15 H2	6J x 15 H2	38	X	-
	205/60 R15 91 V	6 1/2 J x 15 H2	-	43	-	X
	205/55 R16 91 V	6 1/2 J x 16 H2	-	42	-	X
	205/55 R16 91 W	5 1/2 J x 16 H2	-	36	X	-
1,9 l/81 kW TDI	195/65 R15 91 H, V	6J x 15 H2	6J x 15 H2	38	X	-
	205/60 R15 91 H	6 1/2 J x 15 H2	-	43	-	X
	205/55 R16 91 H, V, W	6 1/2 J x 16 H2	-	42	-	X
	205/55 R16 91 W	5 1/2 J x 16 H2	-	36	X	-
1,9 l/96 kW PDi	195/65 R15 91 V	6J x 15 H2	6J x 15 H2	38	X	-
	205/60 R15 91 V	6 1/2 J x 15 H2	-	43	-	X
	205/55 R16 91 V, W	6 1/2 J x 16 H2	-	42	-	X
	205/55 R16 91 W	5 1/2 J x 16 H2	-	36	X	-

1) Tyre inflation pressure
⇒ Inspection and Maintenance as well as sticker on vehicle

2) Not valid for Octavia Estate RS

Load rating-index (Last Index):	88 = 560 kg 89 = 580 kg	91 = 615 kg
Speed symbol:	T = 190 km/h V = 240 km/h	H = 210 km/h W = 270 km/h

Notes:

- *Only use tyres of a same size and type on a vehicle, however the tread pattern and manufacturer may differ per axle. It is exceptionally allowed to use a different tyre temporarily in the event of a breakdown. Take into account a change in driving and braking behaviour.*
- *Wheel bolts with spherical collar and a thread of M14 x 1,5 - torque: 120 Nm*
- *Only use authorized on the relevant vehicle.*
- *When replacing rims always use wheel bolts to these rims (different length and spherical cap shape).*
- *Also observe the national legislation.*

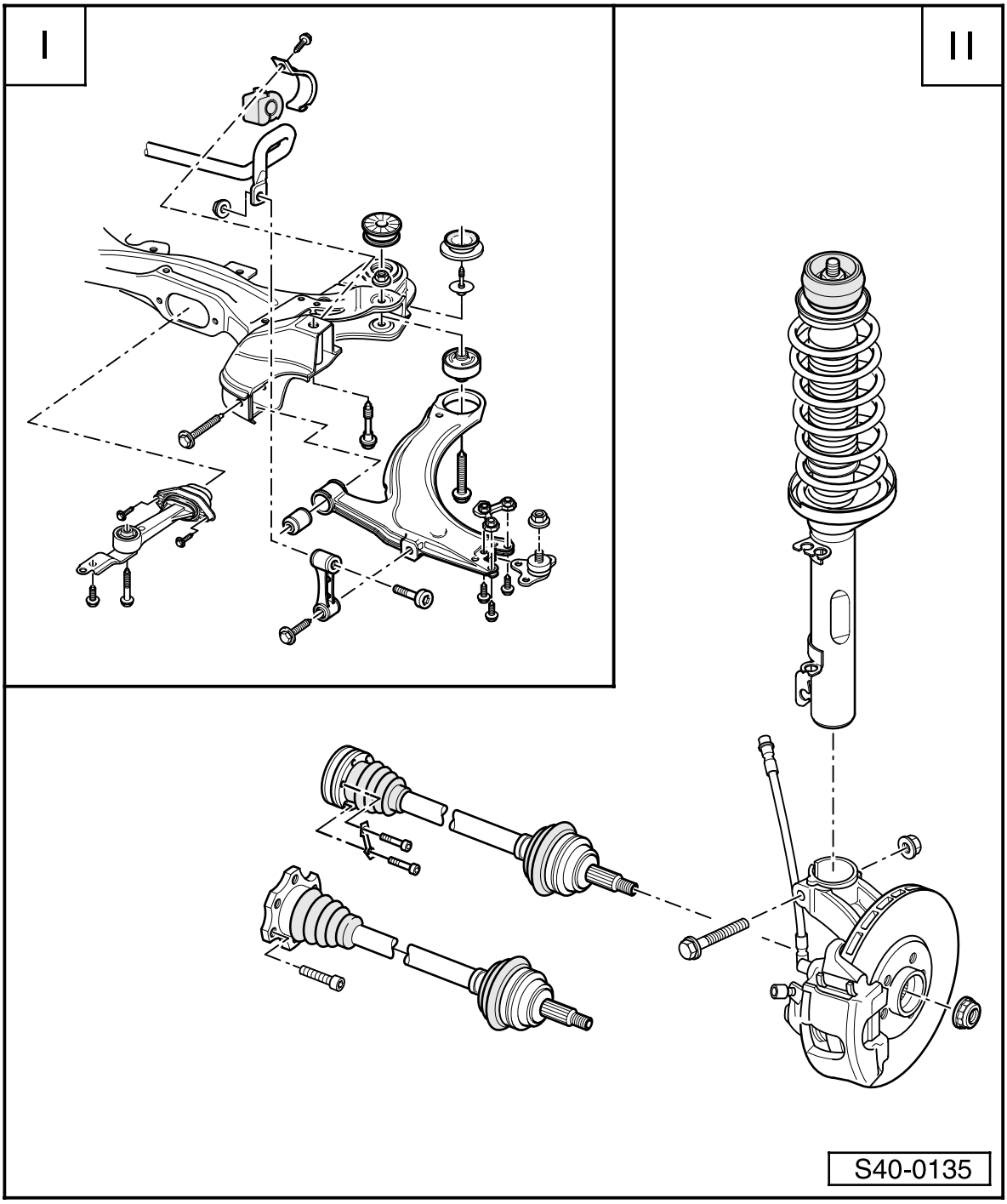
Caution!

Tyres that are more than 6 years old must only be used in case of emergency and while driving very carefully.

Tyre inscription

Inscription e.g. 175/80 R14 88 T	Meaning
175/80	Tyre width (mm)/cross section ratio of height - width (%)
R	Tyre construction (radial)
14	Wheel diameter (inch)
88	Load index
T	Speed symbol
Date of manufacture	
DOT ... 394 ◄	Manufactured in 39th week 1994 (◄ = designates decade 1990 ... 1999)
DOT ... 0300	Manufactured in 3rd week 2000 (03 = 3rd calendar week, 00 = year 2000)

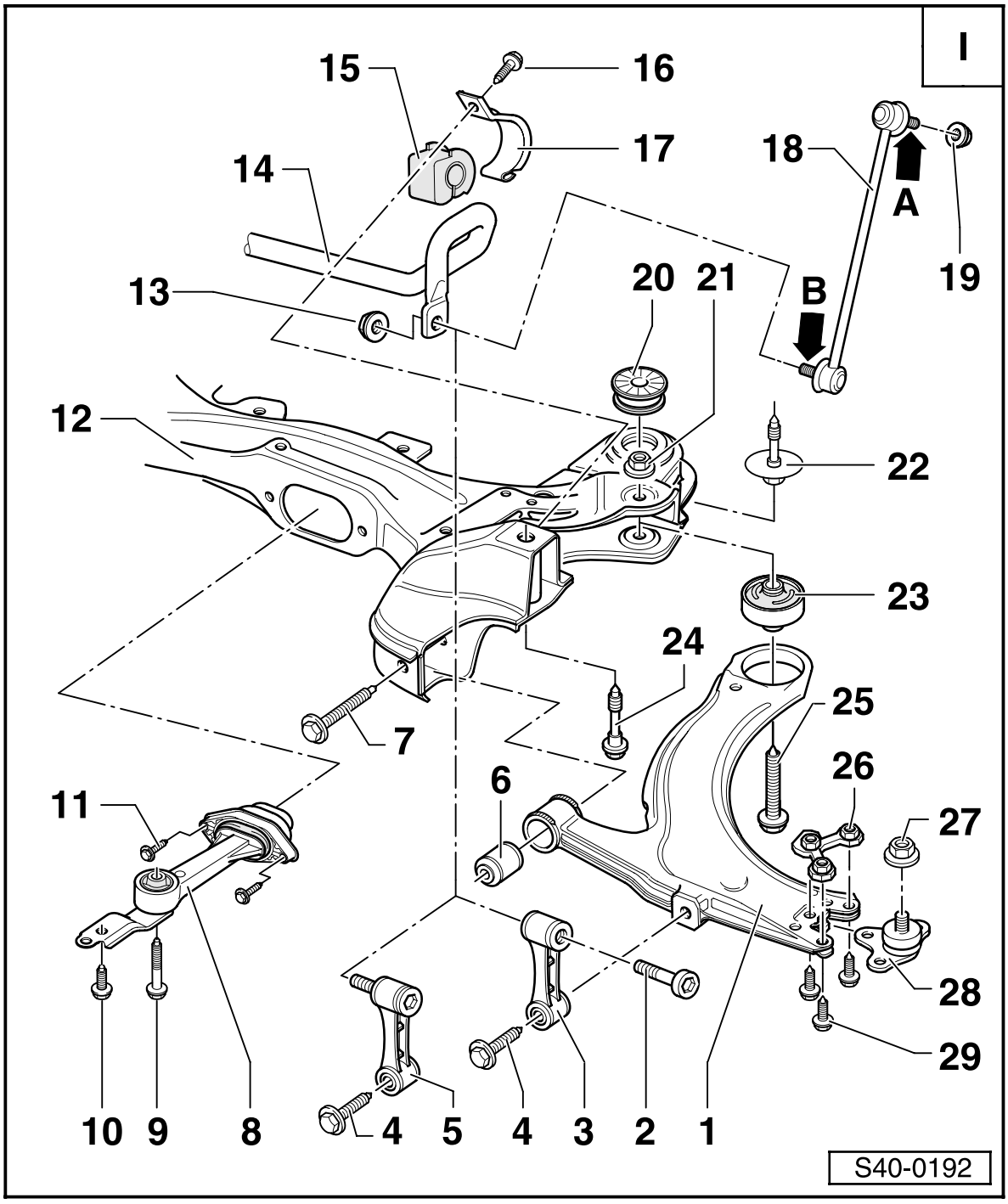
Servicing front suspension



I - Removing and installing subframe, anti-roll bar, track control arm ⇒ page 40-2

II - Removing and installing wheel mounting, suspension strut, drive shaft, brake ⇒ page 40-13

I - Summary of the components of the assembly carrier, anti-roll bar, track control arm



Comments:

- *If vehicles on which the universal drive shaft has been removed have to be moved then an outer joint must be fitted instead of the universal drive shaft which should be tightened to 50 Nm otherwise the wheel bearing will be damaged.*
- *It is not allowed to do welding and straightening work on weight carrying and wheel guiding components of the wheel suspension system.*
- *Self-locking nuts must always be replaced.*
- *Corroded bolts/nuts must always be replaced.*

1 - Axle guide

- Removing and installing ⇒ Page 40-4
- Elongated holes only serve to adjust the wheel camber!

2 - 15 Nm and turn through a further 90°

3 - Shift rail

- Shift rails on a given axle must be of the same design
- Allocation ⇒ spare parts catalogue

4 - 15 Nm and turn through a further 90°
- Replace after every disassembly operation

5 - Shift rail
- Only for anti-roll bars with a diameter of 23 mm
- Replace with a steel unit
- Shift rails on a given axle must be of the same design
- Allocation ⇒ spare parts catalogue

6 - Bearing at the front for the axle guide
- Pressing out and pressing in ⇒ Page 40-8

7 - 70 Nm and turn through a further 90°
- Replace after every disassembly operation

8 - Rocking pier

9 - 40 Nm and turn through a further 90°
- Replace after every disassembly operation

10 - 40 Nm and turn through a further 90°
- Replace after every disassembly operation

11 - 20 Nm and turn through a further 90°
- Replace after every disassembly operation

12 - Assembly carrier
- Removing and installing ⇒ Page 40-10
- The undertaking of repairs on the thread of the front axle guide screw connection is not allowed!

13 - 15 Nm and turn through a further 90°
- Replace after every disassembly operation

14 - Anti-roll bar
- The assembly carrier must be lowered in order to remove and install this

15 - Rubber bearing

16 - 25 Nm

17 - Clamp

18 - Shift rail
- Mount the spherical head with the long threaded pin -A- (above) on the spring plate
- Mount the spherical head with the short threaded pin -B- (below) on the anti-roll bar
- Allocation ⇒ spare parts catalogue

19 - 90 Nm
- Replace after every disassembly operation

20 - Metal - rubber bearing
- Pressing out and pressing in ⇒ Page 40-12

21 - Nut, self-locking
- Replace after every disassembly operation

22 - 100 Nm and turn through a further 90°
- Replace after every disassembly operation

23 - Bearing behind for the axle guide
- Installed location ⇒ Page 40-9
- Pressing out and pressing in ⇒ Page 40-9

24 - 100 Nm and turn through a further 90°
- Replace after every disassembly operation

25 - 70 Nm and turn through a further 90°
- Replace after every disassembly operation

26 - Securing plate
- Replace after every disassembly operation

27 - 20 Nm and turn through a further 90°
- Replace after every disassembly operation

28 - Axle joint
- Checking ⇒ Page 40-19
- Check the rubber bellows for damage and replace the axle joint as necessary
- Removing and installing only in connection with the wheel bearing housing ⇒ Page 40-20
- Mark the installed location before removing and place in the middle of the elongated hole when replacing the axle guide; also check the tracking

29 - 20 Nm and turn through a further 90°
- Replace after every disassembly operation

Removing and installing track control arm

Special tools, testers and aids required

- Removing tool MP 6-425
- Supporting device MP 9-200
- Torque wrench 75 ... 400 Nm, e.g. V.A.G 1576
- Torquing angle wrench, e.g. V.A.G 1756

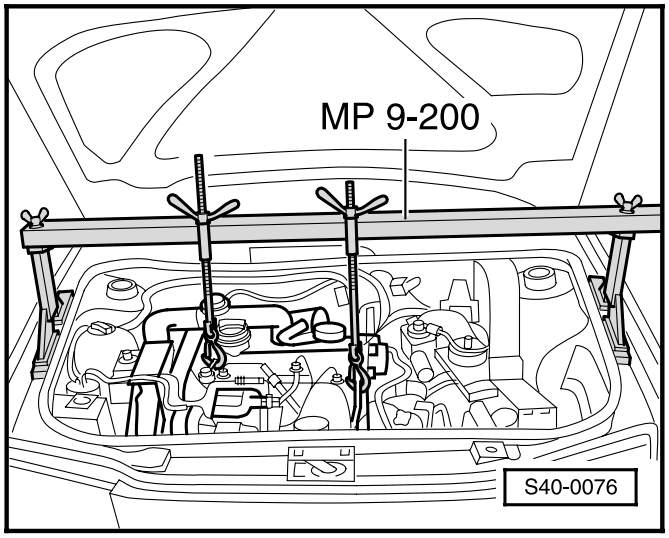
Removing

- Take off the wheel trim; pull off cap on light-alloy wheels (hook included in tool kit).
- Jack up vehicle until no weight is pressing on the front suspension.
- Slacken twelve-point nut.
- Raise vehicle and take off wheel.
- Unscrew twelve-point nut.
- Remove noise insulation panel.

⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine

Only for models with automatic gearbox:

◄- Insert supporting device MP 9-200 and take up weight of engine/gearbox in this position.

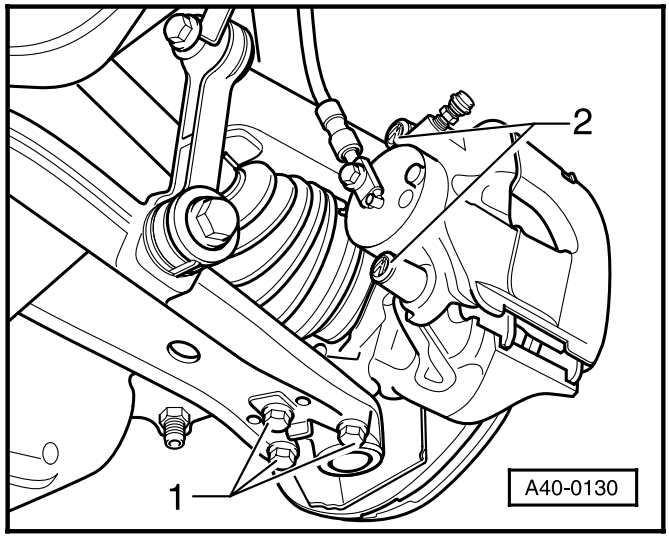


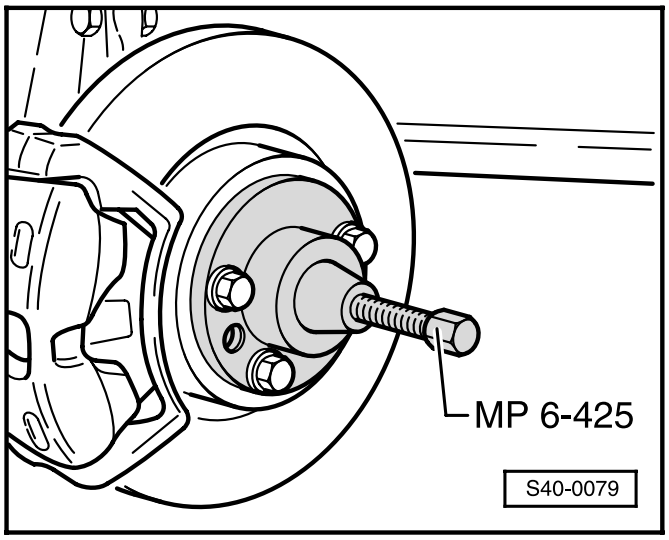
All models:

Note:

Mark installation position of the bolts -1- otherwise the axle geometry must be checked.

◄- Unscrew bolts -1-.

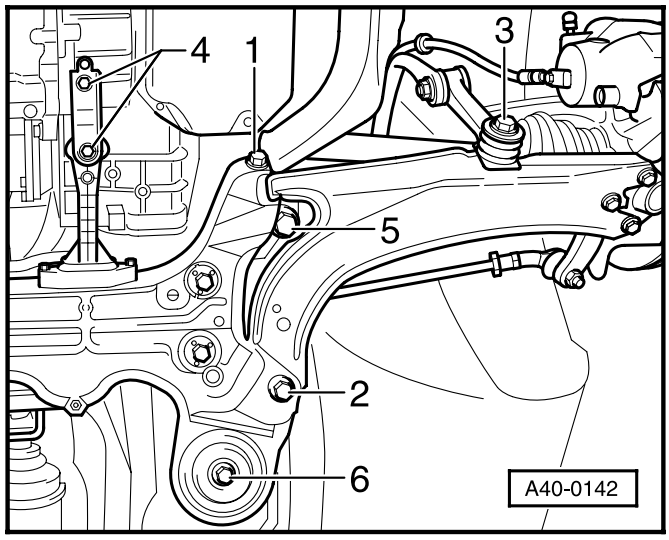




◄- Press out drive shaft. Position tool, as shown in Fig., for this step.

Note:

Ensure adequate clearance when pressing out the drive shaft.



◄- Unscrew hexagon bolt -3-, if fitted, at wishbone.

- Unscrew hexagon bolts -1- and -2-.
- Take out wishbone.

Only for models with automatic gearbox

- Unscrew hexagon bolts -4- for pendulum support.
- Unscrew bolts + washers -5- and -6- for subframe.

Note:

Pull out bolt -1- by pushing subframe slightly down and take out wishbone.

Installing

(applies to models fitted with manual and automatic gearbox)

Remove any corrosion present in the thread/ spline of the outer joint.

- Insert wishbone and attach.
- Attach subframe.
- Moisten splines of wheel hub with oil.
- Insert outer joint as far as possible into the splines of the wheel hub.
- Attach steering joint and wishbone with new bolts onto old impression.
- Bolt pendulum support to gearbox.
- Bolt coupling rod, as appropriate, to wishbone.
- **Moisten contact surface of twelve-point nut and also splines and thread of outer joint with oil and screw on twelve-point nut as far as possible.**
- Pull outer joint sufficiently far into the wheel hub until it is making contact in the wheel bearing.
- Install noise insulation.

⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine

- Fit on wheel.
- Lower vehicle; when doing this, ensure that the wheels do not yet touch the ground.

Tightening torques:

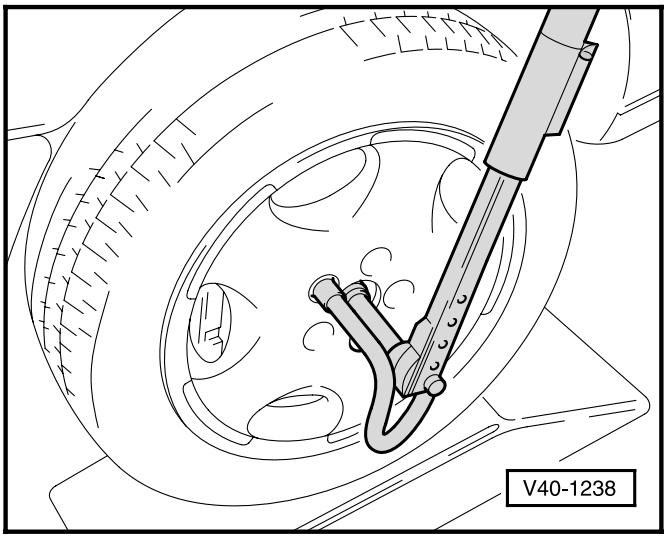
Subframe to body **Use new bolts!**	100 Nm + 90°
Steering joint to wishbone **Use new bolts and new locking plate!**	20 Nm + 90°
Pendulum support to gearbox **Use new bolts!**	40 Nm + 90°
Coupling rod to wishbone **Use new bolt!**	15 Nm + 90°

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

- Operate brake (second mechanic required).
- Tighten new twelve-point nut with 225 Nm and slacken half a turn.
- Turn wheel hub at least 90°
- Tighten twelve-point nut:

Tightening torque:

50 Nm and torque a further 60°



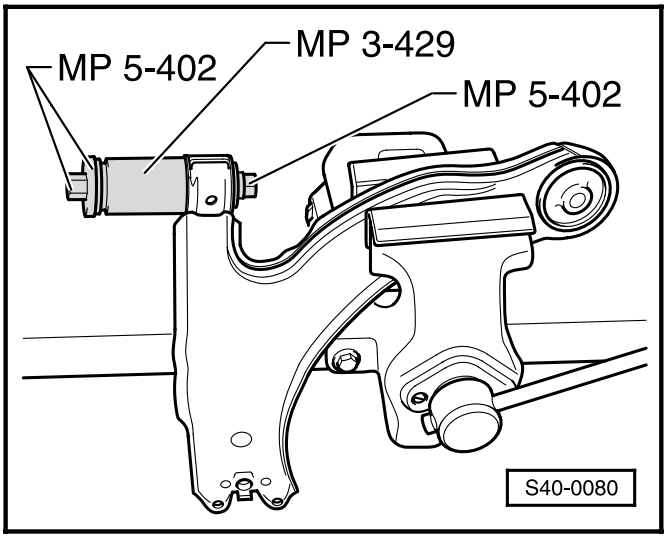
Note:

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

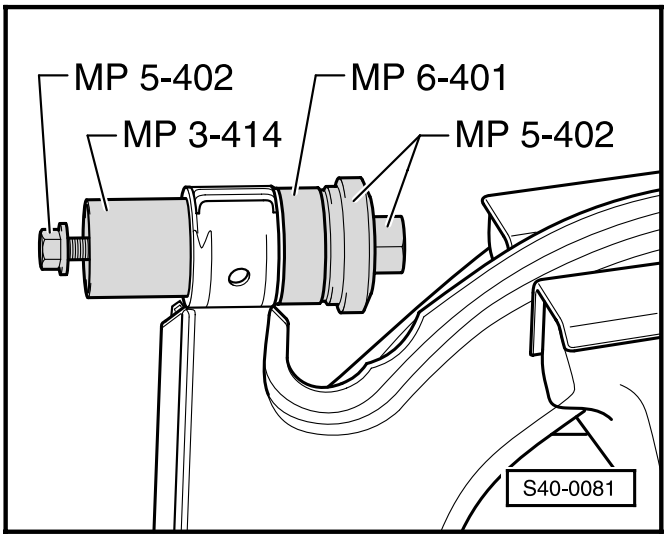
Removing and inserting bush for track control arm

Special tools, testers and aids required

- Thrust plate MP 3-406
- Thrust plate MP 3-407
- Pipe section MP 3-414
- Pipe section MP 3-429
- Thrust washer MP 3-456
- Assembly device MP 5-402
- Assembly device MP 6-401
- Plunger MP 6-405
- Base MP 6-407
- Extraction tube MP 6-408
- Workshop pressing tool, e.g. V.A.G 1290 A
- Acid-free lubricant, e.g. G 294 421



◄ **Pressing out front bush for track control arm**

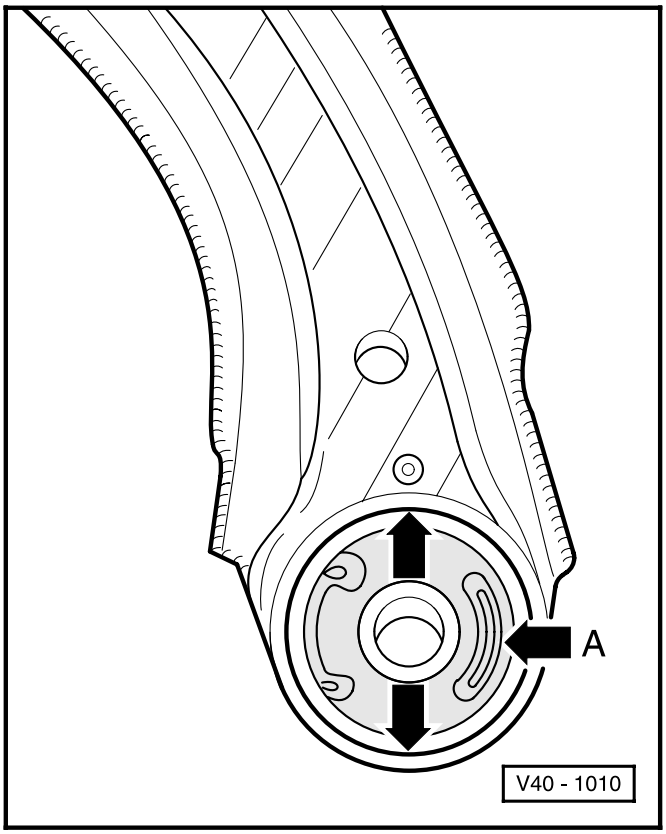


◄ **Inserting front bush for track control arm**

- Insert bush into pipe section MP 3-414.

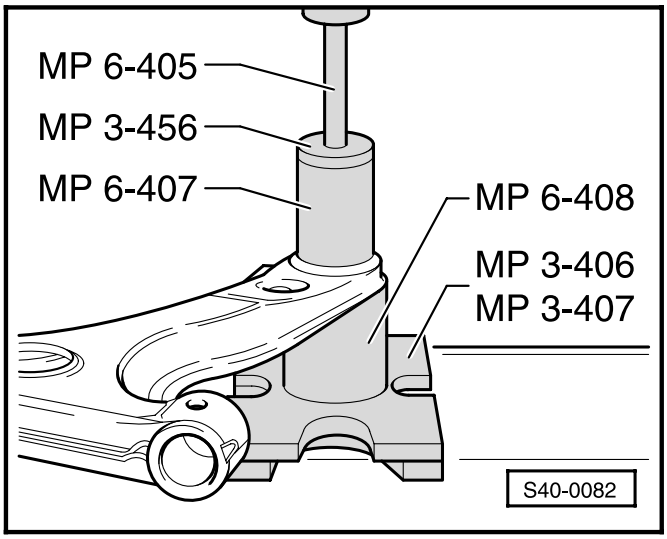
Note:

Use acid-free lubricant, e.g. G 294 421, for inserting the bush. On no account use grease or soapsuds.



◄ **Installation position for rear bush in track control arm**

One of the stamped arrows points towards the recess in the track control arm; kidney-shaped recess (arrow A) in bush points toward centre of vehicle.



◄ **Removing and inserting rear bush for track control arm**

Pay attention to installation position when inserting ⇒ Fig. V40-1010.

Removing and installing subframe

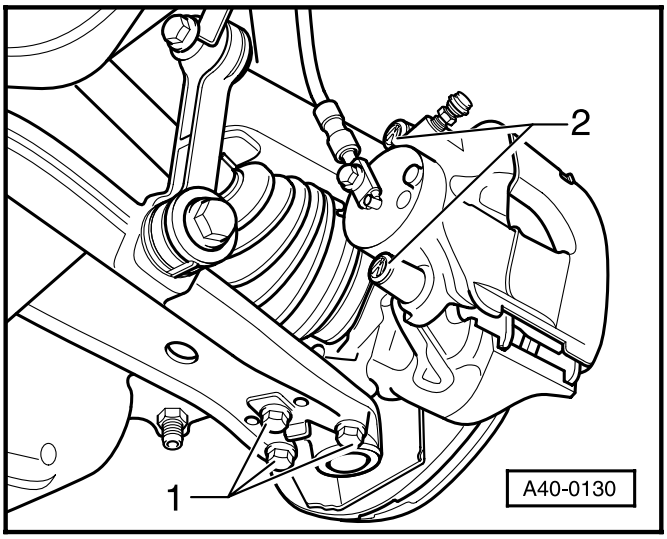
Special tools, testers and aids required

- Removal tool MP 6-425
- Gearbox jack with attachment, e.g. V.A.G 1383 A with V.A.G 1359/2

Removing

- Take off the wheel trims of the front wheels; remove caps on light-alloy wheels (hook included in tool kit).
- Jack up vehicle sufficiently so that there is no load pressing on the front suspension.
- Slacken twelve-point nut on left and right.
- Raise vehicle and take off wheels.
- Unscrew twelve-point nut on left and right.
- Remove noise insulation panel.

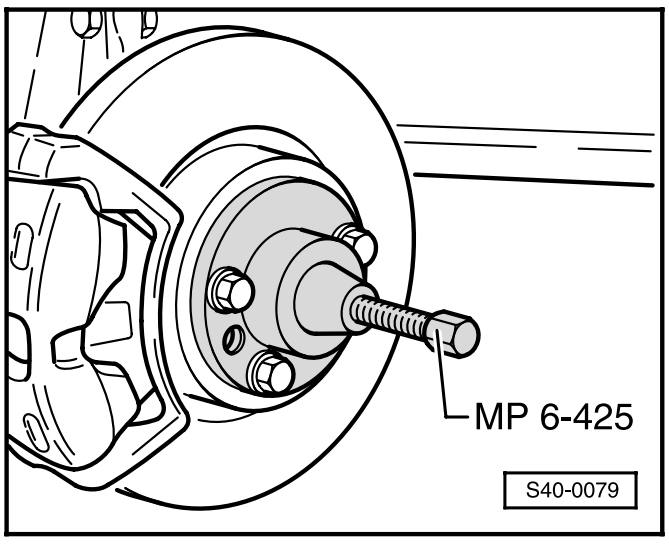
⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine



Note:

Mark installation position of bolts -1- otherwise the axle geometry must be checked.

◄- Unscrew bolts -1-.

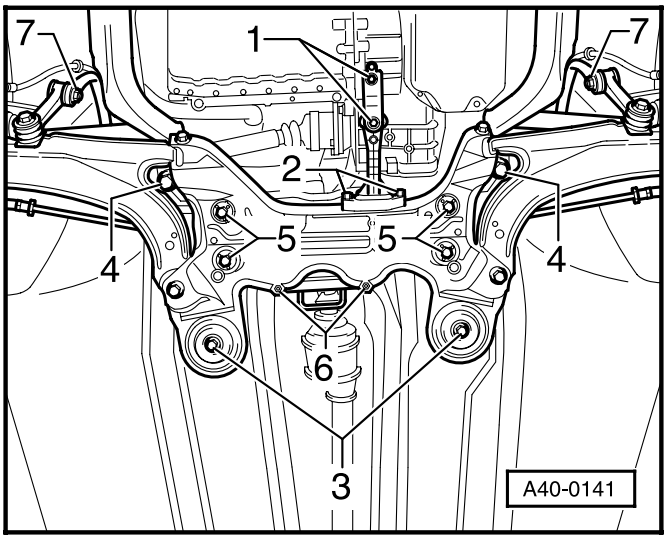


◄- Press out drive shaft on left and right. Position tool as shown in illustration for this step.

Note:

Ensure adequate clearance when pressing out the drive shafts.

- Separate track control arm on left and right from steering joint.
- Swivel wheel bearing housing and steering joint out and support.



◄ - Unscrew bolts -1- and -2- and take off pendulum support.

- Unscrew bolts for steering gear -5-.

- Unscrew nut -7- for coupling rod of anti-roll bar.

- Unscrew bolts -6- for exhaust system (only TDI).

- Position gearbox jack with attachment, e.g. V.A.G 1383 A with V.A.G 1359/2, below subframe.

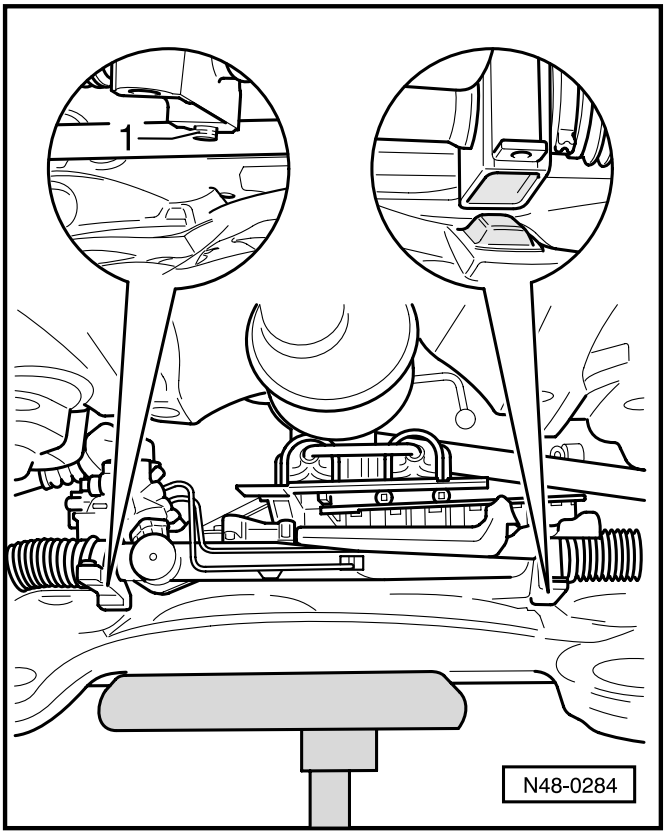
- Unscrew bolts -3- and -4- for subframe.

- Lower subframe with gearbox jack.

Note:

Ensure that the steering gear detaches from the subframe.

- Support steering gear; take up weight with tensioning strap if necessary.



Installing

Before fitting on the bolts for the subframe, position steering gear on subframe and then insert bolts for steering gear.

◄ The threaded sleeve -1- should be located in the hole of the subframe.

The remaining installation is carried out in the reverse order.

Tightening torques ⇒ page 40-2.

After installing, carry out a road test in order to check the position of the steering wheel.

If the steering wheel is not properly centred, it is then necessary to check the axle alignment.

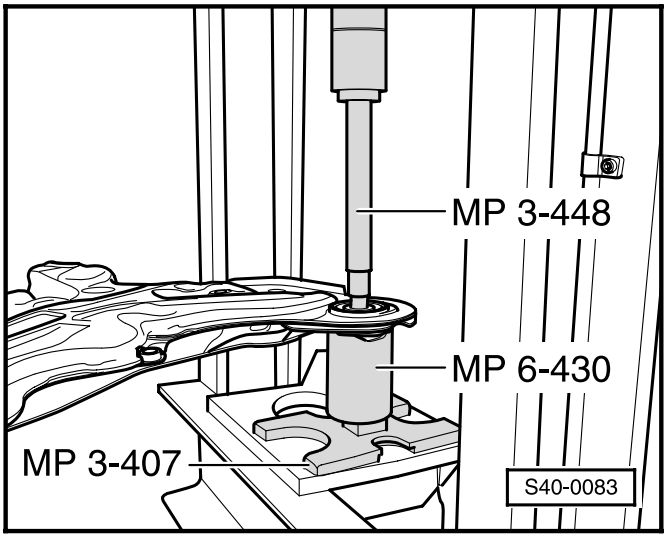
Removing and installing bonded rubber bush

Special tools, testers and aids required

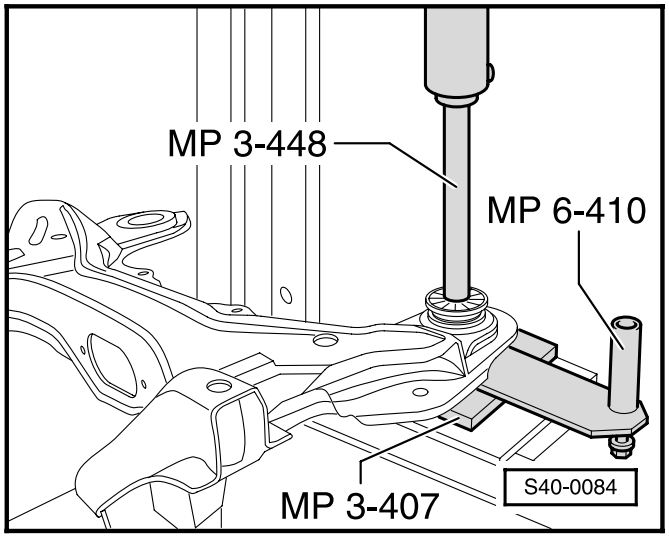
- Pressure plate MP 3-407
- Pressure die MP 3-448
- Counterholder MP 6-410
- Removal tool MP 6-425
- Assembly device MP 6-430
- Workshop press, e.g. V.A.G 1290 A
- Gearbox lift with attachment, e.g. V.A.G 1383 A with V.A.G 1359/2
- Acid-free lubricant, e.g. G 294 421 A1

It is possible to remove and install the bonded rubber bush after removing the subframe.

- Removing and installing subframe ⇒ page 40-10.



◄ **Pressing out bonded rubber bush**

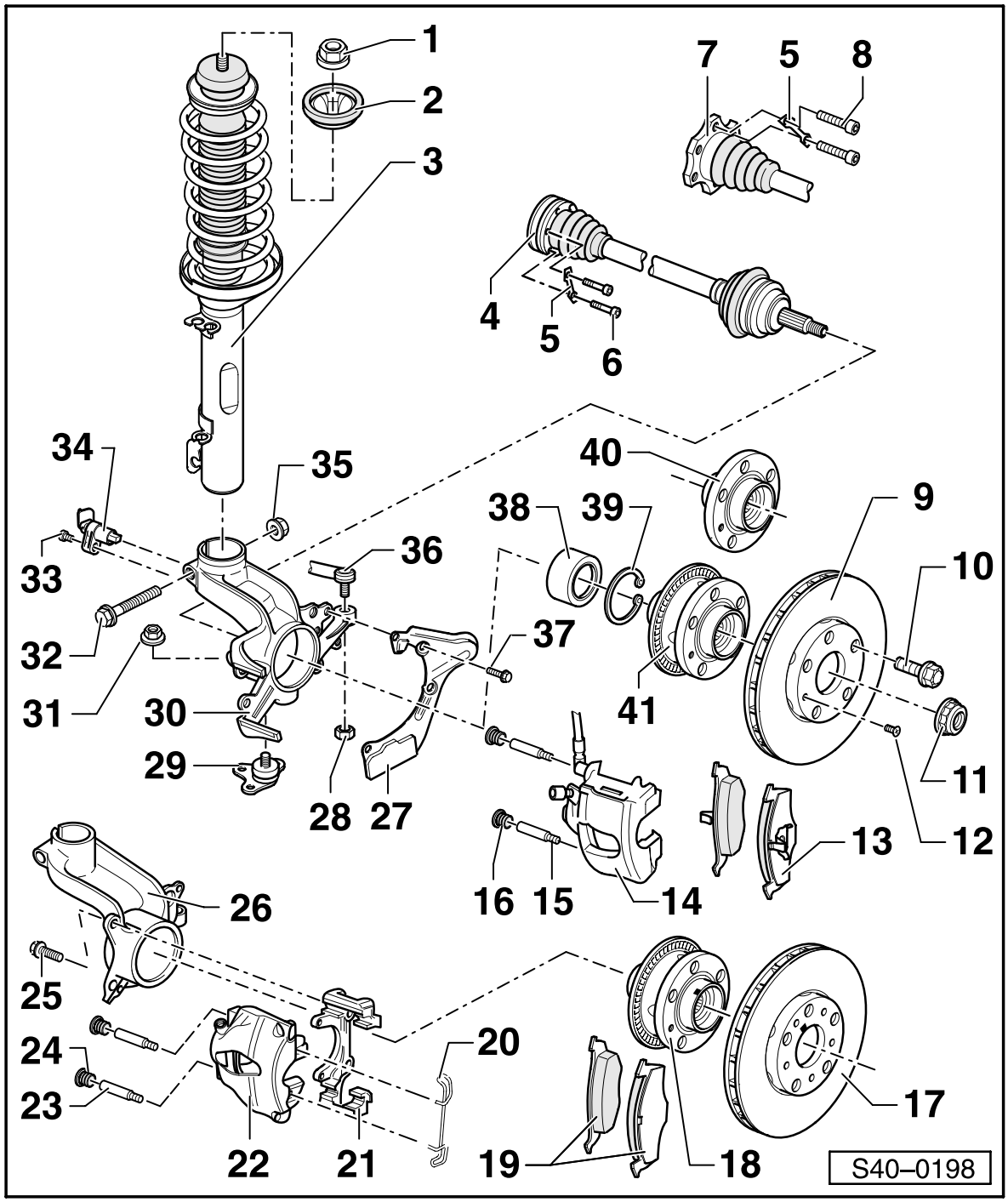


◄ **Pressing in bonded rubber bush**

Note:

Coat bonded rubber bush in subframe with acid-free lubricant, e.g. G 294 421 A1, before pressing in. On no account use grease or soap suds.

II - Assembly overview of wheel mounting, suspension strut, drive shaft, brake



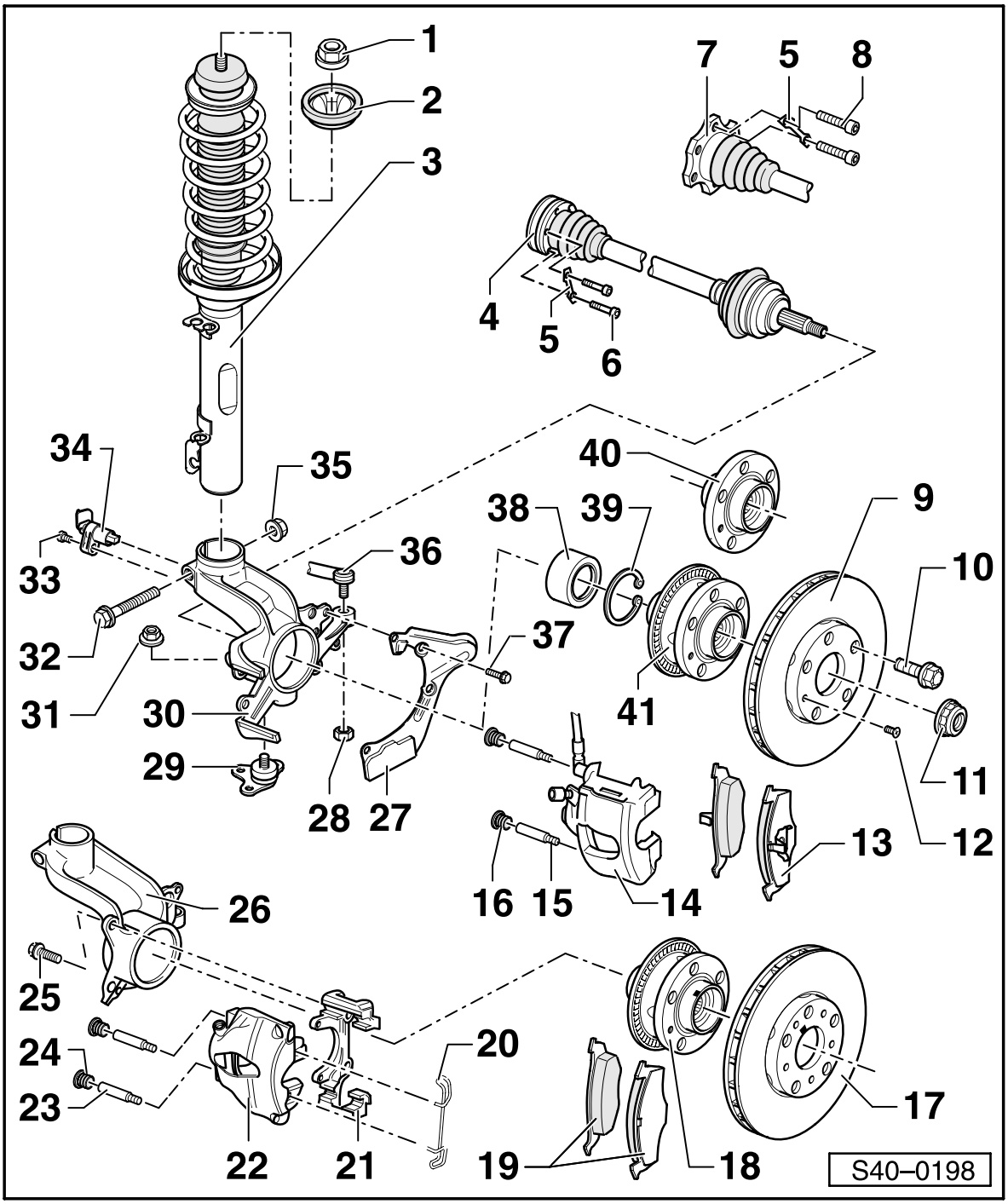
Notes:

- *If it is necessary to move a vehicle on which the drive shaft has been removed, first of all install an outer joint in place of the drive shaft and tighten to 50 Nm otherwise the wheel bearing will be damaged.*
- *It is not permitted to carry out any welding and straightening work on load-bearing and wheel-locating components of the front suspension.*
- *Always replace self-locking nuts.*
- *Always replace corroded nuts and bolts.*

1 - Self-locking hexagon collar nut, 60 Nm
- replace each time removed

2 - Stop

3 - Suspension strut
- removing and installing ⇒ page 40-21
- servicing ⇒ page 40-25
- assignment ⇒ Parts List



4 - Drive shaft with inner CV joint
- ♦ removing and installing ⇒ page 40-34
- ♦ servicing ⇒ page 40-38

5 - Base plate

6 - Machine bolt with internally serrated head
- ♦ replace each time removed
- ♦ tighten initially to 10 Nm, then diagonally across to final torque
  M8 = 40 Nm
  M10 = 70 Nm
- ♦ assignment ⇒ Parts List

7 - Drive shaft with inner tripod joint
- ♦ removing and installing ⇒ page 40-34
- ♦ servicing ⇒ page 40-49

8 - Machine bolt with internally serrated head
- ♦ replace each time removed
- ♦ tighten initially to 10 Nm, then diagonally across to final torque
  M8 = 40 Nm
  M10 = 70 Nm
- ♦ assignment ⇒ Parts List

9 - Brake disc (FS-III)
- without marking for axial run-out
- with a fixing hole for the wheel hub
- assignment ⇒ electronic catalogue of original parts

10 - Wheel bolt, 120 Nm

11 - Twelve-point nut, self-locking
- loosen and tighten ⇒ page 40-6
- replace after each disassembly

12 - Screw, 4 Nm

13 - Brake pads (FS-III)
- removing and installing ⇒ page 46-3

14 - Brake caliper (FS-III)
For vehicles with engine up to 92 kW.
- do not release brake hose when working on the front wheel suspension
- tie up with wire or anything similar
- repairing ⇒ page 47-8

15 - Guide bolts (FS-III), 28 Nm
- removing and installing ⇒ from page 46-3

16 - Cap (FS-III)

17 - Brake disc (FN-3)
- with marking for axial run-out
- with 5 fixing holes for the wheel hub
- removing and installing ⇒ from page 46-5.7
- assignment ⇒ electronic catalogue of original parts

18 - Wheel hub with pulse rotor for speed sensor
- with marking for minimum axial run-out
- only on vehicles with ABS
- pressing out ⇒ page 40-16 and futher
- pressing in ⇒ page 40-16 and further
- removing inner ring of bearing ⇒ page 40-16 and further
- inspecting lateral run-out of pulse rotor ⇒ page 45-61
- assignment ⇒ electronic catalogue of original parts

19 - Brake pads (FN-3)
- removing and installing ⇒ page 46-5.2

20 - Retaining spring (FN-3)

21 - Brake carrier (FN-3)

22 - Brake caliper (FN-3)
For vehicles with engine as of 96 kW
- do not release brake hose when working on the front wheel suspension
- tie up with wire or anything similar
- removing and installing brake pads ⇒ Repair Group 46
- repairing ⇒ Repair Group 47

23 - Guide bolts (FN-3), 28 Nm
- removing and installing ⇒ page 46-5.2

24 - Cap (FN-3)

25 - Bolt with safety collar (FN-3), 125 Nm
- clean ribbing on underside

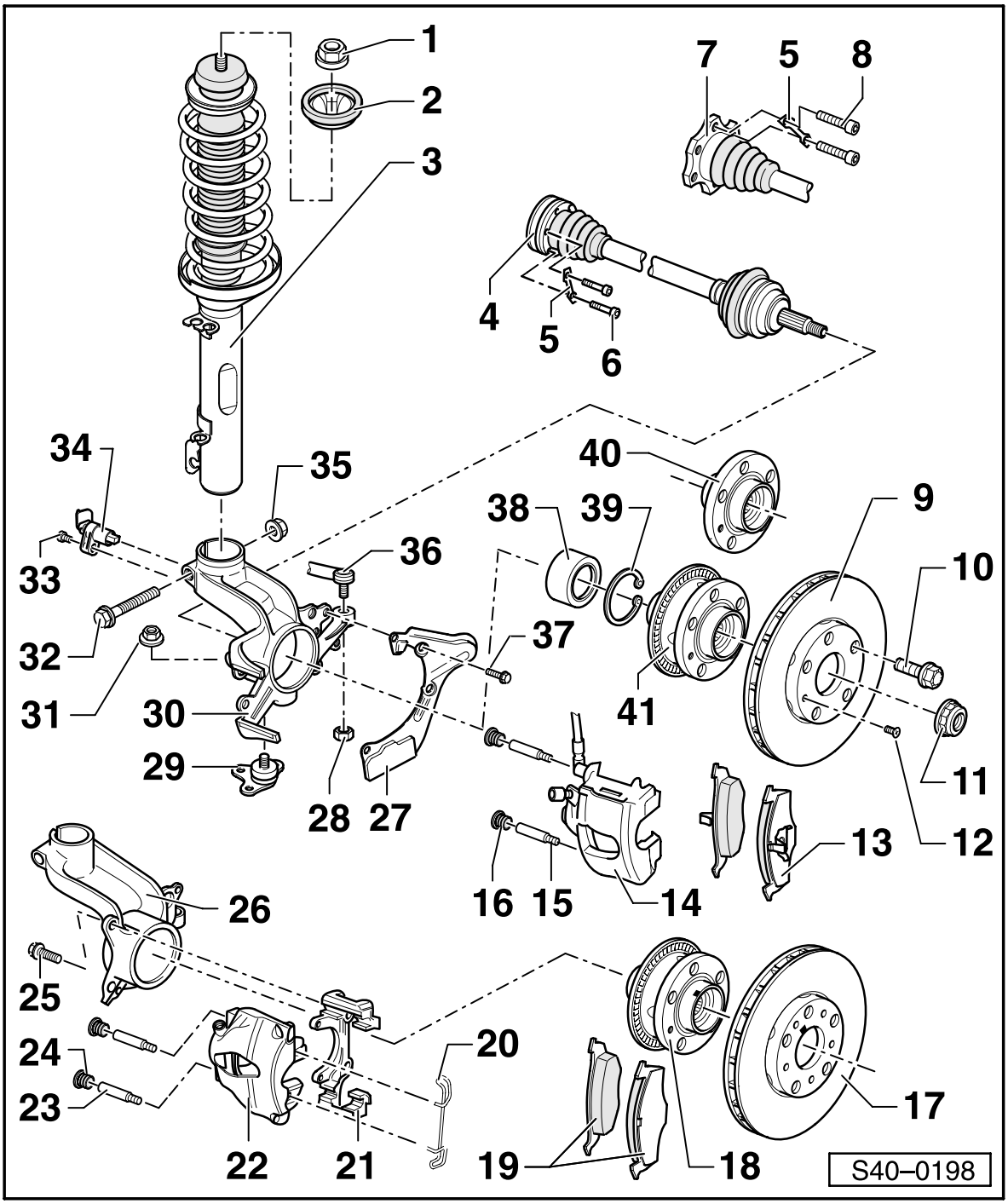
26 - Wheel bearing housing
For vehicles with engine as of 96 kW
- removing and installing ⇒ page 40-21
- repairing ⇒ from page 40-16
- before pressing in wheel bearing coat evenly the entire wheel bearing seat in the wheel bearing housing with G 052 723 A2

27 - Cover plate

28 - Self-locking nut, 45 Nm
- replace after each disassembly

29 - Steering joint
- inspecting ⇒ page 40-19
- inspecting rubber bellows for damage, if necessary replace steering joint
- removing and installing ⇒ page 40-20

30 - Wheel bearing housing
For vehicles with engine up to 92 kW
- removing and installing ⇒ page 40-21
- repairing ⇒ from page 40-16
- before pressing in wheel bearing coat evenly the entire wheel bearing seat in the wheel bearing housing with G 052 723 A2



31 - Self-locking hexagon collar nut, 20 Nm + torque a further 90° (1/4 turn)
- replace each time removed

32 - Hexagon bolt
- replace each time removed

33 - Hexagon socket bolt, 10 Nm

34 - ABS wheel speed sensor
- only on models with ABS
- insert with lubricating paste G 000 650 (e.g. Wolfrakote Top Paste)

35 - Self-locking hexagon collar nut
- up to 05.98: 50 Nm + torque a further 90° (1/4 turn)
  from 06.98: 60 Nm + torque a further 90° (1/4 turn)
- torque not less than 90°
- torquing angle tolerance 90° to 120°
- replace each time removed

36 - Track rod with track rod end
- removing and installing ⇒ page 40-22

37 - Hexagon bolt, 10 Nm

38 - Wheel bearing
- pressing out ⇒ from page 40-16
- replace, is destroyed when pressed out
- pressing in ⇒ from page 40-16
- replacement part only available as kit “wheel bearing with assembly parts” (items 11, 39, 38, 28, 31 and 35)

39 - Circlip
- ensure properly installed ⇒ from page 40-16
- replace each time removed

40 - Wheel hub without pulse rotor
- only on models without ABS
- assignment ⇒ Parts List

41 - Wheel hub with pulse rotor for wheel speed sensor
- without marking for minimum axial runout
- only on models with ABS
- pressing out ⇒ from page 40-16
- pressing in ⇒ from page 40-16
- pulling off bearing inner race ⇒ from page 40-16
- inspecting lateral runout of pulse rotor ⇒ page 45-61
- assignment ⇒ Parts List

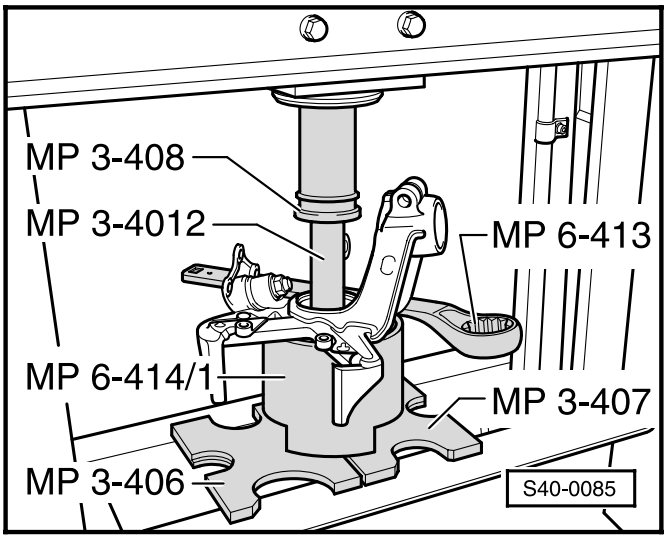
Repairing wheel bearing housing

Special tools, testers and aids required

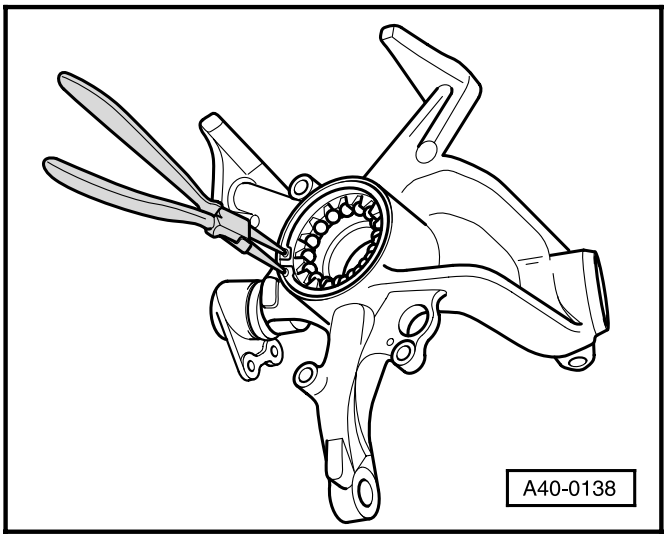
- Thrust plate MP 3-406
- Thrust plate MP 3-407
- Thrust plunger MP 3-408
- Tube section MP 3-4012
- Tube section MP 3-450
- Thrust plate MP 3-467
- Ring wrench WAF 46 MP 6-413
- Assembly device MP 6-414/1
- Washer MP 6-415
- Washer MP 6-416
- Thrust plate MP 6-418
- Tube MP 6-419
- Pressure pipe MP 6-420
- Extractor MP 6-425
- Socket wrench insert WAF 21 MP 6-427
- Spreader 3424
- Extractor Kukko V 176
- Workshop press, e.g. V.A.G 1290 A
- Torque wrench, e.g. V.A.G 1756
- Cross member Kukko 18-0
- Grease G 052 723 A2 (Molykote)

The repair of the wheel bearing housing by pressing out and in the wheel hub and the wheel bearing is only possible after removing the suspension strut and wheel bearing housing.

- Removing and installing suspension strut and wheel bearing housing ⇒ page 40-21.



◄ **Pressing wheel hub out of wheel bearing**

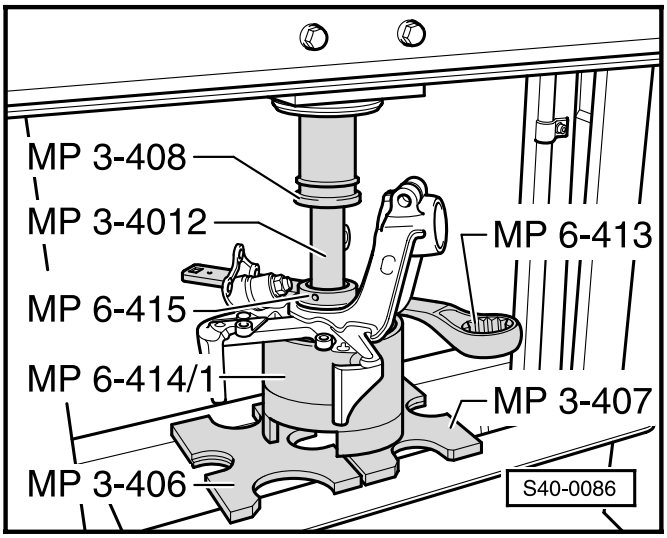


◄ **Removing and installing circlip**

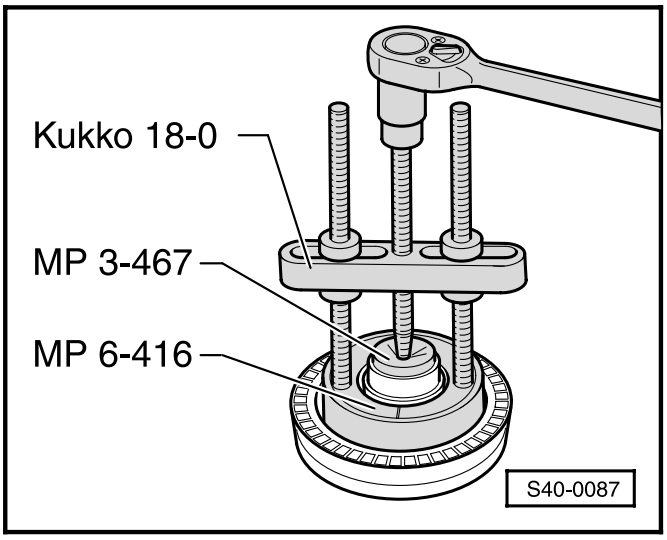
- Use commercially available circlip pliers to remove and replace circlip.

Notes:

- *Replace*
- *When inserting, ensure the circlip is correctly located.*

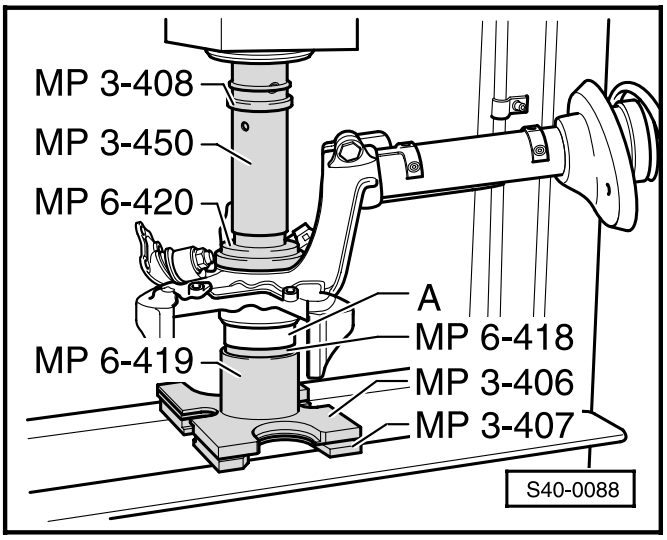


◄ **Pressing wheel bearing out of wheel bearing housing**



◄ **Pull the inner ring of the bearing off the wheel hub**

- Insert washer MP 6-416 as shown.
- Screw cross member Kukko 18-0 into washer MP 6-416.
- Install pressure plate MP 3-467 onto wheel hub and pull off inner ring of bearing by turning the threaded spindle.



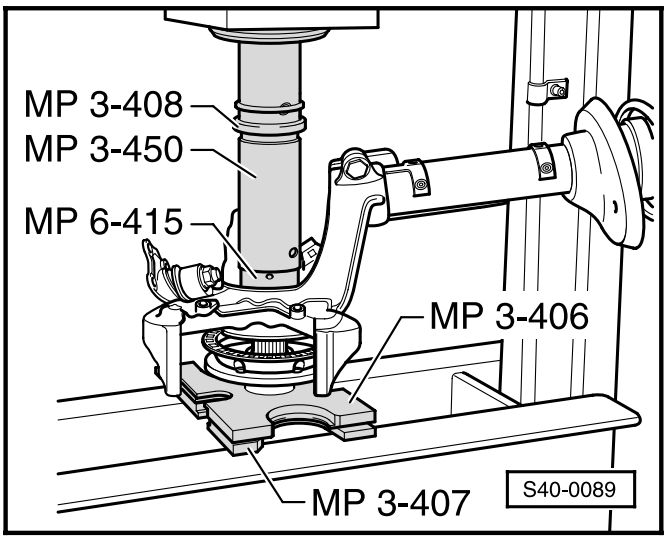
◄ **Press wheel bearing into wheel bearing housing**

A - wheel bearing

- Before pressing in wheel bearing coat evenly the entire wheel bearing seat in the wheel bearing housing with G 052 723 A2.

Note:

After pressing in the wheel hub, the circlip must be inserted ⇒ page 40-17.



◄ **Press wheel hub into wheel bearing**

Note:

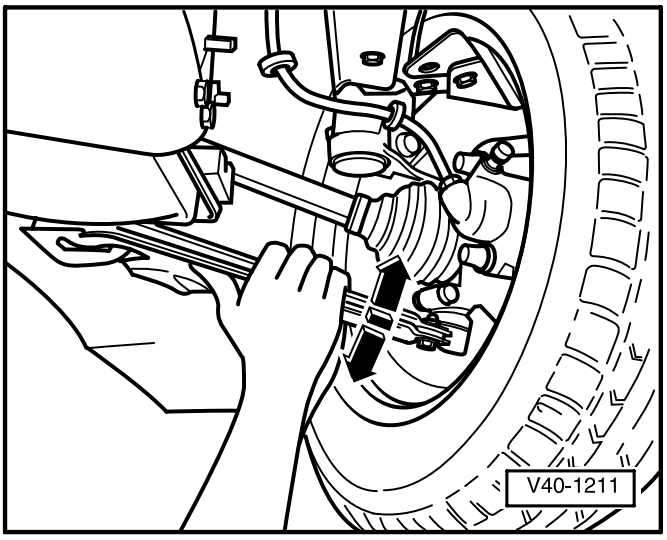
- *When pressing in the wheel hub, make sure the washer MP 6-415 is supported at the inner ring of the bearing.*
- *Observe assignment of wheel hub with wheel bearing housing and wheel hub for vehicles with engine as of 110 kW (Brake FN-3)*

⇒ Spare Part catalogue.

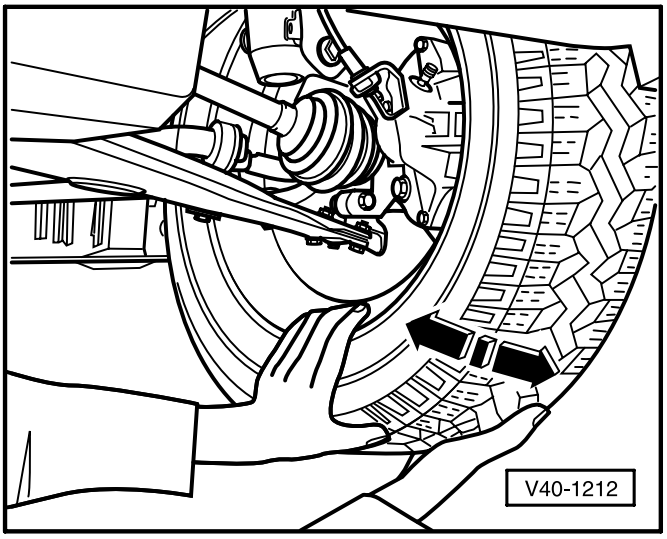
- *Wheel hubs with a 3 mm wide ink jet mark for marking of minimum axial run-out can also be combined with brake discs without marking of maximum axial run-out.*
  The reduction of the entire axial run-out for Brake FN-3 is then not effective.

Inspecting steering joint

Inspecting axial play



◄ - Pull steering link firmly down and push up again.



Inspecting radial play

◄ - Push wheel firmly in and out at the bottom.

Notes:

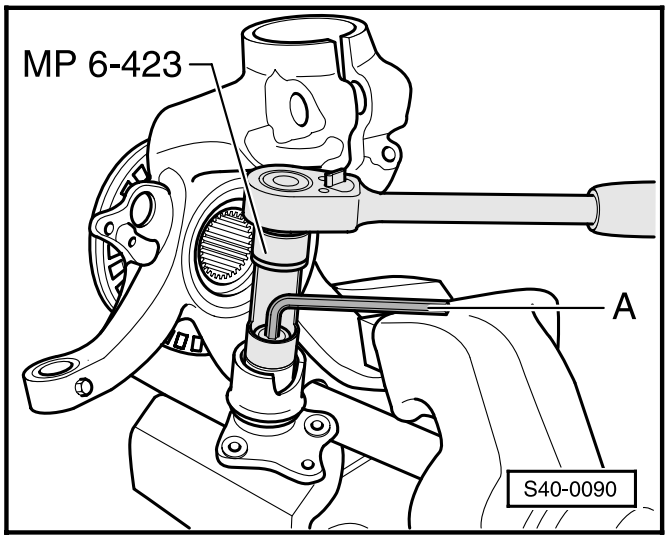
- *There must not be any perceptible or visible play present when conducting both inspections.*
- *Observe steering joint when carrying out the inspections.*
- *Allow for any wheel bearing play which is present or "play" in the top suspension strut bush.*
- *Inspect rubber boot for damage; replace steering joint if necessary.*

Removing and installing steering joint

Special tools, testers and aids required

- Wrench socket waf 19 MP 6-423
- Extraction tool MP 6-425
- Wrench socket waf 21 MP 6-427
- Expanding tool 3424
- Torquing angle wrench, e.g. V.A.G 1756
- Puller, Matra V176

Removing

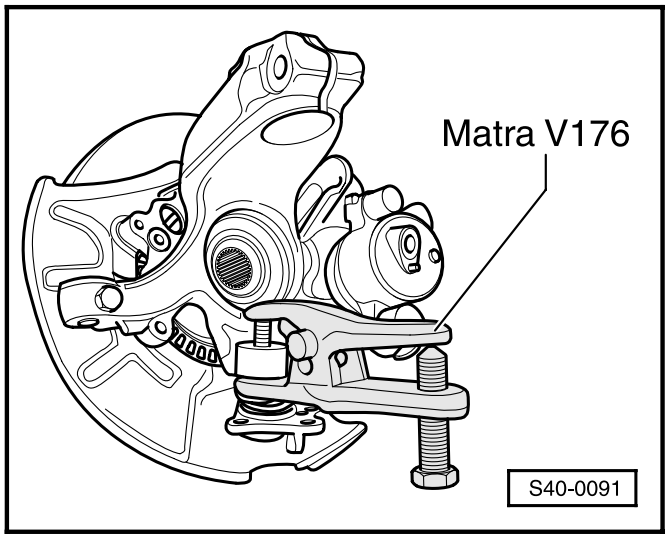


It is only possible to remove the steering joint after removing the suspension strut and wheel bearing housing.

- Removing and installing suspension strut and wheel bearing housing ⇒ page 40-21.

◄- Position special tools as shown in illustration, and slacken hexagon nut.

A - Torx T 30



◄- Position puller as shown in illustration, and press out steering joint.

Installing

Installation is carried out in the reverse order.

Note:

Replace hexagon collar nut.

Tightening torque:

Steering joint to wheel bearing housing:
20 Nm + torque a further 90°.

Removing and installing suspension strut and wheel bearing housing

Special tools, testers and aids required

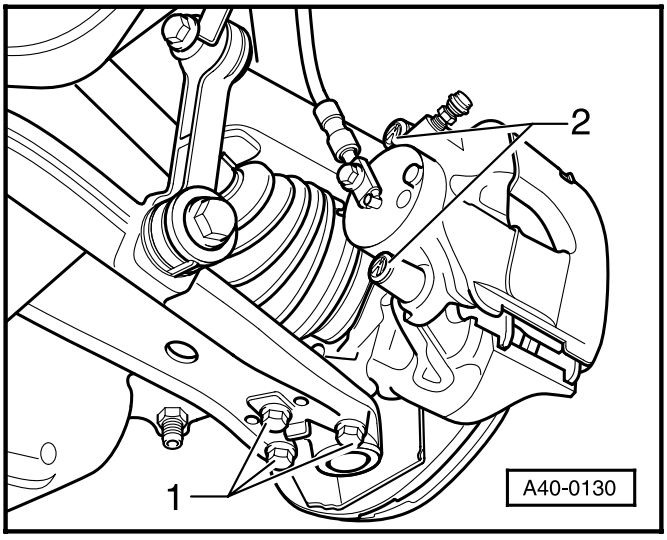
- Extractor MP 6-425
- Socket wrench bit waf 21 MP 6-427
- Expander 3424
- Torque wrench 75 ... 400 Nm, e.g. V.A.G 1576
- Torquing angle wrench, e.g. V.A.G 1756
- Puller Matra V176

Removing

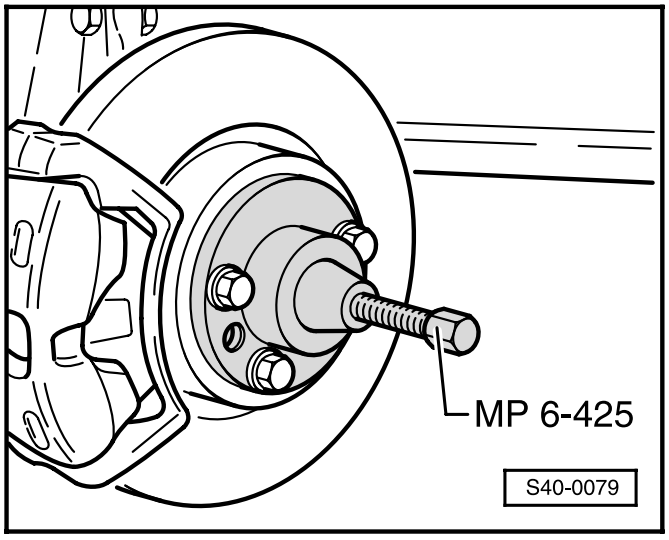
- Take off wheel trim; pull off cap of light alloy wheels (hook for pulling off cap in tool kit).
- Raise vehicle sufficiently so that no load is acting on the front suspension.
- Slacken twelve-point nut.
- Take off wheel and raise vehicle.

Note:

Mark fitting location of the bolts -1- otherwise the suspension geometry has to be inspected.



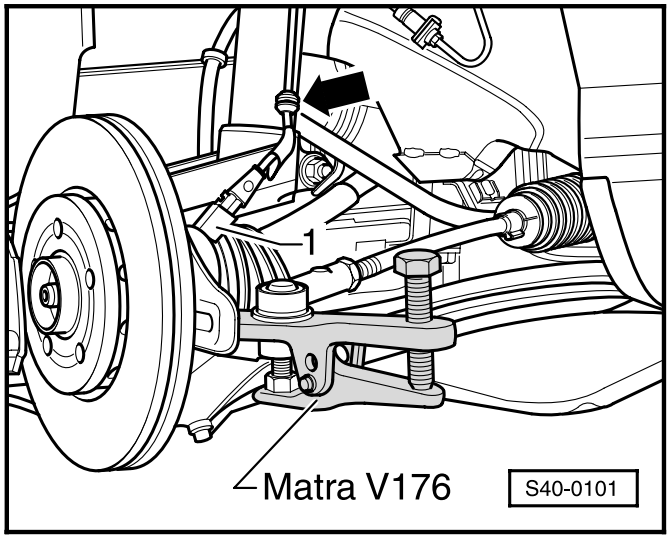
◄ - Unscrew bolts -1-.



◄ - Press out drive shaft. Position tool as shown in illustration for this step.

Note:

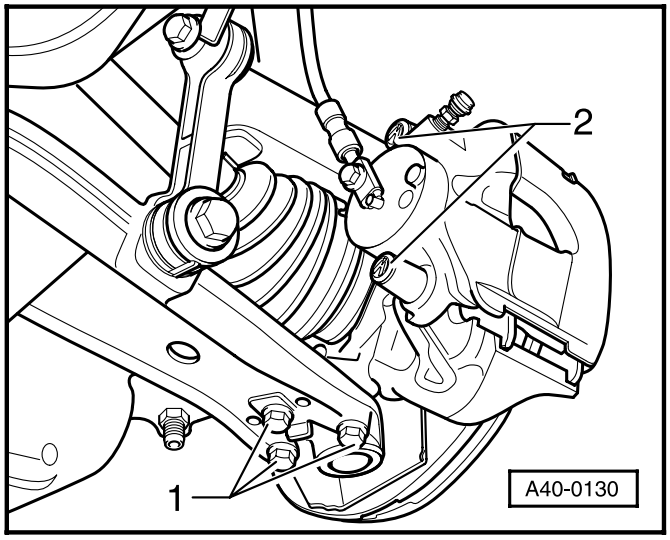
Ensure adequate clearance when pressing out the drive shaft.



◄ - Use puller Matra V176 (commercial) to press track rod off the steering arm

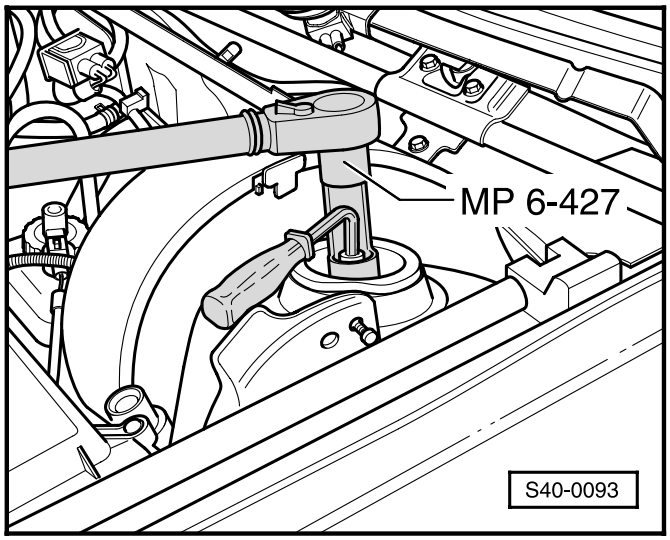
- Unplug connector -1- ABS speed sensor from the mountings.

- Disconnect the ABS speed sensor from the mountings -arrow-.



◄ - Remove caps -2- and unscrew brake caliper. Secure the brake caliper with wire to the body.

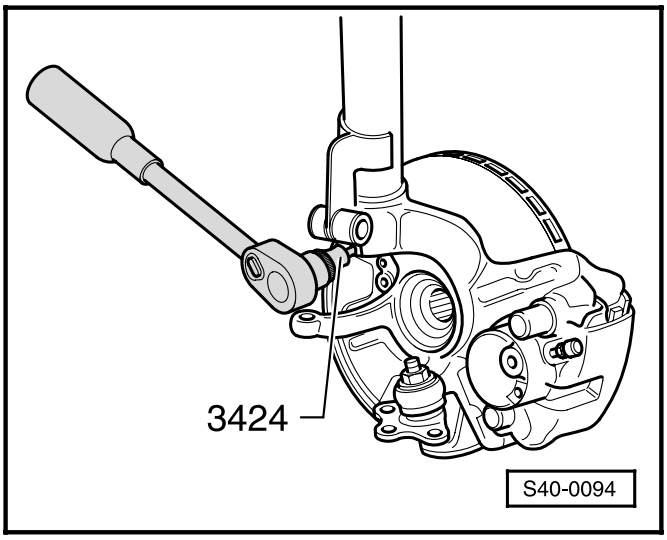
- Remove the brake disc (brake disc is fixed with one screws to the wheel hub).



- If necessary remove the coupling rod from the suspension rod.

◄ - Unscrew the suspension strut on the body using the socket wrench insert -MP 6-427

- Remove suspension strut with wheel-bearing housing.



◄ **Separating suspension strut from wheel bearing housing**

- Insert special tool -3424- as shown, and spread wheel bearing housing apart.
- Take out suspension strut.

Installing

Remove any corrosion present in the thread/ spline of the outer joint.

- Insert suspension strut together with wheel bearing housing and attach to suspension strut dome.
- Attach coupling rod, if fitted, to suspension strut.
- Moisten splines of wheel hub with oil.
- Insert outer joint as far as possible into the splines of the wheel hub.
- Attach steering joint and wishbone with new bolts to old impression.
- Attach brake caliper housing to wheel bearing housing.

Note:

Tighten FN-3 brakes to wheel bearing housing with a torque of 125 Nm.

- Insert cable of ABS wheel speed sensor into fixtures.
- Plug in connector of ABS wheel speed sensor.
- **Moisten contact surface of twelve-point nut and also splines and thread of outer joint with oil and screw on twelve-point nut as far as possible.**
- Pull outer joint sufficiently far into the wheel hub until outer joint is making contact in the wheel bearing.
- Fit on wheel.

Tightening torque:

Suspension strut to suspension strut dome	60 Nm
Use new nuts!	
Coupling rod to suspension strut	90 Nm
Use new nuts!	
Steering joint to track control arm	20 Nm + 90°
Use new screws and new lock washer!	
Brake caliper to wheel bearing housing	28 Nm

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

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

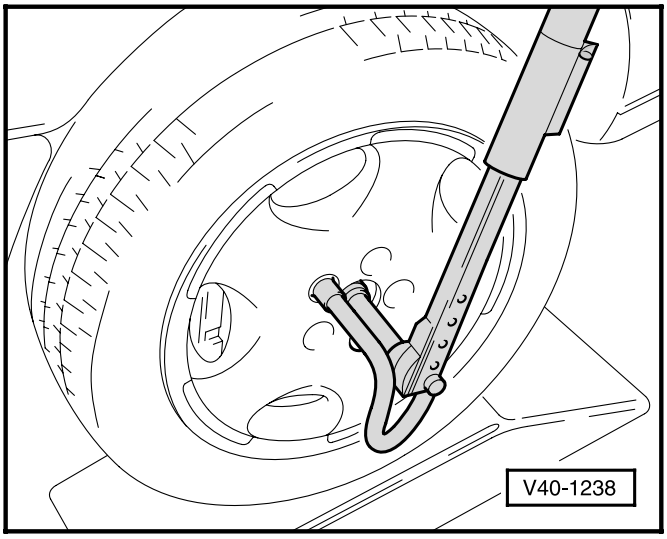
- Operate brake (second mechanic required)
- Tighten new twelve-point nut with 225 Nm and slacken half a turn.
- Turn wheel hub at least 90°.
- Tighten twelve-point nut:

Tightening torque

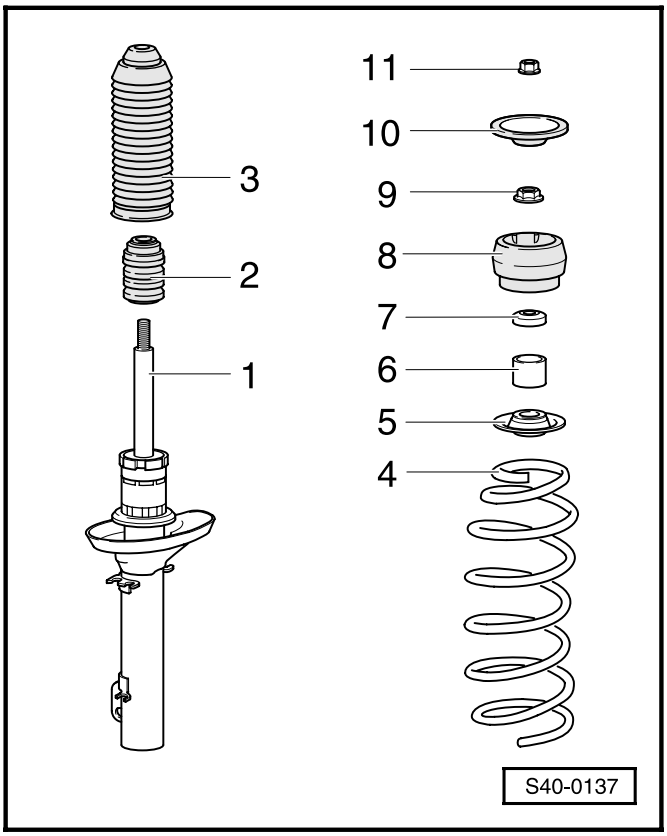
50 Nm and torque a further 60°

Note:

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



Servicing front suspension strut



Special tools, testers and aids required

- Wrench insert waf 21 MP 6-427
- Spring tensioning device, e.g. S 505 501 V or V.A.G 1752/1
- Suspension strut mount, e.g. V.A.G 1752/2
- Spring holder with protective insert, e.g. V.A.G 1752/4

1 - Shock absorber
- Always replace complete
- Assigning ⇒ Parts List
- Can be replaced individually
- Inspecting shock absorber ⇒ page 40-28
- Disposal ⇒ page 40-31

2 - Bump stop

3 - Protective sleeve

4 - Coil spring
- Removing and installing ⇒ from page 40-26, Fig. 1, 2, 3, 4
- Assigning ⇒ Parts List
- Pay attention to colour coding
- Surface of spring coil must not be damaged
- Always replace on both sides
- Use only coil springs of same manufacturer on an axle

5 - Spring disc

6 - Bush
- Only on models with heavy-duty suspension (PR No. 1GB). This PR No. is indicated on the vehicle data sticker in the boot or in the Service Schedule ⇒ page 00-4

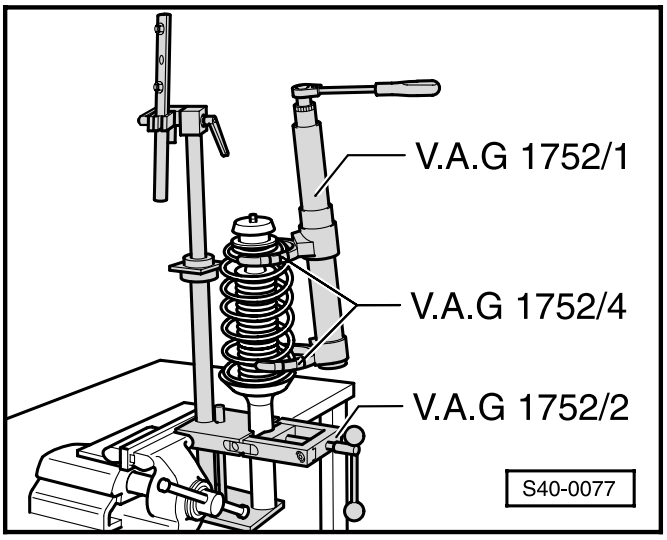
7 - Axial grooved ball bearing

8 - Suspension strut bearing

9 - Collar nut, 60 Nm
- Replace each time removed
- Slackening and tightening ⇒ page 40-26

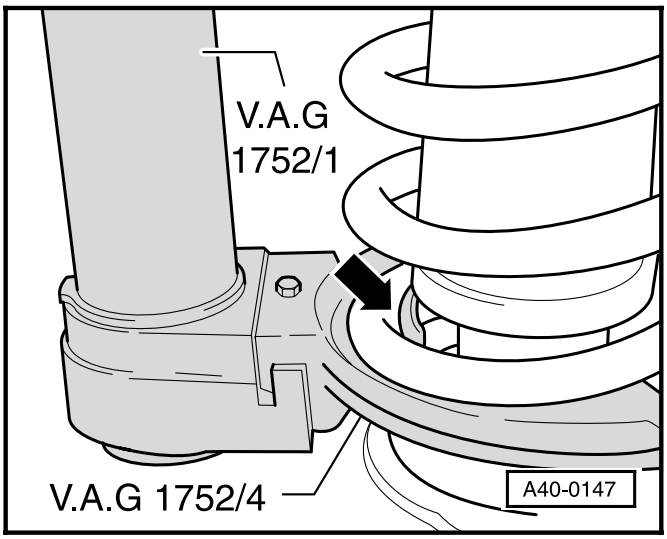
10 - Stop

11 - Hexagon collar nut, self-locking, 60 Nm
- Replace each time removed



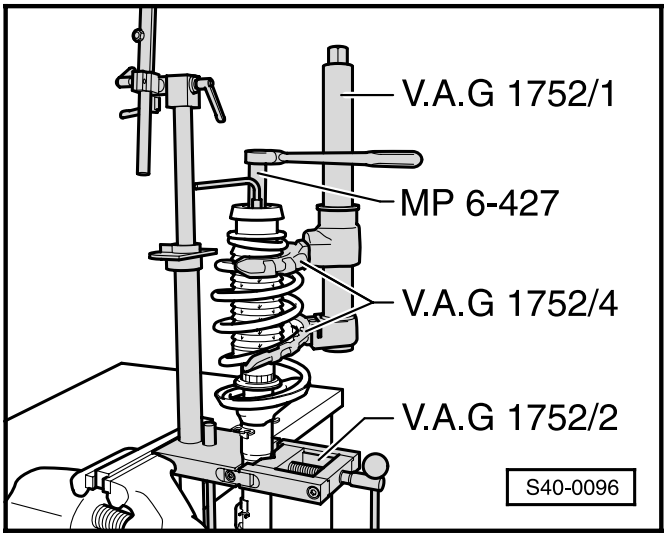
◄ **Fig. 1 Removing coil spring**

- Clamp suspension strut mount, e.g. V.A.G 1752/2, in a vice.
- Clamp suspension strut at shock absorber tube in suspension strut mount.
- Prestress screwdriver sufficiently with tensioning device, e.g. V.A.G 1752/1, until the spring disc at the top is free.



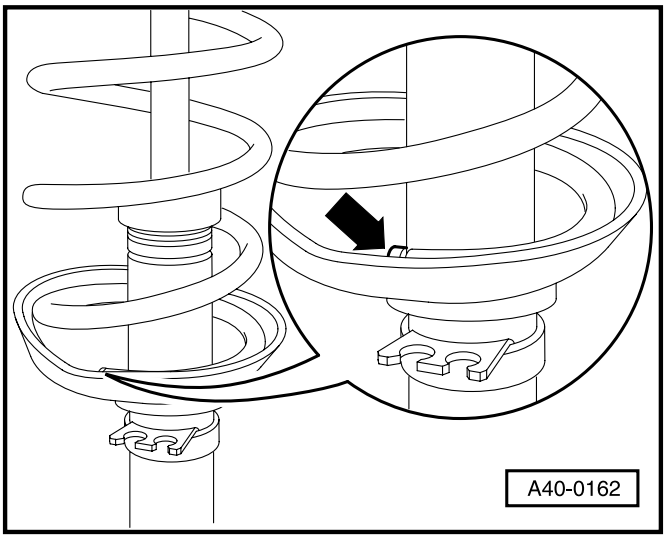
◄ **Fig. 2 Removing coil spring**

- Ensure that the coil spring is correctly located in the adapter, e.g. V.A.G 1752/4, -arrow-.



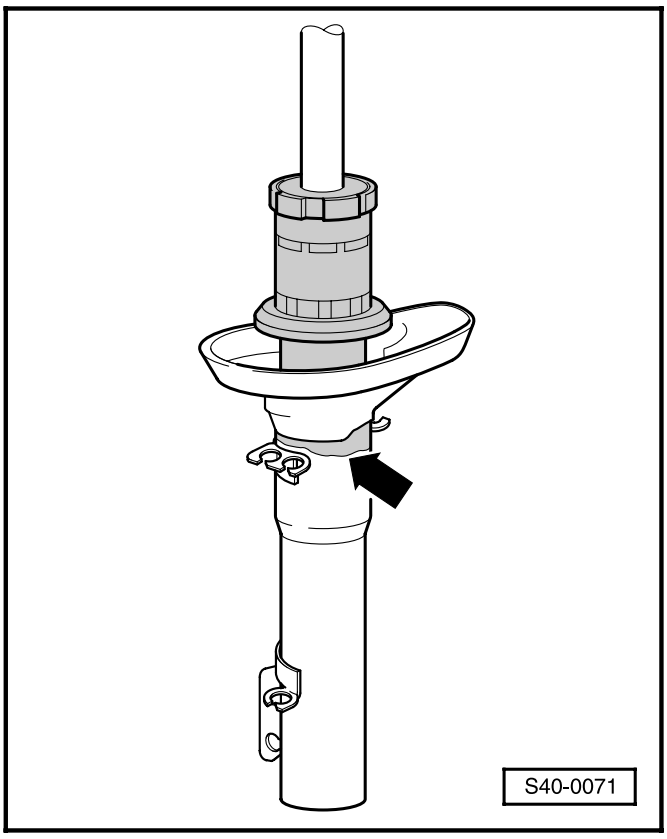
◄ **Fig. 3 Removing coil spring**

- Use special tool -MP 6-427- to unscrew collar nut from the piston rod; restrain with hexagon socket wrench during this step.
- Take off individual parts of suspension strut and prestressed screwdriver with tensioning device, e.g. V.A.G 1752/1.



◄ **Fig. 4 Installing coil spring**

- Mount pretensioned screwdriver with tensioning device, e.g. V.A.G 1752/1, onto spring base at bottom; the end of the spring coil should be touching the stop -arrow- when this is done.



Inspecting shock absorbers

◄ **Leaks at shock absorbers**

A slight oil leakage (sweating) at the gasket of the piston rod is not a reason for replacing the shock absorber.

If an oil stain is visible (but mat, possibly dry because of dust) and does not spread any further than from the top shock absorber closure (piston rod seal) to the bottom spring retainer (arrow), the shock absorber is regarded as being in proper order.

Note:

A slight outflow of oil is advantageous as this lubricates the seal and thus increases the service life. This applies both to the front and rear shock absorbers.

Noises at shock absorbers

We have reason to point out that, if a complaint is received regarding noise, the shock absorbers are too often regarded as a source of the noise.

Note:

When dealing with complaints which can be interpreted as a rumbling or snapping noise, it is essential to first of all carry out a road test together with the customer in order to find out where, when and how the noises exist (this is best done on a dry road surface with bumps).

Inspecting shock absorber without gas pressure

Faulty shock absorbers can be detected when driving as a result of rumbling noises - as a consequence of the wheel jumping - particularly on a poor road surface, and should be replaced. The cause of the problem is in most cases a loss of oil. The shock absorber can then be compressed and/or pulled apart suddenly. There is an „idle travel“ before the shock absorber begins to operate.

Note:

Shock absorbers require no maintenance. It is not possible to top up the shock absorber fluid.

Testing shock absorber with gas pressure

Faulty shock absorbers with gas pressure are also recognizable from loud rumbling noises because of the wheel jumping and, in most cases, as a result of an oil loss visible on the outside.

It is possible to carry out an inspection by hand to determine whether the shock absorber is faulty or not:

- Compress shock absorber by hand.
- When this is done, it must be possible to move the piston rod with even pressure and free of jerks over the entire stroke.
- Release piston rod; if the shock absorber has an adequate gas pressure, the piston rod automatically returns to its initial position.
- If this is not the case, it is not immediately necessary to replace the shock absorber as it continues to operate like a conventional shock absorber (see Notes below).

Notes:

- *The damping function is fully retained even without gas pressure provided no major oil loss has occurred. There may, however, be a deterioration in the noise characteristics. On older vehicles, a shock absorber which has become pressureless but is otherwise operating properly, can continue to be reused.*
- *Shock absorbers with gas pressure are fitted only to the rear axle.*
- *The gas pressure in the shock absorber improves the noise characteristics and operation when driving on poor road surfaces.*

Disposing of shock absorbers

Special tools, testers and aids required

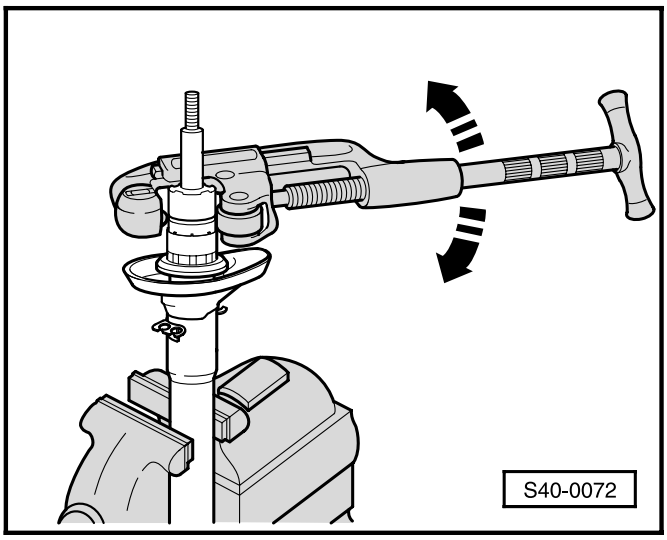
- Pipe cutter, e.g. Stahlwille Express 150/3
- Protective goggles
- Oil drip tray

Warning!

Cover over opening and wear eye protection when releasing the gas pressure (gas pressure of new shock absorber as much as 25 bar).

Notes:

- *All the shock absorbers contain hydraulic fluid. The hydraulic fluid can be drained after drilling into, sawing or cutting open the part. In addition, gas pressure shock absorbers are filled with gas. The gas should be released from the gas pressure shock absorbers before disposing of them.*
- *The hydraulic fluids used in shock absorbers do not contain any harmful substances. These fluids can be disposed of together with old oil from engines and gearboxes.*
- *Old oils (this term refers to used engine and gearbox oils incl. ATF as well as mineral hydraulic fluids), which are suitable for reprocessing, must on no account be mixed with brake fluid, antifreeze agent, synthetic resin or nitro thinners, chemicals etc.*
- *After draining, allow any remaining fluid to adequately drip out.*



Draining front shock absorber

◄ - Clamp shock absorber in a vice.

- Use an assembly lever or a similar tool to lever off the protective cap, and take off protective tube.

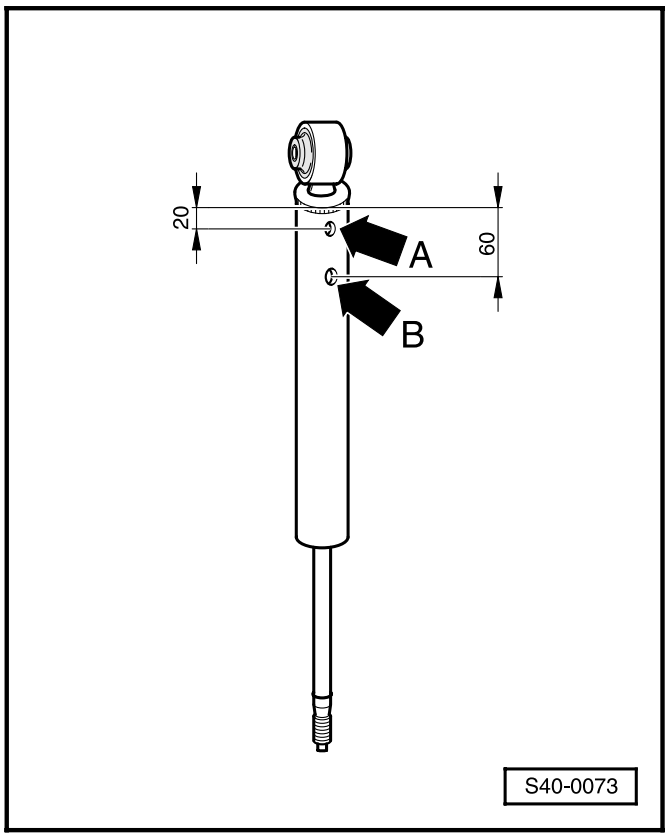
Protective cap and protective tube are fitted only to caulked shock absorbers.

- Fit on pipe cutter, e.g. Stahlwille Express 150/3, and cut through outer tube.

- Pull up piston rod; hold the inner tube tight with water pipe pliers for this step, and push down so that the inner tube remains in the outer tube when the piston rod is pulled slowly up.

- Pull piston rod off the inner tube.

- Drain shock absorber.



Draining rear shock absorber (gas pressure shock absorber)

- Clamp shock absorber vertically in a vice, with the piston rod facing down.

◄ - Drill a ∅ 3 mm hole (arrow A) in the outer tube.

Warning!

Wear eye protection.

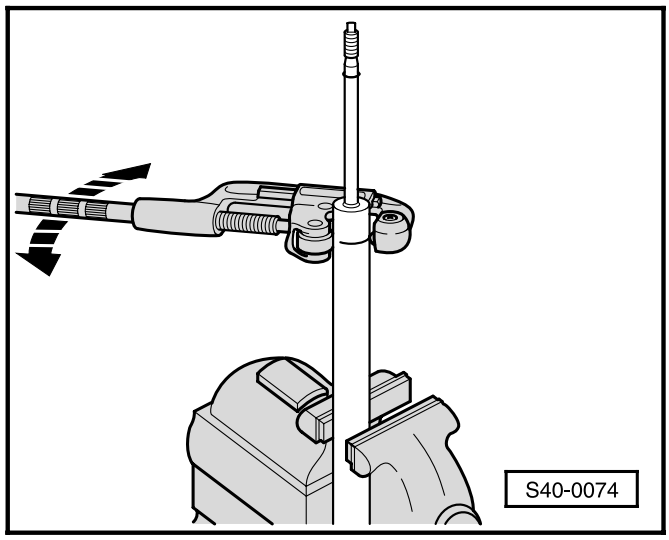
Note:

Gas escapes when drilling through the first pipe wall (only in the case of gas pressure shock absorbers).

- Continue drilling until you have drilled through the inner tube (about 25 mm deep).

- Drill a second ∅ 6 mm hole (arrow B) deep enough to pierce the inner tube.

- Hold shock absorber over oil drip tray, move piston rod up and down several times over the entire stroke until no further fluid flows out.



Note:

◄ *Shock absorber can also be opened with a pipe cutter ⇒ page 40-32. First of all, render the shock absorber pressureless by drilling into the outer tube (arrow A)⇒ previous Fig. (S40-0073).*

Removing and installing drive shafts

Special tools, testers and aids required

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

Removing

Notes:

- *If the twelve-point nut is slackened, do not apply a load on the wheel bearing. If the weight of the vehicle is allowed to press on the wheel bearing, it will suffer initial damage and the life of the wheel bearing will be reduced as a result.*
- *If it is necessary to remove a vehicle at which the drive shaft has been removed, first of all install an outer joint in place of the drive shaft and tighten to 50 Nm to avoid the wheel bearing being damaged.*

Assignment and marking of drive shafts
⇒ Parts List.

- Take off wheel trim; pull off cap on light-alloy wheels (hook included in tool kit).
- Jack up vehicle so that no load is pressing on the front suspension.
- Slacken twelve-point nut.
- Take off wheel and raise vehicle.
- Remove noise insulation panel.

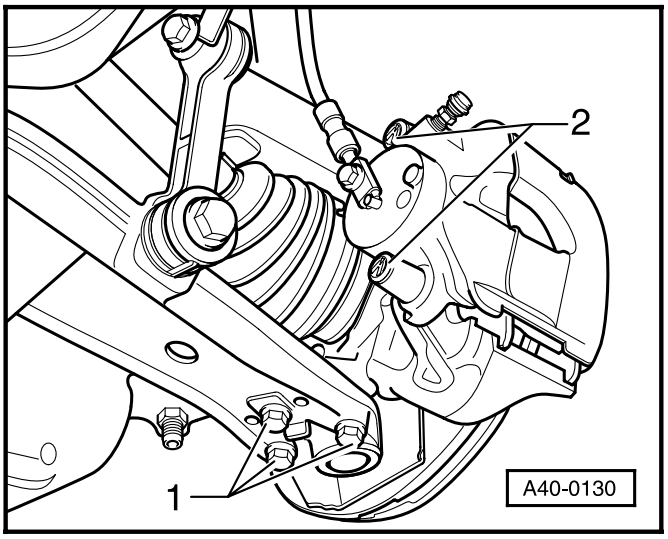
⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine

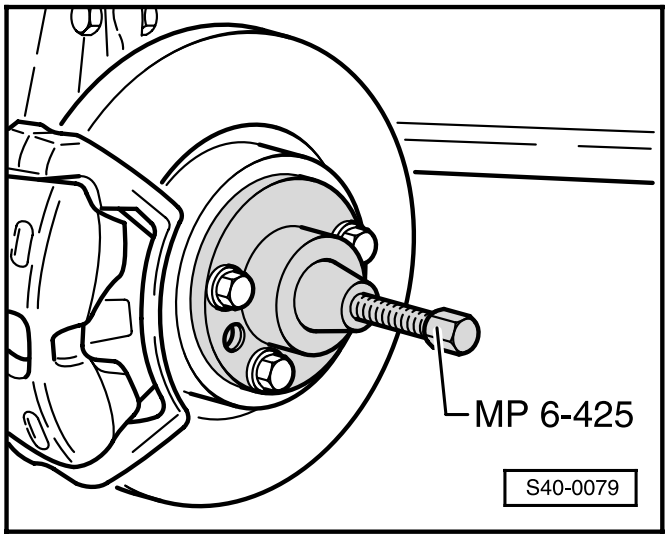
- Unbolt drive shaft from flange shaft/gearbox.

Note:

Mark installation position of the bolts -1- otherwise the axle geometry must be checked.

◄ - Unscrew bolts -1-.



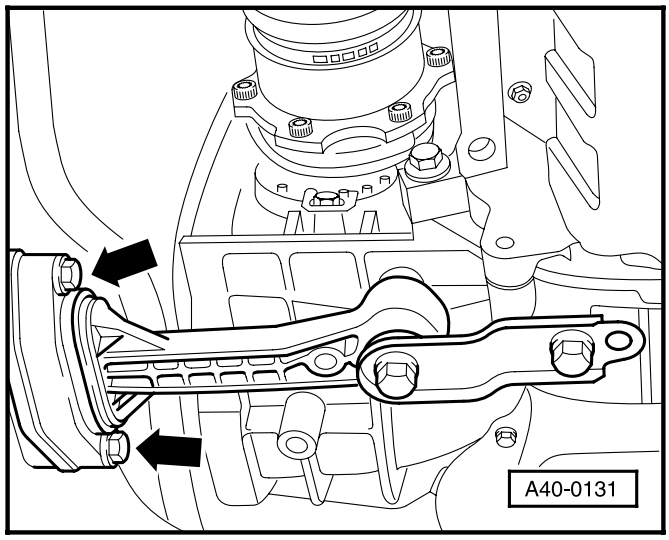


◄ - Press out drive shaft. Position tool as shown in the illustration for this step.

Notes:

- *Ensure adequate clearance when pressing out the drive shaft.*
- *The drive shaft must not hang down when it is pressed out. Otherwise, the inner joint will be damaged as a result of excessive flexing.*

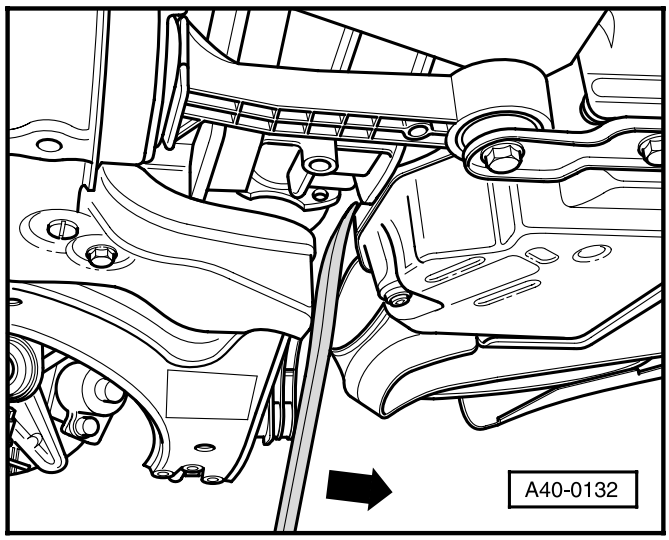
- Take out drive shaft.



Note:

The step described below only requires to be carried out on models with automatic gearbox.

◄ - Slacken gearbox supporting bolts -arrow- at the subframe.



◄ - Use assembly iron to lever engine/gearbox unit in direction of travel; the tripod drive shaft can be taken out at the same time.

- Arrow points in direction of travel.

Installing
(models fitted with manual and automatic gearbox)

Remove any corrosion present in the thread/ spline of the outer joint.

- Moisten splines of wheel hub with oil.
- Insert drive shaft.
- Insert outer joint as far as possible into the splines of the wheel hub.
- Attach steering joint and wishbone with new bolts onto old impression.
- Tighten drive shaft fully to flange shaft.
- Bolt pendulum support to subframe.
- **Moisten contact surface of twelve-point nut and also splines and thread of outer joint with oil and screw on new twelve-point nut as far as possible.**
- Draw outer joint sufficiently far into the wheel hub until outer joint is making contact in the wheel bearing.
- Install noise insulation.

⇒ Engine, Mechanical Components; Repair Group 10; Removing and installing engine

- Fit on wheel.

Tightening torques:

Steering joint to wishbone **Use new bolts and new locking plate!**	20 Nm + 90°
Drive shaft to flange shaft M8, tighten diagonally across in 2 stages (I and II) **Use new bolts!**	I - 10 Nm II - 40 Nm
Drive shaft to flange shaft M10, tighten diagonally across in 2 stages (I and II) **Use new bolts!**	I - 10 Nm II - 70 Nm
Pendulum support to subframe **Use new bolts!**	20 Nm + 90°

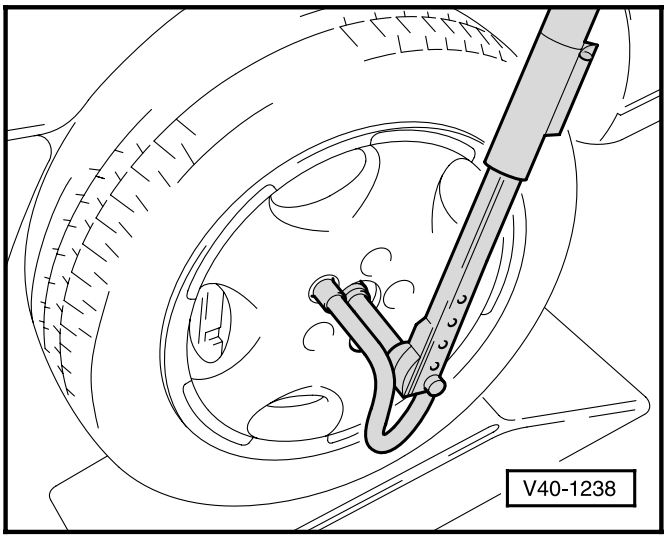
- Make sure when lowering the vehicle that the wheels do not touch the ground.

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

- Operate brake (second mechanic required)
- Tighten new twelve-point nut with 225 Nm and slacken half a turn
- Turn wheel hub at least 90°
- Tighten twelve-point nut:

Tightening torque:

50 Nm and torque a further 60°



Note:

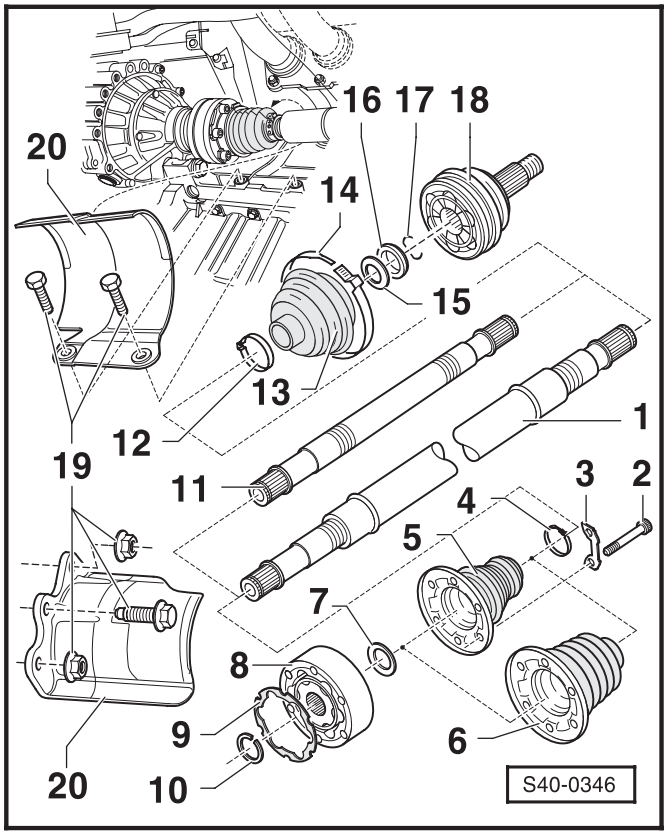
◄ *It is recommended to use the torque wrench V.A.G 1756 for tightening the twelve-point nut.*

Servicing drive shaft

Servicing drive shaft with outer and inner CV joint

Special tools, testers and aids required

- Circlip pliers, e.g. VW 161 A
- Thrust plate MP 3-406
- Thrust plate MP 3-407
- Thrust plunger MP 3-448
- Supporting sleeve MP 6-428
- Clamping device MP 6-429
- Workshop press, e.g. V.A.G 1290 A
- Torque wrench
- Tensioning pliers, e.g. V.A.G 1682
- Sealant D 454 300 A2



Notes:

- *Assignment of the drive shafts*

⇒ Electronic catalogue of original parts

- *Grease joint if necessary, when replacing the joint boot.*
- *Spread the grease filling evenly in the joint boot - only on the joint side.*

1 - Right drive shaft (tubular shaft)
- assignment ⇒ electronic catalogue of original parts

2 - Fillister head screw with internal serration
- replace after each disassembly
- initially tighten to 10 Nm, subsequently tighten crosswise to final torques
  M 8 = 40 Nm
  M 10 = 70 Nm
- assignment ⇒ electronic catalogue of original parts

3 - Shim
- assignment ⇒ electronic catalogue of original parts

4 - Warm-type clamp
- replace
- tighten ⇒ Fig. 10

Grease quantities and grade of grease

Grease packing of CV joints with high-temperature grease G 000 603 or G 000 633.

Notes:

- *G 000 603 - Can containing 90 g grease*
- *G 000 633 - Can containing 120 g grease*
- *Re-grease joint, if necessary, when replacing joint boot.*

Engine/ gearbox	Left/right drive shaft	Outer joint	Grease	of which in:		Inner joint	Grease	of which in:	
	Part No.	Ø mm	Total quantity (g)	Joint [1] (g)	Joint boot [2] (g)	Ø mm	Total quantity (g)	Joint [1] (g)	Joint boot [2] (g)
1.6 l/55 kW (AEE) 02K	1 J0 407 271 F 1 J0 407 272 F	81	80	40	40	94	80	60	20
1.6 l/74 kW (AEH, AKL) 02K	1 J0 407 271 Q 1 J0 407 272 AB	81	80	40	40	94	80	60	20
1.8 l/92 kW (AGN) 02J	357 407 271 R 1 J0 407 272 AC	90	100	50	50	100	110	80	30
1.9 l/50 kW (AGP) 02K	1 J0 407 271 F 1 J0 407 272 F	81	80	40	40	94	80	60	20
1.9 l/66 kW (AGR) 02J	1 J0 407 271 H 1 J0 407 272	90	100	50	50	100	110	80	30
1.9 l/81 kW (AHF) 02J	1 J0 407 271 H 1 J0 407 272	90	100	50	50	100	110	80	30

1) The quantity of grease stated for the inner joint should be inserted into the joint from both sides.

2) Distribute the grease packing evenly in the joint boot.

5 - Joint boot for inner CV joint, ∅ 94 mm
- material: Hytrel (Polyelastomere)
- inspect for tears and chafing points
- remove CV joint with drift
- fitting location of joint boot for inner CV joint for left shaft is identical to the fitting location of the joint boot for the outer CV joint ∅ 84 mm ⇒ Fig. 12
- fitting location of joint boot for inner CV joint for right shaft is identical to the fitting location of the joint boot for the outer CV joint ∅ 84 mm ⇒ Fig. 12
- before assembling coat inner cap with sealant D 454 300 A2
- assignment ⇒ electronic catalogue of original parts

6 - Joint boot for inner CV joint, ∅ 100 mm
- material: rubber
- inspect for tears and chafing points
- remove from CV joint with drift
- fitting location for left shaft ⇒ Fig. 6
- fitting location for right shaft ⇒ Fig. 7
- before assembling coat inner cap with sealant D 454 300 A2
- assignment ⇒ electronic catalogue of original parts

7 - Disc spring
- Fitting location ⇒ Fig. 3

8 - Inner CV joint
- must be replaced completely
- pressing out ⇒ Fig. 2
- pressing on ⇒ Fig. 5
- grease ⇒ page 40-62
- inspecting ⇒ page 40-46
- assignment ⇒ electronic catalogue of original parts

9 - Gasket
- adhesive surface on the inner CV joint must be free of grease and oil!
- replace
- pull off protective foil and stick gasket in the housing
- assignment ⇒ electronic catalogue of original parts

10 - Circlip
- replace
- remove with circlip pliers, e.g. VW 161 A
- assignment ⇒ electronic catalogue of original parts

11 - Left drive shaft (solid shaft)
- assignment ⇒ electronic catalogue of original parts

12 - Warm-type clamp
- replace
- tighten ⇒ Fig. 9

13 - Joint boot
- material: Hytrel (Polyelastomere)
- inspecting for tears and chafing points
- assignment ⇒ electronic catalogue of original parts
- pay attention to different version:
  ∅ 84 mm
  ∅ 90 mm
- fitting location of joint boot for outer CV joint for left shaft ∅ 90 mm ⇒ Fig. 11
- fitting location of joint boot for outer CV joint ∅ 90 mm for right shaft determined by the fitting location on the shaft is identical as ⇒ Fig. 11
- fitting location of joint boot for outer CV joint ∅ 84 mm for left shaft ⇒ Fig. 12
- fitting location of joint boot for outer CV joint ∅ 84 mm for right shaft ⇒ Fig. 12

14 - Warm-type clamp
- replace
- tighten with tensioning pliers, e.g. V.A.G 1682 ⇒ Fig. 8

15 - Disc spring
- fitting location ⇒ Fig. 4

16 - Thrust ring
- fitting location ⇒ Fig. 4

17 - Circlip
- replace
- insert in the groove on the shaft

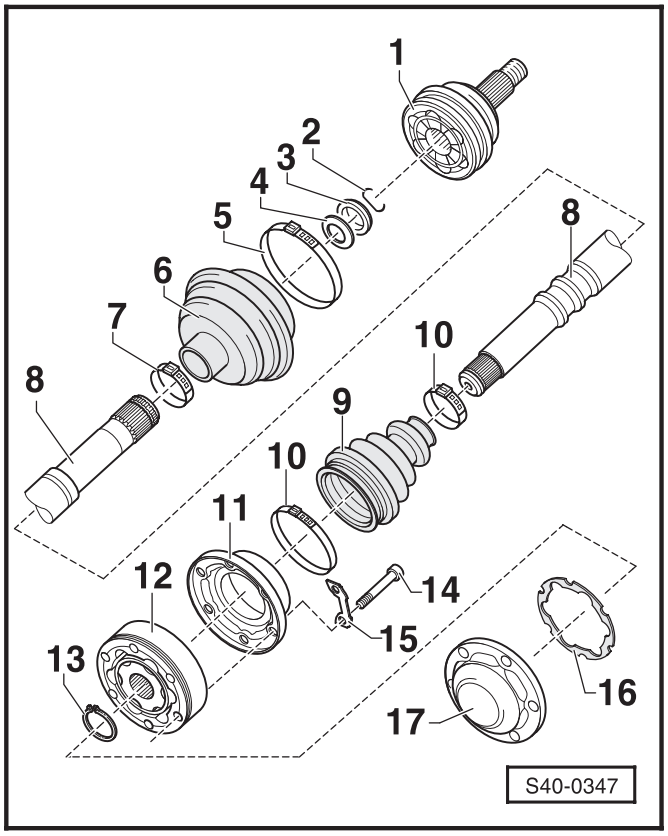
18 - Outer CV joint
- must be replaced completely
- removing ⇒ Fig. 1
- installing: drive onto the shaft with a plastic hammer until the compressed circlip expands
- grease ⇒ page 40-62
- inspecting ⇒ page 40-45

19 - M8 = 25 Nm, M10 = 35 Nm

20 - Protective cap

Servicing drive shaft with outer and inner CV joint VL 3700

Special tools, testers and aids required
⇒ page 40-38



Notes:

- *Assignment of the drive shafts*

⇒ Electronic catalogue of original parts

- *Grease joint if necessary, when replacing the joint boot.*

1 - Outer CV joint
- must be replaced completely
- removing inspect for tears and chafing points
- remove ⇒ Fig. 1
- installing: drive onto the shaft with a plastic hammer until the compressed circlip expands
- grease ⇒ page 40-62
- inspect ⇒ page 40-45

2 - Circlip
- replace
- insert in the groove on the shaft

3 - Thrust ring
- Fitting location ⇒ Fig. 4

4 - Disc spring
- Fitting location ⇒ Fig. 4

5 - Clamp
- replace
- tighten with tensioning pliers, e.g. V.A.G 1682 ⇒ Fig. 8

6 - Joint boot for outer CV joint
- material: Hytrel (Polyelastomere)
- inspect for tears and chafing points
- fitting location for left shaft ⇒ Fig. 14
- fitting location for right shaft ⇒ Fig. 15
- assignment ⇒ electronic catalogue of original parts

7 - Clamp
- replace
- tighten ⇒ Fig. 9

8 - Left drive shaft (solid shaft)
- assignment ⇒ electronic catalogue of original parts

9 - Joint boot for inner CV joint
- material: Arnitel (Polyelastomere)
- inspect for tears and chafing points
- fitting location for left shaft ⇒ Fig. 13
- fitting location for right shaft ⇒ Fig. 13
- assignment ⇒ electronic catalogue of original parts

10 - Clamp
- replace

11 - Cap
- remove from CV joint with drift
- before assembling coat sealing surface of cap with sealant D 454 300 A2
- sealing surface must be clean and free of grease

12 - Inner CV joint
- must be replaced completely
- pressing out ⇒ Fig. 2
- pressing on ⇒ Fig. 5
- grease ⇒ page 40-62
- inspecting ⇒ page 40-46
- assignment ⇒ electronic catalogue of original parts

13 - Circlip
- replace
- remove with circlip pliers, e.g. VW 161 A

14 - Fillister head screw with internal serration
- replace after each disassembly
- initially tighten to 10 Nm, subsequently tighten crosswise to final torques
  M 8 = 40 Nm
  M 10 = 70 Nm
- assignment ⇒ electronic catalogue of original parts

15 - Shim
- assignment ⇒ electronic catalogue of original parts

16 - Gasket
- adhesive surface on the inner CV joint must be free of grease and oil!
- replace
- pull off protective foil and stick gasket in the joint
- assignment ⇒ electronic catalogue of original parts

17 - Cap
- remove from CV joint with drift
- before assembling coat sealing surface of cap with sealant D 454 300 A2
- sealing surface must be clean and free of grease

Grease quality and grease quantity

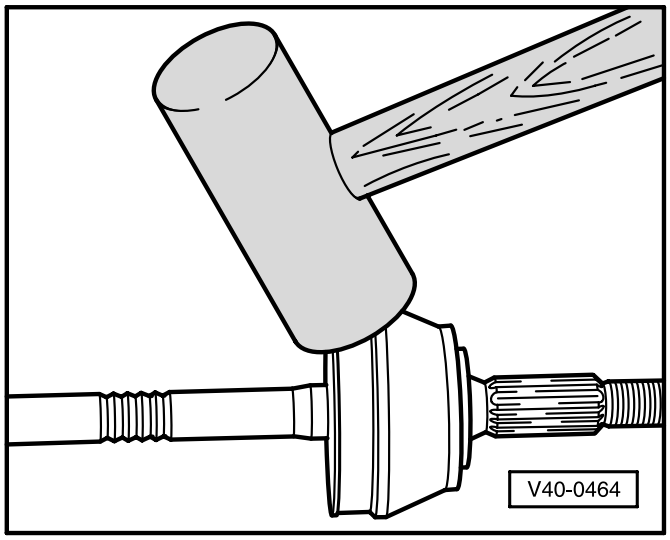
Notes:

- *The outer joints of the drive shaft are filled with:*
  - *grease for normal temperatures Part-No. G 052 738 A2*
  - *grease from the relevant repair kit*
  - *High temperature grease Part No. G 052 133 A2, or Part No. G 052 133 A3*
- *The inner joints of the drive shaft must be filled with high temperature grease from the relevant repair kit or with grease Part No. G 052 133 A2 or Part No. G 052 133 A3*

⇒ Electronic catalogue of original parts

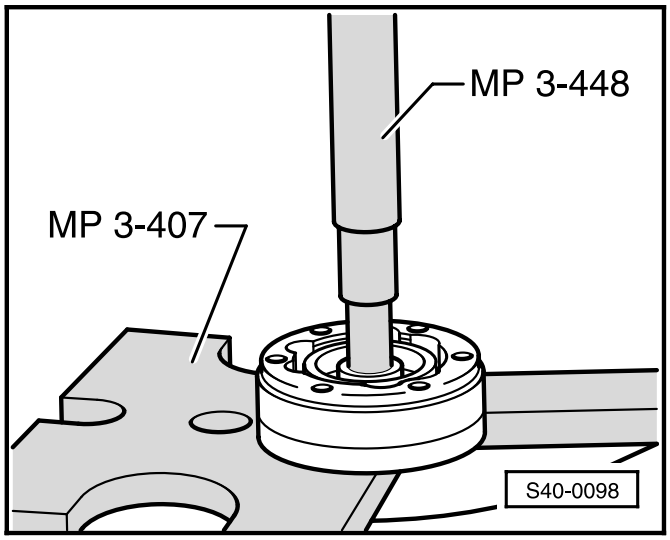
Grease quantity

⇒ page 40-62



◀ **Fig. 1 Removing outer CV joint**

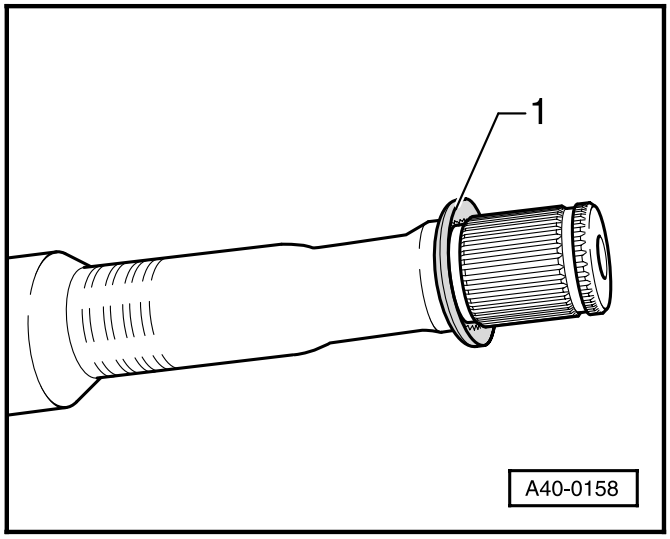
- Remove the CV joint with a drift.
- Drive off the drive shaft with a strong blow of a plastic hammer.



◀ **Fig. 2 Pressing off inner CV joint**

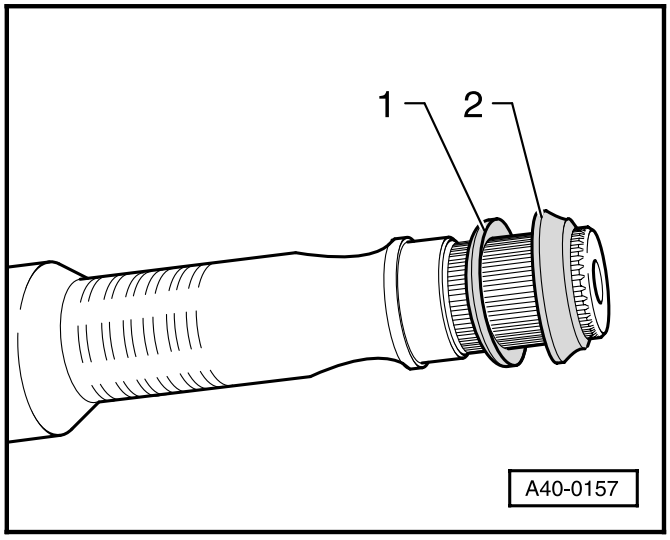
Note:

Support ball hub.



◀ **Fig. 3 Fitting position of the disc spring at outer joint (gearbox side)**

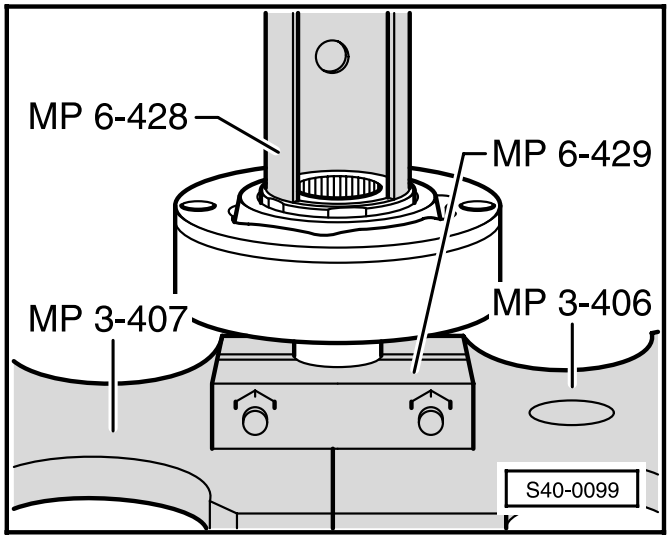
1 - Disc spring



◄ **Fig. 4 Fitting position of the disc spring and thrust ring at outer joint (gearbox side)**

1 - Disc spring

2 - Thrust ring

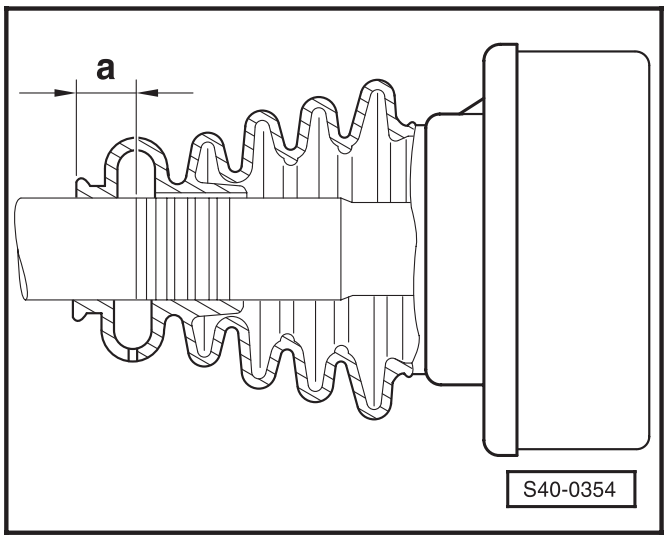


◄ **Fig. 5 Pressing in the inner CV joint**

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

Note:

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

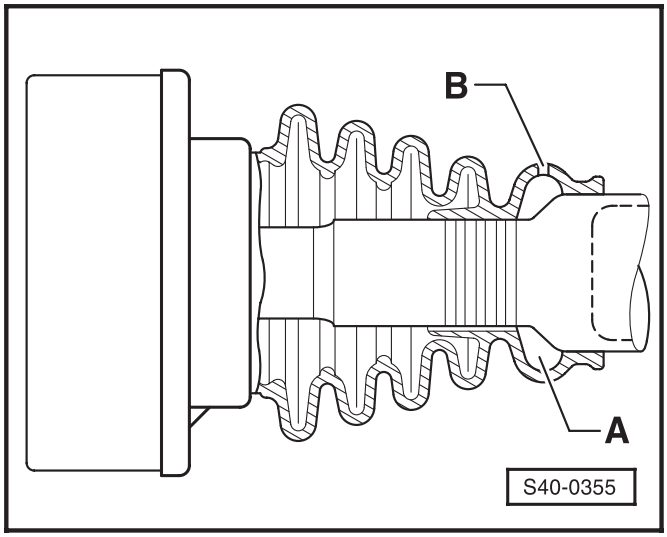


◄ **Fig. 6 Fitting position of the joint boot for the outer joint ∅ 100 mm on the left shaft**

Dimension a = 17 mm

Note:

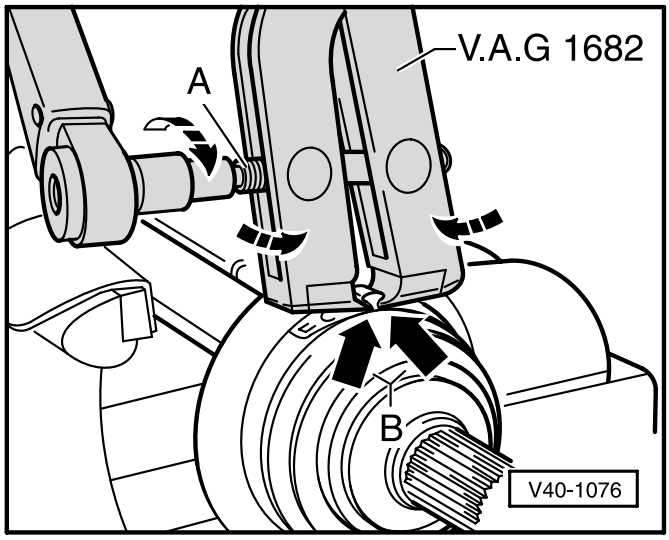
Mark dimension -a- before assembling the joint boot on the drive shaft, e.g. using colour or adhesive tape. The paintwork must never be damaged with a sharp object.



◄ **Fig. 7 Fitting position of the joint boot for the outer joint ∅ 100 mm on the right shaft**

The ventilation chamber -A- must be located on the largest pipe diameter.

B - Ventilation hole

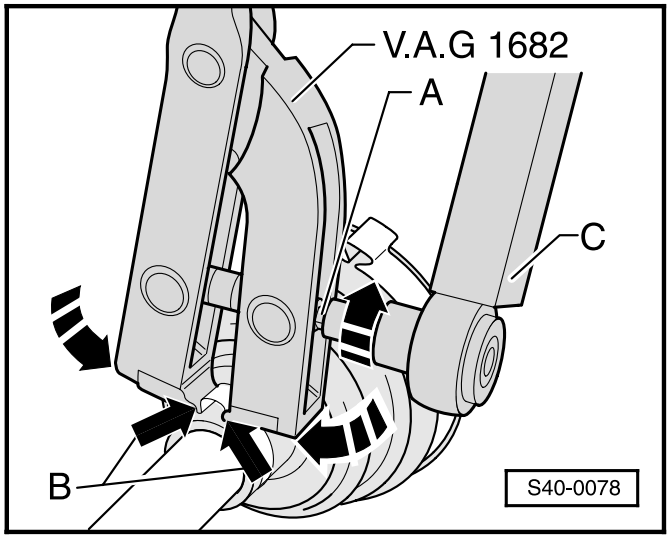


◄ **Fig. 8 Tighten warm-type clamp at outer joint (large diameter)**

Notes:

- *In view of the hard material (as opposed to rubber) of the joint boot, which requires the use of a stainless steel warm-type clamp, it can only be correctly tightened with tensioning pliers e.g. V.A.G 1682.*
- *Tightening torque: 25 Nm*
- *Use a torque wrench.*
- *Make sure the thread of the spindle -A- of the tensioning pliers is smooth. If necessary grease with Molykote MoS_2.*
- *If it is not smooth, e.g. if the thread is dirty, the necessary tensioning force of the warm-type clamp is not reached at the given torque.*

- Position the tensioning pliers, e.g. V.A.G 1682, as shown in the Fig. Make sure the cutting edges of the pliers are positioned in the corners (arrows -B-) of the warm-type clamp.



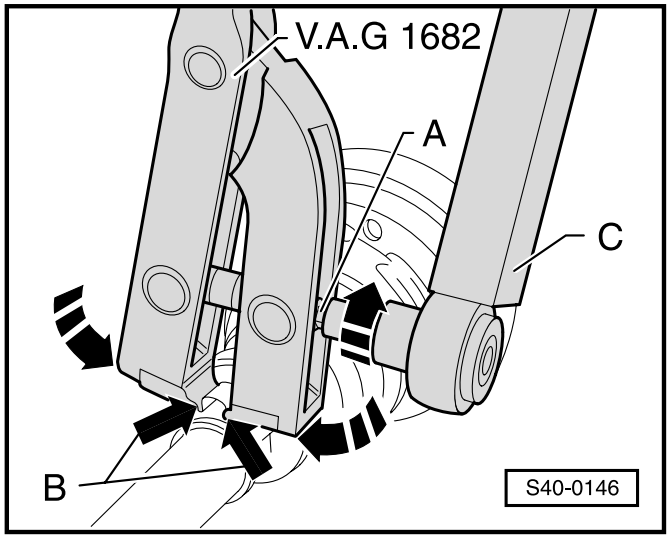
- Tighten the warm-type clamp by turning the spindle with a torque wrench (do not tilt the pliers during this process)

A - Spindle of tensioning pliers

B - Cutting edges of tensioning pliers

◄ **Fig. 9 Tighten warm-type clamp at outer joint (small diameter)**

- Position the tensioning pliers, e.g. V.A.G 1682, as shown in the Fig. Make sure the cutting edges of the pliers are positioned in the corners (arrows -B-) of the warm-type clamp.



- Tighten the warm-type clamp by turning the spindle with a torque wrench (do not tilt the pliers during this process)

  A - Spindle of tensioning pliers

  B - Cutting edges of tensioning pliers

  C - Torque wrench

◄ **Fig. 10 Tighten warm-type clamp at inner joint**

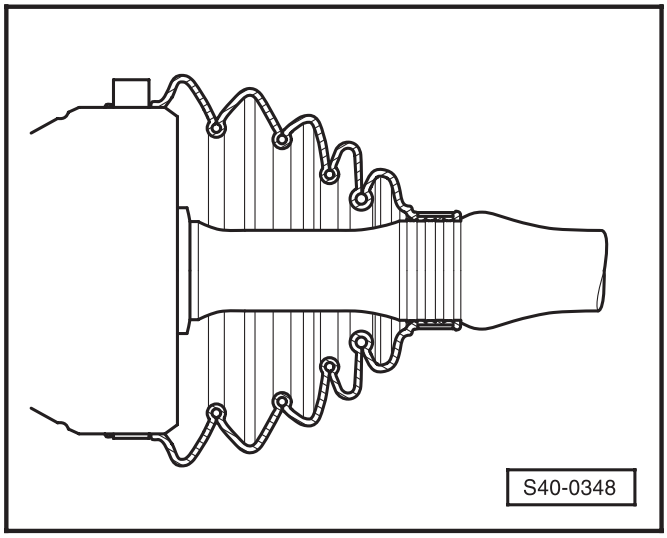
- Position the tensioning pliers, e.g. V.A.G 1682, as shown in the Fig. Make sure the cutting edges of the pliers are positioned in the corners (arrows -B-) of the warm-type clamp.

- Tighten the warm-type clamp by turning the spindle with a torque wrench (do not tilt the pliers during this process).

  A - Spindle of tensioning pliers

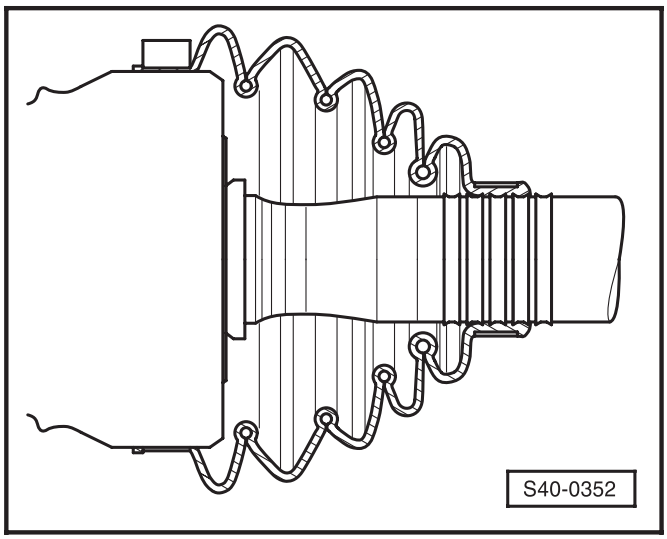
  B - Cutting edges of tensioning pliers

  C - Torque wrench



◄ **Fig. 11 Fitting position of the joint boot for the outer joint ∅ 90 mm on the left shaft**

The sealing surface of the joint boot must be positioned up to the stop on the shoulder of the shaft.

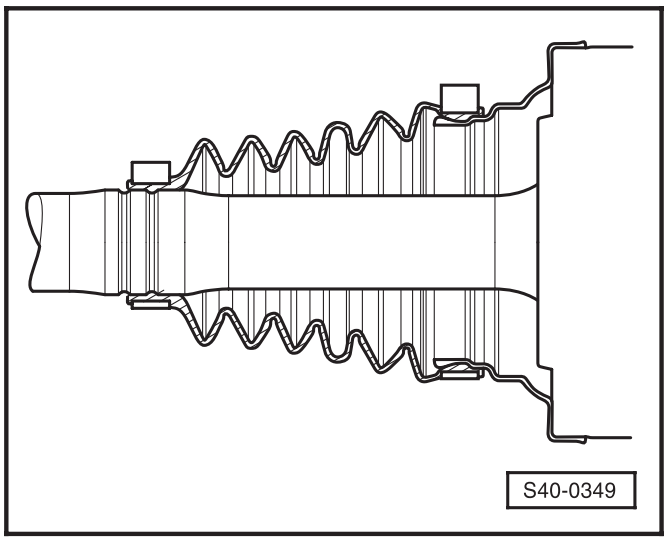


◄ **Fig. 12 Fitting position of the joint boot for the outer joint ∅ 84 mm on the left and right shaft**

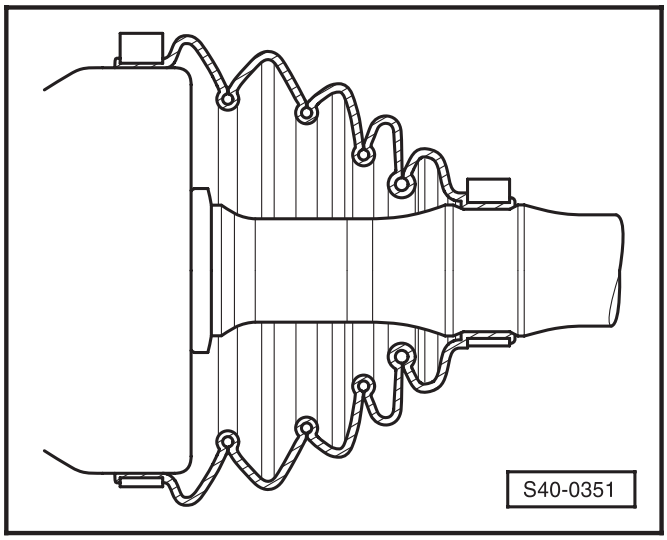
1 to 1 $^{1}/_{2}$ groove must be visible on the drive shaft

Note:

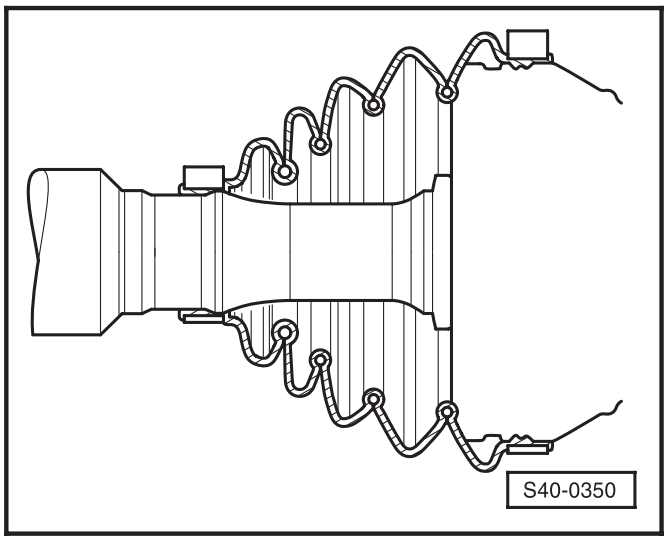
The above-mentioned condition regarding the fitting position is valid also for the joint boot for inner CV joint ∅ 94 mm.



◄ **Fig. 13 Fitting position of the joint boot for the inner joint on the left and right shaft**

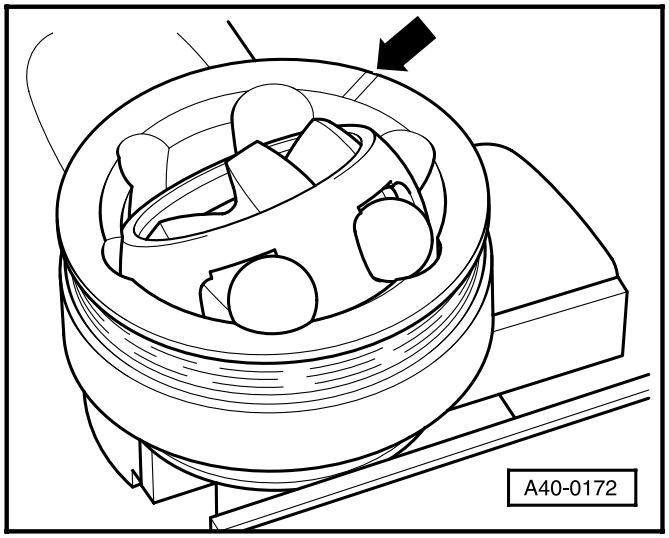


◄ **Fig. 14 Fitting position of the joint boot for the outer joint on the left shaft**



◄ **Fig. 15 Fitting position of the joint boot for the outer joint on the right shaft**

Inspecting outer CV joint



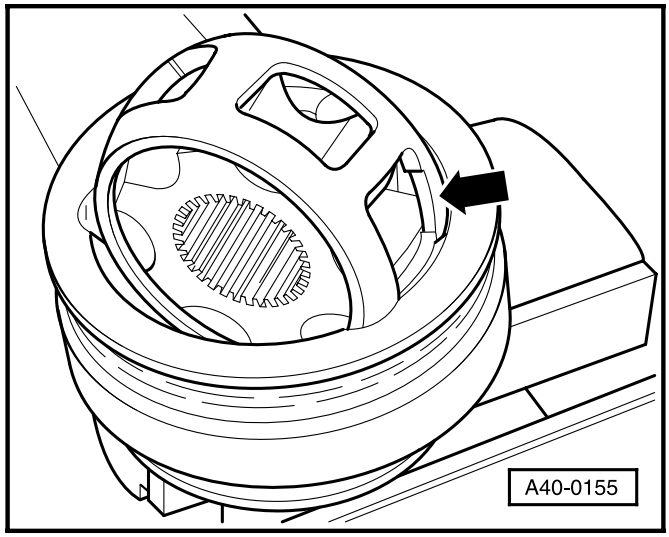
The joint should be disassembled to replace the grease if the grease is extremely dirty or if the running surfaces of the balls need to be inspected for signs of wear and damage.

Removing

◄ - Use an electric pen or dressing stone to mark the position of the ball hub relative to the ball cage and the housing before disassembling (see arrow).

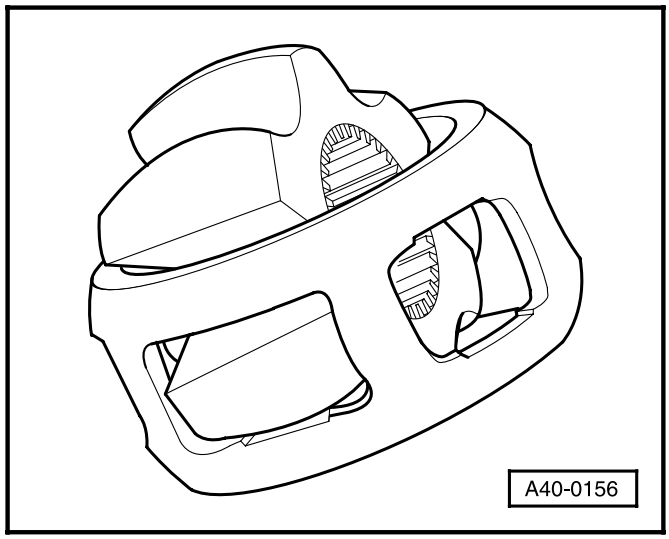
- Swivel ball hub and ball cage

- Take out the balls one after the other



◄ - Rotate cage until two cage windows (arrow) are positioned at the joint body.

- Lift out cage with hub.



◄ - Swivel segment of the hub into the cage window.

- Tilt hub out of cage.

Note:

- *The 6 balls for each joint are assigned to a tolerance group. Inspect stub axle, hub, cage and balls for pitting and signs of rubbing. Excessive torsional play in the joint is noticeable from load change jolts. The joint should be replaced in such cases. Smooth areas and traces of running produced by the balls are not a reason for replacing the joint.*
- *Inspect cage for cracks.*

Installing

- Press the required grease quantity into the joint part ⇒ page 40-62; grease quality and grease quantity

- Insert the cage and hub in the joint body.

Note:

The cage must be inserted in the correct position.

- Press in opposite balls one after the other, during this process observe the prior position of the ball hub relatively to the ball cage and to the joint body.

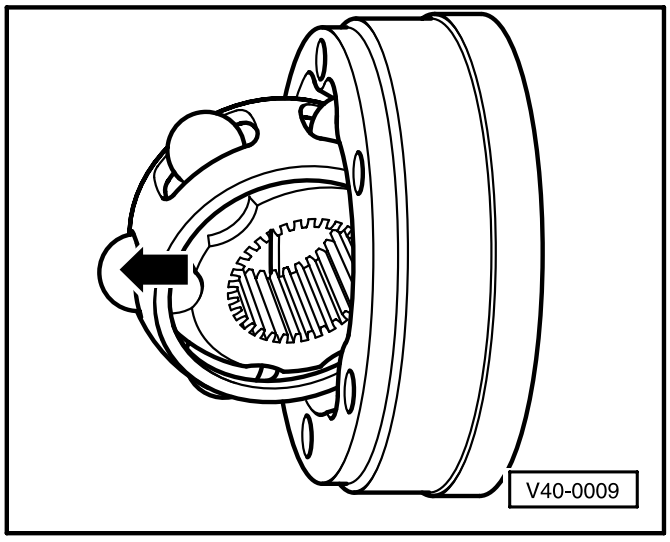
- Insert new circlip in the groove of the shaft.

- Spread any residual grease in the joint boot ⇒ page 40-62

- Assembling the joint boot ⇒ page 40-41 and further.

Inspecting inner CV joint

Disassemble the joint to replace badly soiled grease and if the contact surfaces and the balls must be inspected for wear and damage.



Removing

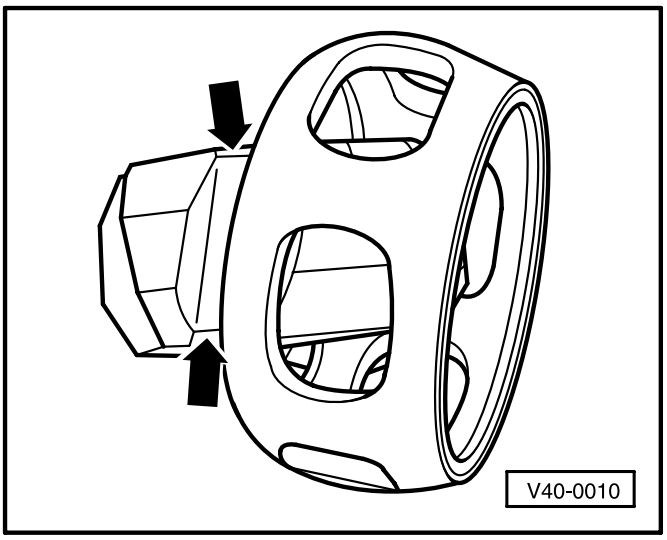
Note:

The ball hub and joint piece are paired and must be marked before disassembly. Do not interchange the bearing track assignment.

◄ - Rotate the ball hub and ball cage.

- Press the ball hub and ball cage out of the joint part -arrow-.

- Press out the balls from the cage.

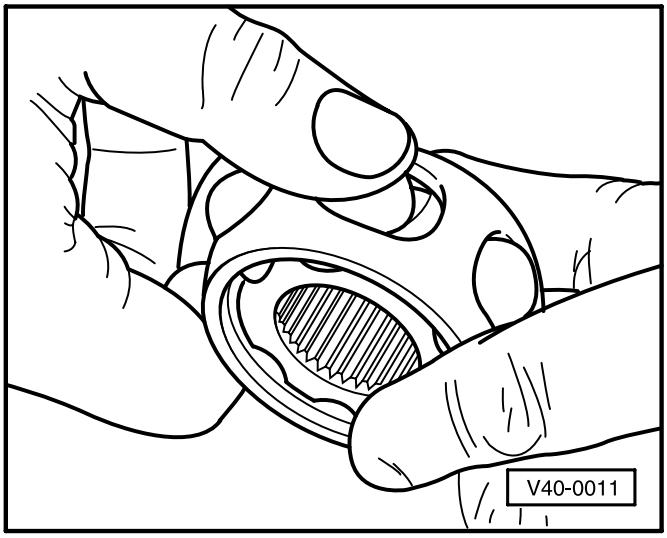


◄ - Tilt the ball hub out of the ball cage over the ball track (arrow).

- Inspect the joint body, ball hub, ball cage and balls for pitting and signs of rubbing.

Note:

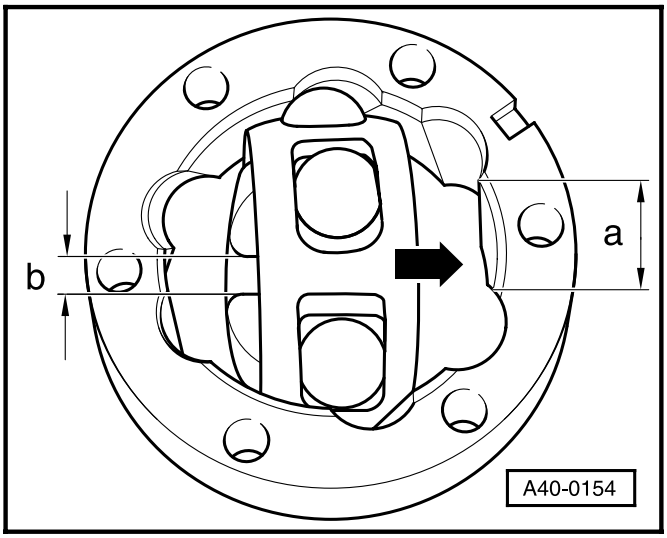
Excessive torsional play in the joint is noticeable from load change jolts. The joint should be replaced in such cases. Smooth areas and traces of running produced by the balls are not a reason for replacing the joint.



Installing

◄ - Insert the ball hub over the two chamfers in the ball cage. The fitting location is at random. Press the balls in the cage.

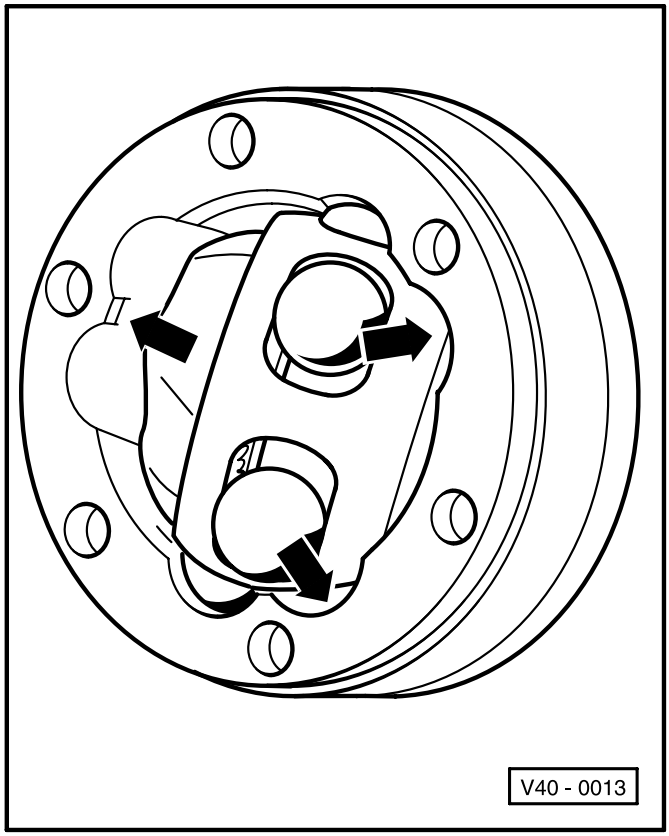
- Insert the hub with cage and balls edgeways into the joint body.



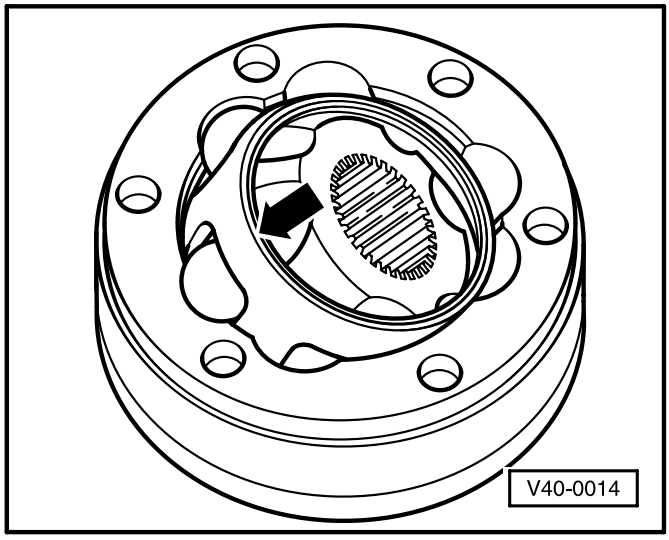
Note:

◄ ♦ *During insertion make sure wide distance -a- on the joint body coincides with narrow distance -b- on the hub after swivelling (arrow).*

♦ *Chamfer on the inside diameter of the ball hub (serration) must point towards the large diameter of the joint body.*



◄ - Swivel in the ball hub. To do so swivel the hub out of the cage until the balls are at bearing track distance -arrow-.



◄ - Lock the hub with the balls into position by exerting considerable pressure on the cage -arrow-.

Inspecting the operation of the inner CV joint:

- The CV joint is correctly assembled if the ball hub can be rolled by hand up and down the entire linear compensation.
- Push the clamp and the joint boot onto the drive shaft.
- Install the drive shaft.
- Push the grease quantity indicated for the inner joint from both sides into the joint.
- Distribute the specified grease quantity evenly into the joint boot.

  Grease quality and grease quantity ⇒ page 40-62.
- Install joint boot ⇒ page 40-42 and further.

Servicing drive shaft with tripod joint AAR 2900 and CV joint

Special tools, testers and aids required

- Thrust plate MP 3-406
- Thrust plunger MP 3-448
- Tube section MP 3-4012
- Tensioning pliers, e.g. V.A.G 1275, V.A.G 1682
- Workshop press, e.g. V.A.G 1290 A
- Torque wrench
- Circlip pliers (commercially available)

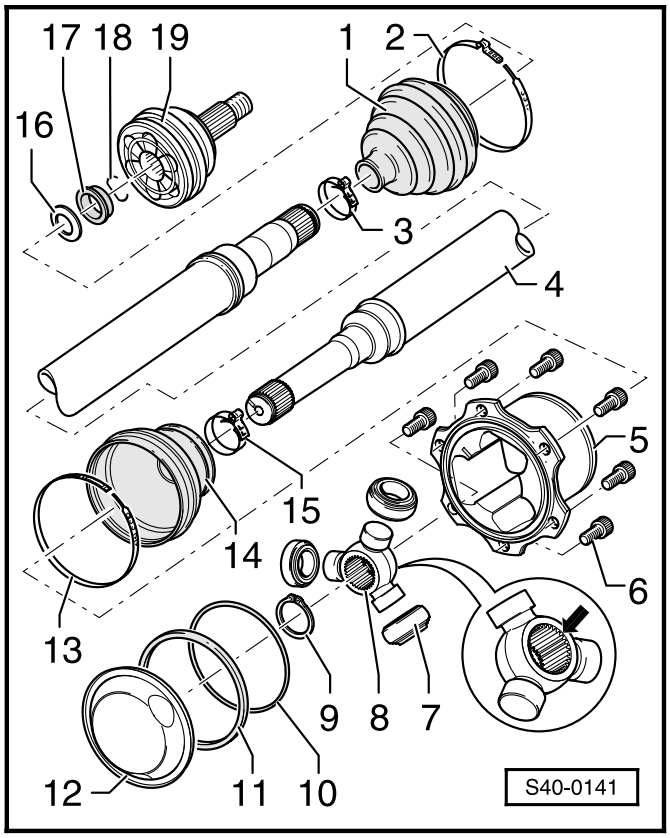
Grease quality and grease quantity

Notes:

- *Only use high temperature grease from the relevant repair kit for filling the inner CV joints and tripod joints*

⇒ Spare Part catalogue

- *Quantity of grease for outer CV joint ⇒ page 40-62*
- *Quantity of grease for inner tripod joint ⇒ page 40-62.*



Notes:

- *Assignment of drive shafts*

⇒ electronic catalogue of original parts

- *Grease joint if necessary, when replacing joint boot.*
- *On tripod joints only apply grease in the joint never in the joint boot*

1 - Joint boot for inner CV joint
- inspecting for tears and chafing points
- assignment ⇒ electronic catalogue of original parts

2 - Warm-type clamp
- replace
- tighten ⇒ page 40-42, Fig. 8

3 - Warm-type clamp
- replace
- tighten ⇒ page 40-42, Fig. 9

4 - Drive shaft
- assignment ⇒ electronic catalogue of original parts

5 - Joint part
- grease ⇒ page 40-62
- assignment ⇒ electronic catalogue of original parts

6 - Fillister head screw with internal serration
- replace after each diassembly
- initially tighten to 10 Nm, subsequently tighten crosswise to final torques
  M 8 = 40 Nm
  M10 = 70 Nm
- assignment ⇒ electronic catalogue of original parts

7 - Rollers

8 - Tripod spider
- Chamfer -arrow- points toward the drive shaft serration

9 - Circlip
- replace
- insert in the groove on the shaft

10 - O-ring seal
- not required for assembling the drive shaft

11 - Rectangular seal
- seal is contained in the repair kit
- seal is not fitted in the series, it is only necessary for the spare part sector
- assignment ⇒ electronic catalogue of original parts

12 - Cover
- is destroyed after every removal
- It is not required any more for assembling the drive shaft and is therefore not available as a spare part

13 - Warm-type clamp
- for tripod joint
- always replace

14 - Joint boot for tripod joint
- Inspecting for tears and chafing points

15 - Warm-type clamp
- for tripod joint
- always replace
- tighten ⇒ page 40-55, Fig. S40-0107

16 - Disc spring
- fitting location ⇒ page 40-41, Fig. 4

17 - Thrust ring
- ♦ fitting location ⇒ page 40-41, Fig. 4

18 - Circlip
- ♦ replace
- ♦ insert in the groove on the shaft

19 - Outer CV joint
- ♦ must be replaced completely
- ♦ removing ⇒ page 40-40, Fig. 1
- ♦ installing: drive onto the shaft with a plastic hammer until the compressed circlip expands
- ♦ grease ⇒ page 40-62
- ♦ inspecting ⇒ page 40-45

Disassembling and assembling Tripod joint AAR 2900

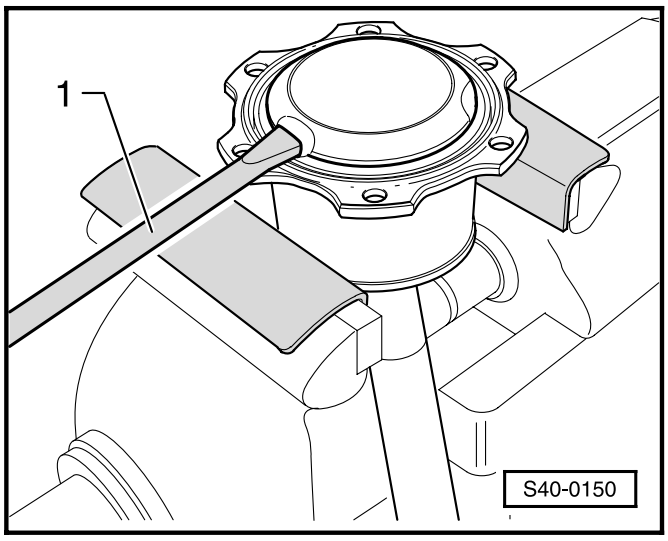
Special tools, testers and aids required

⇒ page 40-49

Grease quality and grease quantity

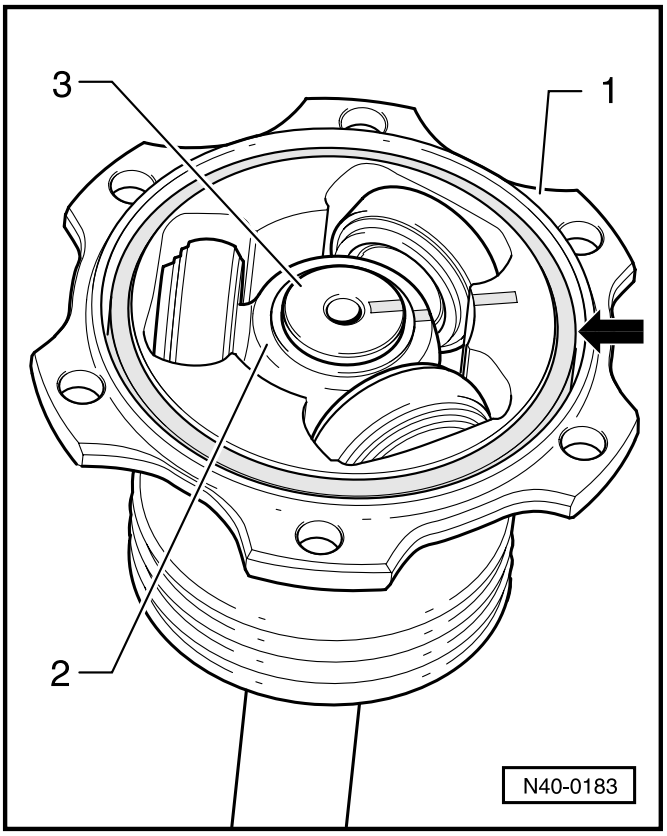
⇒ page 40-62

Disassembling



- Open warm-type clamp on joint part.
- Open warm-type clamp to the drive shaft and push back joint boot.
- ◄ - Clamp drive shaft on joint part in a vice with protective jaws.
- Lever the cover -1- off with a screwdriver.

Notes:
- ♦ *If the cover cannot be levered out, we recommend the re-insertion of the screwdriver on the opposite side and then lever out the cover.*
- ♦ *The cover will be damaged when levered off and it is no longer required for assembling the drive shaft.*



◄- Take O-ring -arrow- out of groove.

- Mark fitting location of parts 1 ... 3.

  1 - Joint

  2 - Tripod star

  3 - Drive shaft

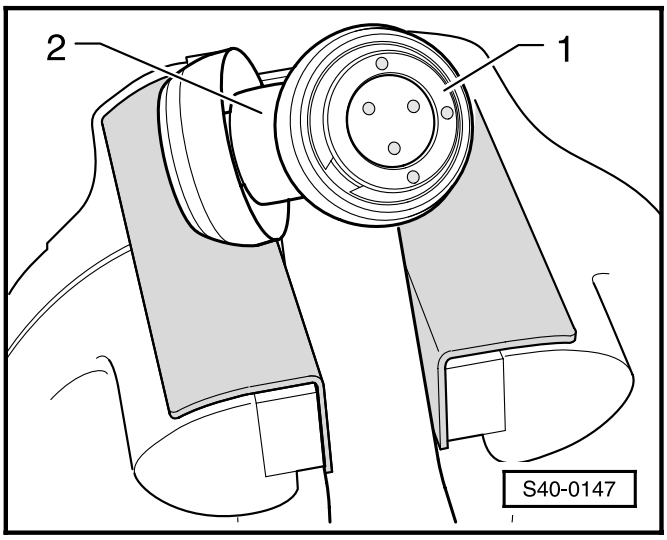
Notes:

- *If parts 1 ... 3 are not marked and are not re-installed in their previous position when assembled, this may result in noise problems subsequently when driving.*
- *A waterproof felt pen is suitable for marking the position of the parts.*

- Hold joint tight and take drive shaft out of the vice.

  Ensure that the rollers do not slip off the tripod star and fall onto the ground!

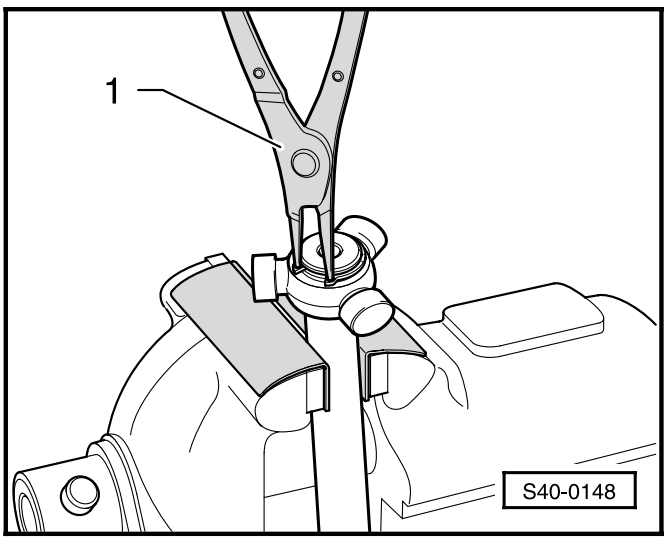
- Hold drive shaft with joint vertically and slowly push back the joint with your other hand.



◄- Clamp the drive shaft in a vice with protective jaws.

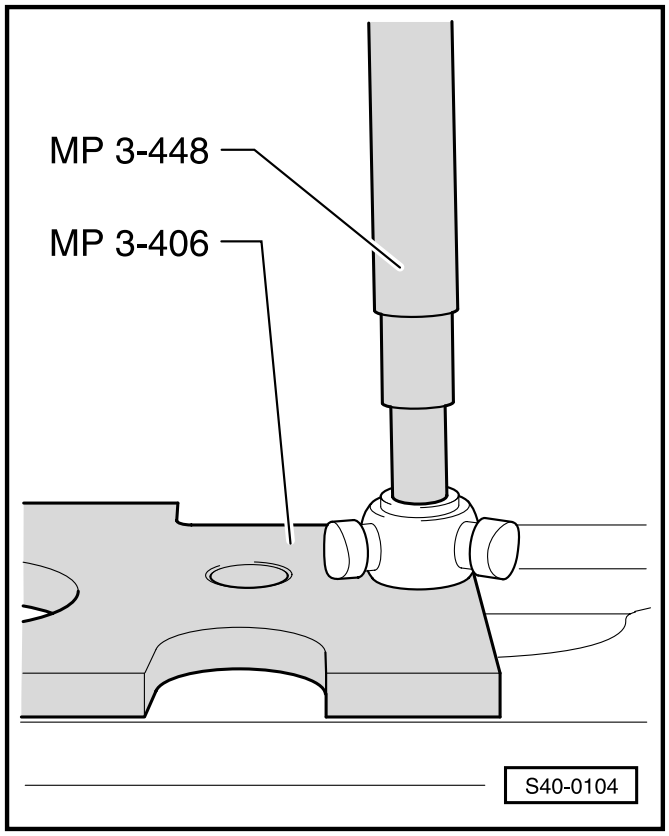
- Mark fitting location of the rollers -1- relative to the tripod star -2- with a felt pen.

- Take off rollers -1- and place down on a clean surface.



◄- Remove circlip.

  1 - Commercially available circlip pliers



- Insert drive shaft into press.

◄ - Hold drive shaft tight and press out the tripod star.

- Pull joint together with joint boot off the drive shaft.

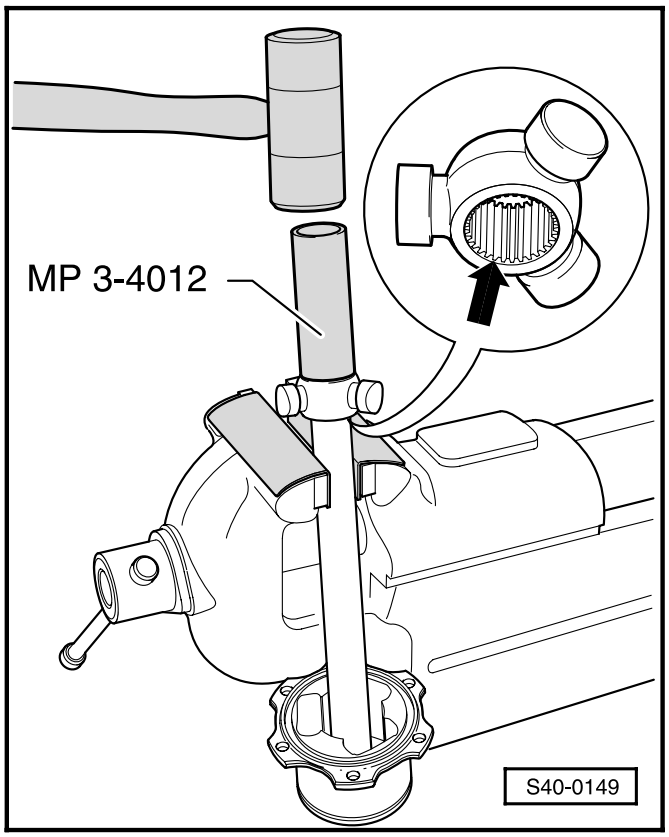
- Clean drive shaft and joint.

Assembling

- Fit small hose strap for joint boot onto the drive shaft.

- Push joint boot onto the drive shaft.

- Push joint onto the drive shaft.



Installing tripod star

◄ - Clamp the drive shaft in a vice with protective jaws.

Note:

Chamfer -arrow- on the tripod star should face toward the drive shaft. The chamfer is used as an assembly aid.

- Fit tripod star onto the drive shaft according to the marking made and knock on as far as the stop.

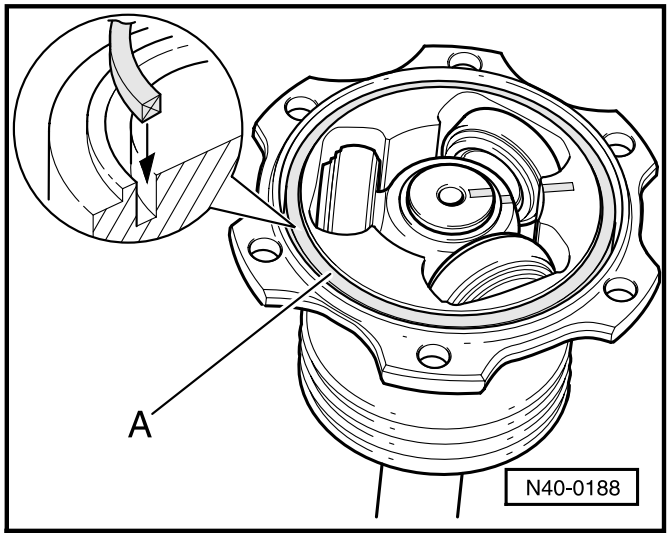
- Insert new circlip; ensure circlip is correctly located.

- Fit rollers onto the tripod star according to the markings.

- Take drive shaft out of the vice.

- Push joint over the rollers and hold tight.

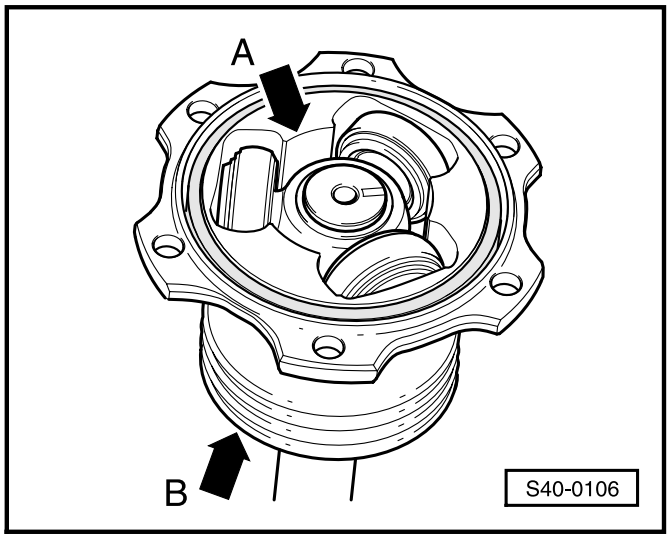
- Clamp joint in the vice.



◄ - Insert rectangular seal -A- from repair kit into the groove -arrow-.

Notes:

- *A direct sealing between tripod joint (joint part) and joint flange (gearbox side) occurs through the shape of the rectangular section of the seal.*
- *Cover is no longer required.*

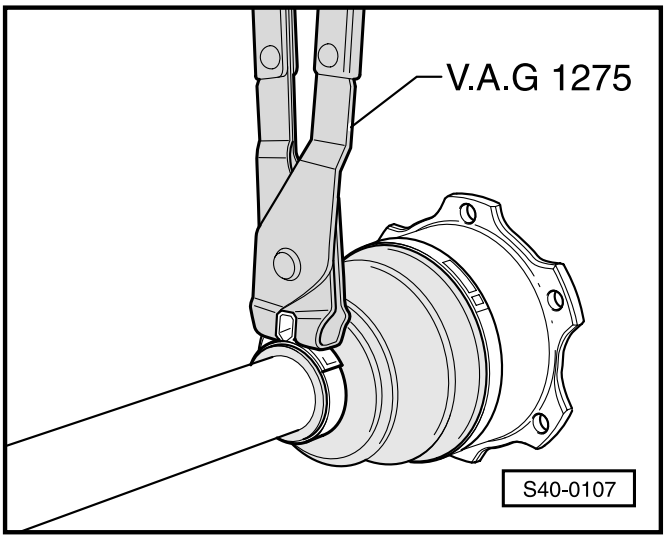


◄ - Press high temperature grease from the repair kit evenly in the tripod joint (tripod spider side) -arrow A- and in the rear of the tripod joint -arrow B-.

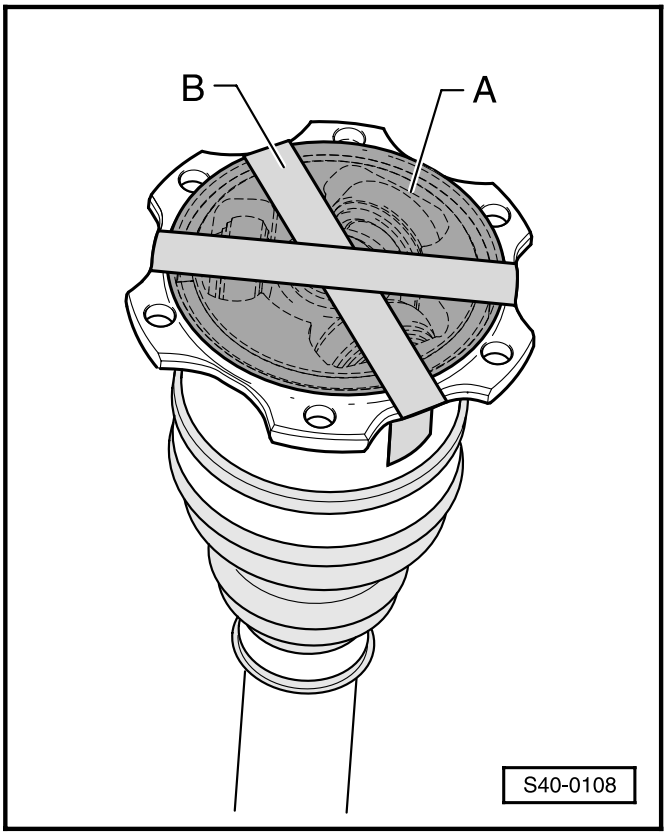
Grease quality and grease quantity
⇒ page 40-62

- Fit on joint boot.

- Tighten warm-type clamp with pliers.



◄- Tighten warm-type clamp (drive shaft side) with tensioning pliers e.g. V.A.G 1275.



◄- Cover tripod joint with cardboard disk -A- and adhesive tape -B-.

Notes:

- *After repairing, the tripod joint is covered with a clean cut cardboard disk -A- and adhesive tape -B-. A contamination of the tripod spider, the joint part and the grease filling is prevented through this. Furthermore an accidental push back of the tripod joint is avoided when installing the drive shaft.*
- *The adhesive tape and cardboard disk must only be removed when screwing the drive shaft to the drive flange.*

Servicing drive shaft with inner tripod joint AAR 2000 and outer CV joint

Special tools, testers and aids required

- Thrust plate MP 3-406
- Thrust plate MP 3-407
- Thrust plunger MP 3-408
- Distance sleeveMP 3-458/2
- Thrust plunger MP 6-405
- Supporting sleeve MP 6-428
- Clamping device MP 6-429
- Workshop press, e.g. V.A.G 1290 A
- Torque wrench
- Tensioning pliers, e.g. V.A.G 1275, V.A.G 1682
- Circlip pliers (commercially available)

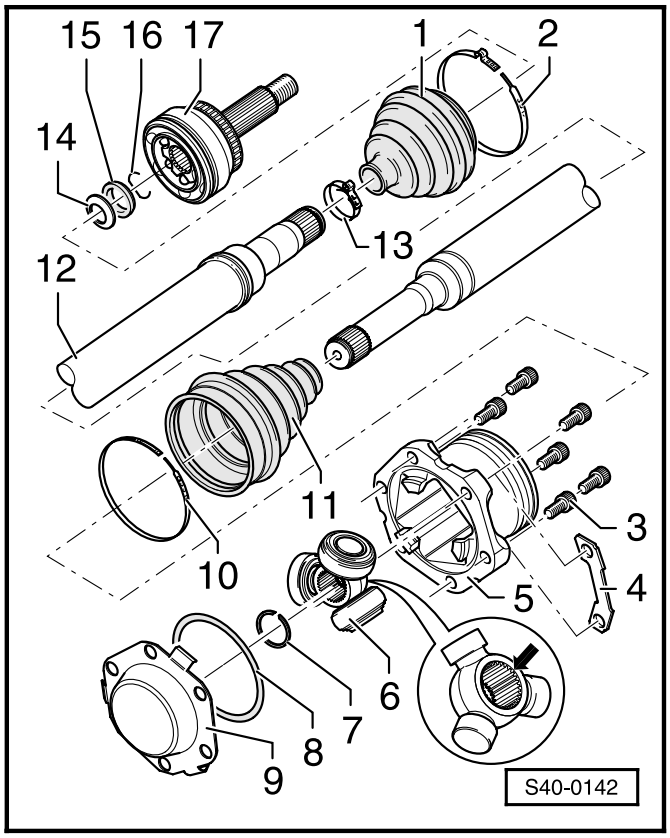
Grease quality and grease quantity

Notes:

- *Only use high temperature grease from the relevant repair kit for filling the inner joints and tripod joints*

⇒ Spare Part catalogue

- *Quantity of grease for outer CV joint ⇒ page 40-62*
- *Quantity of grease for inner tripod joint ⇒ page 40-62*



Notes:

- *Assignment of drive shafts*

⇒ electronic catalogue of original parts

- *Grease joint if necessary, when replacing the joint boot*
- *On tripod joints only apply grease in the joint, never in the joint boot.*

1 - Joint boot with inner CV joint
- inspecting for tears and chafing points
- assignment ⇒ electronic catalogue of original parts

2 - Warm-type clamp
- replace
- tighten ⇒ page 40-42, Fig. 8

3 - Fillister head screw with internal serration
- replace after each disassembly
- initially tighten to 10 Nm, subsequently tighten crosswise to tightening torques
  M 8 = 40 Nm
  M 10 = 70 Nm
- assignment ⇒ electronic catalogue of original parts

4 - Shim
- assignment ⇒ electronic catalogue of original parts

5 - Joint part
- grease ⇒ page 40-62
- assignment ⇒ electronic catalogue of original parts

6 - Tripod spider with rollers
- chamfer -arrow- points toward the drive shaft serration.

7 - Circlip
- replace
- insert in the groove on the shaft

8 - O-ring seal
- replace

9 - Cover
- replace

10 - Warm-type clamp
- for tripod joint
- always replace

11 - Joint boot for tripod joint
- inspecting for tears and chafing points
- assignment ⇒ electronic catalogue of original parts

12 - Drive shaft
- assignment ⇒ electronic catalogue of original parts

13 - Warm-type clamp
- replace
- tighten ⇒ page 40-42, Fig. 9

14 - Disc spring
- fitting location ⇒ page 40-41, Fig. 4

15 - Thrust ring
- fitting location ⇒ page 40-41, Fig. 4

16 - Circlip
- replace
- insert in the groove on the shaft

17 - Outer CV joints
- must be replaced completely
- removing ⇒ page 40-40, Fig. 1
- installing: drive onto the shaft with a plastic hammer until the compressed circlip expands
- grease ⇒ page 40-62
- inspecting ⇒ page 40-45
- assignment ⇒ electronic catalogue of original parts

Disassembling and assembling tripod joint AAR 2000

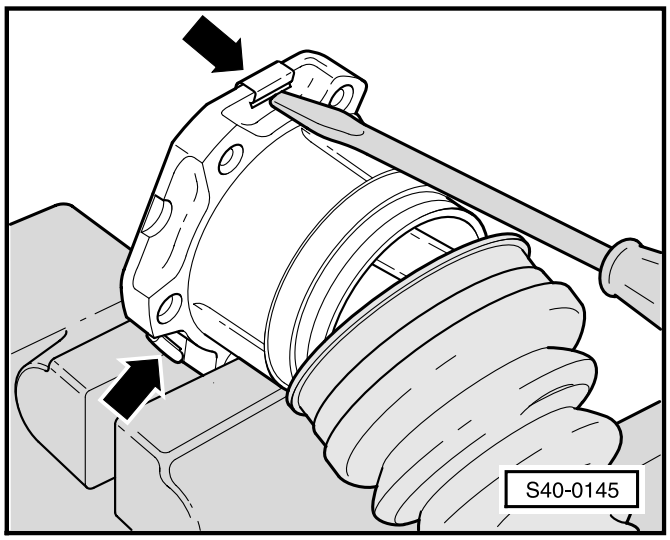
Special tools, testers and aids required

⇒ page 40-56

Grease quality and grease quantity

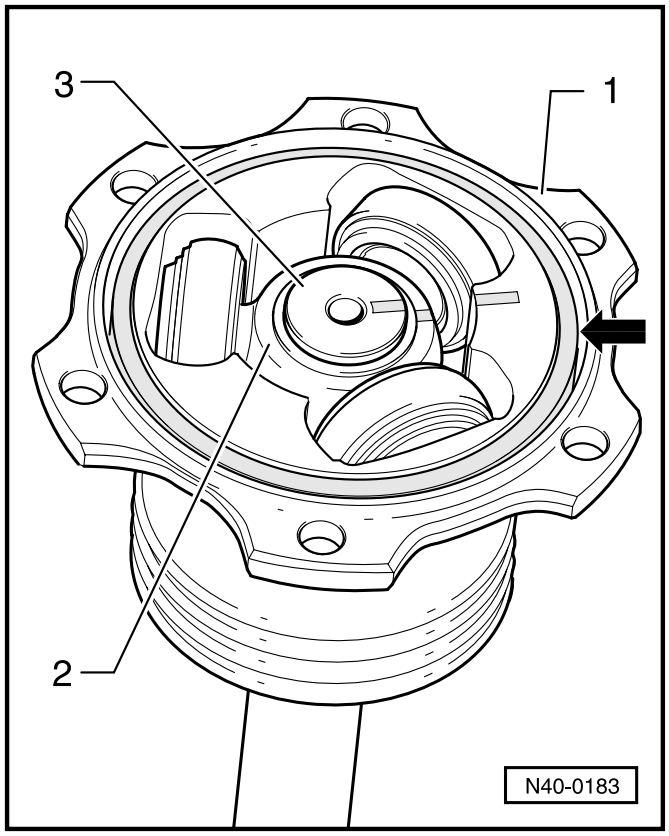
⇒ page 40-62

Disassembling



- Open warm-type clamp on joint part.
- Push back joint boot.

◄ - Straighten the metal tabs -arrows- with a screwdriver and lever off.



◄- Take O-ring seal -arrow- out of groove.

- Mark fitting location of parts 1 ... 3.

  1 - Joint

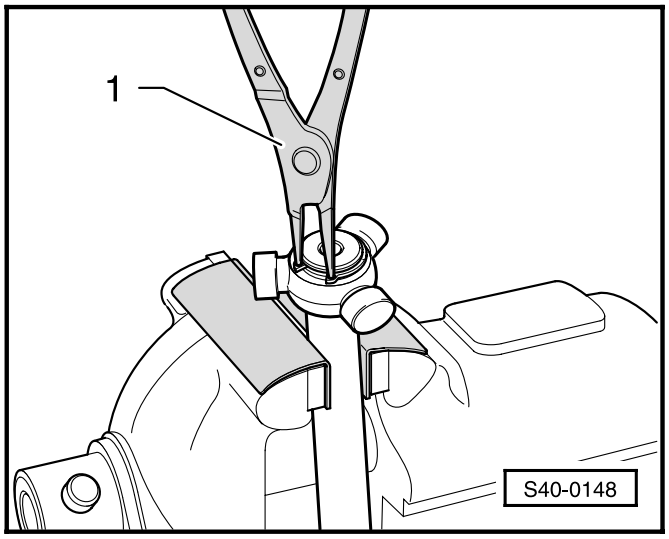
  2 - Tripod star

  3 - Drive shaft

Notes:

- *If parts 1 ... 3 are not marked and are not re-installed in their previous position when assembled, this may result in noise problems subsequently when driving.*
- *A waterproof felt pen is suitable for marking the position of the parts.*

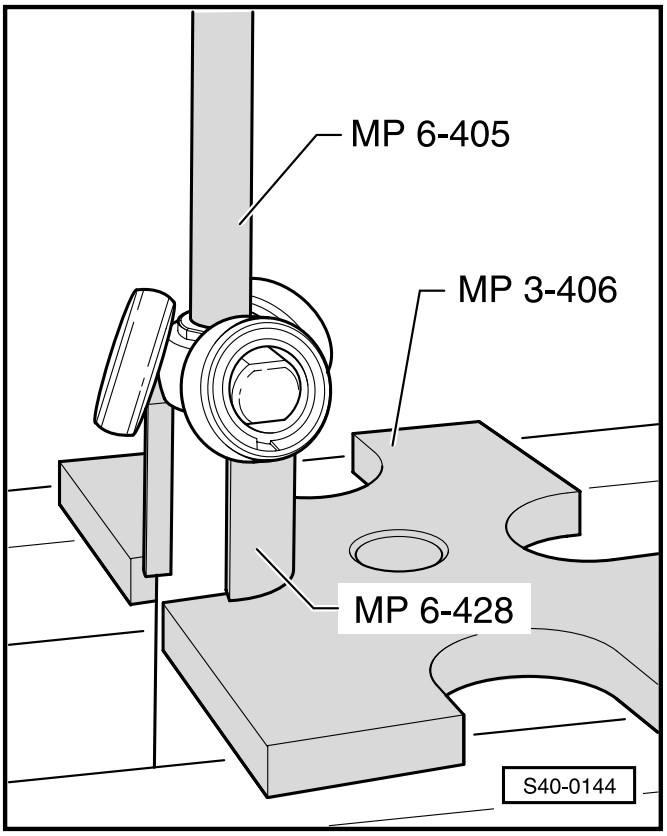
- Hold joint tight and take drive shaft out of the vice.



◄- Clamp drive shaft in a vice with protective jaws.

- Remove circlip

  1 - commercially available circlip pliers



- Insert drive shaft into press.

◄- Hold drive shaft tight and press out the tripod star.

- Remove tripod star with rollers and place on a clean surface.

- Pull joint off the drive shaft.

- Pull joint boot off the drive shaft.

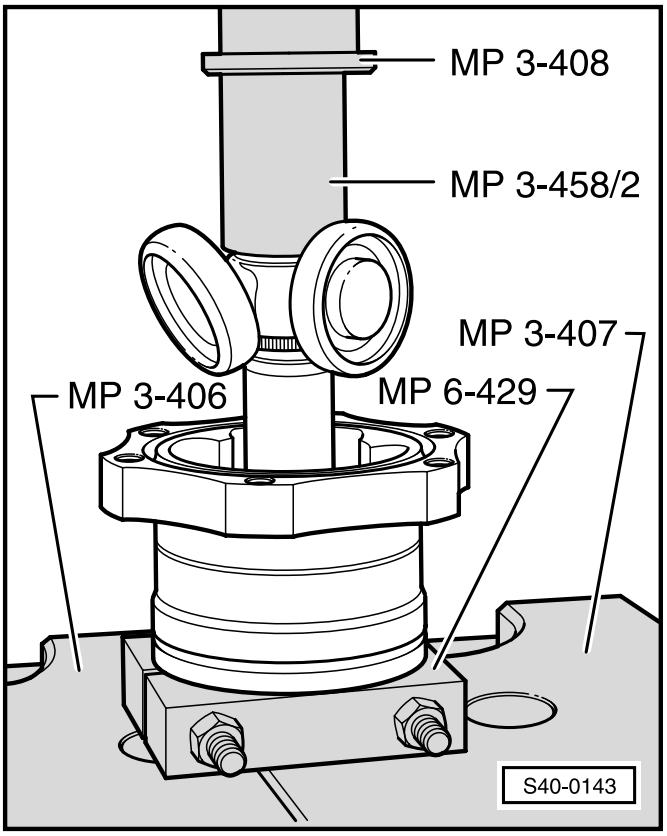
- Clean drive shaft and joint.

Assembling

- Push joint boot onto the drive shaft.

- Push joint onto the drive shaft.

Installing tripod star



Note:

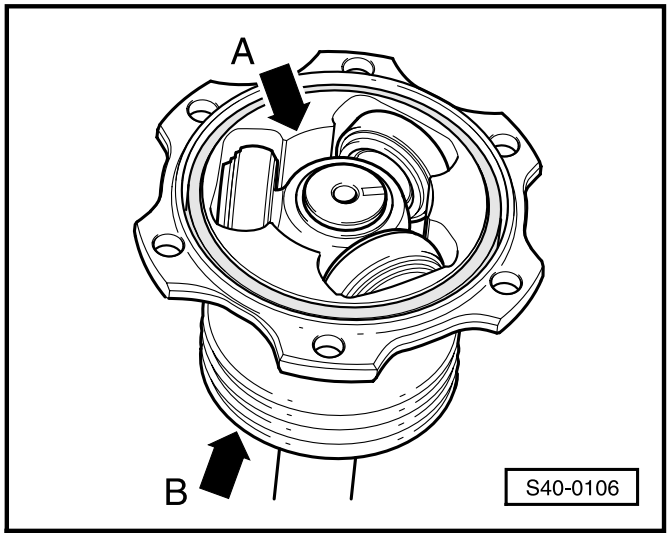
Chamfer -arrow- on the tripod star should face toward the drive shaft. The chamfer is used as an assembly aid.

◄- Fit tripod star onto the drive shaft according to the marking made and knock on as far as the stop.

- Insert new circlip; ensure circlip is correctly located.

- Push joint over the rollers and hold tight.

- Remove drive shaft from special tool and clamp in vice.



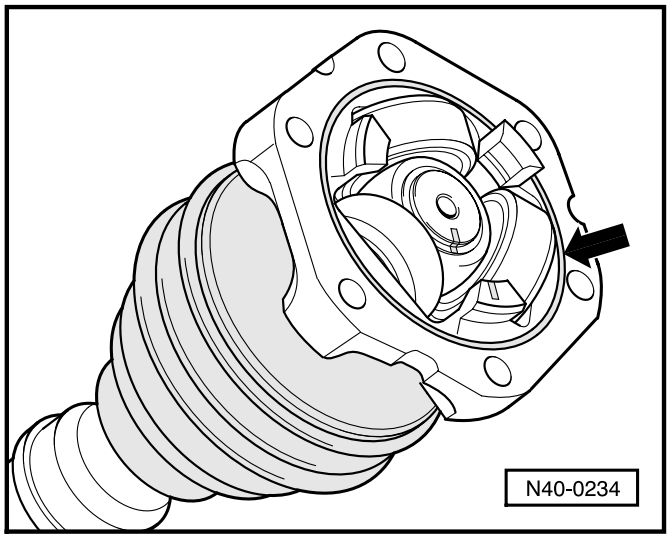
◄ - Press high temperature grease from the repair kit evenly in the tripod joint (tripod spider side) -arrow A- and in the rear of the tripod joint -arrow B-.

Grease quality and grease quantity
⇒ page 40-62

- Assembling the joint boot.

Note:

The bead in the joint boot must fit into the groove of the joint part.



- Remove drive shaft from the vice and clamp the joint part.

◄ - Insert new gasket ring -arrow- from the repair kit in the groove.

- Fit the new cover on the joint part.

Note:

The bores of the cover and the joint part must be flush.

- Tighten warm-type clamp with pliers.

Grease quantity

Outer CV joint ∅ mm	Total grease (g) Distribute evenly into the joint	Inner CV joint ∅ mm	Total grease (g)	of which	
				Joint (g)	Joint boot (g)
81	90	94 (joint)[1)]	90	45	45
90	110	100 (joint)[1)]	120	60	60
90	110	108 (tripod)[1)]	110	110	-
90	110	124 (tripod)[1)]	140	140	-
98	130	100 (joint)[2)]	190	190	-

1) Valid for all vehicle, except engines 1.9 l/74 kW PD and 1.9 l/96 kW PD.

2) Valid for vehicles with engines 1.9 l/74 kW PD and 1.9 l/96 kW PD.

Grease quantity - outer CV joint
Outer CV joints can be filled with the following grease qualities:

- Grease for normal temperatures, Part-No.: G 052 738 A2
- Grease from the relevant repair kit
- High temperature grease, Part-No.: G 052 133 A2 or Part-No.: G 052 133 A3

Grease quantity - inner CV joint
Outer CV joints can be filled with the following grease qualities:

- Grease from the relevant repair kit
- High temperature grease, Part-No.: G 052 133 A2 or Part-No.: G 052 133 A3

Notes:

- *G 052 133 A2 - can with 90g grease content*
- *G 052 133 A3 - can with 120g grease content*
- *Put grease into the joint if necessary or grease joint if necessary, when replacing the joint boot.*
- *Distribute grease quantity for joint evenly into the joint on the left and right.*
- *Distribute grease quantity for joint boot evenly into the joint boot - only on the joint side.*

Servicing rear suspension - drum brakes

Removing and installing rear suspension

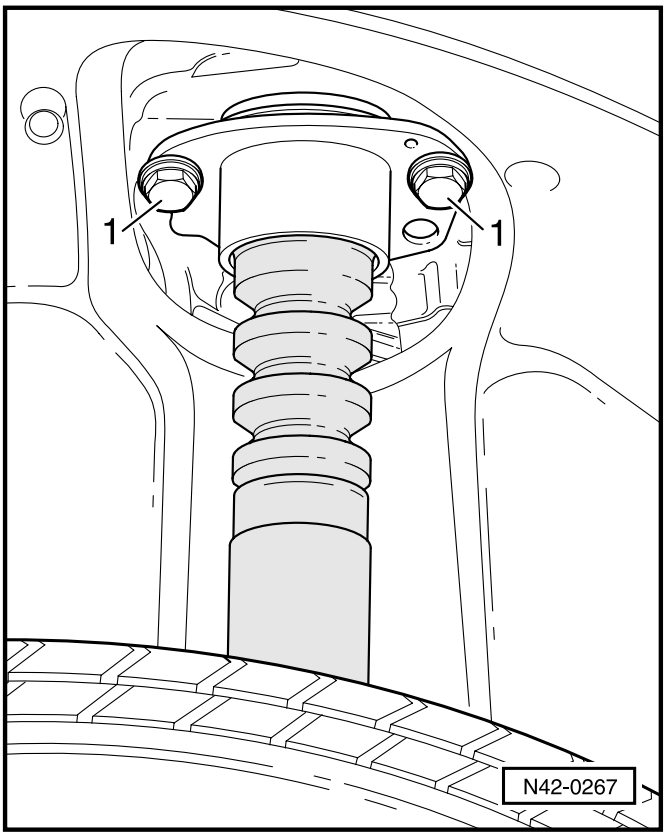
Special tools, testers and aids required

- Tester for brake pressure regulator, e.g. V.A.G 1310
- Gearbox jack with attachment, e.g. V.A.G 1383 A with V.A.G 1359/2
- Brake filling and bleeding appliance, e.g. ROMESS S 15
- Sealing plug for brake line
- Brake fluid ⇒ page 00-8
- Assembly paste G 052 150 A2

Removing

Note:

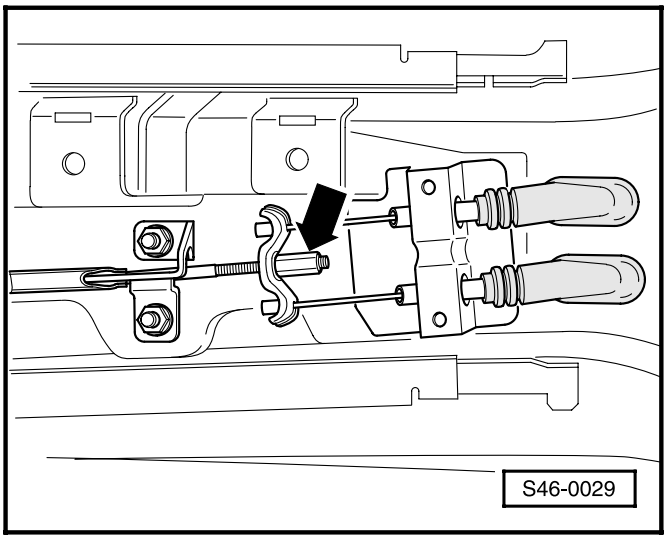
To remove the rear suspension, do not slacken bearing bracket at the body otherwise it is necessary to check the wheel toe of the rear suspension and to align if necessary.



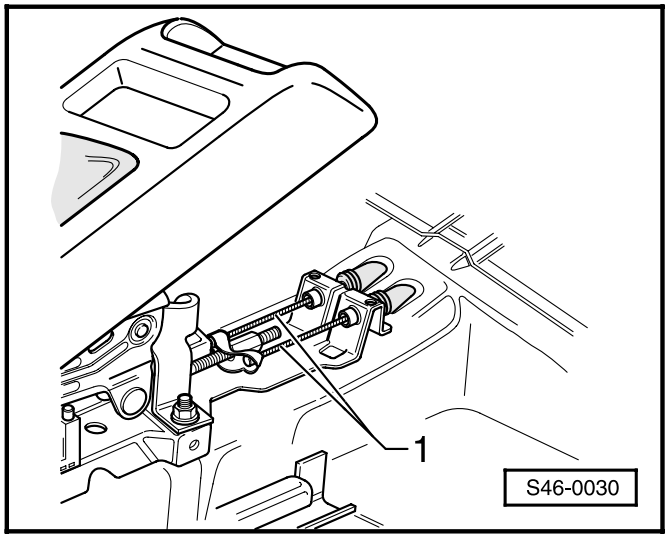
◄- Remove bolts -1- with vehicle standing on its wheels. Jack up vehicle sufficiently, if necessary, until the bolts are accessible.

- Jack up vehicle to fitting height so that no load is pressing on the coil spring.
- Take off wheels.
- Release handbrake.
- Tilt forward rear centre console, remove if necessary.

⇒ Body Fitting Work; Repair Group 68; Interior Equipment

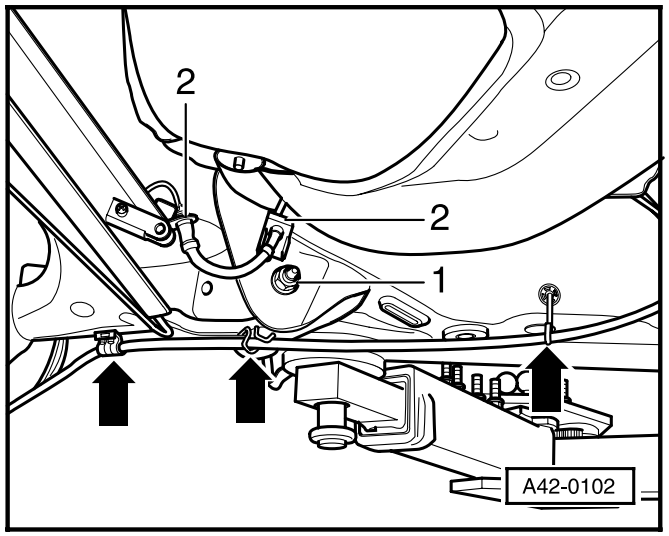


◄- Slacken adjusting nut -arrow-.



◄- Detach handbrake cables -1- from handbrake lever.

- Pull handbrake cables out of the guide tubes.



◄- Unclip brake cables -arrows-.

- Detach clips -2- from brake hose fixture and

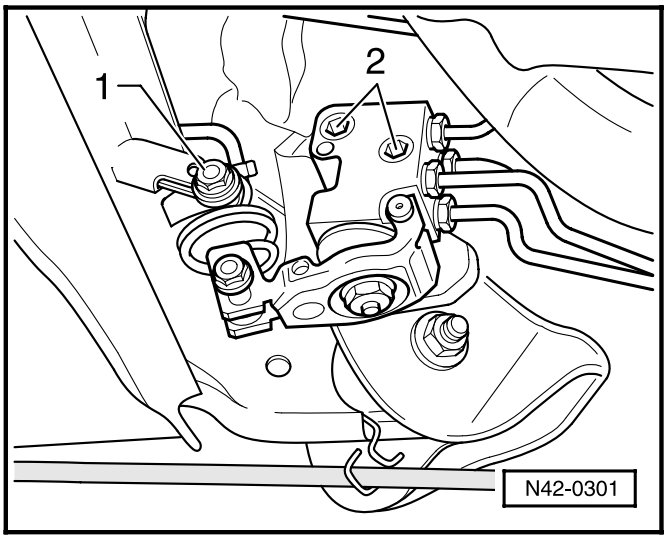
- Separate brake lines.

Note:

Seal lines with plugs.

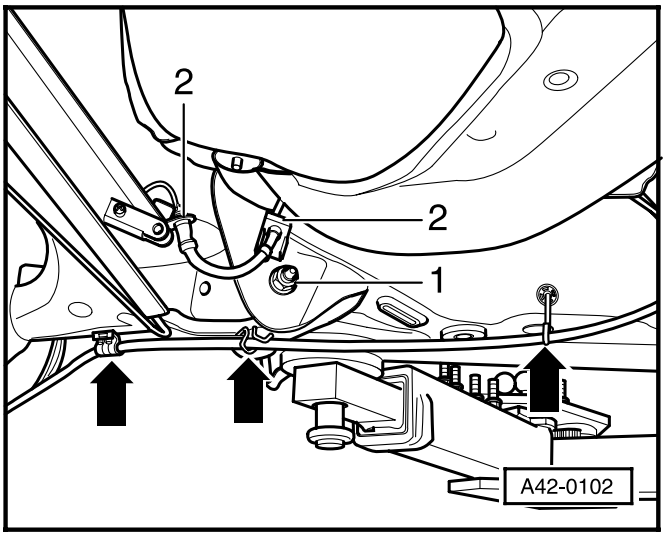
- Unplug connectors of wheel speed sensors.

- Unclip cable for wheel speed sensor from the fixture.



Only on models with load-sensitive brake pressure regulator (without ABS):

◄- Unscrew bolt -1- for brake pressure regulator.



Continued for all models:

- Support rear axle with gearbox lifter and adapter, e.g. V.A.G 1383 A with V.A.G 1359/2.

◄- Unscrew hexagon bolts -1- of the bonded rubber bush and lower rear axle.

Installing

- Before inserting the rear axle, grease the kidney-shaped cavities of the bonded rubber bushes with assembly paste G 052 150 A2.

Installation is carried out in the reverse order.

Notes:

- *When tightening the hexagon bolt of the bonded rubber bush, the axle beam must be in the horizontal position (unladen weight condition).*
- *When installing the handbrake cables, pay attention to Fitting location ⇒ page 46-18.*

- Bleed brake system ⇒ from page 47-18.

- Inspect load-sensitive brake pressure regulator, if fitted, and adjust if necessary ⇒ page 47-16.

After completing installation, it is necessary to check the position of the steering wheel during a road test.

If the steering wheel is not straight, carry out a check of the wheel alignment!

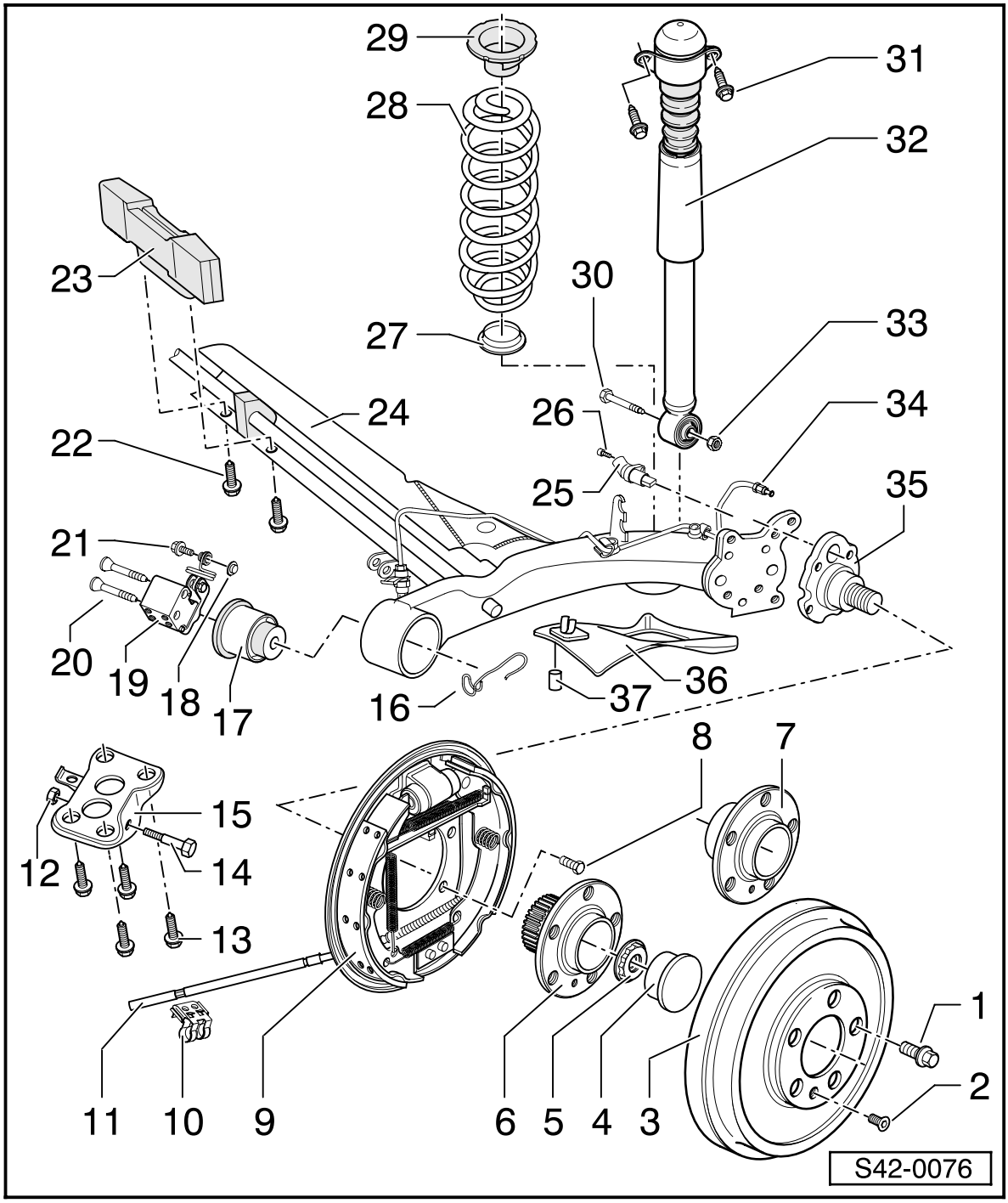
Note:

After slackening or replacing the bearing bracket, check total wheel toe of rear axle, and align if necessary.

Tightening torques:

Shock absorber to body **Use new bolts!**	30 Nm + 90°
Rear axle to bearing bracket **Use new nuts and bolts!**	45 Nm + 90°
Bolts attaching brake lines	14 Nm

Summary of components of rear axle



Notes:

- *Welding and straightening on axle body and axle studs not allowed.*
- *Always replace the self-locking nuts and screws.*
- *Tighten pipe screws of the brake lines to 14 Nm.*

1 - Wheel bolt, 120 Nm

2 - Screw, 4 Nm

3 - Brake drum

- reset brake before removing the brake drum ⇒ page 42-24, Fig. 1

4 - Cap

- replace after each removal
- pressing off ⇒ page 24-25, Fig. 2 and 3
- inserting ⇒ page 42-27, Fig. 8

5 - Twelve-point nut, self-locking, 70 Nm and torque a further 40°
- Replace each time removed

6 - Wheel hub with wheel bearing and pulse rotor
- Only on models with ABS
- Wheel bearing and wheel hub are installed together in a housing
- This wheel bearing/wheel hub unit requires no maintenance and is free of play. It is not possible to carry out any setting or servicing work!
- Removing and installing ⇒ from page 42-23

7 - Wheel hub with wheel bearing without pulse rotor
- Only on models without ABS
- Wheel bearing and wheel hub are installed together in a housing
- This wheel bearing/wheel hub unit requires no maintenance and is free of play. It is not possible to carry out any setting or servicing work!
- Removing and installing ⇒ from page 42-23

8 - Bolt + washer, 50 Nm and torque a further 60°
- Replace each time removed

9 - Brake carrier with brake shoe

10 - Bracket for handbrake cable
- Replace

11 - Handbrake cable

12 - Hexagon nut, self-locking
- Replace each time removed

13 - Hexagon bolt, self-locking, 30 Nm and torque a further 90°
- Replace each time removed
- If thread of welded nut is damaged, thread can be repaired with Heli-Coil threaded insert. Pay attention to manufacturer's instructions.
- Reworking of thread of welded nut is permissible at not more than 2 bolted connection points on each side of vehicle.

14 - Hexagon bolt, 45 Nm and torque a further 90°
- Replace each time removed
- Insert from outside of vehicle
- When tightening hexagon bolt, axle beam should be horizontal (unladen weight condition)

15 - Bearing bracket for rear axle
- After installing, inspect total wheel toe of rear axle, and align if necessary
- Do not slacken if possible for removing rear axle

16 - Bracket for handbrake cable

17 - Bonded rubber bush
- Removing and installing ⇒ page 42-7

18 - Nut

19 - Brake pressure regulator
- Only on models without ABS
- Inspecting and setting ⇒ page 47-16

20 - Hexagon socket bolt, 20 Nm

21 - Hexagon bolt, 20 Nm

22 - Hexagon bolt, 20 Nm and torque a further 45°
- Replace each time removed

23 - Balancing weight

24 - Axle beam
- Contact surface and threaded holes for axle journal must be free of paint and dirt

25 - ABS wheel speed sensor
- Only on models with ABS

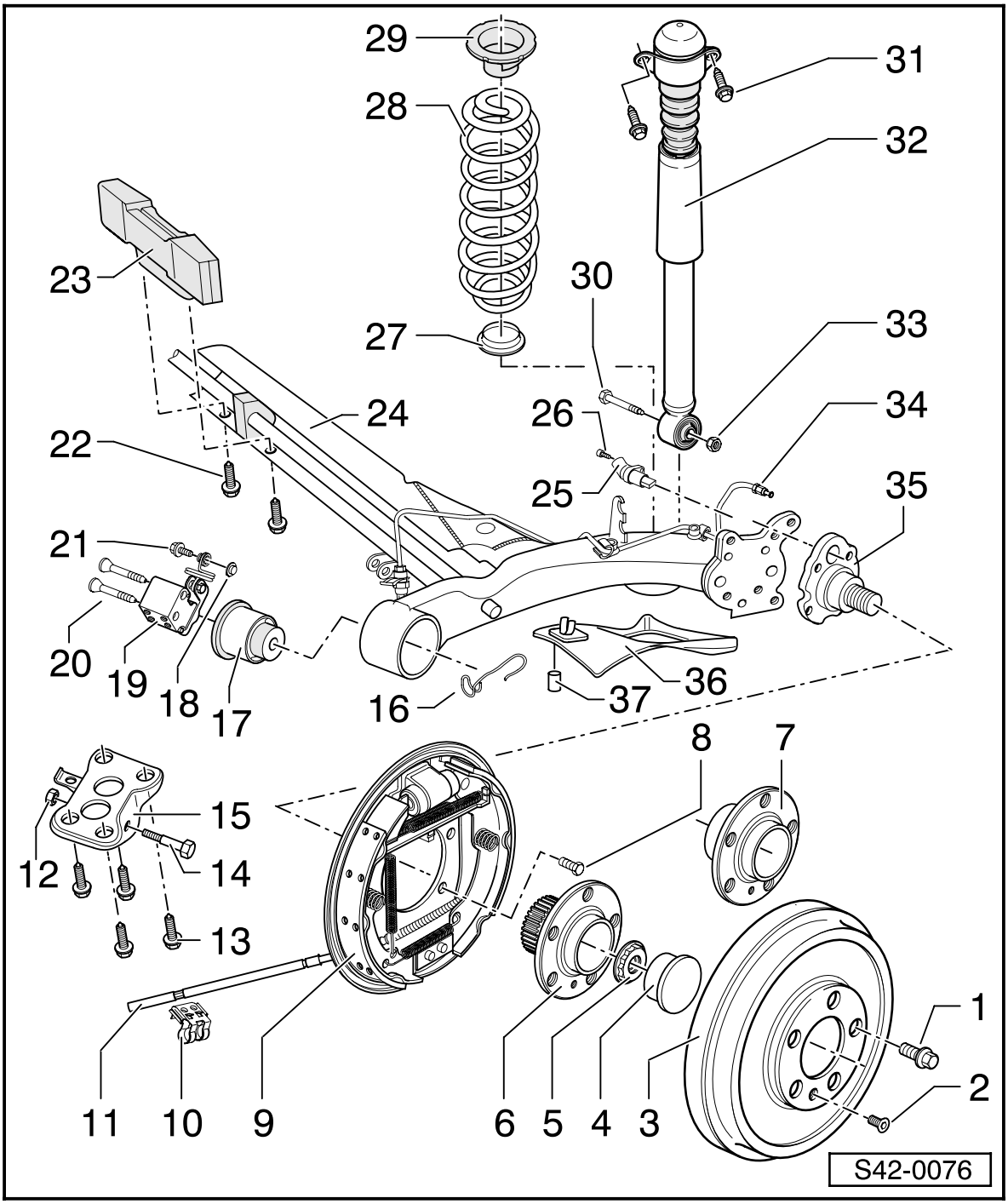
26 - Hexagon socket bolt, 8 Nm

27 - Bottom base

28 - Coil spring
- Removing and installing ⇒ page 42-10
- Inspect for paint damage, touch up any paint damage
- Assigning ⇒ Parts List
- Always replace on both sides of axle
- Fit only coil springs of same manufacturer to rear axle

29 - Top base
- Installing ⇒ Notes, page 42-10

30 - Hexagon bolt, 60 Nm
- Replace each time removed
- Insert from inside of vehicle
- When tightening, pay attention to installation angle of rear axle to shock absorber ⇒ Fig. 1
- Tighten hexagon bolt when vehicle standing on its wheels and load of about 100 kg in boot



31 - Hexagon bolt, self-locking, 30 Nm and torque a further 90°

- Replace each time removed
- If thread of welded nut is damaged, thread can be repaired with Heli-Coil threaded insert. Pay attention to manufacturer's instructions.
- Reworking of thread of welded nut is permissible at not more than 1 bolted connection points on each side of vehicle.

32 - Shock absorber

- Can be replaced individually
- Removing and installing ⇒ page 42-10
- Assigning ⇒ Parts List
- Disposal ⇒ page 40-31
- Inspecting shock absorber ⇒ page 40-28
- Fit only shock absorbers of same make to rear axle

Note:

No provision made for servicing shock absorbers.

33 - Hexagon nut, self-locking,

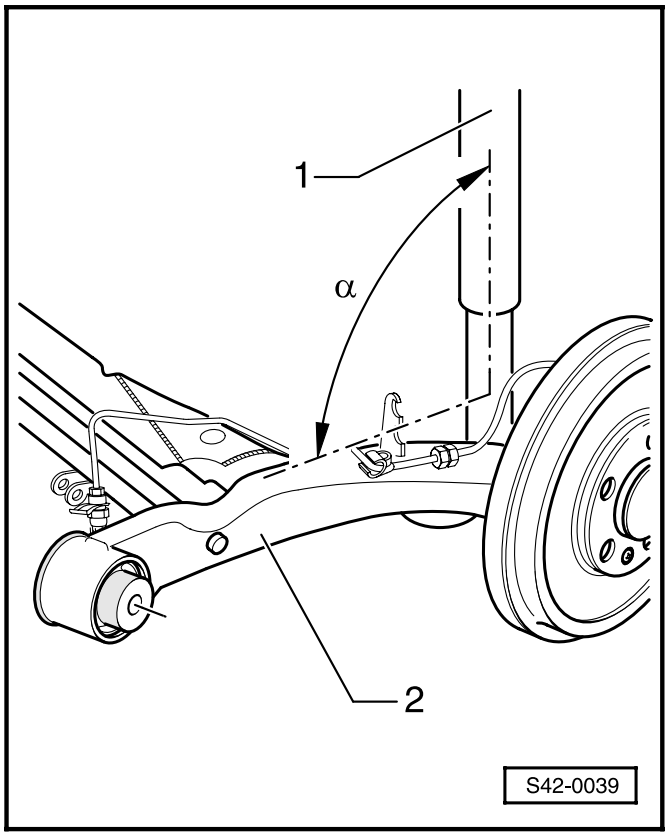
- Replace each time removed

34 - Brake line

35 - Axle stub
- ♦ No straightening work permitted!
- ♦ It is not permitted to re-tap thread.

36 - Stone chip guard

37 - Element for attaching stone chip guard
- ♦ Included in parts supplied with stone chip guard



◄ **Fig. 1 Installation angle of rear axle/shock absorber**

1 - Shock absorber

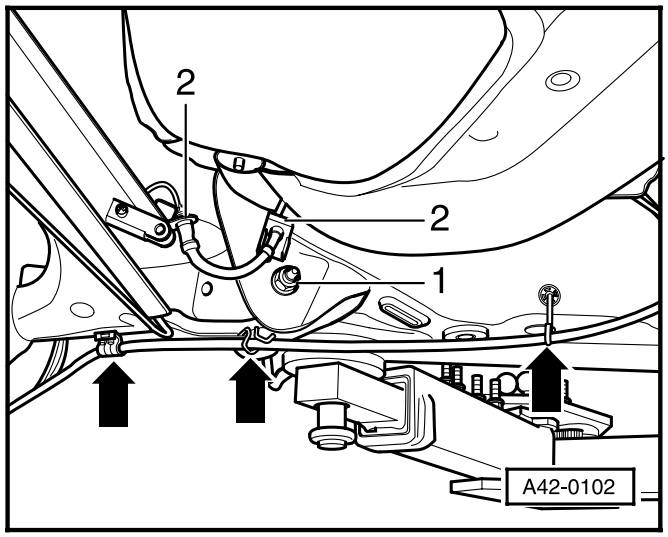
2 - Track control arm

α - approx. 104°

Removing and installing bonded rubber bush

Special tools, testers and aids required

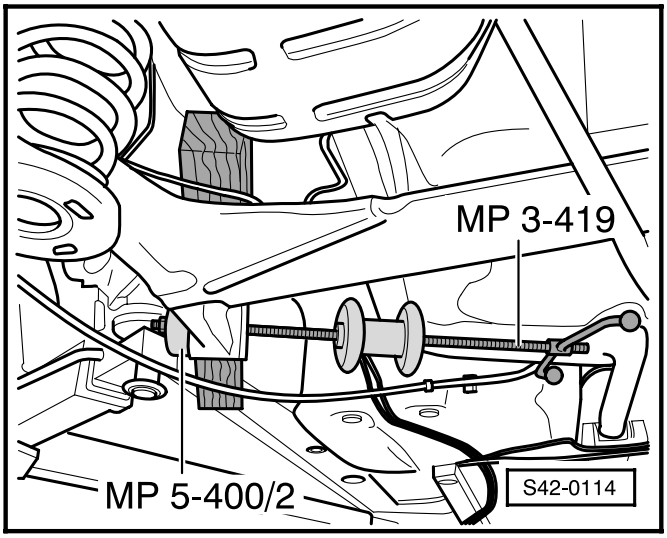
- ♦ Universal tool MP 3-419
- ♦ Thrust piece MP 5-400/1
- ♦ Thrust piece MP 5-400/2
- ♦ Supporting tube MP 5-400/3
- ♦ Installation device MP 5-401



Removing

◄ - Unclip brake cables -arrows-.

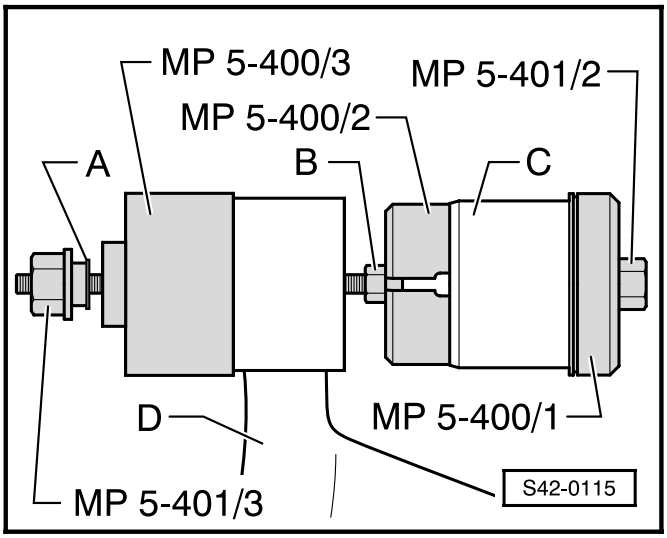
- Detach clips -2- of brake hose fixture.
- Unscrew hexagon bolt -1- of bonded rubber bush at both track control arms.



Note:

Place a soft block of wood of about 10 cm between axle beam and body in order to be able to fit on the special tool.

◄- Insert special tool and knock bonded rubber bush out of axle beam.



Installing

◄- Use special tool to pretension bonded rubber bush -C- and insert into the bearing seat of the axle beam -D-.

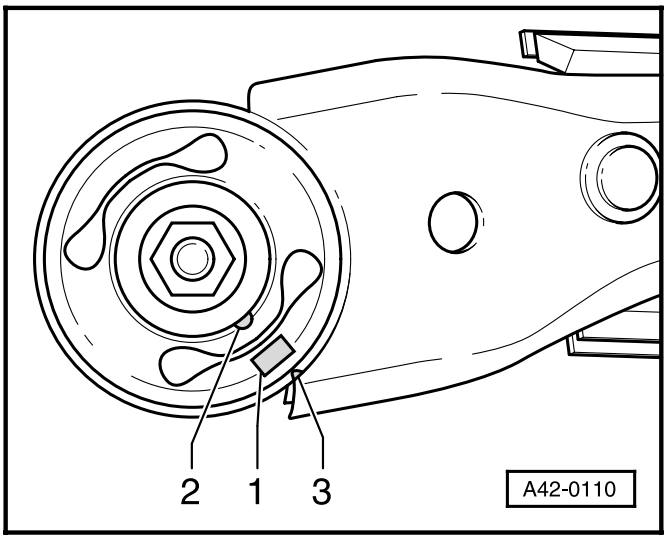
A - Washer of installation device MP 5-401

B - Hexagon nut of installation device MP 5-401

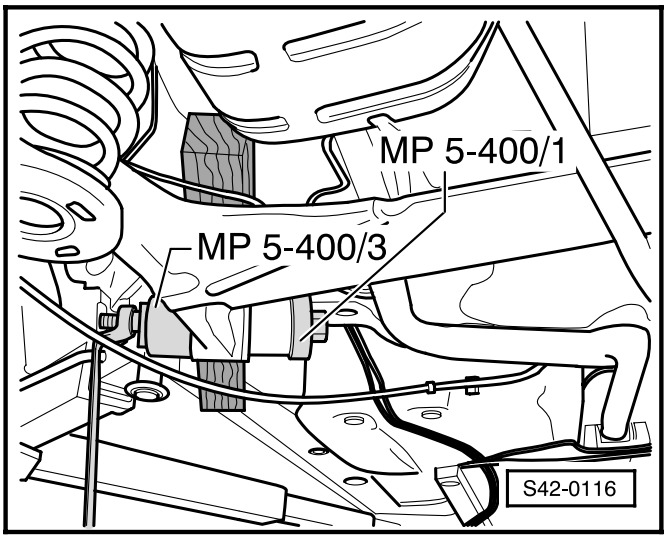
- Pay attention to installation position before drawing in ⇒ Fig. A42-0110, page 42-8.

Note:

♦ *It is essential to install the bonded rubber bush in the specified position in the rear axle beam otherwise this will result in a deterioration in the handling of the car when cornering.*



◄- Align orientation studs -1- and orientation bead -2- to edge of track control arm -3-.

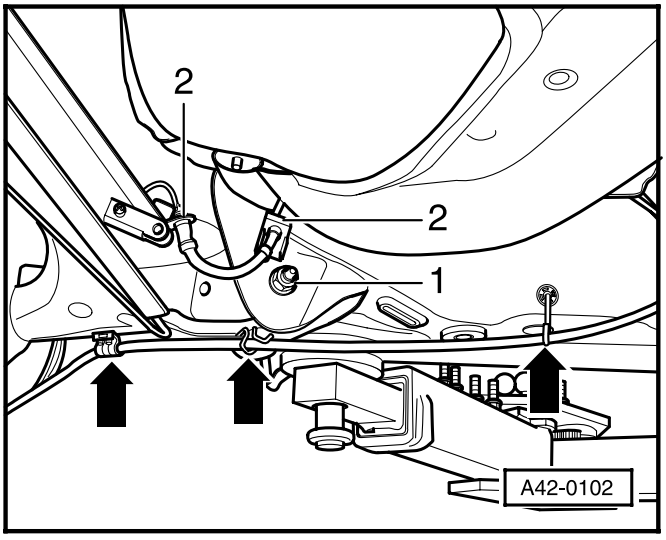


◄- Insert bonded rubber bush into axle beam and then draw in as shown in the illustration.

- Inspect Fitting location ⇒ Fig. A42-0110, page 42-8.

- Remove soft wooden block between axle beam and body.

- Insert axle beam with bonded rubber bush into bearing bracket.



◄- Insert hexagon bolt into the bearing bracket/ bonded rubber bush from the outside of the vehicle, screw on hexagon nut -1- and tighten fully.

Tightening torque: 45 Nm + torque a further 90°

Note:

When tightening the hexagon bolt of the bonded rubber bush, the axle beam must be in horizontal position (unladen weight condition).

- Push on clips -2- of brake hose fixture.

Note:

When installing the handbrake cables, pay attention to Fitting location ⇒ page 46-18.

- Clip brake cables into place -arrows-.

- Fit on wheels and lower vehicle.

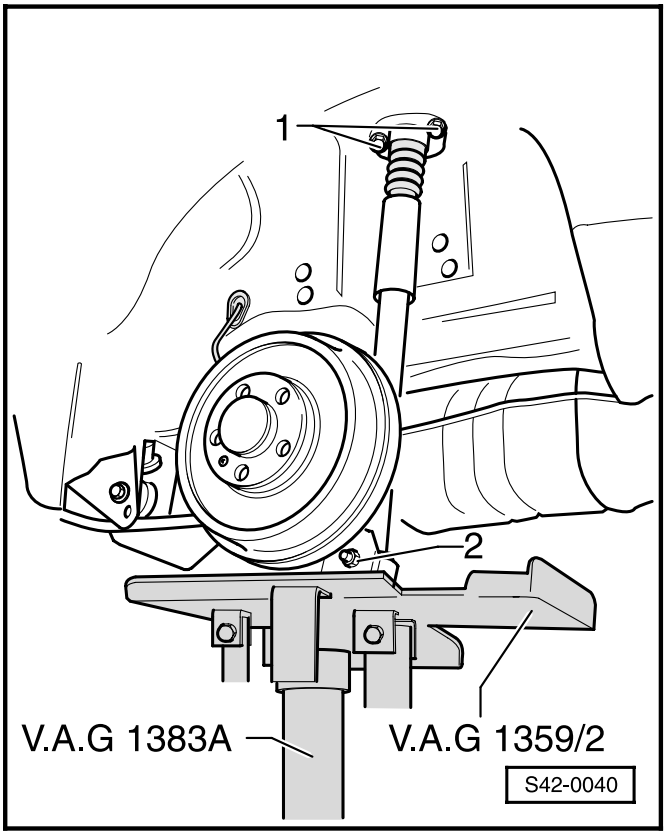
Removing and installing shock absorber/spring

Special tools, testers and aids required

- Gearbox lifter with adapter, e.g. V.A.G 1383 A with V.A.G 1359/2

Notes:

- *It is not necessary to take out the coil spring in order to remove the shock absorber.*
- *It is not necessary to take out the shock absorber in order to remove the coil spring.*



Removing shock absorber

- Take off wheel trim or pull off cap on light-alloy wheels (hook for removing cap included in car tool kit).
- Take off wheel and raise vehicle.

◄ - Unscrew bolts -1- and -2- and take out shock absorber.

Removing spring

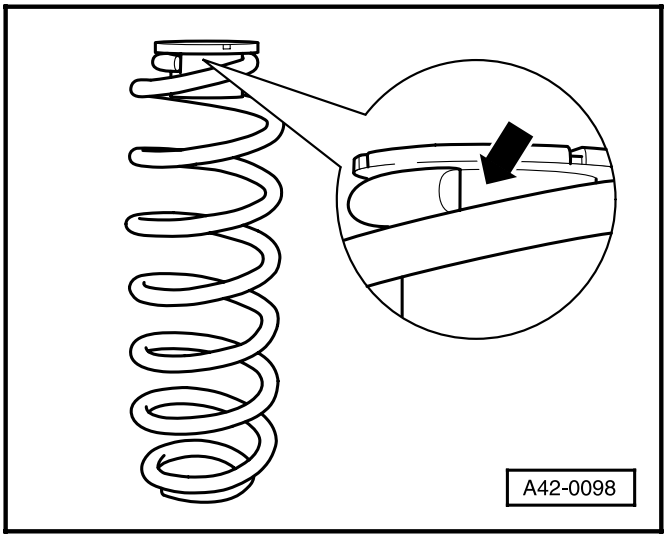
- Take off wheel trim or pull off cap on light-alloy wheels (hook for removing cap included in car tool kit).
- Take off wheel and raise vehicle.
- Separate plug connection of wheel speed sensor cable.
- Unscrew bolt -2-.
- Lower gearbox lifter and take out spring.

Installing

Installation is carried out in the reverse order.

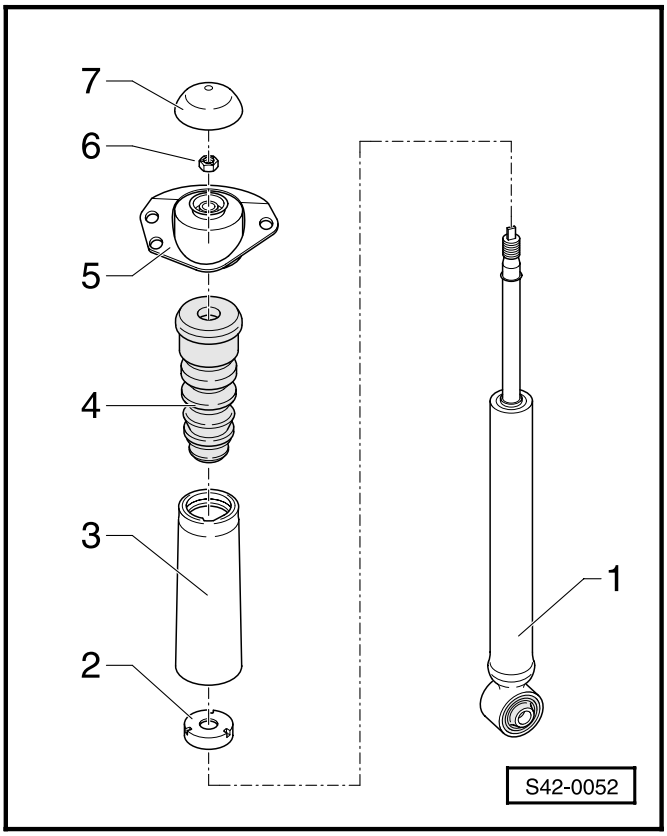
Notes:

- *Ensure that the top base (rubber) for the spring is correctly inserted when placing into the mount of the body.*
- *Pay attention to the correct colour coding.*
- *The start of the coil at the bottom must always point toward the middle of the vehicle.*



◄ - Start of spring -arrow- must be positioned at the stop of the bottom base.

Disassembling and assembling shock absorber



1 - Shock absorber
- Can be replaced individually
- Removing and installing ⇒ page 42-10
- Assigning ⇒ Parts List
- Disposing ⇒ page 40-31
- Inspecting shock absorber ⇒ page 40-28

Note:

Shock absorbers must not be disassembled or repaired.

2 - Protective cap

3 - Protective tube

4 - Bump stop

5 - Top shock absorber bearing

6 - Self-locking hexagon nut, 25 Nm
- Replace each time removed
- Counterhold at the piston rod of the shock absorber for slackening and tightening the hexagon nut

7 - Cover

Servicing rear suspension - disc brakes

Removing and installing rear suspension

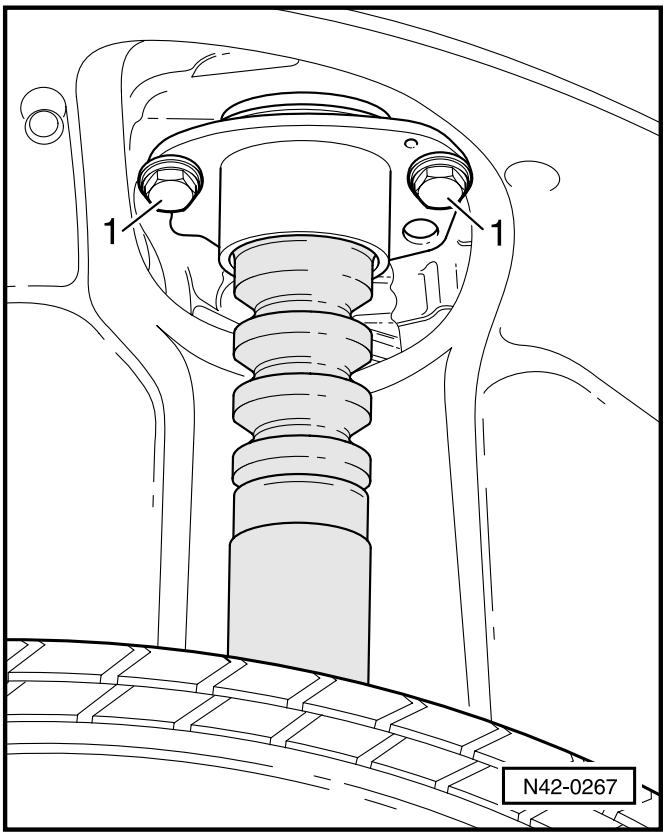
Special tools, testers and aids required

- Gearbox jack with attachment, e.g. V.A.G 1383 A with V.A.G 1359/2
- Brake filling and bleeding appliance, e.g. ROMESS S 15
- Sealing plug for brake line
- Brake fluid ⇒ page 00-8
- Assembly paste G 052 150 A2

Removing

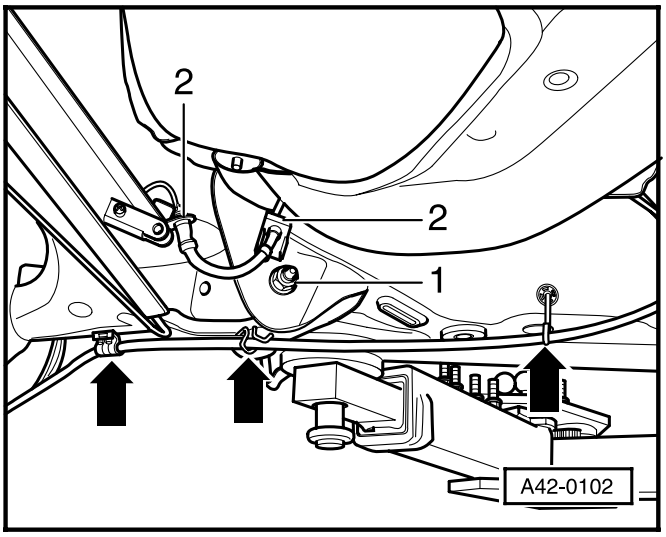
Note:

To remove the rear suspension, do not slacken bearing bracket at the body otherwise it is necessary to check the total wheel toe of the rear suspension and to align if necessary.



◄- Remove bolts -1- with vehicle standing on its wheels. Jack up vehicle sufficiently, if necessary, until the bolts are accessible.

- Jack up vehicle to fitting height in order to take the load off the coil spring.
- Take off wheels.
- Release handbrake.



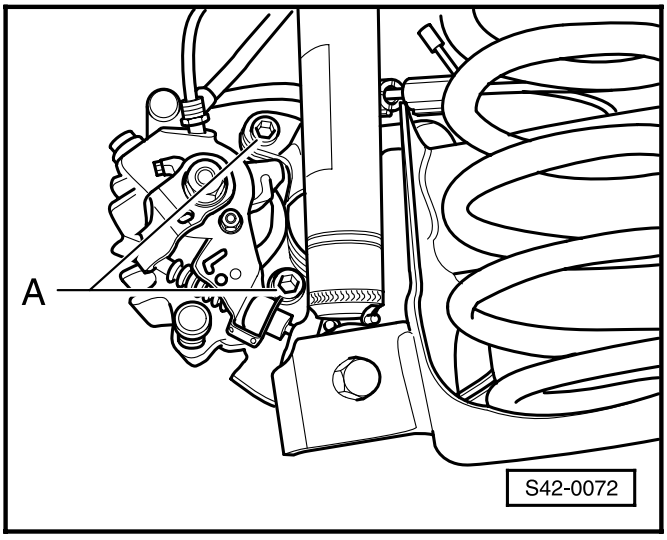
◄- Unclip brake cables -arrows-.

- Detach clips -2- of brake hose fixture.

- Separate brake lines.

Note:

Seal lines with plugs.

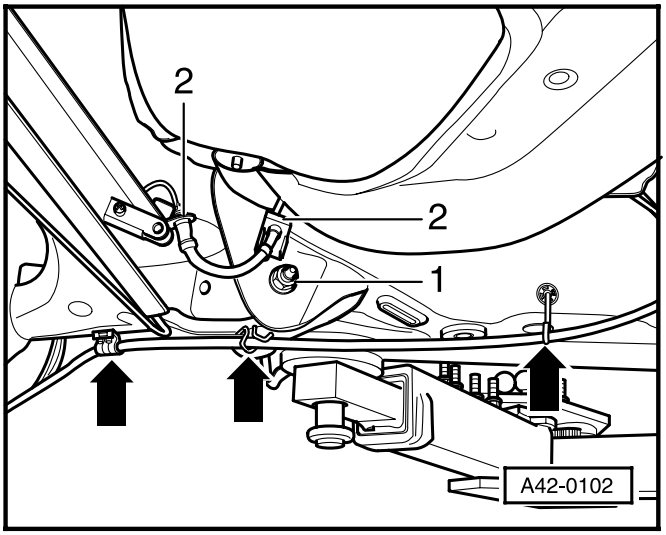


◄- Unscrew bolts -A- attaching brake caliper housing and attach brake caliper housing to body with a wire.

- Unplug connectors of the wheel speed sensors.

- Unclip cable for wheel speed sensor from the fixture.

- Support rear axle with gearbox lifter and adapter, e.g. V.A.G 1383 A with V.A.G 1359/2.



◄- Unscrew hexagon bolts -1- of the bonded rubber bush and lower rear axle.

Installing

- Before inserting the rear axle, grease the kidney-shaped cavities of the bonded rubber bushes with assembly paste G 052 150 A2.

Installation is carried out in the reverse order.

Notes:

- *When tightening the hexagon bolt of the bonded rubber bush, the axle beam must be in the horizontal position (unladen weight condition).*
- *When installing the handbrake cables, pay attention to Fitting location ⇒ page 46-18.*

- Bleed brake system ⇒ from page 47-18.

After completing installation, it is necessary to check the position of the steering wheel during a road test.

If the steering wheel is not straight, carry out a check of the wheel alignment!

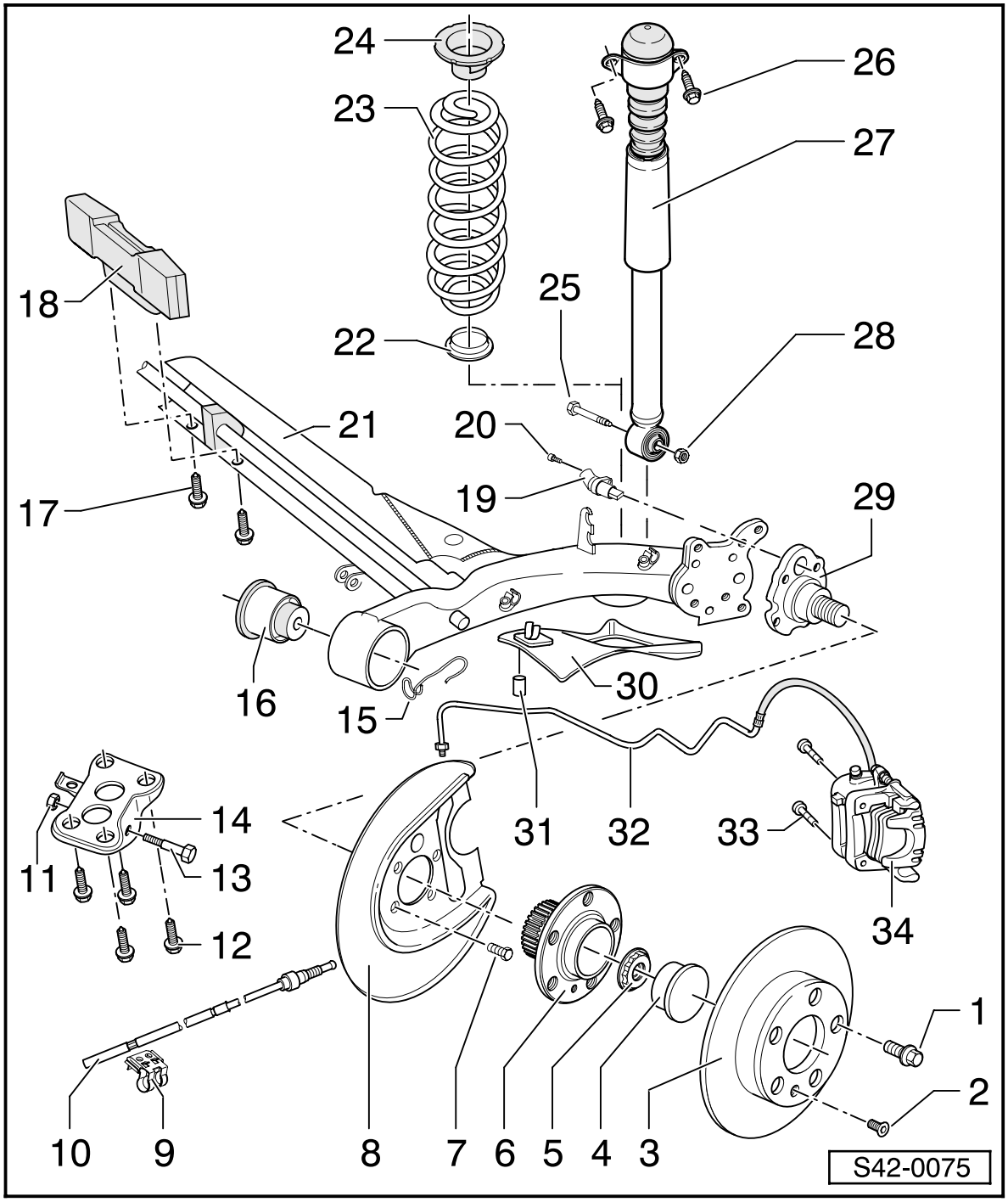
Note:

After slackening or replacing the bearing bracket, check total wheel toe of rear axle, and align if necessary.

Tightening torques:

Shock absorber to body **Use new bolts!**	30 Nm + 90°
Rear axle to bearing bracket **Use new nuts and bolts!**	45 Nm + 90°
Bolts attaching brake lines	14 Nm

Summary of components of rear axle



Notes:

- *Welding and straightening on axle body and axle studs not allowed.*
- *Always replace the self-locking nuts and screws.*
- *Tighten pipe screws of the brake lines to 14 Nm.*

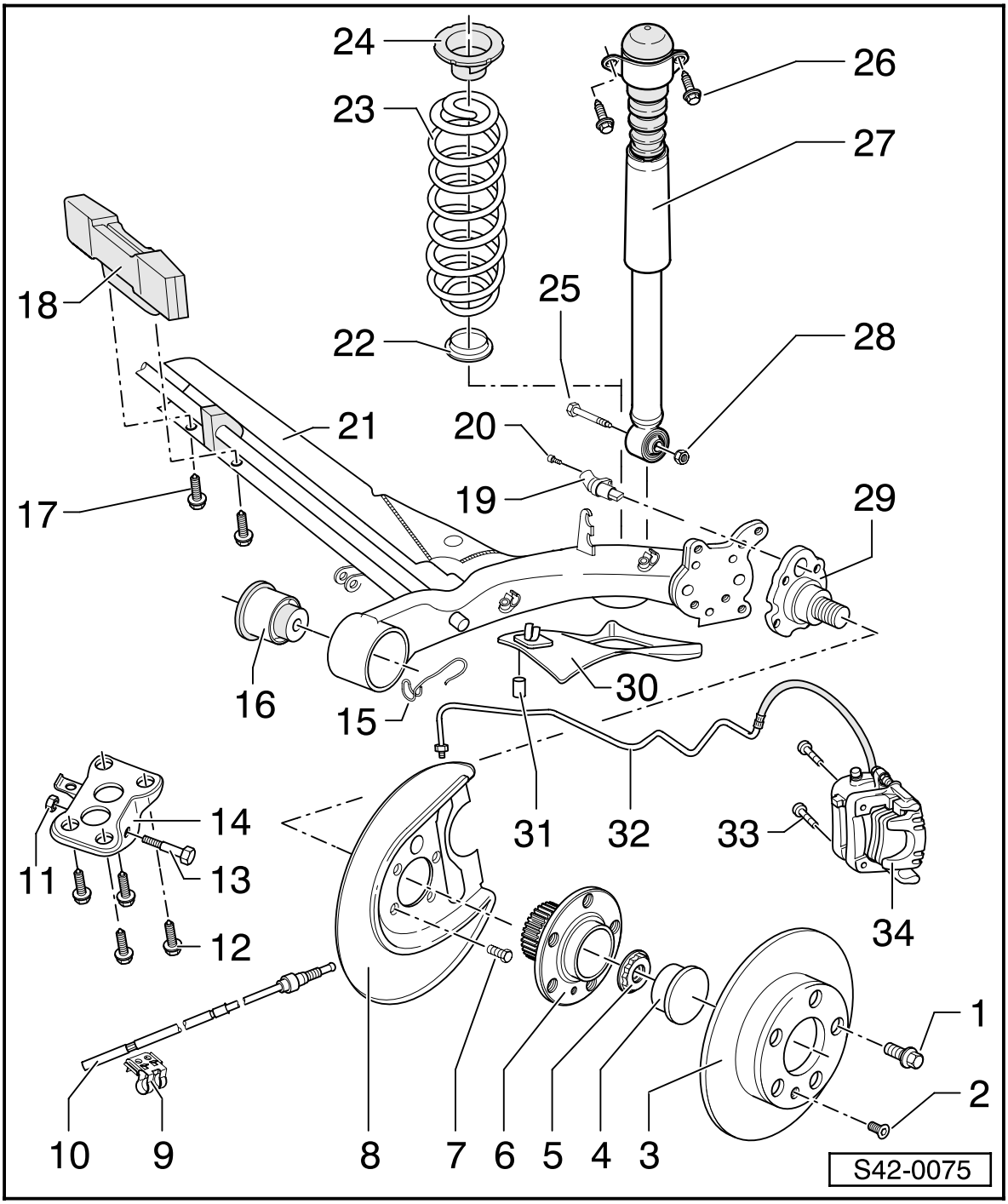
1 - Wheel bolt, 120 Nm

2 - Screw, 4 Nm

3 - Brake disc

4 - Cap
- replace after each removal
- pressing off ⇒ page 42-29, Fig. 1 and 2
- inserting ⇒ page 42-31, Fig. 8

5 - Self-locking twelve-point nut, 70 Nm and tighten a further 40°
- replace after each removal



6 - Wheel hub with wheel bearing and pulse rotor
- Only on models with ABS
- Wheel bearing and wheel hub are installed together in a housing
- This wheel bearing/wheel hub unit requires no maintenance and is free of play. It is not possible to carry out any setting or servicing work!
- Removing and installing ⇒ from page 42-28
- Always replace complete

7 - Bolt + washer, 30 Nm and torque a further 45°
- Replace each time removed

8 - Splash guard

9 - Bracket for handbrake cable
- Replace

10 - Handbrake cable

11 - Hexagon nut, self-locking
- Replace each time removed

12 - Hexagon bolt, self-locking, 30 Nm and torque a further 90°
- Replace each time removed
- If thread of welded nut is damaged, thread can be repaired with Heli-Coil threaded insert. Pay attention to manufacturer's instructions.
- Reworking of thread of welded nut is permissible at not more than 2 bolted connection points on each side of vehicle.

13 - Hexagon bolt, 40 Nm and torque a further 90°
- Replace each time removed
- Insert from outside of vehicle
- When tightening hexagon bolt, axle beam should be horizontal (unladen weight condition)

14 - Bearing bracket for rear axle
- After installing, inspect total wheel toe of rear axle, and align if necessary
- Do not slacken if possible for removing rear axle

15 - Bracket for handbrake cable

16 - Bonded rubber bush
- Removing and installing ⇒ page 42-18

17 - Hexagon bolt, 20 Nm and torque a further 45°
- Replace each time removed

18 - Balancing weight

19 - ABS wheel speed sensor
- Only on models with ABS

20 - Hexagon socket bolt, 8 Nm

21 - Axle beam
- Contact surface and threaded holes for axle journal must be free of paint and dirt

22 - Bottom base

23 - Coil spring
- Removing and installing ⇒ page 42-21
- Inspect for paint damage, touch up any paint damage
- Assigning ⇒ Parts List
- Always replace on both sides of axle
- Fit only coil springs of same manufacturer to rear axle

24 - Top base
- Installing ⇒ Notes, page 42-21

25 - Hexagon bolt, 60 Nm
- Replace each time removed
- Insert from inside of vehicle
- When tightening, pay attention to installation angle of rear axle to shock absorber ⇒ Fig. 1
- Tighten hexagon bolt when vehicle standing on its wheels and load of about 100 kg in boot

26 - Hexagon bolt, self-locking, 30 Nm and torque a further 90°
- Replace each time removed
- If thread of welded nut is damaged, thread can be repaired with Heli-Coil threaded insert. Pay attention to manufacturer's instructions.
- Reworking of thread of welded nut is permissible at not more than 1 bolted connection points on each side of vehicle.

27 - Shock absorber
- Can be replaced individually
- Removing and installing ⇒ page 42-21
- Assigning ⇒ Parts List
- Disposal ⇒ page 40-31
- Inspecting shock absorber ⇒ page 40-28
- Fit only shock absorbers of same make to rear axle

Note:

No provision made for servicing shock absorbers.

28 - Hexagon nut, self-locking,
- Replace each time removed

29 - Axle stub
- No straightening work permitted!
- It is not permitted to re-tap thread.

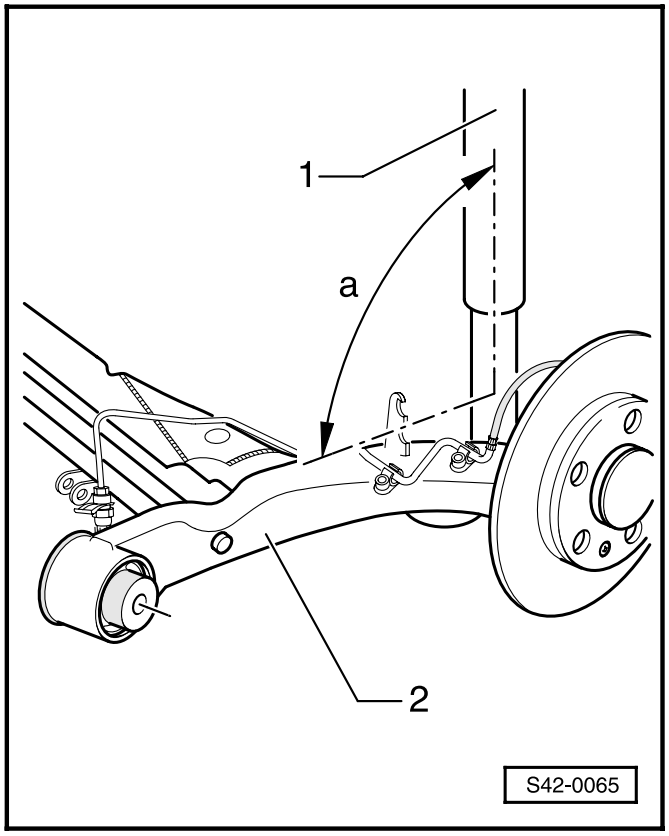
30 - Stone chip guard

31 - Element for attaching stone chip guard
- Included in parts supplied with stone chip guard

32 - Brake line

33 - Hexagon socket bolt, 30 Nm and torque a further 30°
- Replace each time removed

34 - Brake caliper
- Servicing ⇒ from page 47-11



◄ **Fig. 1 Installation angle of rear axle/shock absorber**

1 - Shock absorber

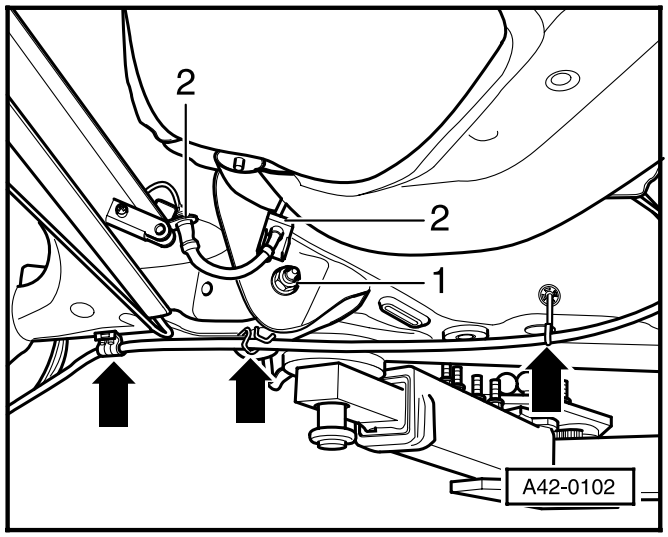
2 - Track control arm

α - approx. 104°

Removing and installing bonded rubber bush

Special tools, testers and aids required

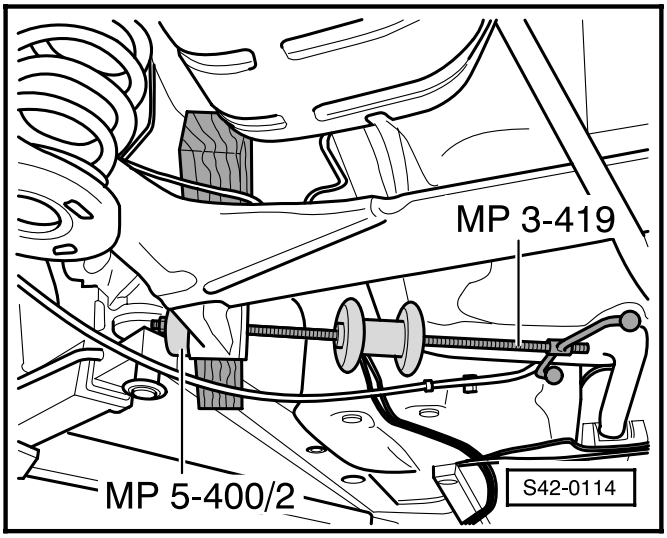
- Universal tool MP 3-419
- Thrust piece MP 5-400/1
- Thrust piece MP 5-400/2
- Supporting tube MP 5-400/3
- Installation device MP 5-401



Removing

◄ - Unclip brake cables -arrows-.

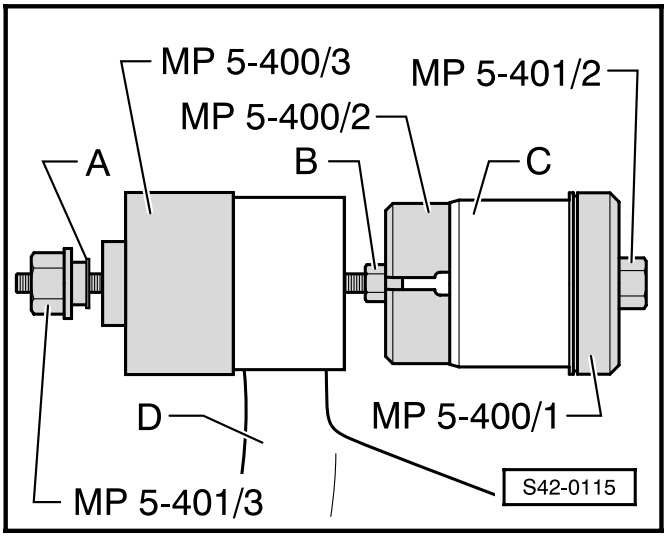
- Detach clips -2- of brake hose fixture.
- Unscrew hexagon bolt -1- of bonded rubber bush at both track control arms.



Note:

Place a soft block of wood of about 10 cm between axle beam and body in order to be able to fit on the special tool.

◄- Insert special tool and knock bonded rubber bush out of axle beam.



Installing

◄- Use special tool to pretension bonded rubber bush -C- and insert into the bearing seat of the axle beam -D-.

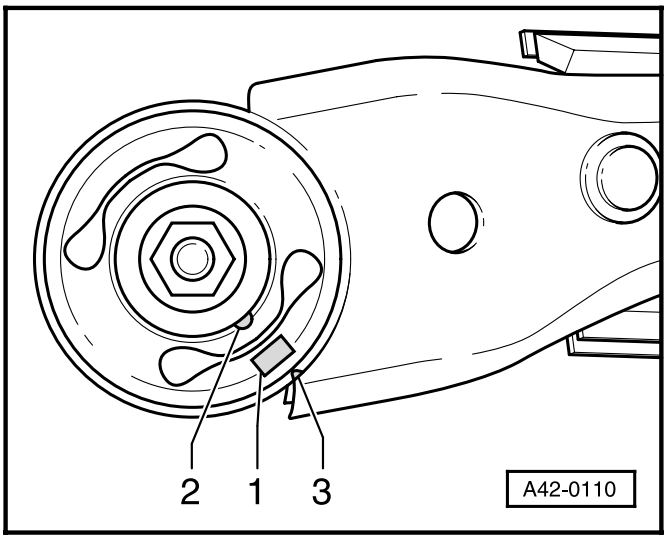
A - Washer of installation device MP 5-401

B - Hexagon nut of installation device MP 5-401

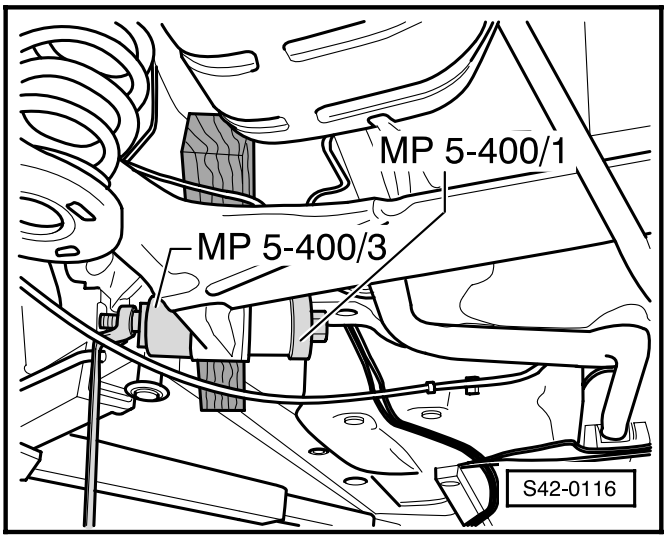
- Pay attention to installation position before drawing in ⇒ Fig. A42-0110, page 42-19.

Note:

♦ *It is essential to install the bonded rubber bush in the specified position in the rear axle beam otherwise this will result in a deterioration in the handling of the car when cornering.*



◄- Align orientation studs -1- and orientation bead -2- to edge of track control arm -3-.

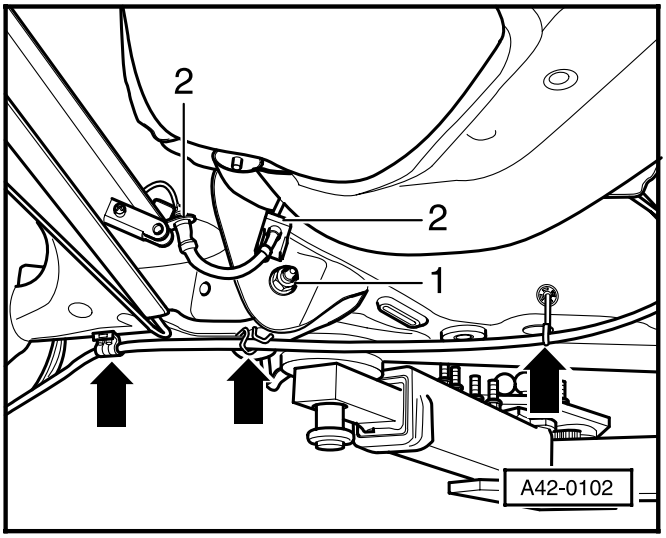


◄- Insert bonded rubber bush into axle beam and then draw in as shown in the illustration.

- Inspect Fitting location ⇒ Fig. A42-0110, page 42-19.

- Remove soft wooden block between axle beam and body.

- Insert axle beam with bonded rubber bush into bearing bracket.



◄- Insert hexagon bolt into the bearing bracket/ bonded rubber bush from the outside of the vehicle, screw on hexagon nut -1- and tighten fully.

Tightening torque: 45 Nm + torque a further 90°

Note:

When tightening the hexagon bolt of the bonded rubber bush, the axle beam must be in horizontal position (unladen weight condition).

- Push on clips -2- of brake hose fixture.

Note:

When installing the handbrake cables, pay attention to Fitting location ⇒ page 46-18.

- Clip brake cables into place -arrows-.

- Fit on wheels and lower vehicle.

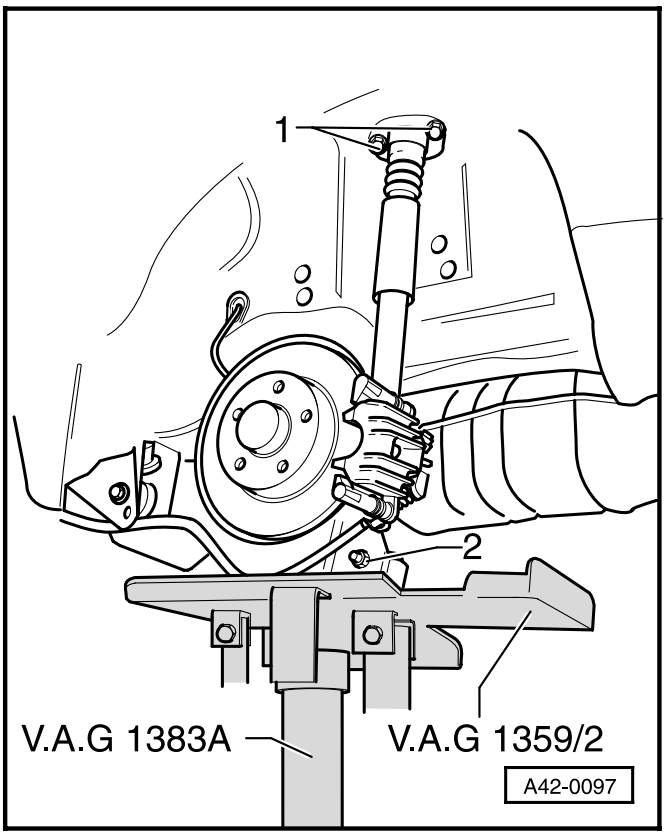
Removing and installing shock absorber/spring

Special tools, testers and aids required

- Gearbox lifter with adapter, e.g. V.A.G 1383 A with V.A.G 1359/2

Notes:

- *It is not necessary to take out the coil spring in order to remove the shock absorber.*
- *It is not necessary to take out the shock absorber in order to remove the coil spring.*



Removing shock absorber

- Take off wheel trim or pull off cap on light-alloy wheels (hook for removing cap included in car tool kit).
- Take off wheel and raise vehicle.

◄ - Unscrew bolts -1- and -2- and take out shock absorber.

Removing spring

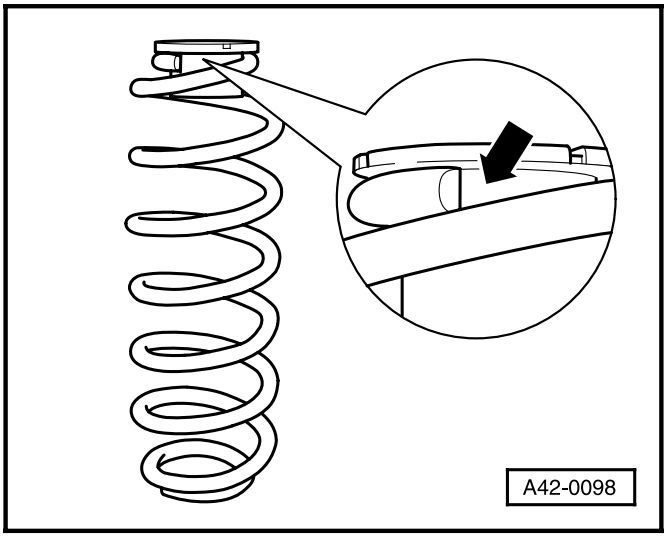
- Take off wheel trim or pull off cap on light-alloy wheels (hook for removing cap included in car tool kit).
- Take off wheel and raise vehicle.
- Separate plug connection of wheel speed sensor cable.
- Unscrew bolt -2-.
- Lower gearbox lifter and take out spring.

Installing

Installation is carried out in the reverse order.

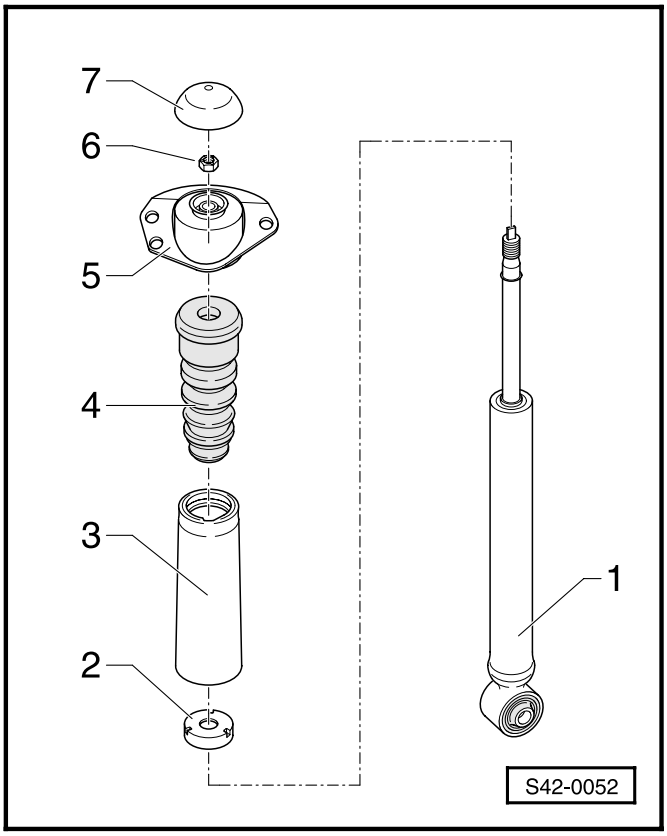
Notes:

- *Ensure that the top base (rubber) for the spring is correctly inserted when placing into the mount of the body.*
- *Pay attention to the correct colour coding.*
- *The start of the coil at the bottom must always point toward the middle of the vehicle.*



◄ - Start of spring -arrow- must be positioned at the stop of the bottom base.

Disassembling and assembling shock absorber



1 - Shock absorber
- Can be replaced individually
- Removing and installing ⇒ page 42-21
- Assigning ⇒ Parts List
- Disposing ⇒ page 40-31
- Inspecting shock absorber ⇒ page 40-28

Note:

Shock absorbers must not be disassembled or repaired.

2 - Protective cap

3 - Protective tube

4 - Bump stop

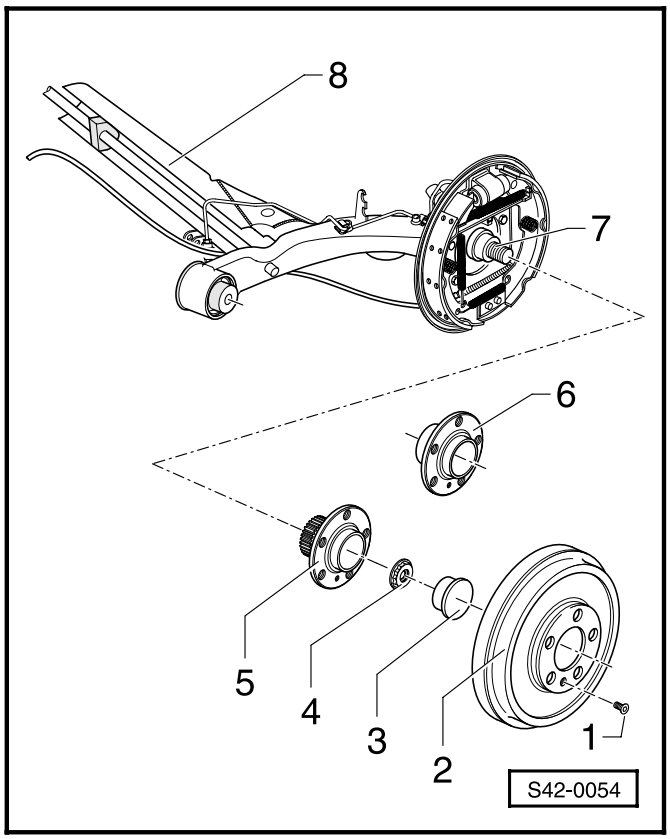
5 - Top shock absorber bearing

6 - Self-locking hexagon nut, 25 Nm
- Replace each time removed
- Counterhold at the piston rod of the shock absorber for slackening and tightening the hexagon nut

7 - Cover

Repairing the wheel bearing

Repairing the wheel bearing, vehicles with front-wheel-drive vehicles - drum brakes



Special tools, testers and aids required

- Drive bushing MP 3-427
- Assembly device MP 5-403
- Hub cover puller MP 5-404
- Puller Kukko 20/2
- Puller Kukko 204/1

1 - Screw, 4 Nm

2 - Brake drum
- reset brake before removing the brake drum ⇒ Fig. 1

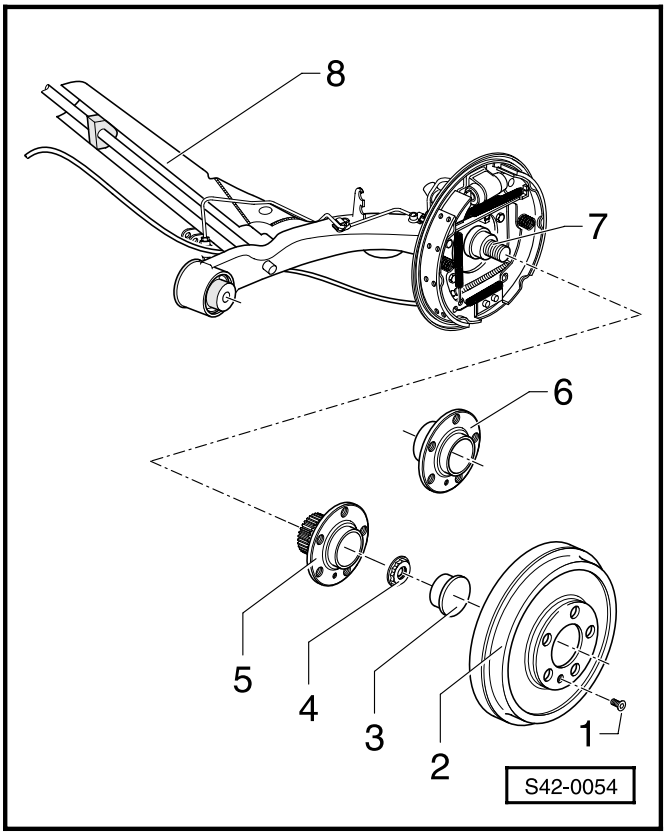
3 - Cap
- replace after each removal
- pressing off ⇒ Fig. 2 and 3
- inserting ⇒ Fig. 8

4 - Self-locking twelve-point nut, 175 Nm
- replace after each removal

5 - Wheel hub with wheel bearing and pulse rotor
- only on vehicles with ABS
- wheel hub and wheel bearing are fitted together in one housing
- the wheel hub and the wheel bearing are a single unit; it does not need servicing and is free of play; it is not possible to undertake any kind of adjustment or repair work on it
- replace completely after each removal
- Remove wheel hub with wheel bearing from axle stud ⇒ Fig. 4
- Pull the wheel hub with wheel bearing onto the axle stud ⇒ Fig. 6 and 7

Notes:

- *After pulling off the wheel hub with the wheel bearing, the inner ring of the bearing remains on the axle stud, then pull off the old inner ring of the bearing before pressing on the new wheel hub with wheel bearing ⇒ Fig. 5.*
- *The inner ring of the bearing is a component part of the new wheel hub with wheel bearing and is therefore not pressed on separately.*



6 - Wheel hub with wheel bearing without pulse rotor

- Only on models without ABS
- Wheel bearing and wheel hub are installed together in a housing
- This wheel bearing/wheel hub unit requires no maintenance and is free of play. It is not possible to carry out setting or repair work!
- Replace complete each time removed
- Pulling wheel hub and bearing off axle end ⇒ Fig. 4

Notes:

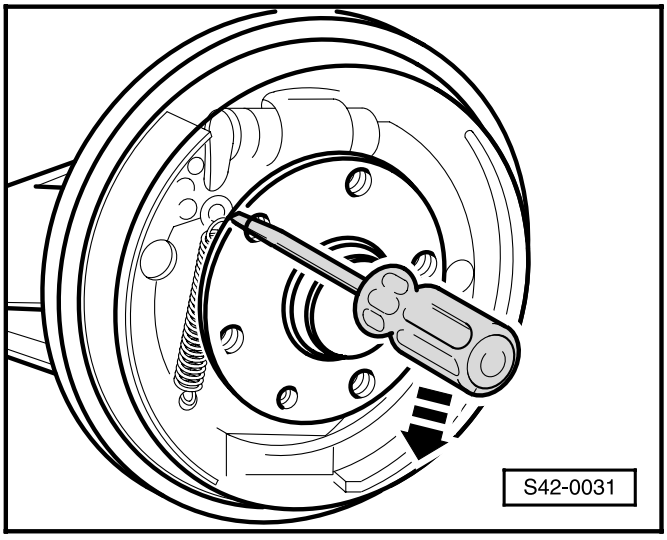
⇒ *Item 5*

- Fitting wheel hub and bearing onto axle end ⇒ Figs. 6 and 7

7 - Axle end

- It is not permitted to carry out straightening work
- It is not permitted to re-tap the thread

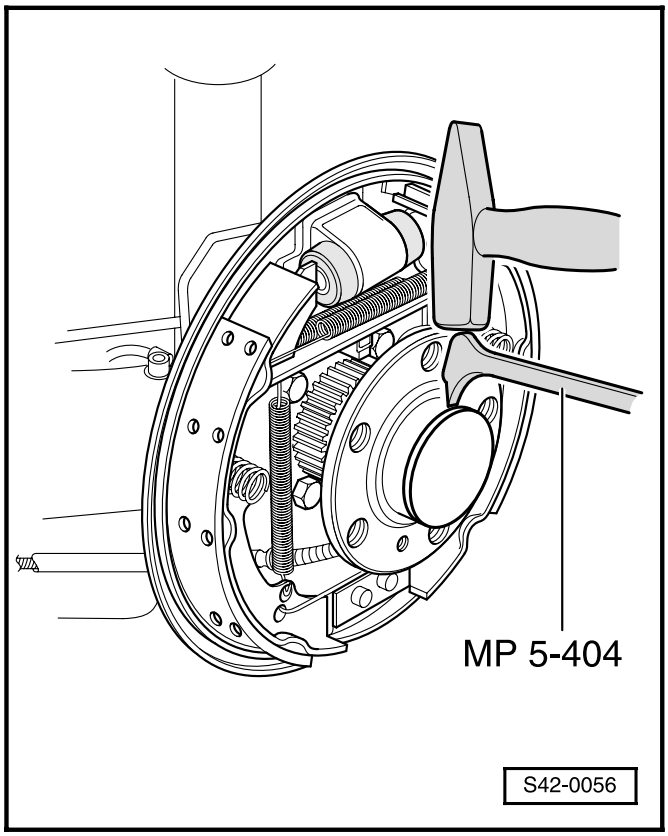
8 - Axle beam



◄ **Fig. 1 Moving back brake**

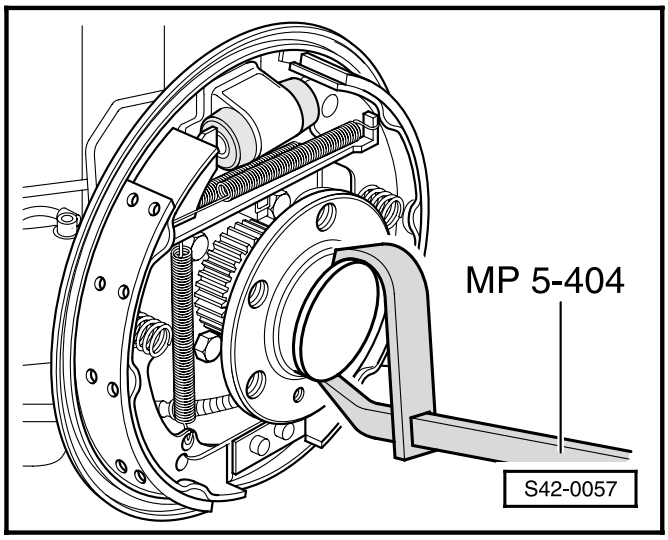
- To do this, insert the screwdriver through a hole in the brake drum and push the wedge up.

- Removing brake drum ⇒ page 46-6, Removing and installing rear brakes.

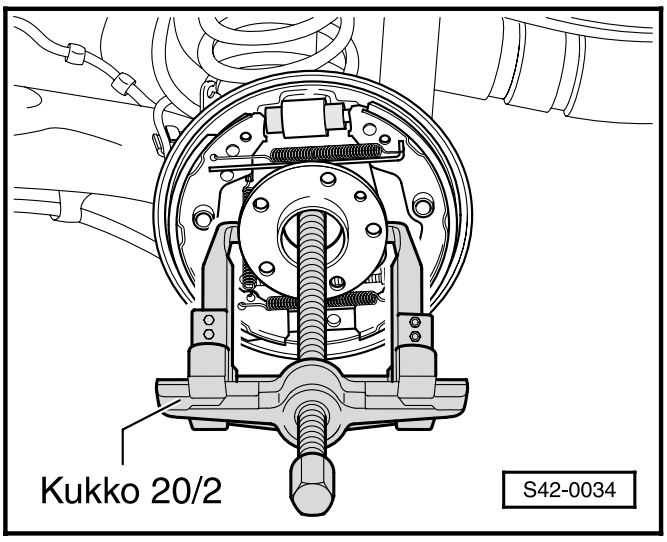


◄ **Fig. 2 Pressing off cap**

- Detach cap from its seat by striking with light blows on the claw.

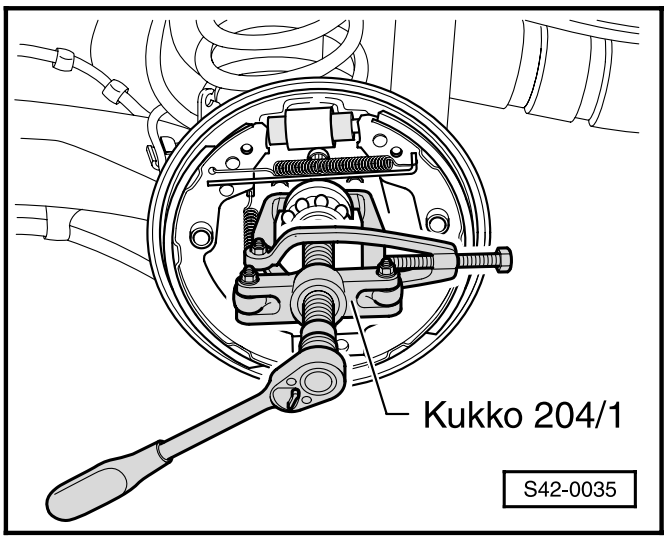


◄ **Fig. 3 Pressing off cap**



◄ **Fig. 4 Pulling wheel hub and wheel bearing off axle end**

Use a commercially available puller, e.g. Kukko 20/2.

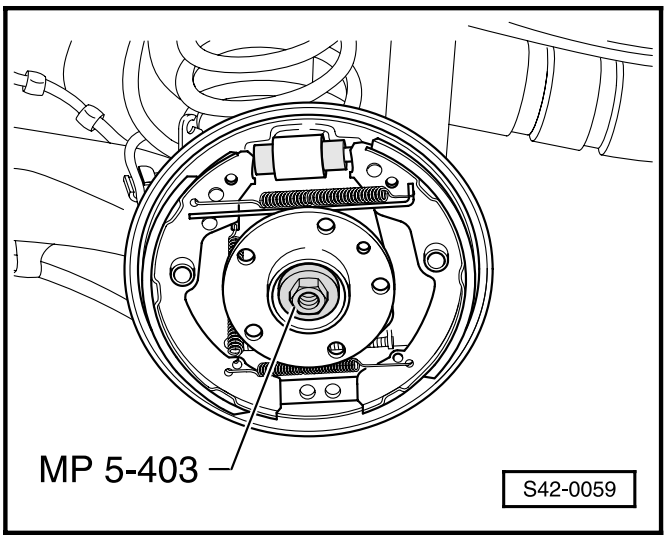


◄ **Fig. 5 Pulling bearing inner race off axle end**

Use a commercially available puller, e.g. Kukko 204/1.

Note:

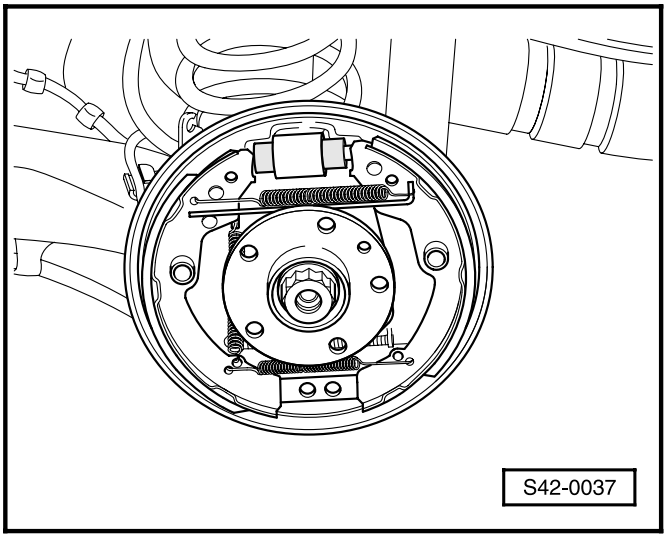
Do not damage the ABS sensor when pulling out the bearing inner race.



◄ **Fig. 6 Fitting wheel hub and wheel bearing onto axle end**

Use special tool MP 5-403.

- Fit wheel hub and wheel bearing as far as possible onto axle end.
- Screw on special tool MP 5-403 and pull on wheel hub and wheel bearing as far as the stop.

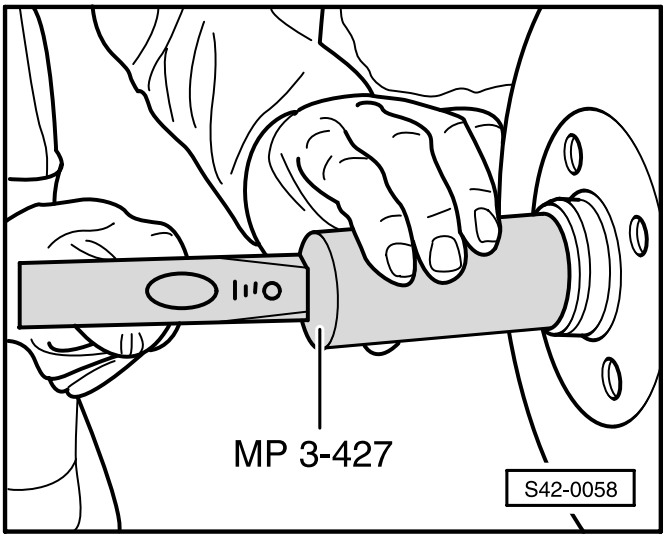


◄ **Fig. 7 Fitting wheel hub with wheel bearing onto axle stub**

- Remove special tool MP 5-403 and screw on new twelve-point collar nut and tighten fully.

  Tightening torque: 70 Nm + torque a further 40°

- Install brake drum ⇒ page 46-6, Removing and installing rear brakes.

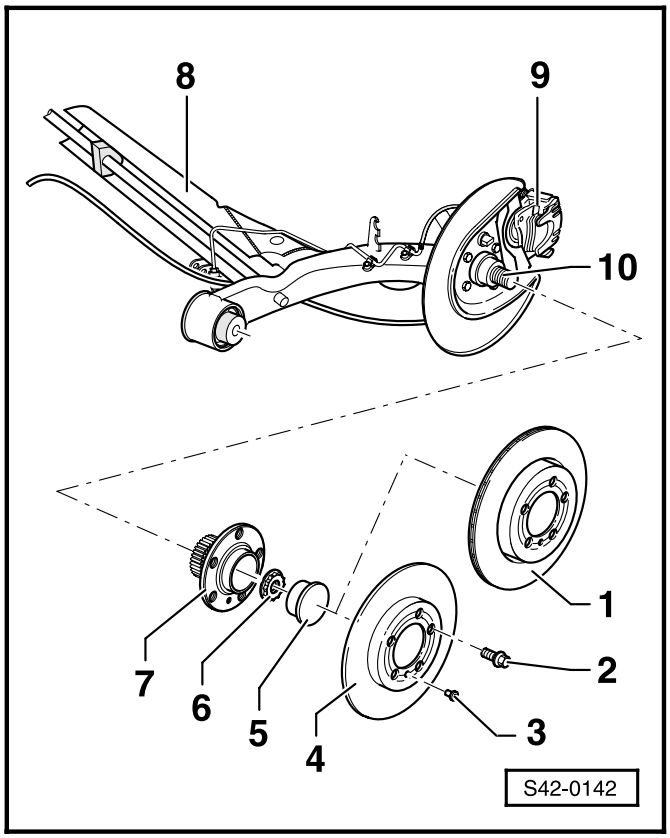


◄ **Fig. 8 Knocking in cap**

Notes:

- *Replace cap each time removed.*
- *If a cap is damaged, this allows moisture to get in. It is therefore essential to use the tool illustrated.*

Repairing the wheel bearing - Disc brake



Special tools, testers and aids required

- Drive bushing MP 3-427
- Assembly device MP 5-403
- Hub cover puller MP 5-404
- Puller Kukko 20/2
- Puller Kukko 204/1

1 - Brake disc, internally ventilated
- assignment ⇒ electronic catalogue of original parts

2 - Wheel bolt, 120 Nm

3 - Screw, 4 Nm

4 - Brake disc
- assignment ⇒ electronic catalogue of original parts

5 - Cap
- replace after each removal
- pressing off ⇒ Fig. 1 and 2
- inserting ⇒ Fig. 8

6 - Self-locking twelve-point nut, 70 Nm and tighten a further 40°
- replace after each removal

7 - Wheel hub with wheel bearing and pulse rotor
- only on vehicles with ABS
- wheel hub and wheel bearing are fitted together in one housing
- the wheel hub and the wheel bearing are a single unit; it does not need servicing and is free of play; it is not possible to undertake any kind of adjustment or repair work on it
- replace completely after each removal
- Remove wheel hub with wheel bearing from axle stud ⇒ Fig. 4
- Pull the wheel hub with wheel bearing onto the axle stud ⇒ Fig. 6 and 7

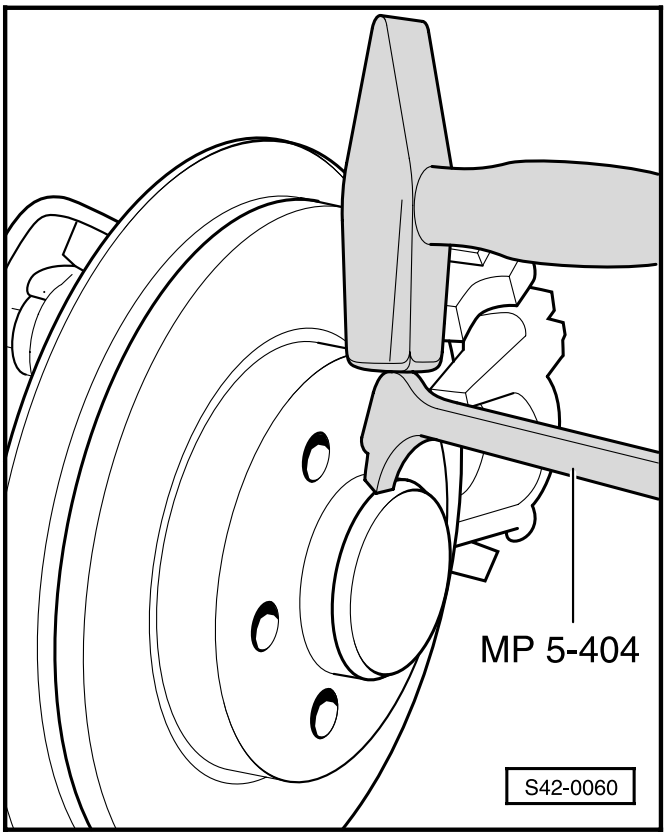
Notes:

- *After pulling off the wheel hub with the wheel bearing, the inner ring of the bearing remains on the axle stud, then pull off the old inner ring of the bearing before pressing on the new wheel hub with wheel bearing ⇒ Fig. 5.*
- *The inner ring of the bearing is a component part of the new wheel hub with wheel bearing and is therefore not pressed on separately.*

8 - Axle body
- removing and installing ⇒ page 42-12

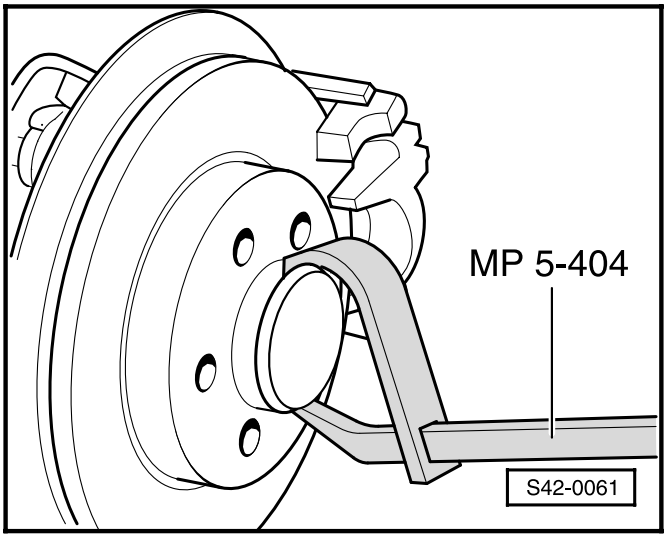
9 - Brake caliper
- removing ⇒ Fig. 3.

10 - Axle stud
- Straightening work is not allowed!
- Re-cutting the thread is not allowed.

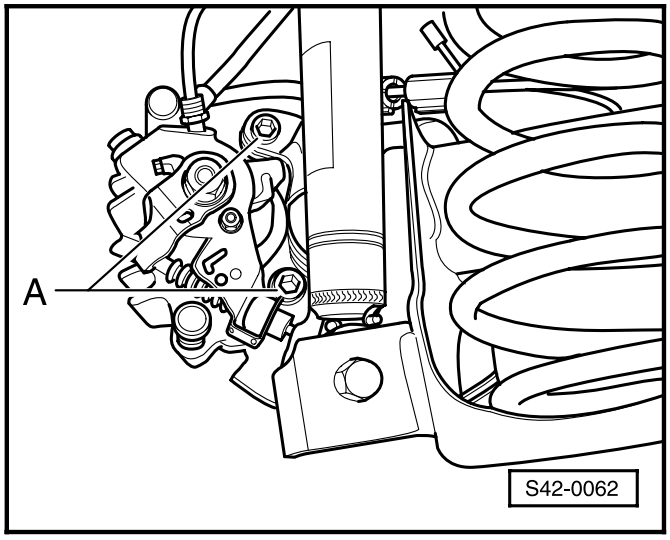


◄ **Fig. 1 Pressing off cap**

- Detach cap from the seat by applying light blows to the claw.



◄ **Fig. 2 Pressing off cap**



◀ **Fig. 6 Removing the brake caliper**

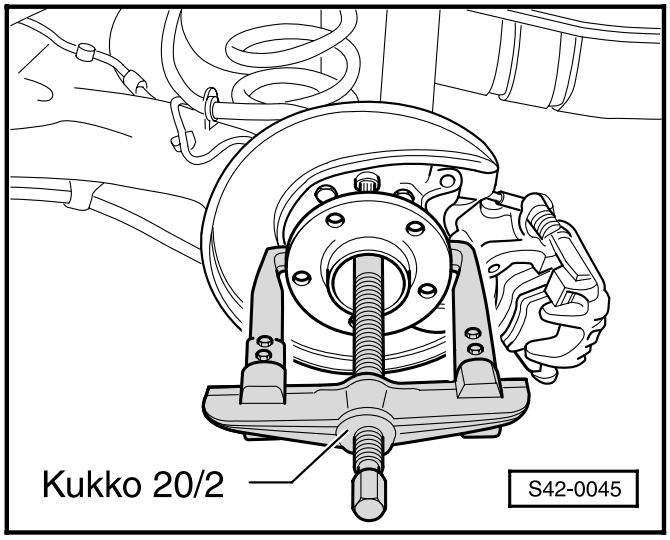
- Unscrew screws -A-, remove brake caliper and tie up with wire to the body.

Note:

Do not unscrew the brake hose to remove the brake caliper.

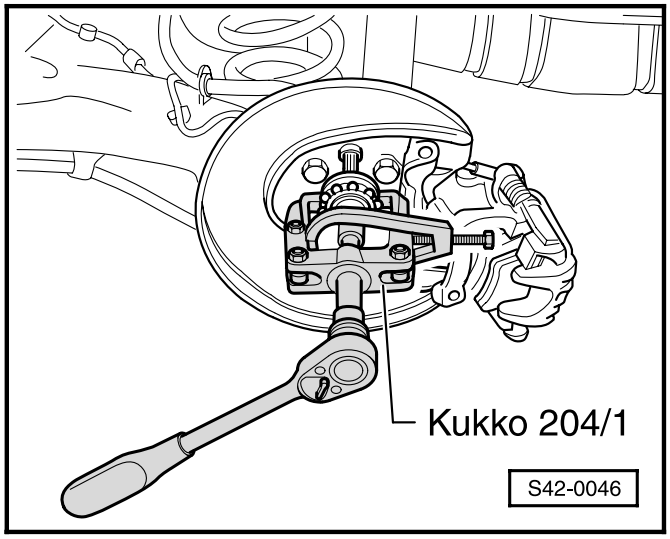
- Unscrew the fixing screws of the brake disc and remove brake disc.

- Unscrew twelve-point nut



◀ **Fig. 7 Removing wheel-bearing housing from axle stud**

Use puller (commercially available) Kukko 20/2.

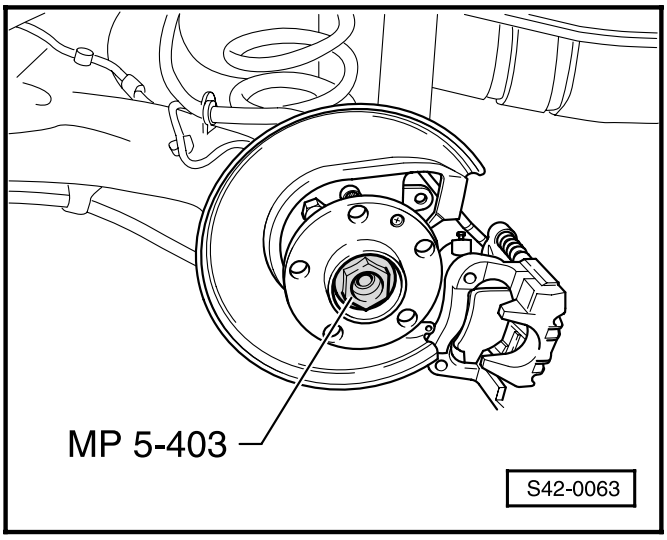


◀ **Fig. 8 Removing inner ring of the bearing from axle stud**

Use puller (commercially available) Kukko 204/1.

Note:

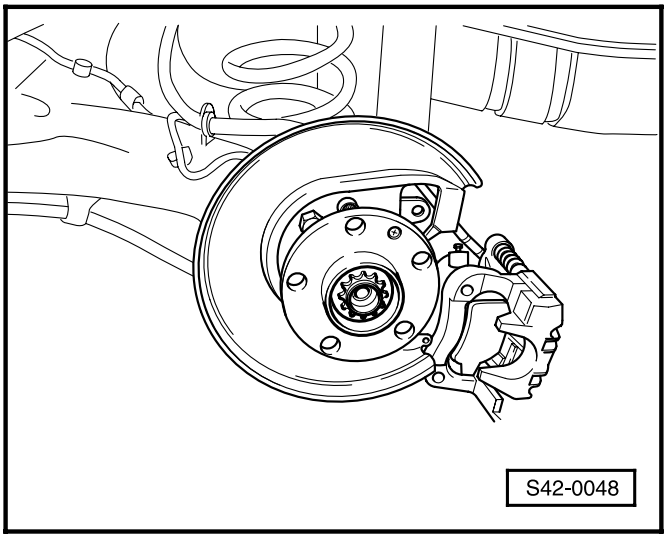
Do not damage the ABS-speed sensor when removing the inner ring of the bearing.



◄ **Fig. 6 Fitting wheel hub and wheel bearing onto axle stud**

Use special tool MP 5-403.

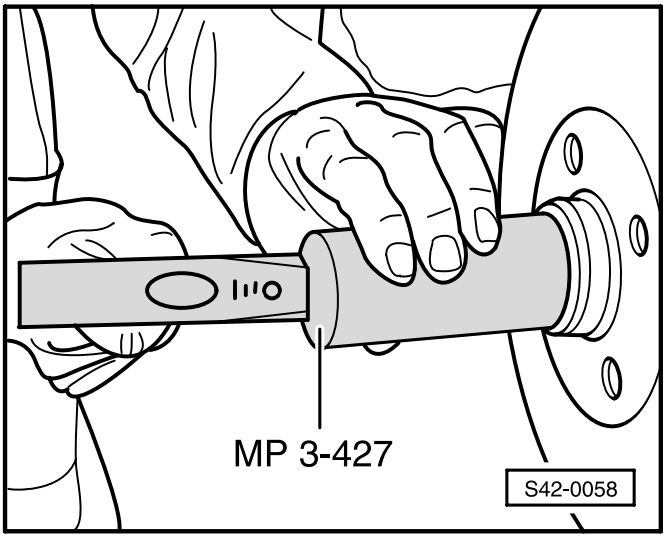
- Fit wheel hub and wheel bearing as far as possible onto axle stud.
- Screw on special tool MP 5-403 and pull on wheel hub and wheel bearing as far as the stop.



◄ **Fig. 7 Fitting wheel hub with wheel bearing onto axle stub**

- Remove special tool MP 5-403 and screw on wheel hub with twelve-point collar nut and tighten fully.

  Tightening torque: 70 Nm + torque a further 40°
- Install brake disc, insert cross-head screw and tighten to 4 Nm.



◄ **Fig. 8 Knocking in cap**

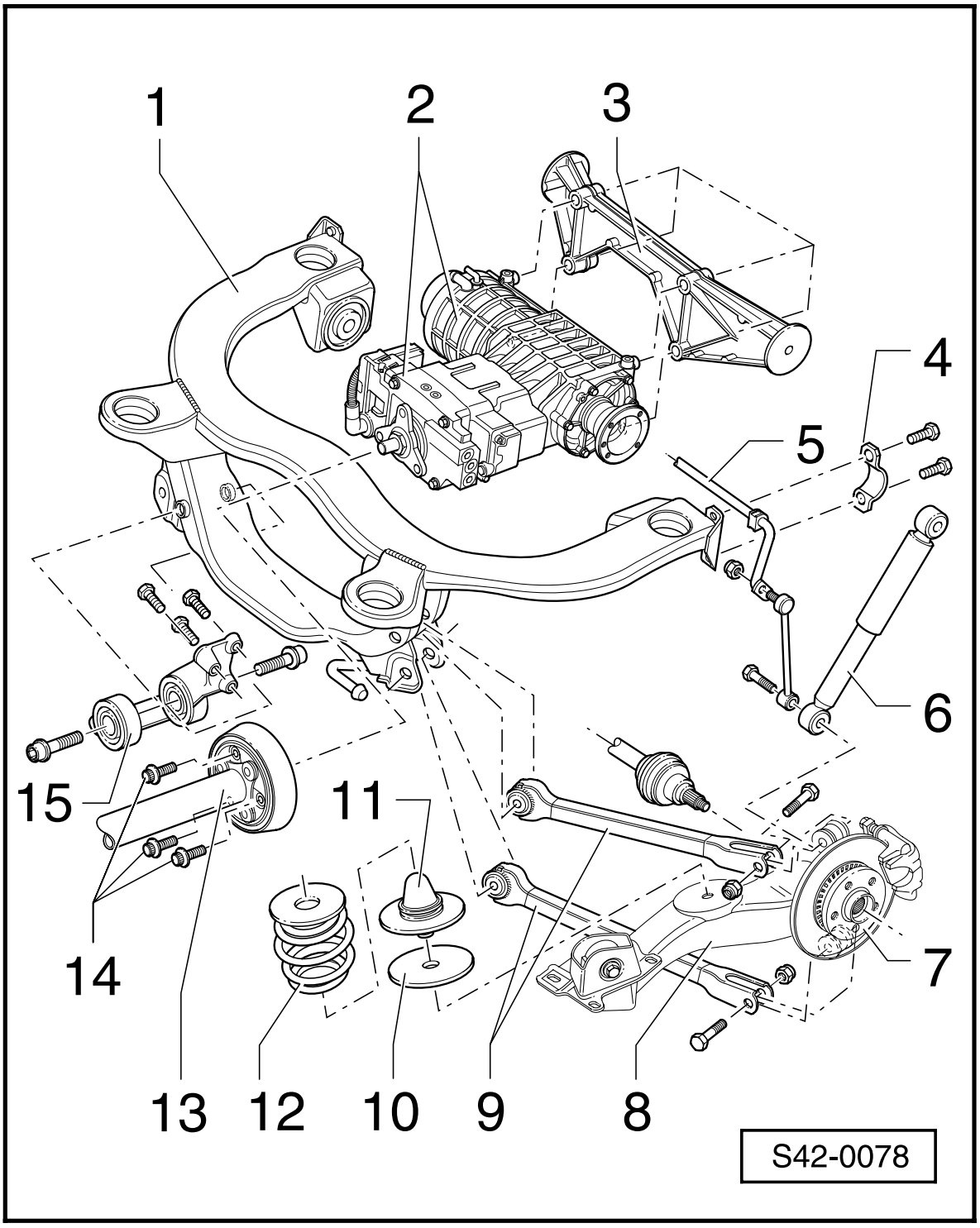
Notes:

- *Replace cap each time removed.*
- *If a cap is damaged, this allows moisture to get in. It is therefore essential to use the tool illustrated.*

- Install brake caliper and tighten hexagon socket bolts fully to 65 Nm.

Servicing rear suspension (4x4 models)

Overview of rear suspension for 4x4 models



Notes:

- *Always replace self-locking nuts and bolts.*
- *Always replace nuts and bolts which have signs of surface rust.*

1 - Subframe

- ♦ Assembly overview ⇒ page 42-60

2 - Final drive

- ♦ Removing and installing

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

- ♦ Servicing

For technical reasons it has not yet been possible to prepare the repair description. It will be published in a subsequent supplement.

At present, if any faults exist at the rear final drive, it should be replaced complete.

3 - Cross member

4 - Clamp

5 - Anti-roll bar
- ♦ if necessary eliminate paint damage and carry out protection against corrosion

6 - Pressurized shock absorber
- ♦ summary of components ⇒ page 42-33
- ♦ removing and installing ⇒ page 42-39

7 - Wheel bearing
- ♦ pressing in and out ⇒ page 42-44

8 - Trailing arm
- ♦ summary of components ⇒ page 42-41

9 - Suspension arm
- ♦ summary of components ⇒ page 42-41

10 - Spacer
- ♦ only on vehicles with rough road suspension
- ♦ on vehicles without spacer this must not be installed subsequently
- ♦ summary of components ⇒ page 42-33

11 - Stop buffer
- ♦ summary of components ⇒ page 42-33

12 - Helical spring
- ♦ summary of components ⇒ page 42-33

13 - Propshaft
- ♦ removing and installing

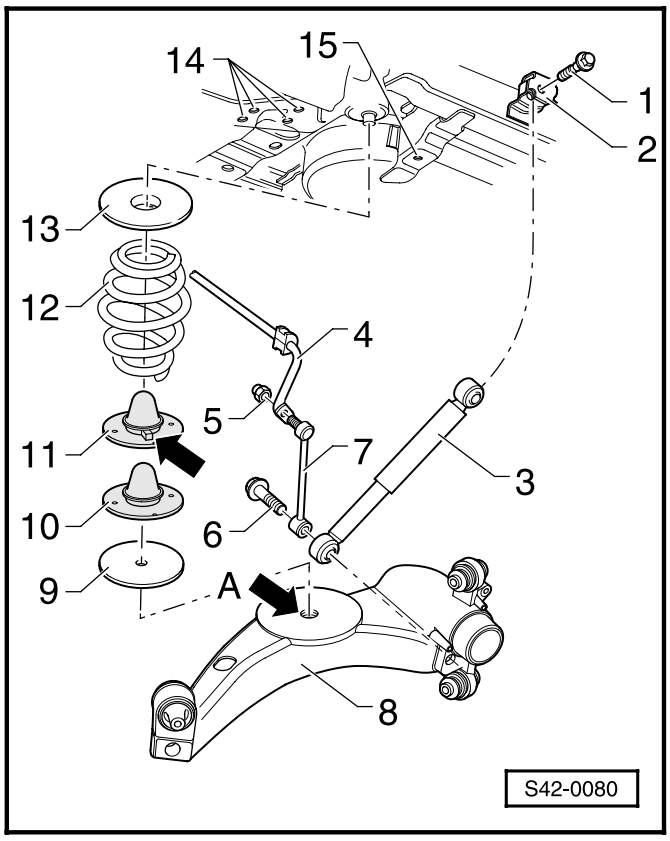
⇒ 5-speed Manual Gearbox 02C Four-wheel drive; epair Group 39; Removing and installing propshaft
- ♦ repairing

⇒ 5-speed Manual Gearbox 02C Four-wheel drive; Repair Group 39; Repairing propshaft

14 - Screw, 60 Nm

15 - Support for final drive
- ♦ summary of components ⇒ page 42-60

Summary of components - helical spring and shock absorber on vehicles with four-wheel drive



1 - Screw, 60 Nm
- ♦ replace after each removal

2 - Shock absorber bushing

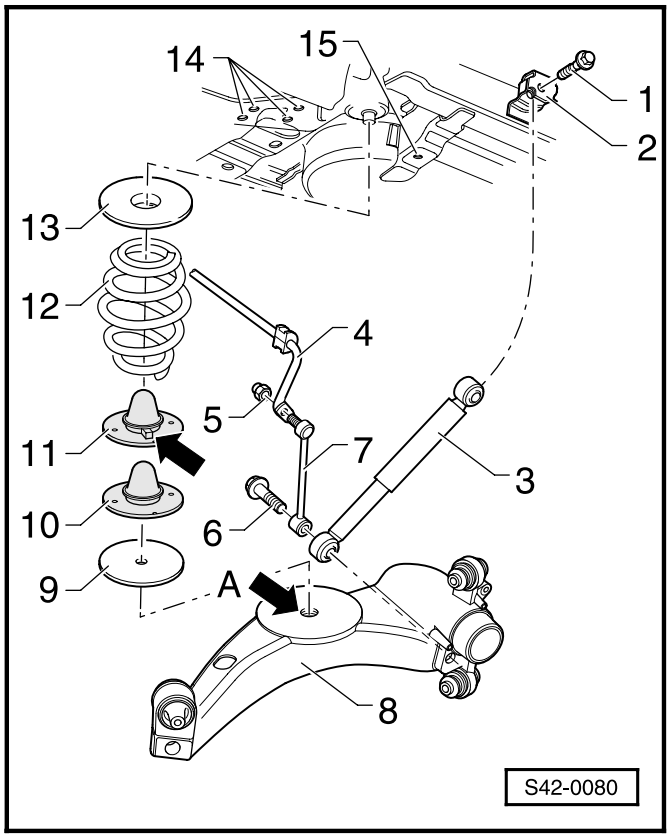
3 - Pressurized shock absorber
- ♦ removing and installing ⇒ page 42-39
- ♦ inspecting ⇒ page 40-30
- ♦ assignment ⇒ electronic catalogue of original parts
- ♦ disposing ⇒ age 40-31
- ♦ can be replaced individually
- ♦ per rear axle only use shock absorbers of the same make

4 - Anti-roll bar

5 - Nut, self-locking 25 Nm
- ♦ replace after each removal

6 - Screw 110 Nm
- ♦ M 14 x 1.5 x 90

7 - Coupling rod



8 - Trailing arm
- Thread -arrow A- for support of the stop buffer -Pos. 10- is no longer applicable as of 08.99
- in case the stop buffer -Pos. 11- is installed in the trailing arm before the manufacturing date 08.99 the thread -arrow A- is bored out to ∅ 10.5 mm

9 - Spacer
- only on vehicles with rough road suspension
- on vehicles without spacer, it must not be installed subsequently

10 - Stop buffer with threaded pin, 10 Nm
- no longer inserted as of 08.99
- stop buffer -Pos. 11- is supplied as spare part

11 - Stop buffer with positioning pin
- as of 08.99
- the correct fitting position is determined by the positioning pin
- the positioning pin must be removed on the bottom side when used for vehicles manufactured before 08.99
- the start of the spring coil must lie against the leg -arrow-
- Fitting position of helical spring ⇒ page 42-38

12 - Helical spring
- removing and installing ⇒ page 42-35
- check for paint damage, if necessary eliminate paint damage
- check colour coding
- assignment ⇒ electronic catalogue of original parts
- replace axle-wise
- per rear axle only use shock absorbers of the same make

13 - Base

14 - Thread in the frame side rail
- in the event of damage of the thread of the welded nuts in the trailing arm, the thread can be repaired with the Heli-Coil-Thread kit
- reworking the thread of the welded nuts is allowed on two permissible screw points per vehicle side
- pay attention to installation instructions of the manufacturer

15 - Thread in the cross arm
- in the event of damage of the thread of the welded nuts in the trailing arm, the thread can be repaired with the Heli-Coil-Thread kit
- pay attention to installation instructions of the manufacturer

Removing and installing coil springs

Special tools, testers and aids required

- Spring tensioning device, e.g. V.A.G 1752/1
- Spring retainer set, e.g. V.A.G 1752/15

  The spring retainer set consists of:

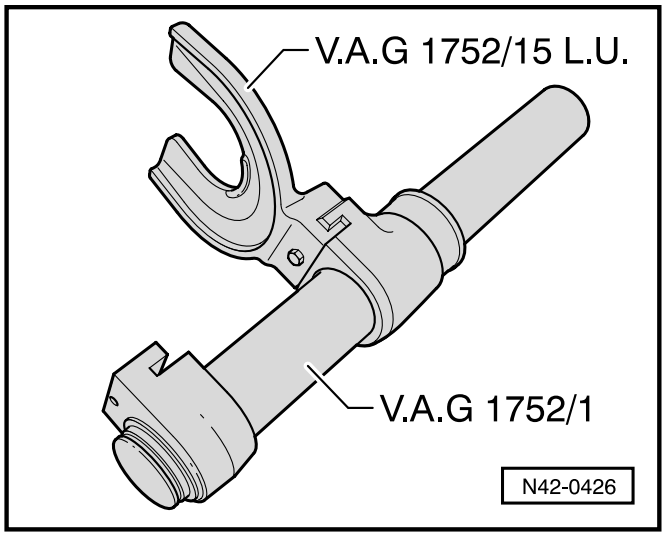
  - Spring retainer, e.g. V.A.G 1752/15 L. U. (left bottom)
  - Spring retainer, e.g. V.A.G 1752/15 L. O. (left top)
  - Spring retainer, e.g. V.A.G 1752/15 R. U. (right bottom)
  - Spring retainer, e.g. V.A.G 1752/15 R. O. (right top)

Notes:

- *The spring retainer set V.A.G 1752/15 has been specially developed for 4x4 vehicles in order to provide reliable removal and installation of the coil springs.*
- *Very high forces are produced when tensioning the coil springs. For this reason, it is important to closely observe the following safety precautions.*

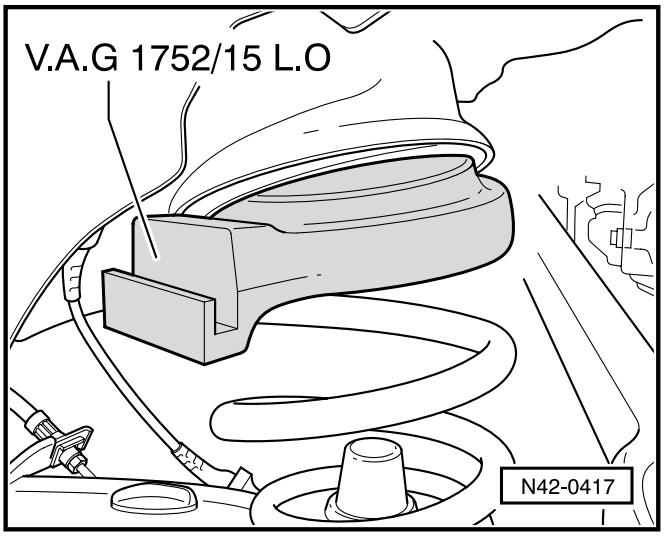
Warning!

- ***Ensure that the spring retainers are positioned as close as possible to the spring coils.***
- ***During the tensioning operation, ensure that the spring retainers are correctly located at the spring coils.***
- ***On no account use an impact screwdriver!***

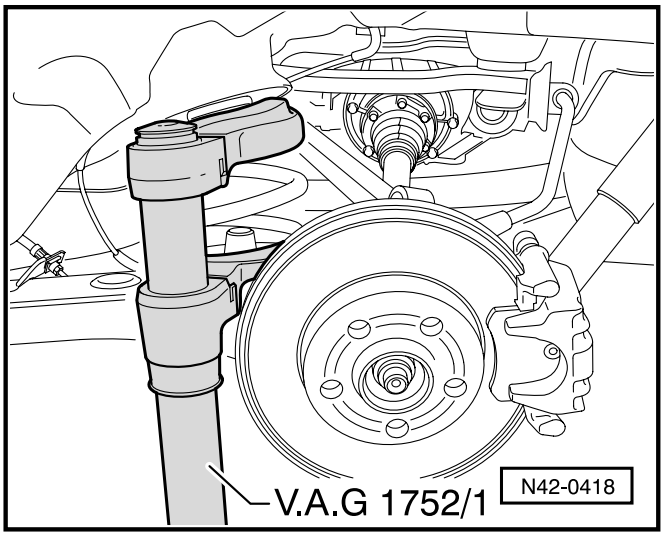


Removing left coil spring

◄- Install the spring retainer, e.g. V.A.G 1752/15 L. U. at the spring tensioning device, e.g. V.A.G 1752/1.



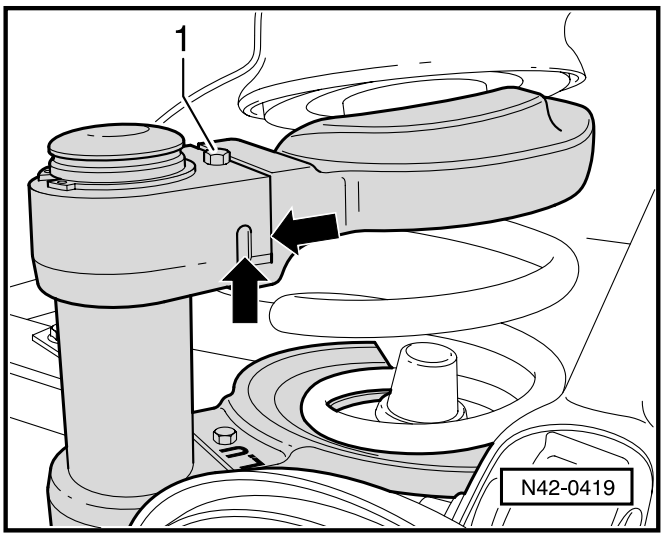
◄- Position spring retainer, e.g. V.A.G 1752/15 L. O. onto the topmost accessible spring coil.



◄- Insert the spring tensioning device, e.g. V.A.G 1752/1.

Note:

Do not use an impact screwdriver or similar for tensioning the coil spring.



◄- Turn the shaft of the spring tensioning device in a clockwise direction until the claws -arrows- of the spring tensioning device and spring retainer mesh into each other.

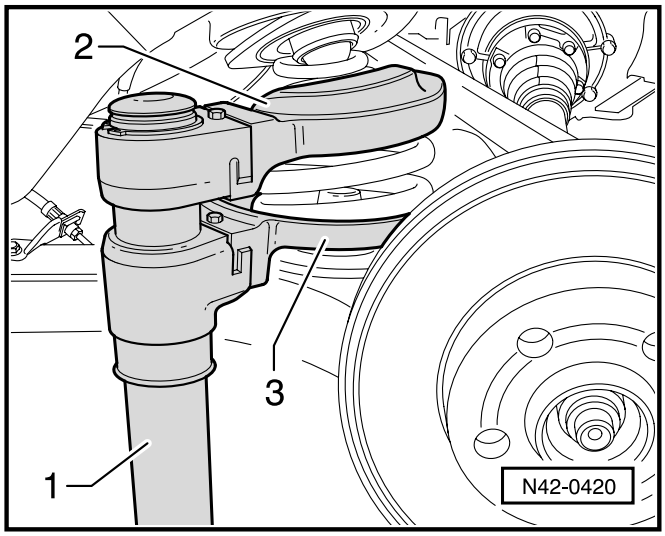
- Insert bolt -1- at the top spring retainer from below, screw on hexagon nut and tighten fully.

- Turn the shaft of the spring tensioning device until the coil spring is slightly tensioned.

- **Inspect whether spring retainers are correctly positioned at the spring coils; adjust position, if necessary.**

Note:

It is essential to end the tensioning device once the spring coils touch.



◄ - Tension coil spring sufficiently until it can be removed.

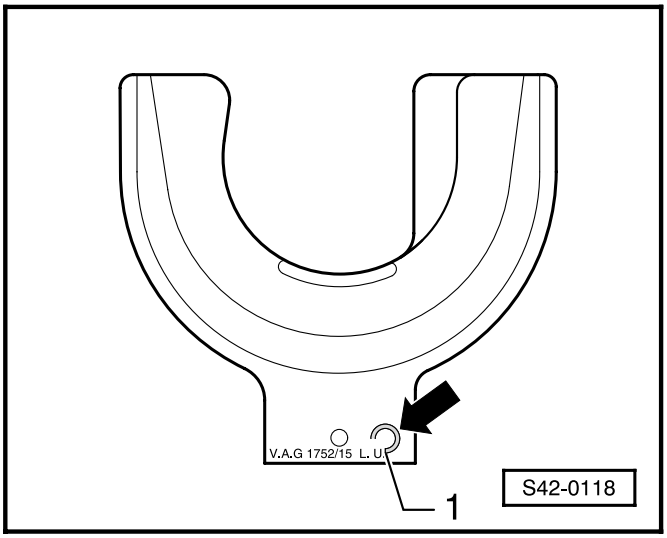
- Take the coil spring out of the vehicle together with the spring tensioning device.

- Take coil spring out of spring tensioning device.

1 - Spring tensioning device, e.g. V.A.G 1752/1

2 - Spring retainer, e.g. V.A.G 1752/15 L. O.

3 - Spring retainer, e.g. V.A.G 1752/15 L. U.



Installing left coil spring

◄ The start of the spring coil must be positioned in the spring retainer, as shown in the illustration -arrow-.

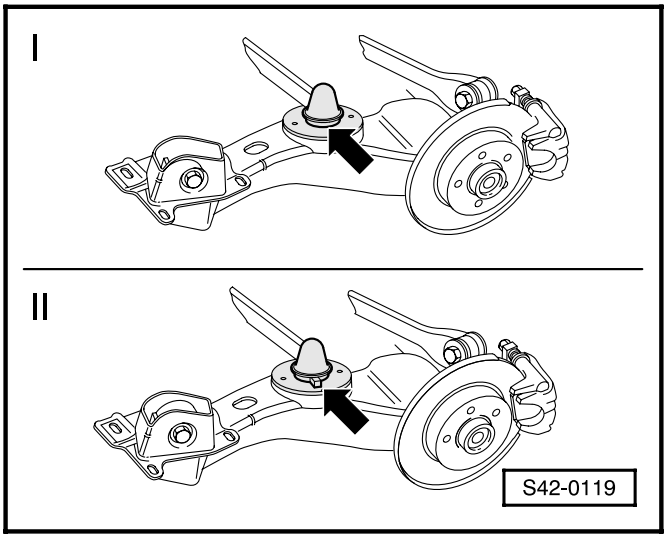
1 - Start of spring coils

- Insert coil spring into the spring tensioning device, e.g. V.A.G 1752/1, together with the spring retainers, e.g. V.A.G 1752/15 L. U. and V.A.G 1752/15 L. O., and position.

- **Inspect whether spring retainers are correctly positioned at the spring coils; adjust position, if necessary.**

Notes:

- *Do not use an impact screwdriver or similar for tensioning or slackening the coil spring.*
- *It is essential to end the tensioning device once the spring coils touch.*



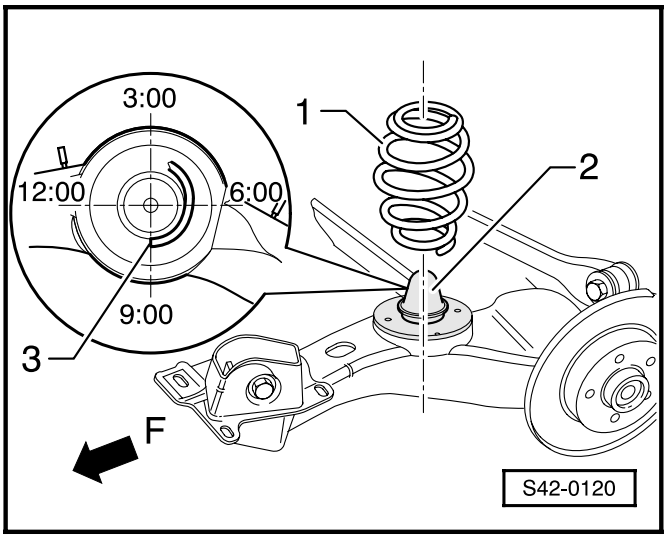
- Tension coil spring sufficiently until it can be inserted into the vehicle.

◄ - Inspect which version of bump stop is mounted on the trailing arm.

I - Bump stop without stop for coil spring -arrow-

II - Bump stop with stop for coil spring -arrow-

- Insert the coil spring with the spring tensioning device into the vehicle, paying attention to the correct installation position.



Installation position of left coil spring

◄ Models without stop on bump stop:

The start of the spring coil -3- must be in the 9 o'clock (9:00) position.

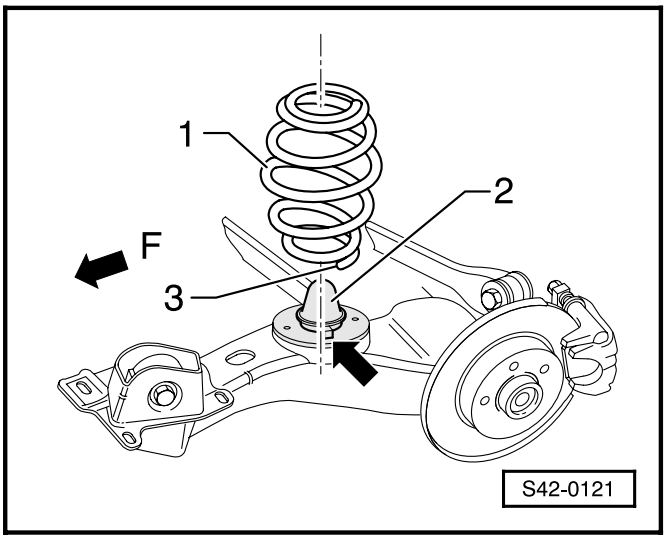
1 - Coil spring

2 - Bump stop without stop for coil spring

F - Direction of travel

Notes:

- *The theoretical line between 12 o'clock (12:00) and 6 o'clock (6:00) points parallel to the longitudinal axis of the vehicle in the direction of travel.*
- *The 9 o'clock (9:00) position for the left and right coil springs is identical.*
- *On no account install the right coil spring in a mirror image.*



◄ Models with stop at bump stop:

The start of the spring coil -3- must be positioned against the stop -arrow-.

1 - Coil spring

2 - Bump stop without stop for coil spring

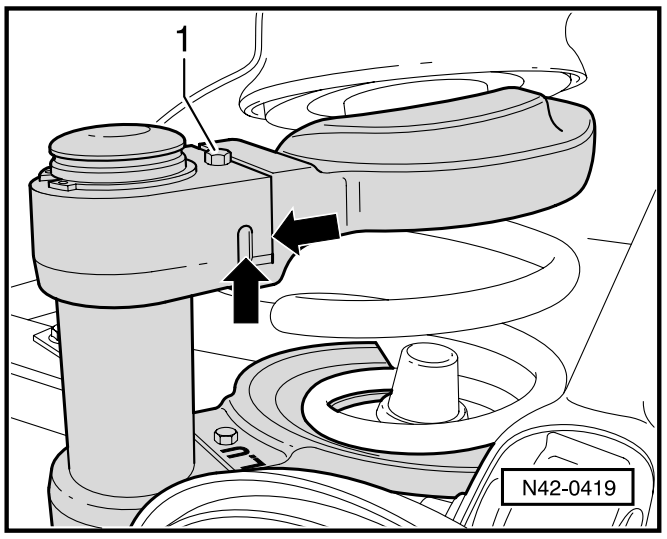
F - Direction of travel

Notes:

- *Installation position for left and right coil springs is identical.*
- *On no account install the right coil spring in a mirror image.*

- Release the tension of the coil spring by turning the shaft of the spring tensioning device in an anti-clockwise direction.

- During the slackening process, check that the coil spring is in the correct installation position.



◄- Unscrew hexagon nut -1- and take off bolt together with spring retainer.

- Take spring tensioning device out of the coil spring.

Removing and installing right coil spring

Removal and installation of the right coil spring is similar to the procedure for the left coil spring ⇒ page 42-35.

In place of the special tools

- Spring retainer, e.g. V.A.G 1752/15 L. U. (left bottom)
- Spring retainer, e.g. V.A.G 1752/15 L. O. (left top)

use the

- Spring retainer, e.g. V.A.G 1752/15 R. U. (right bottom)
- Spring retainer, e.g. V.A.G 1752/15 R. O. (right top).

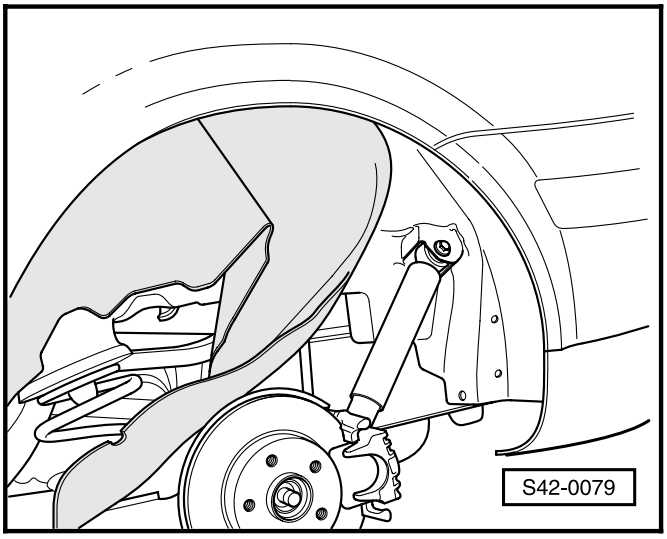
Installation position of right coil spring

The installation position of the right coil spring is identical to that of the left coil spring ⇒ page 42-38.

Removing and installing shock absorbers

Special tools, testers and aids required

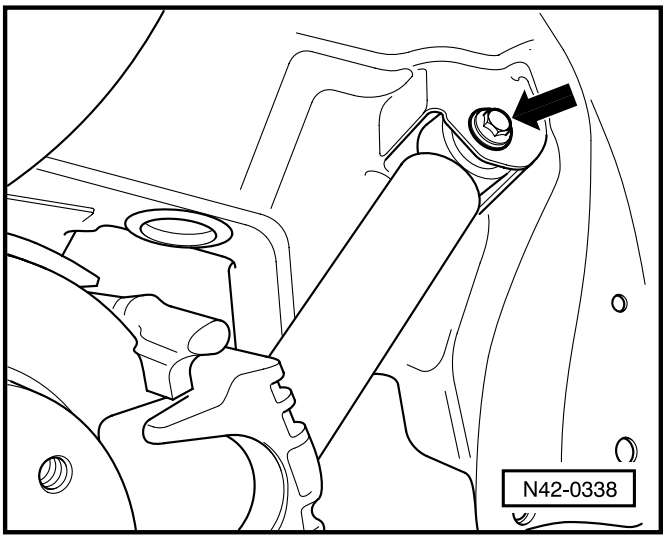
- Gearbox lift, e.g. V.A.G 1383 A
- Attachment, e.g. V.A.G 1359/2



Removing

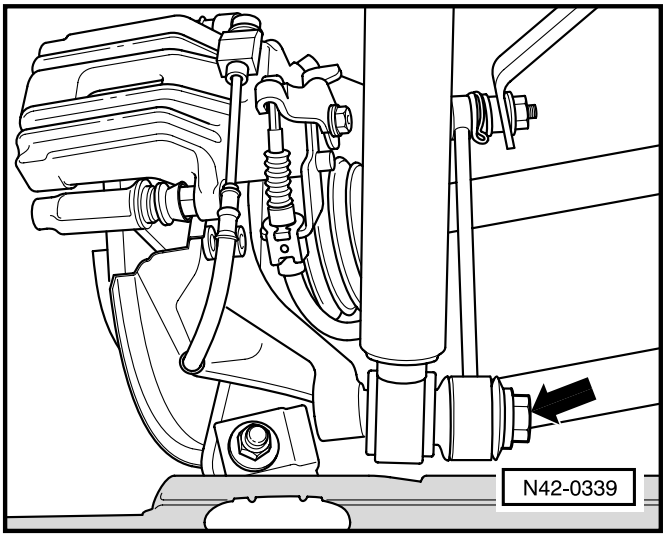
- Raise vehicle.
- Take off wheel.
- Remove coil spring ⇒ page 42-35.
- Unclip cable for wheel speed sensor from fixture.

◄ - Partially detach wheelhouse liner, if necessary.



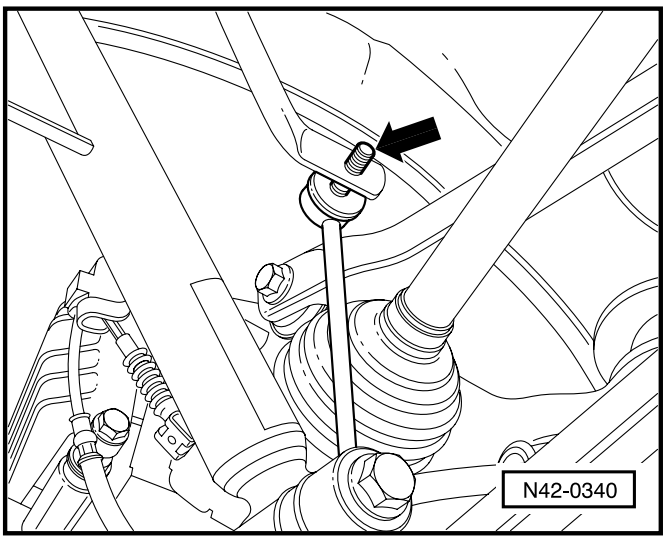
◄- Unscrew top bolt for shock absorber -arrow-.

- Use gearbox lift and attachment, e.g. V.A.G 1383 A with V.A.G 1359/2, to slowly lower trailing arm.



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

- Take shock absorber out of the vehicle.



Installing

◄- If necessary, unbolt the coupling rod from the anti-roll bar -arrow-.

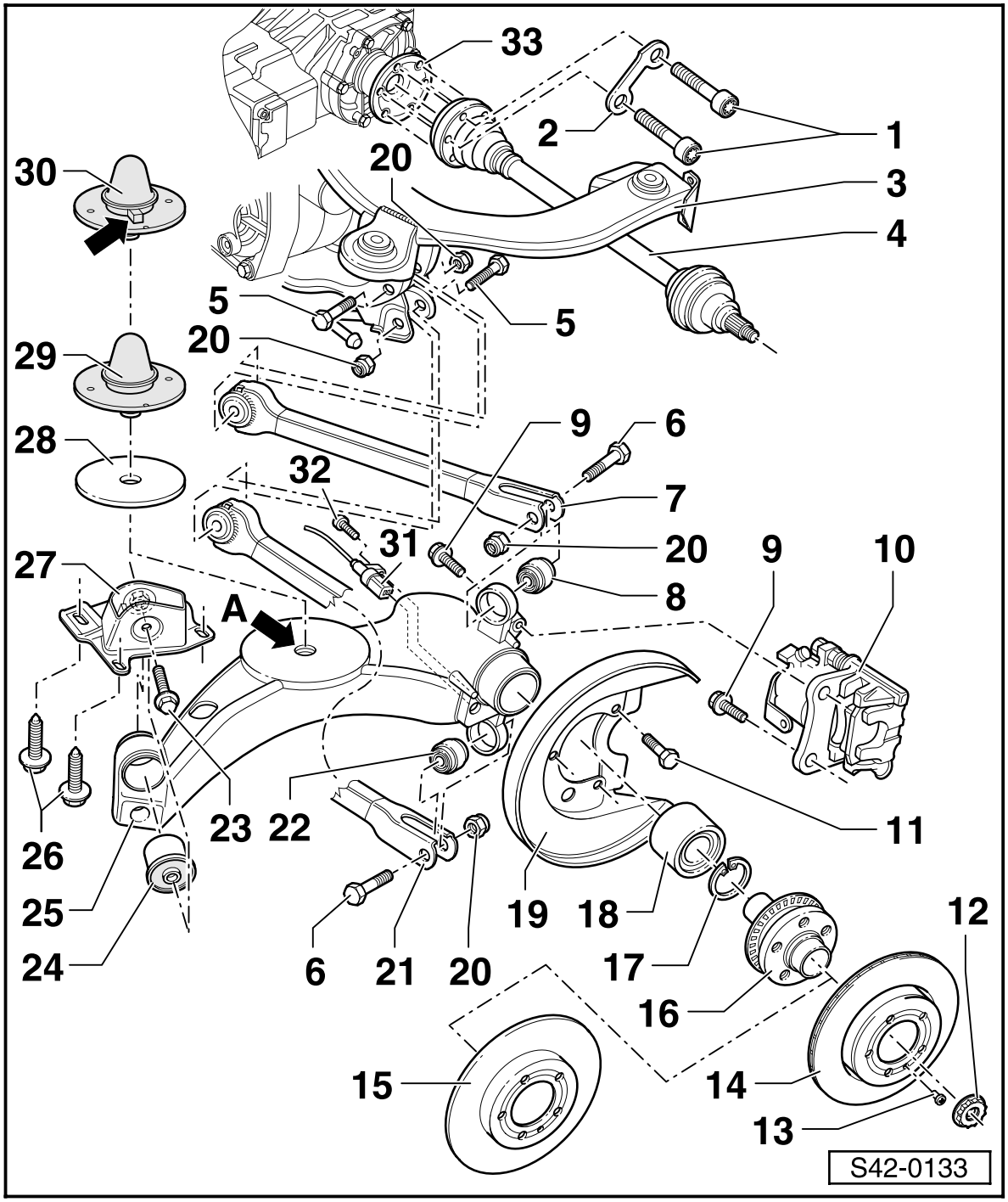
This makes it easier to position the bottom bolt for the shock absorber.

Further installation is carried out in the reverse order.

Tightening torques:

Shock absorber to body **Use new bolts!**	60 Nm
Shock absorber to trailing arm Vehicle must be standing on its wheels and one person sitting on the rear seat for this step.	110 Nm
Anti-roll bar to coupling rod **Use new nut!**	25 Nm
Wheel bolt	120 Nm

Summary of components - trailing arm and suspension arm



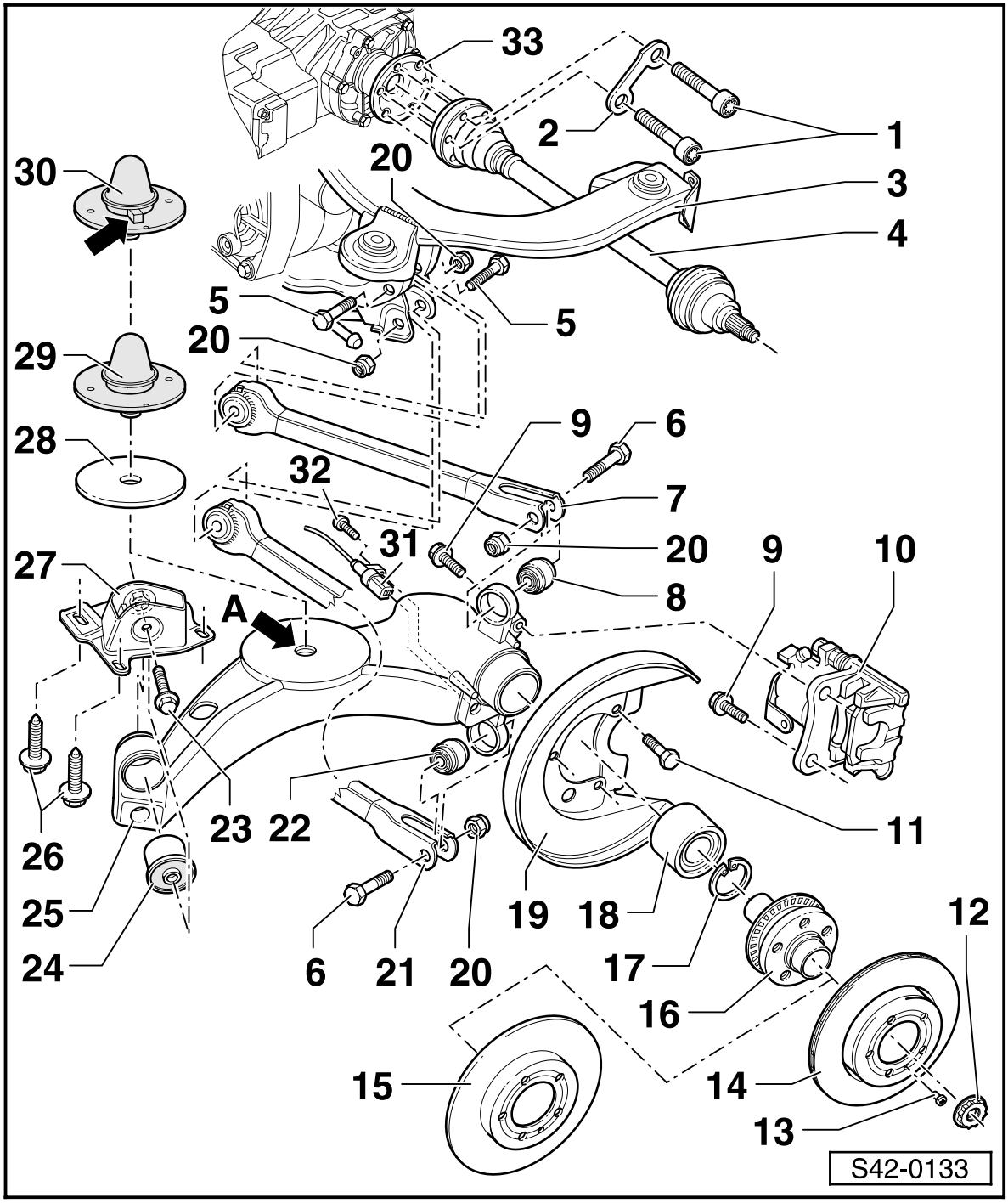
Notes:

- *Never load the wheel-bearing, if the drive shaft was removed!*
- *In case the vehicle is placed onto its wheels and moved, temporarily the outer joint of a drive shaft must be inserted.*
- *Welding and straightening work is not allowed on the bearing and wheel control components of the front wheel suspension.*
- *Always replace self-locking nuts.*
- *Always replace corroded screws/nuts.*

1 - Fillister head screw with internal serration, 40 Nm

- replace after each removal
- initially tighten to 10 Nm, subsequently tighten crosswise to final torques

2 - Shim



3 - Assembly carrier
- removing and installing ⇒ page 42-61

4 - Drive shaft with inner CV joint
- removing and installing ⇒ page 42-72
- repairing ⇒ page 42-75

5 - Tighten screw 70 Nm and 90°
- M 12 x 1.5 x 80
- replace after each removal

6 - Tighten screw 70 Nm and 90°
- M 12 x 1.5 x 75
- replace after each removal

7 - Top suspension arm
- removing and installing ⇒ page 42-58
- different versions, assignment ⇒ electronic catalogue of original parts

8 - Guide joint
- removing and installing ⇒ page 42-52

9 - Collar screw, 65 Nm

10 - Brake carrier with brake caliper
- ♦ repairing ⇒ page 46-24
- ♦ removing and installing brake pads ⇒ page 46-26

11 - Screw, 10 Nm

12 - Self-locking twelve-point nut
- ♦ tightening ⇒ page 42-74
- ♦ replace after each removal

13 - Screw, 4 Nm

14 - Brake disc
- ♦ assignment ⇒ electronic catalogue of original parts

15 - Brake disc, internally ventilated
- ♦ assignment ⇒ electronic catalogue of original parts

16 - Wheel hub with pulse rotor for speed sensor
- ♦ pulse rotor is welded to the wheel hub
- ♦ inspect axial run-out of pulse rotor ⇒ page 45-61
- ♦ pressing in and out ⇒ page 42-44

17 - Circlip
- ♦ replace after each removal
- ♦ check for firm seating

18 - Wheel bearing
- ♦ pressing in and out ⇒ page 42-44
- ♦ replace, is destroyed when pressing out
- ♦ spare part supplied only as kit „wheel bearing with assembly parts“ (with Pos. 12, 17)

19 - Cover plate

20 - Nut, self-locking
- ♦ replace after each removal

21 - Bottom suspension arm
- ♦ removing and installing ⇒ page 42-58
- ♦ different versions, assignment ⇒ electronic catalogue of original parts

22 - Guide joint
- ♦ removing and installing ⇒ page 42-52

23 - Screw, 90 Nm
- ♦ replace after each removal
- ♦ insert from the vehicle outside

24 - Rubber metal bearing
- ♦ for trailing arm
- ♦ removing and installing ⇒ page 42-50

25 - Trailing arm
- ♦ removing and installing ⇒ page 42-54
- ♦ Thread -arrow A- for support of the stop buffer -Pos. 29- is no longer applicable as of 08.99
- ♦ in case the stop buffer -Pos. 30- is installed in the trailing arm before the manufacturing date 08.99 the thread -arrow A- is bored out to ∅ 10.5 mm

26 - Screw 75 Nm
- ♦ replace after each removal

27 - Mount for rear axle
- ♦ check the overall tracking of the rear axle after installation and take the mean as necessary
- ♦ the track can be correct by moving the mount

28 - Spacer
- ♦ only on vehicles with rough road suspension
- ♦ on vehicles without spacer this must not be installed subsequently

29 - Stop buffer with threaded pin, 10 Nm
- ♦ no longer inserted as of 08.99
- ♦ stop buffer -Pos. 30- is supplied as spare part

30 - Stop buffer with positioning pin
- ♦ as of 08.99
- ♦ the correct fitting position is determined by the positioning pin
- ♦ the positioning pin must be removed on the bottom side when used for vehicles manufactured before 08.99
- ♦ the start of the spring coil must lie against the leg -arrow-
- ♦ fitting position of helical spring ⇒ page 42-38 and page 42-39

31 - Speed sensor
- ♦ removing and installing ⇒ page 45-82
- ♦ insert with solid lubricant paste G 000 650 (e.g. Wolfrakote Top Paste)

32 - Allen screw, 8 Nm

33 - Flange shaft of rear axle gearbox

Removing and inserting wheel bearing

Special tools, testers and aids required

- Gearbox lift with attachment, e.g. V.A.G 1383 A with V.A.G 1359/2
- Foot pump with high-pressure hose, e.g. V.A.G 1389 A/1 (Paschke)
- Hydraulic removal and insertion device for wheel bearings, e.g. V.A.G 1459 B (Paschke)

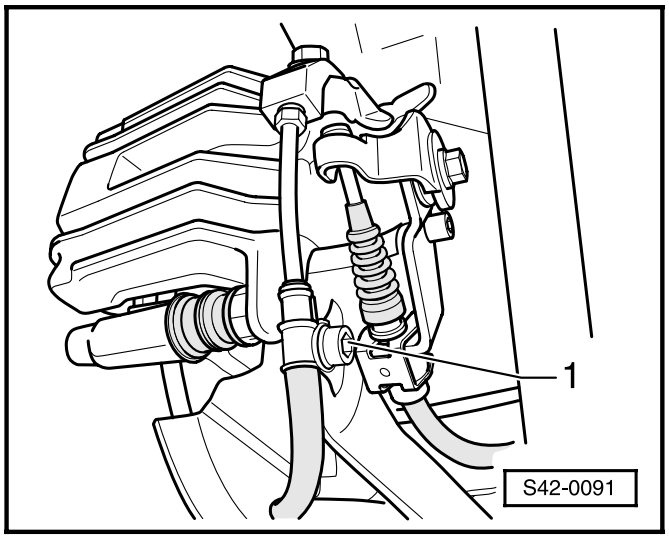
  with the following individual tools:

  - Hollow piston cylinder, e.g. HKZ-15, with thrust piece, e.g. E-0-204T
  - Tensile pin, e.g. E-0-217 + 218
  - Special nut, e.g. E-8-214
  - Thrust piece, e.g. E-5
  - Centring device with clip, e.g. E-76-2
- Complementary set, e.g. V.A.G 1459 B/2

  with the following individual tools:

  - Thrust sleeve, e.g. E-44
  - Bell, e.g. E-40
  - Thrust piece, e.g. E-6-1
  - Thrust piece, e.g. E-13-1
- Thrust plate, e.g. E-39 (VAS 5146)
- Thrust plate MP 3-467
- Grip of wheel bearing inner race MP 6-416
- Cross member Kukko 18-0

- Raise vehicle.
- Take off wheel.
- Remove drive shaft ⇒ page 42-72.

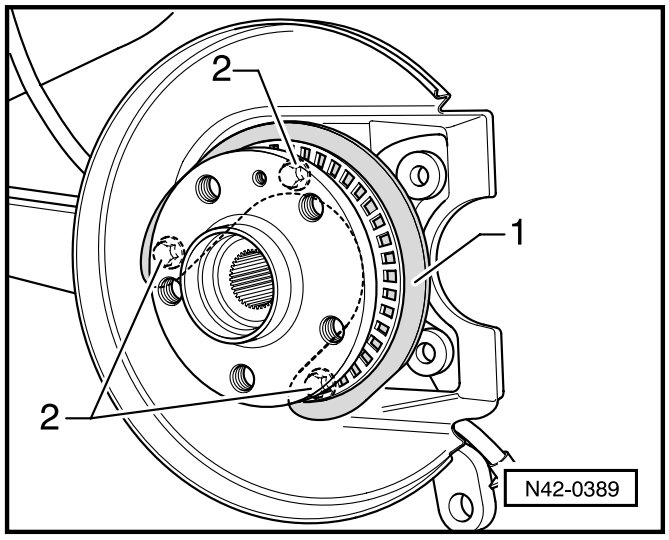


◄- Unscrew bolts -1- attaching brake carrier and take brake carrier off together with brake caliper.

Note:

Top bolt attaching brake carrier is concealed.

- Attach the brake caliper to the body. Brake line must not be subjected to excessive pull.
- Remove cross-head screw for brake disc and take off brake disc.
- Remove ABS wheel speed sensor from housing of trailing arm ⇒ page 45-82.

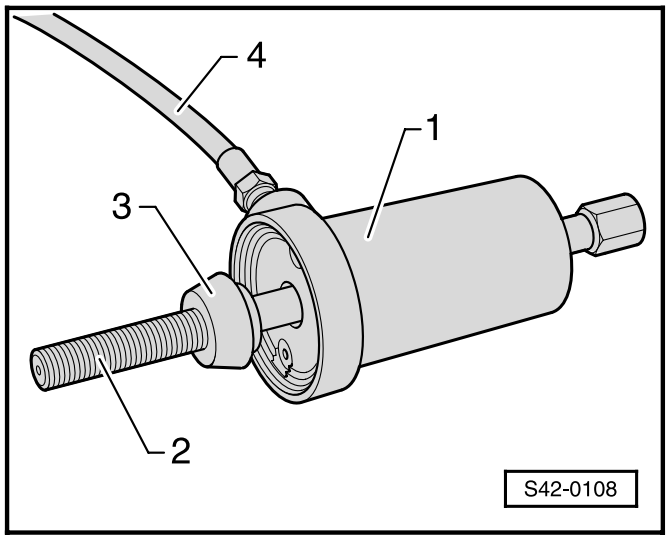


Pressing out wheel hub

◄- Insert the thrust plate -1-.

Position the thrust plate -1- so that it is resting all round on the bolt heads -2-.

1 - Thrust plate, e.g. E-39 (VAS 5146)



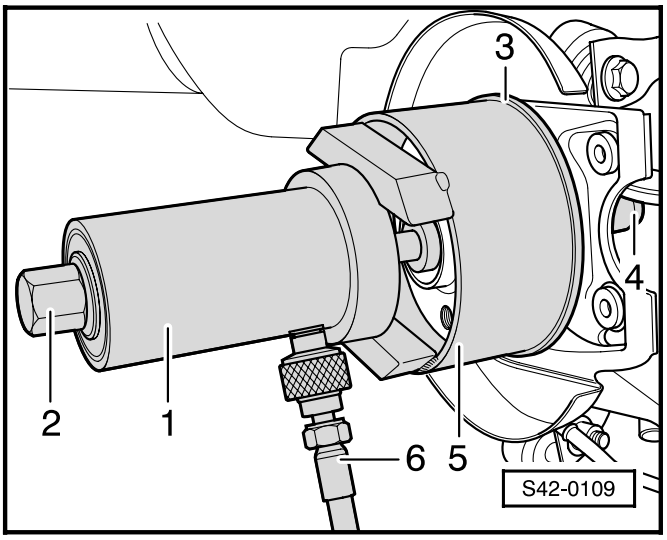
◄- Install the centring device with clip, e.g. E-76-2.

1 - Hollow piston cylinder, e.g. HKZ-15, with thrust piece, e.g. E-0-204T hydraulic

2 - Tensile bolt, e.g. E-0-217

3 - Centring device with clip, e.g. E-76-2

4 - High-pressure hose with quick coupling, part of foot pump, e.g. V.A.G 1389 A/1



◄- Install hollow piston cylinder -1- together with tensile bolt -2-, bell -5- and special nut -4-.

1 - Hollow piston cylinder, e.g. HKZ-15, with thrust piece, e.g. E-0-204T hydraulic

2 - Tensile bolt, e.g. E-0-217

3 - Thrust plate, e.g. E-39 (VAS 5146)

4 - Special nut, e.g. E-8-214

5 - Bell, e.g. E-40

6 - High-pressure hose with quick coupling, part of foot pump, e.g. V.A.G 1389 A/1

- Build up pressure by pumping with the foot pump.

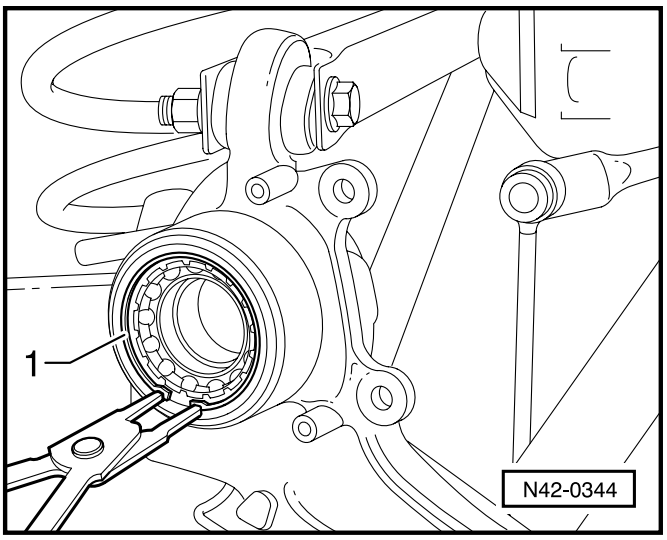
- Check whether all the tools are correctly centred; adjust position, if necessary.

Note:

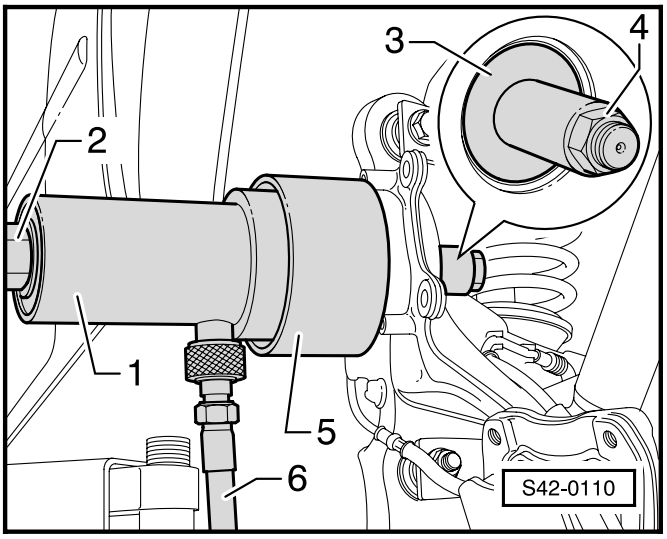
Place gearbox lift with attachment below, e.g. V.A.G 1383/A with V.A.G 1359/2 (risk of accident from parts dropping off when wheel hub pressed out).

- Press wheel hub out of wheel bearing by pumping.

Pressing out wheel bearing



◄- Remove circlip -1-.



◄- Position thrust piece -3- on the rear of the wheel bearing.

- Install hollow piston cylinder -1- with tensile bolt -2- and special nut -4-.

1 - Hollow piston cylinder, e.g. HKZ-15, with thrust piece, e.g. E-0-204T hydraulic

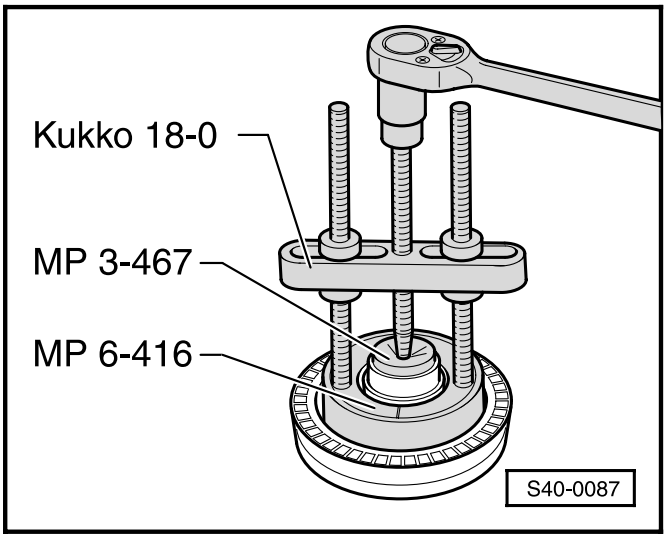
2 - Tensile bolt, e.g. E-0-217

3 - Thrust piece, e.g. E-5

4 - Special nut, e.g. E-8-214

5 - Bell, e.g. E-40

6 - High-pressure hose with quick coupling, part of foot pump, e.g. V.A.G 1389 A/1



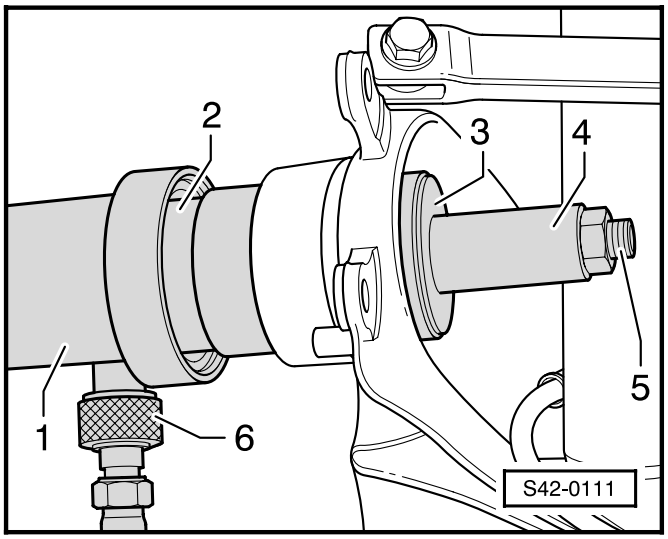
- Build up pressure by pumping with the foot pump.
- Check whether all the tools are correctly centred, adjust position, if necessary.
- Press wheel bearing out of wheel bearing housing of trailing arm by pumping.

◄- Pull bearing inner race off the wheel hub.

- Insert special tool -MP 6-416-, as shown.
- Screw cross member -Kukko 18-0- into special tool -MP 6-416-.
- Fit special tool -MP 3-467- onto wheel hub and pull off bearing inner race by turning the threaded spindle.

Pressing in wheel bearing

- Position the wheel bearing at the wheel bearing housing of the trailing arm.



◄- Place thrust piece -3- onto the rear of the wheel bearing housing.

- Position hollow piston cylinder -1- together with tensile bolt -5-, thrust piece -2- and special nut -4-.

  1 - Hollow piston cylinder, e.g. HKZ-15, with thrust piece, e.g. E-0-204T hydraulic

  2 - Thrust piece, e.g. E-13-1

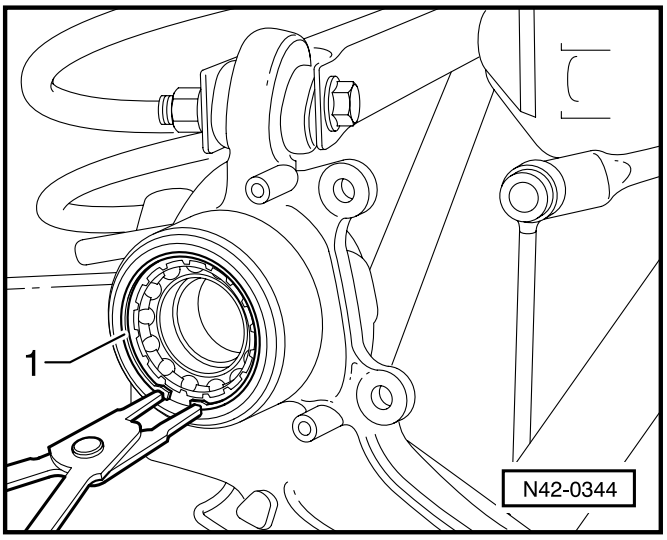
  3 - Thrust piece, e.g. E-6-1

  4 - Special nut, e.g. E-8-214

  5 - Tensile bolt, e.g. E-0-217

  6 - High-pressure hose with quick coupling, part of foot pump, e.g. V.A.G 1389 A/1

- Build up pressure by pumping with foot pump.
- Check whether all the tools are correctly centred; adjust position, if necessary.
- Press wheel bearing into wheel bearing housing of trailing arm by pumping.

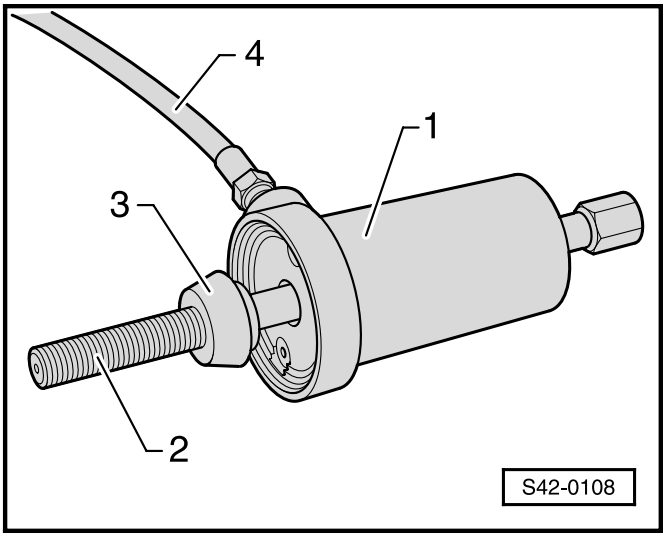


Notes:

- *Replace circlip each time removed.*
- *When inserting circlip, ensure it is correctly installed.*

◄- Insert new circlip -1-.

Pressing in wheel hub



- Position the wheel hub against the wheel bearing.

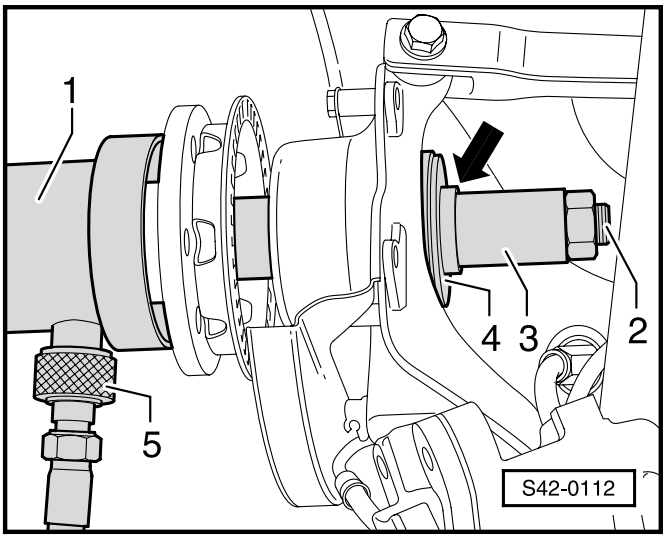
◄- Install the centring device with clip, e.g. E-76-2.

1 - Hollow piston cylinder, e.g. HKZ-15, with thrust piece, e.g. E-0-204T hydraulic

2 - Tensile bolt, e.g. E-0-217

3 - Centring device with clip, e.g. E-76-2

4 - High-pressure hose with quick coupling, part of foot pump, e.g. V.A.G 1389 A/1



◄- Position thrust piece -4- onto the rear of the wheel bearing housing.

Note:

The collar -arrow- of the thrust piece -4- must be pointing toward the special nut -3-.

- Position hollow piston cylinder -1- with tensile bolt -2- and special nut -3-.

1 - Hollow piston cylinder, e.g. HKZ-15, with thrust piece, e.g. E-0-204T hydraulic

2 - Tensile bolt, e.g. E-0-217

3 - Special nut, e.g. E-8-214

4 - Thrust piece, e.g. E-5

5 - High-pressure hose with quick coupling, part of foot pump, e.g. V.A.G 1389 A/1

- Build up pressure by pumping with the foot pump.

- Check if all tools are correctly centered, if necessary correct position.

- Then press in wheel hub by pumping with the foot pump.

Further installation occurs in reverse order.

- Install ABS speed sensor ⇒ page 45-82.

- Install brake disc.

- Install brake carrier with brake calliper.

- Install drive shaft ⇒ page 42-72.

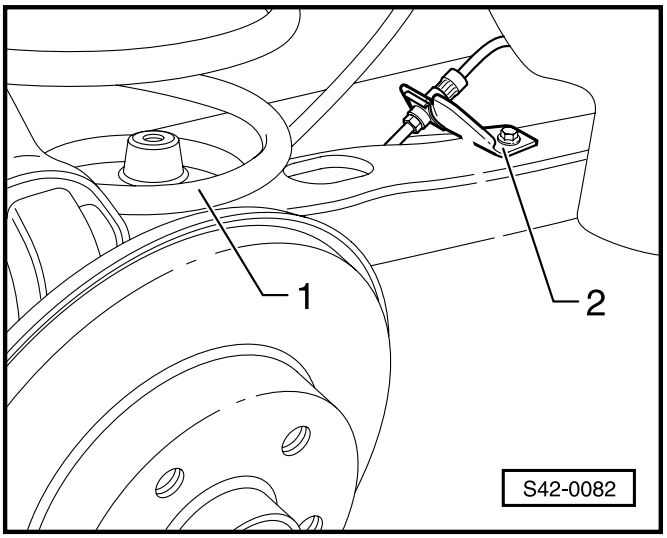
Tightening torques:

Screw for ABS speed sensor	8 Nm
Screw for brake disc	4 Nm
Brake carrier with brake calliper to trailing arm	65 Nm
Tighten drive shaft to flange shaft M8 crosswise in 2 steps (I and II)	I - 10 Nm II - 40 Nm
Use new screws!	
Wheel screw	120 Nm
Nut to wheel hub	
Always use new nut!	
Tightening torque ⇒ page 42-74	

Removing and installing bonded rubber bush for trailing arm

Special tools, testers and aids required

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

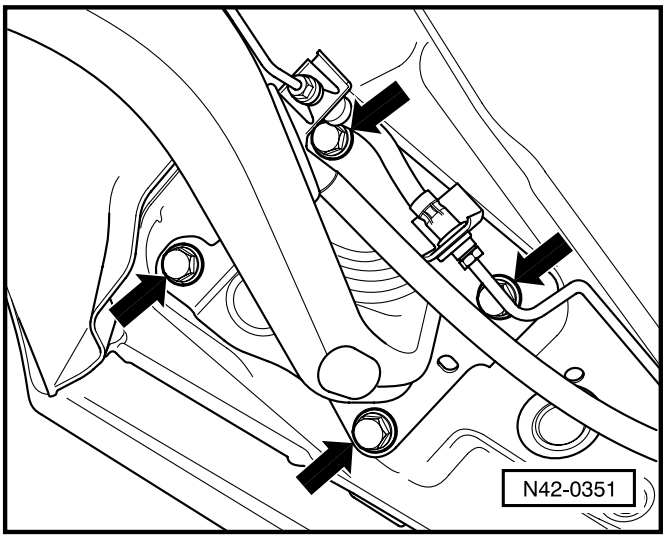


Removing trailing arm

- Raise vehicle.
- Take off wheel.

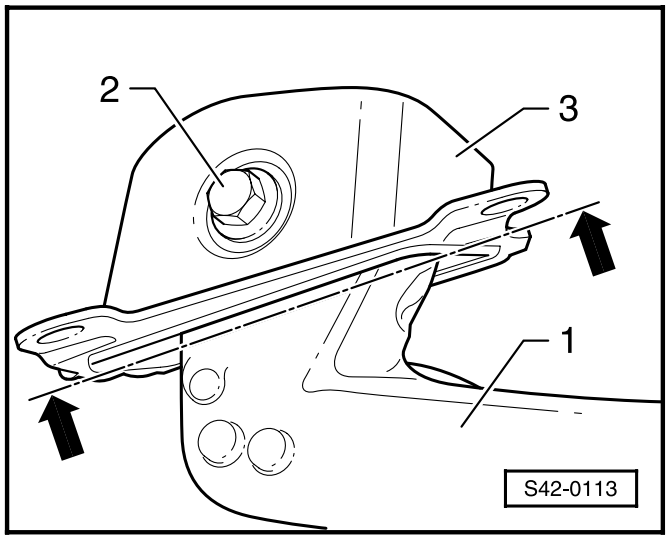
◄ - Remove coil spring -1- ⇒ page 42-35.

- Unbolt bracket for brake line -2- from trailing arm.
- Unclip brake line from bracket.



◄ - Mark the installation position of the bearing bracket at the body -arrows-.

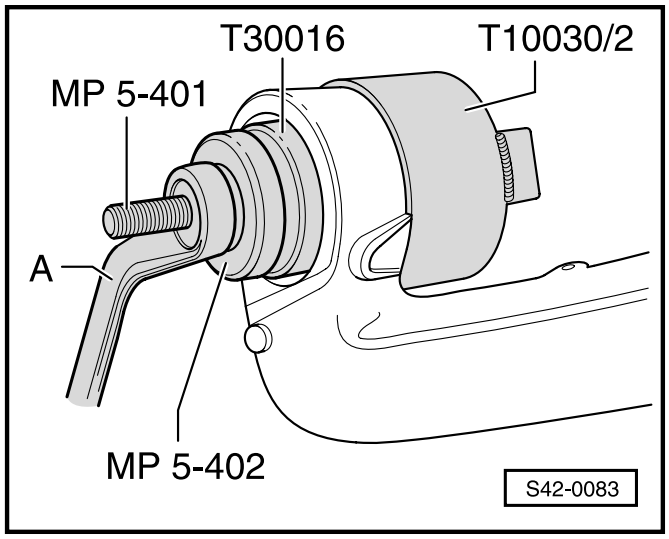
- Unbolt the bearing bracket from the body.



◄- Mark the installation position of the bearing bracket -3- relative to the trailing arm -1-, e.g. with a felt pen.

See arrows and dash-dotted line.

- Unscrew hexagon bolt -2- and take bearing bracket -3- off the trailing arm.

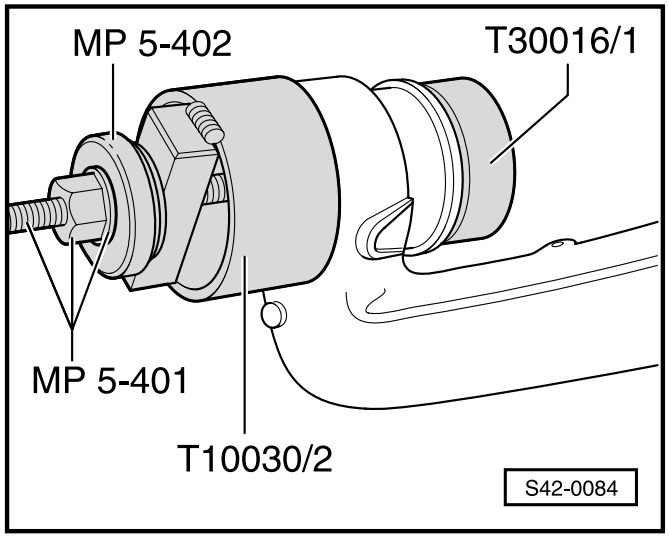


Pulling out bonded rubber bush at trailing arm

◄- Position special tools, as shown in illustration.

- Pull out bonded rubber bush by turning the shaft.

A - Ring wrench



Inserting bonded rubber bush

◄- Position special tools, as shown in the illustration.

- Draw in the bonded rubber bush by turning the shaft.

Installing trailing arm

Installation is carried out in the reverse order ⇒ page 42-54.

If the installation position of the bearing bracket to the trailing arm was not marked, it is then necessary to determine the installation position ⇒ page 42-57.

Removing and installing the guide joint

Special tools, testers and aids required

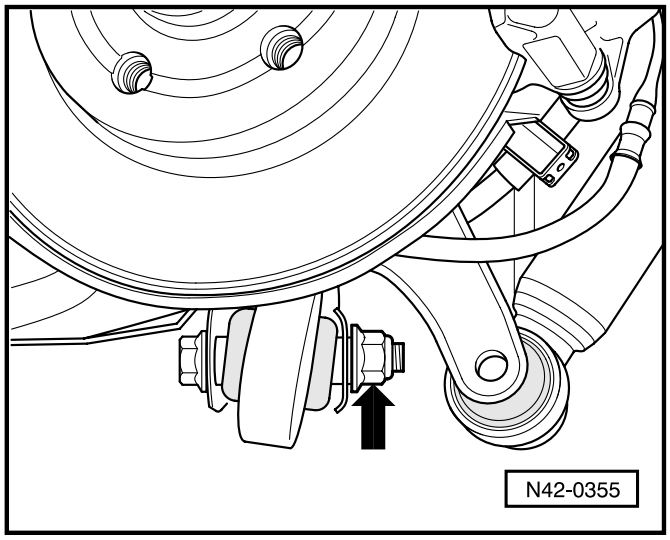
- Assembly device MP 5-401
- Assembly device MP 5-402
- Assembly device T10030
- Assembly device T30017

Caution!

If the top and bottom guide joint must be replaced, first of all the helical spring must be removed.

- Remove helical spring ⇒ page 42-35.

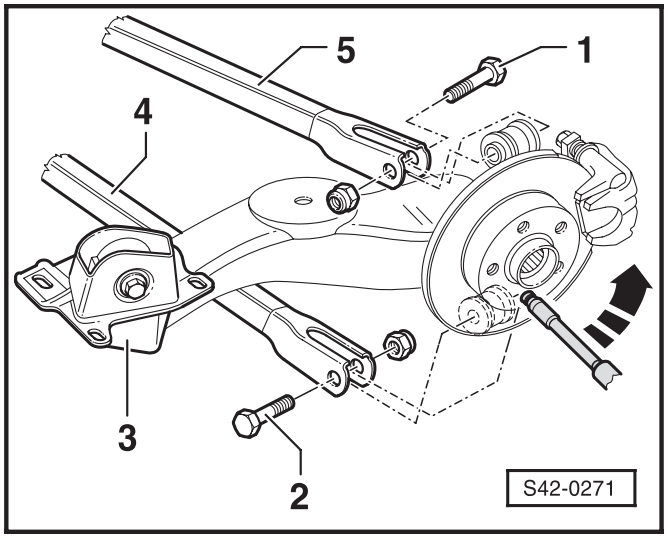
Removing guide joint



- Raise vehicle.
- Remove wheel

◄ - Unscrew bottom suspension arm from the trailing arm -arrow-.

- Screw the wheel bolt up to the stop into the brake disc.



◄ - Fit socket nut with two extensions onto the wheel bolt.

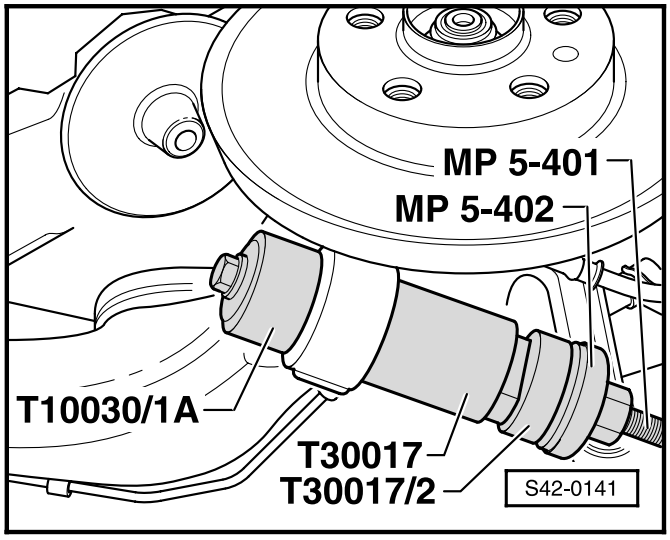
- Press extension slightly upwards -arrow- and pull out screw -2-.

1 - Screw for top suspension arm - do not slacken!

3 - Trailing arm

4 - Bottom suspension arm - do not remove!

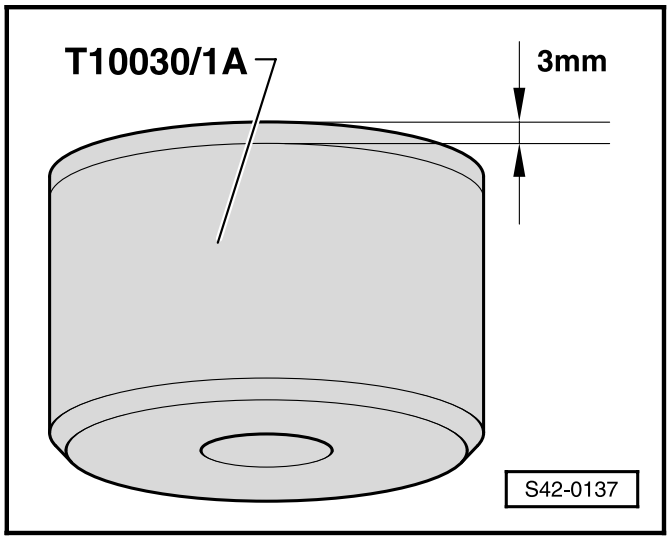
5 - Top suspension arm



- Press down the bottom suspension arm only so far, that the assembly device can be mounted.

◄ - Position the special tools as shown.

- Pull out the guide joint by turning the spindle.



Installing bottom guide joint

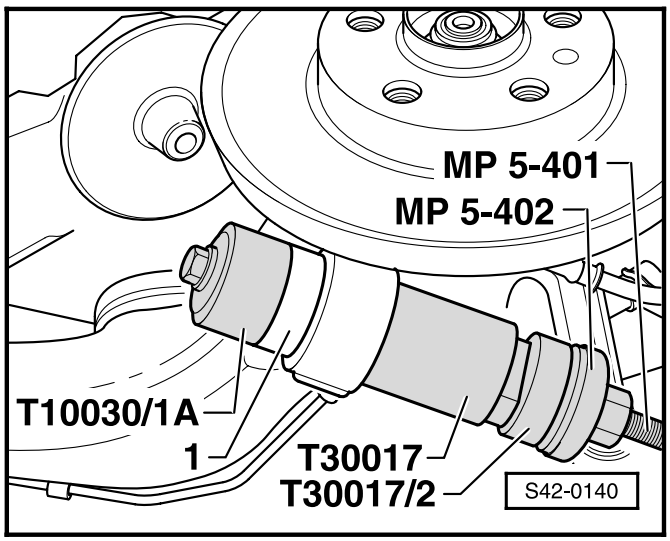
◄ - Before positioning, the pressure plate T10030/1A must be marked along the entire circumference.

Distance: 3 mm

The marking must be towards the open side.

Note:

The marking is required for positioning the guide joint in the trailing arm.



◄ - Position the special tools as shown.

- Press in the guide joint -1- by turning the spindle until the marking on the pressure plate T10030/1A reaches the support on the trailing arm.

- Slacken special tools, do not remove.

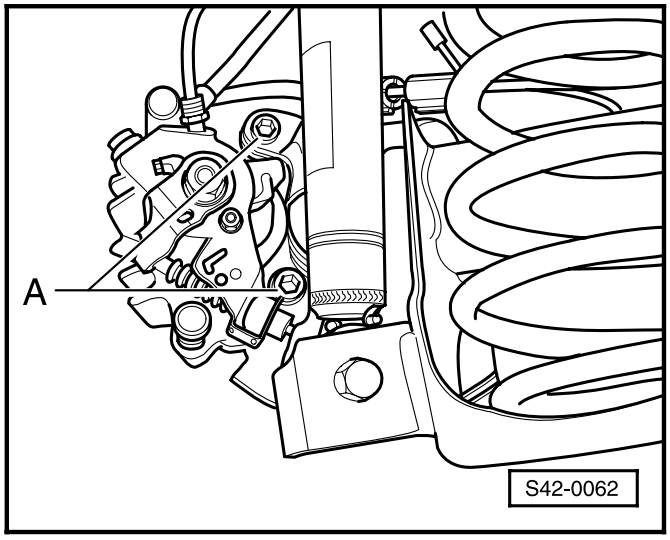
- Check if the guide joint is located in the middle in the support of the trailing arm.

- If this is not the case, correct the fitting position of the guide joint accordingly.

- Install bottom suspension arm ⇒ page 42-58.

- Install the wheel.

- Lower the vehicle.



Removing top guide joint

Caution!

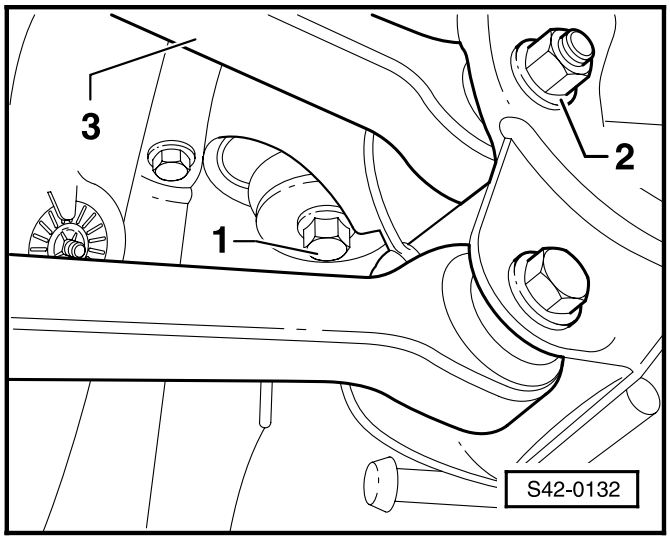
If the top and bottom guide joint must be replaced, first of all the helical spring must be removed.

- Raise the vehicle.
- Remove the wheel.

◄ - Unscrew screws -A-, remove brake caliper and tie up with wire or anything similar.

Note:

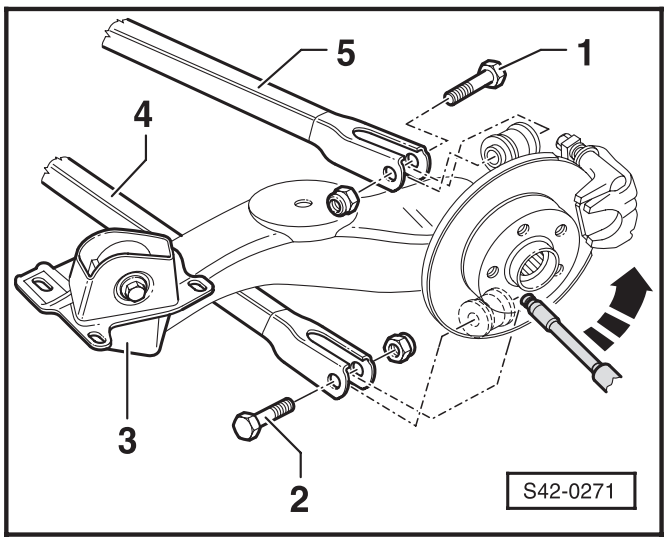
Do not unscrew the brake hose to remove the brake caliper.



- Unscrew the screw for the brake disc and remove brake disc.

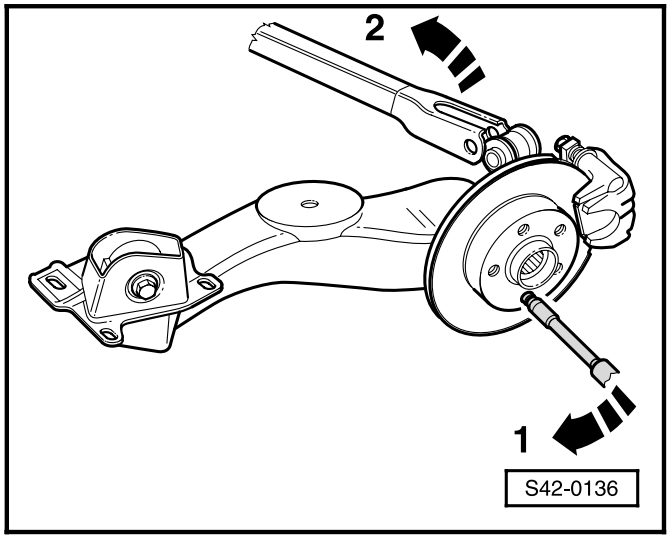
◄ - Unscrew screw -1- from the assembly carrier.

- Unscrew nut -2- for top suspension arm.



◄ - Unscrew nut of screw -1-.

- Screw the wheel bolt up to the stop into the wheel hub.
- Fit socket nut with two extensions onto the wheel bolt.
- Press extension slightly upwards -arrow- and pull out screw -1-.

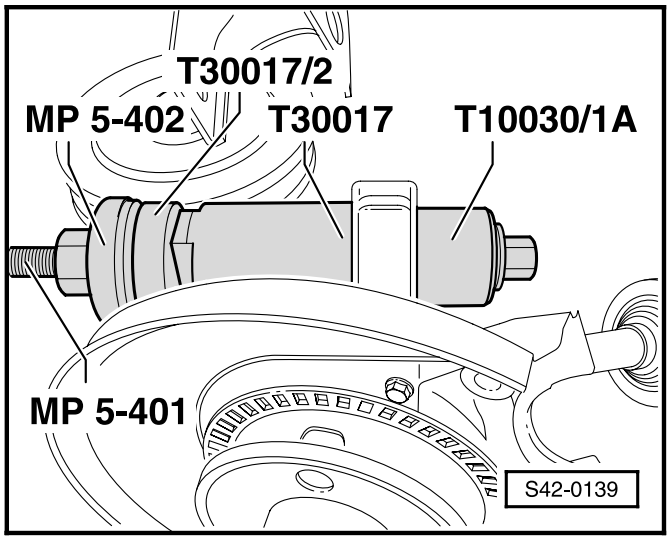


◄- Press down the extension only so far -arrow 1-, that the top suspension arm can be removed upwards -arrow 2-.

Note:

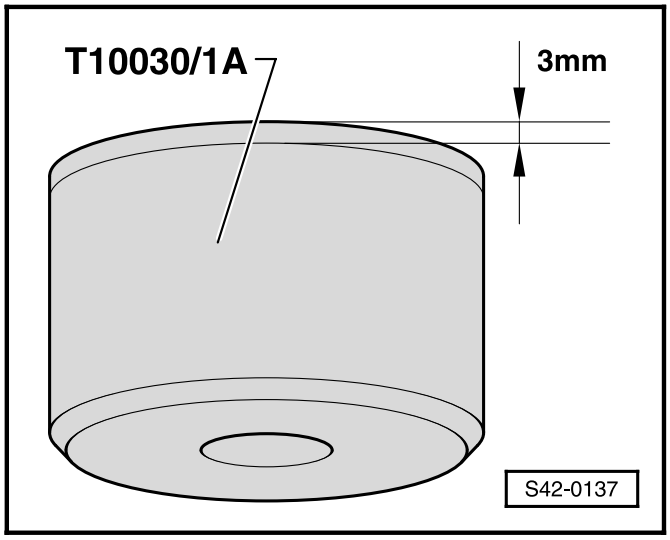
If the extension is pushed so far downwards, the drive shaft can be damaged.

- Pull screw and top suspension arm out of the assembly carrier.



◄- Position the special tools as shown.

- Pull out the guide joint by turning the spindle.



Installing top guide joint

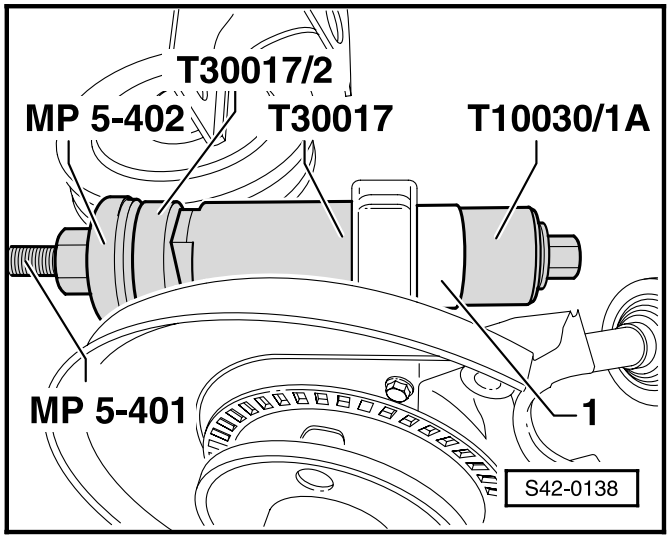
◄- Before positioning, the pressure plate T10030/1A must be marked along the entire circumference.

Distance: 3 mm

The marking must be towards the open side.

Note:

The marking is required for positioning the guide joint in the trailing arm.



◄ - Position the special tools as shown.

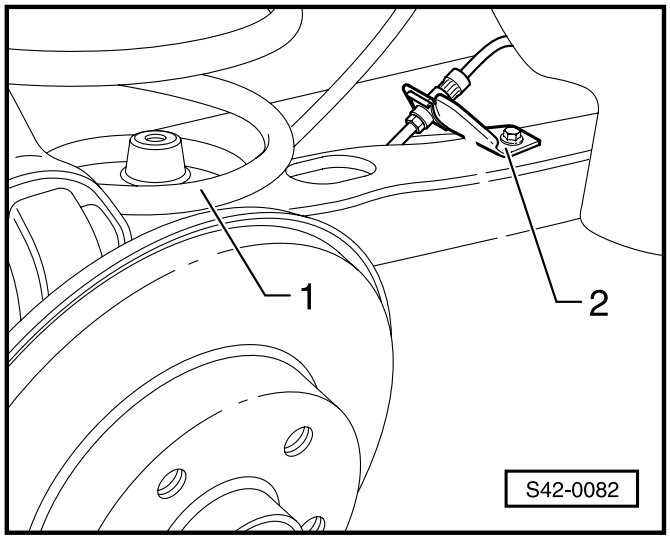
- Press in the guide joint -1- by turning the spindle until the marking on the pressure plate T10030/1A reaches the support on the trailing arm.
- Slacken special tools, do not remove.
- Check if the guide joint is located in the middle in the support of the trailing arm.
- If this is not the case, correct the fitting position of the guide joint accordingly.
- Install bottom suspension arm ⇒ page 42-58.
- Install the wheel.
- Lower the vehicle.

Removing and installing the trailing arm

Special tools, testers and aids required

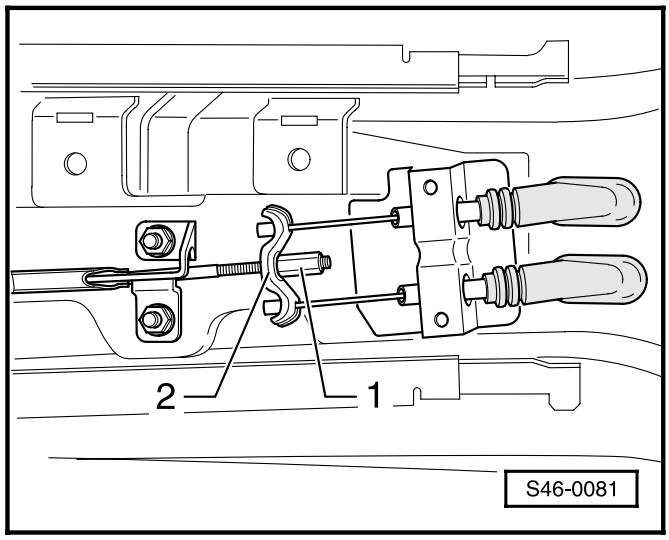
- Gearbox jack e.g. V.A.G 1383 A
- Adapter e.g. V.A.G 1359/2

Removing



- Raise the vehicle.
- Remove the wheel.

◄ - Remove helical spring -1- ⇒ page 42-35.



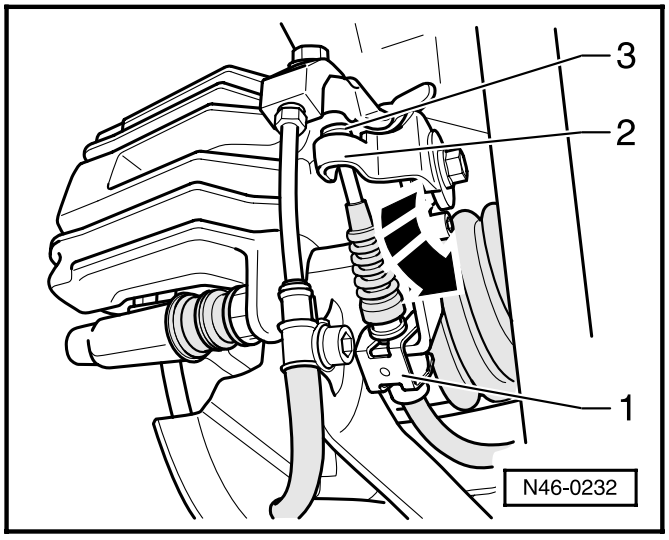
- Unbolt bracket for brake line -2- from trailing arm.
- Unclip brake line from bracket, if necessary.
- Lower vehicle.
- Remove rear centre console.

⇒ Body Fitting Work; Repair Group 68; Interior Equipment

- Release handbrake.

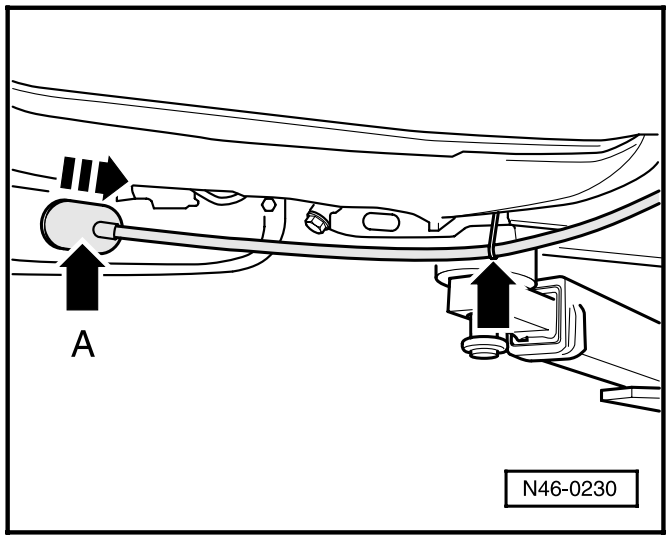
◄- Slacken adjusting nut -1- sufficiently until the handbrake cable can be released from the compensating arm -2-.

- Raise vehicle.



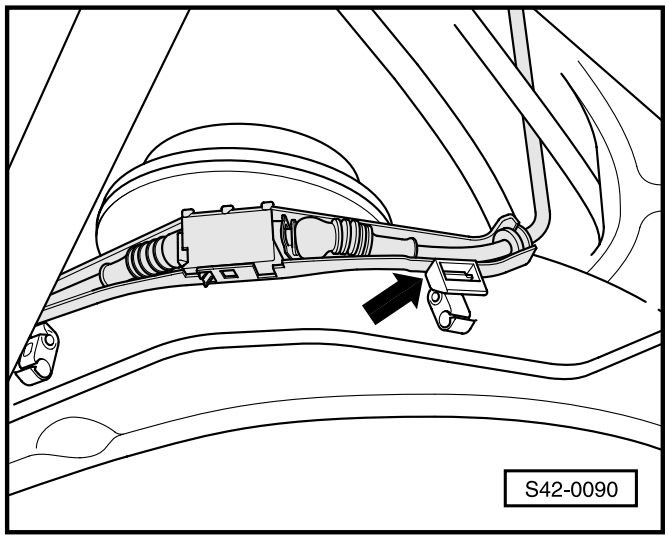
◄- Use a screwdriver to lever out clip -1- and pull down and off.

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



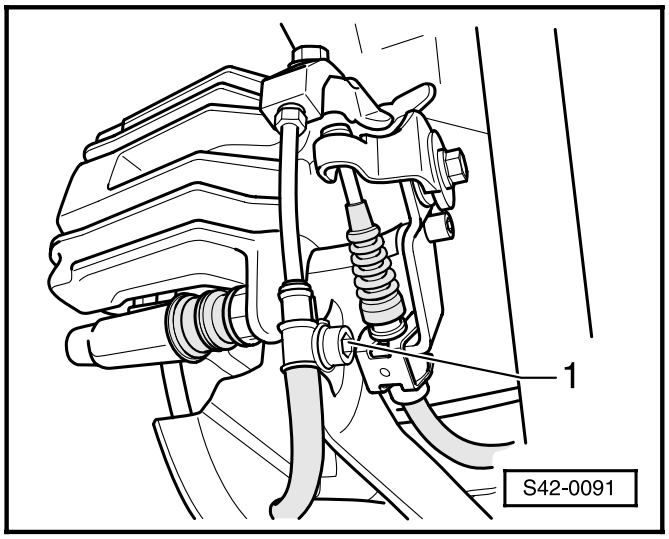
◄- Remove rubber grommet -arrow A- from the trailing arm.

- Detach handbrake cable from fixture -arrow- and pull it out of trailing arm in direction of arrow.
- Remove drive shaft ⇒ page 42-72.



◄- Unclip cable for wheel speed sensor from fixture -arrow-.

- Remove ABS wheel speed sensor from trailing arm housing.



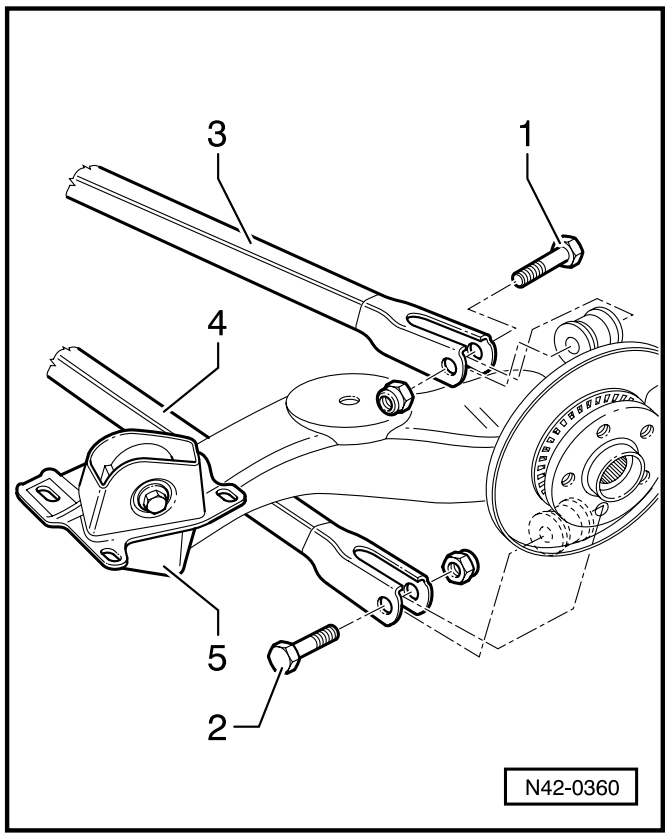
◄- Unscrew bolts -1- attaching brake carrier and take brake carrier off together with brake caliper.

Note:

Top bolt attaching brake carrier is concealed.

- Attach the brake caliper at the body. Brake line must not be subjected to pulling stresses.

- Remove cross-head screw for brake disc and take off brake disc.

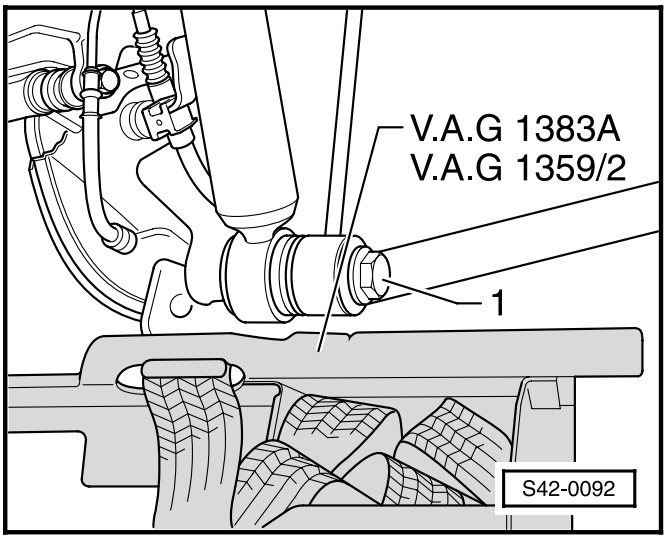


◄- Unscrew bolts -1- and -2- for track control arms.

3 - Top track control arm

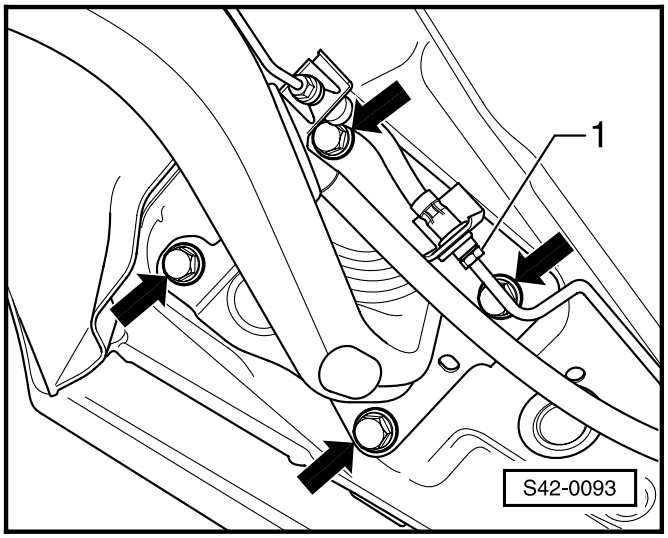
4 - Bottom track control arm

5 - Trailing arm



◄ - Position the gearbox lift with attachment, e.g. V.A.G 1383A with V.A.G 1359/2, below the trailing arm.

- Unscrew bolt -1- for shock absorber.



◄ - Separate brake line at the pipe union -1-.

- Seal brake lines.

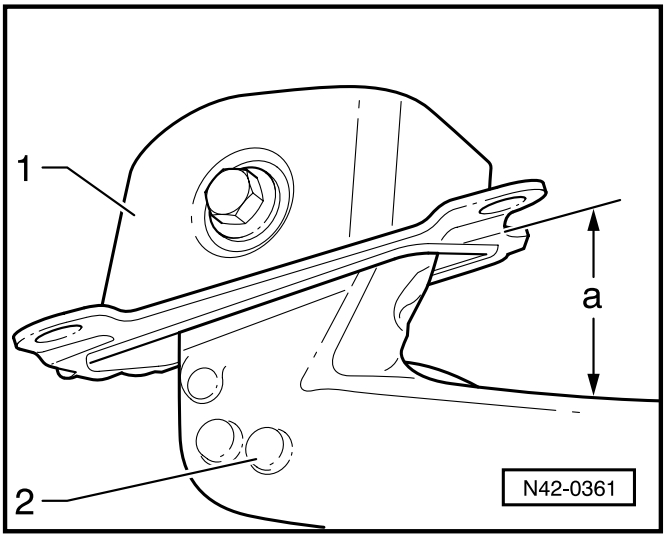
- Mark the installation position of the bearing bracket at the body.

- Unbolt the bearing bracket from the body -arrows-.

Notes:

- *If the trailing arm is replaced, use the existing track control arm.*
- *The installation position of the bearing bracket must then be set as described on page 42-57.*

Determining installation position of bearing bracket relative to trailing arm



◄ The dimension -a- is 53.5 ± 2 mm.

1 - Bearing bracket

2 - Trailing arm

Installing

Installation is carried out in the reverse order.

- Bleed brake system ⇒ page 47-18.

- Adjust handbrake ⇒ page 46-29.

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

Tightening torques:

Brake carrier with brake calliper to trailing arm	65 Nm
Bracket to trailing arm	90 Nm
Bracket to body	75 Nm
Suspension arm to trailing arm **Use new screws and nuts!**	70 Nm + 90°
Shock absorber to trailing arm Vehicle must be standing on its wheels and loaded with one person on the rear seat.	110 Nm
Tighten drive shaft to flange shaft M8 crosswise in 2 steps (I and II) **Use new screws!**	I - 10 Nm II - 40 Nm
Pipe bolted connection - brake line	14 Nm
Wheel screw	120 Nm
Nut to wheel hub **Always use new nut!**	

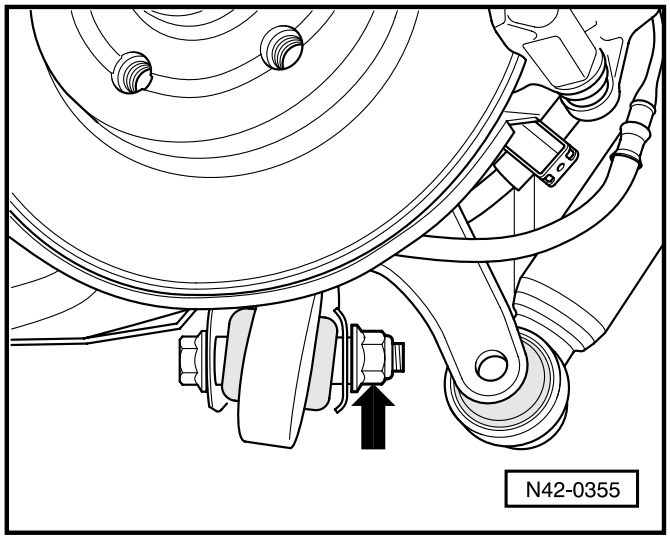
Tightening torque ⇒ page 42-74

Removing and installing suspension arm

Caution!

If the top and bottom guide joint must be replaced, first of all the helical spring must be removed.

- Remove helical spring ⇒ page 42-35.

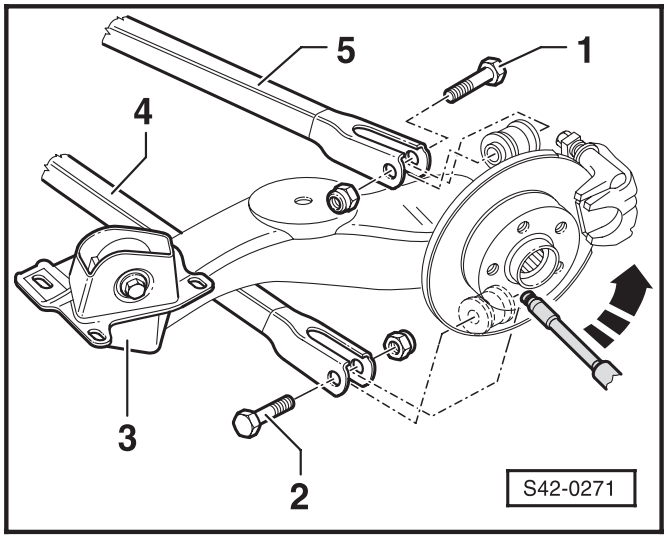


Removing bottom suspension arm

- Raise the vehicle.
- Remove the wheel.

◄ - Unscrew bottom suspension arm from the trailing arm -arrow-.

- Screw the wheel bolt up to the stop into the brake disc.



◄ - Fit socket nut with two extensions onto the wheel bolt.

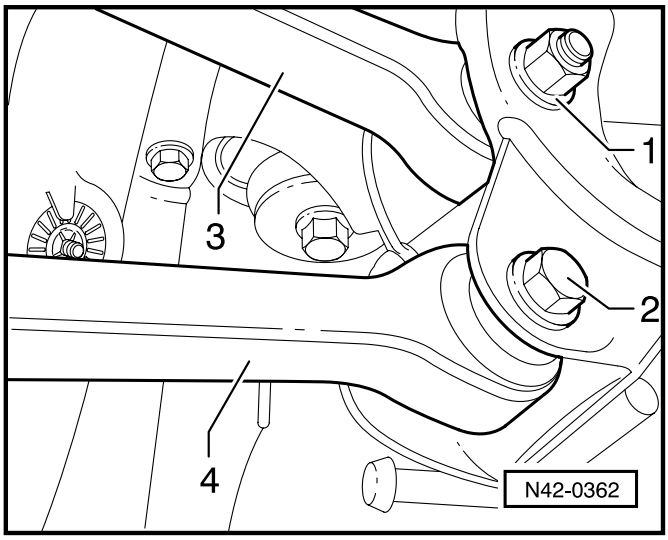
- Press extension slightly upwards -arrow- and pull out screw -2-.

1 - Screw for top suspension arm - do not slacken!

3 - Trailing arm

4 - Bottom suspension arm - do not remove!

5 - Top suspension arm



◄ - Unscrew screw -2- from the assembly carrier.

- Unscrew bottom suspension arm -4- from the assembly carrier.

Installing bottom suspension arm

Further installation occurs in reverse order.

The screw for bottom suspension arm must only be tightened for a vehicle standing on its wheels!

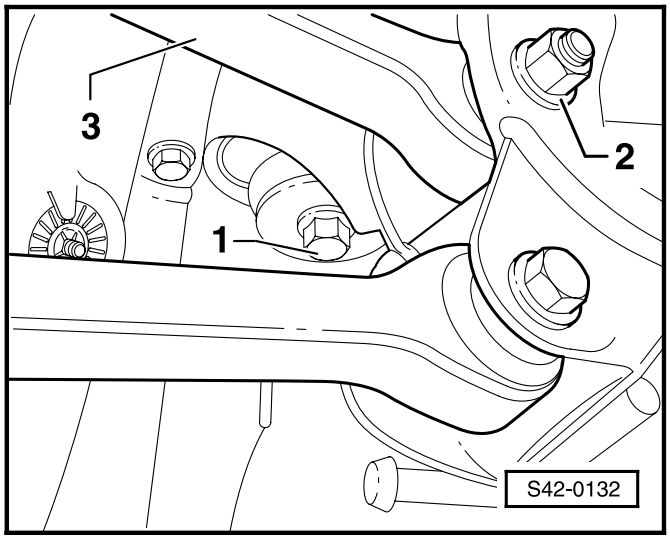
After installation inspect the wheel toe and camber, if necessary adjust ⇒ page 44-1.

Tightening torques:

Suspension arm to trailing arm **Use new screws and nuts!**	70 Nm + 90°
Suspension arm to assembly carrier **Use new screws and nuts!**	70 Nm + 90°

Removing top suspension arm

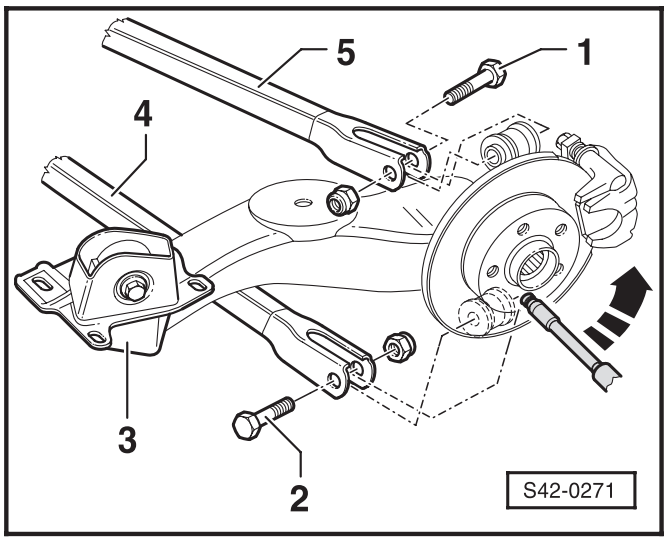
> ***Caution!***
>
> ***If the top and bottom suspension arm must be replaced, first of all the helical spring must be removed.***



- Raise the vehicle.
- Remove the wheel.

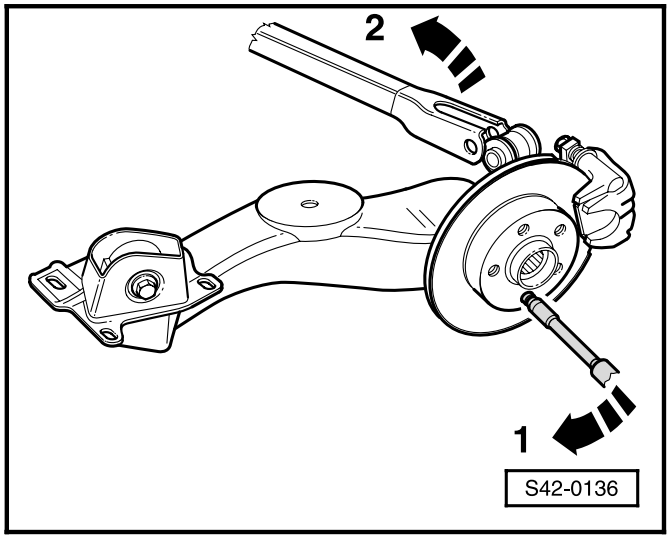
◄ - Unscrew screw -1- from the assembly carrier.

- Unscrew nut -2- for top suspension arm.



◄ - Unscrew nut of screw -1-

- Screw the wheel bolt up to the stop into the brake disc.
- Fit socket nut with two extensions onto the wheel bolt.
- Press extension slightly upwards -arrow- and pull out screw -1-.



◄ - Press down the extension only so far -arrow 1-, that the top suspension arm can be removed upwards -arrow 2-.

Note:

If the extension is pushed too far downwards, the drive shaft can be damaged.

- Pull screw and top suspension arm out of the assembly carrier.

Installing top suspension arm

Further installation occurs in reverse order.

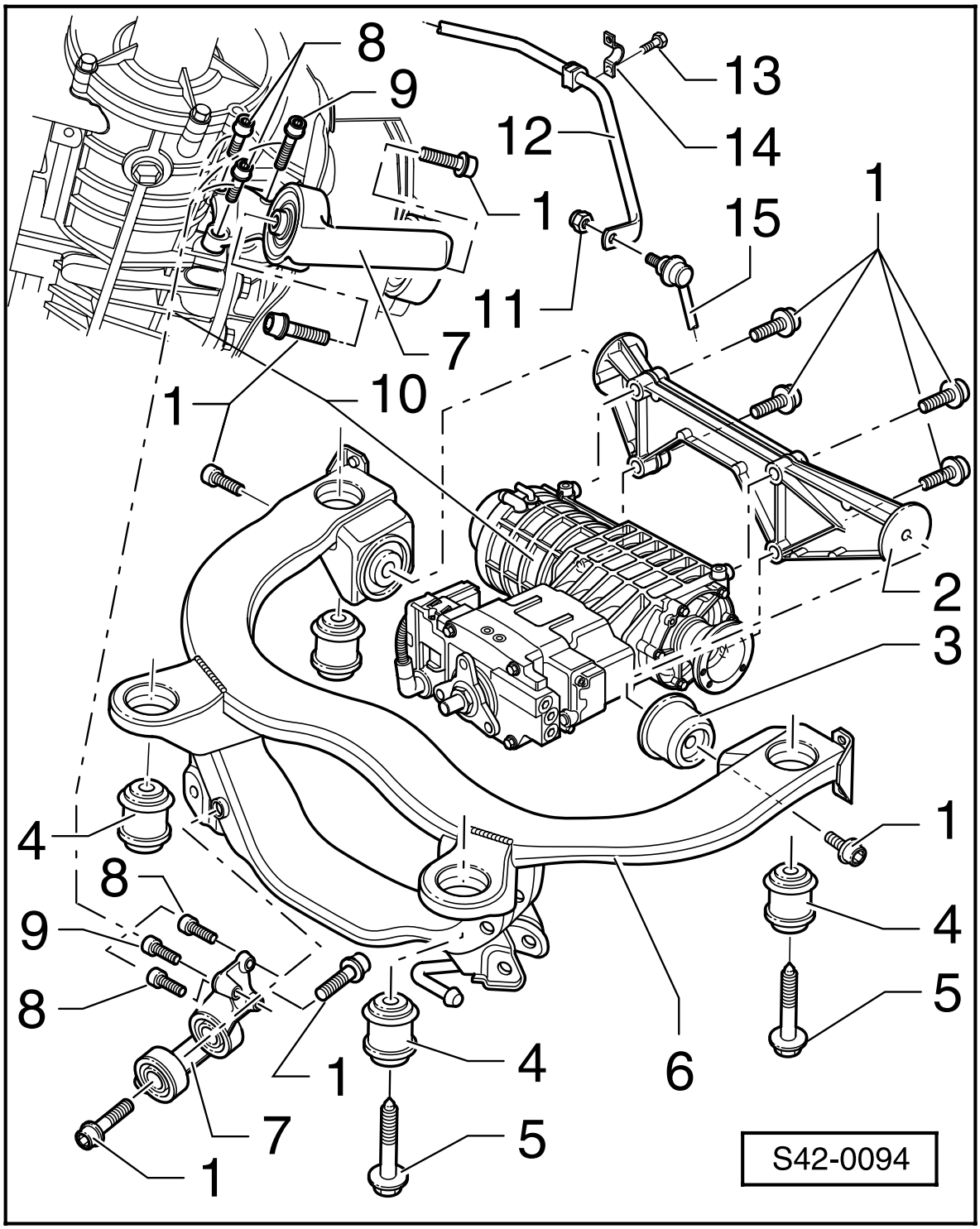
The screw for top suspension arm must only be tightened for a vehicle standing on its wheels!

After installation inspect the wheel toe and camber, if necessary adjust ⇒ page 44-1.

Tightening torques:

Suspension arm to trailing arm **Use new screws and nuts!**	70 Nm + 90°
Suspension arm to assembly carrier **Use new screws and nuts!**	70 Nm + 90°
Assembly carrier to body **Use new screw!**	110 Nm + 90°

Assembly overview for subframe and final drive



1 - Internally serrated bolt, 60 Nm

2 - Cross member

3 - Bonded rubber bush for final drive
- Removing and installing ⇒ page 42-68
- Pay attention to installation position: kidney-shaped openings and arrow must point up or down

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

5 - Hexagon bolt, 110 Nm + 90°
- Replace each time removed

6 - Subframe
- ♦ Removing and installing ⇒ page 42-61

7 - Support for final drive

8 - Hexagon socket bolt, 40 Nm + 45°
- ♦ M10 x 40
- ♦ Replace each time removed

9 - Hexagon socket bolt, 40 Nm + 45°
- ♦ M10 x 55
- ♦ Replace each time removed

10 - Final drive
- ♦ Removing and installing

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

11 - Self-locking nut, 25 Nm
- ♦ Replace each time removed

12 - Anti-roll bar

13 - Hexagon bolt, 20 Nm
- ♦ Insert both bolts, tighten initially to 5 Nm, and then tighten fully

14 - Clip

15 - Coupling rod

Removing and installing subframe with final drive

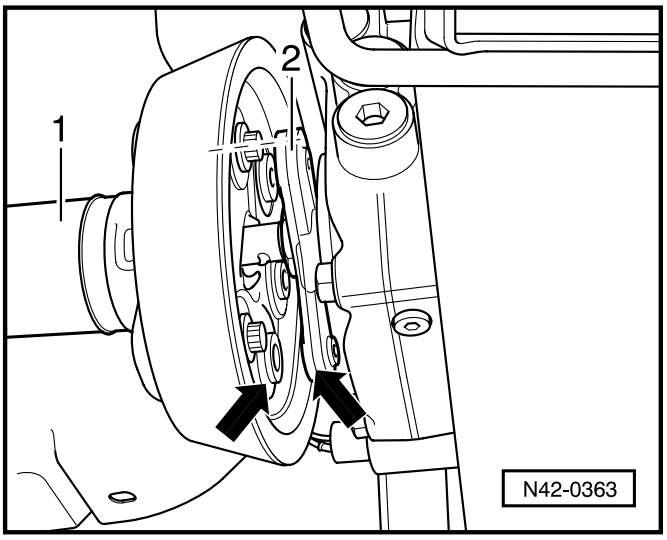
Special tools, testers and aids required

♦ Gearbox lift, e.g. V.A.G 1383 A

♦ Attachment, e.g. T10031

Removing

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



Note:

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

◄- Unbolt the propshaft from the final drive.

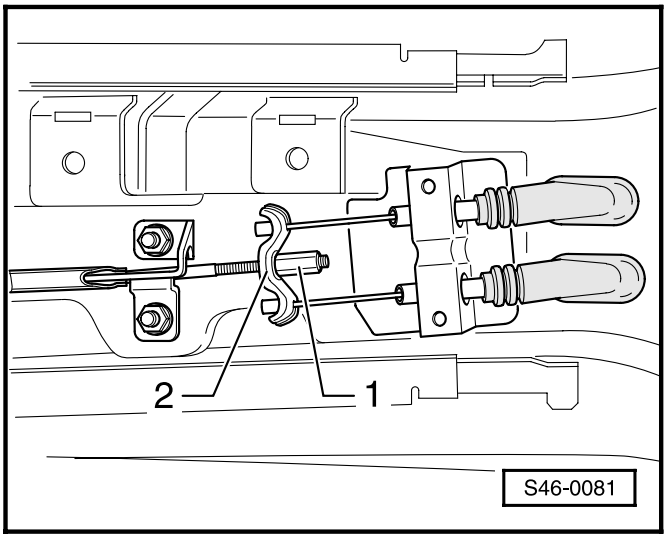
1 - Propshaft with balancing shaft

2 - Flange for propshaft

Do not twist propshaft or flange for propshaft.

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

- Lower vehicle.

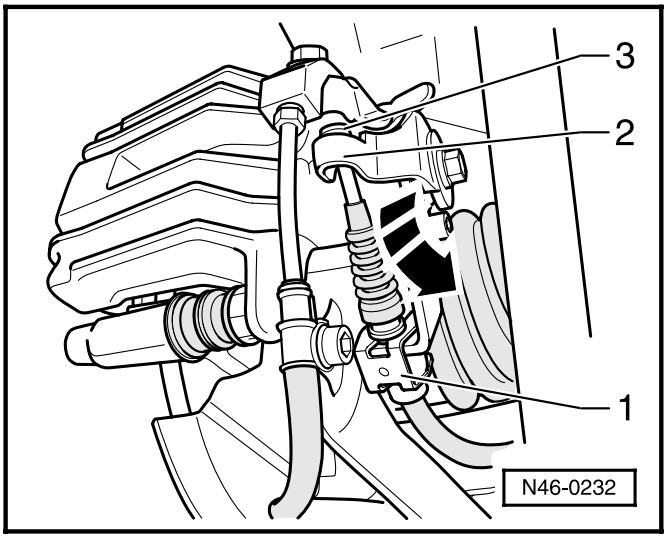


- Remove rear centre console.
⇒ Body Fitting Work; Repair Group 68; Interior Equipment

- Release handbrake.

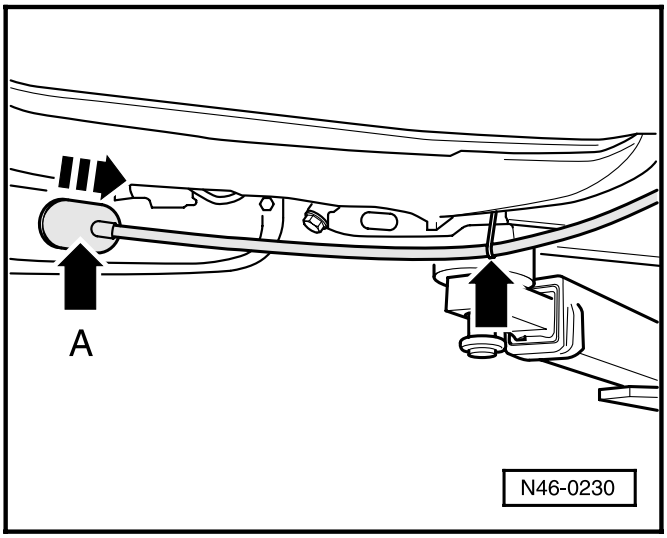
◄- Slacken adjusting nut -1- sufficiently until it is possible to release the handbrake cable from the compensating bar -2-.

- Raise vehicle.



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

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

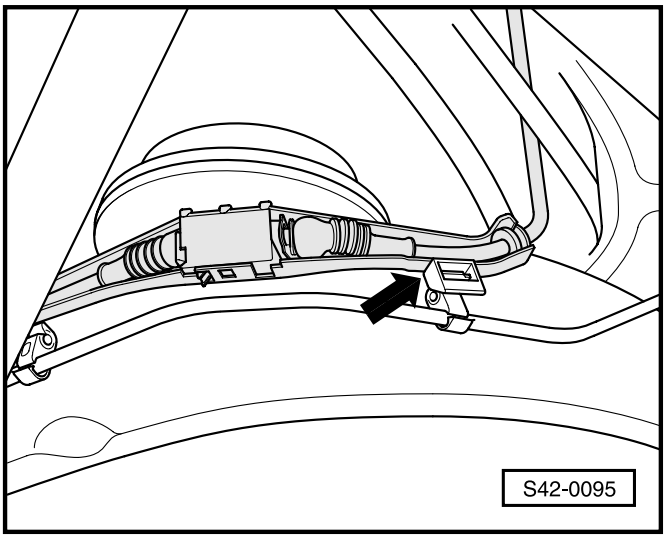


◄- Remove rubber grommet -arrow A- from the trailing arm.

Note:

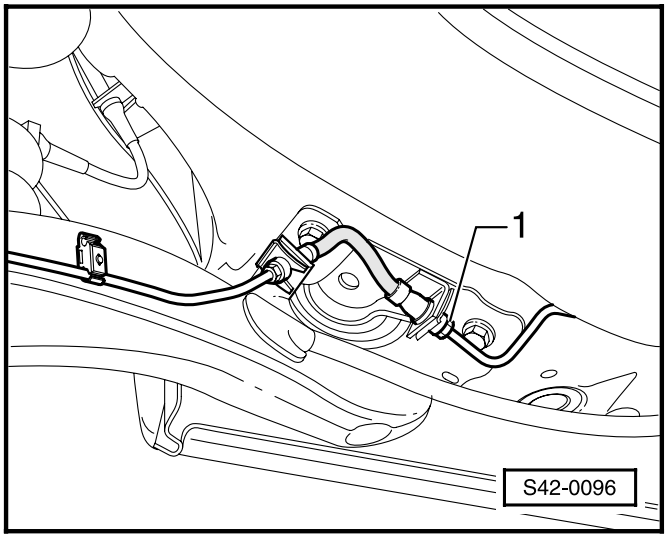
If the subframe is only to be lowered, e.g. for replacing the bonded rubber bush, it is not necessary to pull the handbrake cables out of the trailing arm.

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



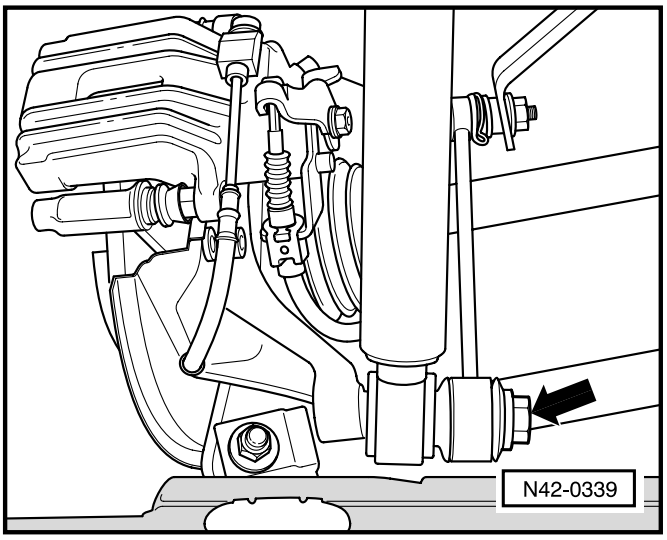
◄- Unclip cable for wheel speed sensor from fixture -arrow-.

- Remove ABS wheel speed sensor from trailing arm housing.

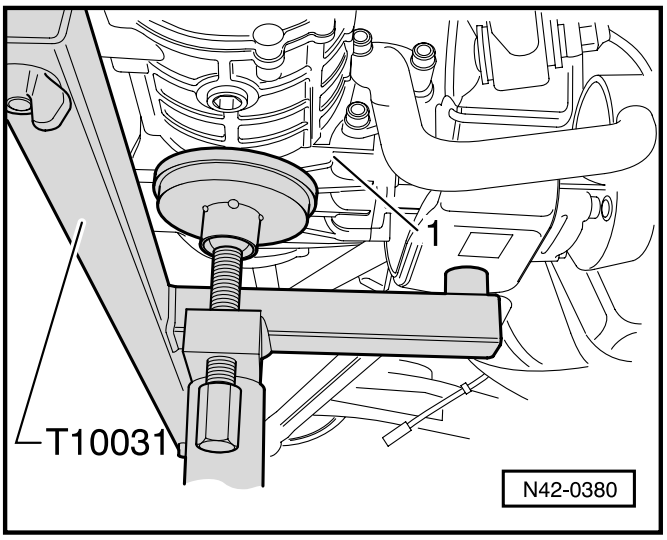


◄- Separate brake lines at the pipe union -1-.

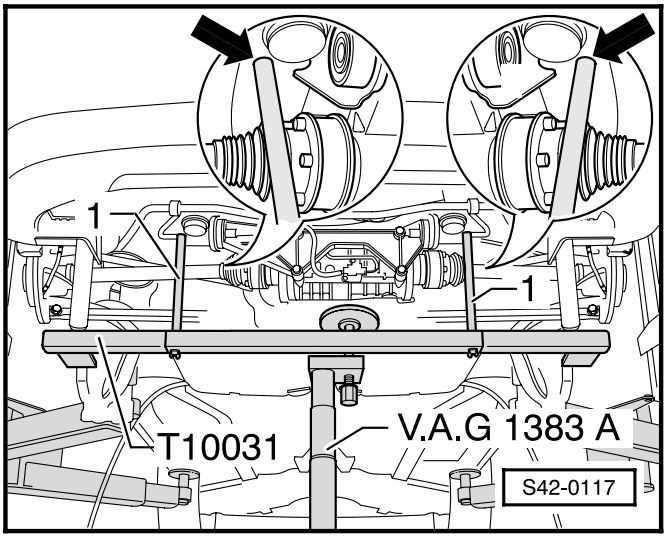
- Seal brake lines.



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

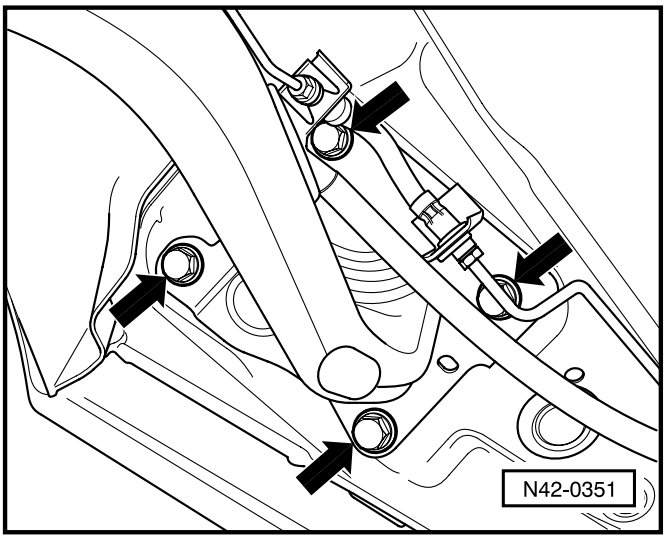


◄- Place gearbox lift together with attachment, e.g. V.A.G 1383 A with T10031, below the final drive -1-.



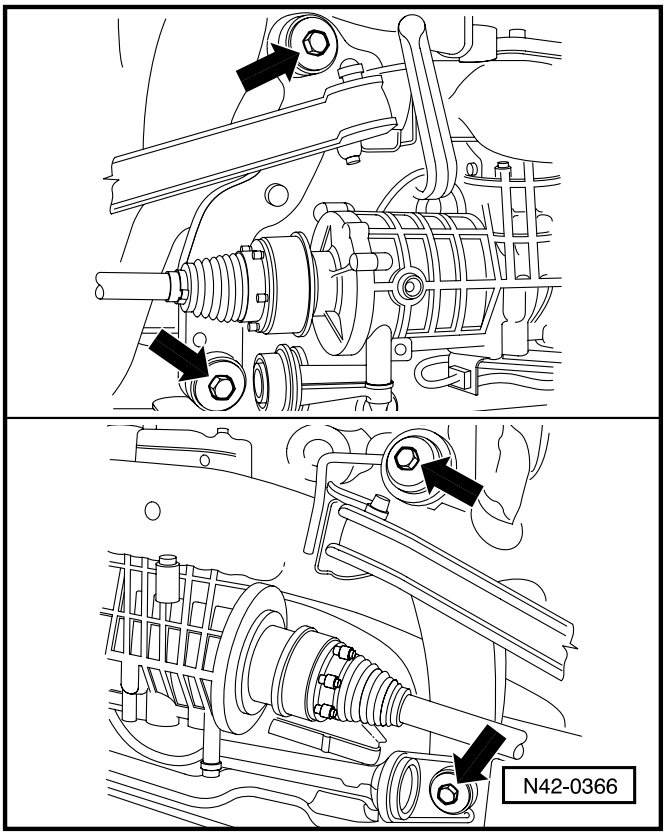
◄- Insert the pins -1- into the holes of the subframe -arrows-.

- Separate vacuum line and electric cable.



- Mark the installation position of the bearing bracket at the body.

◄- Unbolt the bearing bracket from the body -arrows-.



◄- Unscrew bolts for subframe -arrows-.

- Slowly lower rear suspension with gearbox lift and attachment, e.g. V.A.G 1383 A with T10031.

Installing

Installation is carried out in the reverse order.

- Tighten the bolts for the subframe and the bearing brackets fully at the marked installation position.

- Bleed brake system ⇒ page 47-18.

- Adjust handbrake ⇒ page 46-29.

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

Tightening torques:

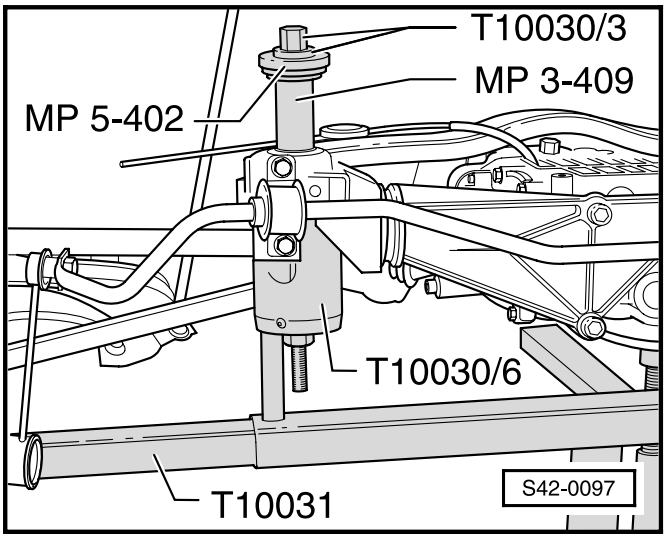
Bearing bracket to body **Use new bolts!**	75 Nm
Subframe to body **Use new bolts!**	110 Nm + 90°
Propshaft to final drive	60 Nm
Shock absorber to trailing arm Vehicle must be standing on its wheels and one person seated on the rear seat for this step.	110 Nm
Pipe union of brake line	14 Nm
Wheel bolt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

Removing and installing bonded rubber bush for subframe

Special tools, testers and aids required

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

Removing



- Raise vehicle.
- Take off wheels.
- Remove coil spring ⇒ page 42-35.
- Remove subframe together with final drive ⇒ page 42-61.

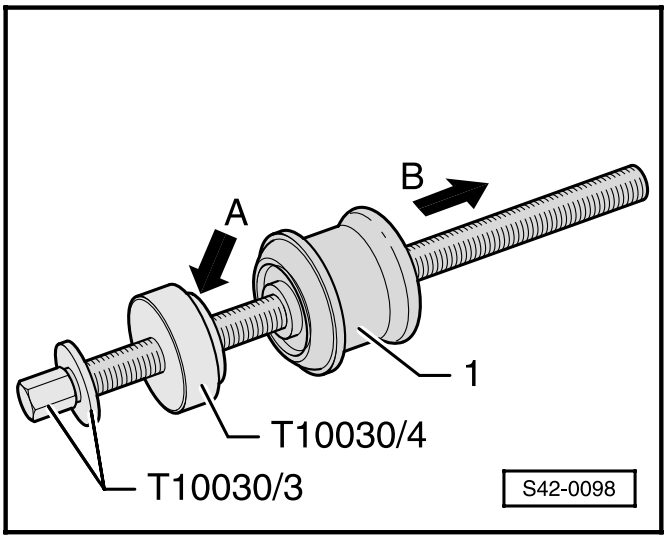
◄ - Install the special tools.

- Pull out the bonded rubber bush by turning the spindle.

Installing

Notes:

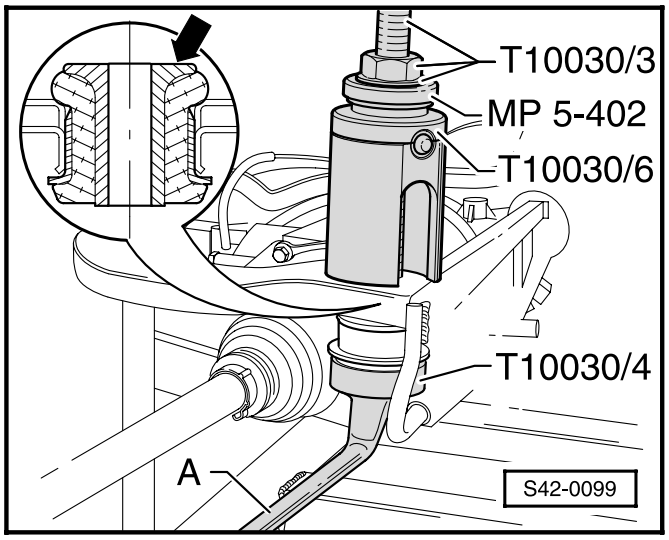
- *The bonded rubber bushes are supplied as replacement parts in a sealed plastic bag.*
- *Do not use bonded rubber bushes which have been stored unwrapped!*



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

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

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



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

◄- Now, place the bonded rubber bush and the special tools against the subframe.

- Draw in the bonded rubber bush by turning the spindle.

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

  A - Ring wrench

Note:

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

Further installation is carried out in the reverse order.

- Install subframe together with final drive ⇒ page 42-61.

- Bleed brake system ⇒ page 47-18.

- Adjust handbrake ⇒ page 46-29.

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

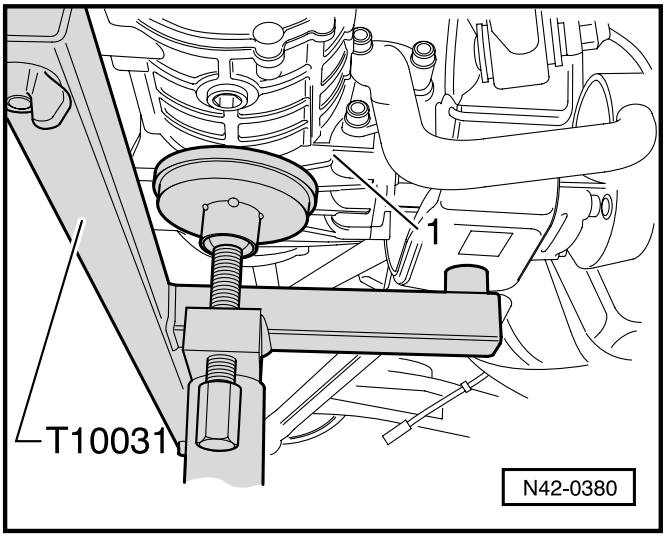
Tightening torques:

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

Removing and installing bonded rubber bush for final drive

Special tools, testers and aids required

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



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

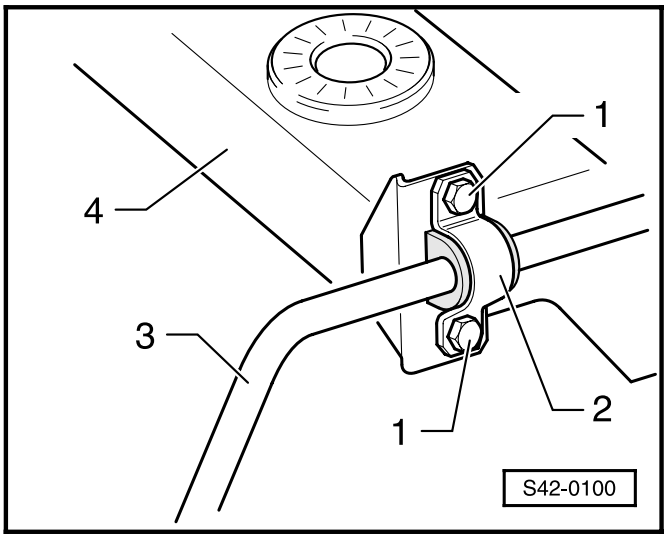
◄- Remove subframe together with final drive ⇒ page 42-61.

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

- Support the final drive -1-.

Note:

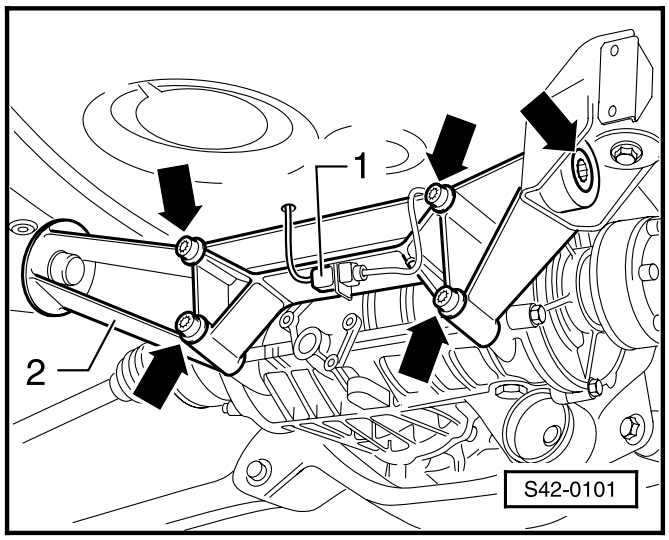
The surrounding area is not shown in Fig. S42-0100 to simplify the illustration.



◄- Remove anti-roll bar -3-, if necessary.

- Unscrew bolts -1-.
- Take off clamp -2- and anti-roll bar together with bush and coupling rod.

4 - Subframe



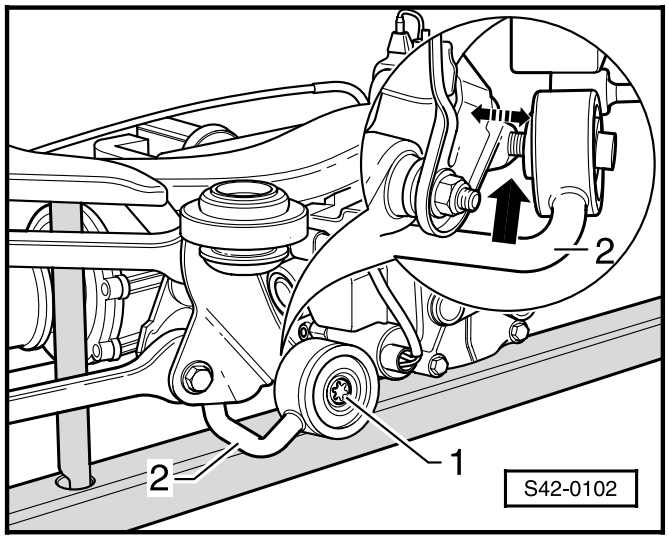
Note:

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

◄- Detach the plug connection -1- from the bracket.

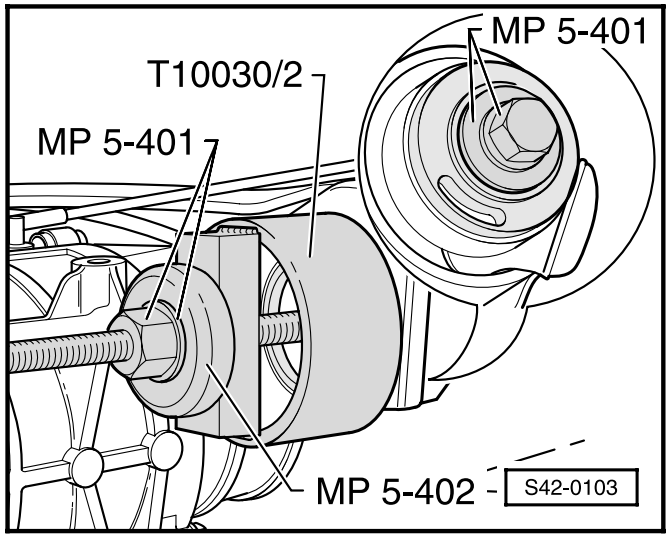
- Unscrew the internally serrated bolts -arrows-.

- Take the cross member -2- off the final drive.



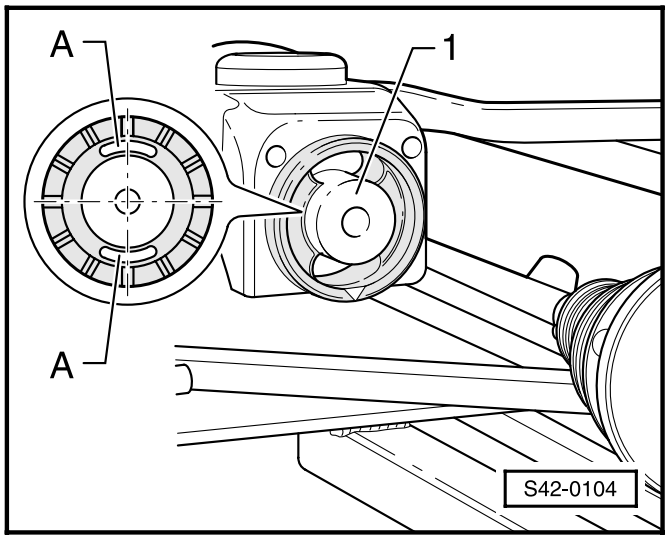
◄- Slacken the internally serrated bolts -1- of the final drive support -2- on both sides.

- Move the final drive by about 15 to 20 mm -arrow-.



◄- Install the special tools.

- Draw the bonded rubber bush out by turning the spindle.



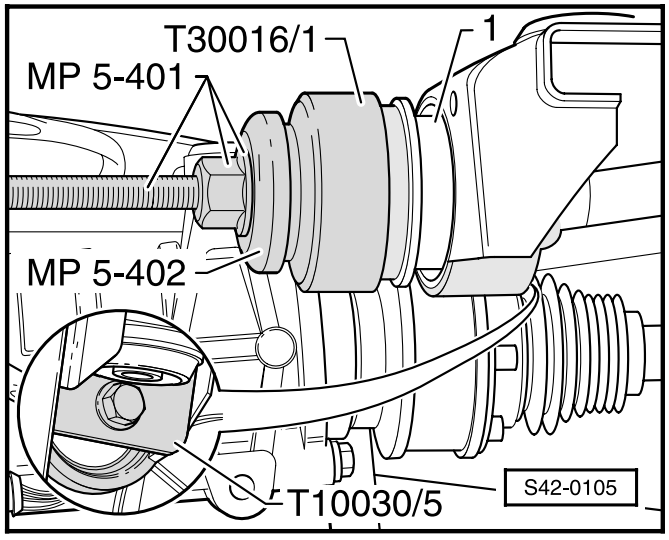
Installing

Installation position of bonded rubber bush

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

Variation from vertical of ± 2° permissible.

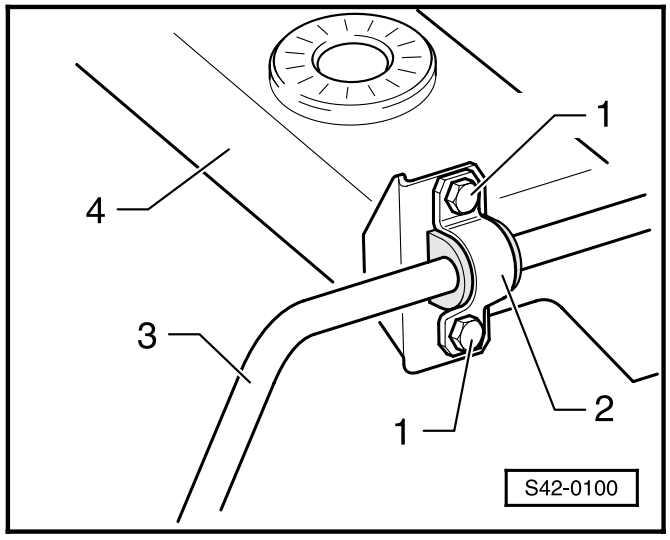
- Coat the bonded rubber bush with water, if necessary, for drawing in.



◄ - Install the special tools.

1 - Bonded rubber bush

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



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

4 - Subframe

Further installation is carried out in the reverse order.

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

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

Tightening torques:

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

Servicing drive shaft

Removing and installing drive shafts

Special tools, testers and aids required

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

Removing

Notes:

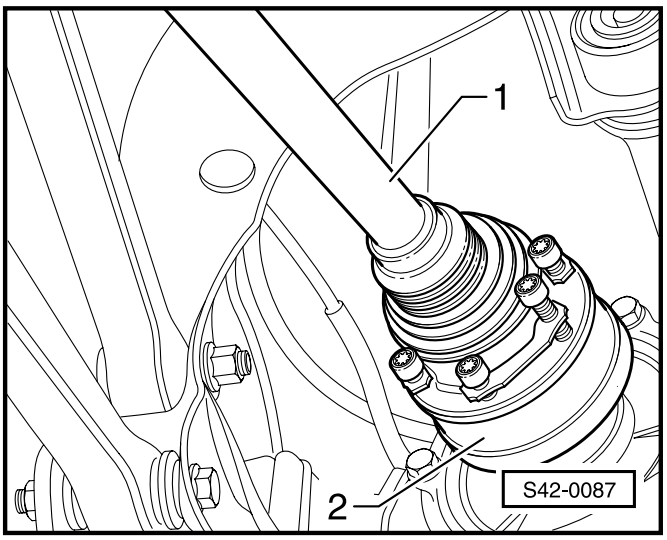
- *No load should be acting on the wheel bearing when the twelve-point nut is slackened. If a load from the deadweight of the vehicle is acting on the wheel bearing, it will suffer initial damage and the wheel bearing life will thus be reduced.*
- *If it is necessary to move the vehicle on which the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

Drive shaft assignment and marking
⇒ Parts List

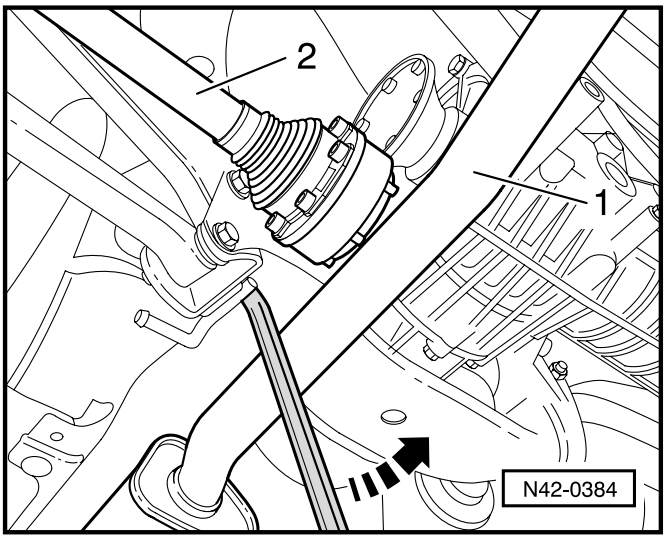
Left and right drive shafts

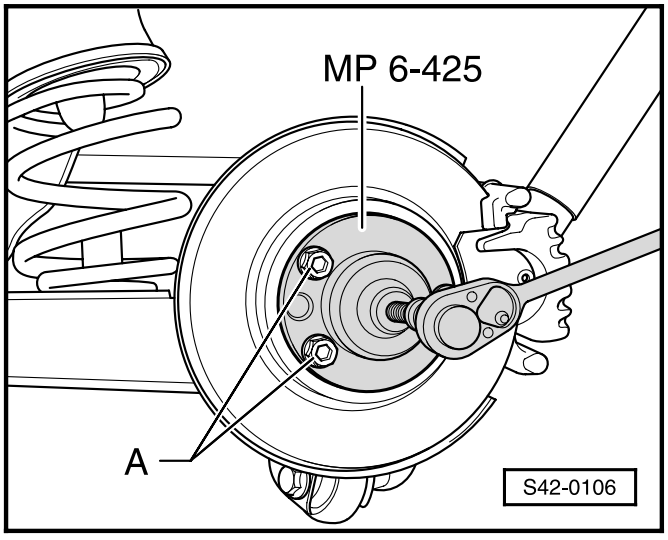
- Take off wheel trim; pull off cap of light alloy wheels (pulling hook in tool kit).
- Raise vehicle sufficiently to take the load off the rear axle.

  The wheel must still be touching the ground.
- Slacken twelve-point nut.
- Raise vehicle to working height.



◄ - Unbolt drive shaft -1- from the flange shaft of the final drive -2-.





Left drive shaft

◄ - Use an assembly lever to press the exhaust system -1- to the side in direction of arrow.

- Take the inner joint of the drive shaft -2- off the final drive.

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

- Unscrew twelve-point nut.

Note:

♦ *Ensure adequate clearance when pressing out the drive shaft.*

◄ - Press out drive shaft.

A - Wheel bolts

- Take out drive shaft.

Installing

- **Remove any varnish residues and/or corrosion present in the thread/spline of the outer joint.**

- Before inserting the drive shaft, moisten

  ♦ the spline of the outer joint

  ♦ the thread of the outer joint

  ♦ the spline of the wheel hub

  ♦ the contact surface and the thread of the new twelve-point nut

  with oil.

- Insert drive shaft.

- Insert outer joint as far as possible into the spline of the wheel hub.

- Draw outer joint sufficiently far into the wheel hub until outer joint is making contact with the wheel bearing by screwing on the new twelve-point nut.

- Position inner joint of drive shaft against the flange shaft of the final drive and tighten bolts fully to 40 Nm.

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

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

- Operate brake (second mechanic required) or tighten handbrake

- Tighten the new twelve-point nut with 250 Nm and slacken half a turn.

- Turn wheel hub at least 90°

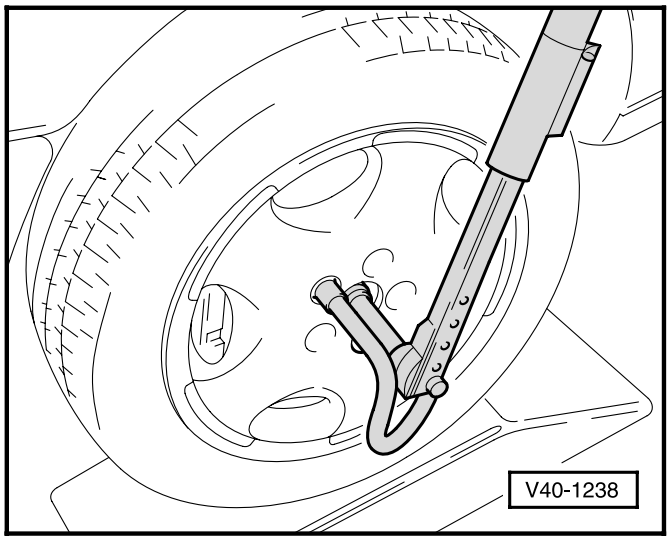
- Tighten twelve-point nut:

Tightening torque:

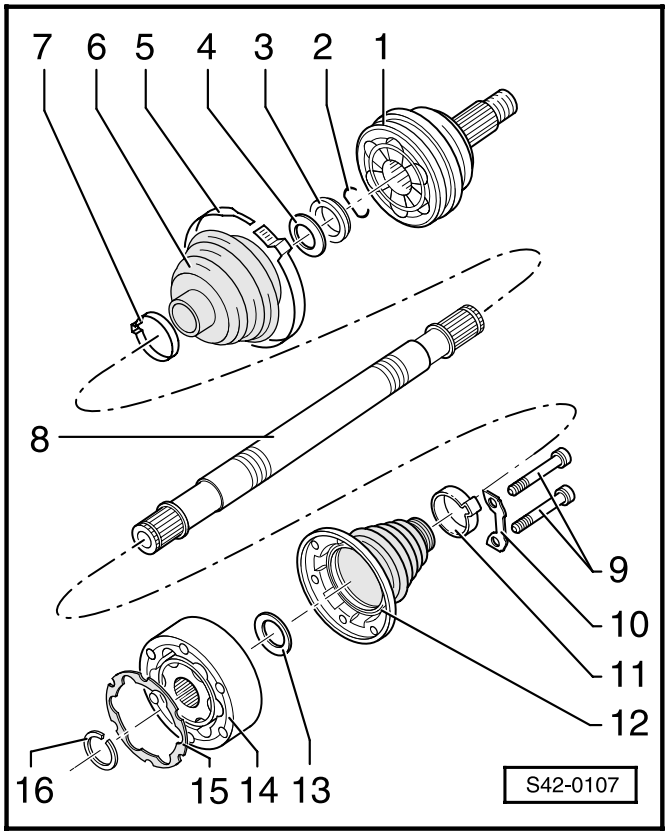
50 Nm and torque a further 60°

Note:

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



Servicing drive shaft with CV joint



Special tools, testers and aids required

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

Notes:

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

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

2 - Circlip
- replace
- insert in the groove on the shaft

3 - Thrust ring
- fitting location ⇒ Fig. 4

4 - Disc spring
- fitting location ⇒ Fig. 4

5 - Warm-type clamp
- replace
- tighten with tensioning pliers, e.g. V.A.G 1682 ⇒ Fig. 6

6 - Joint boot
- material: Hytrel (Polyelastomere)
- inspecting for tears and chafing points

7 - Warm-type clamp
- replace
- tighten ⇒ Fig. 7

8 - Drive shaft (solid shaft)
- assignment ⇒ Spare Part catalogue

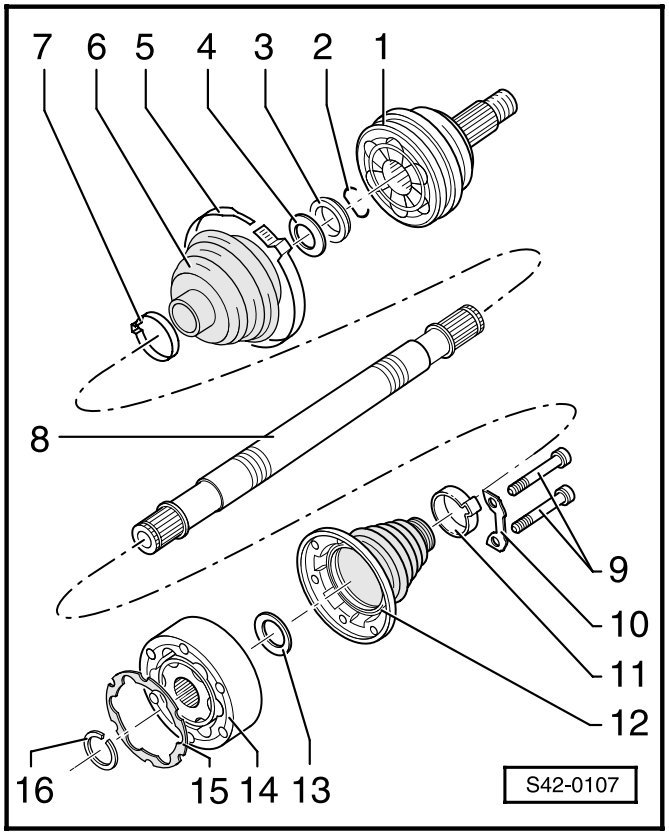
9 - Fillister head screw with internal serration, 40 Nm
- M8 x 48

10 - Shim

11 - Warm-type clamp
- replace
- tighten ⇒ Fig. 8

12 - Joint boot for inner CV joint
- material: Hytrel (Polyelastomere
- inspecting for tears and chafing points
- drive off with drift

13 - Disc spring
- fitting location ⇒ Fig. 3



14 - Inner CV joint

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

15 - Gasket

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

16 - Circlip

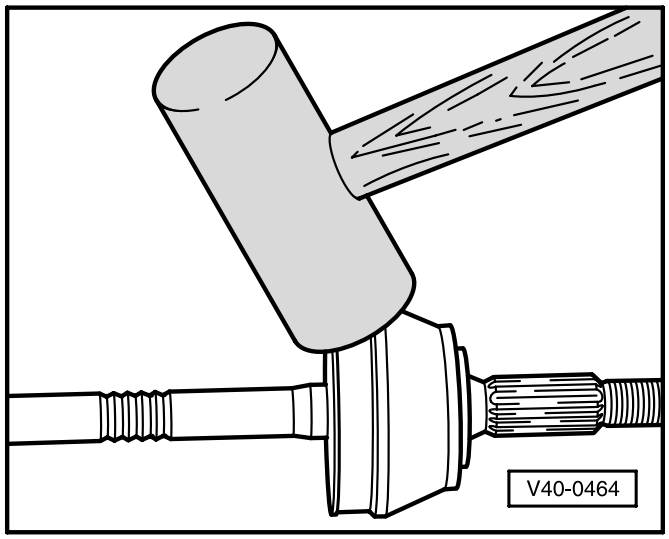
- ♦ replace
- ♦ use circlip pliers, e.g. VW 161 A, for removing and installing

Grade and quantities of grease

Note:

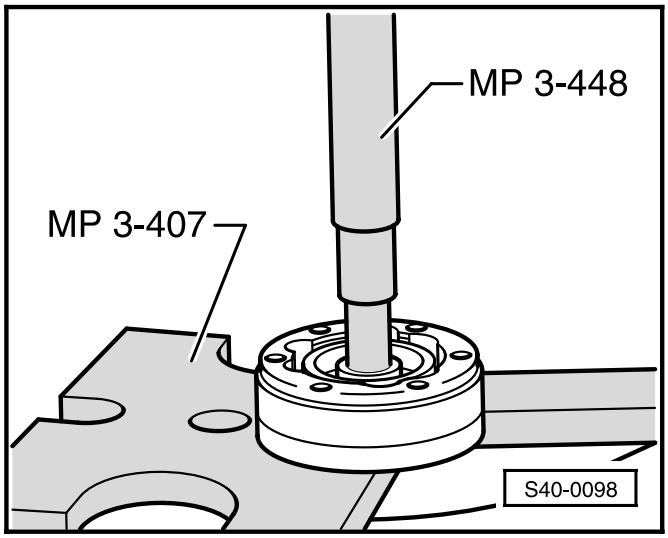
- ♦ *CV joints are packed with normal-temperature grease, e.g. N 052 738.00.*

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



◄ **Fig. 1 Removing outer CV joint**

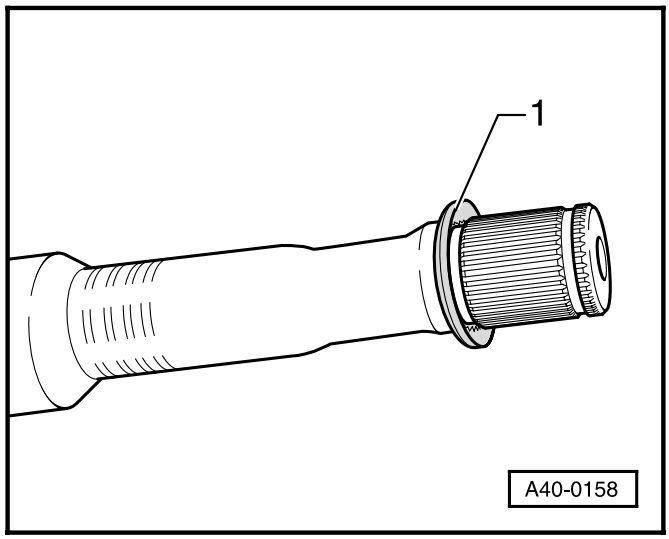
- Knock joint off drive shaft by striking firmly with a plastic-headed hammer.



◄ **Fig. 2 Pressing off inner CV joint**

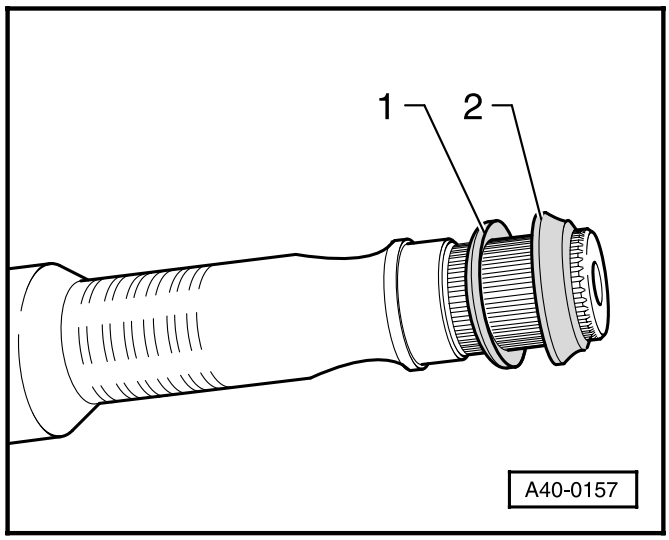
Notes:

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



◄ **Fig. 3 Installation position of dished washer at inner joint**

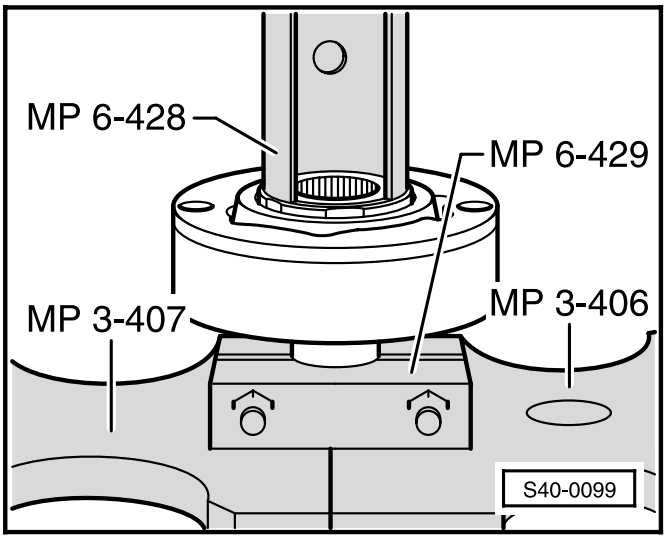
1 - Dished washer



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

1 - Dished washer

2 - Thrust ring



◄ **Fig. 5 Pressing in inner CV joint**

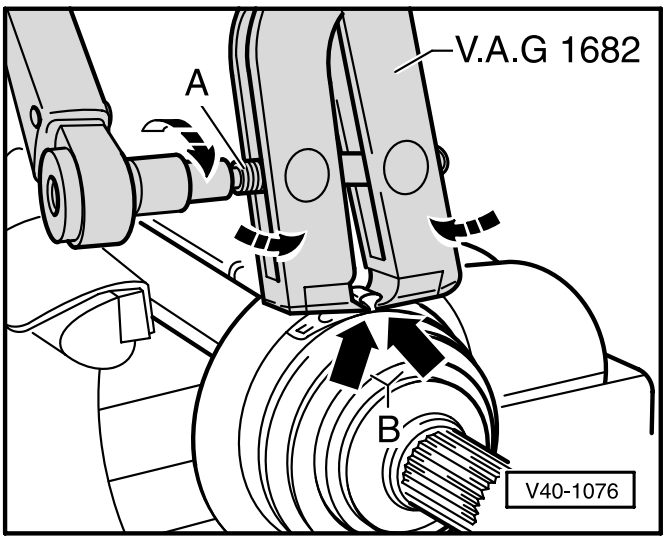
Note:

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

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

Notes:

- *In view of the hard material (as opposed to rubber) of the joint boot, which requires the use of a stainless steel warm-type clamp, it can only be tightened with tensioning pliers, e.g. V.A.G 1682.*
- *Tightening torque: 20 Nm*
- *Use a torque wrench.*
- *Make sure the thread of the spindle -A- of the tensioning pliers is smooth . If necessary grease with Molykote MOS_2.*
- *If it is not smooth, e.g. if the thread is dirty, the necessary tensioning force of the warm-type clamp is not reached at the given torque.*

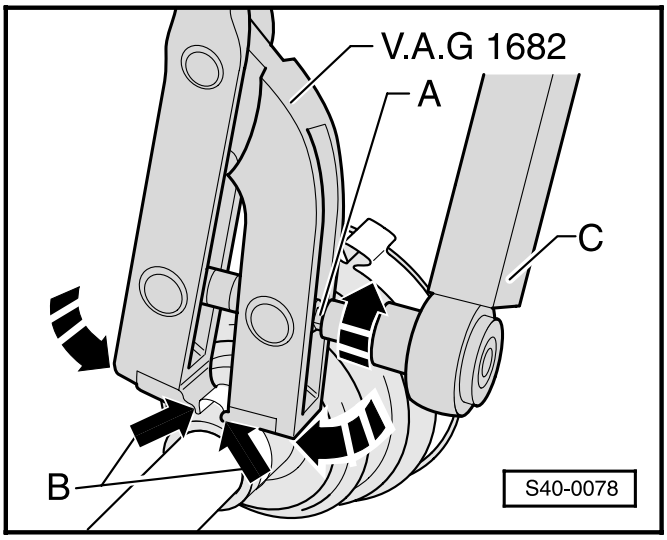


◄ **Fig. 6 Tighten warm-type clamp at outer joint (large diameter)**

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

  A - Spindle of tensioning pliers

  B - Cutting edges of tensioning pliers



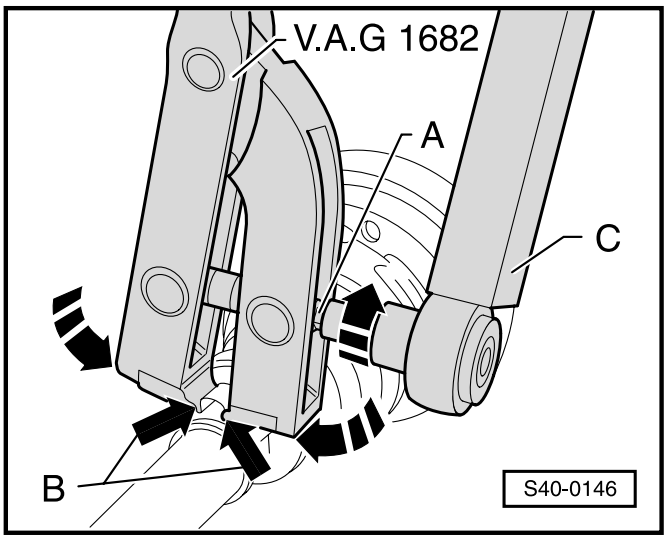
◄ **Fig. 7 Tighten warm-type clamp at outer joint (small diameter)**

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

A - Spindle of tensioning pliers

B - Cutting edges of tensioning pliers

C - Torque wrench



◄ **Fig. 8 Tighten warm-type clamp at inner joint**

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

A - Spindle of tensioning pliers

B - Cutting edges of tensioning pliers

C - Torque wrench

Vehicle measurement

General points

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

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

Correct driving behaviour cannot be guaranteed otherwise!

Comments:

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

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

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

The necessity for undertaking a vehicle measurement exists when:

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

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

1) Only for vehicles with four-wheel drive

Conditions for performing checking and tests

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

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

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

⇒ Inspection and Maintenance; or a sticker on the vehicle

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

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

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

- The vehicle is aligned, rocked a number of times to settle the springs and settled.

- Make sure that no sliding base and turning plate has reached its end position during the measurement process.

- The steering wheel must be in the position required to drive straight ahead.

Attention!

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

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

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

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

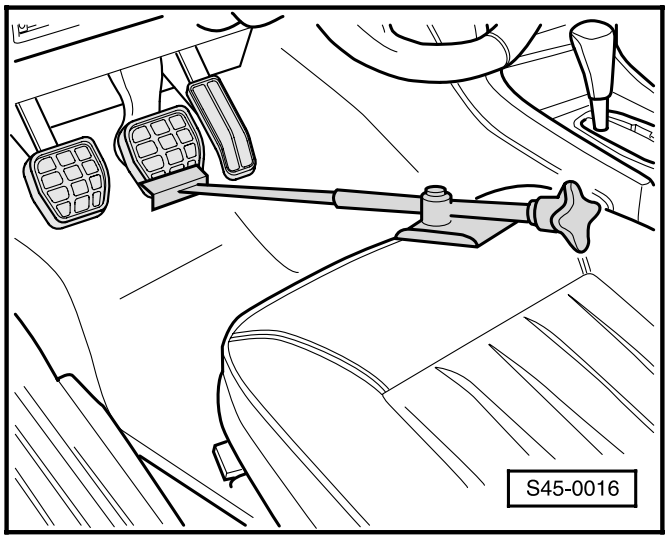
  These highly sensitive apparatus should be treated carefully and scrupulously!

Measuring preparations

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

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

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



- Perform rim runout compensation.
- Lower vehicle and bounce.

◄ - Use brake-pedal arrester, e.g. V.A.G 1238 /B.

Overview of procedure for checking vehicle alignment

It is essential to observe the following sequence of steps!

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

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

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

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

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

4x4 models:
The toe of the rear suspension can be set.

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

The following general rule applies!

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

Suspension designations

⇒ page 00-4

Specifications for vehicle alignment

- Specifications for front suspension ⇒ page 00-1
- Specifications for rear suspension ⇒ page 00-3 and page 00-3.2

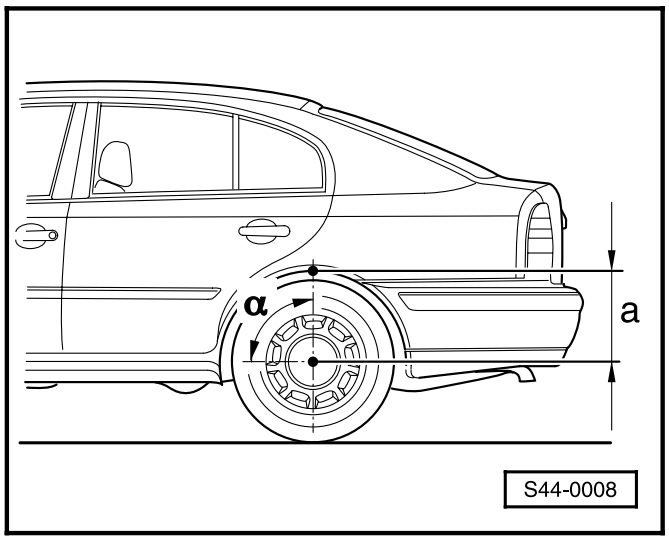
Inspecting the vehicle's transversal inclination

"Zero position" transversal inclination of vehicle

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

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

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



- Bounce vehicle several times and allow to settle.

Note:

Dimension "a" to be determined only on the rear axle.

◄ - Determining dimension "a" for the left and right vehicle side.

a_{left} - left vehicle side

a_{right} - right vehicle side

$\alpha = 90°$

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

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

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

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

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

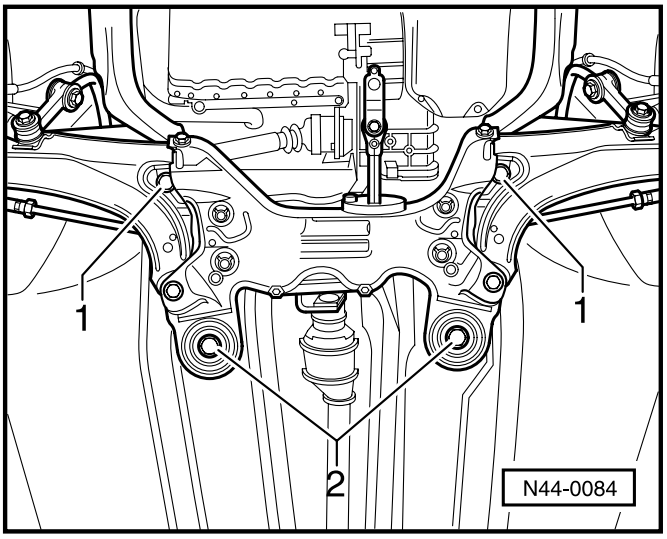
Sandbags of approx. 10 kg can be used as weight.

Inspecting front suspension camber, center if necessary

The camber cannot be aligned but only centered!

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

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



◄ - Loosen screws -1- and -2-.

- Shift the assembly support until a uniform camber is obtained on both sides.

- **Subsequently check the castor offset.**

  The caster offset may have changed due to the shifting of the assembly support.

- Screw down the assembly support using new screws.

Tightening torques:

Assembly support on body screw postion -1- **Use new screws!**	100 Nm + 90°
Assembly support on body screw postion -2- **Use new screws!**	100 Nm + 90°

Inspecting camber at rear suspension

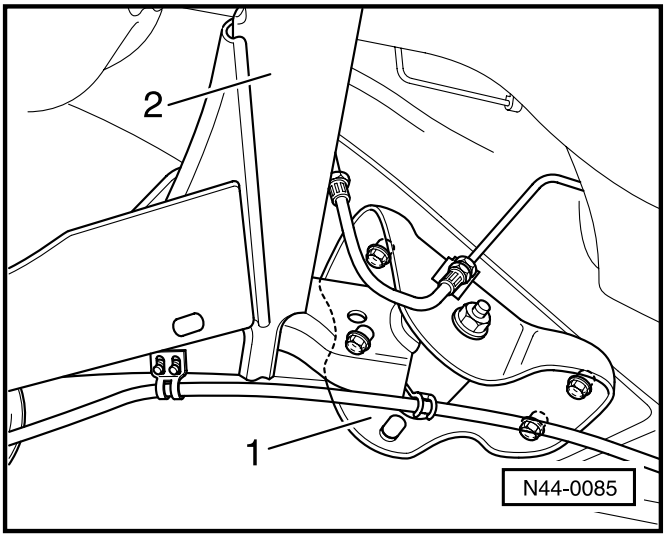
The camber cannot be set.

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

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

Inspecting toe at rear suspension, centring/setting if necessary

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



FWD models

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

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

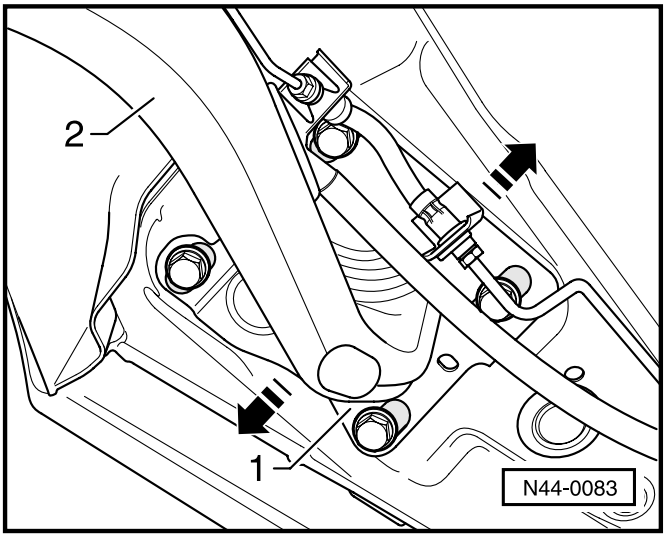
◄ - Slacken all the bolts of the bearing bracket -1-.

- Move bearing bracket -1- in transverse direction.

  2 - Rear axle beam

- Tighten the bolts fully to 30 Nm + 90°.
  Always use new bolts!

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



4x4 models

The toe of the rear suspension can be set.

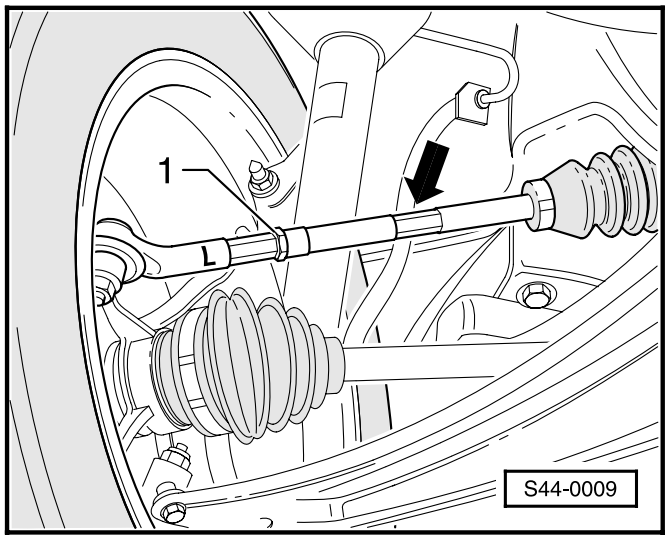
◄ - Slacken all the bolts of the bearing bracket -1-.

- Move bearing bracket -1- in transverse direction.

  2 - Trailing arm

- Tighten the bolts fully to 75 Nm.
  Always use new bolts!

- After setting the individual wheel toe, inspect total wheel toe.
  Total wheel toe must equal the specification ⇒ page 00-3.2.



Inspecting front suspension track, align if necessary

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

◄ - Loosen locknut -1-.

- Align front end by moving the left and/or right tie rods.

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

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

Twisted bellows wear rapidly.

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

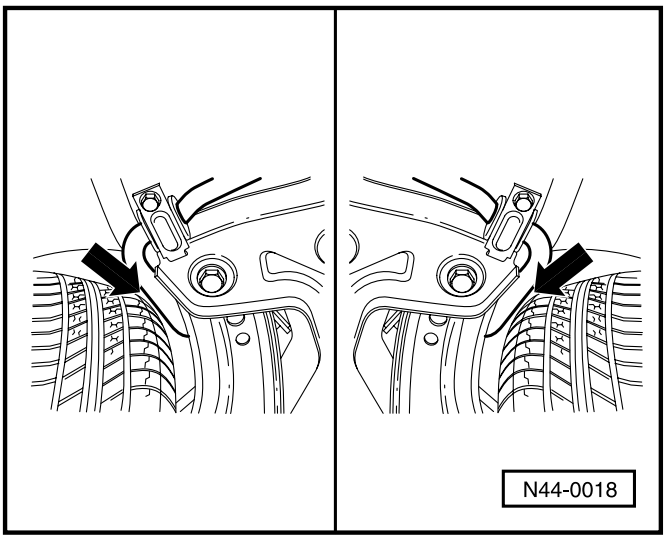
After tightening locknut -1- the set value may have changed slightly.

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

Inspecting steering angle left and right

This inspection only needs to be carried out:

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



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

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

Example:

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

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

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

- Tighten locknuts with 50 Nm.

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

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

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

Arithmetical determination of rolling direction deviation of rear suspension

Note:

The values below are only given by way of example.

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

Track value for rear left wheel **Track value for rear right wheel**

+15’ +5’

15’ - 5’ = 10’
10’ : 2 = 5’

Rolling direction deviation = 5’

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

Track value for rear left wheel **Track value for rear right wheel**

+15’ -5’

15’ + 5’ = 20’
20’ : 2 = 10’

Rolling direction deviation = 10’
The result thus obtained is the actual rolling direction deviation of the longitudinal vehicle axis.

Wheels and tyres

Wheel/tyre combinations ⇒ page 00-8

General

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

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

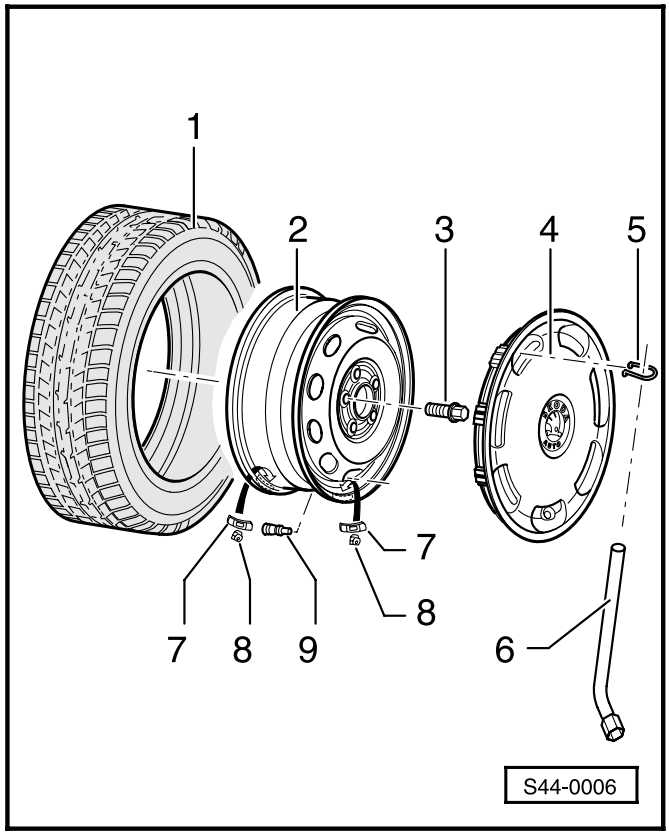
It is recommended to fit tyres of the same make, same type and tread pattern on all wheels.

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

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

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

Disc wheel



Notes:

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

1 - Tyres

2 - Wheel rim

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

3 - Wheel bolt, 120 Nm

4 - Wheel trim cap

5 - Pull-off hook

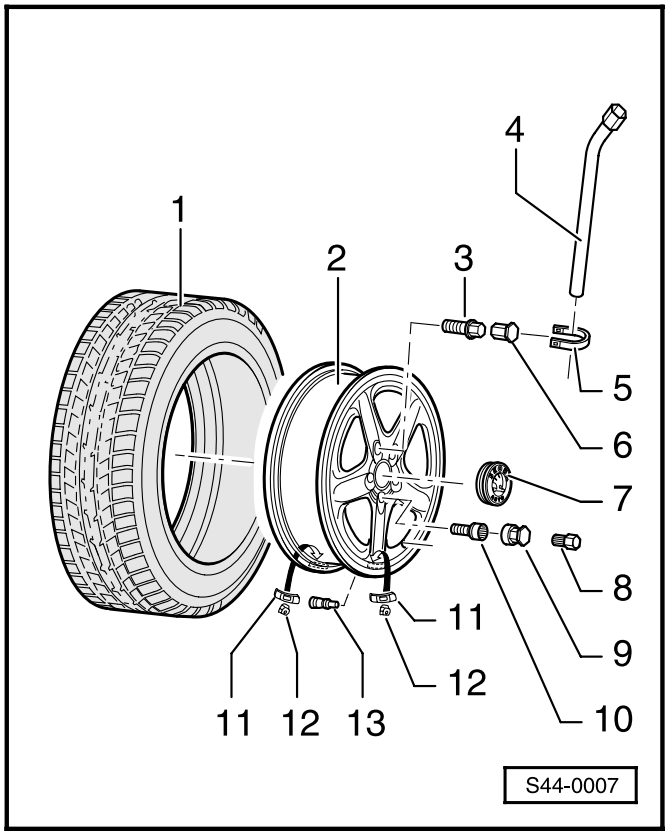
6 - Wheel bolt key
- included in tool kit

7 - Balancing weights
- max. 60 g allowed per rim flange

8 - Retaining spring for balancing weights

9 - Valve
- only use valve in accordance with spare part catalogue

Light alloy wheel



Note:

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

1 - Tyre

2 - Light alloy wheel
- 6J x 15 H2, offset 38
- 6½J x 15 H2, offset 43
- 6½J x 16 H2, offset 42

3 - Wheel bolt, 120 Nm

4 - Wheel bolt wrench

5 - Removal tool
- Contained in car tool kit

6 - Bolt cap

7 - Wheel trim cap

8 - Adapter for theft-deterrent wheel bolt

9 - Bolt cap

10 - Theft-deterrent wheel bolt, 120 Nm

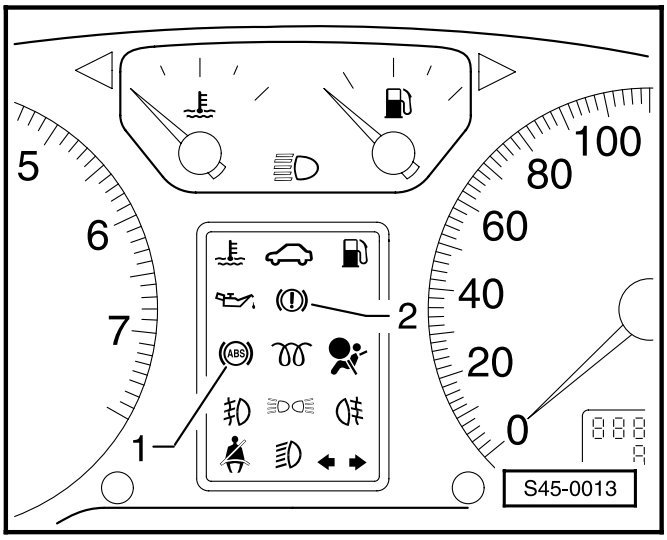
11 - Balancing weights
- Max. 60 g permissible for each wheel flange

12 - Retaining spring for balancing weights

13 - Valve
- Fit only valve as specified in Parts List

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

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



- *The ABS, ABS/EDL are vehicle safety systems; system knowledge is required for working on such systems.*
- *Faults are indicated by the ABS warning light (K47) -1- and the red warning light for handbrake/brake fluid level (K14/33) -2- coming on. Certain faults are not detected until after a minimum speed of 20 km/h has been exceeded (conduct a road test).*
- *If the ABS warning light -K47- and handbrake/brake fluid warning light -K14/33- do not come on and the brake system is nevertheless not fully operational, look for the fault in the conventional brake system ⇒ from page 46-1 and from page 47-1.*
- *Notes on rectifying current faults*

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

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

- *Before commencing work on the ABS system, it is necessary to interrogate the fault memory in order to be able to check complaints and conduct specific fault finding.*
- *Do not separate plug connections unless the ignition is switched off.*
- *Before commencing work on the ABS, ABS/EDL, switch off ignition and disconnect the earth strap at the battery. On models fitted with coded radio set, pay attention to coding; determine if necessary.*
- *Welding work using electric welding equipment may affect the ABS, ABS/EDL system.*

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

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

Technical information required

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

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

General information

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

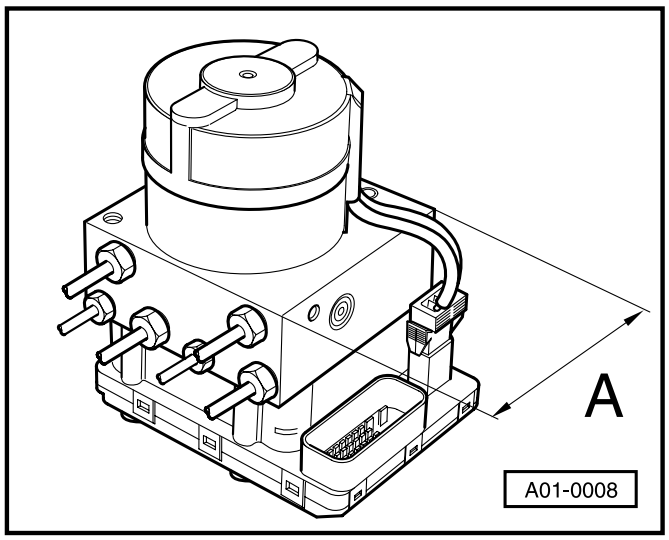
The electronic differential lock, EDL, is a starting-off aid. A supporting torque is created for the differential by electronically controlling the braking of the driven wheel which is slipping. The engine power is thus available for the gripping wheel with the better adhesion. This also applies when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

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

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

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

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



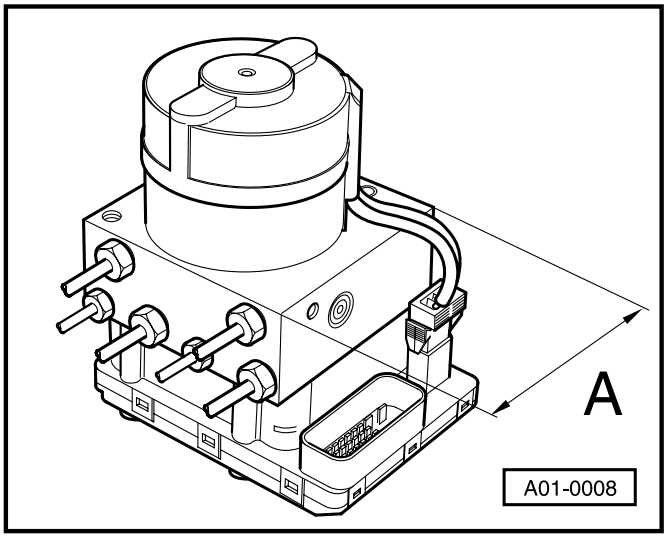
ABS ITT Mark 20 IE

◄ ***Distinguishing features:***

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

⇒ Parts List

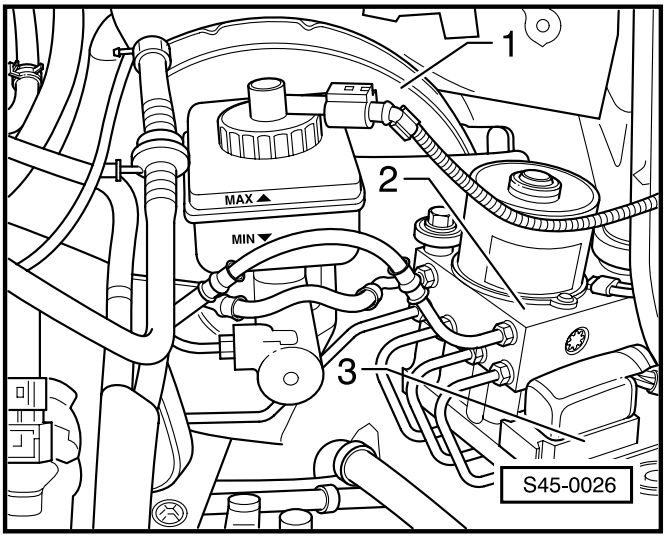
- *List of available functions ⇒ page 45-12.*



ABS/EDL ITT Mark 20 IE

◄ ***Recognition features:***

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



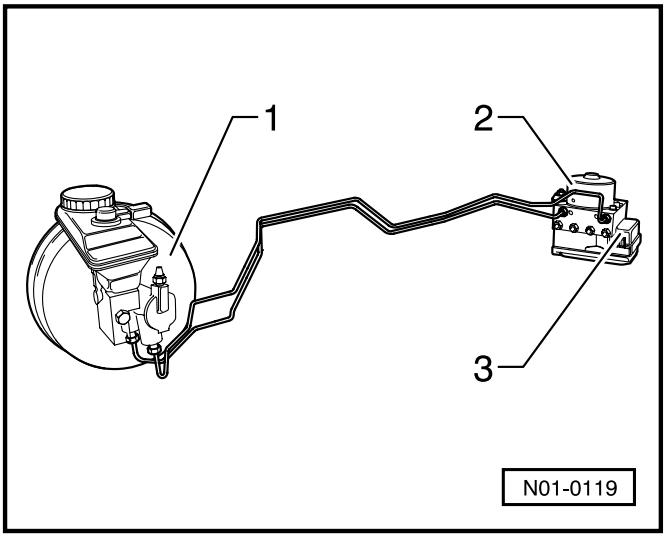
Installation position of ABS or ABS/ EDL ITT Mark 20 IE

◄ **LHD models**

1 - Brake servo unit 10"

2 - Hydraulic unit

3 - Control unit, 25-pin bolted to hydraulic unit



◄ **RHD models**

1 - Brake servo unit 7"/8"

2 - Hydraulic unit

3 - Control unit, 25-pin bolted to hydraulic unit

Self-diagnosis

Function of self-diagnosis

Models fitted with data BUS (CAN-BUS)

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

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

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

All models

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

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

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

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

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

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

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

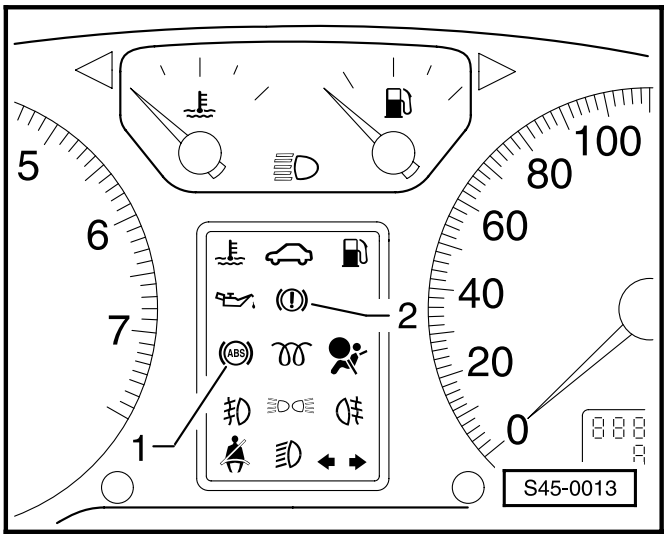
When commencing fault finding, always initiate self-diagnosis and interrogate the information stored with the

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

Notes:

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

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



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

◄ ♦ If the ABS warning light (K47) -1- does not go out after the ignition is switched on and after completion of the test sequence, the causes of the fault may be:

a - voltage supply is less than 11 V

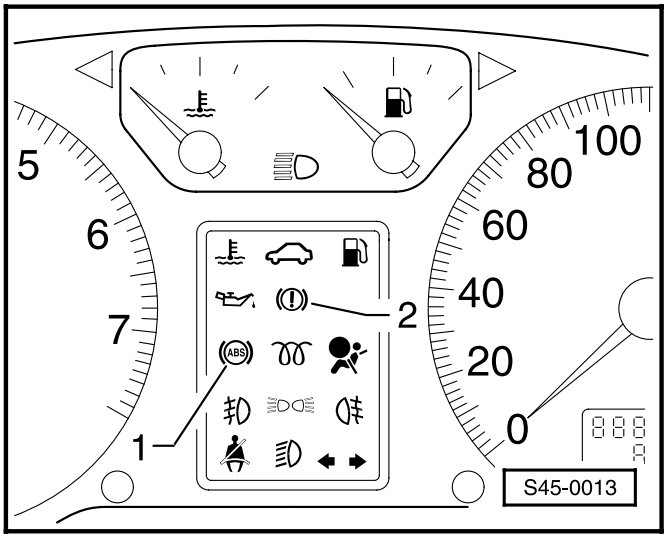
b - an ABS fault is present
If an ABS fault is present, the anti-lock brake system remains switched off while the conventional brake system remains fully operational.

c - a fault existed at a wheel speed sensor after last vehicle start (sporadic fault).
If a fault exists at a wheel speed sensor, the ABS warning light goes out automatically after restarting the vehicle and speed increased to more than 20 km/h.

d - there is an interruption in the link from the dash panel insert to control unit -J104-.

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

e - the dash panel insert is faulty.



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

a - the handbrake is still applied

b - the brake fluid level is too low

c - there is a fault in the wiring

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

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

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

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

Models fitted with ABS/EDL - EDL does not operate

Special tools, testers and aids required

♦ Vehicle system tester V.A.G 1552

♦ Diagnosis cable V.A.G 1551/3

Complaint: „EDL system of vehicle does not operate“

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

Performing self-diagnosis

Test requirements

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

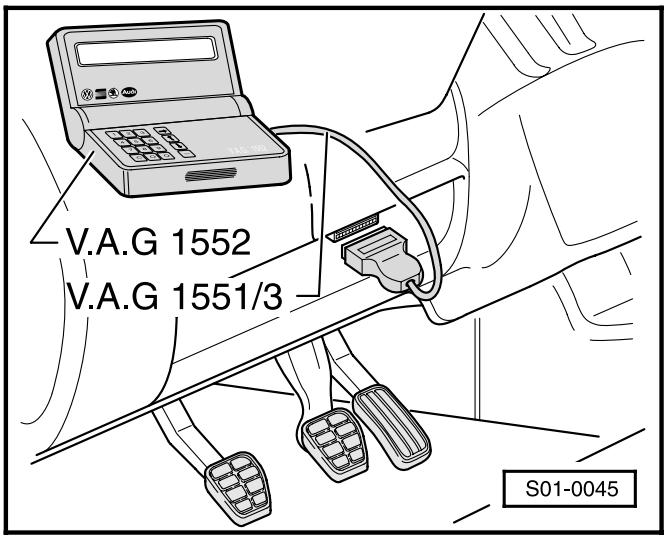
Connecting vehicle system tester V.A.G 1552 and selecting function

Special tools, testers and aids required

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

Notes:

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



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

Interrogating control unit version

Test of vehicle systems Enter address word XX	HELP

◄ Readout in display:

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

Notes:

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

- Switch on ignition.

Test of vehicle systems Enter address word XX	HELP

◄ Readout in display:

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

Models not fitted with CAN databus

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

◄ The following readout then appears (example):

What is displayed is:

- the control unit identification number, e.g. 1J0907379
- the system designation, e.g. ABS ITT AE 20 GI
- the number of the version, e.g. V00
- the code No. of the control unit, e.g. 03604
- the workshop code (WSC)

⇒ Operating instructions of vehicle system tester V.A.G 1552

Models fitted with CAN databus

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

◄ The following readout then appears (example):

Models fitted with MK 60

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

◄ The following readout then appears (example):

Continued for all models

Assignment of control unit
⇒ Parts List

Coding control unit ⇒ page 45-22.

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

- Press → key.

Note:

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

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

Test of vehicle systems Select function XX	HELP

◄ Readout in display:

⇒ page 45-12, List of available functions.

List of available functions

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

[1)] is required only for models fitted with EDL

Interrogating fault memory

Test of vehicle systems Select function XX	HELP

◄ Readout in display:

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

X faults recognized!

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

No fault recognized!	→

- Press → key.

The faults stored are displayed one after the other.

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

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

Test of vehicle systems HELP Select function XX

◄ Readout in display:

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

Notes:

If a fault has been recognized:

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

Automatic test sequence

Note:

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

- Switch ignition on.

Test of vehicle systems HELP Select function XX

◄ Readout in display:

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

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

◄ The control unit identification appears in the display.

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

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

Fault table

Notes:

- *In view of the control units which are interlinked over a databus line, always commence fault finding by initiating the „Automatic test sequence“ with the key function 0 and 0 at all the control units fitted to the vehicle. This interrogates the control unit fitted to the vehicle and any faults which may be stored in them.*
- *All the possible faults which can be detected by the ABS control unit (J104) and displayed on V.A.G 1552, are listed below according to the 5-digit fault code.*
- *In addition, the fault type may also be indicated in the fault table.*
- *Reference is made in the column „Rectifying fault“ to individual test steps of the electrical test.*
- *Before replacing components indicated as faulty, test the appropriate plug connections, cables and earth connections according to the current flow diagram.*

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

- *After completing repairs, always once again interrogate and then erase the fault memory with the vehicle system tester V.A.G 1552, and conduct a road test (at a speed of more than 20 km/h).*
- *After conducting the road test, once again interrogate the fault memory.*

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

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

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

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

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

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

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

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

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

Coding table

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

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

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

- Press → key.

Test of vehicle systems	HELP
Select function XX	

◄ Readout in display:

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

Notes:

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

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

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

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

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

2) Only on models fitted with automatic gearbox.

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

Erasing fault memory

Requirement:

- Fault memory has been interrogated.

- Press → key.

Test of vehicle systems HELP Select function XX

◄ Readout in display:

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

Test of vehicle systems → Fault memory is erased!

◄ Readout in display:

- Press → key.

Test of vehicle systems HELP Select function XX

◄ Readout in display:

Notes:

Attention! Fault memory was not interrogated

◄ ♦ *If this readout appears in the display, then the test sequence was incorrect.*

♦ *Follow the test sequence exactly:*
First of all, interrogate fault memory and then erase it.

Ending output

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

Test of vehicle systems Enter address word XX	HELP

◄ Readout in display:

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

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

Coding control unit

Special tools, testers and aids required

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

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

Requirement for coding

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

Procedure

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

Test of vehicle systems Select function XX	HELP

◄ Readout in display:

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

Code the control unit	Q
Enter code number XXXXX	(0-32767)

◄ Read out on display

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

Table of codes ⇒ page 45-23.

Table of codes

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

Vehicles without CAN-BUS

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

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

Vehicles with CAN-BUS

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

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

Continued for all models

- Press → key.

Test of vehicle systems Select function XX	HELP

◄ Readout in display:

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

Notes:

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

Reading measured value block

Special tools, testers and aids required

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

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

Safety precautions

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

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

Test procedure and test tables with measured values

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

Test of vehicle systems HELP Select function XX

◄ Readout in display:

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

Testing wheel speed sensor assignment

Display group number 001:

Read measured value block Enter display group number XXX

◄ Readout in display:

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

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

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

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

◄ Readout in display (vehicle stationary):

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

Example:

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

◄ Readout in display (wheel rotated):

The momentary speed of the front right wheel is displayed.
The vehicle must be raised for this purpose and the wheel rotated by hand by a second person.

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

- Press key C.

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

Test of wheel speed sensors

Display group number 002:

Read measured value block Enter display group number XXX

◄ Readout in display:

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

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

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

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

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

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

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

Possible causes of fault:

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

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

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

◄ Readout in display (vehicle stationary):

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

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

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

Example:

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

◄ Readout in display (starting off slowly):

- Press key C.

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

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

Display group number 003

Read measured value block
Enter display group number XXX

◄ Readout in display:

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

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

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

Read measured value block 3 →
0

◄ Readout in display:

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

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

- Perform electrical test ⇒ from page 45-41.

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

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

Final control diagnosis

Special tools, testers and aids required

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

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

Notes:

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

Example:

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

(e.g. front left wheel, fl)

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

IFL = Inlet valve front left

VBAT = Battery voltage; voltage present at valve

OFL = Exhaust valve front left

0V = 0 volts; no voltage exists at valve

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

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

Hydr p = Hydraulic pump

Performing final control diagnosis

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

Test of vehicle systems HELP Select function XX

◄ Readout in display:

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

Test of vehicle systems Q 03 - Final control diagnosis

◄ Readout in display:

- Confirm the entry with the key Q.

ABS hydraulic pump -V64- must run.

Note:

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

Final control diagnosis - → ABS hydraulic pump -V64

◄ Readout in display:

- Press → key within the next 60 seconds.

Final control diagnosis - → Operate brake

◄ Readout in display:

- Operate the brake pedal.
- Press → key.

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

◄ Readout in display:

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

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

- Press → key.

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

◄ Readout in display:

- Press → key.

ABS hydraulic pump -V64- must run.

Brake pedal must not yield.

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

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

◄ Readout in display:

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

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

- Press → key.

ABS hydraulic pump -V64- no longer runs.

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

◄ Readout in display:

- Press → key.

Brake pedal must be felt to yield.

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

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

◄ Readout in display:

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

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

- Press → key.

Final control diagnosis - → Release brake

◄ Readout in display:

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

Final control diagnosis - → Operate brake

◄ Readout in display:

- Operate the brake pedal.
- Press → key.

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

◄ Readout in display:

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

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

- Press → key.

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

◄ Readout in display:

- Press → key.

ABS hydraulic pump -V64- must run.

Brake pedal must not yield.

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

Final control diagnosis - → IFR: VBAT OFR: VBAT Wheel FR free

◄ Readout in display:

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

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

- Press → key.

ABS hydraulic pump -V64- no longer runs.

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

◄ Readout in display:

- Press → key.

Brake pedal must be felt to yield.

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

Final control diagnosis - → IFR: 0V OFR: 0V Wheel FR locked	◄ Readout in display: - Instruct the 2nd person to rotate the relevant wheel by hand. *If the wheel does **not** block, it is possible that there is a fault in the mechanical/hydraulic part of the brake system.* - Press → key.
Final control diagnosis - → Release brake	◄ Readout in display: - Take your foot off the brake pedal. - Press → key.
Final control diagnosis - → Operate brake	◄ Readout in display: - Operate the brake pedal. - Press → key.
Final control diagnosis - → IRL: 0V ORL: 0V Wheel RL locked	◄ Readout in display: - Instruct the 2nd person to rotate the relevant wheel by hand. *If the wheel does **not** block, it is possible that there is a fault in the mechanical/hydraulic part of the brake system.* - Press → key.
Final control diagnosis - → IRL: VBAT ORL: 0V Wheel RL locked	◄ Readout in display: - Press → key. ABS hydraulic pump -V64- must run. Brake pedal must not yield. If the brake pedal **yields**, there is a fault in the hydraulic unit. In this case, replace the hydraulic unit ⇒ page 45-57.
Final control diagnosis - → IRL: VBAT ORL: VBAT Wheel RL free	◄ Readout in display: - Instruct the 2nd person to rotate the relevant wheel by hand. *If the wheel **locks**, it is possible that the brake pressure lines to the wheel brakes are wrongly connected.* - Press → key. ABS hydraulic pump -V64- no longer runs.

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

◄ Readout in display:

- Press → key.

Brake pedal must be felt to yield.

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

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

◄ Readout in display:

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

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

- Press → key.

Final control diagnosis	- →
Release brake	

◄ Readout in display:

- Take your foot off the brake pedal.

- Press → key.

Final control diagnosis	- →
Operate brake	

◄ Readout in display:

- Operate the brake pedal.

- Press → key.

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

◄ Readout in display:

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

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

- Press → key.

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

◄ Readout in display:

- Press → key.

ABS hydraulic pump -V64- must run.

Brake pedal must not yield.

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

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

◄ Readout in display:

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

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

- Press → key.

ABS hydraulic pump -V64- no longer runs.

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

◄ Readout in display:

- Press → key.

Brake pedal must be felt to yield.

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

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

◄ Readout in display:

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

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

- Press → key.

Final control diagnosis	- →
Release brake	

◄ Readout in display:

- Take your foot off the brake pedal.

- Press → key.

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

◄ **Readout in display (applies to models with EDL)**

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

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

- Press → key.

The ABS warning light -K47- goes out.

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

◄ Readout in display:

Final control diagnosis is ended.

- Press → key.

Test of vehicle systems Select function XX	HELP

◄ Readout in display:

Notes:

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

- End output ⇒ page 45-22.

Initiating basic setting

Special tools, testers and aids required

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

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

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

Note:

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

Warning!

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

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

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

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

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

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

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

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

Special tools, testers and aids required

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

Test steps from page 45-44 apply to:

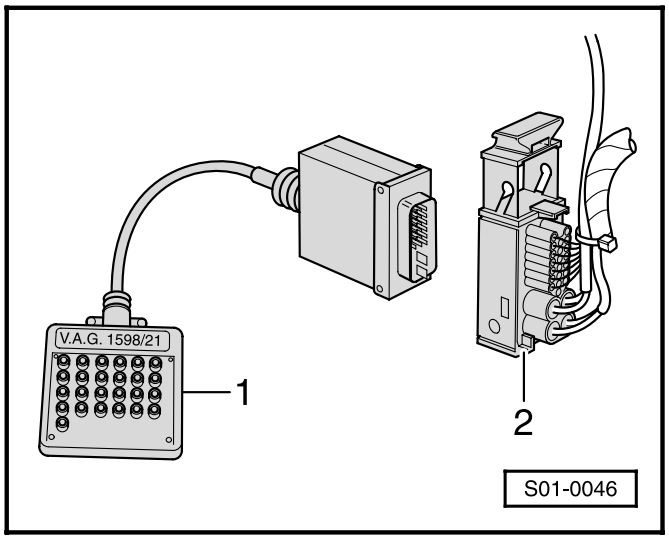
- Models on which the self-diagnosis does not provide any indication of the source of the fault. In this case, work through the complete electrical test.
- Models on which the self-diagnosis provides a direct indication of the source of the fault. In this case, work through only the test step recommended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

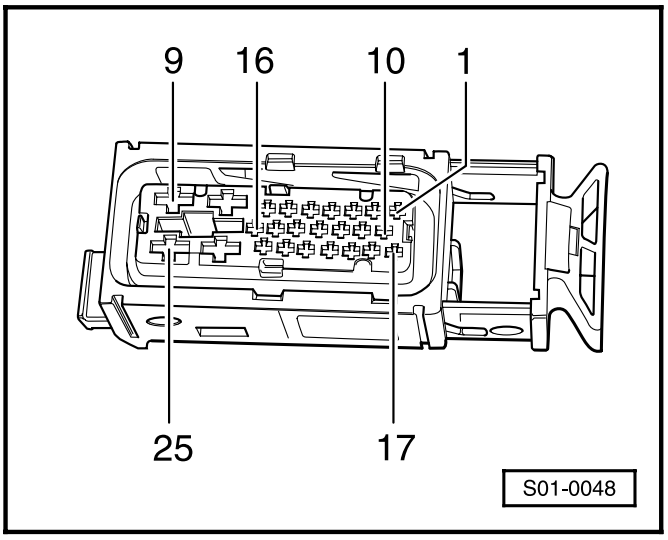
Test requirements

- Fuses according to current flow diagram must be in proper order.
  ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
  As a check, remove fuse from the fuse holder on the battery and on the left fuse holder on the dash panel.
- Before commencing the test, switch off ignition and electrical components (head-lights, lighting, fan etc.).

◄ ● Separate multi-pin connector from control unit (J104) and connect test box V.A.G 1598/21 -1- to the connector of the wiring loom -2-.

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





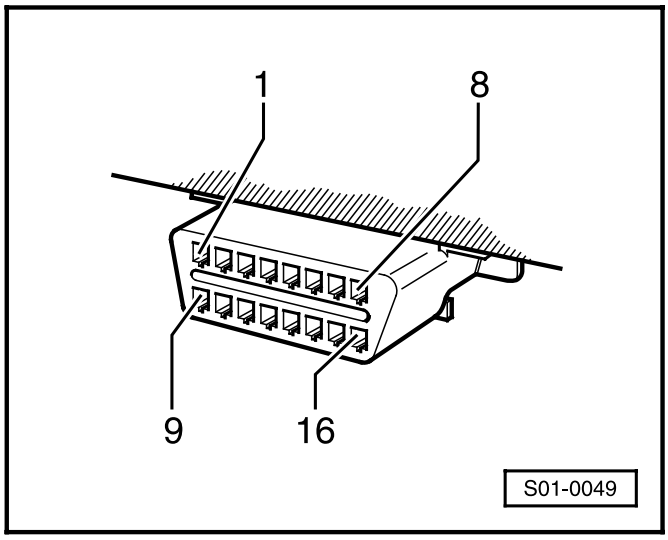
Multi-pin connectors with contact assignment

Note:

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

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

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



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

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

Summary of test steps

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

Test table

- *The socket assignments of the test box V.A.G 1598/21 are identical with contact designations of the control unit (J104) in the current flow diagram.*

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

- *If the measurements obtained differ from the specifications, carry out measurements for rectifying faults in the right-hand part of the table.*
- *If the specifications are achieved, additionally test the cables for short circuit to positive and to earth.*
- *Use the adapter cable set V.A.G 1594 A for conducting continuity test (bridges).*
- *If the measurements obtained differ only slightly from the specifications, clean sockets and connectors of the test equipment and test cables (e.g. with contact spray) and repeat test. Before replacing the relevant components, test cables and connections and, particularly for specifications of less than 10 ohms, repeat the resistance measurement at the component.*

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

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

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

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

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

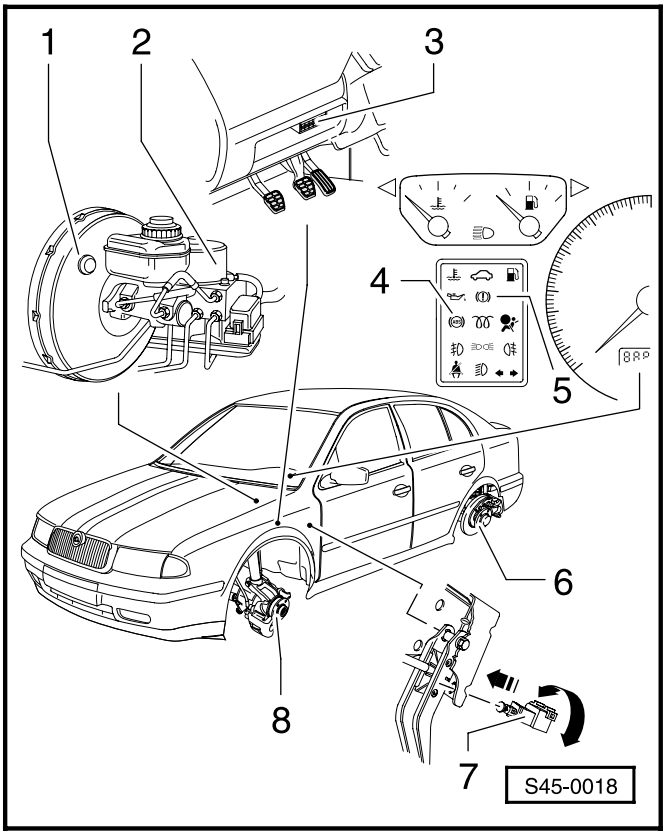
Switch on measuring range: Resistance measurement (200 Ω)					
Test step	**V.A.G 1598/21 Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
15	-	Resistance of K wire for V.A.G 1552, plug connection T16a [1]	• Ignition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

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

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

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

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



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

1 - Brake servo unit with brake master cylinder and brake fluid reservoir
- ♦ assembly overview ⇒ page 47-1

2 - Hydraulic control unit 1)
- ♦ fitting location: in left of engine compartment
- ♦ removing and installing ⇒ page 45-52
- ♦ servicing ⇒ page 45-57

3 - Diagnostic connection
- ♦ fitting location: in stowage compartment driver side

4 - ABS warning light (K47)
- ♦ fitting location: in dash panel insert

Function:
- ♦ ABS warning light comes on:
- for about 2 seconds after ignition is switched on and/or engine start
- if fault is detected (e.g. open circuit to wheel speed sensor)

⇒ page 45-7

5 - Handbrake/brake fluid level warning light (K14/33)
- ♦ fitting location: in dash panel insert

Function:
- ♦ The handbrake/brake fluid warning light comes on:
- when handbrake applied
- if brake fluid level is low
- for about 2 seconds after ignition is switched on
- if the electronic brake force distribution fails, i.e. if the ABS warning light comes on

⇒ page 45-7

6 - Parts of ABS system at rear axle
(illustration shows only disc brakes)
- ♦ rear right and left wheel speed sensor -G44/G46 1)
- removing and installing ⇒ page 45-65
- installing wheel speed sensor cables ⇒ page 45-67
- ♦ rear right and left pulse rotor for wheel speed sensor
- testing ⇒ page 45-66
- removing and installing: the pulse rotor should be replaced together with the wheel hub ⇒ page 42-23 and 42-28

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

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

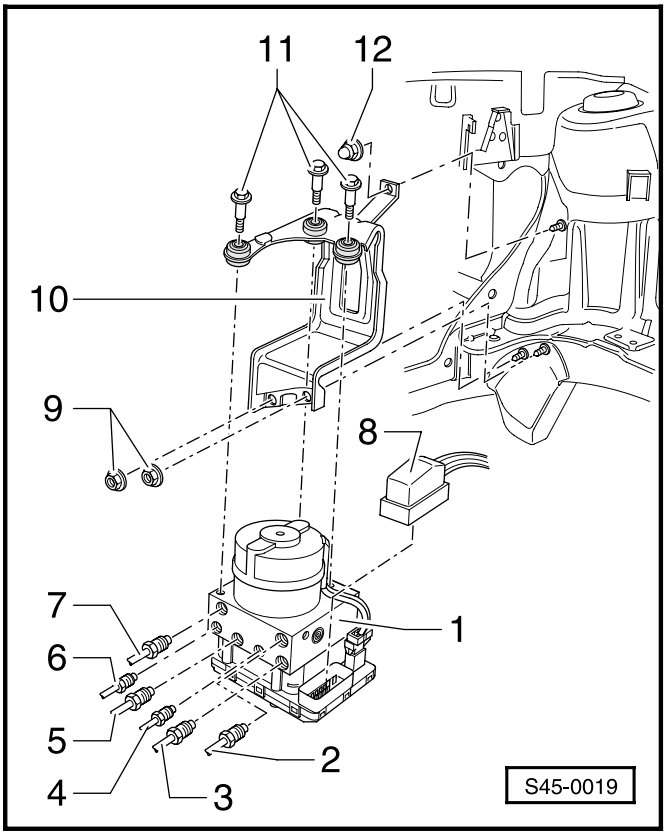
Removing and installing hydraulic control unit and bracket

Note:

As a general rule, always ensure that no brake fluid gets into the connector housing of the control unit.
This can result in corrosion to the contacts and thus in a failure of the system.
If the plug housing is soiled, it should be carefully cleaned with compressed air.

Special tools, testers and aids required

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



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

2 - Brake line, 14 Nm
- Between brake master cylinder/ floating piston circuit and hydraulic unit

3 - Brake line, 14 Nm
- Hydraulic unit to front left brake caliper

4 - Brake line, 14 Nm
- Hydraulic unit to rear right wheel cylinder/brake caliper

5 - Brake line, 14 Nm
- Hydraulic unit to rear left wheel cylinder/brake caliper

6 - Brake line, 14 Nm
- Hydraulic unit to front right brake caliper

7 - Brake line, 14 Nm
- Between brake master cylinder/ pushrod piston circuit and hydraulic unit

8 - Multipin connector of control unit
- 25-pin
- Do not separate plug connection before self-diagnosis is completed. Switch off ignition before separating the plug connection.

9 - Hexagon nut, self-locking, 20 Nm

10 - Bracket

11 - Fit bolt, 8 Nm

12 - Cap nut, 25 Nm

Removing hydraulic control unit

Notes:

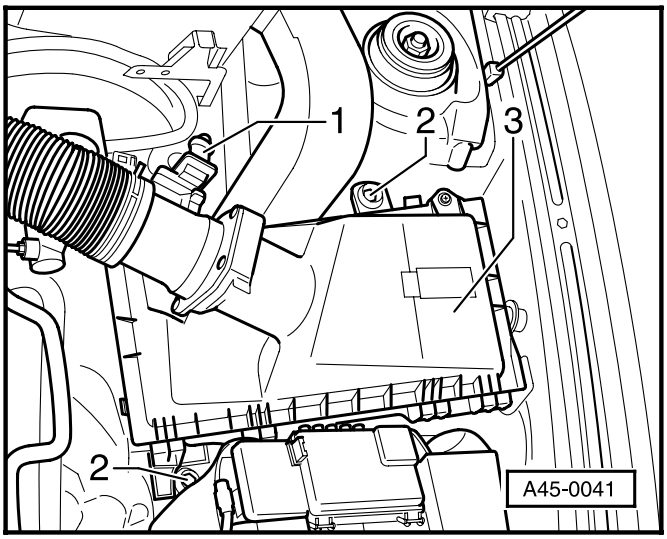
- *Before disconnecting the battery, determine the code of radio set fitted with anti-theft coding.*
- *When the battery is re-connected, please check the vehicle equipment:*
  - Enter radio code
  - Re-set clock
  - Initialise power windows.

⇒ Inspection and Maintenance

- Disconnect battery.

Note:

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

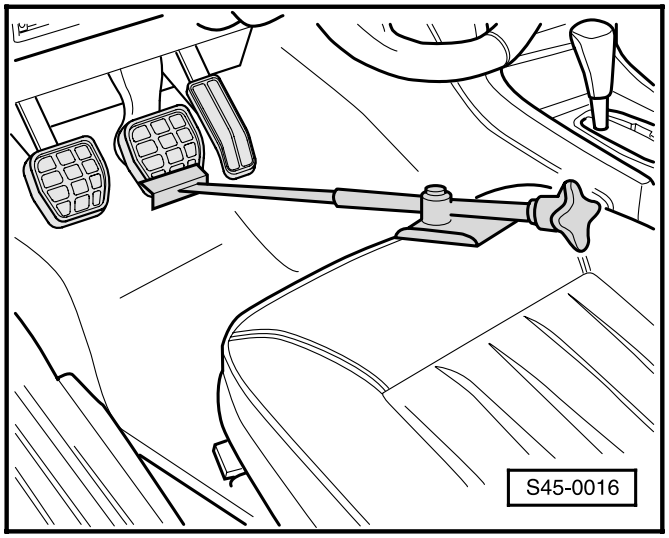


◄- Unplug the connector -1- of the air mass meter at the air guide pipe of the air filter.

- Take out the bolts -2- at the air filter -3- and place filter to the side.

- On diesel engines, remove relay carrier above brake servo unit.

- Extract as much brake fluid as possible from the brake fluid reservoir with a bleeder bottle.

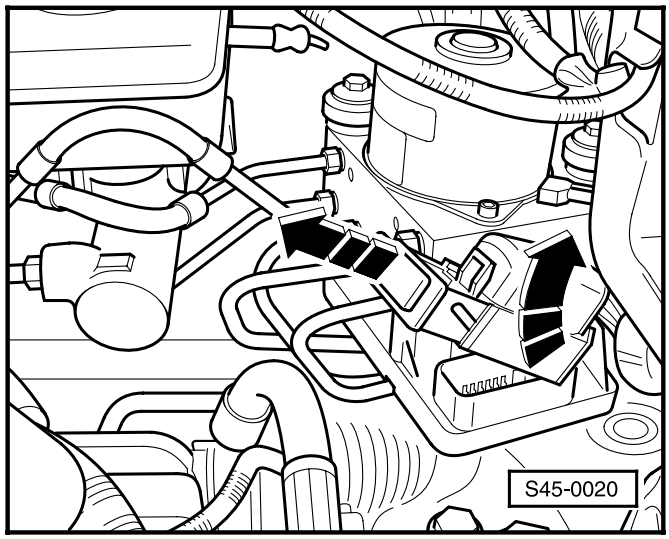


◄ - Depress brake pedal and lock in position with brake pedal depressor, e.g. V.A.G 1238/B.

- Fit the bleeder hose of the bleeder bottle onto the bleeder screw of the front left brake caliper and open bleeder screw.

- After brake fluid has flowed out, close bleeder screw.

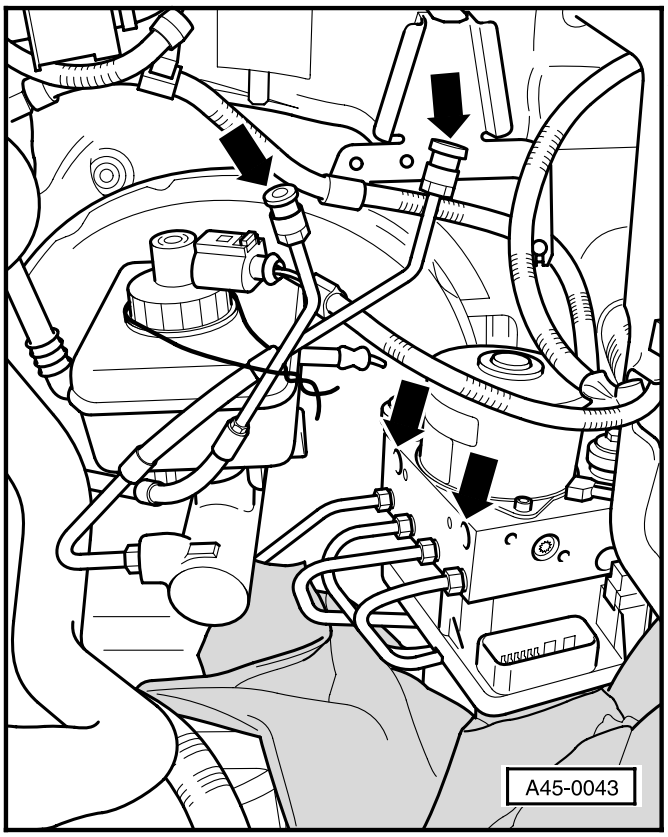
- Detach bleeder hose from the bleeder screw.



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

Note:

Ensure that no brake fluid gets onto the contacts.



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

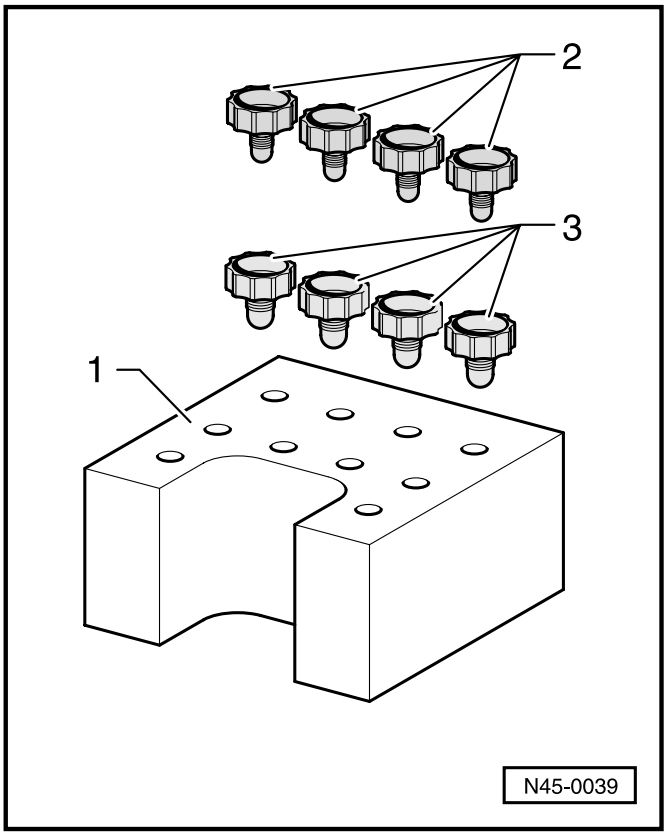
Note:

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

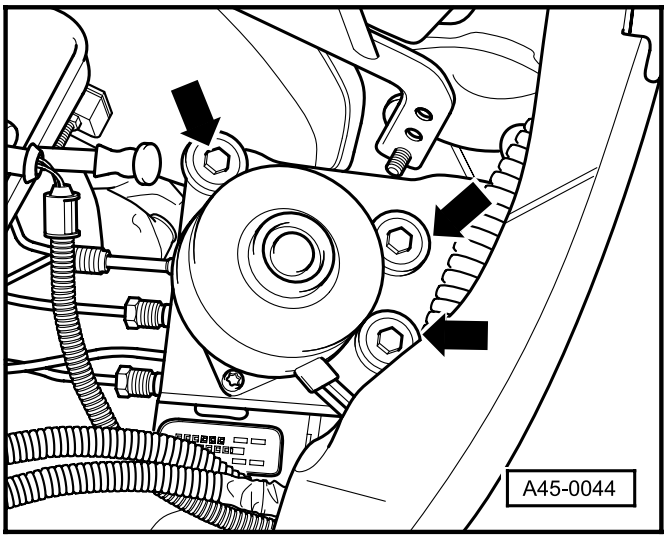
- Detach the brake lines from the brake master cylinder to hydraulic unit, see arrows, and fit on caps from repair kit Part No. 1H0 698 311 A to protect them from dirt.

- On models with left-hand steering, tie up the detached brake lines with a welding wire as high up as possible so that the ends of the lines project above the fluid level in the brake fluid reservoir -arrows-.

- Detach the remaining brake lines from the hydraulic unit.



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



◄- Remove bolts -arrows- at the bracket of the hydraulic control unit.

- Take out hydraulic control unit.

Installing hydraulic control unit

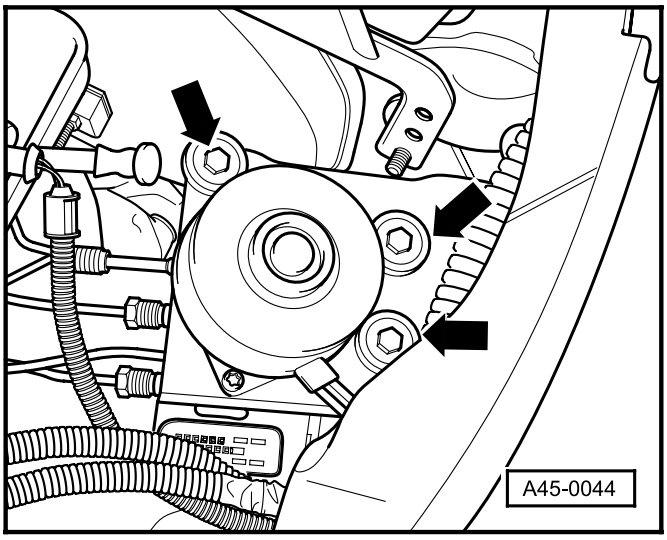
Notes:

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

- Bolt hydraulic control unit onto bracket.

Note:

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



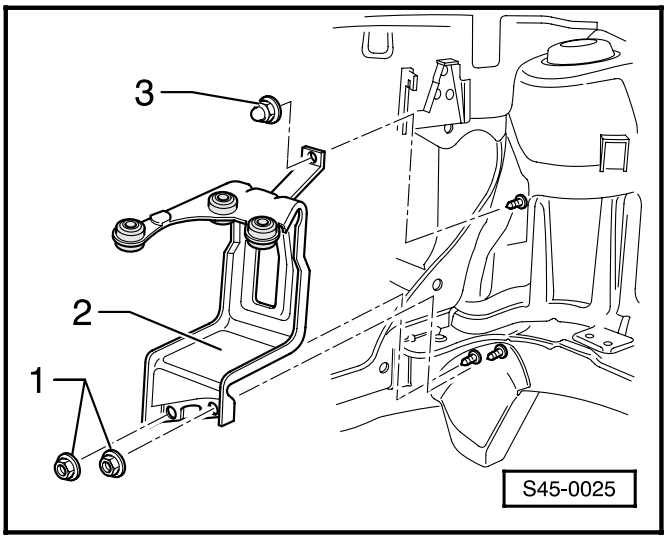
- Attach brake lines to the hydraulic unit and tighten fully ⇒ page 45-52.

◄- Bolt hydraulic control unit tight -arrow-.

- Plug multipin connector into the control unit and lock.

The remaining installation is carried out in the reverse order.

- Connect battery.
- Bleed brake system ⇒ page 47-18.
- Code control unit ⇒ page 45-22.
- Interrogate fault memory ⇒ page 45-12.
- Erase fault memory ⇒ page 45-21.



Removing and installing bracket

Removing

- Remove hydraulic control unit ⇒ page 45-53.

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

- Take off bracket -2-.

Installing

Installation is carried out in the reverse order.

Tightening torques:

Hexagon nuts to body **Always fit new nuts!**	20 Nm
Cap nut to body	25 Nm

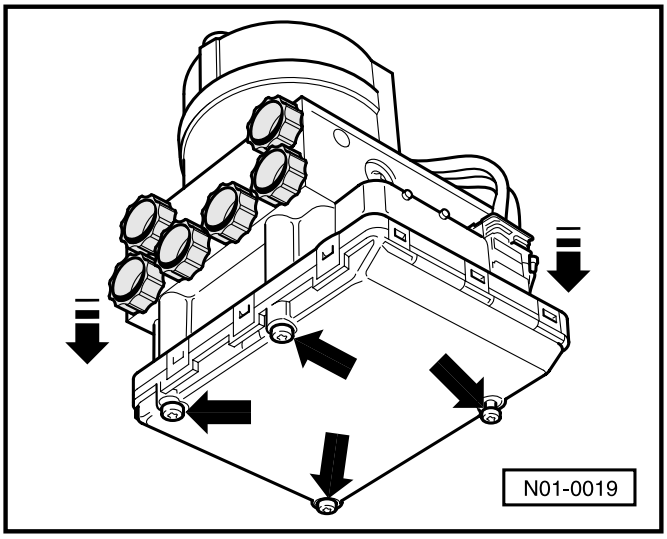
Servicing hydraulic control unit

Special tools, testers and aids required

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

Disassembly and assembly of the hydraulic control unit is described at an ABS unit.
The procedure for the other versions of the ABS ITT Mark 20 IE is identical ⇒ page 45-4.

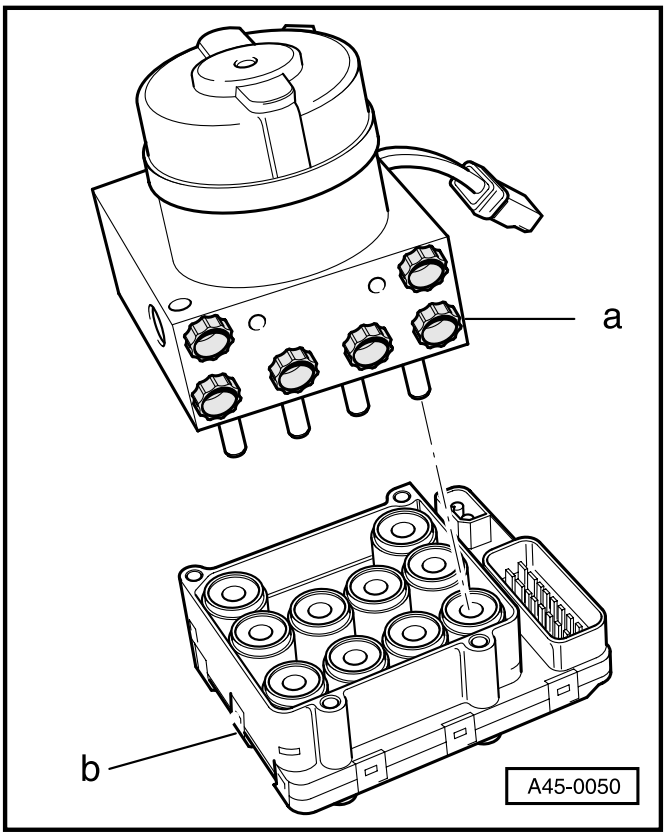
The hydraulic control unit is serviced by separating the control unit -J104- from the hydraulic unit -N55-, which is connected to the hydraulic pump -V64-. The faulty component is replaced.



Disassembling hydraulic control unit

- Unplug connector for hydraulic pump motor from control unit.

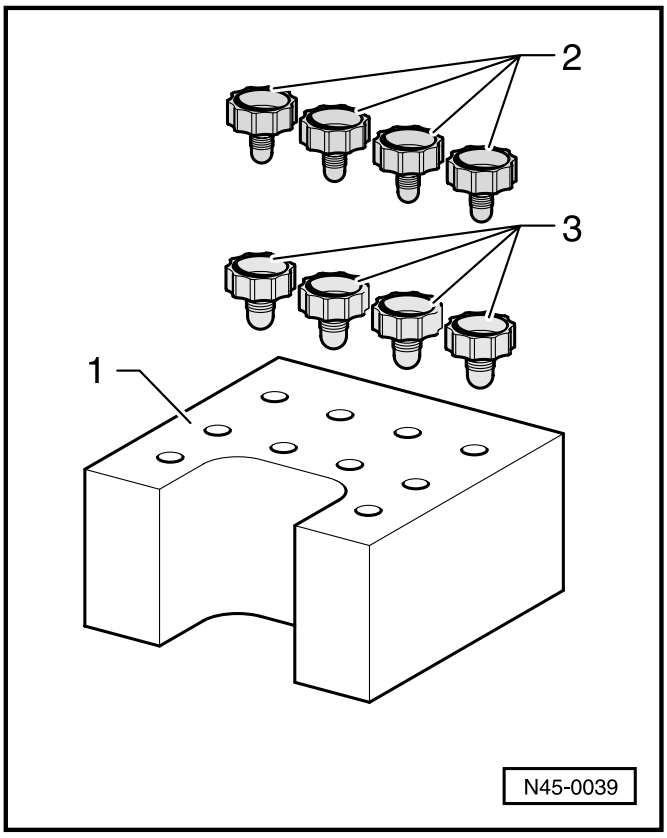
◄ - Remove screws from control unit -arrows- and pull off control unit.



Note:

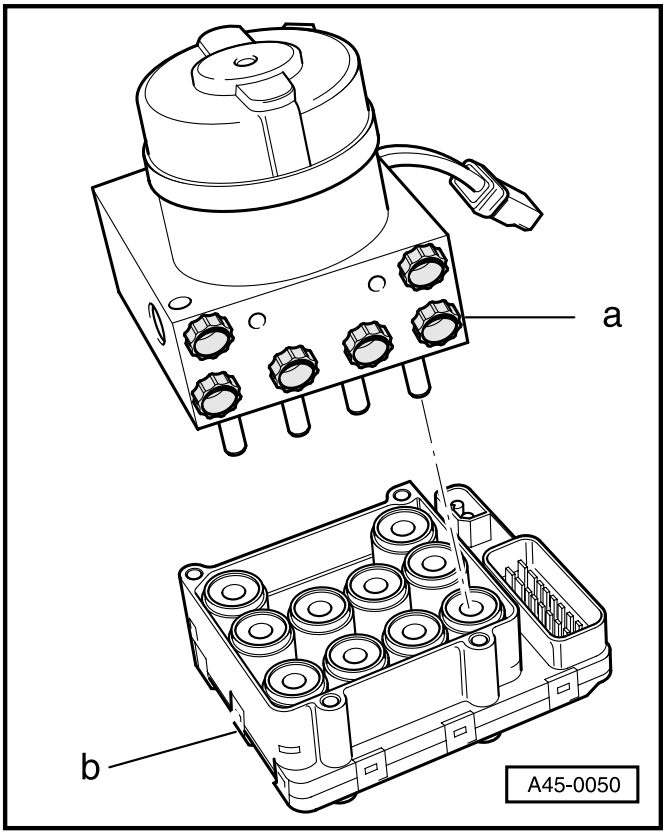
◄ *When pulling off the control unit -b-, ensure that the valve domes of the hydraulic unit -a- are not twisted with the magnetic coils of the control unit.*

- Cover over coils of control unit with non-fluffing cloths.



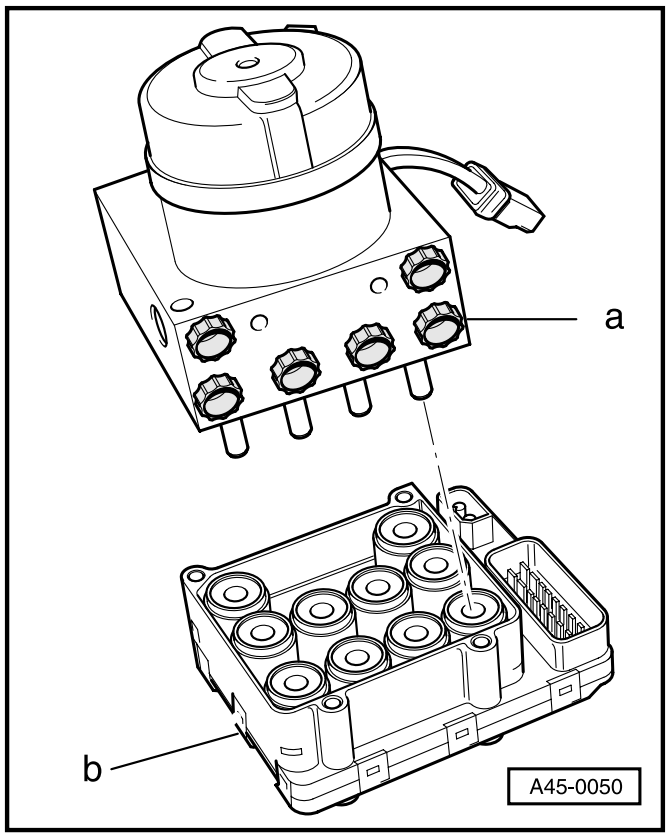
◄ - After separating the hydraulic unit from the control unit, fit transport protection -1- from the repair kit Part No. 1H0 698 311 A onto the valve domes.

This is a condition for any warranty claims.



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

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



◄ ***ABS control unit (J104) -b-:***

⇒ page 45-42, Contact assignment

⇒ page 45-41, Test requirements

Assembling hydraulic control unit

Notes:

- *It is essential that the area of the control unit-valve block is clean.*
- *When assembling control unit and hydraulic unit, ensure that the valve domes of the hydraulic unit are not tilted with the coils of the control unit.*

- Attach control unit to hydraulic unit. Max. tightening torque 4 Nm (always use the screws supplied).

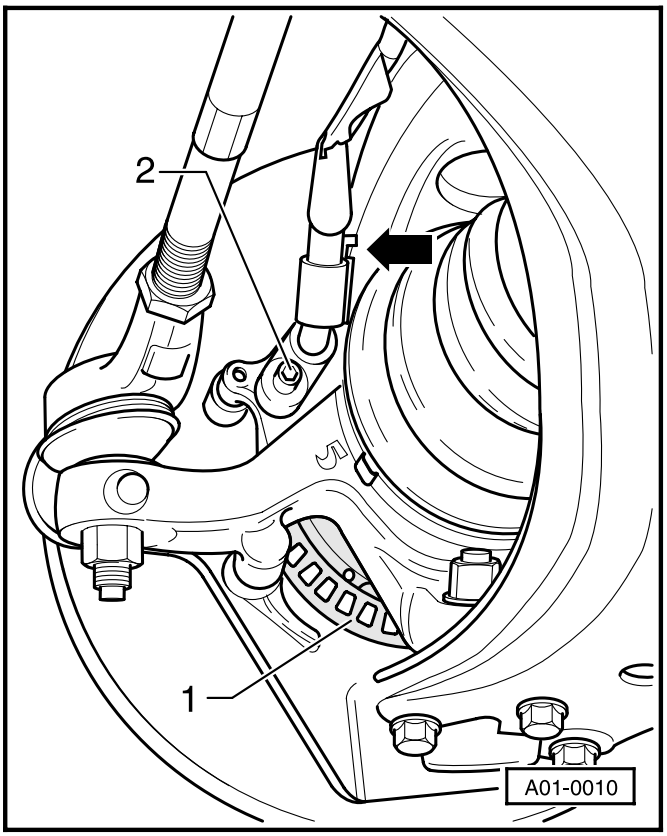
- Plug in connector of the hydraulic pump motor.

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

Special tools, testers and aids required

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

Removing and installing wheel speed sensors



Removing

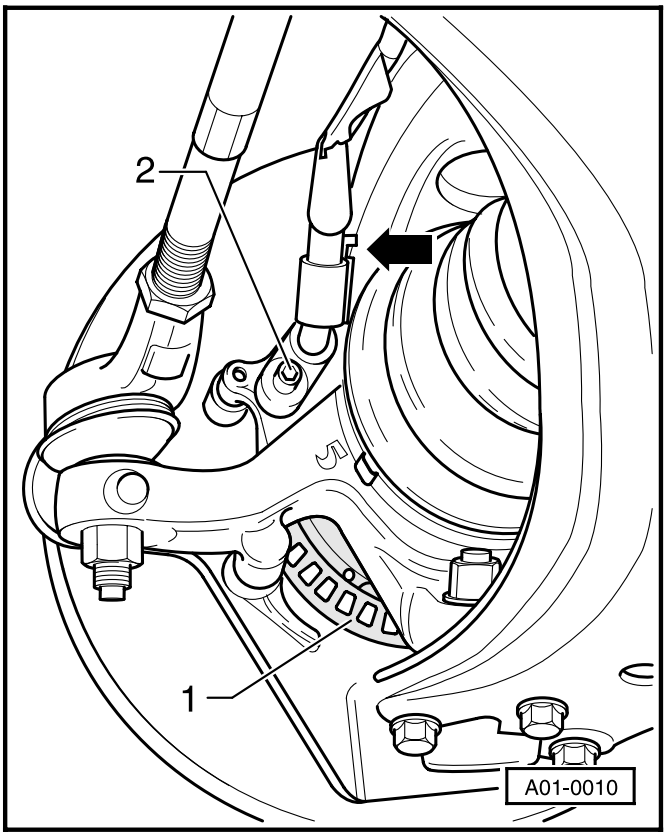
- Raise vehicle.

◄ - Separate plug connection of wheel speed sensor - wheel speed sensor cable -arrow-.

- Remove hexagon socket screw -2-.
- Pull wheel speed sensor -G45/G47- out of wheel bearing housing.

Installing

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

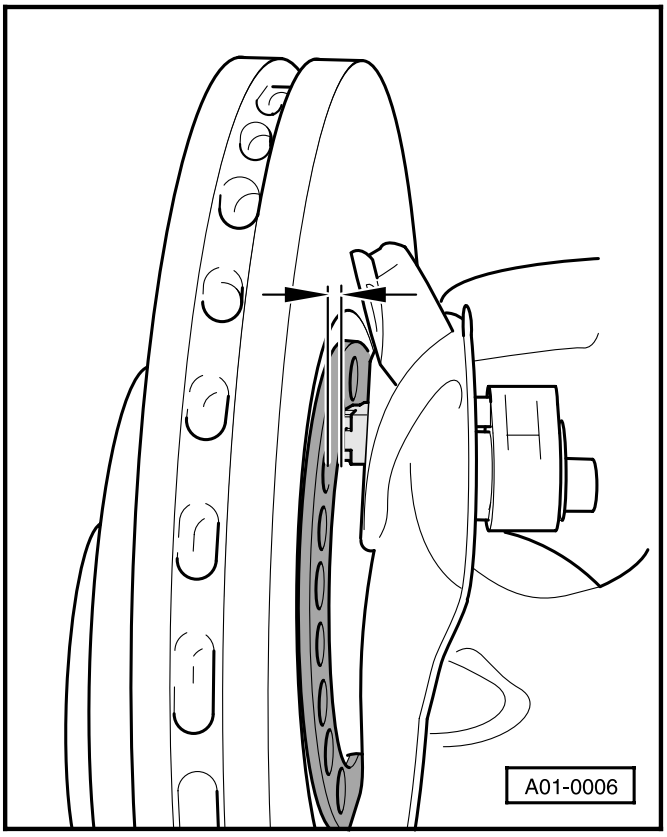


Testing pulse rotor/removing and installing

- Raise vehicle.
- Take off wheel.

◄ - Inspect pulse rotor -1- for dirt and damage by turning the brake disc.

- If the recesses of the pulse rotor are clogged by dirt, it is important to clean the rotor.
- If the pulse rotor is damaged, replace wheel hub and pulse rotor ⇒ page 40-13.
- Fit on wheel.
- Lower vehicle.



Inspecting lateral runout of pulse rotor

- Raise vehicle.
- Take off wheel.

◄ - Rotate wheel hub and check that clearance between pulse rotor and wheel speed sensor is even (runout tolerance). The wheel bearing play should also be checked at the same time.

● The runout tolerance of the pulse rotor is 0.3 mm.

- If the runout tolerance is not to specification, replace pulse rotor together with wheel hub ⇒ page 40-13.
- Fit on wheel.
- Lower vehicle.

Removing and installing front wheel speed sensor cables

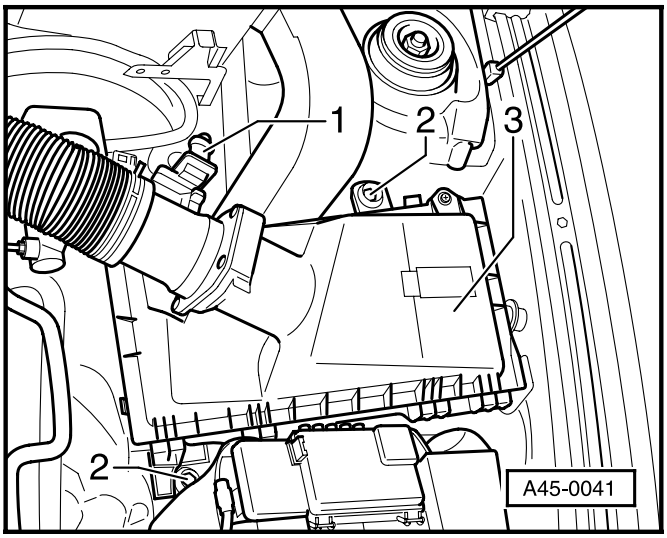
Removing

Notes:

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

⇒ Inspection and Maintenance

- Disconnect battery.



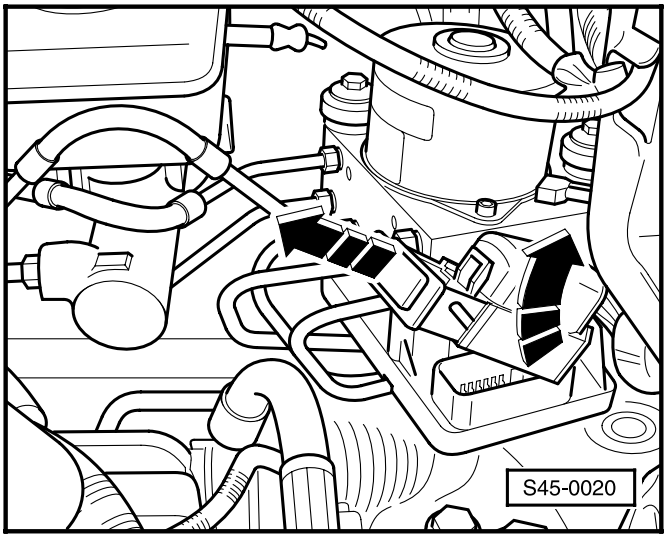
Note:

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

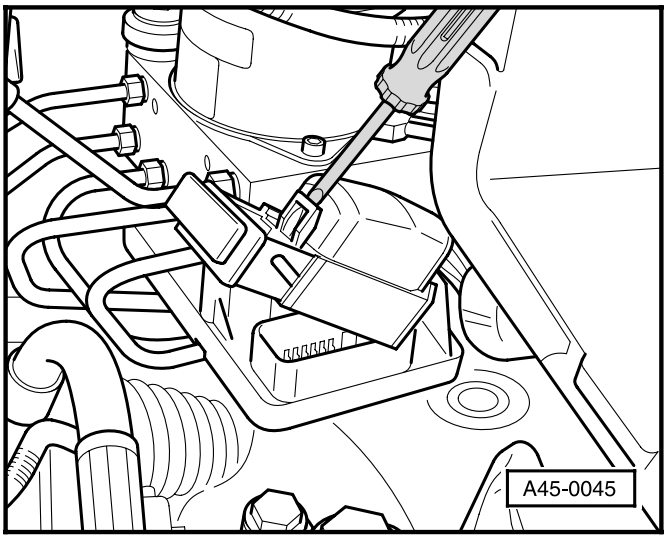
◄- Unplug connector of the air mass meter -1- from the air guide pipe of the air filter.

- Remove screws -2- at the air filter -3- and place filter to the side.

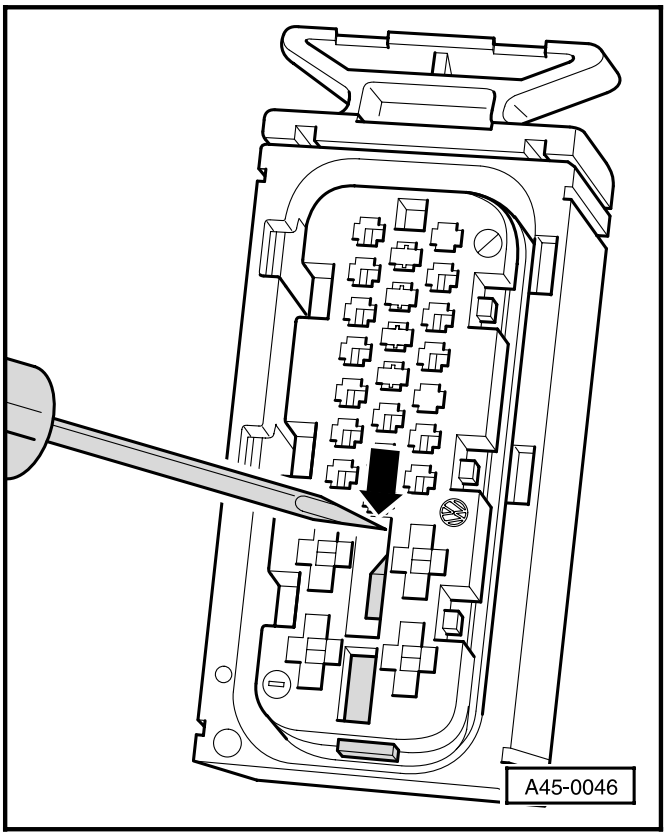
- On diesel engines, remove relay carrier above brake servo unit.



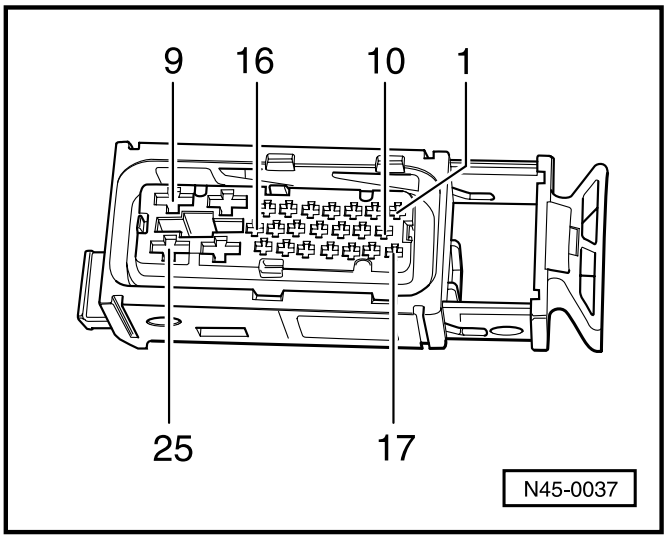
◄- Release multi-pin connector and unplug from the control unit.



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

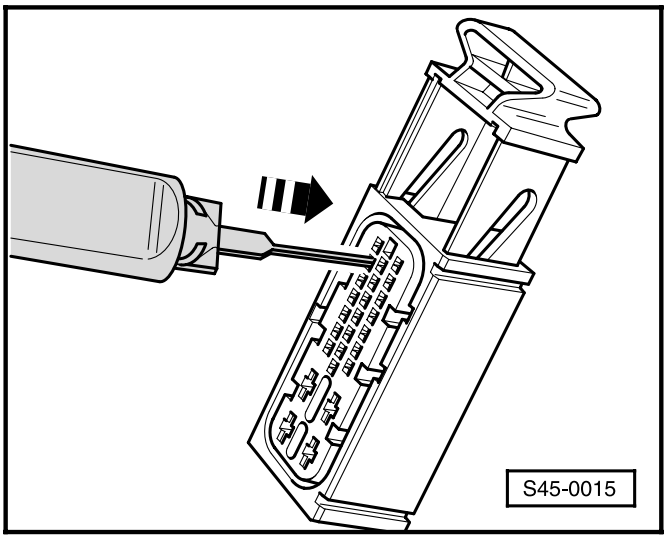


◄ - Use a small screwdriver to release secondary lock (purple) in direction of arrow.



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

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



◄- Use a suitable ejection tool from the wiring loom repair kit to knock out the appropriate contacts.

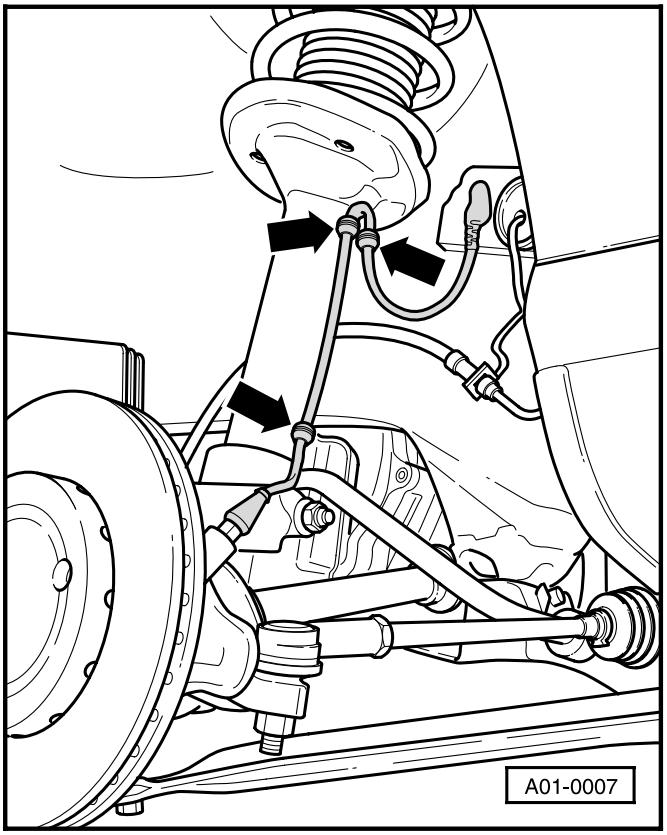
- Release connector at wheel speed sensor and separate plug connection.

- Remove faulty wheel speed sensor cable.

Installing

- Pull in new wheel speed sensor cable.

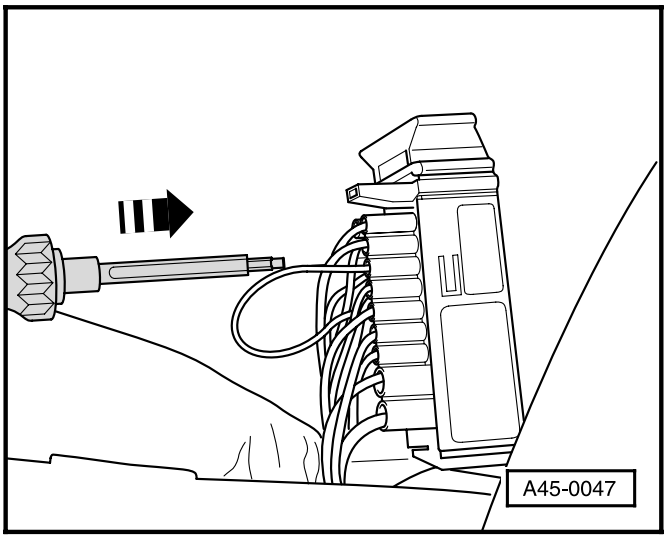
- Connect wheel speed sensor cable to wheel speed sensor.



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

Note:

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



◄- Insert contact into the plug housing and use a suitable insertion tool from the wiring loom repair kit to push in the single-wire seal as far as the stop.

- Secure the contacts with the secondary lock and fit the cap of the multi-pin connector onto it.

- Connect battery ⇒ page 45-62.

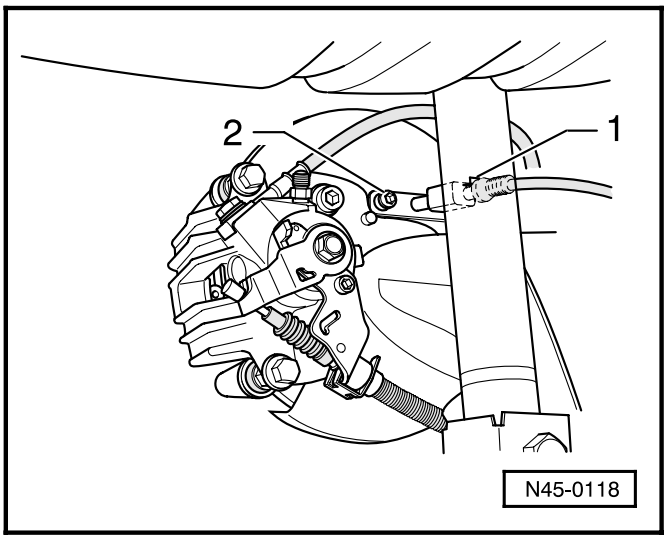
- Interrogate fault memory ⇒ page 45-12.

- Erase fault memory ⇒ page 45-21.

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

Special tools, testers and aids required

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



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

Removing

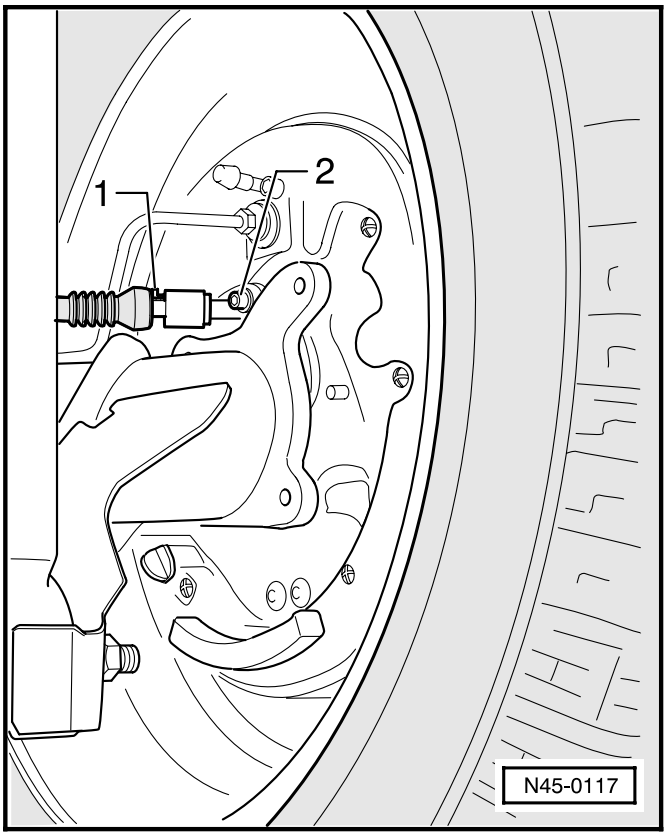
- Raise vehicle.

◄ - Separate plug connection -1- of wheel speed sensor - wheel speed sensor cable -arrow-.

- Remove hexagon socket screw -2-.
- Pull wheel speed sensor -G44/G46- out of wheel bearing housing.

Installing

- Before inserting the wheel speed sensor, clean the inner surface of the hole and coat with solid lubricating paste G 000 650.



◄ - Insert wheel speed sensor into the hole of the wheel bearing housing and tighten hexagon socket screw -2- to a final torque of 8 Nm.

- Fit together plug connection -1- of speed sensor cable - wheel speed sensor.

Removing and installing wheel speed sensors (drum brakes)

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

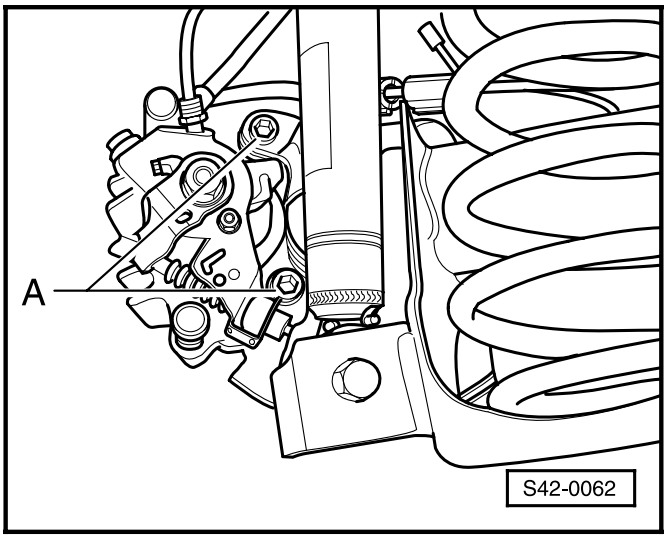
1 - Plug connection of speed sensor cable - wheel speed sensor

2 - Hexagon socket screw for attaching wheel speed sensor

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

Notes:

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



- Raise vehicle.
- Take off wheel.

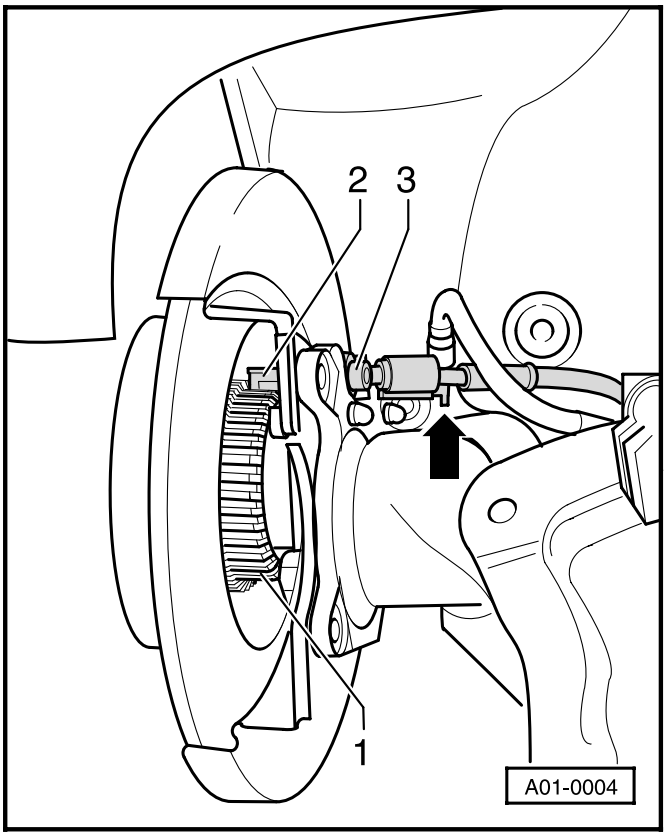
Models with disc brakes:

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

Brake line must not be tensioned.

Models with drum brakes:

- Remove brake drum ⇒ page 46-6.



All models:

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

2 - Wheel speed sensor G44/G46

3 - Hexagon socket screw of wheel speed sensor

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

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

Models with drum brakes ⇒ page 42-23.

Models with disc brakes ⇒ page 42-28.

- Fit on wheel.
- Lower vehicle.

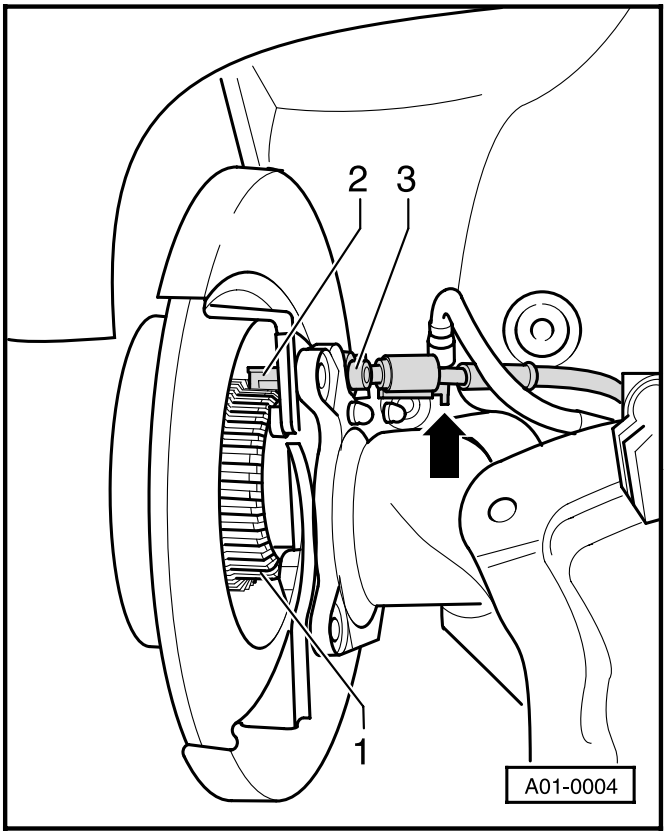
Removing and installing rear wheel speed sensor cables

Notes:

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

⇒ Inspection and Maintenance

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



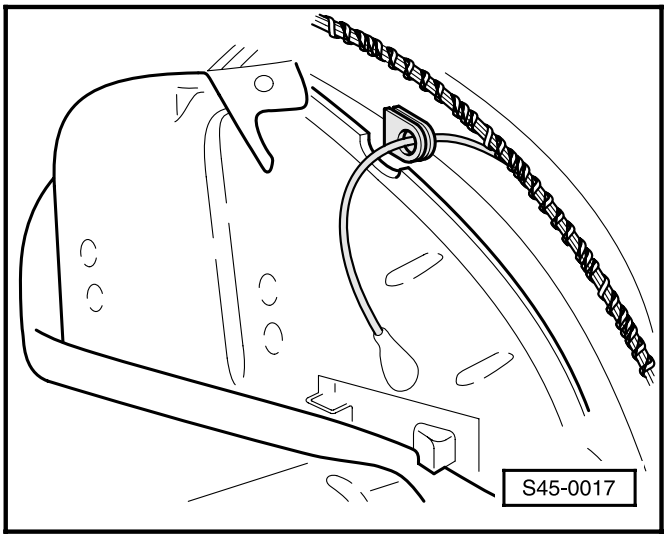
- Disconnect battery.
- Raise vehicle.
- Take off wheel.

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

1 - Pulse rotor

2 - Wheel speed sensor

3 - Hexagon socket screw for wheel speed sensor

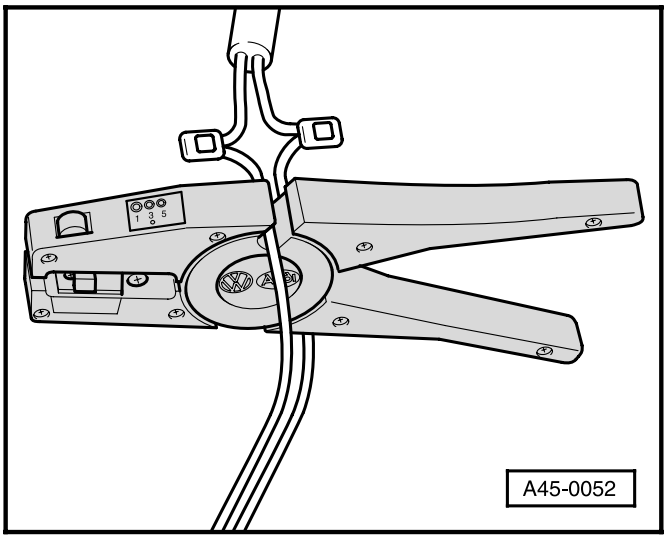


- Remove side luggage compartment trim panel.

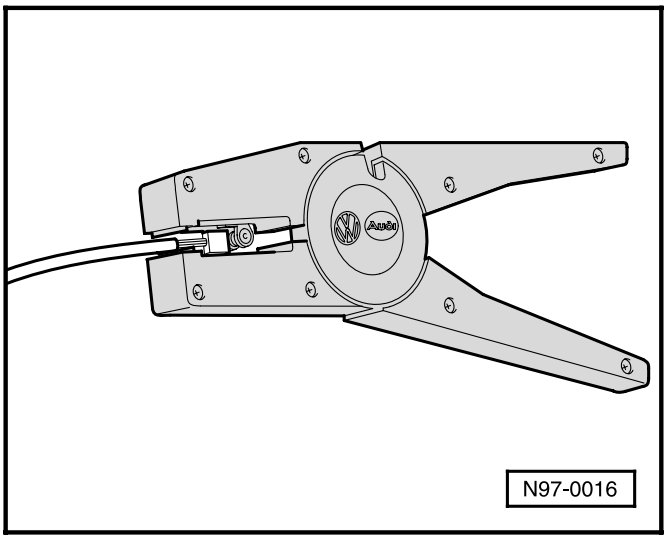
⇒ Body Fitting Work; Repair Group 70; Trim panel of cargo area and luggage compartment

◄- Pinpoint welded connection at wheel speed sensor cable.

- Pull off insulating grommet of welded connection.



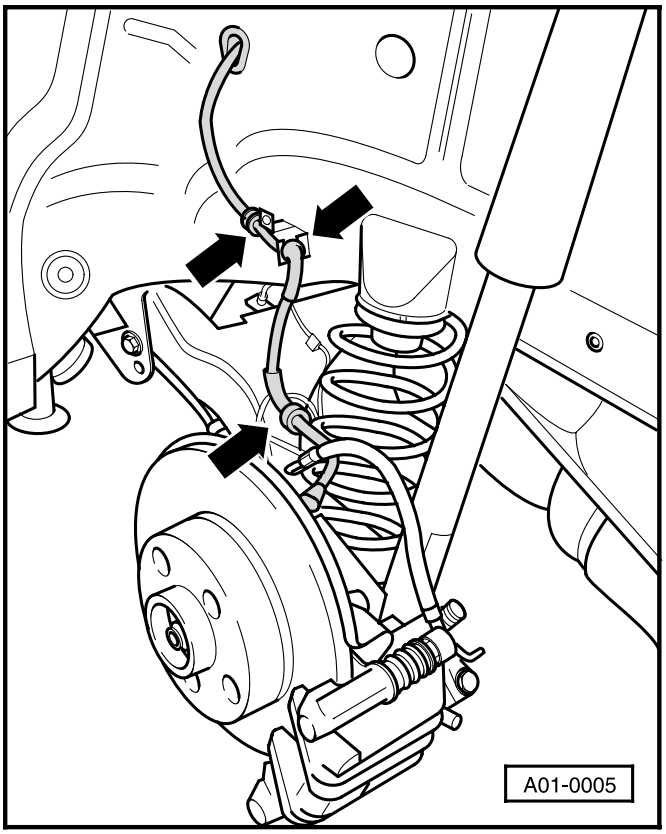
◄- Use insulation stripping pliers from wiring loom repair kit to separate wheel speed sensor cable ahead of welded connection and remove the faulty section of cable.



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

- Draw in new wheel speed sensor cable.

- Fit together plug connection of wheel speed sensor cable - wheel speed sensor.



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

Notes:

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

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

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

- Install side trim panel of luggage compartment.

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

- Fit on wheel.

- Connect battery ⇒ page 45-67.

- Interrogate fault memory ⇒ page 45-12.

- Erase fault memory ⇒ page 45-21.

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

Special tools, testers and aids required

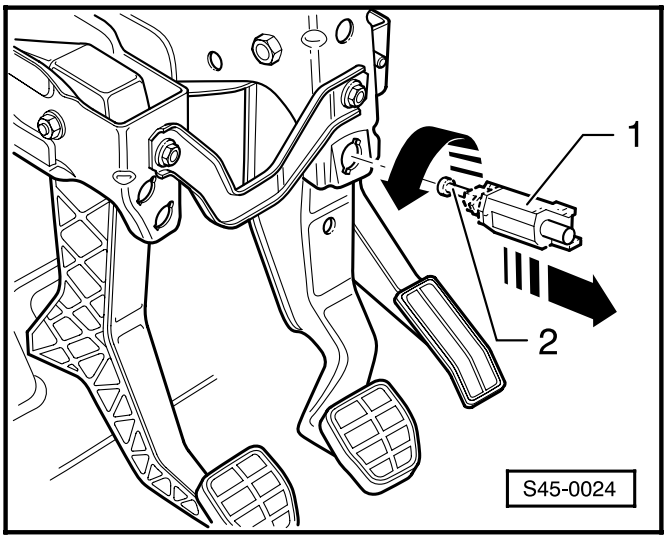
♦ Poly resin grease -G 052 142 A2-

Note:

The brake light switch must be removed for setting.

- Remove trim in driver footwell.

⇒ Body Fitting Work; Repair Group 68; Storage compartments, covers and trim panels



- Unplug connector from brake light switch.

◄ - Remove brake light switch -1- by turning 90° to the left.

- Pull out plunger -2- of brake light switch for setting.

Note:

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

- Depress brake pedal as far as possible with your hand.

- Guide brake light switch through the assembly opening and install by turning 90° to the right.

- Release brake pedal.

- Plug connector into brake light switch.

- Install footwell trim on driver side.

⇒ Body Fitting Work; Repair Group 68; Storage compartments, covers and trim panels

- Check operation of brake lights.

  Depress brake pedal ⇒ all the brake lights come on.

  Release brake pedal ⇒ all the brake lights go off.

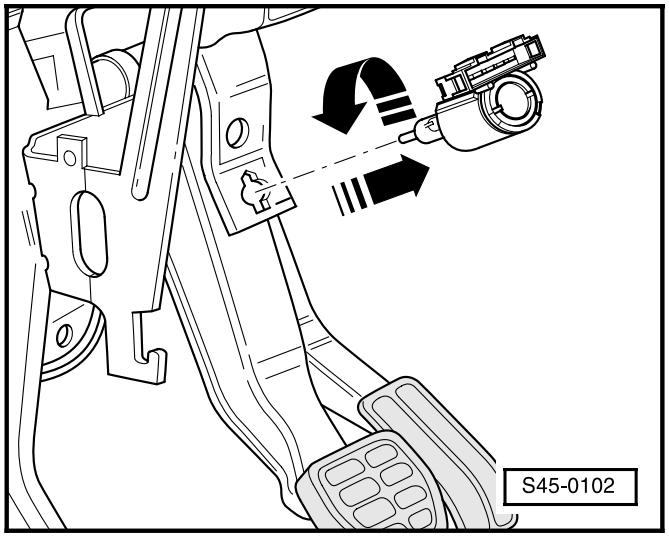
Removing and installing, as well as setting brake light switch, from MY 2000

Special tools, testers and aids required

♦ Poly resin grease -G 052 142 A2-

Note:

The brake light switch must be removed for setting.



- Unplug connector from brake light switch.

◄ - Remove brake light switch by turning 45° to the left.

- Pull out plunger fully for setting. When the brake light switch is installed, the plunger adjusts automatically.

Note:

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

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

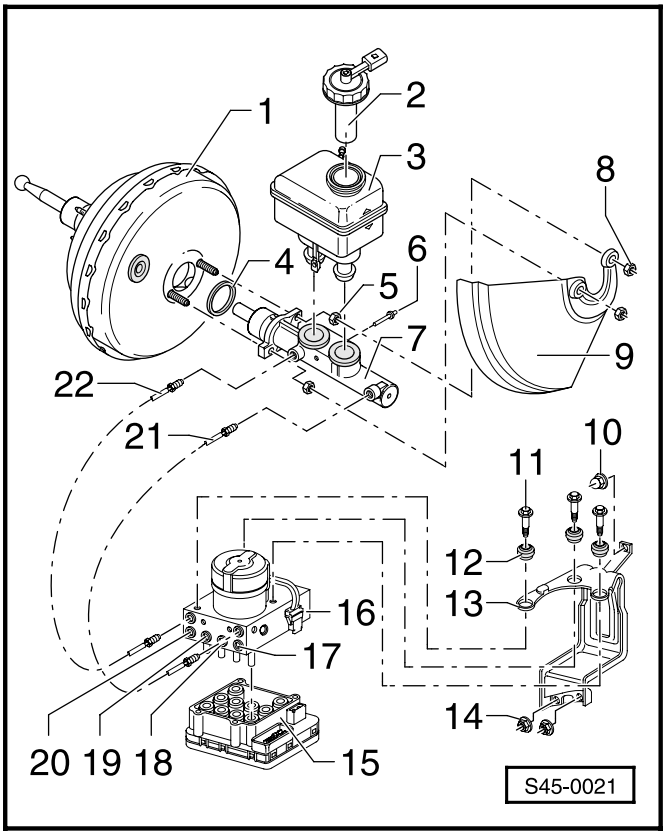
Brake pedal always remains in off position during this step **(do not depress!)**.

- Plug in connector of brake light switch.

- Check operation of brake lights.

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

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



Notes:

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

1 - Brake servo unit
- operational check ⇒ page 47-4
- removing and installing ⇒ page 47-4.1

2 - Cap
- with integrated brake fluid level warning contact -F34-

3 - Brake fluid reservoir

4 - Seal
- replace

5 - Self-locking hexagon nut, 20 Nm

6 - Retaining pin

7 - Brake master cylinder
- cannot be serviced; replace complete if fault exists
- removing and installing ⇒ page 47-2

8 - Self-locking hexagon nut, 20 Nm
- only on models with 74 kW, 92 kW and 110 kW engine

9 - Heat shield
- only on models with 74 kW, 92 kW and 110 kW engine

10 - Cap nut, 25 Nm

11 - Fit bolt, 8 Nm

12 - Rubber shock absorber

13 - Bracket

14 - Self-locking hexagon nut, 20 Nm

15 - ABS or ABS/EDL control unit

16 - ABS or ABS/EDL hydraulic unit

17 - Brake line connection
- hydraulic unit to front left brake caliper

18 - Brake line connection
- hydraulic unit to rear right wheel cylinder/brake caliper

19 - Brake line connection
- hydraulic unit to rear left wheel cylinder/brake caliper

20 - Brake line connection
- hydraulic unit to front right brake caliper

21 - Brake line
- brake master cylinder/floating piston circuit to hydraulic unit

22 - Brake line
- brake master cylinder/pushrod piston circuit to hydraulic unit

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

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

Note:

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

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

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

- Fitting location ⇒ page 45-81
- Fault table ⇒ page 45-72

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

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

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

Interrogating control unit version

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

Interrogating control unit version ⇒ page 45-10.

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

◄ Readout in display (example):

What is displayed is:

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

- the number of the version, e.g. V006
- the code No. of the control unit, e.g. 13504
- the workshop code (WSC)

⇒ Operating instructions of vehicle system tester V.A.G 1552

Assignment of control unit
⇒ Parts List

Coding control unit ⇒ page 45-22.

Interrogating fault memory ⇒ page 45-12.

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

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

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

Coding control unit

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

Coding control unit ⇒ page 45-22.

Reading measured value block

⇒ page 45-24

Testing longitudinal acceleration sender -G251

Read measured value block ⇒ page 45-24

Display group number 006

Read measured value block Enter display group number XXX

◄ Readout in display:

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

Read measured value block 6 → 0.00 m/s2

◄ Readout in display:

Display block	Test conditions	Readout in V.A.G 1552
1	Longitudinal accele-ration sender	
	♦ Specification vehicle stationary:	± 0.5 m/s2
	♦ Specification forward:	Readout rises constantly
	♦ Specification reverse:	Readout rises constantly with negative sign (-)
2	not assigned	—
3	not assigned	—
4	not assigned	—

If the readout differs from the specifications:

- Perform electrical test ⇒ page 45-79.

Testing data BUS lines

Read measured value block ⇒ page 45-24

Display group number 125

Read measured value block Enter display group number XXX

◄ Readout in display:

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

Read measured value block 125 → Engine 1 AWD1 Gearbox 1

◄ Readout in display: (vehicle stationary)

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

If the readout differs from the specifications:

- Read the fault memories of the control units connected to the data BUS.
  - ♦ Engine control unit
  - ♦ Gearbox control unit (only in the case of automatic gearbox)
  - ♦ 4x4 control unit
- Test the wiring according to the current flow diagram.

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

Initiating basic setting

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

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

Note:

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

- Initiating basic setting ⇒ page 45-36.

Switching off longitudinal acceleration sender -G251-

Note:

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

Display group number: 040

Basic setting Enter display group number XXX	HELP

◄ Readout in display:

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

System in basic setting	40

◄ Readout in display:

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

Zero adjustment of longitudinal acceleration sender -G251-

Note:

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

Display group number: 069

Test of vehicle systems HELP Select function XX	◄ Readout in display:
	- Press the key 1 twice for the function „login procedure“ and confirm the entry with the key Q.
Login procedure Enter code number XXXXX	◄ Readout in display:
	- Enter code number 40168 and confirm entry with the key Q.
Test of vehicle systems HELP Select function XX	◄ Readout in display:
	- Press the keys 0 and 4 for function „Initiate basic setting“ and confirm the entry with the key Q.
Basic setting HELP Enter display group number XXX	◄ Readout in display:
	- Press the keys 0, 6 and 9 for „display group number 069“ and confirm the entry with the key Q.
	- The ABS warning light flashes.
System in basic setting 69 Adjustment o.k. 0.3 m/s2	◄ Readout in display:
	Adjustment is thus completed.
	The readout does not move back exactly to 0.00 m/s2.
Function is unknown or cannot be - → performed at the moment	◄ If this readout appears in the display, the login procedure was not successfully performed.
	- Repeat login procedure.
System in basic setting 69 Adjustment n. possible 5.0 m/s2	◄ If this readout appears in the display, the measured values are not within a tolerance range permitted for the zero adjustment.

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

- Press the → key.

Test of vehicle systems Select function XX	HELP

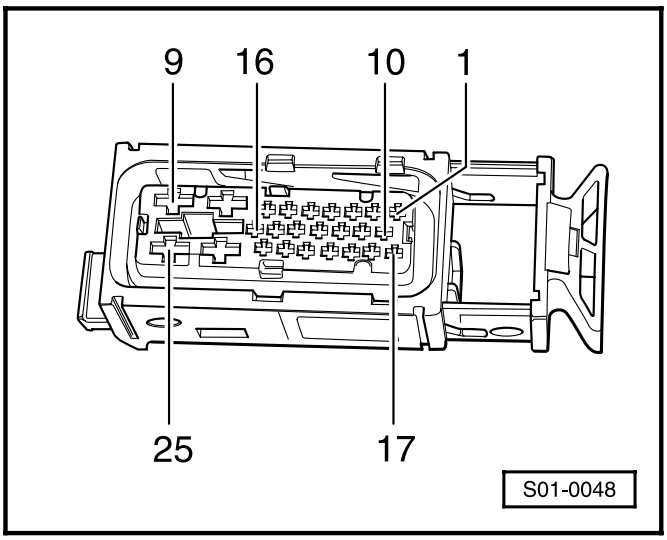
◄ Readout in display:

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

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

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

Multipin connectors with contact assignment ⇒ page 45-42.



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

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

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

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

Test table

Test steps 1 to 19 ⇒ page 45-44

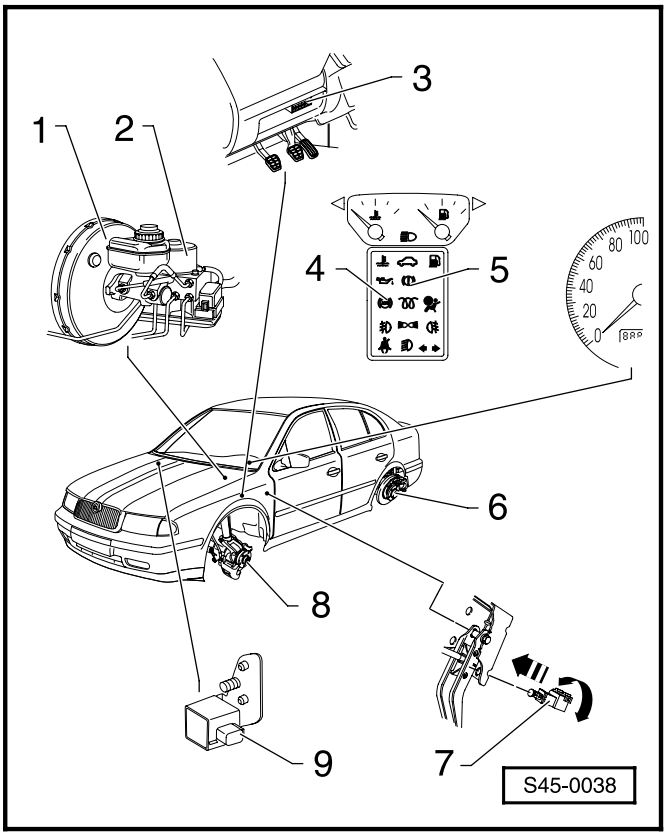
- *The socket designations of test box V.A.G 1598/21 are identical with contact designations of the control unit (J104) in the current flow diagram.*

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

- *If the measurements obtained differ from the specifications, carry out measures for rectifying faults stated in the right-hand column of the table.*
- *If the specifications are achieved, additionally test the cables for short circuit to positive and to earth.*
- *Perform continuity tests with adapter cable set V.A.G 1594 A (bridges).*
- *If the measurements obtained differ only slightly from the specifications, clean sockets and connectors of the test equipment and test cables (e.g. with contact spray) and repeat test. Before replacing the relevant components, inspect cables and connections, and repeat the resistance measurement at the component, particularly in the case for specifications of less than 10 ohms.*

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

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



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

1 - Brake master cylinder and brake servo unit

2 - Hydraulic control unit 1)
- ♦ Fitting location: in left of engine compartment
- ♦ Removing and installing ⇒ page 45-52
- ♦ Servicing ⇒ page 45-57

3 - Diagnostic connection
- ♦ Fitting location: in shelf on driver side

4 - ABS warning light (K47)
- ♦ Fitting location: in dash panel insert

Function:
- ♦ The ABS warning light comes on:
- - For about 2 seconds after ignition is switched on and/or engine start
- - If fault detected (e.g. open circuit to wheel speed sensor)

⇒ page 45-7

5 - Handbrake/brake fluid level warning light (K14/33)
- ♦ Fitting location: in dash panel insert

Function:
- ♦ The handbrake/brake fluid level warning light comes on:
- - if handbrake is applied
- - if brake fluid level is low
- - for about 2 seconds after ignition switched on
- - if electronic brake pressure distribution fails, i.e. if ABS warning light comes on

⇒ page 45-7

6 - Parts of ABS system at rear suspension

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

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

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

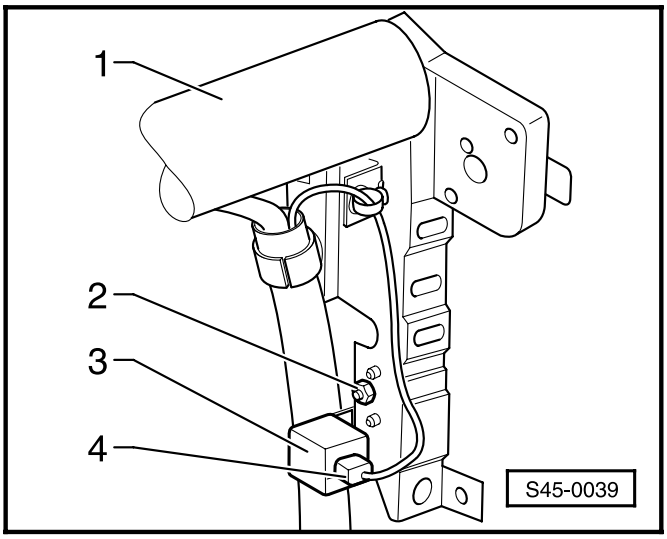
9 - Longitudinal acceleration sender -G251- 1)
- ♦ Fitting location: at central tube on right, close to right A pillar
- ♦ Removing and installing ⇒ page 45-82

Removing and installing longitudinal acceleration sender -G251-

Removing

- Remove the glove box.

⇒ Body Fitting Work; Repair Group 70; Removing and installing dash panel



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

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

Installing

- Installation is carried out in the reverse order.

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

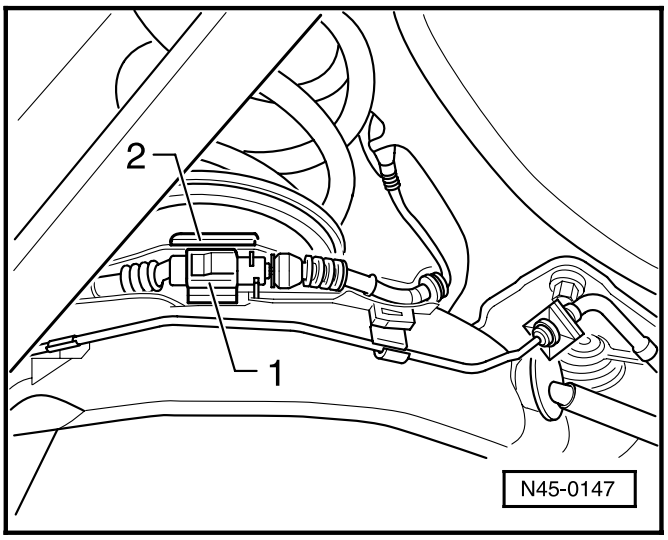
Special tools, testers and aids required

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

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

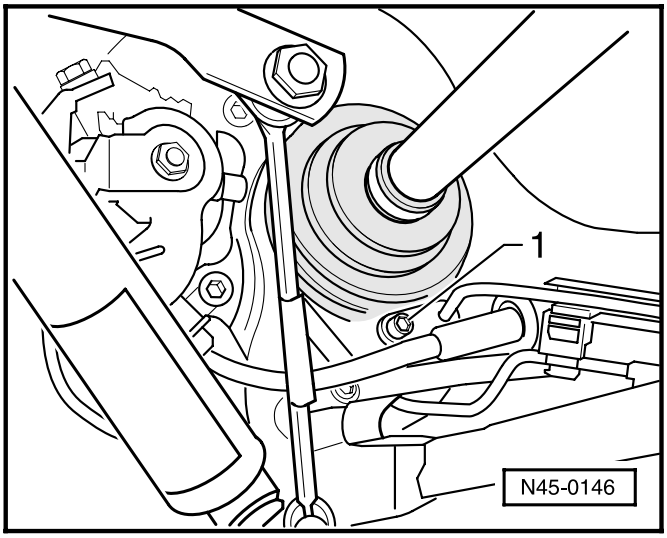
Removing

- Raise vehicle.



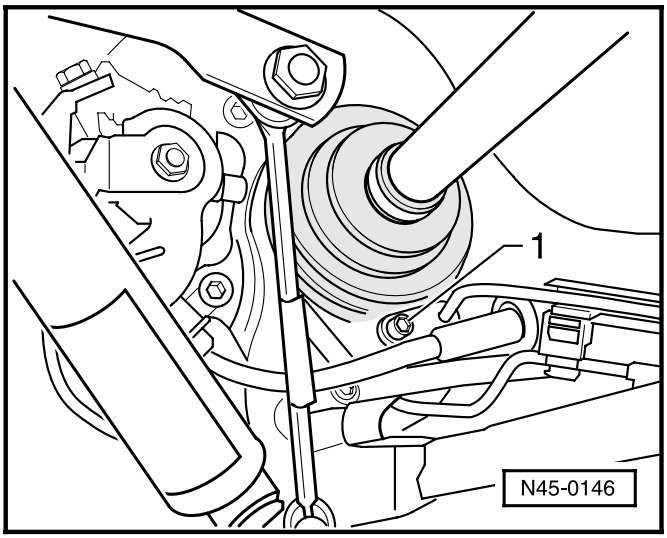
◄ - Open cover -2- of plug connection -1-.

- Separate plug connection -1- of wheel speed sensor cable - wheel speed sensor.



◄- Remove hexagon socket bolt -1-.

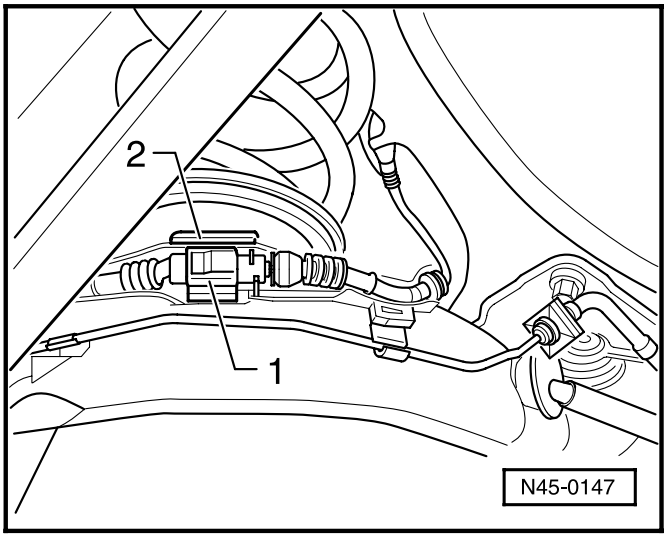
- Pull wheel speed sensors -G44/G46- out of trailing arm.



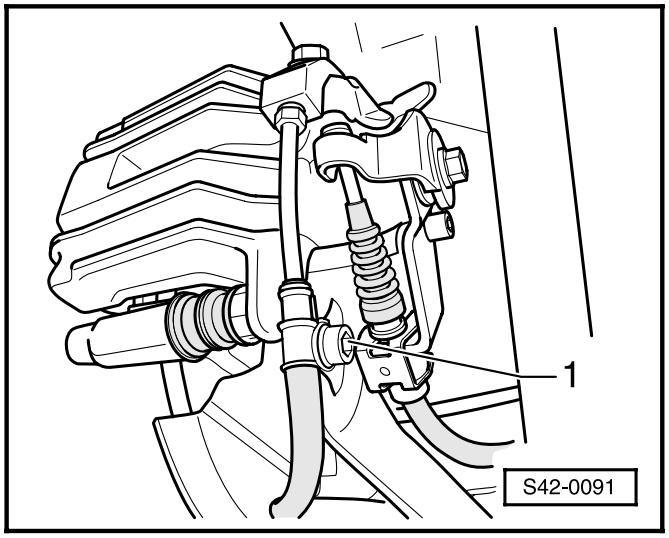
Installing

- Before installing the wheel speed sensor, clean the inner surface of the hole and coat wheel speed sensor all round with solid lubricating paste G 000 650.

◄- Insert sensor into the hole of the trailing arm and tighten hexagon socket bolt -1- fully to 8 Nm.



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



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

- Raise vehicle.
- Take off wheel.

◄ - Unscrew bolts -1- attaching brake carrier and take brake carrier off together with brake caliper.

Note:

Top bolt attaching brake carrier is concealed.

- Suspend the brake caliper at the body.

  Brake line must not be subjected to pulling stresses.

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

Tightening torques:

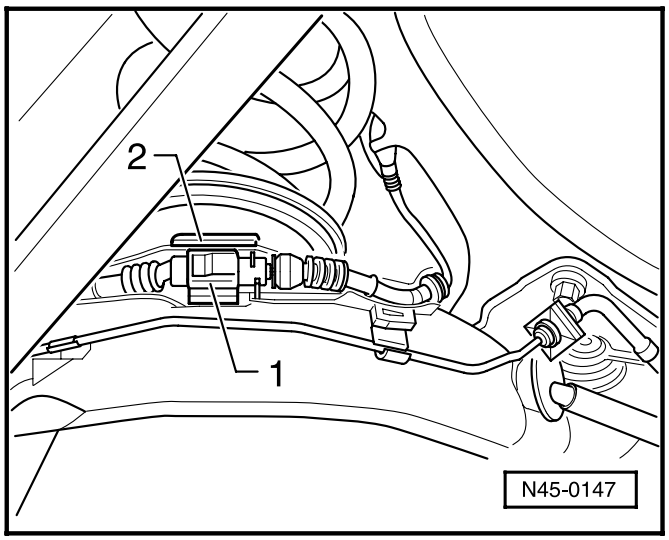
Brake carrier with brake caliper to trailing arm	65 Nm
Wheel bolt	120 Nm

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

Notes:

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

⇒ Inspection and Maintenance



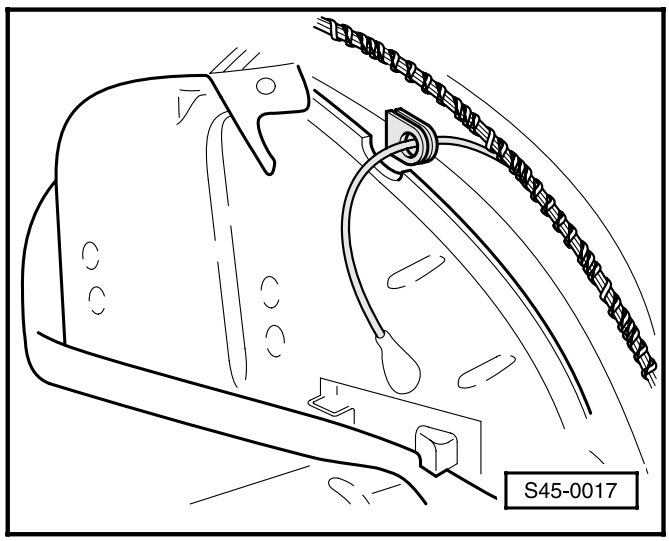
- Disconnect battery.
- Raise vehicle.
- Take off wheel.

◄ - Open cover -2- of plug connection -1-.

- Separate plug connection -1- of wheel speed sensor cable - wheel speed sensor.

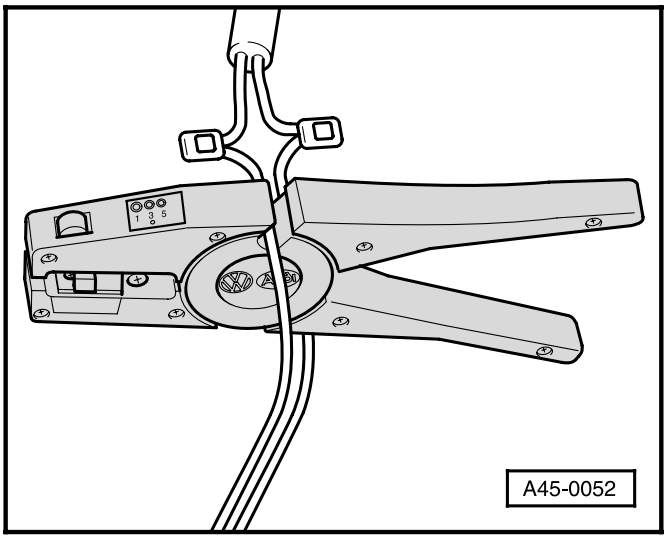
- Remove side trim panel of luggage compartment.

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

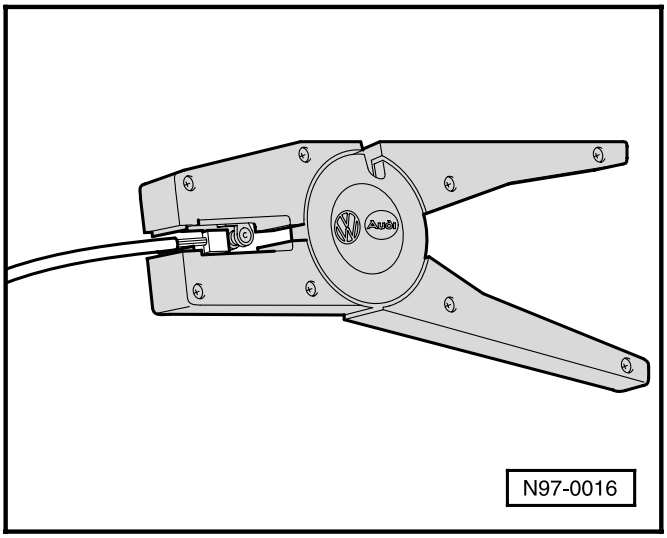


◄ - Locate weld connection at wheel speed sensor cable.

- Pull insulating grommet off the welded connection.

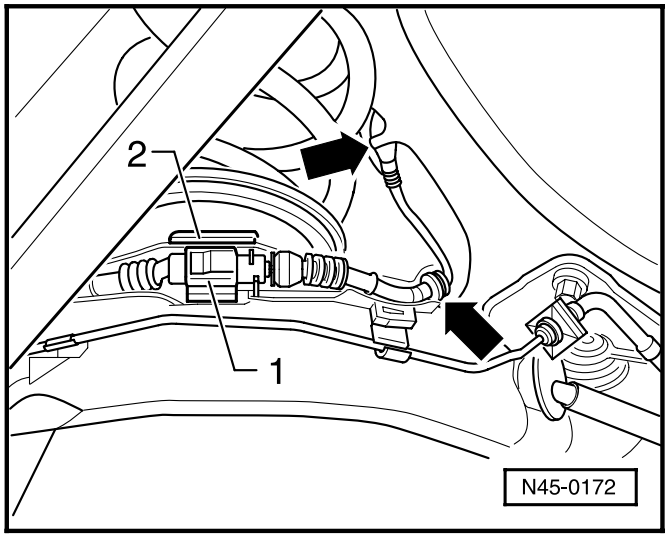


◄- Use cable insulation stripping pliers from the wiring harness repair kit to separate wheel speed sensor cable ahead of the welded connection and remove the faulty section of cable.



◄- Bare end of cable over 15 mm with the insulation stripping pliers and turn over the bared end of the cable halfway.

- Draw in new wheel speed sensor cable.



◄- Fit together plug connection of wheel speed sensor cable - wheel speed sensor -1- and close cover -2-.

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

Note:

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

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

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

- Install side trim panel of luggage compartment.

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

- Fit on wheel.

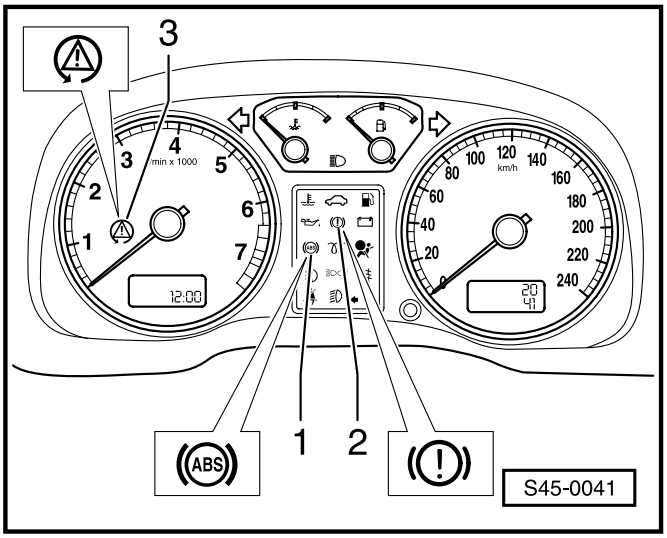
- Connect battery ⇒ page 45-85.

- Interrogate fault memory ⇒ page 45-12.

- Erase fault memory ⇒ page 45-21.

Antilock brake system ABS/ EDL/ESP Mark 20

Safety measures, basic information regarding fault finding and repairs



- The ABS/EDL/ESP is a vehicle safety system; work on this system requires system knowledge.

◄ ♦ Indication of faults by the warning lights for:
- ABS (K47) -1-
- Handbrake/brake fluid level (K14/33) -2-
- Electronic stability programme (K155) -3-
⇒ page 45-92.

- Certain faults are not detected until the vehicle speed is more than 20 km/h (conduct a road test).

- If the ABS warning light -K47- and the handbrake/brake fluid level warning light -K14/33- do not come on and the brake system is nevertheless not fully operational, look for the fault in the conventional brake system ⇒ from page 46-1 and from page 47-26.

- Information on rectifying current faults
⇒ Service Technical Handbook and
⇒ “Current Flow Diagrams, Electrical Fault Finding and Fitting Locations” binder

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

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

Technical information required

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

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

General information

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

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

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

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

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

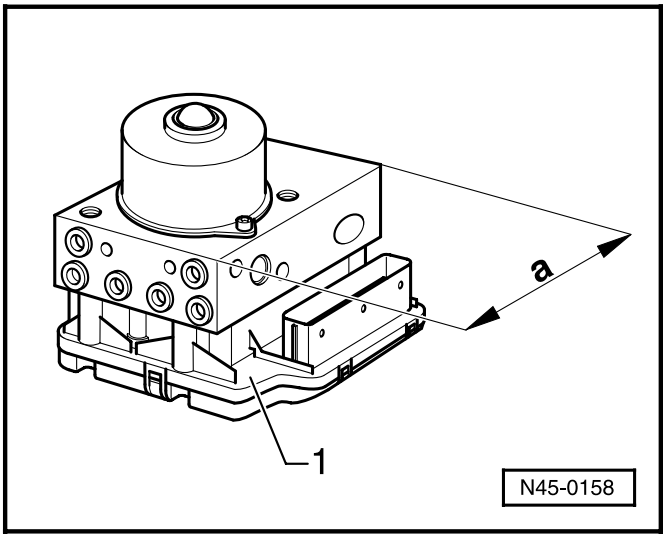
You can find a description of the design and operation of the ESP in the Self Study Programme No. 28.

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

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

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

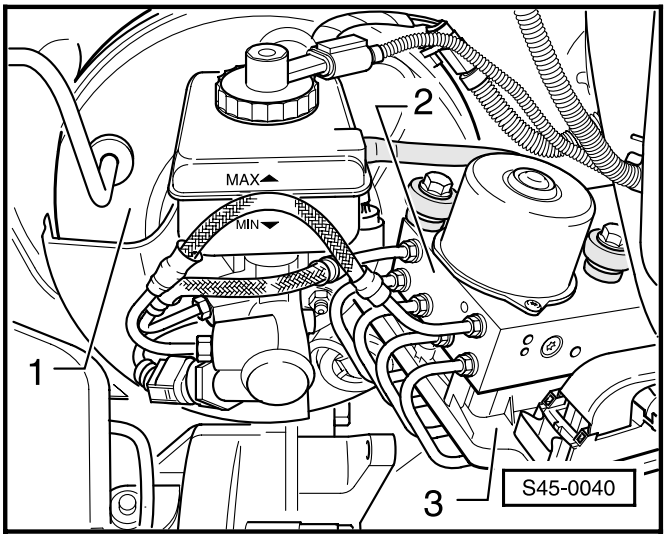
New control units supplied through the Parts Sector are not coded. They require to be coded after being installed.



ABS/EDL/ESP ITT Mark 20 IE

◄ ***Distinguishing features:***

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



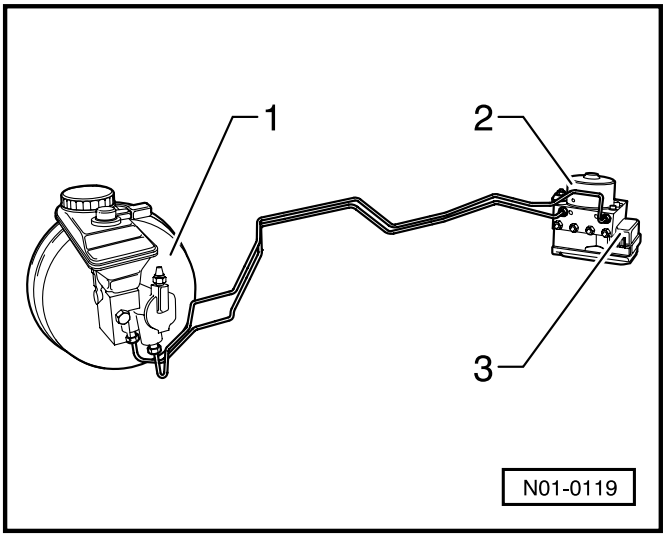
Fitting location of ABS/EDL/ESP ITT Mark 20 IE

◄ **LHD models**

1 - Brake servo unit 10”

2 - Hydraulic unit

3 - Control unit, 47-pin, bolted to hydraulic unit



◄ **RHD models**

1 - Brake servo unit 7”/8”

2 - Hydraulic unit

3 - Control unit, 47-pin, bolted to hydraulic unit

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

Function

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

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

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

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

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

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

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

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

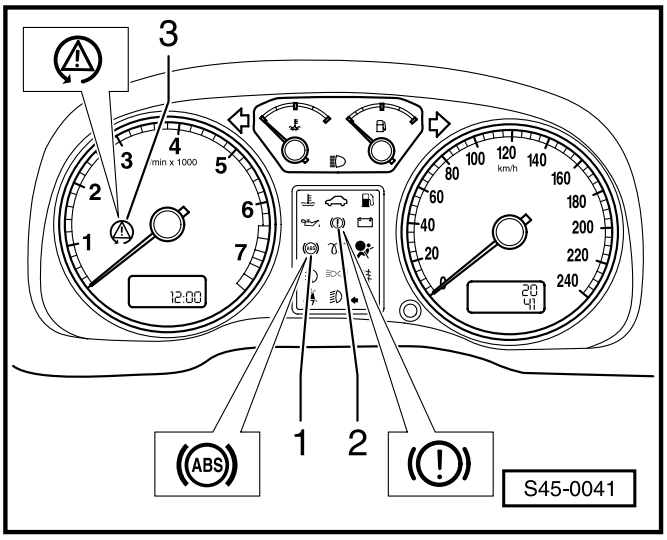
During this time a test procedure (self-check) with the following functions is performed in the control unit:

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

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

Notes:

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



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

◄ **Position of warning lights**

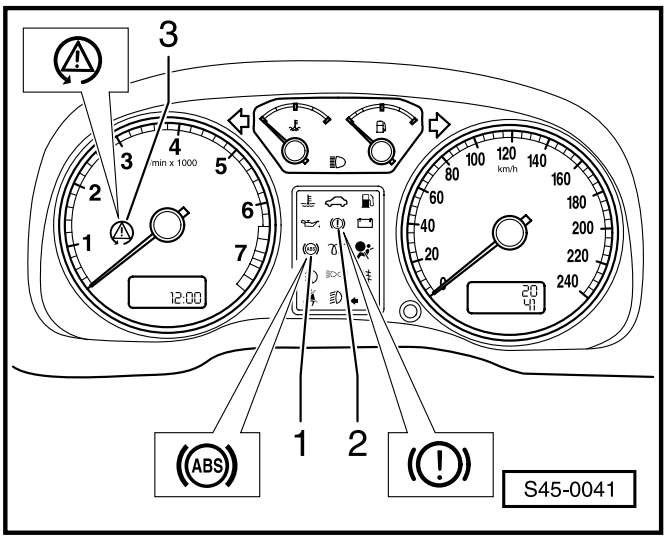
Item	Designation
1	ABS warning light -K47-
2	Handbrake/brake fluid level warning light -K14/33-
3	Electronic stability programme warning light -K155-

Warning!

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

Overview

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



◄ ABS warning light -K47-

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

  -a- voltage supply is less than 10 V

  -b- there is a fault in the ABS

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

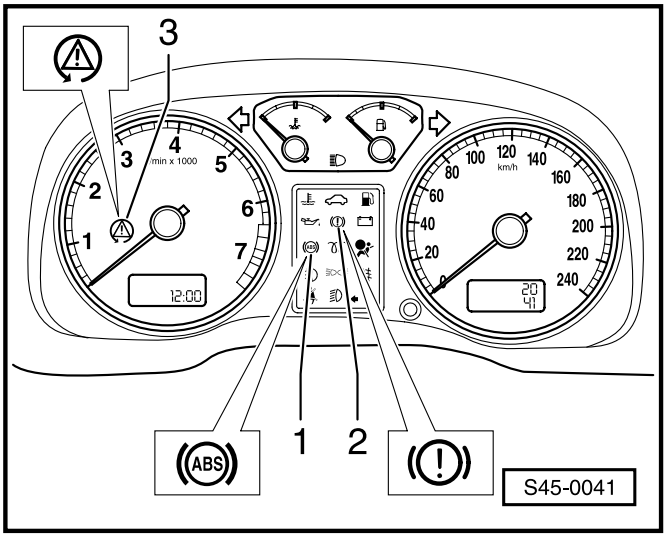
  -c- there was a sporadic wheel speed sensor fault after vehicle last started.

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

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

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

-e- the dash panel insert is faulty.



◄ Warning lights -K47- and -K14/33

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

  -a- the brake fluid level is too low.

  -b- the handbrake is applied.

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

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

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

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

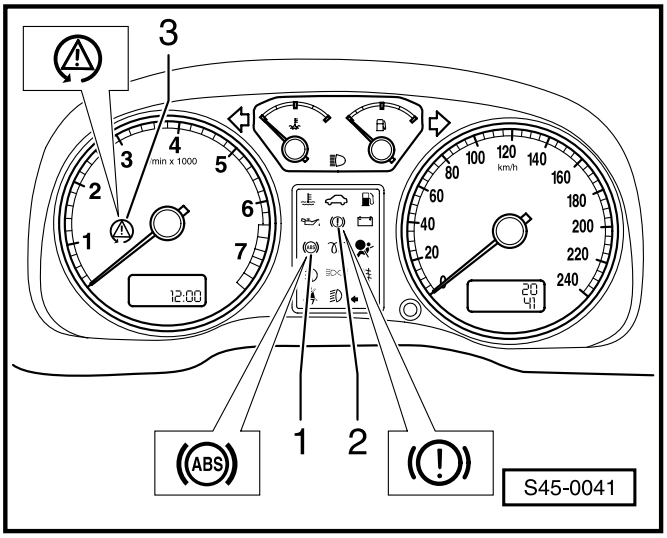
- If the ABS warning light (K47) -1- and the handbrake/brake fluid level warning light (K14/33) -2- come on and 3 warning signals are heard, this indicates that the ABS system and the EBD (electronic brake force distribution) are not operating.

Note:

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

Warning!

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



◄ **Electronic stability programme warning light -K155-**

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

There is a fault which affects only the ESP safety system. The ABS/EDL and EBD safety systems of the vehicle remain fully operational.
Interrogate fault memory ⇒ page 45-101.

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

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

-c- open circuit in cable for operating electronic stability programme warning light -K155-.
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

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

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

Code control unit ⇒ page 45-114.

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

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

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

Code control unit ⇒ page 45-114.

Models fitted with ABS/EDL/ESP - EDL does not operate

Special tools, testers and aids required

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

Complaint: „EDL system of vehicle does not operate“

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

Performing self-diagnosis

Test requirements

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

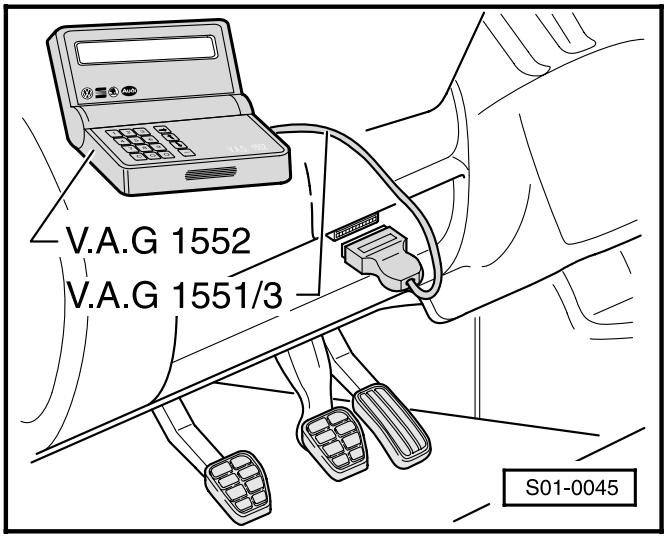
Connecting vehicle system tester V.A.G 1552 and selecting function

Special tools, testers and aids required

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

Notes:

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



♦ *The fault memory can be erased after completing repairs and interrogating memory.*

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

Interrogating control unit version

Test of vehicle systems Enter address word XX	HELP

◄ Readout in display:

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

Notes:

♦ *Depending on the programme, additional user information can be displayed by pressing the HELP key of V.A.G 1552.*

♦ *The → key is used for moving forward within the test programme.*

- Switch on ignition.

Test of vehicle systems Enter address word XX	HELP

◄ Readout in display:

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

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

◄ The following readout then appears (example):

What is displayed is:

♦ the control unit identification number, e.g. 1J0907379

♦ the system designation, e.g. ESP 20

♦ Databus present (CAN)
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

♦ the number of the version, e.g. V002

♦ the code No. of the control unit, e.g. 18945

♦ the workshop code (WSC)
⇒ Operating instructions of vehicle system tester V.A.G 1552

Assignment of control unit
⇒ Parts List

Coding control unit ⇒ page 45-114

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

- Press → key.

Test of vehicle systems HELP Select function XX	◄ Readout in display:

Note:

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

Test of vehicle systems HELP Select function XX	◄ Readout in display; (function selection, e.g. 02 - Interrogating fault memory)

Note:

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

Test of vehicle systems HELP Control unit does not answer!	◄ A possible cause of the fault are the fuses of the inlet/outlet valves S13, S162, S163.
Test of vehicle systems HELP K wire not switching to positive!	◄ Check whether ignition is switched on.
Test of vehicle systems → No signal from control unit!	◄ Faults occurred when interrogating the control unit identification (also external sources of interference).

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

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

Test of vehicle systems Tester sends address word 03	◄ Readout in display after entering address word 03
1J0 907 379 ESP 20 CAN V005 → Coding 18945 WSC XXXXX	◄ and the following readout then appears:

- Press → key.

Test of vehicle systems HELP Select function XX	◄ Readout in display:

Automatic test sequence

Note:

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

- Switch on ignition.

Test of vehicle systems Select function XX	HELP

◄ Readout in display:

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

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

◄ The control unit identification appears in the display.

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

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

List of available functions

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

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

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

Interrogating fault memory

Test of vehicle systems HELP Select function XX

◄ Readout in display:

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

X faults recognised!

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

No fault recognised! →

- Press → key.

  The faults stored are displayed one after the other.

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

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

Test of vehicle systems HELP Select function XX

◄ Readout in display:

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

- Switch off ignition and separate diagnosis plug connection.

Notes:

If a fault was detected:

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

Fault table

Notes:

- *In view of the control units which are interlinked over a databus line, always commence fault finding by initiating the „Automatic test sequence“ with the key function 0 and 0 at all the control units fitted to the vehicle. This interrogates the control unit fitted to the vehicle and any faults which may be stored in them.*
- *All the possible faults which can be detected by the ABS control unit (J104) and displayed on V.A.G 1552, are listed below according to the 5-digit fault code.*
- *If faults occur only occasionally or if the fault memory was not erased after rectifying faults, these faults are displayed for a defined period as „sporadically occurring faults“ -SP- ⇒ page 45-91, Fault recognition of ABS control unit.*
- *In addition, the fault type may also be indicated in the fault table.*
- *Reference is made in the column „Rectifying fault“ to individual test steps of the electrical test.*
- *Before replacing components indicated as faulty, test the appropriate plug connections, cables and earth connections according to the current flow diagram.*

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

- *After completing repairs, always once again interrogate and then erase the fault memory with the vehicle system tester V.A.G 1552, and conduct a road test (at a speed of more than 20 km/h).*
- *After conducting the road test, once again interrogate the fault memory.*

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1) Only on vehicles fitted with automatic gearbox.

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

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

Erasing fault memory

Requirement:

- Fault memory has been interrogated.

- Press → key.

Test of vehicle systems HELP Select function XX

◄ Readout in display:

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

Test of vehicle systems → Fault memory is erased!

◄ Readout in display:

- Press → key.

Test of vehicle systems HELP Select function XX

◄ Readout in display:

Notes:

Attention! Fault memory was not interrogated

◄ ♦ *If this readout appears in the display, then the test sequence was incorrect.*

♦ *Follow the test sequence exactly:*
First of all, interrogate fault memory and then erase it.

Ending output

Test of vehicle systems Select function XX	HELP

◄ Readout in display:

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

Test of vehicle systems Enter address word XX	HELP

◄ Readout in display:

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

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

Coding control unit

Special tools, testers and aids required

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

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

Requirement for coding

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

Test procedure

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

Test of vehicle systems HELP Select function XX

◄ Readout in display:

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

Code control unit Q Enter code number XXXXX (0-32767)

◄ Readout in display:

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

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

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

Table of codes

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

Note:

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

- Press → key.

Test of vehicle systems HELP Select function XX

◄ Readout in display:

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

Note:

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

Error Coding XXXXX not accepted →

◄ Readout in display:

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

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

Reading measured value block

Special tools, testers and aids required

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

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

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

Safety precautions

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

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

Test procedure and test tables with measured values

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

Test of vehicle systems HELP Select function XX

◄ Readout in display:

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

List of available display group numbers

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

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

2) Only on vehicles fitted with automatic gearbox.

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

Display group number 001

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

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

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

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

◄ Readout in display (vehicle stationary):

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

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

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

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

Press key C for entering the next display group number.

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

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

Display group number 002

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

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

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

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

◄ Readout in display (vehicle stationary):

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

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

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

1) If the variations in display blocks 1 and 2 are greater than 6 km/h, the causes of the fault may be the following:

2) If the variations in display blocks 3 and 4 are greater than 2 km/h, the causes of the fault may be the following:

♦ *Gap between wheel speed sensor and pulse rotor too large.*

- Check whether the wheel speed sensor is correctly attached to the wheel bearing housing.

♦ *External damage to wheel speed sensor or pulse rotor.*

- Replace the damaged component.

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

Press key C for entering the next display group number.

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

Test of brake light switch -F- and of ESP brake recognition switch -F83-

Display group number 003

- Press keys 0, 0 and 3 and confirm the entry with the key Q.

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

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

Read measured value block 3 →
Not oper. Not oper.

◄ Readout in display (vehicle stationary):

Read measured value block 3 →				**Display group number: 003**
Not oper.	Not oper.			◄ Readout in display
			Not assigned	
		Not assigned		
	ESP brake recognition switch:[1)] ♦ Not oper. → brake pedal not operated ♦ Operated → brake pedal operated If variations exist ⇒ page 45-133, Electrical Test, test step 25			
Brake light switch: ♦ Not oper. → brake pedal not operated ♦ Operated → brake pedal operated If the readout in the display of V.A.G 1552 is -Not oper.- although the footbrake is operated, or is -Operated- although the footbrake is not operated, carry out test step 4 of the Electrical Test ⇒ page 45-133. It is also possible that the brake light switch is not correctly set ⇒ page 45-69, Setting brake light switch.				

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

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

Press key C for entering the next display group number.

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

Test of steering angle sensor -G85-, of lateral acceleration sensor -G200- and of yaw rate sensor -G202-

Display group number 004

- Press keys 0, 0 and 4 and confirm entry with the key Q.

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

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

Read measured value block 4 →		
-3.0°	0,0 m/s²	0.17°/s

◄ Readout in display (vehicle stationary):

Pay attention to the following aspects regarding display group number 004:
When driving forward through a left-hand curve, all three readouts must be positive (without sign).
When reversing through a right-hand curve, all three readouts must be negative (-).

Read measured value block 4 →			**Display group number: 004**
-3.0°	0.0 m/s²	0.17°/s	◄ Readout in display (example)
			Not assigned
			Yaw rate sensor -G202-: ♦ Specification when vehicle stationary: ± 2.5°/s ♦ Conduct Electrical Test, test step 21 ⇒ page 45-133.
			Lateral acceleration sensor -G200-: ♦ Specification when vehicle stationary: ± 0.5 m/s² ♦ Specification when steering at full lock and at a speed of 20 km/h in a left-hand curve: The readout rises constantly with a positive sign (no sign). ♦ Specification when steering at full lock and at a speed of 20 km/h in a right-hand curve: The readout rises constantly with a negative sign (-). ♦ Conduct Electrical Test, test step 20 ⇒ page 45-133.
			Steering angle sensor -G85-: ♦ If the steering angle sensor -G85- is tested during straightahead running, it is also necessary to conduct a zeroing.[1)] ♦ Specification when driving straightahead ± 4.5° - Basic setting ⇒ page 45-124, display group number 060 ♦ Conduct Electrical Test, test step 19 ⇒ page 45-133.

1) No ABS or ESP control is performed during a road test with vehicle system tester V.A.G 1552 connected and in the diagnosis or reading measured value block mode. The ABS or ESP warning lights do not come on in this case. Self-diagnosis of control unit -J104- is ended if vehicle speed exceeds 20 km/h.

The next higher display group number 005 can be selected with the ↑ key.

Press key C for entering the next display group number.

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

Test of brake pressure sensor -G201- and -G214-

Display group number 005

- Press keys 0, 0 and 5 and confirm the entry with the key Q.

Read measured value block 5 →
→ 1 → 2 → 3 → 4

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

Read measured value block 5 →
- 1.27 bar - 1.48 bar

◄ Readout in display (vehicle stationary):

Read measured value block 5 →				Display group number: 005
-1.27 bar	-1.48 bar			◄ Readout in display (example)
			Not assigned	
		Not assigned		
	Brake pressure sensors -G201- and -G214- ♦ Specification when brake not depressed: ± 7 bar ♦ Conduct Electrical Test, test steps 22 and 23 ⇒ page 45-133.			
Brake pressure sensors -G201- and -G214- ♦ Specification when brake not depressed: ± 7 bar ♦ Conduct Electrical Test, test steps 22 and 23 ⇒ page 45-133.				

The next lower display group number can be selected consecutively in turn with the ↓ key.

Press key C for entering the next display group number.

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

Checking the data-bus line

Display group number 125

- Enter 125 and confirm the entry with Q

Read the measuring value block 125 → →1 → 2 → 3 → 4	◄ - There are always four display fields which appear in the measuring value block -arrows- Itemisation of the values 1 to 4 in the individual display fields can be found in the following test table.
Read the measuring value block 125 → Engine 1 Steering sh.1 4-wheel drive 1 Gearbox 1	◄ Readout shown on the display (with the vehicle stationary)

Read the measuring value block			125 →	**Display group number 125**
Engine 1	Steering sh.1	4-wheel drive 1	Gearbox 1	◄ Readout shown on the display (an example)
				CAN-BUS for the transmission[1)] ♦ 1 → the data-bus connection is available ♦ 0 → the data-bus connection is not available[2)]
				Data-BUS for the control unit for the four-wheel drive[3)] ♦ 1 → the data-bus connection is available ♦ 0 → the data-bus connection is not available[2)]
				Data-BUS for the steering angle ♦ 1 → the data-bus connection is available ♦ 0 → the data-bus connection is not available[2)]
				Data-BUS for the engine ♦ 1 → the data-bus connection is available ♦ 0 → the data-bus connection is not available[2)]

[1)] Only for vehicles with an automatic gearbox

♦ A wrong transmission control unit or wrong coding in the transmission control unit.

♦ The transmission control unit is defect

⇒ Rep. Gr. 01 of the corresponding transmission identification code

[2)] The data-bus connection was interrupted or the data-bus line has been changed around

⇒ File „Current flow plans, Fault Detection on Electrics and Installed Locations“

[3)] Only for vehicles with four-wheel drive

Comment:

If a control unit is not connected to data-bus lines or not installed then the corresponding display field will remain blank.

Press the C-button to enter the next display group number.

Once the → button has been pressed one should then enter the function 08 „Read measuring value block“.

Initiating basic setting

Special tools, testers and aids required

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

Tasks of function 04 „Initiating basic setting“

Function 04 „Initiating basic setting“ in the case of ESP performs several tasks:

- -1- Display group number 001 is required for bleeding the hydraulic unit.
- -2- Display group number 031 is used to perform the operational check of the brake pressure solenoid and of the ESP brake recognition switch.
- -3- Display group numbers 060, 063 and 066 are required for the zeroing of the steering angle sensor, lateral acceleration sensor and of the brake pressure sensors.

-1- Display group number 001 is selected on vehicles fitted with the ESP system to bleed the hydraulic unit. Initiate basic setting ⇒ page 45-36.

Basic setting 04, display group number 001, is only required if at least one chamber of the brake fluid reservoir has been completely emptied.

Initiating the basic setting should also be carried out after completing repairs involving leaks in the brake system.

Function 11 „Login procedure“ is not required in this case.

-2- Display group number 031 is selected to perform an operational check of the brake pressure solenoid -N247- and of the ESP brake recognition switch -F83- ⇒ **page 45-126.**

This is necessary if:

- the brake servo unit has been replaced.
- this is requested in the fault memory.

Function 11 „Login procedure“ is not required in this case.

-3- Display group numbers 060, 063 and 066 are selected in order to perform a zeroing.

- Display group number 060 is selected to perform the zeroing of the steering angle sensor -G85- ⇒ page 45-127.
- Display group number 063 is selected to perform the zeroing of the lateral acceleration sensor -G200- ⇒ page 45-129.
- Display group number 066 is selected to perform the zeroing of the brake pressure sensors -G201- and -G214- ⇒ page 45-130.

Conducting the zeroing of display group numbers 060, 063 and 066 requires that function 11 „Login procedure“ has first of all been successfully completed with the aid of the vehicle system tester ⇒ page 45-131.

Zeroing is necessary if:

- the control unit -J104-, or the steering column has been replaced,
- the steering angle sensor -G85- has been replaced,
- settings at the running gear has been changed as part of a check of chassis alignment,
- the lateral acceleration sensor -G200- has been replaced,
- the brake pressure sensors -G201- and/or -G214- have been replaced,

- if, when dealing with a fault entry in the fault memory of control unit -J104-, an instruction is contained in the fault table to carry out zeroing,
- the steering wheel has been taken off.

Display group number 031: test of brake pressure solenoid -N247- and of the ESP brake recognition switch -F83-.

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

Test of vehicle systems HELP Select function XX	◄ Readout in display:

- Start the engine.
- Press keys 0 and 4 for the function „Basic setting“ and confirm the entry with the key Q.

Basic setting HELP Enter display group number XXX	◄ Readout in display:

- Press keys 0, 3 and 1 and confirm the entry with the key Q.

ABS warning light -K47- flashes.

System in basic setting 31 Solenoid activated	◄ Readout in display:

- Press ↑ key.

System in basic setting 31 5.95 bar 6.16 bar not oper.	◄ Readout in display: *Do not depress brake pedal.*

- Press ↑ key.

System in basic setting 33 Operate pedal and hold...	◄ Readout in display:

- Depress brake pedal with firm foot pressure and hold.

Brake lights come on.

If the brake lights do not come on:

- ♦ Brake light suppression relay -J508- faulty.
  ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
- ♦ ESP brake recognition switch -F83- or brake pressure solenoid -N247- faulty.
- Perform electrical test ⇒ page 45-133, test step 25.
- Press ↑ key.

System in basic setting 34 18.06 bar 19.12 bar operated	◄ Readout in display:

- Press ↑ key.

System in basic setting 35 Release pedal	◄ Readout in display:

- Take foot off brake pedal.
- Press ↑ key.

System in basic setting 36 0.85 bar 1.27 bar not oper.	◄ Readout in display:

- Press ↑ key.

System in basic setting 37 Solenoid test ended	◄ Readout in display:

- Press → key.

Test of vehicle systems HELP Select function XX	◄ Readout in display:

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

Display group number 060: zeroing of steering angle sensor -G85.

- Start the engine.
- Conduct a short road test on a flat surface. Drive straightahead and not faster than 20 km/h; pay attention to the following two points.
  - If the steering wheel is not in the middle position when driving straightahead, correct the position of the steering wheel as part of a check of chassis alignment.
  - Carry out the zeroing.

- If the steering wheel is in the middle position during the road test, keep the vehicle out of straightahead running.

Ensure that the position of the steering wheel is no longer altered. Switch the ignition off!

- Carry out the zeroing by selecting function 08 „Read measured value block“ ⇒ page 45-116, display group number 004.

- First of all, successfully carry out function 11 „Login procedure“ with vehicle system tester V.A.G 1552 ⇒ page 45-131.

Test of vehicle systems HELP Select function XX	◄ Readout in display:

- Press keys 0 and 4 for the function „Basic setting“ and confirm the entry with the key Q.

Basic setting HELP Enter display group number XXX	◄ Readout in display:

- Press keys 0, 6 and 0 and confirm the entry with the key Q.

ABS warning light -K47- flashes.

Function is unknown or cannot be carried out at the moment - →	◄ If this readout appears in the display, the login procedure has not been successfully performed.
System in basic setting 60 Zeroing o.k. 0.0°	◄ Readout in display:

The readout in the display changes to 0.0° after successful zeroing.

or:

System in basic setting 60 Zeroing n. possible 12.0°	◄ If this readout appears in the display, the measured values are not within the range of ± 10° which is permitted for the zeroing.

1. Interrogate fault memory (function 02)

2. Erase fault memory (function 05)

3. End output (function 06)

4. Switch the ignition off.

5. Switch the ignition on.

6. Once again carry out zeroing.

- Press → key.

Test of vehicle systems HELP Select function XX

◄ Readout in display:

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

ABS warning light -K47- and ESP warning light -K155- come on for about 2 seconds.

Display group number 063: zero adjustment of lateral acceleration sender -G200-

- Vehicle is standing on level ground.
- Select function 08 “Read measured value block” and check the measured values ⇒ page 45-116, display group number 004.
- First of all, successfully complete function 11 “Login procedure” with vehicle system tester V.A.G 1552 ⇒ page 45-131.

Test of vehicle systems HELP Select function XX

◄ Readout in display:

- Press keys 0 and 4 for the function “Basic setting” and confirm the entry with the key Q.

Basic setting Enter display group number XXX

◄ Readout in display:

- Press keys 0, 6 and 3 and confirm the entry with the key Q.

ABS warning light -K47- flashes.

Function is not known or cannot be carried out at the moment - →

◄ If this readout appears in the display, the login procedure has not been successfully completed.

System in basic setting 63 Adjustment o.k. 0.6m/s^2

◄ Readout in display:

After successful zero adjustment, the readout in the display does not return to 0.0 m/s^2.

or:

System in basic setting 63 Adjustment n. possible 5.0m/s^2

◄ If this readout appears in the display, the measured values are not within the tolerance range of ± 2.5 m/s^2.

1. Interrogate fault memory (function 02)
2. Erase fault memory (function 05)
3. End output (function 06)
4. Switch ignition off.

5. Switch ignition on.

6. Repeat the zero adjustment.

- Press → key.

Test of vehicle systems Select function XX	HELP

◄ Readout in display:

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

ABS warning light -K47- and ESP warning light -K155- come on for about 2 seconds.

Display group number 066: zero adjustment of brake pressure senders -G201- and -G214-

- Brake pedal not operated.

- Select function 08 “Read measured value block” to check the measured values ⇒ page 45-116, display group number 005.

- First of all, successfully perform the function 11 “Login procedure” with the vehicle system tester V.A.G 1552 ⇒ page 45-131.

Test of vehicle systems Select function XX	HELP

◄ Readout in display:

- Press keys 0 and 4 for the function “Basic setting” and confirm the entry with the key Q.

Basic setting Enter display group number XXX

◄ Readout in display:

- Press keys 0, 6 and 6 and confirm the entry with the key Q.

ABS warning light -K47- flashes.

Function is not known or cannot be carried out at the moment	- →

◄ If this readout appears in the display, the login procedure has not been successfully performed.

System in basic setting Adjustment o.k.	-0.85bar	-2.12bar	66

◄ Readout in display:

After successful zero adjustment, the readout in the display does not return to 0.00 bar.

or:

System in basic setting Zeroing -10.85bar -12.12bar n. possible	66

◄ If this readout appears in the display, the measured values are not within the range of -2 bar to 8 bar which is permitted for the zeroing.

1. Interrogate fault memory (function 02)

2. Erase fault memory (function 05)

3. End output (function 06)

4. Switch the ignition off.

5. Switch the ignition on.

6. Once again carry out zeroing.

- Press → key.

Test of vehicle systems Select function XX	HELP

◄ Readout in display:

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

ABS warning light -K47- and ESP warning light -K155- come on for about 2 seconds.

Login procedure

Special tools, testers and aids required

♦ Vehicle system tester V.A.G 1552

♦ Diagnostic cable V.A.G 1551/3 or V.A.G 1551/3 A

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

Test procedure

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

Test of vehicle systems Select function XX	HELP

◄ Readout in display:

- Press key 1 twice for the function „Login procedure“ and confirm the entry with the key Q.

Login procedure	HELP
Enter code number	40168

◄ Readout in display:

- Enter the code number 40168 and confirm the entry with the key Q.

Test of vehicle systems	HELP
Select function XX	

◄ Readout in display:

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

Special tools, testers and aids required

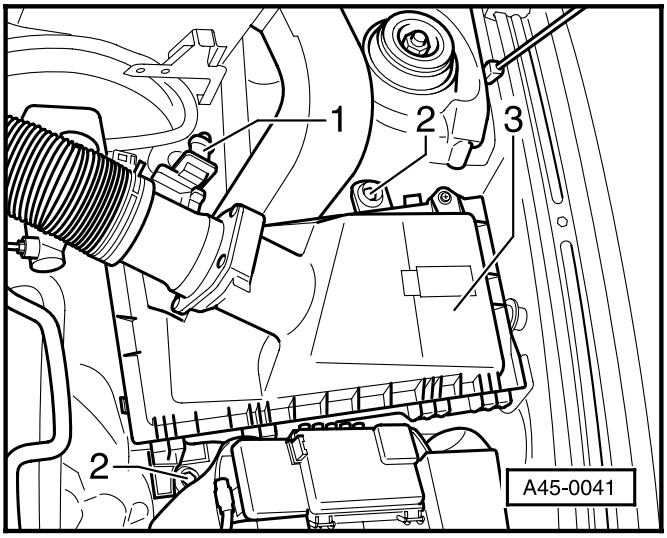
- Hand-held multimeter, e.g. V.A.G 1526 A
- Adapter cable set 1594/A
- Test box V.A.G 1598/A
- Adapter V.A.G 1598/33

Test steps ⇒ from page 45-138 apply only to vehicles fitted with ABS/EDL/ESP

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

Test requirements

- Before commencing the test, switch off ignition and electrical components (headlights, lighting, fan...).
- Fuses S13, S15, S162, S163 must be in proper order.
  ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
  As a check, remove fuse from the fuse holder on the battery and on the left fuse holder on the dash panel.



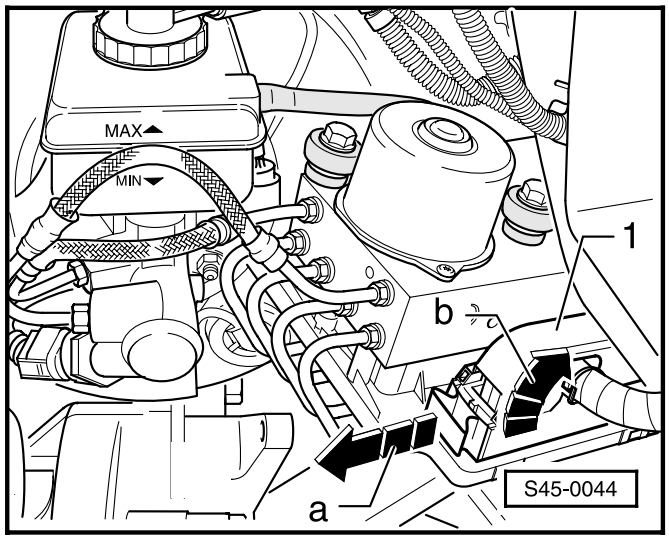
Note:

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

Removing air filter

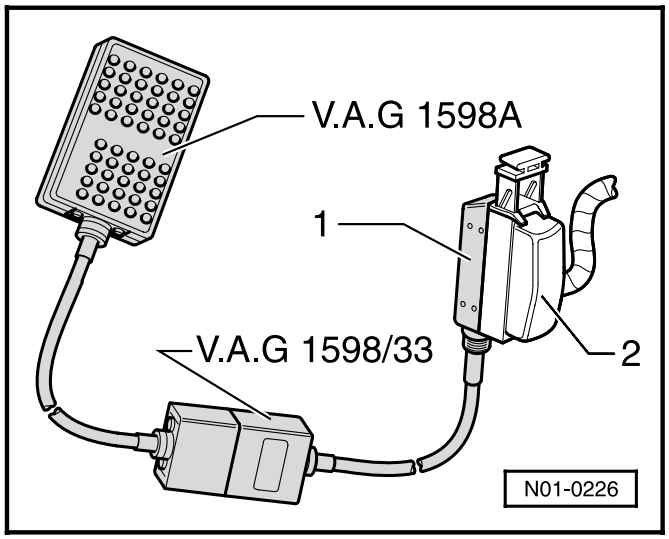
◄ - Unplug the connector of air mass meter -1- from the air guide pipe of the air filter.

- Remove screw -2- at air filter -3- and place filter down to the side.



Connecting test box V.A.G 1598 A with adapter V.A.G 1598/33

◄- Unlock multipin connector -1- (arrow a) and unplug from control unit (arrow b).



◄- Connect test box V.A.G 1598 A with adapter V.A.G 1598/33 -1- to the connector of the wiring loom -2-.

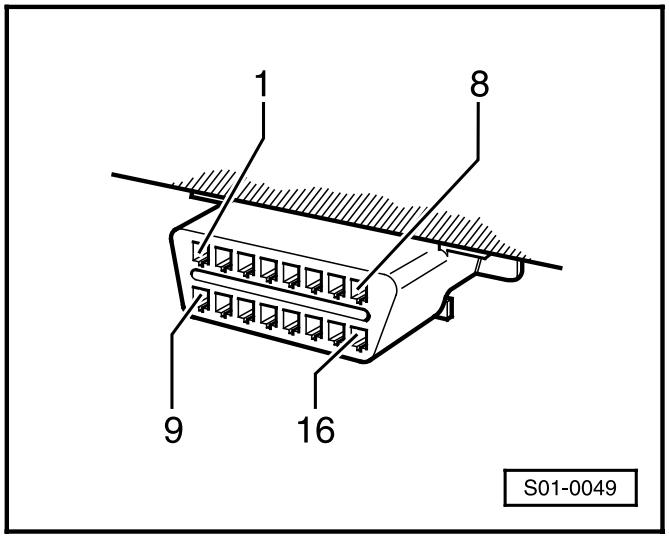
Note:

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

Multipin connectors with contact assignment

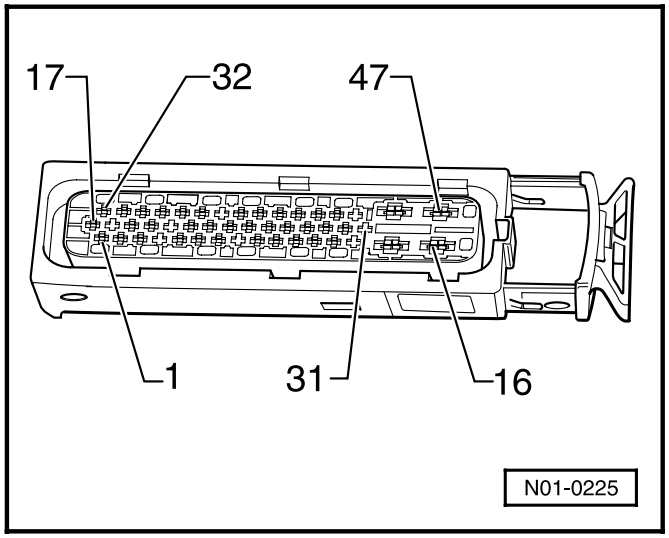
Note:

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



◄ **Contact assignment of plug connection T16a (diagnosis socket) with vehicle system tester V.A.G 1552**

Contact 4	=	Earth (terminal 31)
Contact 16	=	Positive (terminal 30) to S12
Contact 7	=	K wire through diagnostic cable connection to control unit -J104- contact 39



◄ **Contact assignment of plug connection T47a wiring loom/control unit -J104**

Contact	Cable connection to component...
1	⇒ Brake pressure solenoid -N247-
2	⇒ Earth point below battery on left
3	⇒ Front right wheel speed sensor -G45-
4	⇒ Front right wheel speed sensor -G45-
5	⇒ Control unit with display unit for radio and navigation (only with navigation system)
6	⇒ Rear right wheel speed sensor -G44-
7	⇒ Rear right wheel speed sensor -G44-
8	⇒ Coding bridge to contact 18
9	⇒ Lateral acceleration sensor -G200- (earth cable)
10	⇒ Brake pressure sensor 2 -G214-
11	⇒ Yaw rate sensor -G202 (earth cable)
12	⇒ Brake pressure sensor 1 -G201-
13	⇒ ESP brake recognition switch -F83-[1)]
14	⇒ Not assigned
15	⇒ Earth point below battery on left
16	⇒ Voltage supply of battery + (through S162)
17	⇒ Brake pressure solenoid -N247-
18	⇒ Coding bridge for contact 8
19	⇒ Databus line ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
20	⇒ Databus line ⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
21	⇒ Not assigned
22	⇒ ABS warning light -K47-

Contact	Cable connection to component...
23	⇒ Stop light switch -F-
24	⇒ ESP pushbutton -E256-/voltage supply relay for warning light -K155-
25	⇒ Lateral acceleration sensor -G200- (voltage cable)
26	⇒ Brake pressure sensor 2 -G214-
27	⇒ Yaw rate sensor -G202- (voltage cable)
28	⇒ Brake pressure sensor 1 -G201-
29	⇒ ESP brake recognition switch -F83-[1)]
30	⇒ Not assigned
31	⇒ Brake light suppression relay -J508-
32	⇒ ESP brake recognition switch - F83-[1)]
33	⇒ Left front wheel speed sensor -G47-
34	⇒ Left front wheel speed sensor -G47-
35	⇒ Control unit with display unit for radio and navigation (only with navigation system)
36	⇒ Rear left wheel speed sensor -G46-
37	⇒ Rear left wheel speed sensor -G46-
38	⇒ Not assigned
39	⇒ Plug connection T16a/7, K wire
40	⇒ Lateral acceleration sensor -G200- (signal cable)
41	⇒ Brake pressure sensor 2 -G214-
42	⇒ Yaw rate sensor -G202- (signal cable)
43	⇒ Brake pressure sensor 1 -G201-
44	⇒ Voltage supply terminal 15 through S 13
45	⇒ Not assigned
46	⇒ Earth point below battery on left
47	⇒ Voltage supply of battery + (through S163)

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

List of test steps

Component to be tested	
Voltage supply of ABS hydraulic pump -V64-	- Perform test step 1
Voltage supply of valves in hydraulic unit	- Perform test step 2
Voltage supply of control unit -J104	- Perform test step 3
Operation of brake light switch -F	- Perform test step 4
Brake light suppression relay -J508-	- Perform test step 5
Coding bridge	- Perform test step 6
Resistance of front right wheel speed sensor -G45	- Perform test step 7
Resistance of front left wheel speed sensor -G47	- Perform test step 8
Resistance of rear right wheel speed sensor -G44	- Perform test step 9
Resistance of rear left wheel speed sensor -G46	- Perform test step 10
Voltage signal of front right wheel speed sensor -G45	- Perform test step 11
Voltage signal of front left wheel speed sensor -G47	- Perform test step 12
Voltage signal of rear right wheel speed sensor -G44	- Perform test step 13
Voltage signal of rear left wheel speed sensor -G46	- Perform test step 14
Operation of ABS warning light -K47	- Perform test step 15
Operation of handbrake/brake fluid level warning light -K14/33	- Perform test step 16
Operation of ESP stability programme warning light -K155	- Perform test step 17
Operation of ESP pushbutton -E256	- Perform test step 18
Actuation of steering angle sender -G85	- Perform test step 19
Actuation of lateral acceleration sender -G200	- Perform test step 20
Actuation of yaw rate sender -G202	- Perform test step 21
Actuation of brake pressure sender -1- -G201	- Perform test step 22
Actuation of brake pressure sender -2- -G214	- Perform test step 23
Actuation of brake pressure solenoid -N247	- Perform test step 24
Actuation of brake recognition switch -F83 [1)]	- Perform test step 25
Test of databus cable	- Perform test step 26
Voltage supply of V.A.G 1551, plug connection T16a	- Perform test step 27
Resistance of K wire for self-diagnosis, plug connection T16a	- Perform test step 28

1) Brake recognition switch -F83- is identical with brake pressure solenoid release switch -F84-.

Test table

Notes on test table

- *The socket designations of test box V.A.G 1598 A with adapter V.A.G 1598/33 are identical to the contact designations of the control unit -J104- in the current flow diagram.*

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

- *If the measurements obtained differ from the specifications, carry out the measures indicated in the right-hand part of the table for rectifying the fault.*

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

- *Conduct continuity tests with adapter cable set V.A.G 1594 A (bridges).*
- *If the measurements obtained differ only slightly from the specifications, then clean the sockets and connectors of the testers and test cables (with contact spray G 000 700 04) and repeat the test. Before replacing the particular components, inspect the cables and connections and also repeat the resistance measurement at the component, particularly if the specifications are less than 10 Ω.*

Test steps 1 - 20

Test steps 21 - 28 ⇒ page 45-148

Switch on measuring range: Voltage measurement (20 V =)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
1	15 + 47	Voltage supply for hydraulic pump -V64- (terminal 30) at control unit -J104-	• Ignition switched off	10.0 - 14.5 V	- Test cable from contact T47a/47 through fuse S163 to battery +. - Test cable from contact T47a/15 to earth. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
2	46 + 16	Voltage supply for valves in hydraulic unit -N55- (terminal 30) at control unit -J104-	• Ignition switched off	10.0 - 14.5 V	- Test cable from contact T47a/16 through fuse S162 to battery +. - Test cable from contact T47a/46 to earth. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
3	44 + 46	Voltage supply (terminal 15) of control unit -J104-	• Ignition switched on	10.0 - 14.5 V	- Test cable from contact T47a/44 through fuse S13, and ignition/starter switch. - Test cable from contact T47a/46 to earth. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

Switch on measuring range:
Voltage measurement (20 V =) in test step 4, resistance measurement (200 Ω)/(20 MΩ) in test step 4a

Test step	V.A.G 1598 A Sockets	Test of	• Test conditions - Additional operations	Specification	Measures if readout differs from specification
4	23 + 46	Brake light switch -F-	• Ignition switched off • Brake pedal not operated	0.0 - 0.5 V	- Set brake light switch, if necessary ⇒ page 45-69. - Replace brake light switch ⇒ page 45-69.
			- Brake pedal operated	10.0 - 14.5 V	- Test contact 1 from brake light switch -F- to fuse S13.
4a		Brake light switch -F-	• Set measuring range 200 Ω - Unplug multipin connector T47a from control unit -J104. - Unplug multipin connector of brake light/ brake pedal switch. - Test cables for open circuit. - Test cable from contact 23 (control unit) to contact 1 (brake light switch).	max. 1.5 Ω	- Test cables for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Set measuring range 20 MΩ - Remove fuse S13. - Test cables for short circuit to positive or to earth.	∞ Ω	

Switch on measuring range: **Voltage** measurement (20 V =)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
5	23 + 46	Brake light suppression relay -J508-	• Ignition switched on • Brake pedal operated	10.0 - 14.5 V	- Replace brake light suppression relay -J508-.
	31 + 15		- Bridge sockets 31 and 15	0.0 - 0.5 V	- Test cables for open circuit and short circuit according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

Switch on measuring range: **Resistance** measurement (20 Ω)/(20MΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
6	8 + 18	Coding bridge	• Ignition switched off - Unplug multipin connector T47a - Connect test box V.A.G 1598/A with adapter V.A.G 1598/33 - Test cable for open circuit	max. 1.5 Ω	- Test cable from contact 8 to contact 18 for open circuit.

Switch on measuring range: Resistance measurement (2 kΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
7	3 + 4	Resistance of front right wheel speed sensor -G45-	• Ignition switched off	1.0...1.3 kΩ	- Separate plug connection at wheel speed sensor. - Test wiring according to CFD. - Move cables during test. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations If no fault is found in the wiring: - Replace wheel speed sensor -G45- ⇒ page 45-60.
8	33 + 34	Resistance of front left wheel speed sensor -G47-	• Ignition switched off	1.0...1.3 kΩ	- Separate plug connection at wheel speed sensor. - Test wiring according to CFD. - Move cables during test. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations If no fault is found in the wiring: - Replace wheel speed sensor -G47- ⇒ page 45-60.
9	7 + 6	Resistance of rear right wheel speed sensor -G44-	• Ignition switched off	1.0...1.3 kΩ	- Separate plug connection at wheel speed sensor. - Test wiring according to CFD. - Move cables during test. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations If no fault is found in the wiring: - Replace wheel speed sensor -G44- ⇒ page 45-65.

Switch on measuring range: Resistance measurement (2 kΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
10	37 + 36	Resistance of rear left wheel speed sensor -G46-	• Ignition switched off	1.0...1.3 kΩ	- Separate plug connection at wheel speed sensor. - Test wiring according to CFD. - Move cables during test. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations If no fault is found in the wiring: - Replace wheel speed sensor -G46- ⇒ page 45-65.

Switch on measuring range: Voltage measurement (2 V ~)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
11	3 + 4	Voltage signal of front right wheel speed sensor -G45-	• Vehicle raised • Ignition switched off - Rotate front right wheel at approx. 1 rev/sec.	min. 65 mV alternating voltage	- Check installation of wheel speed sensor and of pulse rotor. - Check correct connection of wheel speed sensor -G45- and read measured value block ⇒ page 45-116, display group number 001.
12	33 + 34	Voltage signal of front left wheel speed sensor -G47-	• Vehicle raised • Ignition switched off - Rotate front left wheel at approx. 1 rev/sec.	min. 65 mV alternating voltage	- Check installation of wheel speed sensor and of pulse rotor. - Check correct connection of wheel speed sensor -G47- and read measured value block ⇒ page 45-116, display group number 001.
13	7 + 6	Voltage signal of rear right wheel speed sensor -G44-	• Vehicle raised • Ignition switched off - Rotate rear right wheel at approx. 1 rev/sec.	min. 190 mV alternating voltage	- Check installation of wheel speed sensor and of pulse rotor. - Check correct connection of wheel speed sensor -G44- and read measured value block ⇒ page 45-116, display group number 001.

Switch on measuring range: Voltage measurement (20 V ≈)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
14	36 + 37	Voltage signal of rear left wheel speed sensor -G46-	• Vehicle raised • Ignition switched off - Rotate rear left wheel at approx. 1 rev/sec.	min. 190 mV alternating voltage	- Check installation of wheel speed sensor and of pulse rotor. - Check correct connection of wheel speed sensor -G46- and read measured value block ⇒ page 45-116, display group number 001.

Operational test: ABS warning light -K47-					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
15	-	Operation of ABS warning light -K47	• Fault memory was interrogated and no fault stored in fault memory of control unit -J104. • Ignition switched off • Multipin connector plugged in at control unit -J104 and locked. - Switch ignition on	Warning light -K47- comes on for 2 s and goes out again.	If ABS warning light does not come on: - Test cable from contact T47a/22 (control unit) to contact T32a/19 (dash panel insert) for short circuit to earth. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Test dash panel insert, fault in dash panel insert. ⇒ Electrical System; Repair Group 90; Dash Panel Insert

Operational test: Handbrake/brake fluid level warning light -K14/33-					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
16	-	Operation of hand-brake/brake fluid level warning light -K14/33-	• Brake fluid at correct level • Ignition switched off • Multipin connector plugged in at control unit -J104 and locked. - Switch ignition on.	Warning light -K14/33- comes on for 2 s and goes out again.	- Test brake fluid level warning contact -F34- in cap of brake fluid reservoir. - Test cable from contact T32a/29 (dash panel insert) to brake fluid warning contact for short to earth. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Test dash panel insert, fault in dash panel insert. ⇒ Electrical System; Repair Group 90; Dash Panel Insert

Operational test: Electronic stability programme warning light -K155-					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
17	-	Operation of ESP warning light -K155-	• Ignition switched off • Multipin connector plugged into control unit -J104 and locked. - Switch ignition on.	Warning light -K155- comes on for 2 s and goes out again.	- Test cable from contact T47a/22 (control unit) through voltage supply relay -J535- to contact T32b/14 (dash panel insert) for open circuit and short to positive. If warning light -K155- comes on and remains on: - Test cable from contact T47a/22 (control unit) through voltage supply relay -J535- to contact T32b/14 (dash panel insert) for short to earth. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Test dash panel insert, fault in dash panel insert. - Test ESP button -E256-. ⇒ Electrical System; Repair Group 90; Dash Panel Insert - Test voltage supply relay for warning light -K155-. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

Operational test: Warning light for ESP pushbutton -E256- in test step 18; voltage supply (20 V=) in test step 18a

Test step	V.A.G 1598 A Sockets	Test of	• Test conditions - Additional operations	Specification	Measures if readout differs from specification
18	-	Operation of ESP pushbutton -E256-	• Ignition switched off • Operation of ESP stability programme warning light -K155- was tested in test step 17. • Multipin connector is plugged in at control unit -J104- and locked. - Switch ignition on.	Warning light -K155- comes on for 2 s and goes out again	
			- Operate ESP pushbutton.	Warning light -K155- comes on	- Perform test step 18a
			- Operate ESP pushbutton once again.	Warning light -K155- goes out	
18a	15 + 24	Operation of ESP pushbutton -E256-	- Switch ignition off. - Unplug multipin connector from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/33. - Switch ignition on.		- Test cable from contact T47a/15 (control unit) to earth. - Test cable from contact T47a/24 (control unit) to contact T4f/2 (ESP pushbutton) for open circuit and short circuit to positive or to earth.
			- Pushbutton of -E256- not pressed and warning light -K155- comes on.	3.5 - 5.0 V	- Test cable from contact T47a/24 (control unit) to contact T32b/14 (dash panel) for open circuit and for short circuit to positive or to earth.
			- Hold pushbutton of -E256- pressed and warning light -K155- comes on.	8.0 - 14.5 V	- Test voltage supply of contact T4f/1 (ESP pushbutton) through fuse S13 for open circuit. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Replace ESP pushbutton. ⇒ Body Fitting Work; Repair Group 70; Dash Panel

Switch on measuring range:
Voltage measurement (20 V =) in test step 19, resistance measurement (200 Ω/20 MΩ) in test step 19a

Test step	V.A.G 1598 A Sockets	Test of	• Test conditions - Additional operations	Specification	Measures if readout differs from specification
19	-	Earth and voltage supply of steering angle sensor -G85	• Ignition switched off - Unplug multipin connector T47a from control unit -J104-. - Separate plug connection of steering angle sensor. - Test voltage supply of steering angle sensor at plug connection T6w. - Test cable between contact T6w/4 and contact T6w/1.	10.0 - 14.5 V	- Test cable from contact T6w/4 (steering angle sensor) to fuse S15 for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Ignition switched on - Test cable between contact T6w/5 and contact T6w/1.	10.0 - 14.5 V	- Test cable from contact T6w/5 (steering angle sensor) to fuse S13 for open circuit. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
19a	-	Cables of steering angle sensor -G85	• Measuring range 200 Ω set - Connect test box V.A.G 1598 A with adapter V.A.G 1598/33. - Test the following cables for open circuit: - Cable from contact T6w/3 (steering angle sensor) to contact T47a/19 (control unit). - Cable from contact T6w/2 (steering angle sensor) to contact T47a/20 (control unit). - Cable from contact T6w/1 to earth.	max. 1.5 Ω	- Test cables for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Measuring range 20 MΩ set - Remove fuse S13. - Test cables for short circuit to positive or to earth.	∞ Ω	

Switch on measuring range: **Resistance measurement (200 Ω/20 MΩ)**					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
20	-	Cables of lateral acceleration sensor -G200	• Ignition switched off • Measuring range 200 Ω set - Remove fuse S13. - Unplug multipin connector T47a from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/33. - Separate plug connection T3n of lateral acceleration sensor.		
			- Test cables for open circuit: - Cable from contact T3n/1 (lateral acceleration sensor) to contact T47a/40 (control unit).	max. 1.5 Ω	- Test cables for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			- Cable from contact T3n/2 (lateral acceleration sensor) to contact T47a/9 (control unit).		
			- Cable from contact T3n/3 (lateral acceleration sensor) to contact T47a/25 (control unit).	max. 1.5 Ω	
			• Measuring range 20 MΩ set - Remove fuse S13. - Test cables for short circuit to positive or to earth.	∞ Ω	

Test steps 21 - 28

Switch on measuring range: Resistance measurement (200 Ω/20 MΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
21	-	Cables of yaw rate sensor -G202-	• Ignition switched off • Measuring range 200 Ω set - Unplug multipin connector T47a from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/33. - Separate plug connection T3m from yaw rate sensor -G202-. - Test cables for open circuit: - Cable from contact T3m/1 (yaw rate sensor) to contact T47a/42 (control unit). - Cable from contact T3m/2 (yaw rate sensor) to contact T47a/11 (control unit). - Cable from contact T3m/3 (yaw rate sensor) to contact T47a/27 (control unit).	max. 1.5 Ω	- Test cables for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Measuring range 20 MΩ set - Remove fuse S13. - Test cables for short circuit to positive or to earth.	∞ Ω	

Switch on measuring range: Resistance measurement (200 Ω/20 MΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
22	-	Cables of brake pressure sensor -1- -G201	• Ignition switched off • Measuring range 200 Ω set - Unplug multipin connector T47a from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/33. - Separate plug connection T30 from brake pressure sensor -1- -G201. - Test cables for open circuit: - Cable from contact T30/1 (brake pressure sensor) through plug connection T14c/1 to contact T47a/28 (control unit). - Cable from contact T30/2 (brake pressure sensor) through plug connection T14c/2 to contact T47a/12 (control unit). - Cable from contact T30/3 (brake pressure sensor) through plug connection T14c/3 to contact T47a/43 (control unit).	max. 1.5 Ω	- Test cables for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Measuring range 20 MΩ set - Remove fuse S13. - Test cables for short circuit to positive or to earth.	∞ Ω	

Switch on measuring range: Resistance measurement (200 Ω/20 MΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
23	-	Cables of brake pressure sensor -2- -G214	• Ignition switched off • Measuring range 200 Ω set - Unplug multipin connector T47a from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/33. - Separate plug connection T3p from brake pressure sensor -2- -G201. - Test cables for open circuit: - Cable from contact T3p/1 (brake pressure sensor -2-) through plug connection T14c/12 to contact T47a/26 (control unit). - Cable from contact T3p/2 (brake pressure sensor -2-) through plug connection T14c/13 to contact T47a/10 (control unit). - Cable from contact T3p/3 (brake pressure sensor -2-) through plug connection T14c/14 to contact T47a/41 (control unit).	max. 1.5 Ω	- Test cables for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Measuring range 20 MΩ set - Remove fuse S13. - Test cables for short circuit to positive or to earth.	∞ Ω	

Switch on measuring range: **Resistance measurement (200 Ω/20 MΩ)**					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
24	-	Cables of brake pressure solenoid in brake servo unit -N247-	• Ignition switched off • Measuring range 200 Ω set - Unplug multipin connector T47a from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/33. - Separate plug connection T6x at brake servo unit. - Test cables for open circuit: - Cable from contact T6x/4 (brake pressure solenoid -N247-) through plug connection T14c/7 to contact T47a/17 (control unit). - Cable from contact T6x/3 (brake pressure solenoid -N247-) through plug connection T14c/8 to contact T47a/1 (control unit -J104-).	max. 1.5 Ω	- Test cables for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Measuring range 20 MΩ set - Remove fuse S13. - Test cables for short circuit to positive or to earth.	∞ Ω	
			• Measuring range 200 Ω set - Separate multipin connector T14c. - Test contacts -7- and -8- in plug connection T14c to brake pressure solenoid -N247-.	1.0...2.0 kΩ	- If specification is not achieved, replace brake servo unit ⇒ page 47-32.

Switch on measuring range: **Resistance measurement (200 Ω/20 MΩ)**					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
25	-	Cables of ESP brake recognition switch -F83-	• Ignition switched off • Measuring range 200 Ω set - Unplug multipin connector T47a from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/33. - Separate plug connection T6x at brake servo unit. - Test cables for open circuit: - Cable from contact T6x/1 (brake recognition switch -F83-) through plug connection T14c/5 to contact T47a/13 (control unit -J104-). - Cable from contact T6x/2 (brake recognition switch -F83-) through plug connection T14c/6 to contact T47a/29 (control unit -J104-). - Cable from contact T6x/5 (brake recognition switch -F83-) through plug connection T14c/9 to contact T47a/32 (control unit -J104-).	max. 1.5 Ω	- Test cables for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Measuring range 20 MΩ set - Remove fuse S13. - Test cables for short circuit to positive or to earth.	∞ Ω	

Switch on measuring range: **Resistance measurement (200 Ω/20 MΩ)**					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
26	19 + 20	Databus lines	• Ignition switched off • Measuring range 200 Ω set - Separate multipin connectors from the control units connected to databus (connection in dash panel wiring loom -A122- and -A121-). - Connect test box V.A.G 1598 A with adapter V.A.G 1598/33. - Test cables for open circuit: - to steering angle sensor - to engine control unit - to automatic gearbox control unit[1]. - Cable from contact T47a/19 (control unit) through connection A121 to contact T6w/3 (steering angle sensor -G85-). - On through connection A121 to the connected control units. - Cable from contact T47a/20 (control unit) through connection A122 to contact T6w/2 (steering angle sensor -G85-). - On through connection A122 to the connected control units.	max. 1.5 Ω	- Test cables for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Measuring range 20 MΩ set - Remove fuse S13. - Test cables for short circuit to positive or to earth.	∞ Ω	

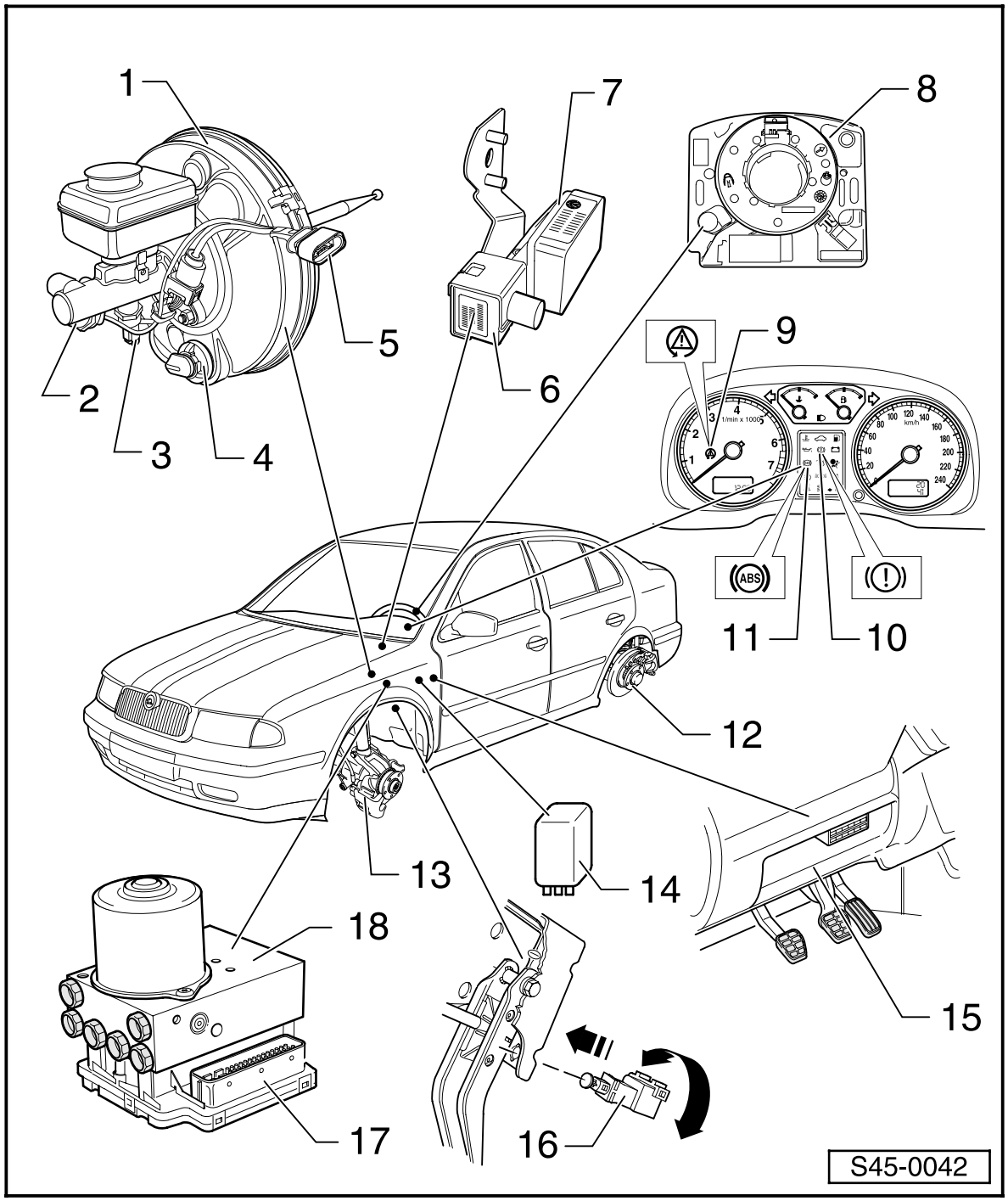
[1] Only on vehicles fitted with automatic gearbox.

Switch on measuring range: Voltage measurement (20 V =)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
27	-	Voltage supply of vehicle system tester V.A.G 1552, plug connection T16a	• Ignition switched off - Connect hand-held multimeter, e.g. V.A.G 1526 A with adapter cable set V.A.G 1594 A to T16a[1]: - Test cable between contact T16a/4 and contact T16a/1	10.0 - 14.5 V	- Test cable from T16a/4 to earth. - Test cable from T16a/1 through fuse S5. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

[1] Contact assignment of plug connection for voltage supply and self-diagnosis with vehicle system tester V.A.G 1552 ⇒ page 45-134.

Switch on measuring range: Resistance measurement (200 Ω)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
28	-	Resistance of K wire for self-diagnosis, plug connection T16a	• Ignition switched off • Measuring range 200 Ω set - Remove fuse S13. - Separate multipin connector T47a from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/33. - Test cable between contact T16a/7 and contact T47a/39.	max. 1.5 Ω	- Test cable from T16a/7 to contact T47a/39. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Measuring range 20 MΩ set - Remove fuse S13. - Test cables for short circuit to positive or to earth.	∞ Ω	- Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

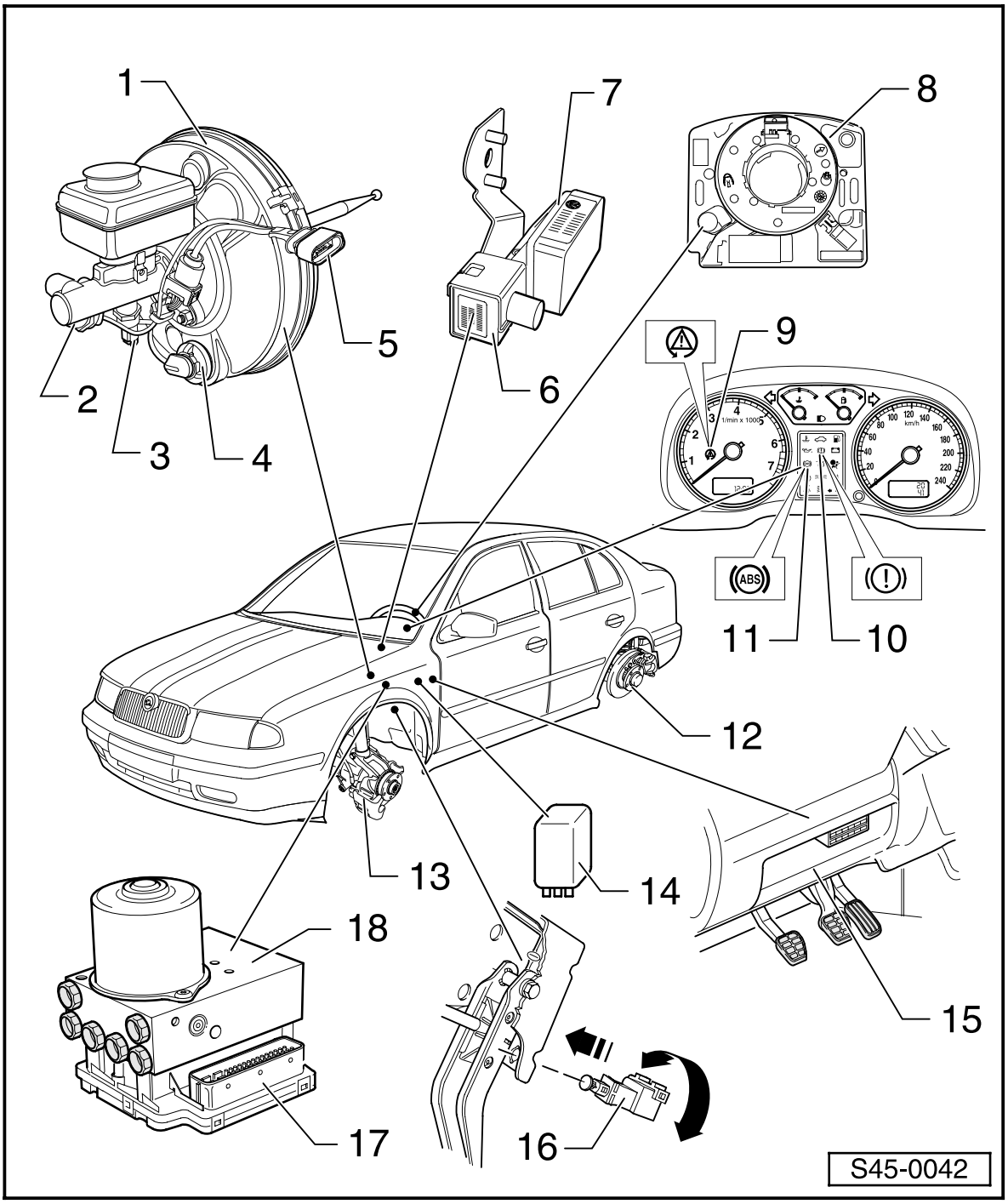
Electrical/electronic components and fitting locations ABS/EDL/ESP Mark 20



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

The brake servo unit includes the following components:

- release switch for brake pressure solenoid -F84-. This switch is identical with the ESP brake recognition switch -F83-.
- ESP brake recognition switch -F83- is tested by self-diagnosis
- brake pressure solenoid in brake servo unit -N247-
- brake pressure solenoid in brake servo unit -N247- is tested by self-diagnosis



2 - Brake pressure sensor -1- -G201-

- Is tested by self-diagnosis
- Brake pressure sensor -1- and brake pressure sensor -2- are identical components
- Brake pressure sensor -1- can also be fitted at the same location as brake pressure sensor -2-, item 3
- Removing and installing ⇒ page 47-28

3 - Brake pressure sensor -2- -G214-

- Is tested by self-diagnosis
- Brake pressure sensor -2- and brake pressure sensor -1- are identical components
- Brake pressure sensor -2- can also be fitted at the same location as brake pressure sensor -1-, item 2
- Removing and installing ⇒ page 47-28

4 - Cable opening

- ESP brake recognition switch -F83-
- Brake pressure solenoid -N247-

5 - Plug connection T14c
- ♦ Brake recognition switch -F83-
- ♦ Brake pressure solenoid in brake servo unit -N247-
- ♦ Sender -1- for brake pressure -G201-
- ♦ Sender -2- for brake pressure -G214-

6 - Lateral acceleration sender -G200-
- ♦ Fitting location: next to steering column below dash panel
- ♦ Is tested by self-diagnosis

7 - Yaw rate sender -G202-
- ♦ Fitting location: next to steering column below dash panel
- ♦ Is tested by self-diagnosis

8 - Steering angle sender -G85-
- ♦ Fitting location: on steering column between steering wheel and steering column switch
- ♦ Is tested by self-diagnosis

9 - Electronic stability programme warning light -K155-
- ♦ Fitting location: in dash panel insert
- ♦ Operation ⇒ page 45-92

10 - Handbrake/brake fluid level warning light -K14/33-
- ♦ Fitting location: in dash panel insert
- ♦ Operation ⇒ page 45-92

11 - ABS warning light
- ♦ Fitting location: in dash panel insert
- ♦ Operation ⇒ page 45-92

12 - Parts of ABS system at rear suspension

(Fig. shows only disc brakes)
- ♦ Rear right and left wheel speed sensors -G44/G46-
- ♦ Is tested by self-diagnosis
- - Removing and installing ⇒ page 45-65
- - Installing wheel speed sensor cables ⇒ page 45-67
- ♦ Pulse rotor for rear right and left wheel speed sensors
- - Testing ⇒ page 45-66
- - Removing and installing: pulse rotor is replaced together with wheel hub ⇒ page 42-23 and 42-28.

13 - Parts of ABS system at front suspension
- ♦ Front right and left wheel speed sensors -G45/G47 [1)]
- - Removing and installing ⇒ page 45-60
- - Installing wheel speed sensor cables ⇒ page 45-62
- ♦ Pulse rotor for front right and left wheel speed sensors
- - Testing ⇒ page 45-61
- - Removing and installing: pulse rotor is replaced together with wheel hub ⇒ page 40-13.

14 - Voltage relay for warning light K155 -J535-
- ♦ Fitting location: additional relay holder, position 7

15 - Diagnostic connection
- ♦ Fitting location: in storage compartment driver side

16 - Brake light switch -F-
- ♦ Open in off position
- - Setting ⇒ page 45-69
- - Remove by turning 90° to the left ⇒ page 45-69
- - Install by turning 90° to the right ⇒ page 45-69
- ♦ Must be tested in measured value block ⇒ page 45-116

17 - ABS/EDL/ESP control unit -J104-
- ♦ Fitting location: at hydraulic unit in left of engine compartment
- ♦ Is tested by self-diagnosis
- ♦ Test of multipin connection to control unit ⇒ page 45-134
- ♦ Do not unplug multipin plug connection before completing self-diagnosis. Switch ignition off before separating plug connection.

18 - Hydraulic control unit for ABS/EDL/ESP -N55-
- ♦ Fitting location: in left of engine compartment
- ♦ Hydraulic unit -N55- consists of hydraulic pump -V64- and valve block with inlet and outlet valves
- ♦ Is tested by self-diagnosis
- ♦ If hydraulic unit is replaced, it is essential to seal old part with plugs from installation parts kit; Part No. ⇒ Parts List
- ♦ Removing and installing hydraulic control unit (hydraulic unit -N55- with control unit -J104-) ⇒ page 45-158
- ♦ Hydraulic pump -V64- and valve block must not be separated
- ♦ Servicing hydraulic control unit ⇒ page 45-163

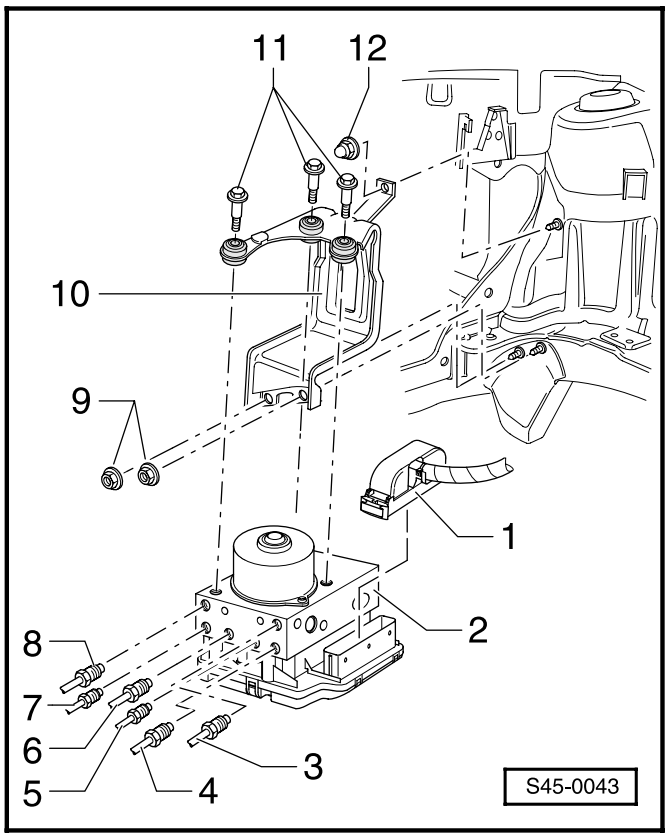
Removing and installing ABS/EDL/ ESP hydraulic control unit and bracket

Note:

As a general rule, always ensure that no brake fluid gets into the connector housing of the control unit.
This can result in corrosion to the contacts and thus in a failure of the system.
If the plug housing is soiled, it should be carefully cleaned with compressed air.

Special tools, testers and aids required

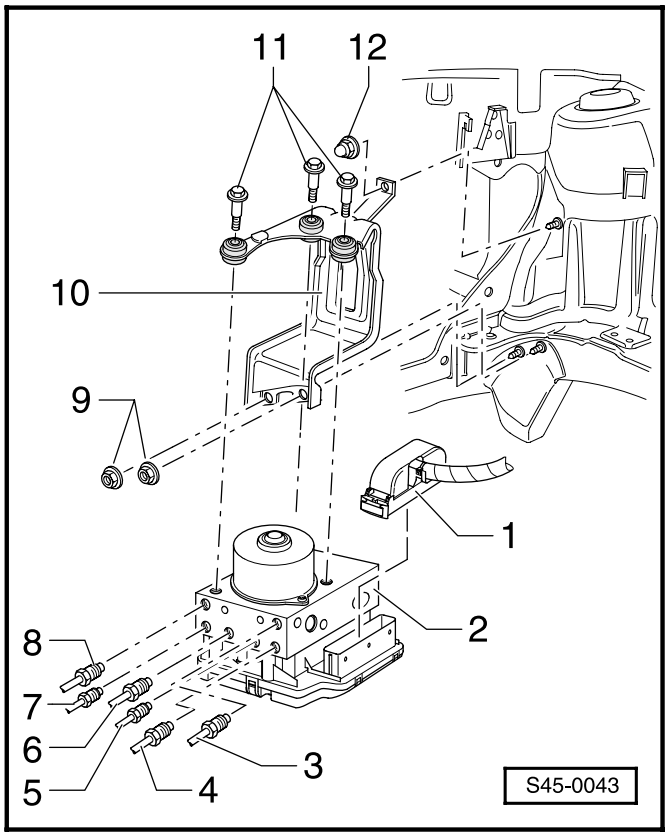
- Vehicle system tester V.A.G 1552
- Diagnostic cable V.A.G 1551/3 or V.A.G 1551/3A
- Brake pedal depresser, e.g. V.A.G 1238/B or V.A.G 1869/2
- Installation parts kit, Part No. ⇒ Parts List
  Installation parts kit consists of plugs and protective cap
- Brake filling and bleeding appliance, e.g. ROMESS S15
- Bleeder bottle (commercially available)
- Brake fluid ⇒ page 00-8



1 - Multipin connector of control unit
- 47-pin
- Do not separate plug connection before self-diagnosis is completed. Switch off ignition before separating the plug connection.

2 - Hydraulic control unit
- The hydraulic pump -V64-, the hydraulic unit -N55- and the control unit -J104- together form the hydraulic control unit.
- The hydraulic control unit should be removed and installed as a complete unit ⇒ page 45-159.
- Servicing ⇒ page 45-163

3 - Brake line, 14 Nm
- Between brake master cylinder/floating piston circuit and hydraulic unit



4 - Brake line, 14 Nm
- Hydraulic unit to front left brake caliper

5 - Brake line, 14 Nm
- Hydraulic unit to rear right wheel cylinder/brake caliper

6 - Brake line, 14 Nm
- Hydraulic unit to rear left wheel cylinder/brake caliper

7 - Brake line, 14 Nm
- Hydraulic unit to front right brake caliper

8 - Brake line, 14 Nm
- Between brake master cylinder/push-rod piston circuit and hydraulic unit

9 - Hexagon nut, self-locking, 20 Nm

10 - Bracket

11 - Fit bolt, 8 Nm

12 - Cap nut, 25 Nm

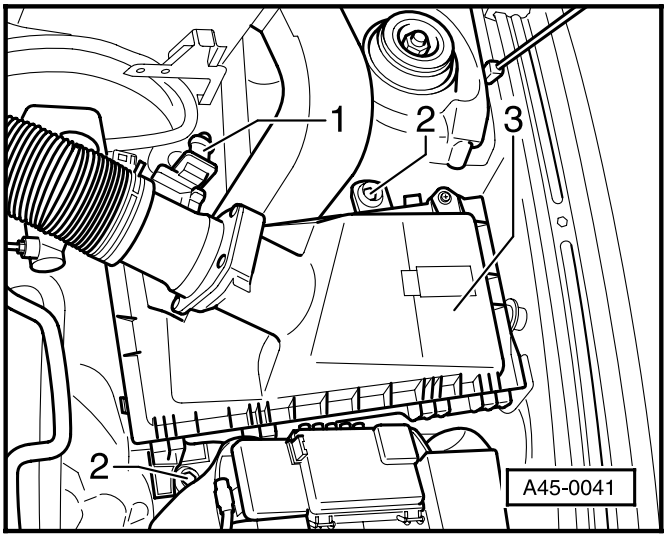
Removing hydraulic control unit

Notes:

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

⇒ Inspection and Maintenance

- Disconnect battery.



Note:

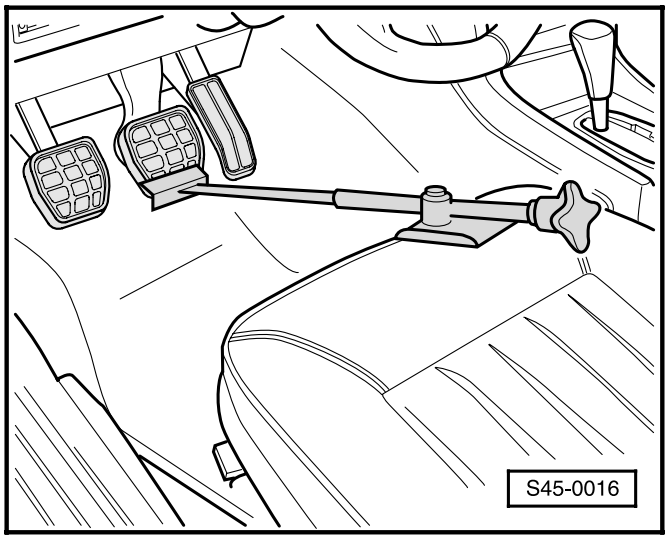
The following 2 steps do not apply to the 1.6-ltr./55 kW engine:

◄- Unplug the connector -1- of the air mass meter at the air guide pipe of the air filter.

- Take out the bolts -2- at the air filter -3- and place filter to the side.

- On diesel engines, remove relay carrier above brake servo unit.

- Extract as much brake fluid as possible from the brake fluid reservoir with a bleeder bottle.

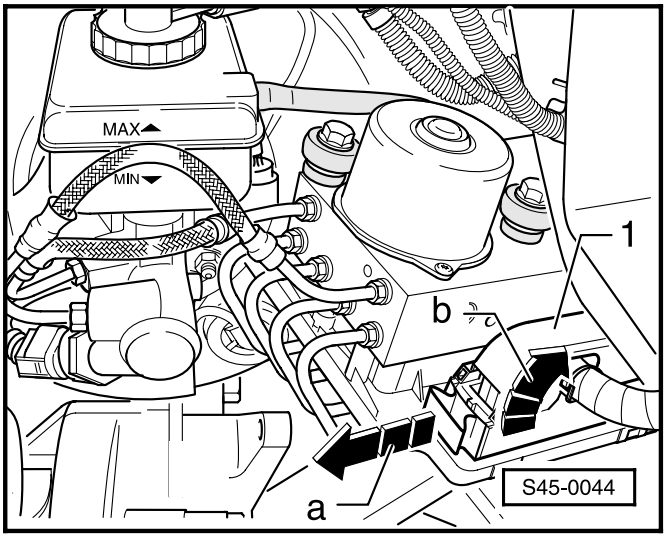


◄- Depress brake pedal and lock in position with brake pedal depresser, e.g. V.A.G 1238/B or V.A.G 1869/2.

- Fit the bleeder hose of the bleeder bottle onto the bleeder screw of the front left brake caliper and open bleeder screw.

- After brake fluid has flowed out, close bleeder screw.

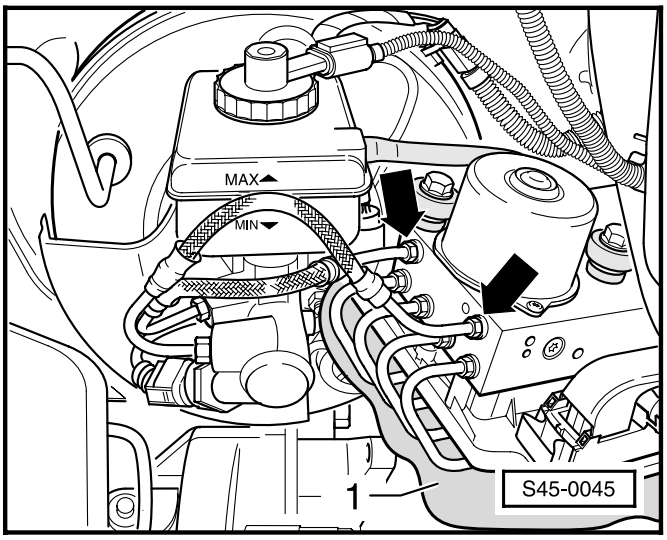
- Detach bleeder hose from the bleeder screw.



◄- Unlock multipin connector -1- -arrow a- and unplug from control unit -arrow b-.

Note:

Ensure that no brake fluid gets onto the contacts.

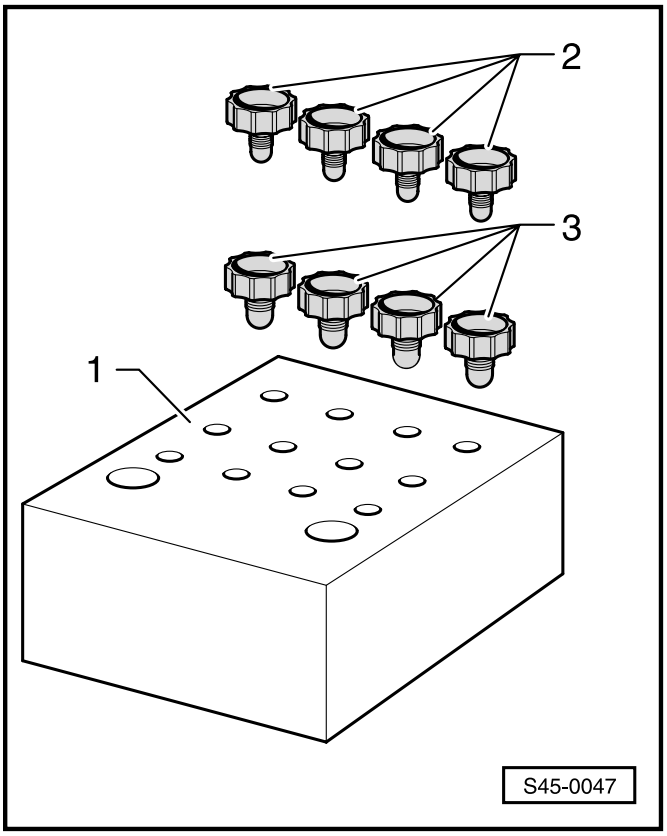


◄- Place an absorbent mat below the hydraulic control unit -1- in order to absorb the brake fluid.

Note:

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

- Detach the brake lines from the brake master cylinder to hydraulic unit, see arrows, and fit on plugs from installation parts kit to protect them from dirt.



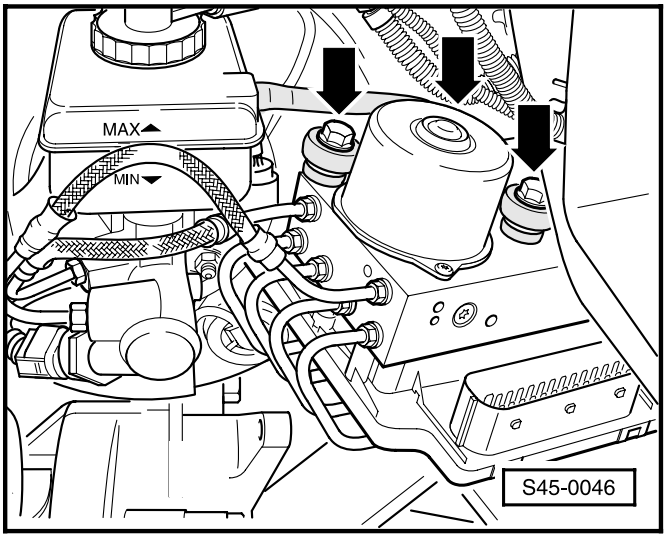
- On models with left-hand steering, tie up the detached brake lines with a welding wire as high up as possible so that the ends of the lines project above the fluid level in the brake fluid reservoir -arrows-.

- Detach the remaining brake lines from the hydraulic unit.

◄- Seal the connections of the hydraulic lines at the hydraulic unit with the from the installation parts kit.

-Item 1- Protective cap for valve domes (foam)

Plugs -item 2- and 3- as well as protective cap -item 1- are included with the „Installation parts kit".
Part No. for „Installation parts kit" ⇒ Parts List



◄- Remove bolts -arrows- at the bracket of the hydraulic control unit.

Note:

Third bolt attaching hydraulic control unit is concealed by hydraulic pump -V64-.

- Take out hydraulic control unit.

Installing hydraulic control unit

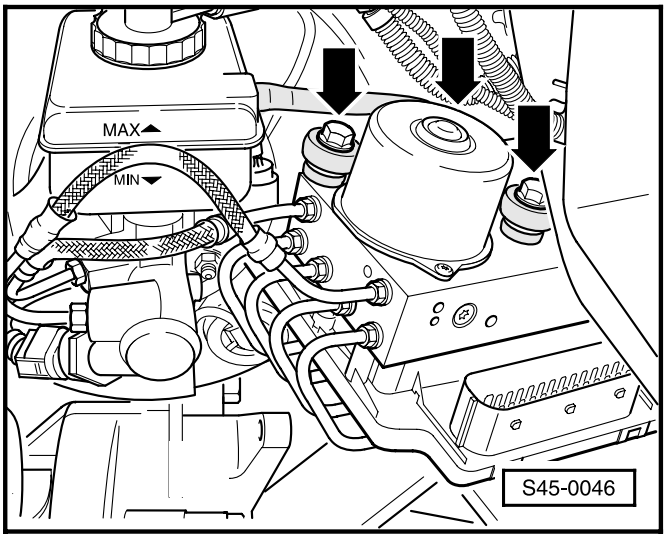
Notes:

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

- Bolt hydraulic control unit onto bracket.

Note:

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



- Attach brake lines to the hydraulic unit and tighten fully ⇒ page 45-158.

◄ - Bolt hydraulic control unit tight -arrows-.

Note:

Third bolt attaching hydraulic control unit is concealed by hydraulic pump -V64-.

- Plug multipin connector into the control unit and lock.

The remaining installation is carried out in the reverse order.

- Connect battery ⇒ page 45-159.
- Code control unit ⇒ page 45-114.
- Bleed brake system ⇒ page 47-18.

If the control unit -J104- was replaced when carrying out repairs to the hydraulic control unit, it is then necessary to perform a zeroing for the following components:

- Steering angle sensor -G85-
- Lateral acceleration sensor -G200-
- Brake pressure sensor -1- -G201-
- Brake pressure sensor -2- -G214-

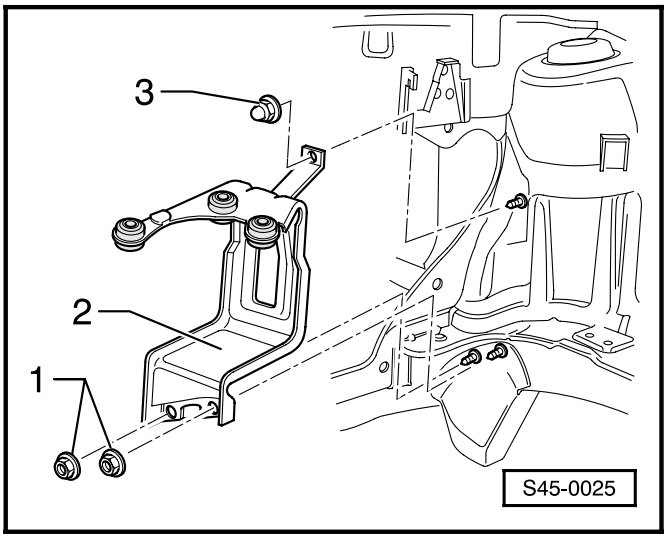
- Initiate basic setting and carry out zeroing ⇒ page 45-124.

- Interrogate fault memory ⇒ page 45-101.
- Erase fault memory ⇒ page 45-113.

Removing and installing bracket

Removing

- Remove hydraulic control unit ⇒ page 45-159.



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

- Take off bracket -2-.

Installing

Installation is carried out in the reverse order.

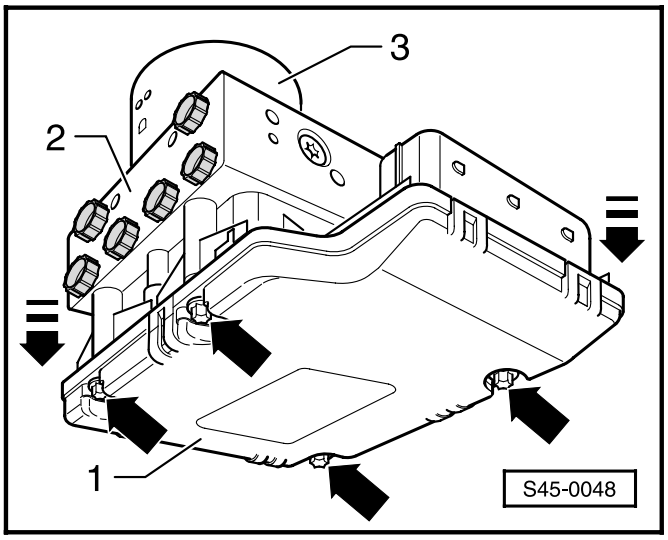
Tightening torques:

Hexagon nuts to body **Always fit new nuts!**	20 Nm
Cap nut to body	25 Nm

Servicing ABS/EDL/ESP hydraulic control unit

Special tools, testers and aids required

♦ Installation parts kit, Part No. ⇒ Parts List
Installation parts kit consists of plugs and protective cap

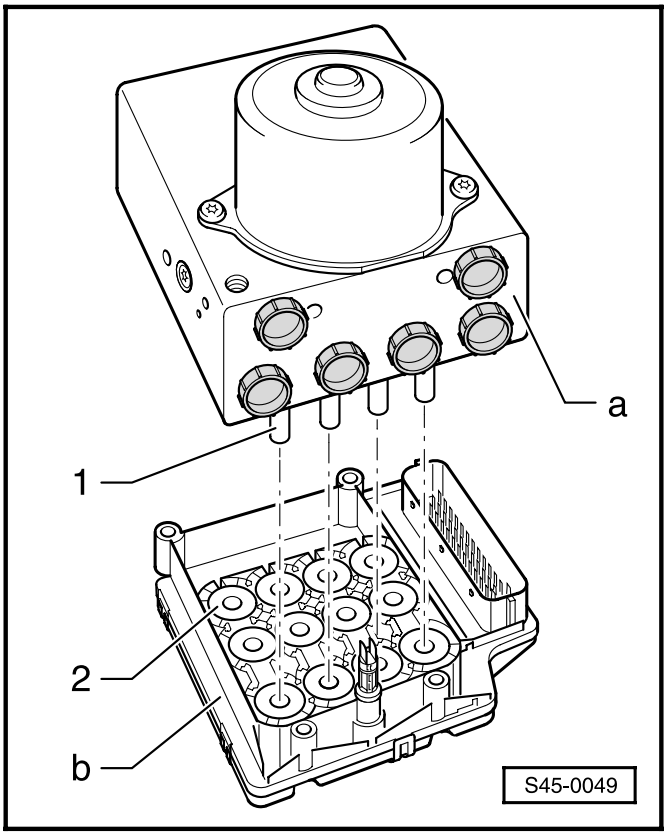


Disassembling hydraulic control unit

◄ The hydraulic control unit is serviced by separating the control unit (J104) -1- from the hydraulic unit (N55) -2-, which is connected to the hydraulic pump (V64) -3-.

It is only possible to replace the control unit (J104) -1- or the hydraulic unit (N55) -2- with hydraulic pump (V64) -3-.
Hydraulic unit and hydraulic pump must not be separated and therefore cannot be replaced separately.

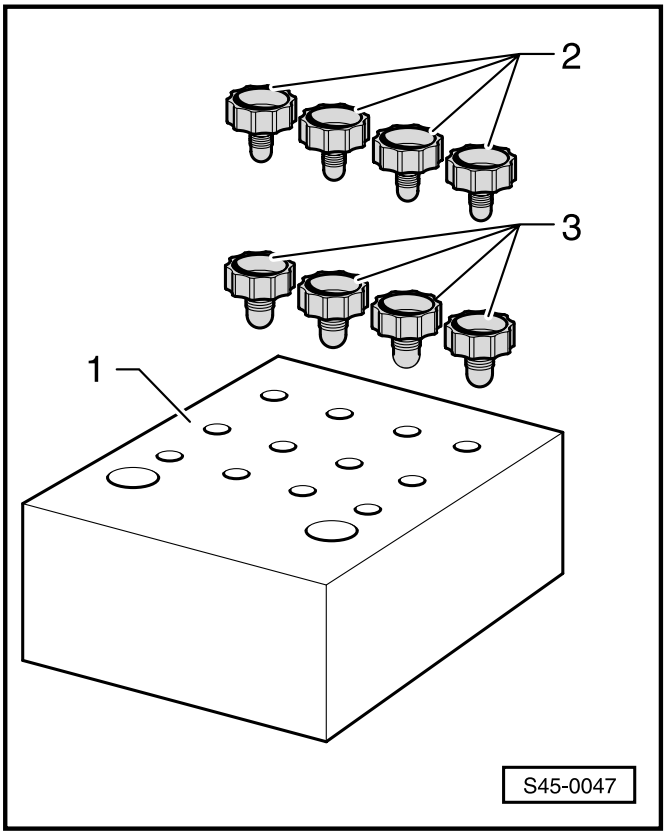
- Unscrew bolts from control unit -arrows- and pull control unit off the hydraulic unit.



Note:

◄ *When pulling off the control unit -b-, ensure that the valve domes of the hydraulic unit -a- are not twisted with the solenoids of the control unit.*

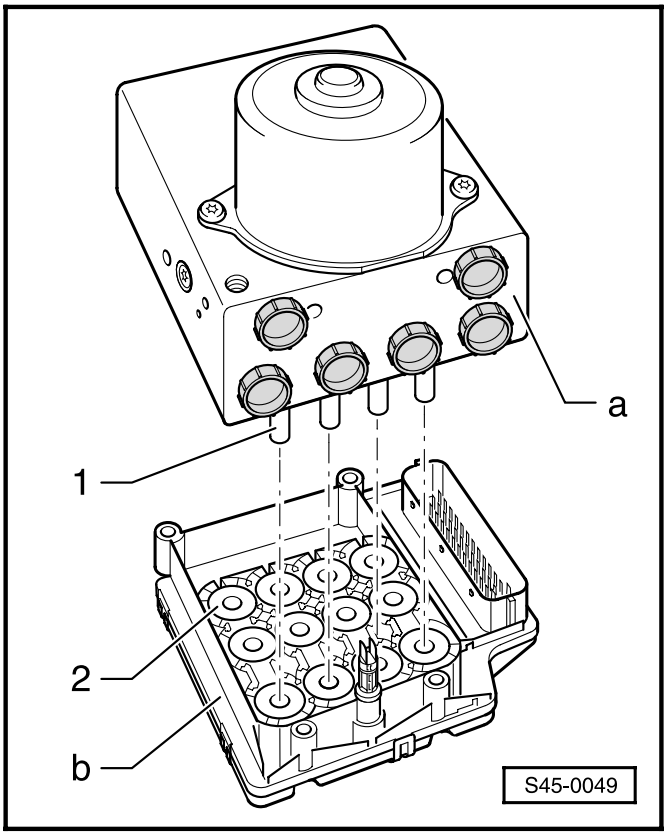
- Cover over solenoids of control unit with non-fluffing cloths.



◄ - After separating the hydraulic unit from the control unit, fit protective cap -1- onto the valve domes of the hydraulic unit.

Notes:

- *Protective cap -1- and plugs -2 and 3- are included in the „Installation parts kit“.*
- *It is also possible to use the same parts from the new hydraulic units fitted in place of the plugs and protective cap supplied with the „Installation parts kit“.*



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

- *Hydraulic unit: The valve block contains the control valves.*
- *Hydraulic pump -V64- and hydraulic unit -N55- must not be separated from each other.*
- *If the hydraulic unit is replaced, fit the protective cap for valve domes (⇒ page 45-164, Fig. S45-0047, item 1) onto the old part and seal the old part with the plugs (⇒ Fig. S45-0047, items 2 and 3). This is a condition for any warranty claims.*

1 - Valve domes of hydraulic unit

2 - Solenoids of control unit

ABS control unit (J104) -b-:

If the control unit -J104- was replaced when carrying out repairs to the hydraulic control unit, it is then necessary to perform a zeroing for the following components:

- Steering angle sensor -G85-
- Lateral acceleration sensor -G200-
- Brake pressure sensor -1- -G201-
- Brake pressure sensor -2- -G214-

- Initiate basic setting and carry out zeroing ⇒ page 45-124.

⇒ page 45-134, Contact assignment

⇒ page 45-133, Test requirements

Assembling hydraulic control unit

Notes:

- *It is essential that the area of the control unit-valve block is clean.*
- *When assembling control unit and hydraulic unit, ensure that the valve domes of the hydraulic unit are not tilted with the solenoids of the control unit.*

- Attach control unit to the hydraulic unit. Max. tightening torque 4 Nm (always use the bolts supplied).

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

Special tools, testers and aids required

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

Removing and installing wheel speed sensors

⇒ page 45-60

Testing pulse rotor/removing and installing

⇒ page 45-61

Inspecting lateral runout of pulse rotor

⇒ page 45-61

Removing and installing front wheel speed sensor cables

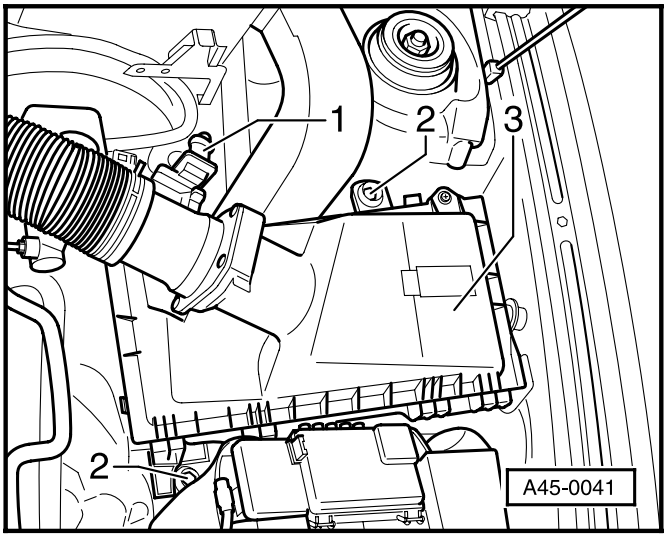
Notes:

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

⇒ Inspection and Maintenance

Removing

- Disconnect battery.

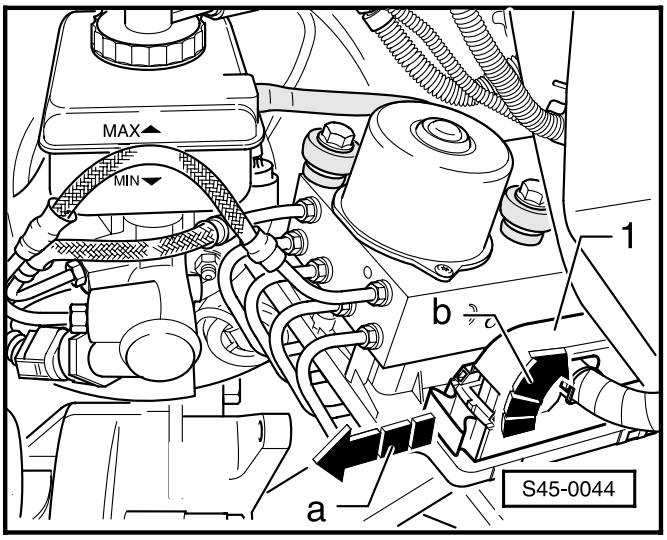


Note:

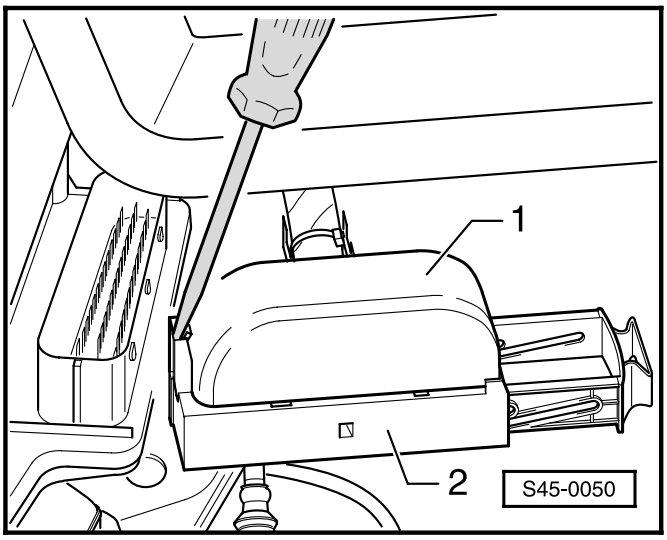
The following 2 steps do not apply to the 1.6-ltr./55 kW engine:

◄- Unplug connector of the air mass meter -1- from the air guide pipe of the air filter.

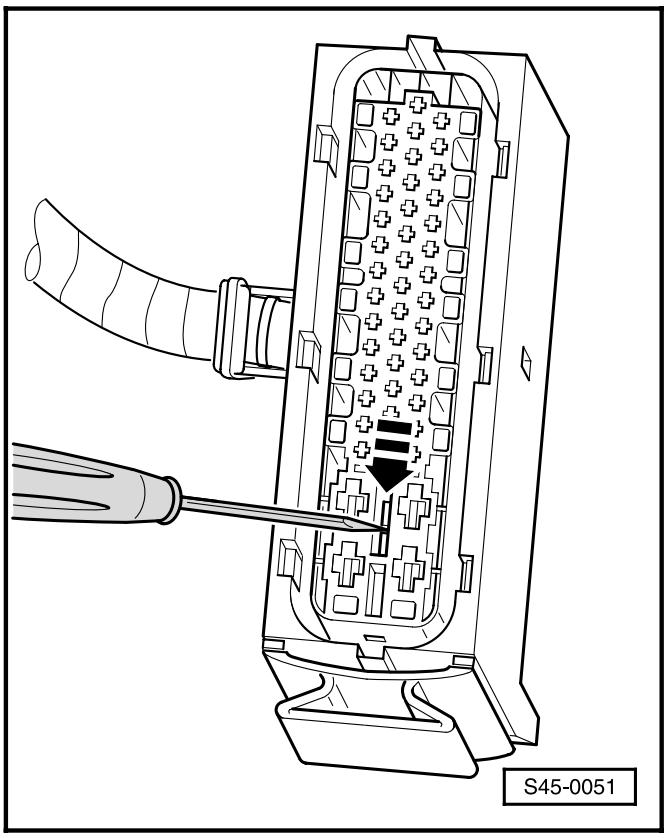
- Remove screws -2- at the air filter -3- and place filter to the side.
- On diesel engines, remove relay carrier above brake servo unit.



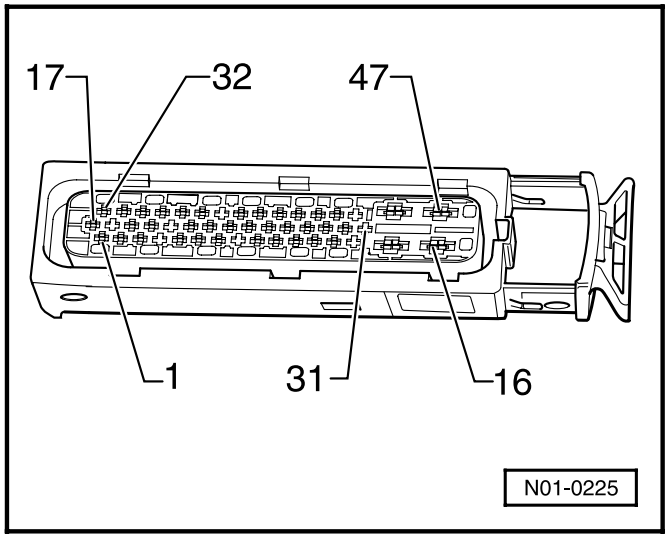
◄- Release multipin connector -1- (arrow -a-) and unplug from control unit -arrow b-.



◄- Use a screwdriver to detach cap -1- of multipin connector -2- and take off.

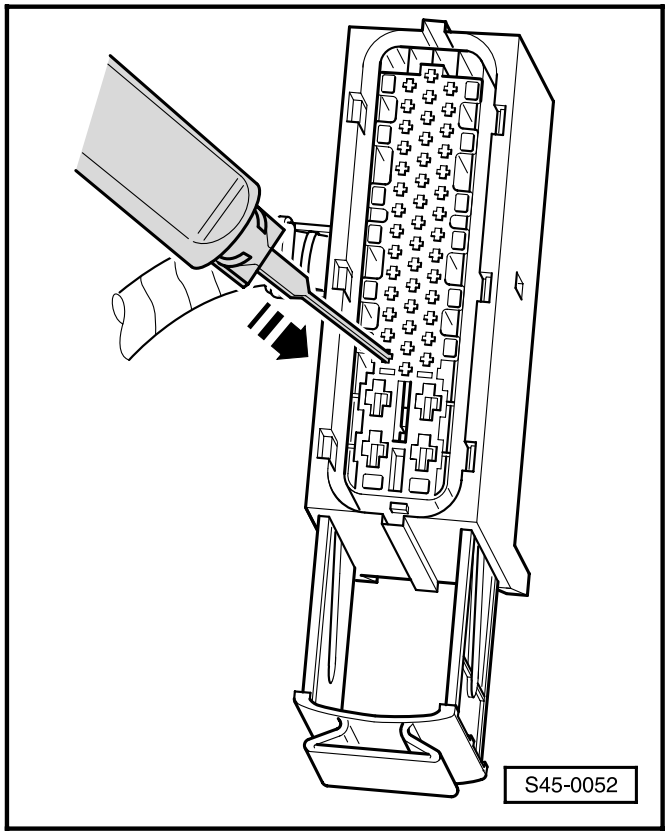


◄- Use a small screwdriver to release secondary lock (purple) in direction of arrow.



◄ **Contact assignment of plug connection T47a of wiring loom/control unit -J104-**

Contact	Cable connection to component...
3 + 4	Front right wheel speed sensor -G45
33 + 34	Front left wheel speed sensor -G47
6 + 7	Rear right wheel speed sensor -G44
36 + 37	Rear left wheel speed sensor -G46

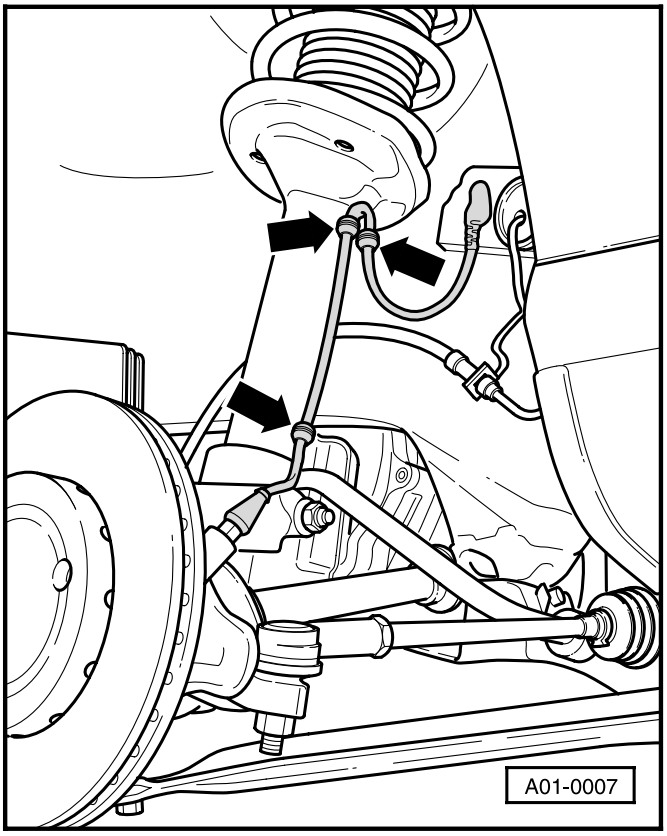


◄ - Use a suitable ejection tool from the wiring loom repair kit to knock out the appropriate contacts.

- Release connector at wheel speed sensor and separate plug connection.
- Remove faulty wheel speed sensor cable.

Installing

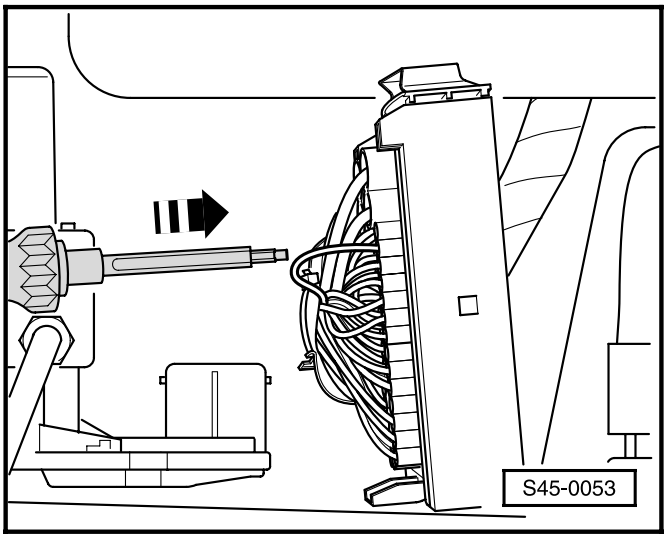
- Pull in new wheel speed sensor cable.
- Connect wheel speed sensor cable to wheel speed sensor.



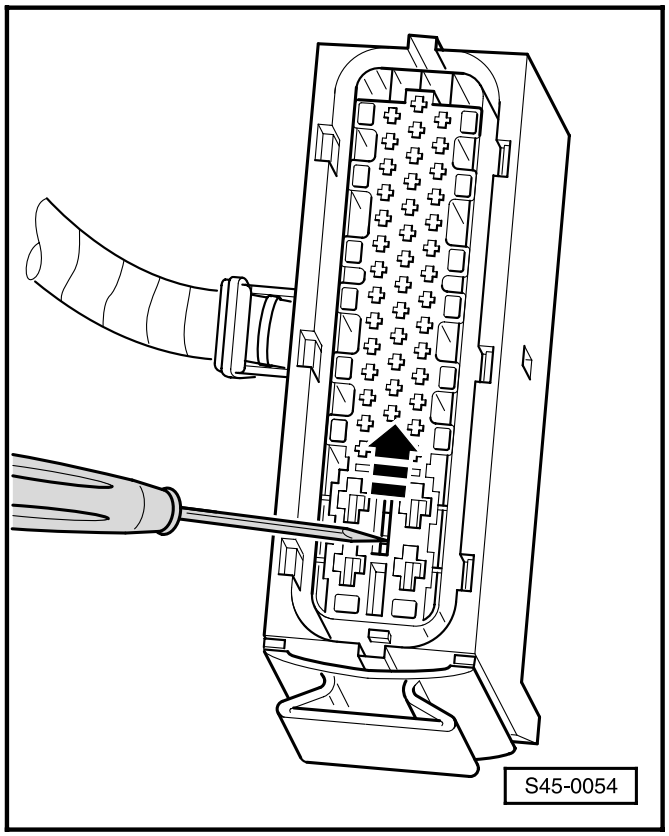
◄- Clip wheel speed sensor cable in place -arrows-.

Note:

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



◄- Insert contact into the plug housing and use a suitable insertion tool from the wiring loom repair kit to push in the single-wire seal as far as the stop.



◄- Secure contacts with the secondary lock (purple).

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

- Fit cap onto the multipin connector.

- Plug multipin connector into control unit -J104- and lock.

- Connect battery ⇒ page 45-166.

- Interrogate fault memory ⇒ page 45-101.

- Erase fault memory ⇒ page 45-113.

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

⇒ page 45-65

Removing and installing parts of the ESP system

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

♦ Removing and installing yaw rate sensor -G202- and lateral acceleration sensor -G200- ⇒ page 45-171

♦ Removing and installing steering angle sensor -G85- ⇒ page 45-174

Special tools, testers and aids required

♦ Torque wrench 5...50 Nm, e.g. V.A.G 1331

♦ Vehicle system tester V.A.G 1552

♦ Diagnostic cable V.A.G 1551/3 or V.A.G 1551/3A

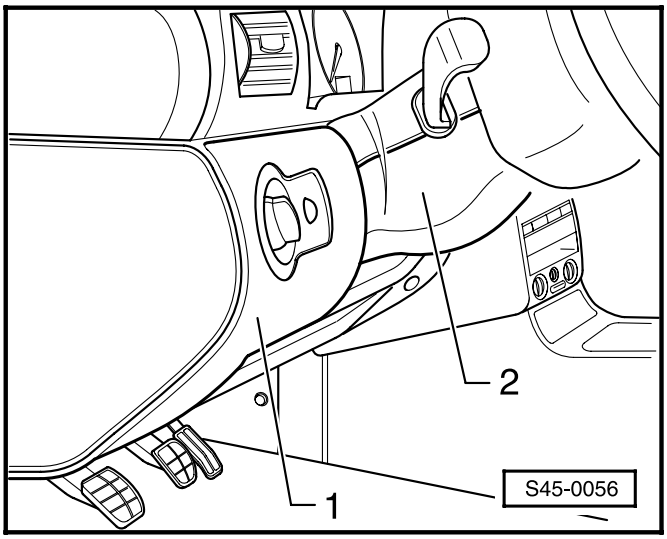
Removing and installing yaw rate sensor -G202- and lateral acceleration sensor -G200-

The procedure for removal and installation of the yaw rate sensor -G202- and of the lateral acceleration sensor -G200- is identical with the exception of the particular sensor to be replaced.

Notes:

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

⇒ Inspection and Maintenance



Removing

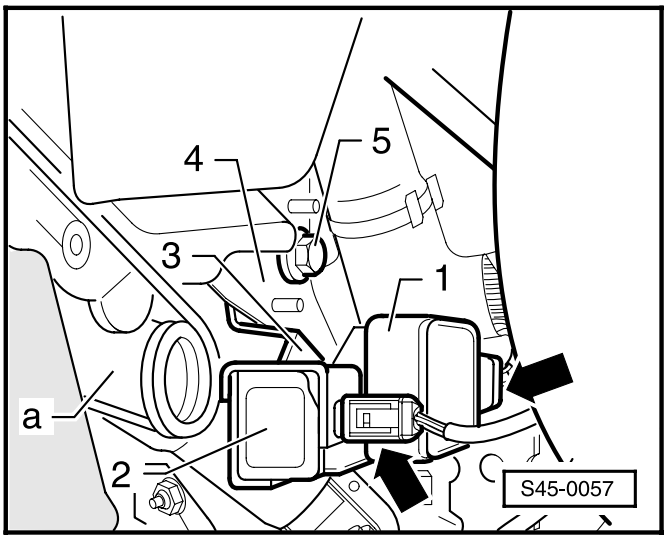
- Disconnect battery.

◄ - Remove bottom part of dash panel -1-.

⇒ Body Fitting Work; Repair Group 70; Dash Panel

- Remove bottom part of steering column trim -2-.

⇒ Body Fitting Work; Repair Group 70; Dash Panel



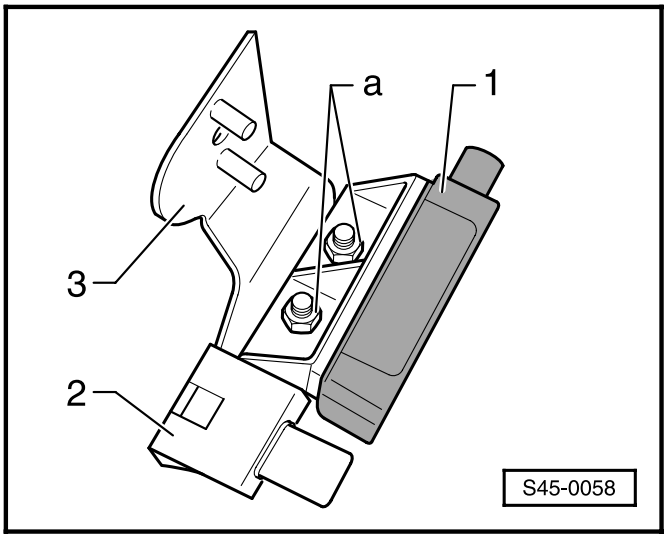
◄ The yaw rate sensor (G202) -1- and the lateral acceleration sensor (G200) -2- are attached by means of a common bracket -3- to the bearing bracket -4- of the steering column -a-.

Note:

Because of the common bracket, it is not possible to remove the sensors individually. After removing the bracket, the yaw rate sensor -G202- and the acceleration sensor -G200- can be replaced separately.

- Unplug the connectors -arrows- of the yaw rate sensor -G202- and of the lateral acceleration sensor -G200-.

- Remove hexagon bolt -5- and take out bracket -3- together with yaw rate sensor -G202- and lateral acceleration sensor -G200-.



Replacing yaw rate sensor -G202-

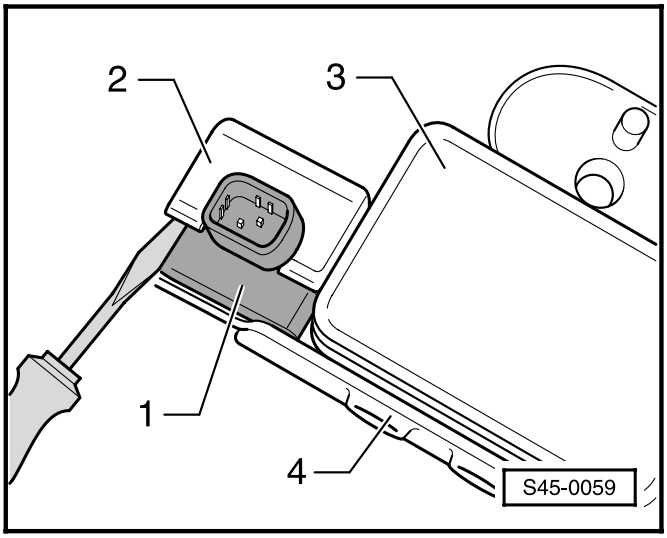
◄ - Unscrew the nuts -a- of the yaw rate sensor (G202) -1-.

- Take yaw rate sensor (G202) -1- off the bracket -3-.

2 - Lateral acceleration sensor -G200-

- Insert new yaw rate sensor (G202) -1- into the bracket -3- and align.

- Screw on nuts -a- and tighten fully.

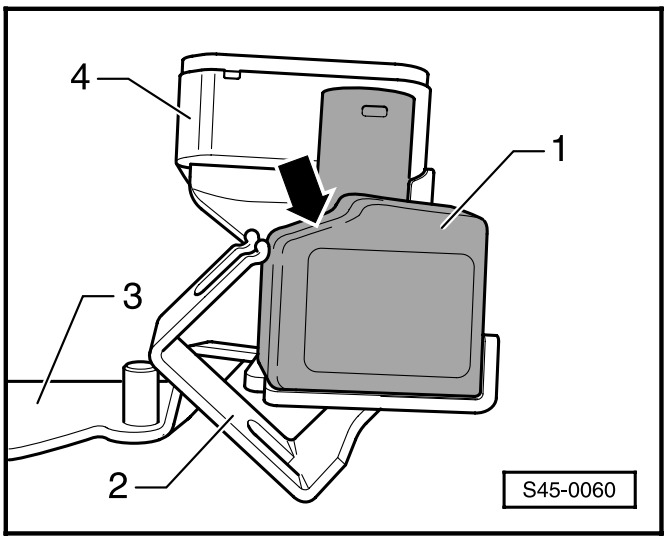


Replacing lateral acceleration sensor -G200-

◄ - Use a screwdriver to lever the fixture -2- off the lateral acceleration sensor (G200) -1-.

- Take lateral acceleration sensor (G200) -1- off the bracket -4-.

3 - Yaw rate sensor -G202-



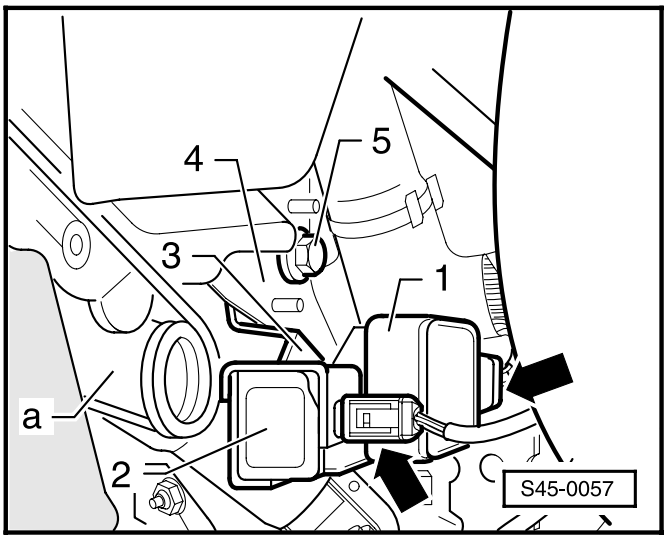
◄ - Insert new lateral acceleration sensor (G200) -1- into the bracket -3-.

4 - Yaw rate sensor -G202-

Note:

The angled side -arrow- of the lateral acceleration sensor (G200) -1- must be pointing toward the fixture -2-.

- Push fixture -2- over the lateral acceleration sensor (G200) -1- and lock in position.



Installing

◄ - Install bracket -3- together with lateral acceleration sensor (G200) -2- and yaw rate sensor (G202) -1- at the bearing bracket -4- of steering column -a-.

- Screw in hexagon bolt -5- and tighten fully.

- Plug in connector of yaw rate sensor (G202) -1- and connector of lateral acceleration sensor (G200) -2- -arrows-.

- Install bottom part of steering column trim.
⇒ Body Fitting Work; Repair Group 70; Dash Panel

- Install bottom part of dash panel.
⇒ Body Fitting Work; Repair Group 70; Dash Panel

- Re-connect battery ⇒ page 45-171.

- Carry out basic setting ⇒ page 45-124.

- Interrogate fault memory ⇒ page 45-101.

- Erase fault memory ⇒ page 45-113.

Tightening torques:

Yaw rate sensor (G202)	9 Nm
Bracket to bearing bracket of steering column	20 Nm

Removing and installing steering angle sensor -G85-

Special tools, testers and aids required

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

Notes:

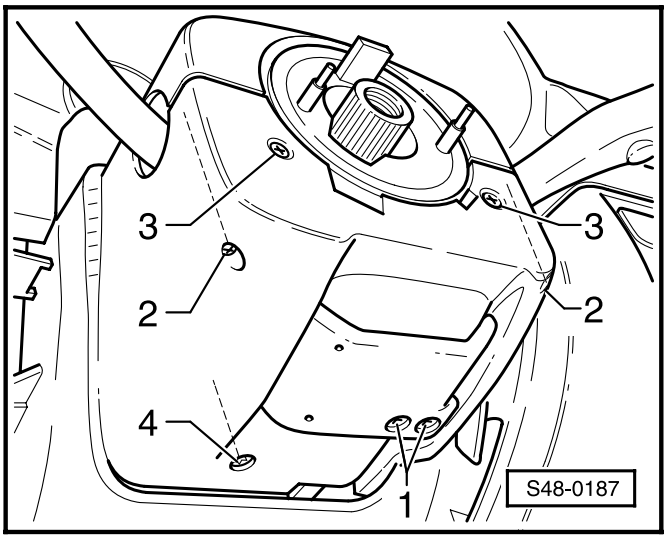
- *Before disconnecting the battery, determine the code of radio sets fitted with anti-theft coding.*
- *When the battery is re-connected, please check the vehicle equipment:*
  - Enter radio code
  - Re-set clock
  - Initialise power windows.

⇒ Inspection and Maintenance

Removing

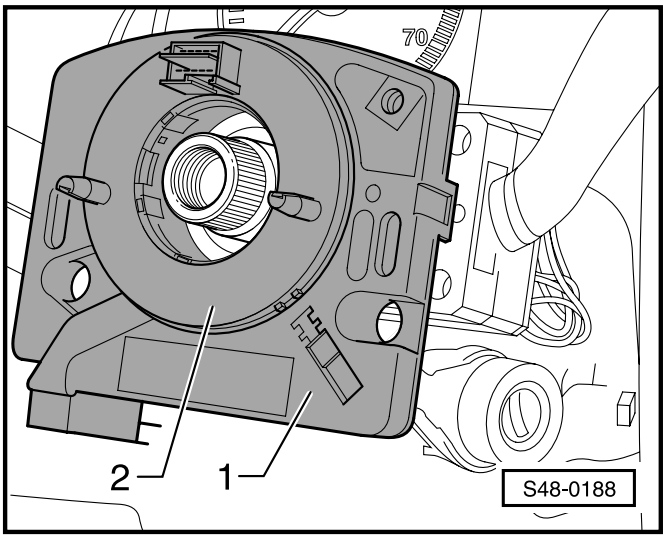
- Disconnect battery.
- Move front wheels into straightahead position.
- Remove steering wheel.

⇒ Body Fitting Work; Repair Group 69; Airbag System

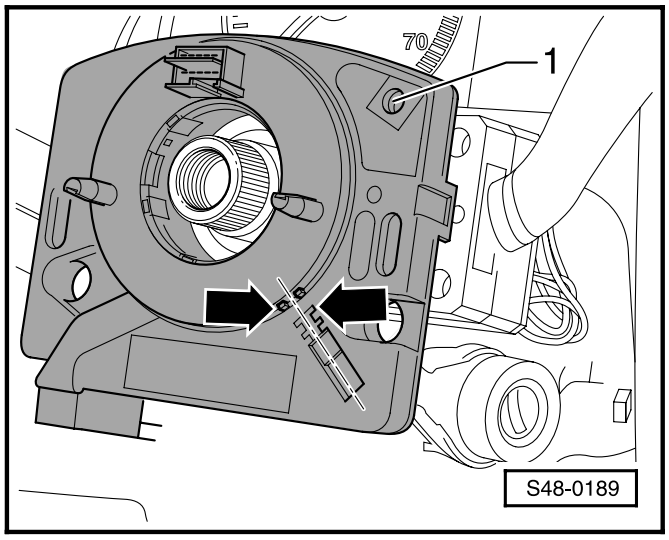


◄ - Remove screws -1-, -2-, -3- and -4-.

- Take off steering column adjustment handle as well as top and bottom parts of steering column trim.
- **Check whether the front wheels are in a straightahead position.**
- Fit on steering wheel, if necessary, and move front wheels into straightahead position.
- Take off steering wheel.



◄ The steering angle sensor -G85- is installed together with the airbag clock spring contact -2- in housing -1-.



Note:

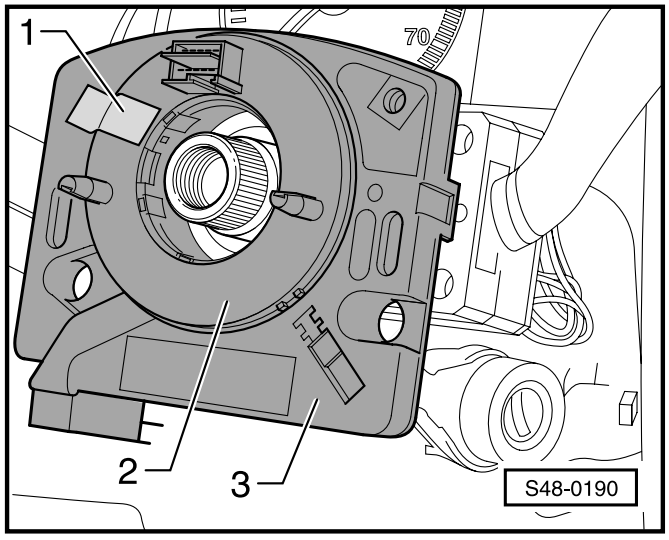
The following two steps only need to be carried out if the same housing with airbag clock spring contact is subsequently re-installed.

◄- Position the steering angle sensor in the middle position:

Yellow dot must be visible in the window -1-.

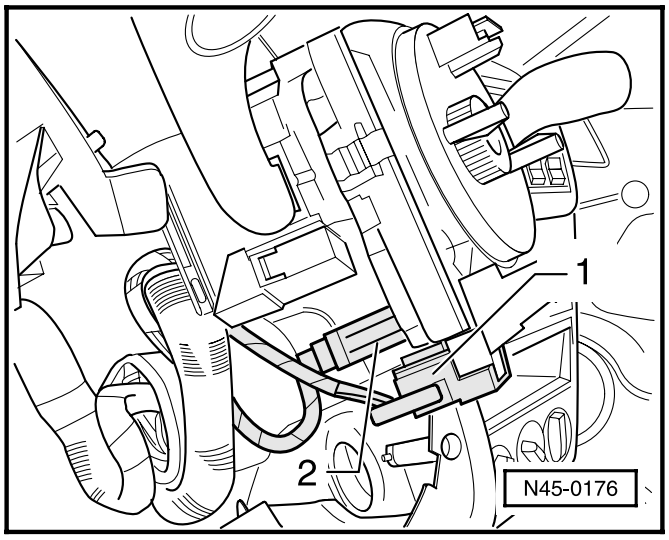
The markings -arrows- must be aligned.

Ensure that this position is maintained.

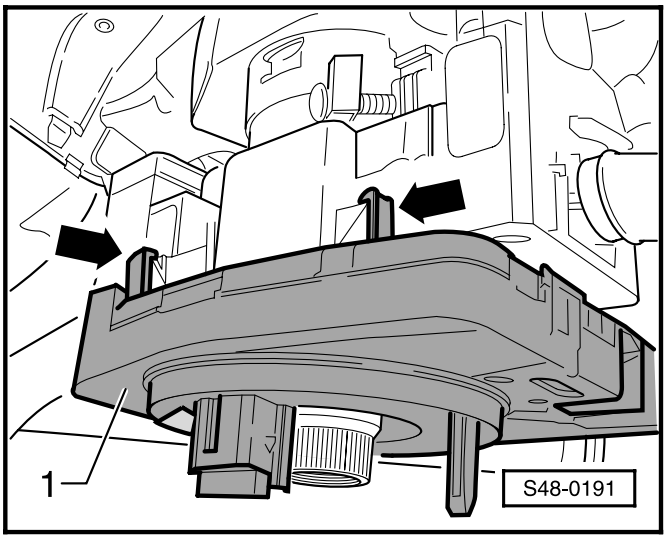


◄- Secure clock spring contact -2- from turning unintentionally by fixing it in place with adhesive tape -1-.

3 - Housing



◄- Unplug connectors -1- and -2-.



◄- Carefully release lock hook -arrows- and pull off housing -1- together with steering angle sensor -G85- and airbag clock spring contact.

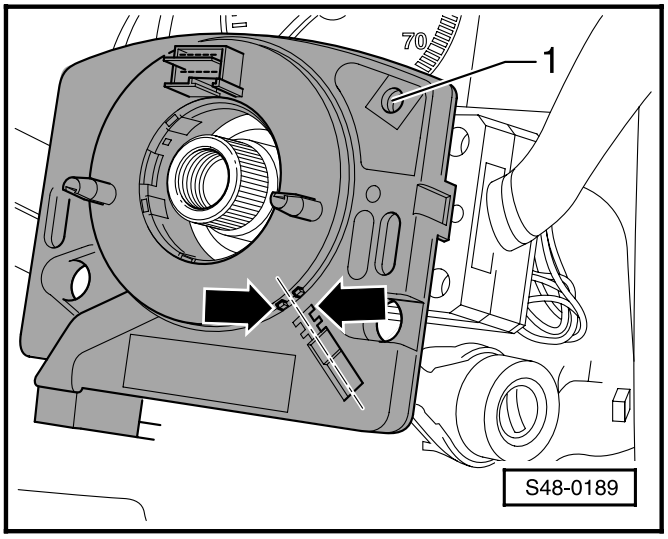
Installing

- Push housing -1- together with steering angle sensor -G85- and clock spring contact onto the steering column and lock in position with steering column switch -arrows-.

- Plug in both connectors.

Note:

After removing the transport protection or the adhesive tape, respectively, do not turn clock spring contact; it is only permissible to position the steering angle sensor -G85- in the middle position.



- Remove transport protection or adhesive tape, respectively.

◄- Position the steering angle sensor in the middle position:

Yellow dot must be visible in window -1-.

The markings -arrows- must be aligned.

Ensure that this position is maintained.

- Install top and bottom parts of steering column trim as well as handle of steering column adjustment.

- Install steering wheel.

⇒ Body Fitting Work; Repair Group 69; Airbag System

- Re-connect battery ⇒ page 45-174.

- Carry out basic setting of steering angle sensor -G85- ⇒ page 45-124.

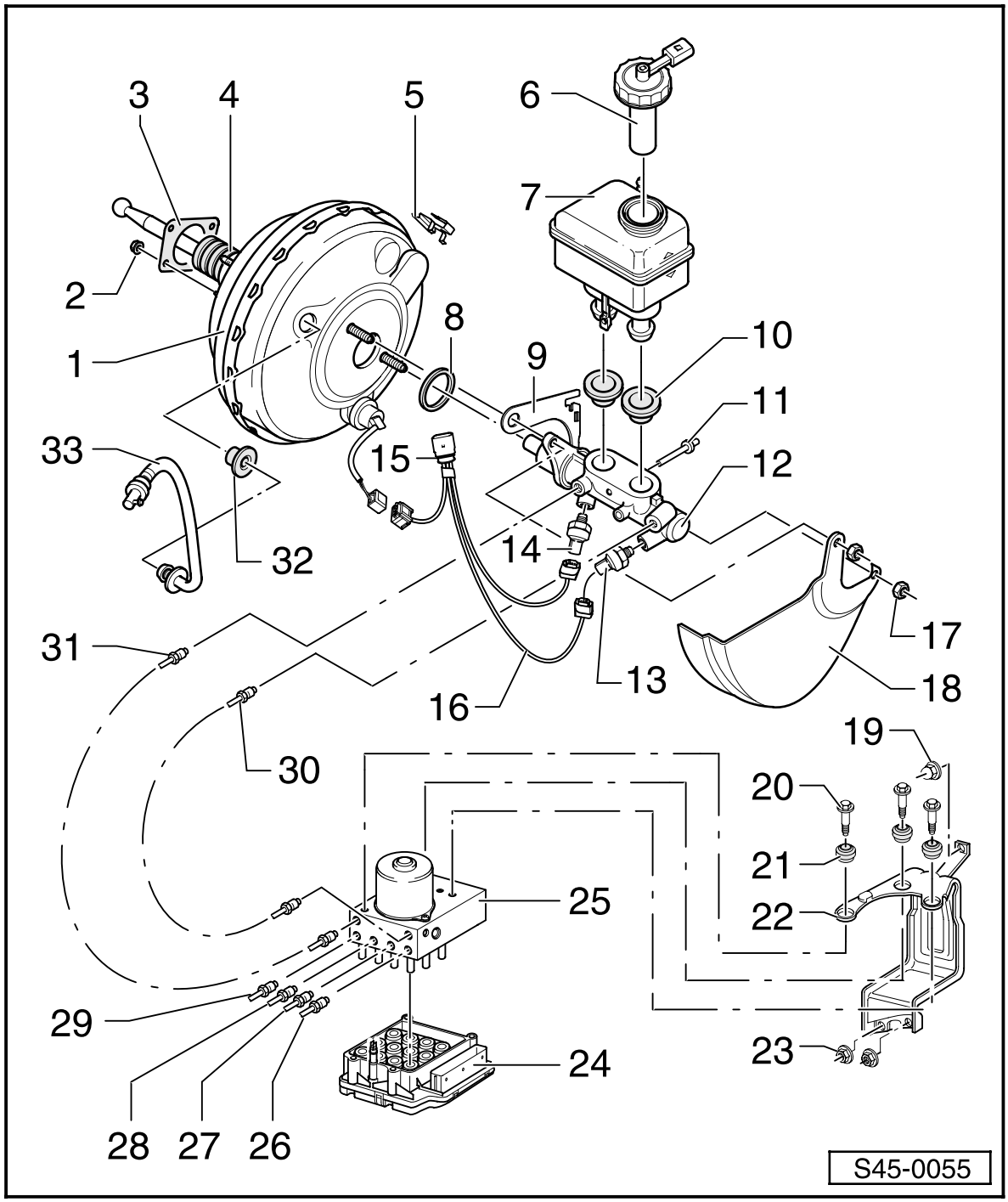
- Interrogate fault memory ⇒ page 45-101.

- Erase fault memory ⇒ page 45-113.

Removing and installing as well as setting brake light switch

⇒ page 45-69.

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



Notes:

- *The hydraulic unit should be removed and installed complete ⇒ page 45-158.*
- *Servicing ⇒ from page 45-163.*
- *Connections of brake lines should be tightened as a general rule to a torque of 14 Nm.*
- *Complete brake master cylinders and brake servo units can be replaced separately from each other.*

1 - Brake servo unit

- operational check ⇒ page 47-4
- removing and installing ⇒ page 47-32

2 - Self-locking hexagon nut, 28 Nm

3 - Gasket

- for brake servo unit

4 - Boot
- Ensure correctly installed; risk of suction noises

5 - Fixture
- Is attached to the edge of the brake servo unit
- Is used for mounting connector -item 15-

6 - Cap
- With integrated brake fluid level warning contact -F34-

7 - Brake fluid reservoir

8 - Seal
- Replace

9 - Retaining plate
- For fixing position of wiring loom -item 16-

10 - Sealing plug
- Moisten with brake fluid and press in expansion reservoir

11 - Retaining pin
- Insert through brake master cylinder

12 - Brake master cylinder
- Must not be repaired; replace complete if fault exists
- Removing and installing
  ⇒ page 47-30

13 - Brake pressure sensor -1- -G201-
- In floating piston circuit
- Removing and installing
  ⇒ page 47-28

14 - Brake pressure sensor -2- -G214-
- In pushrod piston circuit
- Removing and installing
  ⇒ page 47-28

15 - Connector
- Connects wiring loom of dash panel/ engine compartment

16 - Wiring loom

17 - Hexagon nut, self-locking, 20 Nm

18 - Heat shield
- Only on vehicles with 110 kW engines

19 - Cap nut, 25 Nm

20 - Fit bolt, 8 Nm

21 - Rubber shock absorber

22 - Bracket

23 - Hexagon nut, self-locking, 20 Nm

24 - ABS/EDL/ESP control unit

25 - ABS/EDL/ESP hydraulic unit

26 - Connection for brake line, 14 Nm
- Hydraulic unit to front left brake caliper

27 - Connection for brake line, 14 Nm
- Hydraulic unit to rear right wheel cylinder/brake caliper

28 - Connection for brake line, 14 Nm
- Hydraulic unit to rear left wheel cylinder/brake caliper

29 - Connection for brake line, 14 Nm
- Hydraulic unit to front right brake caliper

30 - Brake line, 14 Nm
- Brake master cylinder/floating piston circuit to hydraulic unit

31 - Brake line, 14 Nm
- Brake master cylinder/pushrod piston circuit to hydraulic unit

32 - Sealing plug

33 - Vacuum hose
- With non-return valve
- Insert into brake servo unit

Antilock brake system (ABS) MK 60

Safety precautions, basic information regarding fault finding and repairs to ABS and ABS/TCS/EDL MK 60

⇒ page 45-1, Antilock brake system (ABS) ITT Mark 20 IE.

Information on repair operations to ABS and ABS/TCS/EDL MK 60

⇒ page 45-1, Antilock brake system (ABS) ITT Mark 20 IE.

Technical information required

- „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
- ABS Self-Study Programme
- Technical Service Handbook

General information

⇒ page 45-4.

ABS and ABS/TCS/EDL

There is no exterior distinction between the ABS and ABS/TCS/EDL systems.

- *Control unit identification*
  The control unit version appears in the display of V.A.G 1552. Select function 01 for this „Interrogate control unit version“⇒ page 45-182.

⇒ Parts List

- *List of available functions ⇒ page 45-182.*

Fitting location of ABS or ABS/TCS/EDL MK 60

⇒ page 45-195, Electrical/electronic components and fitting locations.

Self-diagnosis

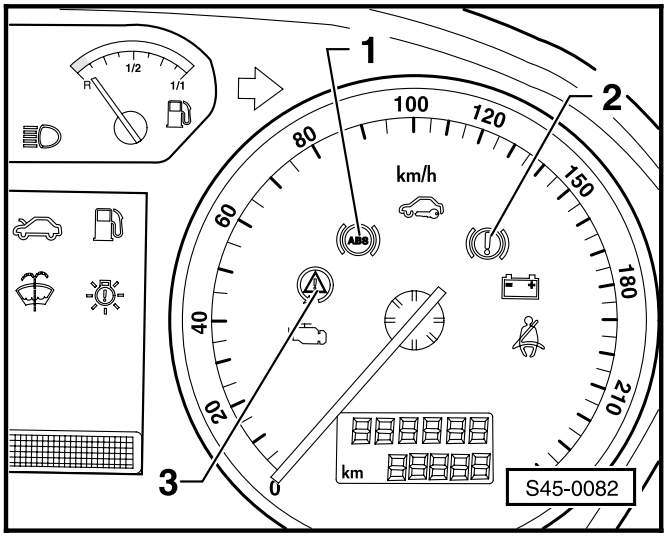
Function of self-diagnosis

⇒ page 45-6

Note:

The MK60 is equipped with a 47-pin control unit.

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



◄ ♦ If the ABS warning light (K47) -1- does not go out after the ignition is switched on and after completion of the test sequence, the causes of the fault may be:

a - voltage supply is less than 11 V

b - an ABS fault is present
If an ABS fault is present, the anti-lock brake system remains switched off while the conventional brake system remains fully operational.

c - a fault existed at a wheel speed sensor after last vehicle start (sporadic fault).
If a fault exists at a wheel speed sensor, the ABS warning light goes out automatically after restarting the vehicle and speed increased to more than 20 km/h.

d - there is an interruption in the link from the dash panel insert to control unit -J104-.

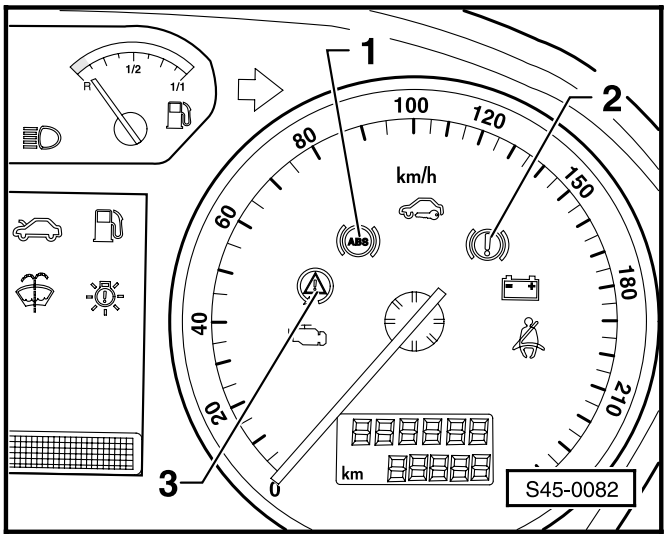
⇒ “Current Flow Diagrams, Electrical Fault Finding and Fitting Locations” binder

e - the dash panel insert is faulty.

f - the ABS control unit is incorrectly coded.

The ABS warning light (K47) -1- flashes at a rate of about 1 Hz if the ABS control unit is not coded.

The ABS warning light (K47) -1- and the handbrake/brake fluid level warning light (K14/33) -2- flash while self-diagnosis is being performed.



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

a - the handbrake is still applied

b - the brake fluid level is too low

c - there is a fault in the wiring

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

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

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

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

Performing self-diagnosis

Test requirements

⇒ page 45-9

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

⇒ page 45-9

List of available functions

		Page
00 -	Automatic test sequence	45-13
01 -	Interrogating control unit version	45-10
02 -	Interrogating fault memory	45-12
03 -	Final control diagnosis	45-29
04 -	Initiating basic setting [1)]	45-36
05 -	Erasing fault memory	45-21
06 -	Ending output	45-22
07 -	Coding control unit	45-190
08 -	Reading measured value block	45-192

1) is required only for models fitted with EDL

Fault table

Notes:

- *In view of the fact that the control units are interconnected by a databus line, it is always necessary to initiate the "Automatic test sequence" with function 00 at all the control units fitted to the vehicle. When this is done, the control units fitted to the vehicle together with the possible faults they contain are interrogated.*
- *After this, all the possible faults which can be detected by the ABS control unit (J104) and displayed by V.A.G 1552, are listed according to the 5-digit fault code.*
- *In addition, a fault type may also appear in the fault table.*
- *Reference is made to individual test steps of the electrical test in the column „Rectifying fault".*
- *Before replacing components which have been displayed as faulty, inspect all the corresponding plug connections, cables and earth connections according to the current flow diagram.*

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

- *After completing the repairs, always once again interrogate the fault memory with the vehicle system tester V.A.G 1552 and erase it, and also conduct a test at more than 20 km/h.*
- *After the road test, once again interrogate the fault memory.*

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
No fault recognized	If after completing the repairs „no fault recognized" appears, the self-diagnosis is ended. If the ABS does not operate properly despite the readout „no fault recognized", then proceed as follows: 1. Conduct a road test at more than 20 km/h. 2. Once again interrogate the fault memory; if there is still no fault stored. 3. Continue fault finding without self-diagnosis and carry out the electrical test in full ⇒ page 45-205.	
00003	♦ Open circuit or loose contact in the wiring to control unit -J104-	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Conduct a road test at a speed of more than 20 km/h
	♦ ABS control unit -J104- faulty	If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-196

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00283 Front left wheel speed sensor -G47- Implausible signal	♦ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G47- and control unit -J104-	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Conduct electrical test ⇒ from page 45-205
	♦ Pulse rotor or wheel speed sensor -G47- damaged ♦ Wheel speed sensor -G47- faulty	- Inspect wheel speed sensor -G47- and pulse rotor for damage - Replace pulse rotor and, if necessary, wheel speed sensor -G47- ⇒ page 45-60
	♦ ABS control unit -J104- faulty	If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-196
00283 Front left wheel speed sensor -G47- Electrical fault in circuit	♦ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G47- and control unit -J104-	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Conduct electrical test ⇒ from page 45-205
	♦ Electrical interference as a result of external sources (high-frequency radiation, e.g. ignition cables not insulated)	- Read data block ⇒ page 45-192, display group number 001 - Replace wheel speed sensor -G47- ⇒ page 45-60
00283 Front left wheel speed sensor -G47- Mechanical fault[1)]	♦ Excessive gap between wheel speed sensor -G47- and pulse rotor (signal not o.k.)	- Inspect installation of wheel speed sensor -G47- and pulse rotor ⇒ page 45-60 - Read data block ⇒ page 45-192, display group number 002 - Conduct final control diagnosis ⇒ page 45-60
	♦ Outlet valves in hydraulic unit -N55- faulty	If the fault occurs once again: - Replace hydraulic unit -N55- ⇒ page 45-196

1) Fault can only be detected from a speed of 20 km/h (conduct road test).

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00285 Front right wheel speed sensor -G45 Implausible signal	♦ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G45- and control unit -J104	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205
	♦ Damage to pulse rotor or speed sensor -G45 ♦ Coil of speed sensor -G45- faulty	- Inspect speed sensor -G45- and pulse rotor for damage - Replace pulse rotor/speed sensor -G45- ⇒ page 45-60
	♦ ABS control unit -J104- faulty	If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-196
00285 Front right wheel speed sensor -G45 Electrical fault in circuit	♦ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G45- and control unit -J104	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205
	♦ Electrical interference because of external sources (high-frequency interference, e.g. ignition cable not insulated)	- Read measured value block ⇒ page 45-192, display group number 001 - Replace speed sensor -G45- ⇒ page 45-60
00285 Front right wheel speed sensor -G45 Mechanical fault[1)]	♦ Air gap between speed sensor -G45- and pulse rotor too large (signal not o.k.)	- Inspect installation of speed sensor -G45- and pulse rotor ⇒ page 45-60 - Read measured value block ⇒ page 45-192, display group number 002 - Perform final control diagnosis ⇒ page 45-194
	♦ Outlet valves in hydraulic unit -N55- faulty	If the fault occurs once again: - Replace hydraulic unit -N55- ⇒ page 45-196

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

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00287 Rear right wheel speed sensor -G44 Implausible signal	♦ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G44- and control unit -J104	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205
	♦ Damage to pulse rotor or speed sensor -G44 ♦ Coil of speed sensor -G44- faulty	- Inspect speed sensor -G44- and pulse rotor for damage - Replace pulse rotor/speed sensor -G44- ⇒ page 45-65
	♦ ABS control unit -J104- faulty	If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-196
00287 Rear right wheel speed sensor -G44 Electrical fault in circuit	♦ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G44- and control unit -J104	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205
	♦ Electrical interference because of external sources (high-frequency interference, e.g. ignition cable not insulated)	- Read measured value block ⇒ page 45-192, display group number 001 - Replace speed sensor -G44- ⇒ page 45-65
00287 Rear right wheel speed sensor -G44 Mechanical fault[1)]	♦ Air gap between speed sensor -G44- and pulse rotor too large (signal not o.k.)	- Inspect installation of speed sensor -G44- and pulse rotor ⇒ page 45-65 - Read measured value block ⇒ page 45-192, display group number 002 - Perform final control diagnosis ⇒ page 45-194
	♦ Outlet valves in hydraulic unit -N55- faulty	If the fault occurs once again: - Replace hydraulic unit -N55- ⇒ page 45-196

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

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00290 Rear left wheel speed sensor -G46 Implausible signal	♦ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G46- and control unit -J104	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205
	♦ Damage to pulse rotor or speed sensor -G46 ♦ Coil of speed sensor -G46- faulty	- Inspect speed sensor -G46- and pulse rotor for damage - Replace pulse rotor/speed sensor -G46- ⇒ page 45-65
	♦ ABS control unit -J104- faulty	If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-196
00290 Rear left wheel speed sensor -G46 Electrical fault in circuit	♦ Open circuit, short circuit to positive or to earth or loose contact in wiring between wheel speed sensor -G46- and control unit -J104	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205
	♦ Electrical interference because of external sources (high-frequency interference, e.g. ignition cable not insulated)	- Read measured value block ⇒ page 45-192, display group number 001 - Replace speed sensor -G46- ⇒ page 45-65
00290 Rear left wheel speed sensor -G46 Mechanical fault[1)]	♦ Air gap between speed sensor -G46- and pulse rotor too large (signal not o.k.)	- Inspect installation of speed sensor -G46- and pulse rotor ⇒ page 45-65 - Read measured value block ⇒ page 45-192, display group number 002 - Perform final control diagnosis ⇒ page 45-194
	♦ Outlet valves in hydraulic unit -N55- faulty	If the fault occurs once again: - Replace hydraulic unit -N55- ⇒ page 45-196
00668 System voltage terminal 30 Implausible signal	♦ Open circuit, short circuit to positive or to earth in wiring	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205

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

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
01044 Control unit incorrectly coded	♦ Control unit -J104- incorrectly coded ♦ Bridge in multipin connector to control unit -J104- from contact 3 to contact 14 open circuit or short circuit	- Check coding of control unit -J104- ⇒ page 45-190 - Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205
01130 ABS operation Implausible signal	♦ Electrical interference caused by external sources (high-frequency interference, e.g. ignition cables not insulated) ♦ Open circuit, short circuit to positive or to earth in wiring ♦ ABS control unit -J104- faulty	- Erase fault memory - Conduct road test at more than 20 km/h - Once again interrogate fault memory - Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205 If the fault occurs once again: - Replace control unit -J104- ⇒ page 45-196
01276 ABS hydraulic pump -V64 Implausible signal	♦ Open circuit, short circuit to positive or to earth in wiring ♦ Hydraulic pump -V64- faulty ♦ ABS control unit -J104- faulty	- Perform final control diagnosis ⇒ page 45-194 - Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205 - Replace hydraulic unit -N55- ⇒ page 45-196

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
01312 Databus drive defective[1)] or:	♦ ABS control unit -J104- incorrectly coded ♦ Engine control unit incorrectly coded ♦ Open circuit, short circuit to positive or to earth in wiring	- Check coding of control unit -J104- ⇒ page 45-190 - Check coding of engine control unit ⇒ Repair Group 01 of relevant engine - Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205
Databus drive defective[1)] sporadically	♦ Ignition/starter switch rotates too slowly	- Erase fault memory ⇒ page 45-21 - No further measures necessary - Inform customer
01314 Engine control unit No communication Please read fault memory	♦ Open circuit, short circuit to positive or to earth in databus wiring	- Test wiring and plug connections of databus cables according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205
01315 Gearbox control unit[2)] No communication	♦ Open circuit, short circuit to positive or to earth in databus wiring	- Test wiring and plug connections of databus cables according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205

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

2) Only on models fitted with automatic gearbox.

Coding the control unit

Required special tools, testing and measuring equipment as well as auxiliary devices and material

- Vehicle system tester V.A.G 1552
- Diagnostics line V.A.G 1551/3, 3A, 3B or 3C

The control unit which is installed in the vehicle is coded. New control units from the spare parts store are uncoded and must be newly coded before being installed.

Pre-requisites for coding

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

Checking procedure

- Determine the engine identification code and the type of ABS hydraulic control unit which has been installed on the vehicle.
- Connect up the vehicle system tester V.A.G 1552 and select the address word 03 „Brake electronics“ with the ignition on ⇒ page 45-182.

Vehicle system test HELP Select function XX

◀ Read out on display:

- Enter 07 for the function „Code the control unit“ and confirm the entry with Q.

Code control unit Q Enter code number XXXXX (0-32767)

◀ Read out on display:

- Enter the appropriate code number for the vehicle and confirm entry with Q.

  Code table ⇒ page 45-191.

1C0907379 C ABS FRONT MK60 0102 → Coding 0001025 WSC XXXXX

◀ The display shows the control unit coding, e.g. 0001025.

- Press the → button.

Vehicle system test HELP Select function XX

◀ Read out on display:

- Enter function 06 „Stop output“ and confirm the entry with Q.

Notes:

- *If the control unit is incorrectly coded, the ABS warning light -K47- and the brake system warning light light up and remain lit.*
- *There is a simultaneous entry in the fault memory of the engine control unit ⇒ page 45-12, Interrogate fault memory 02.*
- *If the control unit is coded with an approved code, no fault entry is made in the fault memory and the ABS warning light does not flash.*
- *If the control unit is not coded (Code 00000), the ABS warning light -K47- flashes (once per second)*

Table of codes for vehicles with Anti-Lock Brake System Mark 60

Note:

Use E-gas on vehicles with MSR.

Engine	Engine code letters	ABS control unit number	Variant ABS	Brakes	Accelerator control with MSR	Chassis		Code number
						Standard	Rough road suspension	
1.4 l/44 kW	AMD	1C0907379K	TCS	FS-III	yes	yes	yes	13313
		1C0907379L	ABS	FS-III	no	yes	yes	04097
		1C0907379L	ABS	FS-III	yes	yes	yes	01025
		1C0907379M	ESP	FS-III	yes	yes	no	11266
		1C0907379M	ESP	FS-III	yes	no	yes	11394
		1C0907379C	ABS	FS-III	no	yes	yes	04097
		1C0907379C	ABS	FS-III	yes	yes	yes	01025
		1C0907379E	ESP	FS-III	yes	yes	no	11266
		1C0907379E	ESP	FS-III	yes	yes	yes	11394
		1C0907379J	ABS	FS-III	no	yes	yes	04097
		1C0907379G	ESP	FS-III	yes	yes	no	11266
		1C0907379G	ESP	FS-III	yes	no	yes	11394
1.4 l/55 kW 16V	AXP BCA	1C0907379L	ABS	FS-III	yes	yes	yes	01025
		1C0907379M	ESP	FS-III	yes	no	yes	11394
		1C0907379M	ESP	FS-III	yes	yes	no	11266
		1C0907379C	ABS	FS-III	yes	yes	yes	01025
		1C0907379C	ABS	FS-III	no	yes	yes	04097
		1C0907379D	TCS	FS-III	yes	yes	yes	13313
		1C0907379E	ESP	FS-III	yes	no	yes	11394
		1C0907379E	ESP	FS-III	yes	yes	no	11266
		1C0907379J	ABS	FS-III	yes	yes	yes	01025
		1C0907379K	TCS	FS-III	yes	yes	yes	13313
		1C0907379G	ESP	FS-III	yes	yes	no	11266
		1C0907379G	ESP	FS-III	yes	no	yes	11394

Engine	Engine code letters	ABS control unit number	Variant ABS	Brakes	Accelerator control with MSR	Chassis		Code number
						Standard	Rough road suspension	
1.6 l/55 kW	AEE	1C0907379L	ABS	FS-III	no	yes	yes	04097
		1C0907379L	ABS	FS-III	yes	yes	yes	01025
		1C0907379M	ESP	FS-III	yes	yes	no	11266
		1C0907379M	ESP	FS-III	yes	no	yes	11394
		1C0907379C	ABS	FS-III	no	yes	yes	04097
		1C0907379E	ESP	FS-III	yes	yes	no	11266
		1C0907379E	ESP	FS-III	yes	no	yes	11394
		1C0907379J	ABS	FS-III	no	yes	yes	04097
		1C0907379G	ESP	FS-III	yes	yes	no	11266
		1C0907379G	ESP	FS-III	yes	no	yes	11394
1.6 l/74 kW	AEH AKL	1C0907379L	ABS	FS-III	no	yes	yes	04097
		1C0907379L	ABS	FS-III	yes	yes	yes	01025
		1C0907379C	ABS	FS-III	no	yes	yes	04097
		1C0907379E	ESP	FS-III	yes	yes	no	11266
		1C0907379J	ABS	FS-III	no	yes	yes	04097
		1C0907379G	ESP	FS-III	yes	yes	no	11266
		1C0907379L	ABS	FS-III	no	yes	yes	04097
		1C0907379M	ESP	FS-III	yes	yes	no	11266
1.6 l/75 kW	AVU BFQ	1C0907379K	TCS	FS-III	yes	yes	yes	13313
		1C0907379L	ABS	FS-III	yes	yes	yes	01025
		1C0907379M	ESP	FS-III	yes	yes	yes	11266
		1C0907379M	ESP	FS-III	yes	no	yes	11394
		1C0907379C	ABS	FS-III	yes	yes	yes	01025
		1C0907379D	TCS	FS-III	yes	yes	yes	13313
		1C0907379E	ESP	FS-III	yes	yes	no	11266
		1C0907379E	ESP	FS-III	yes	no	yes	11394
		1C0907379J	ABS	FS-III	yes	yes	yes	01025
		1C0907379G	ESP	FS-III	yes	yes	no	11266
		1C0907379G	ESP	FS-III	yes	no	yes	11394

Engine	Engine code letters	ABS control unit number	Variant ABS	Brakes	Accelerator control with MSR	Chassis		Code number
						Standard	Rough road suspension	
1.8 l/92 kW	AGN	1C0907379K	TCS	FS-III	yes	yes	yes	13313
		1C0907379L	ABS	FS-III	yes	yes	yes	01025
		1C0907379M	ESP	FS-III	yes	yes	no	11266
		1C0907379M	ESP	FS-III	yes	no	yes	11394
		1C0907379N	ESP 4x4	FS-III	no	yes	no	14342
		1C0907379N	ESP 4x4	FS-III	no	no	yes	14470
		1C0907379C	ABS	FS-III	yes	yes	yes	01025
		1C0907379D	TCS	FS-III	yes	yes	yes	13313
		1C0907379E	ESP	FS-III	yes	yes	no	11266
		1C0907379E	ESP	FS-III	yes	no	yes	11394
		1C0907379F	ESP 4x4	FS-III	no	yes	no	14342
		1C0907379F	ESP 4x4	FS-III	no	no	yes	14470
		1C0907379J	ABS	FS-III	yes	yes	yes	01025
		1C0907379G	ESP	FS-III	yes	yes	no	11266
		1C0907379G	ESP	FS-III	yes	no	yes	11394
		1C0907379H	ESP 4x4	FS-III	no	yes	no	14342
		1C0907379H	ESP 4x4	FS-III	no	no	yes	14470
1.8 l/110 kW	AGU ARZ AUM ARX	1C0907379K	TCS	FS-III	yes	yes	yes	21505
1.8 l/132 kW	AUQ	1C0907379M	ESP	FN-3	yes	yes	no	19970
		1C0907379L	ABS	FN-3	yes	yes	yes	01025
		1C0907379L	ABS	FN-3	no	yes	yes	04097
		1C0907379M	ESP	FN-3	yes	no	yes	20098
		1C0907379N	ESP 4x4	FN-3	no	yes	no	23046
		1C0907379N	ESP 4x4	FN-3	no	no	yes	23174
		1C0907379C	ABS	FN-3	yes	yes	yes	01025
		1C0907379D	TCS	FN-3	yes	yes	yes	21505
		1C0907379E	ESP	FN-3	yes	yes	no	19970
		1C0907379E	ESP	FN-3	yes	no	yes	20098
		1C0907379F	ESP 4x4	FN-3	no	yes	no	23046
		1C0907379F	ESP 4x4	FN-3	no	no	yes	23174
		1C0907379C	ABS	FN-3	no	yes	yes	04097
		1C0907379J	ABS	FN-3	yes	yes	yes	01025
		1C0907379J	ABS	FN-3	no	yes	yes	04097
		1C0907379G	ESP	FN-3	yes	yes	no	19970
		1C0907379G	ESP	FN-3	yes	no	yes	20098
		1C0907379H	ESP 4x4	FN-3	no	yes	no	23046
		1C0907379H	ESP 4x4	FN-3	no	no	yes	23174

Engine	Engine code letters	ABS control unit number	Variant ABS	Brakes	Accelerator control with MSR	Chassis		Code number
						Standard	Rough road suspension	
2.0 l/85 kW	AQY APK AZH AZJ	1C0907379K	TCS	FS-III	yes	yes	yes	21505
		1C0907379L	ABS	FS-III	yes	yes	yes	01025
		1C0907379M	ESP	FS-III	yes	yes	no	19458
		1C0907379M	ESP	FS-III	yes	no	yes	19586
		1C0907379N	ESP	FS-III	no	yes	no	22534
		1C0907379N	ESP	FS-III	no	no	yes	22662
		1C0907379C	ABS	FS-III	yes	yes	yes	01025
		1C0907379D	ABS	FS-III	yes	yes	yes	21505
		1C0907379E	ESP	FS-III	yes	yes	no	19458
		1C0907379E	ESP	FS-III	yes	no	yes	19586
		1C0907379F	ESP 4x4	FS-III	no	yes	no	22534
		1C0907379F	ESP 4x4	FS-III	no	no	yes	22662
		1C0907379J	ABS	FS-III	yes	yes	yes	01025
		1C0907379G	ESP	FS-III	yes	yes	no	19458
		1C0907379G	ESP	FS-III	yes	no	yes	19586
		1C0907379H	ESP 4x4	FS-III	no	yes	no	22534
		1C0907379H	ESP 4x4	FS-III	no	no	yes	22662
2.0 l/82 kW	AEG	1C0907379L	ABS	FS-III	no	yes	yes	04097
		1C0907379M	ESP	FS-III	no	yes	no	22530
		1C0907379M	ESP	FS-III	no	no	yes	22658
		1C0907379C	ABS	FS-III	no	yes	yes	04097
		1C0907379E	ESP	FS-III	no	yes	no	22530
		1C0907379E	ESP	FS-III	no	no	yes	22658
		1C0907379J	ABS	FS-III	no	yes	yes	04097
		1C0907379G	ESP	FS-III	no	yes	no	22530
		1C0907379G	ESP	FS-III	no	no	yes	22658
1.9 l/50 kW (SDI)	AGM AQM	1C0907379K	TCS	FS-III	yes	yes	yes	21505
		1C0907379L	ABS	FS-III	yes	yes	yes	01025
		1C0907379M	ESP	FS-III	yes	yes	no	19458
		1C0907379M	ESP	FS-III	yes	no	yes	19586
		1C0907379C	ABS	FS-III	yes	yes	yes	01025
		1C0907379D	TCS	FS-III	yes	yes	yes	21505
		1C0907379E	ESP	FS-III	yes	yes	no	19458
		1C0907379E	ESP	FS-III	yes	no	yes	19586
		1C0907379J	ABS	FS-III	yes	yes	yes	01025
		1C0907379G	ESP	FS-III	yes	yes	no	19458
		1C0907379G	ESP	FS-III	yes	no	yes	19586

Engine	Engine code letters	ABS control unit number	Variant ABS	Brakes	Accelerator control with MSR	Chassis		Code number
						Standard	Rough road suspension	
1.9 l/66 kW	AGR ALH	1C0907379K	TCS	FS-III	yes	yes	yes	21505
		1C0907379L	ABS	FS-III	yes	yes	yes	01025
		1C0907379M	ESP	FS-III	yes	yes	no	19458
		1C0907379M	ESP	FS-III	yes	no	yes	19586
		1C0907379N	ESP 4x4	FS-III	no	yes	no	22534
		1C0907379N	ESP 4x4	FS-III	no	no	yes	22662
		1C0907379C	ABS	FS-III	yes	yes	yes	01025
		1C0907379D	TCS	FS-III	yes	yes	yes	21505
		1C0907379E	ESP	FS-III	yes	yes	no	19458
		1C0907379E	ESP	FS-III	yes	no	yes	19586
		1C0907379F	ESP 4x4	FS-III	no	yes	no	22534
		1C0907379F	ESP 4x4	FS-III	no	no	yes	22662
		1C0907379J	ABS	FS-III	yes	yes	yes	01025
		1C0907379K	TCS	FS-III	yes	yes	yes	21505
		1C0907379G	ESP	FS-III	yes	yes	no	19458
		1C0907379G	ESP	FS-III	yes	no	yes	19586
		1C0907379H	ESP 4x4	FS-III	no	yes	no	22534
		1C0907379H	ESP 4x4	FS-III	no	no	yes	22662
1.9 l/74 kW	ATD	1C0907379K	TCS	FS-III	yes	yes	yes	21505
		1C0907379L	ABS	FS-III	yes	yes	yes	01025
		1C0907379M	ESP	FS-III	yes	yes	no	19458
		1C0907379M	ESP	FS-III	yes	no	yes	19586
		1C0907379C	ABS	FS-III	yes	yes	yes	01025
		1C0907379D	TCS	FS-III	yes	yes	yes	21505
		1C0907379E	ESP	FS-III	yes	yes	no	19458
		1C0907379E	ESP	FS-III	yes	no	yes	19586
		1C0907379F	ESP 4x4	FS-III	no	yes	no	22534
		1C0907379F	ESP 4x4	FS-III	no	no	yes	22662
		1C0907379J	ABS	FS-III	yes	yes	yes	01025
		1C0907379G	ESP	FS-III	yes	yes	no	19458
		1C0907379G	ESP	FS-III	yes	no	yes	19586
		1C0907379N	ESP 4x4	FS-III	no	yes	no	22534
		1C0907379N	ESP 4x4	FS-III	no	no	yes	22662

Engine	Engine code letters	ABS control unit number	Variant ABS	Brakes	Accelerator control with MSR	Chassis		Code number
						Standard	Rough road suspension	
1.9 l/81 kW	AHF ASV	1C0907379K	TCS	FS-III	yes	yes	yes	21505
		1C0907379L	ABS	FS-III	yes	yes	yes	01025
		1C0907379M	ESP	FS-III	yes	yes	no	19458
		1C0907379M	ESP	FS-III	yes	no	yes	19586
		1C0907379C	ABS	FS-III	yes	yes	yes	01025
		1C0907379D	TCS	FS-III	yes	yes	yes	21505
		1C0907379E	ESP	FS-III	yes	yes	no	19458
		1C0907379E	ESP	FS-III	yes	no	yes	19586
		1C0907379J	ABS	FS-III	yes	yes	yes	01025
		1C0907379G	ESP	FS-III	yes	yes	no	19458
		1C0907379G	ESP	FS-III	yes	no	yes	19586
1.9 l/96 kW	ASZ	1C0907379K	TCS	FS-III	yes	yes	yes	21505
		1C0907379L	ABS	FS-III	yes	yes	yes	01025
		1C0907379M	ESP	FN-3	yes	yes	no	19970
		1C0907379M	ESP	FN-3	yes	no	yes	20098
		1C0907379N	ESP 4x4	FN-3	no	yes	no	23046
		1C0907379N	ESP 4x4	FN-3	no	no	yes	23174
		1C0907379C	ABS	FS-III	yes	yes	yes	01025
		1C0907379D	TCS	FS-III	yes	yes	yes	21505
		1C0907379E	ESP	FN-3	yes	yes	no	19970
		1C0907379E	ESP	FN-3	yes	no	yes	20098
		1C0907379F	ESP 4x4	FN-3	no	yes	no	23046
		1C0907379F	ESP 4x4	FN-3	no	no	yes	23174
		1C0907379J	ABS	FS-III	yes	yes	yes	01025
		1C0907379J	TCS	FS-III	yes	yes	yes	21505
		1C0907379G	ESP	FN-3	yes	yes	no	19970
		1C0907379G	ESP	FN-3	yes	no	yes	20098
		1C0907379H	ESP 4x4	FN-3	no	yes	no	23046
		1C0907379H	ESP 4x4	FN-3	no	no	yes	23174

Reading measured value block

Special tools, testers and aids required

⇒ page 45-24

Safety measures

⇒ page 45-25

Test sequence and test table with measured values

⇒ page 45-25

Testing wheel speed sensor assignment

Display group number 001:

⇒ page 45-25

Starting speed

Display group number 002:

⇒ page 45-26

Testing operation of brake light switch for ABS and ABS/EDL function and the warning lights for ABS (K47) and handbrake/brake fluid level (K14/33)

Display group number 003

Read measured value block Enter display group number XXX

◄ Readout in display:

- Press keys 0, 0 and 3 for the „Display group number 003“ and confirm the entry with the key Q.

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

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

Read measured value block 3 → not op. off off

◄ Readout in display:

Display block	Test conditions	Readout on V.A.G 1552
1	♦ Brake pedal not operated ♦ Brake pedal operated	not op. operated
2	K47	off/on
3	K14/33	off/on
4	Not assigned	—

The readout in display blocks 2 and 3 changes constantly from „off“ to „on“.

If the readout does not appear as described:

- Perform electrical test ⇒ from page 45-41.

Another possible cause of the fault may be that the brake light switch is not correctly set ⇒ page 45-96.

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

Test of databus

Display group number 125:

Read measured value block Enter display group number XXX

◄ Readout in display:

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

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

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

Read measured value block 3 → eng 1 gearb 1

◄ Readout in display:

Display block	Designation	Readout on V.A.G 1552
1	Engine control module at databus	eng 1
	Engine control module not at databus	eng 0
2	Not assigned	—
3	Not assigned	—
4	Gearbox control unit at databus[1)]	gearb 1
	Gearbox control unit not at databus[1)]	gearb 0

[1)] Only on models fitted with automatic gearbox

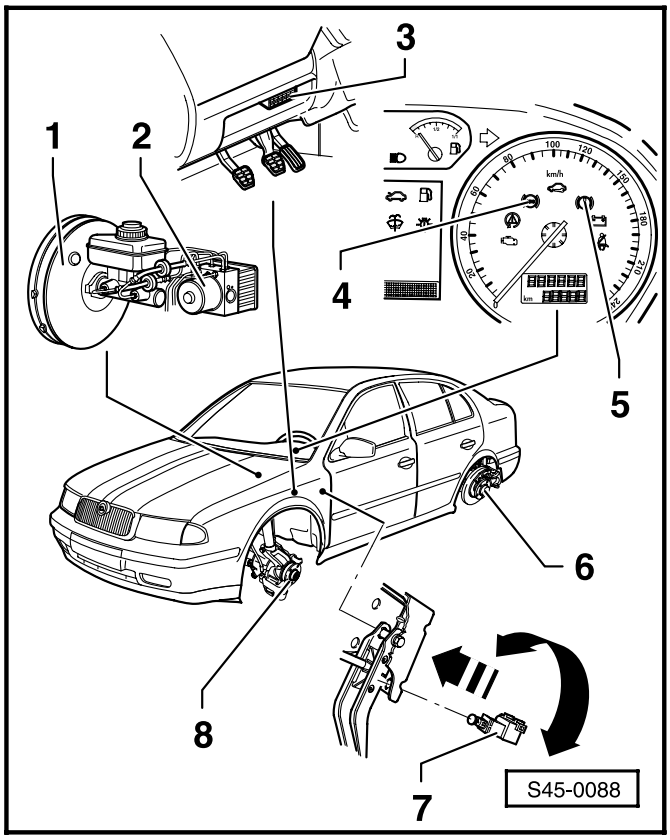
Final control diagnosis

⇒ Antilock Brake System (ABS) ITT Mark 20 IE, Self-Diagnosis ⇒ page 45-29.

Initiating basic setting

⇒ Antilock Brake System (ABS) ITT Mark 20 IE, Self-Diagnosis ⇒ page 45-36.

Electrical/electronic components and fitting locations ABS/EDL/TCS Mark 60



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

1 - Brake servo unit with brake master cylinder and brake fluid reservoir
- ♦ assembly overview ⇒ page 47-36

2 - Hydraulic control unit 1)
- ♦ fitting location: in left of engine compartment
- ♦ removing and installing ⇒ page 45-196
- ♦ servicing ⇒ page 45-200

3 - Diagnostic connection
- ♦ fitting location: in stowage compartment driver side

4 - ABS warning light (K47)
- ♦ fitting location: in dash panel insert

Function:
- ♦ ABS warning light comes on:
- for about 2 seconds after ignition is switched on and/or engine start
- if fault is detected (e.g. open circuit to wheel speed sensor)

⇒ page 45-180

5 - Handbrake/brake fluid level warning light (K14/33)
- ♦ fitting location: in dash panel insert

Function:
- ♦ The handbrake/brake fluid warning light comes on:
- when handbrake applied
- if brake fluid level is low
- for about 2 seconds after ignition is switched on
- if the electronic brake force distribution fails, i.e. if the ABS warning light comes on

⇒ page 45-180

6 - Parts of ABS system at rear axle
(illustration shows only disc brakes)
- ♦ rear right and left wheel speed sensor -G44/G46 1)
- removing and installing ⇒ page 45-65
- installing wheel speed sensor cables ⇒ page 45-67
- ♦ rear right and left pulse rotor for wheel speed sensor
- testing ⇒ page 45-66
- removing and installing: the pulse rotor should be replaced together with the wheel hub ⇒ page 42-23 and 42-28

7 - Brake light switch -F-
- ♦ is open in off position
- adjusting ⇒ page 45-69
- remove by turning 90° to left ⇒ page 45-69
- install by turning 90° to right ⇒ page 45-69
- ♦ must be tested in measured value block ⇒ page 45-192

8 - Parts of ABS system at front axle
- ♦ front right and left wheel speed sensor -G45/G47 1)
- removing and installing ⇒ page 45-60
- installing wheel speed sensor cables ⇒ page 45-201
- ♦ front right and left pulse rotor for wheel speed sensor
- testing ⇒ page 45-61
- removing and installing: the pulse rotor should be replaced together with the wheel hub ⇒ page 40-13

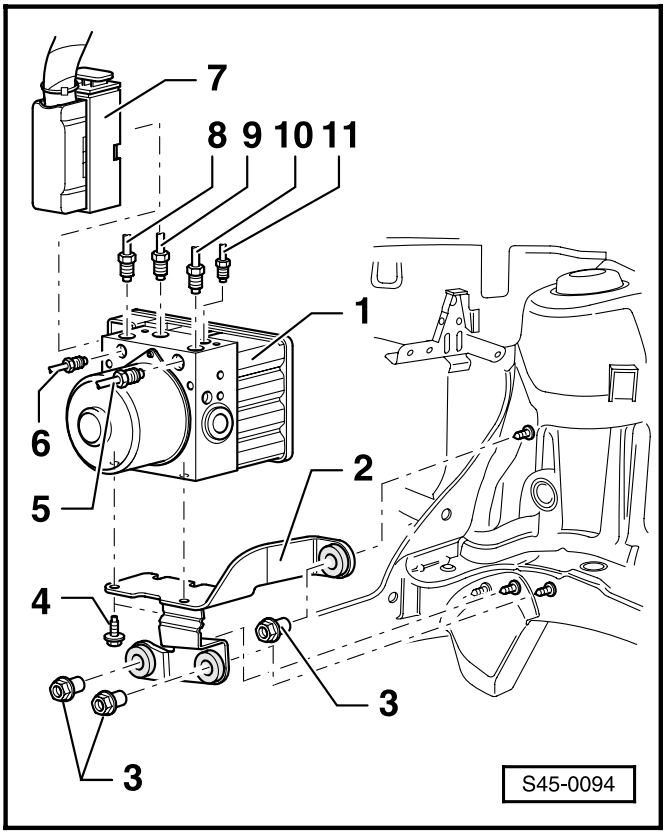
Removing and installing hydraulic control unit and bracket

Note:

As a general rule, always ensure that no brake fluid gets into the connector housing of the control unit.
This can result in corrosion to the contacts and thus in a failure of the system.
If the plug housing is soiled, it should be carefully cleaned with compressed air.

Special tools, testers and aids required

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



1 - Hydraulic control unit
- The hydraulic pump -V64-, the hydraulic unit -N55- and the control unit -J104- together form the hydraulic control unit.
- The hydraulic control unit should be removed and installed as a complete unit ⇒ page 45-197.
- The connections of the brake lines are stamped on the hydraulic unit.
- Servicing ⇒ page 45-200

2 - Bracket

3 - Insert flange nut, 20 Nm

4 - Hexagon bolt, 8 Nm

5 - Brake line, 14 Nm
- Hydraulic unit to rear left wheel cylinder/brake caliper

6 - Brake line, 14 Nm
- Hydraulic unit to rear right wheel cylinder/brake caliper

7 - Multipin connector of control unit
- 47-pin
- Do not separate plug connection before self-diagnosis is completed. Switch off ignition before separating the plug connection.

8 - Brake line, 14 Nm
- Between brake master cylinder/push-rod piston circuit and hydraulic unit

9 - Brake line, 14 Nm
- Hydraulic unit to front left brake caliper

10 - Brake line, 14 Nm
- Between brake master cylinder/floating piston circuit and hydraulic unit

11 - Brake line, 14 Nm
- Hydraulic unit to front right brake caliper

Removing hydraulic control unit

Notes:

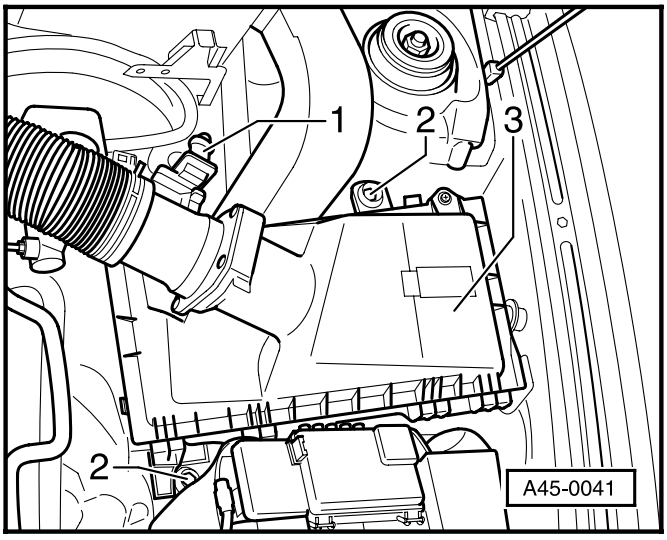
- *Before disconnecting the battery, determine the code of radio set fitted with anti-theft coding.*
- *When the battery is re-connected, please check the vehicle equipment:*
  - Enter radio code
  - Re-set clock
  - Initialise power windows.

⇒ Inspection and Maintenance

- Disconnect battery.

Note:

The following 2 steps do not apply to the 1.4-ltr./55 kW engine:

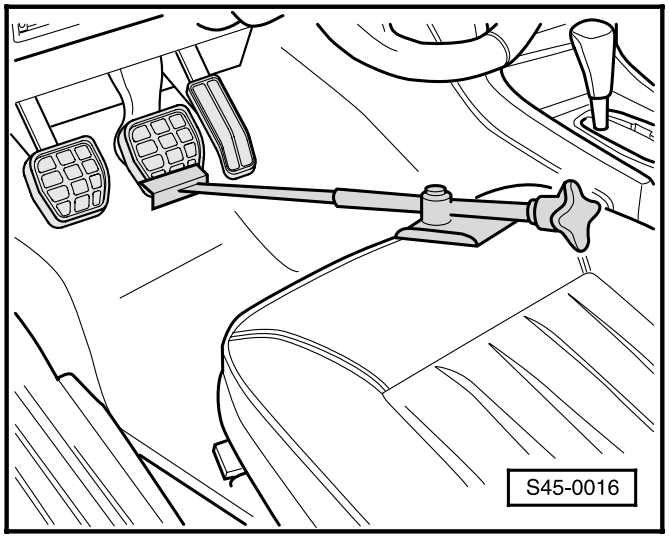


◄- Unplug the connector -1- of the air mass meter at the air guide pipe of the air filter.

- Take out the bolts -2- at the air filter -3- and place filter to the side.

- On diesel engines, remove relay carrier above brake servo unit.

- Extract as much brake fluid as possible from the brake fluid reservoir with a bleeder bottle.

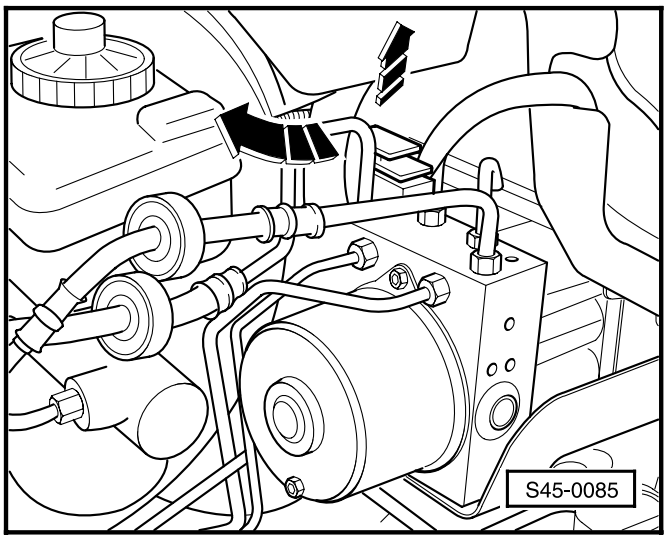


◄ - Depress brake pedal and lock in position with brake pedal depresser, e.g. V.A.G 1238/B.

- Fit the bleeder hose of the bleeder bottle onto the bleeder screw of the front left brake caliper and open bleeder screw.

- After brake fluid has flowed out, close bleeder screw.

- Detach bleeder hose from the bleeder screw.



◄ - Unlock multipin connector and unplug from control unit -arrows-.

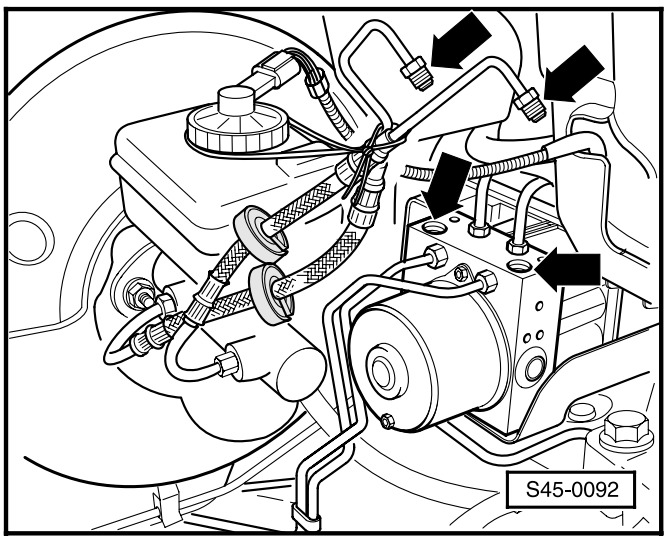
Note:

Ensure that no brake fluid gets onto the contacts.

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

Note:

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

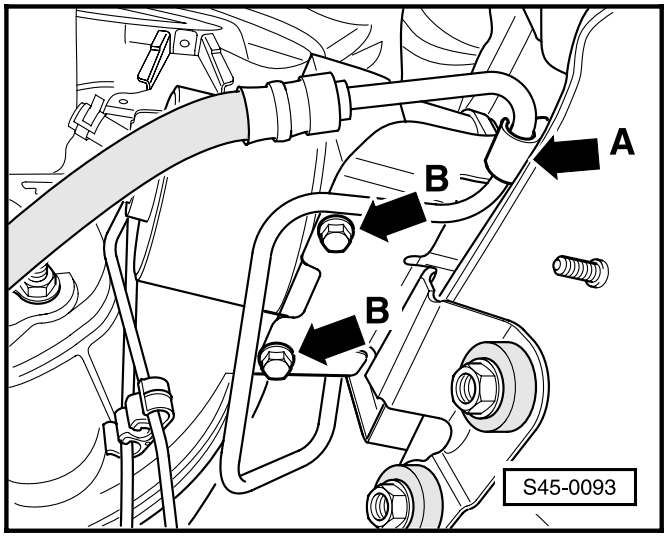


◄ - Detach the brake lines from the brake master cylinder to hydraulic unit, see arrows, and fit on plugs from installation parts kit to protect them from dirt.

- On models with left-hand steering, tie up the detached brake lines with a welding wire as high up as possible so that the ends of the lines project above the fluid level in the brake fluid reservoir -arrows-.

- Detach the remaining brake lines from the hydraulic unit.

- Seal the connections of the hydraulic lines at the hydraulic unit with the plugs from the installation parts kit.



◄- Unclip cable for clutch control -arrow A-.

- Remove bolts -arrows B- at the bracket of the hydraulic control unit.

- Take out hydraulic control unit.

Installing hydraulic control unit

Note:

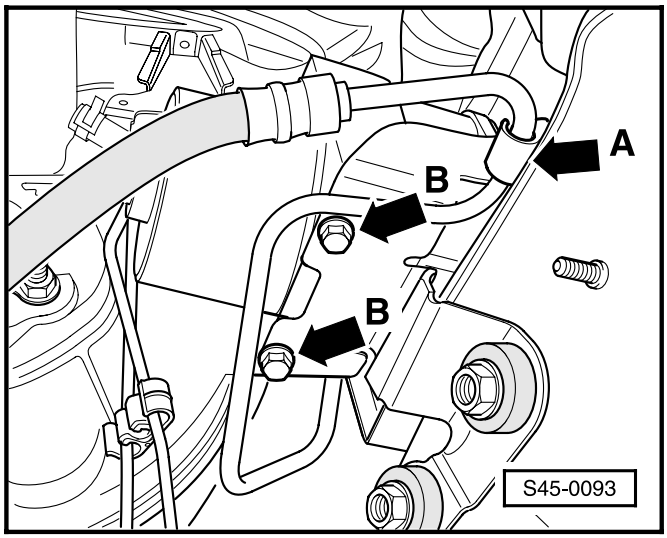
Do not remove plugs at the hydraulic unit until the appropriate brake line is fitted on.

- Bolt hydraulic control unit onto bracket.

Note:

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

- Attach brake lines to the hydraulic unit and tighten fully ⇒ page 45-196.



◄- Bolt hydraulic control unit tight -arrows B-.

- Clip cable for clutch control -arrow A- in place.

- Plug multipin connector into the control unit and lock.

The remaining installation is carried out in the reverse order.

- Connect battery.

- Bleed brake system ⇒ page 47-18.

- Code control unit ⇒ page 45-190.

- Interrogate fault memory ⇒ page 45-12.

- Erase fault memory ⇒ page 45-21.

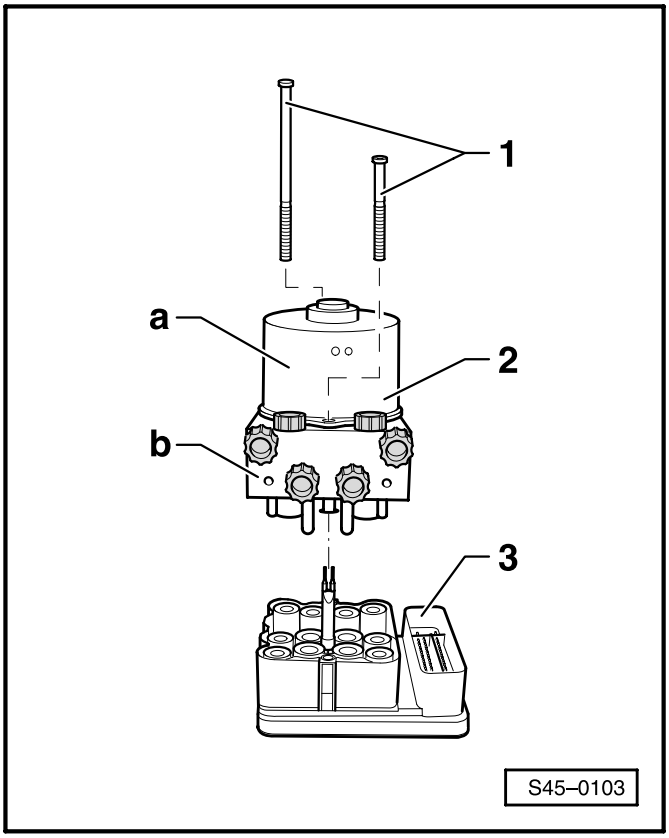
Servicing hydraulic control unit

Notes:

- *The components of the hydraulic control unit are plugged together and connected by means of 2 screws.*
- *Before removing the Torx screws, use adhesive tape to prevent hydraulic pump unintentionally separating from the hydraulic unit.*
- *Hydraulic pump and hydraulic unit are supplied as a single replacement part.*

Warning!

The hydraulic pump must not be separated from the hydraulic unit.



1 - Torx screw, 8 Nm

2 - Hydraulic unit
The hydraulic unit consists of:
a - Hydraulic pump -V64-
b - Hydraulic unit -N55-
- the valve block contains the control valves
- after separating from control unit, fit on transport protection for valve domes

3 - ABS or ABS/TCS/EDL control unit -J104-
- when detaching from hydraulic unit, the valve domes of the hydraulic unit must not be tilted with the solenoids of the control unit
- cover over solenoids with a non-fluffing cloth
- contact assignment ⇒ page 45-202
- test requirements ⇒ page 45-9

Assembling hydraulic unit

Notes:

- *There must not be any impurities in the area of the control unit-valve block.*
- *When assembling control unit and hydraulic unit, ensure that the valve domes of the hydraulic unit are not tilted with the solenoids of the control unit.*

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

⇒ Antilock Brake System (ABS) ITT Mark 20 IE, Self-Diagnosis ⇒ page 45-60.

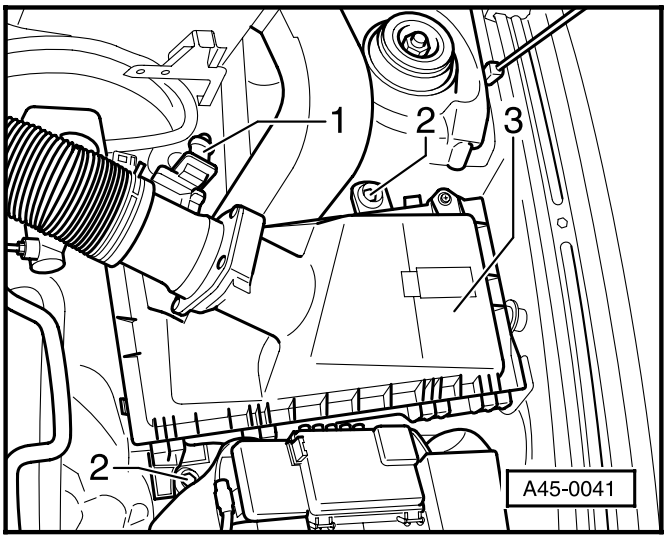
Removing and installing front wheel speed sensor cables

Removing

Notes:

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

⇒ Inspection and Maintenance



- Disconnect battery.

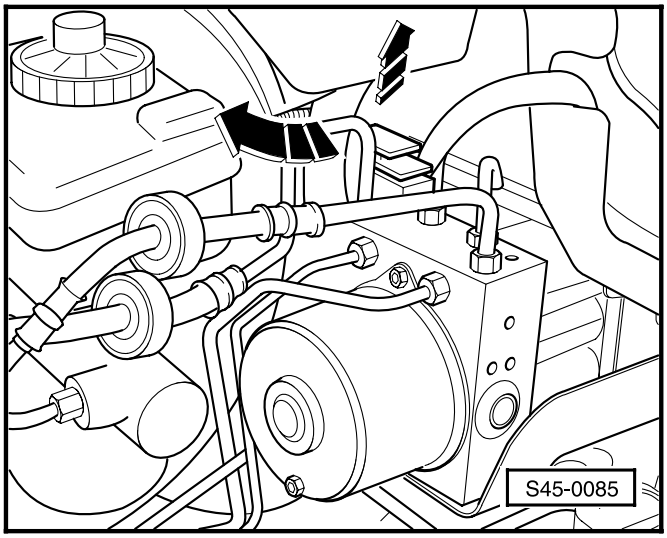
Note:

The following 2 steps do not apply to the 1.4-ltr./55 kW engine:

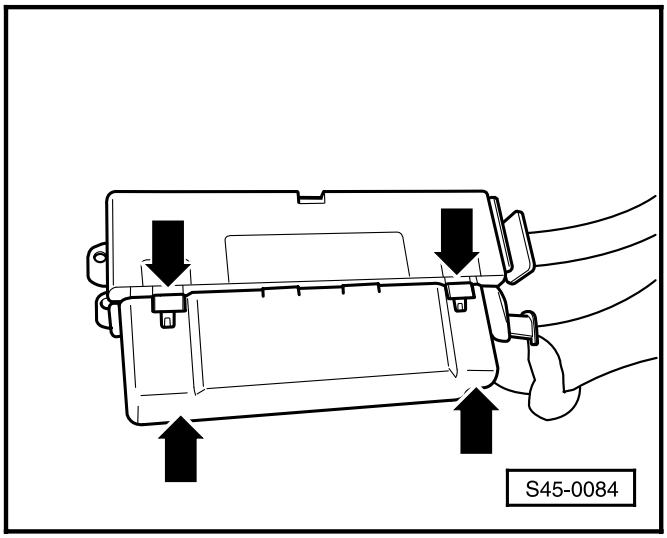
◄- Unplug connector of the air mass meter -1- from the air guide pipe of the air filter.

- Remove screws -2- at the air filter -3- and place filter to the side.

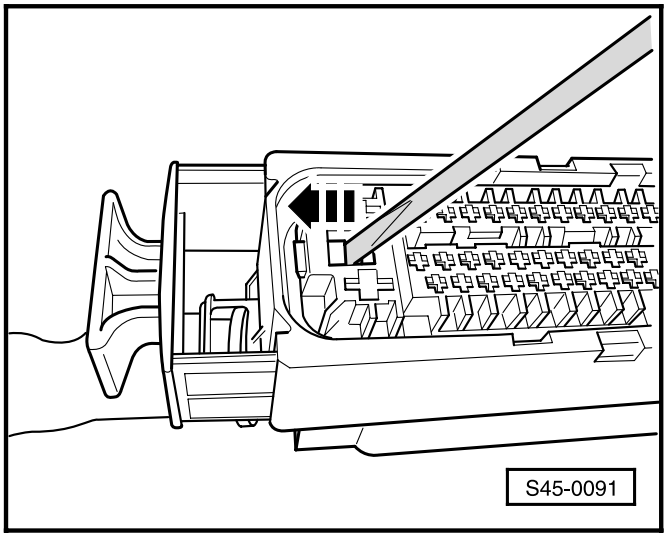
- On diesel engines, remove relay carrier above brake servo unit.



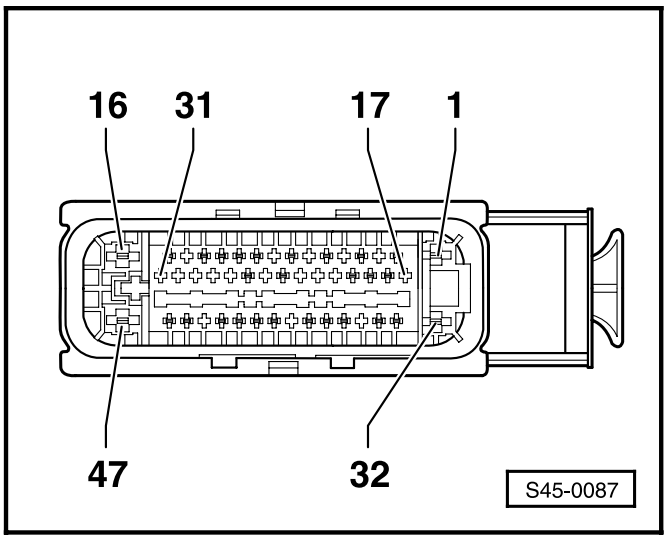
◄- Release multipin connector and unplug from control unit -arrows-.



◄ - Use a screwdriver to detach cap of multipin connector -arrows- and take off.



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



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

Contact	Cable connection to component ...
33 + 34	Front right wheel speed sensor -G45-
45 + 46	Front left wheel speed sensor -G47-
42 + 43	Rear right wheel speed sensor -G44-
36 + 37	Rear left wheel speed sensor -G46-

- Use a suitable ejection tool from the wiring loom repair kit to knock out the appropriate contacts.

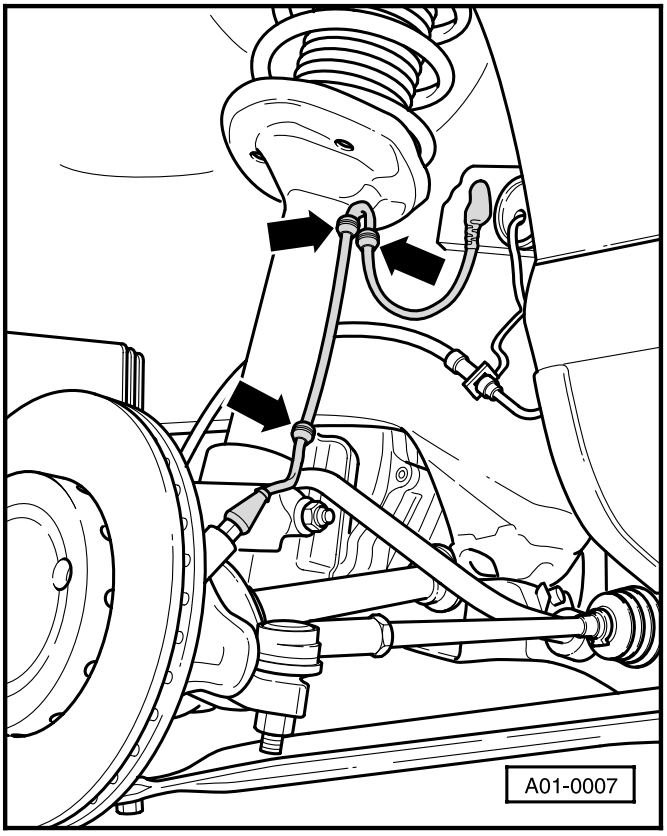
- Release connector at wheel speed sensor and separate plug connection.

- Remove faulty wheel speed sensor cable.

Installing

- Pull in new wheel speed sensor cable.

- Connect wheel speed sensor cable to wheel speed sensor.



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

Note:

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

- Insert contact into the plug housing and use a suitable insertion tool from the wiring loom repair kit to push in the single-wire seal as far as the stop.

- Secure contacts with the secondary lock and fit the cap of the multipin connector onto this.

- Connect battery ⇒ page 45-197.

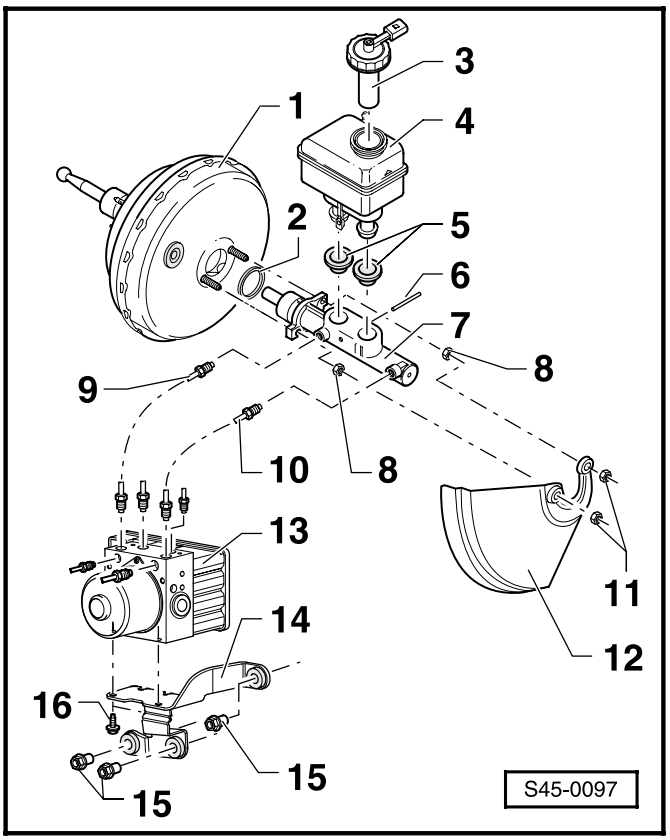
- Interrogate fault memory ⇒ page 45-12.

- Erase fault memory ⇒ page 45-21.

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

⇒ Antilock Brake System (ABS) ITT Mark 20 IE, Self-Diagnosis ⇒ page 45-65.

Assembly overview of hydraulic control unit, brake servo unit/brake master cylinder ABS/EDL/TCS Mark 60



Notes:

- *The hydraulic control unit should be removed and installed complete ⇒ from page 45-196.*
- *Servicing ⇒ from page 45-200.*
- *Connections of brake lines should be tightened as a general rule to a torque of 14 Nm.*

1 - Brake servo unit
- operational check ⇒ page 47-4
- removing and installing ⇒ page 47-32

2 - Seal
- replace

3 - Cap
- with integrated brake fluid level warning contact -F34-

4 - Brake fluid reservoir

5 - Sealing plug
- moisten with brake fluid and press in expansion reservoir

6 - Retaining pin

7 - Brake master cylinder
- cannot be serviced; replace complete if fault exists
- removing and installing ⇒ page 47-2

8 - Self-locking hexagon nut, 20 Nm
- replace

9 - Brake line
- brake master cylinder/pushrod piston circuit to hydraulic unit

10 - Brake line
- brake master cylinder/floating piston circuit to hydraulic unit

11 - Self-locking hexagon nut, 20 Nm
- fitted only to certain models
- replace

12 - Heat shield
- fitted only to certain models

13 - Hydraulic control unit
- removing and installing ⇒ page 45-196
- servicing ⇒ page 45-200
- brake line connections ⇒ page 45-205

14 - Bracket
- with rubber shock absorber

15 - Insert flange nut, 20 Nm

16 - Hexagon bolt, 8 Nm

Electrical test of ABS/EDL/ TCS Mark 60

Special tools, testers and aids required

- Hand-held multimeter, e.g. V.A.G 1526 A
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A
- Adapter V.A.G 1598/36

The test steps from page 45-207 apply only to models fitted with ABS/EDL/TCS

- Vehicles on which self-diagnosis does not provide any indication of the source of the fault. In this case, carry out the complete electrical test.
- Vehicles on which self-diagnosis provides a direct indication of the source of the fault. In this case, carry out only the test steps recommended in the fault table (specific testing).

Overview of all the test steps of the electrical test ⇒ page 45-207.

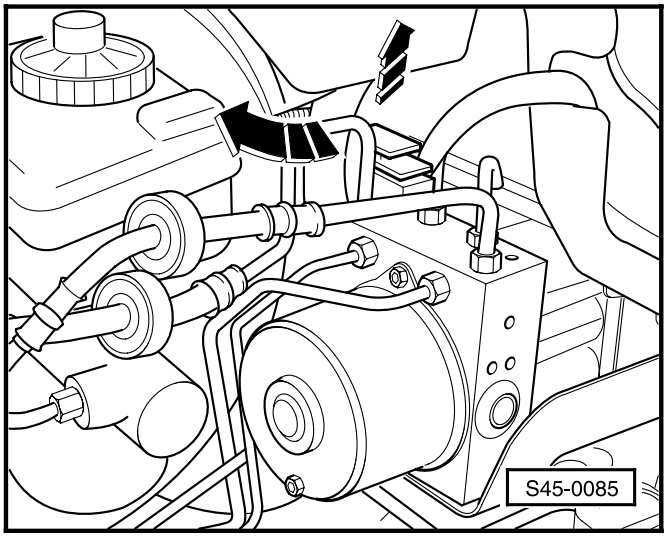
Test requirements

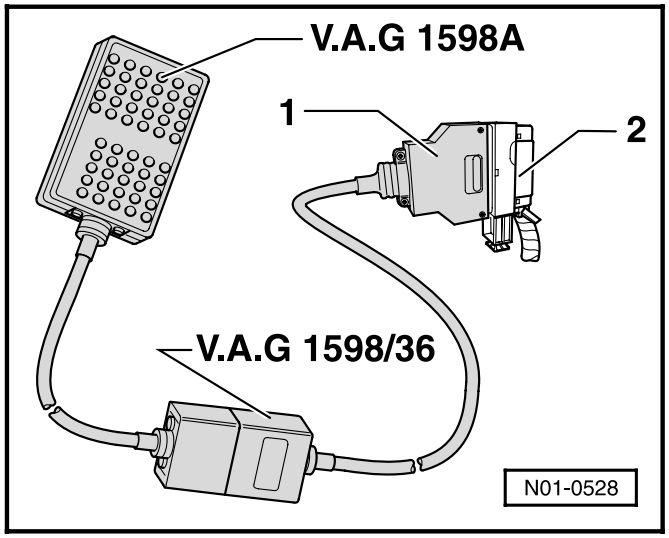
- Before commencing the test, switch off ignition and electrical components (headlights, lighting, fan ...).
- Fuses must be o.k. (as a check, remove fuses from fuse holder).

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

- Remove protective housing for relays from cable duct.

◄- Unlock connector -1- at control unit -J104- -arrow a- and unplug -arrow b-.





◄ - Connect test box V.A.G 1598 A with adapter V.A.G 1598/36 -1- to the multipin plug connection of the control unit -J104- -2-.

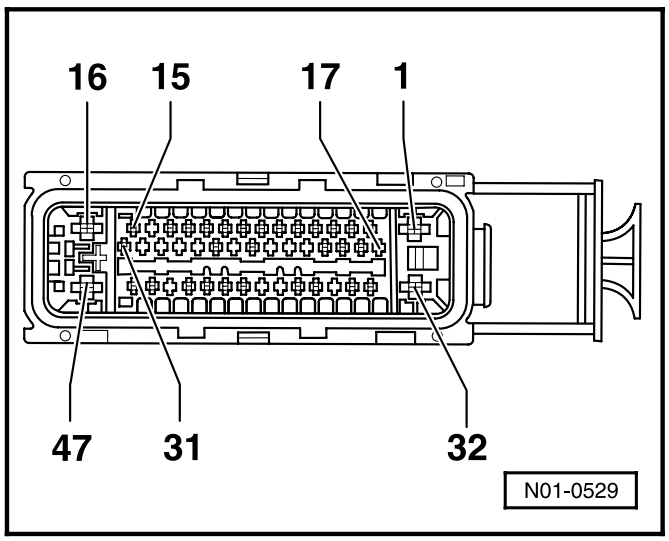
Note:

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

Multipin plug connections with contact assignment for ABS, ABS/ EDL/TCS

Contact assignment of plug connection T16a of diagnosis socket

⇒ page 45-134



◄ **Contact assignment of plug connection T47a wiring loom/control unit -J104-**

Note:

Plug contacts not listed are not assigned.

1 - Voltage supply battery + (through S162)

2 - Plug connection T16a/7, K wire

4 - Terminal 15 through S9

8 - Only on models with Navigation system

10 - Only on models with Navigation system and gas discharge headlights

11 - Databus line
⇒ “Current Flow Diagrams, Electrical Fault Finding and Fitting Locations” binder

13 - TCS/ASR pushbutton -E132-

14 - Coding bridge to contact 38

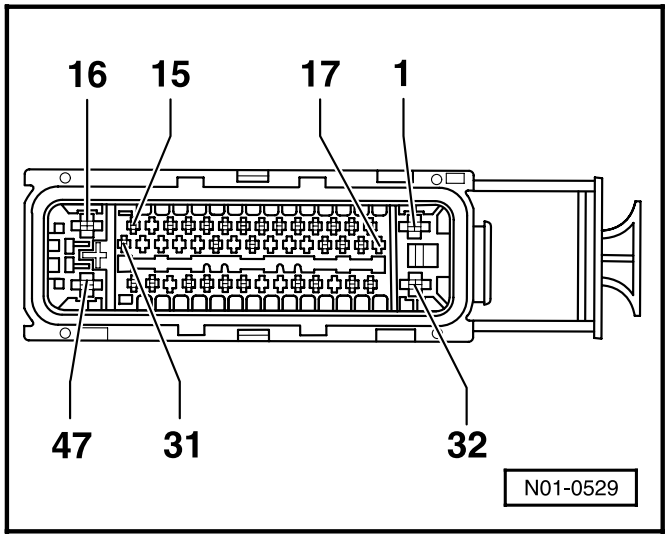
15 - Databus line
⇒ “Current Flow Diagrams, Electrical Fault Finding and Fitting Locations” binder

16 - Earth

32 - Voltage supply of battery + (through S163)

33 - Front right wheel speed sensor -G45-

34 - Front right wheel speed sensor -G45-



36 - Rear left wheel speed sensor -G46-
37 - Rear left wheel speed sensor -G46-
38 - Coding bridge to contact 14
41 - Brake light switch -F-
42 - Rear right wheel speed sensor -G44-
43 - Rear right wheel speed sensor -G44-
44 - Dash panel insert, only models fitted with ABS
45 - Front left wheel speed sensor -G47-
46 - Front left wheel speed sensor -G47-
47 - Earth

List of test steps

Component to be tested	
Voltage supply of hydraulic pump -V64- to control unit -J104	- Perform test step 1
Voltage supply of valves in hydraulic unit -N55- to control unit -J104	- Perform test step 2
Voltage supply (ignition/starter switch) to control unit -J104	- Perform test step 3
Operation of brake light switch -F	- Perform test step 4
Resistance of front right wheel speed sensor -G45	- Perform test step 5
Resistance of front left wheel speed sensor -G47	- Perform test step 6
Resistance of rear right wheel speed sensor -G44	- Perform test step 7
Resistance of rear left wheel speed sensor -G46	- Perform test step 8
Voltage signal of front right wheel speed sensor -G45	- Perform test step 9
Voltage signal of front left wheel speed sensor -G47	- Perform test step 10
Voltage signal of rear right wheel speed sensor -G44	- Perform test step 11
Voltage signal of rear left wheel speed sensor -G46	- Perform test step 12
Operation of ABS warning light -K47-	- Perform test step 13
Operation of handbrake/brake fluid level warning light -K14/33-	- Perform test step 14
Operation of TCS/ASR pushbutton -E132	- Perform test step 15
Test of databus line	- Perform test step 16
Voltage supply of V.A.G 1551, plug connection T16a	- Perform test step 17
Resistance of K wire for self-diagnosis, plug connection T16a	- Perform test step 18
Coding bridge	- Perform test step 19

Test table

Notes on test table

- *The socket designations of test box with adapter V.A.G 1598/36 are identical to the contact designations of the control unit -J104- in the current flow diagram.*

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

- *If the measurements obtained differ from the specifications, carry out the measures indicated in the right-hand part of the table for rectifying the fault.*

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

- *Conduct continuity tests with adapter cable set V.A.G 1594 A (bridges).*
- *If the measurements obtained differ only slightly from the specifications, then clean the sockets and connectors of the testers and test cables (with contact spray G 000 700 04) and repeat the test. Before replacing the particular components, inspect the cables and connections and also repeat the resistance measurement at the component, particularly if the specifications are less than 10 Ω.*

Switch on measuring range: Voltage measurement (20 V =)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
1	1 + 47	Voltage supply for hydraulic pump -V64- (terminal 30) at control unit -J104	• Ignition switched off	10.0 - 14.5 V	- Test wiring according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
2	32 + 16	Voltage supply for valves in hydraulic unit -N55- (terminal 30) at control unit -J104	• Ignition switched off	10.0 - 14.5 V	- Test wiring according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
3	4 + 47	Voltage supply (terminal 15) of control unit -J104	• Ignition switched on	10.0 - 14.5 V	- Test wiring according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
4	47 + 41	Operation of brake light switch -F	• Ignition switched off • Brake pedal not operated - Operate brake pedal	0.0 - 0.5 V approx. battery voltage	- Test brake light switch -F- and read measured value block ⇒ page 45-192, display group number 003. - Test wiring according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Test brake light switch -F- ⇒ page 45-69.1.

Switch on measuring range: Resistance measurement (2 kΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
5	33 + 34	Resistance of front right wheel speed sensor -G45	• Ignition switched off	1.0...1.3 kΩ	- Test wiring according to CFD. - Move cables during test. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder If no fault is found in the wiring: - Replace wheel speed sensor -G45- ⇒ page 45-60.
6	45 + 46	Resistance of front left wheel speed sensor -G47	• Ignition switched off	1.0...1.3 kΩ	- Test wiring according to CFD. - Move cables during test. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder If no fault is found in the wiring: - Replace wheel speed sensor -G47- ⇒ page 45-60.
7	42 + 43	Resistance of rear right wheel speed sensor -G44	• Ignition switched off	1.0...1.3 kΩ	- Test wiring according to CFD. - Move cables during test. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder If no fault is found in the wiring: - Replace wheel speed sensor -G44- ⇒ page 45-65.
8	37 + 36	Resistance of rear left wheel speed sensor -G46	• Ignition switched off	1.0...1.3 kΩ	- Test wiring according to CFD. - Move cables during test. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder If no fault is found in the wiring: - Replace wheel speed sensor -G46- ⇒ page 45-65.

Test step	V.A.G 1598 A bushes	Test of	• Test conditions - Additional work required	Nominal value	Measures to be taken when there is deviation from the nominal value
9	33 + 34	Voltage signal of the rotational speed sensor at the front on the right -G45	• Vehicle raised up • Ignition off - Turn the wheel at the front on the right at ca. 1 r.p.m.	 AC voltage of at least 65 mV	- Check installation of the rotational speed sensor -G45- and of the rotor - Check whether the rotational speed sensor -G45- has been swapped around and read the measuring value block ⇒ Page 45-192, indicator group number 001.
10	45 + 46	Voltage signal of the rotational speed sensor at the front on the left -G47	• Vehicle raised up • Ignition off - Turn the wheel at the front on the left at ca. 1 r.p.m.	 AC voltage of at least 190 mV	- Check installation of the rotational speed sensor -G47- and of the rotor - Check whether the rotational speed sensor -G47- has been swapped around and read the measuring value block ⇒ Page 45-192, indicator group number 001.
11	42 + 43	Voltage signal of the rotational speed sensor at the rear on the right -G44	• Vehicle raised up • Ignition off - Turn the wheel at the rear on the right at ca. 1 r.p.m.	 AC voltage of at least 190 mV	- Check installation of the rotational speed sensor -G44- and of the rotor - Check whether the rotational speed sensor -G44- has been swapped around and read the measuring value block ⇒ Page 45-192, indicator group number 001.
12	37 + 36	Voltage signal of the rotational speed sensor at the rear on the left -G46	• Vehicle raised up • Ignition off - Turn the wheel at the rear on the left at ca. 1 r.p.m.	 AC voltage of at least 190 mV	- Check installation of the rotational speed sensor -G46- and of the rotor - Check whether the rotational speed sensor -G46- has been swapped around and read the measuring value block ⇒ Page 45-192, indicator group number 001.

Operational test: ABS warning light -K47-					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
13	-	Operation of ABS warning light -K47-	• Ignition switched off - Switch ignition on	Warning light -K47- comes on for about 2 s and goes out again.	- Test wiring according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Fault in dash panel insert. ⇒ Electrical System; Repair Group 90; Dash Panel Insert; Self-Diagnosis of Dash Panel Insert

Operational test: Handbrake/brake fluid level warning light -K14/33-					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
14	-	Operation of handbrake/brake fluid level warning light -K14/33-	• Handbrake not applied • Brake fluid at correct level • Ignition switched on	Warning light -K14/33- does not come on.	- Test wiring according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
			- Apply handbrake	Warning light -K14/33- comes on.	- Fault in dash panel insert. ⇒ Electrical System; Repair Group 90; Dash Panel Insert; Self-Diagnosis of Dash Panel Insert

Operational test: Operation of TCS/ASR pushbutton -E132-					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
15	-	Operation of TCS pushbutton -E132-	• Ignition switched on	TCS warning light -K86- comes on for 2 seconds and goes out again.	
			- Operate TCS button -E132-.	TCS warning light -K86- comes on.	- Test wiring according to CFD ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
			- Operate TCS button -E132- once again.	TCS warning light -K86- goes out.	- Replace TCS button -E132- ⇒ Body Fitting Work; Repair Group 70; Dash Panel; Removing and installing dash panel

Switch on measuring range: Resistance measurement (200 Ω/20 MΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
16	11 or 15	Databus lines	• Ignition switched off • Measuring range 200 Ω set		
			- Separate multipin connections from the control units connected by means of a databus line: - Connect test box V.A.G 1598 A with adapter V.A.G 1598/36.		
			- Test databus lines for open circuit.	max. 1.5 Ω	- Test wiring according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
			- Set measuring range 20 MΩ. - Remove fuse S9.		
			- Test wiring for short circuit to positive or to earth.	∞ Ω	- Test wiring according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

Switch on measuring range: Voltage measurement (20 V =)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
17	-	Voltage supply for V.A.G 1552, plug connection T16a[1)]	• Ignition switched off - Connect hand-held multimeter V.A.G 1526 A with adapter cable set V.A.G 1594 to plug connection T16a [1)]:	10.0-14.5 V	- Test wiring according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

1) Contact assignment of diagnostic connector ⇒ page 45-206.

Switch on measuring range: Resistance measurement (200 Ω)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
18	-	Resistance of K wire for V.A.G 1552 plug connection T16a[1)]	• Ignition switched off - Separate multipin connection from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/36.		
			- Connect hand-held multimeter V.A.G 1526 with adapter cable set V.A.G 1594 to contacts T16a/7[1)] and T47a/2[2)] of multipin connection of control unit -J104-.	max. 1.5 Ω	- Test wiring according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

1) Contact assignment of diagnostic connector ⇒ page 45-206.

2) Contact assignment of control unit connector ⇒ page 45-206.

Switch on measuring range: Resistance measurement (200 Ω)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
19	14 + 38	Coding bridge for ABS/EDL/TCS	• Ignition switched off	0.0 - 1.0 Ω	- Test wiring according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

Antilock brake system ABS/ EDL/TCS/ESP Mark 60

Safety precautions, basic information on fault finding and servicing

⇒ Antilock Brake System ABS/EDL/ESP Mark 20IE ⇒ page 45-88

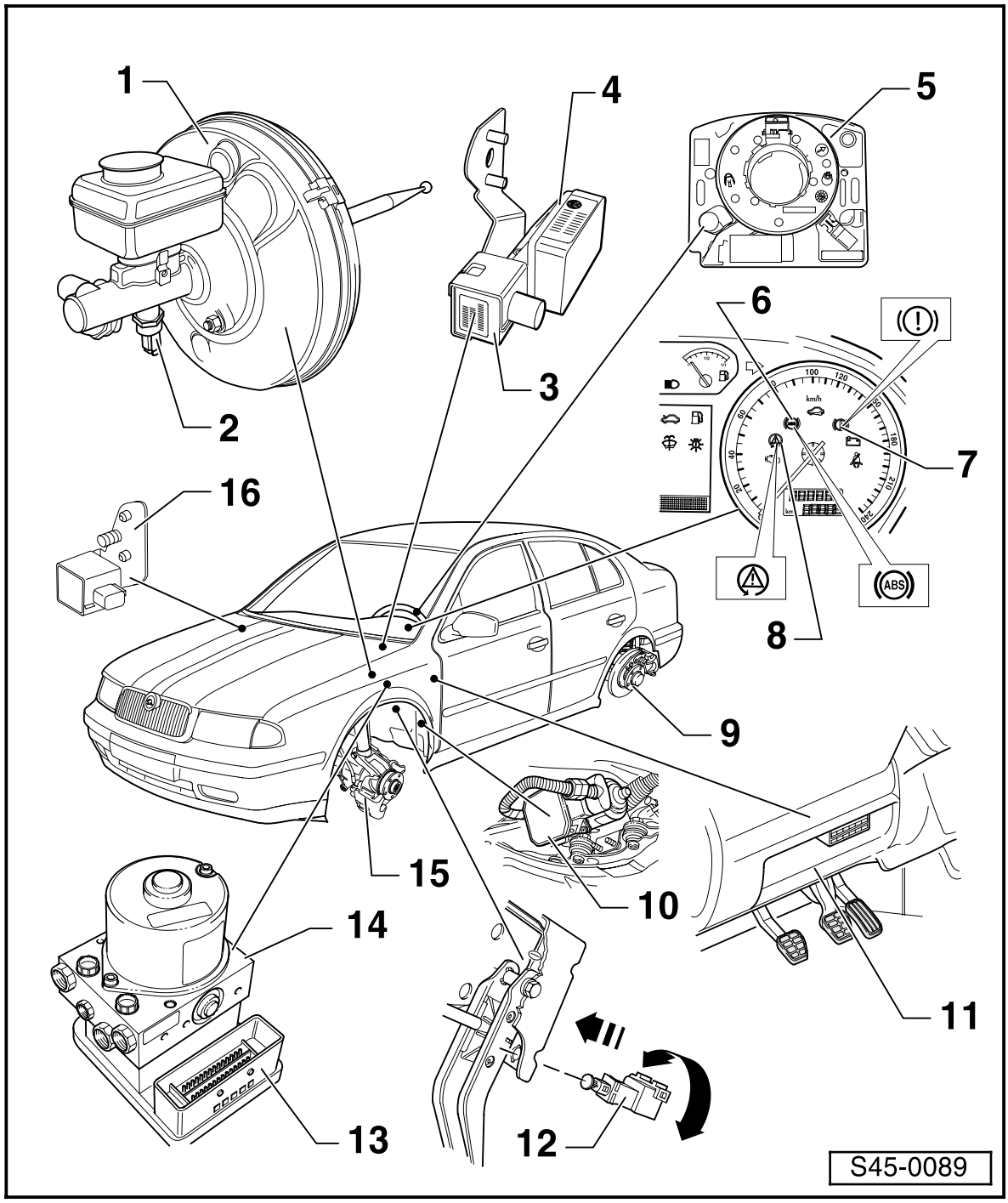
Information on repair operations to ABS/EDL/TCS/ESP Mark 60

⇒ Antilock Brake System ABS/EDL/ESP Mark 20IE ⇒ page 45-88

Technical information required

- „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder
- Service Technical Handbook

Electrical/electronic components and installed location of the ABS/EDL/ASR/ ESP Mark 60 ➤ MJ 02



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

1 - Brake booster

- With the master brake cylinder and brake fluid reservoir
- Removing and installing the brake booster ⇒ Page 47-32

2 - Sender -1- for the brake pressure -G201- 1)

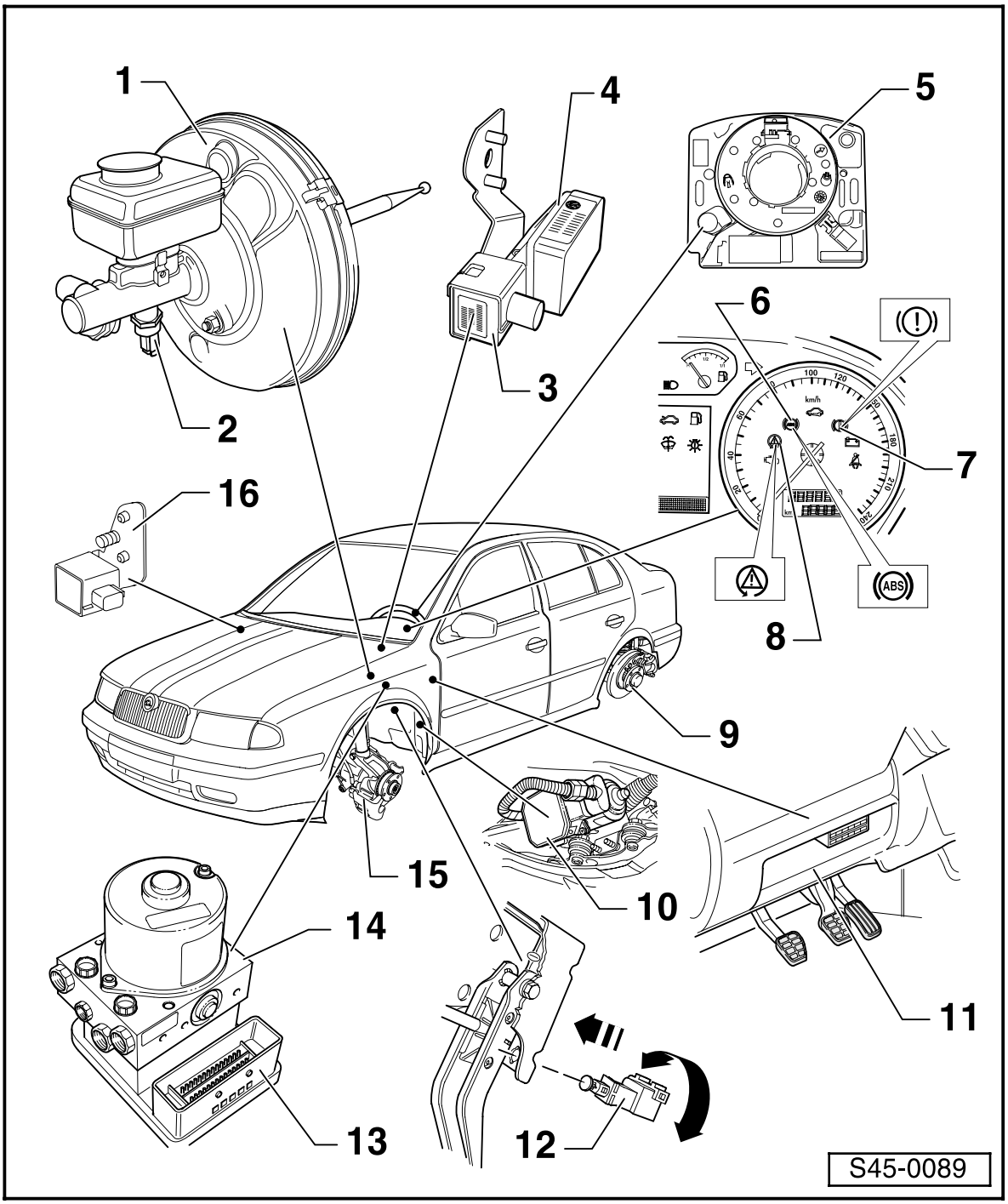
- Removing and installing ⇒ Page 47-28

3 - Sender for transverse acceleration -G200- 1)

- Installed location: next to the steering column under the dash panel

4 - Sender for the rotational speed -G202- 1)

- Installed location: next to the steering column under the dash panel



5 - Steering angle sender -G85- 1)
- Fitting location: on steering column between steering wheel and steering column switch

6 - ABS warning light -K47-
- Fitting location: in dash panel insert
- Operation ⇒ page 45-219

7 - Handbrake/brake fluid level warning light -K14/33-
- Fitting location: in dash panel insert
- Operation ⇒ page 45-219

8 - Electronic stability programme warning light -K155-
- Fitting location: in dash panel insert
- Operation ⇒ page 45-219

9 - Parts of ABS system at rear suspension

- ♦ Rear right and left wheel speed sensors -G44/G46- 1)
- - Removing and installing ⇒ page 45-65
- - Installing wheel speed sensor cables ⇒ page 45-67
- ♦ Pulse rotor for rear right and left wheel speed sensors
- - Testing ⇒ page 45-66
- - Removing and installing: pulse rotor is replaced together with wheel hub ⇒ page 42-23 and 42-28.

10 - Brake vacuum pump -V192-

- ♦ Only fitted to vehicles with automatic gearbox and in combination with EU-4 engines
- ♦ Fitting location: at left of subframe
- ♦ Is tested by self-diagnosis in engine control unit

⇒ Engine, Fuel Injection and Ignition System; Repair Group 01

- ♦ Removing and installing ⇒ page 47-38

11 - Diagnostic connection

- ♦ Fitting location: in storage compartment driver side

12 - Brake light switch -F- 1)

- ♦ Open in off position
- - Setting ⇒ page 45-69.1
- - Remove by turning 90° to the left ⇒ page 45-69.1
- - Install by turning 90° to the right ⇒ page 45-69.1
- ♦ Must be tested in measured value block 003 ⇒ page 45-238

13 - ABS/EDL/ESP control unit -J104-

- ♦ Fitting location: at hydraulic unit in left of engine compartment
- ♦ Is tested by self-diagnosis
- ♦ Test of multipin connection to control unit ⇒ page 45-251
- ♦ Do not unplug multipin plug connection before completing self-diagnosis. Switch ignition off before separating plug connection.

14 - Hydraulic control unit for ABS/EDL/ESP -N55- 1)

- ♦ Fitting location: in left of engine compartment
- ♦ Hydraulic unit -N55- consists of hydraulic pump -V64- and valve block with inlet and outlet valves
- ♦ If hydraulic unit is replaced, it is essential to seal old part with plugs from installation parts kit; Part No. ⇒ Parts List
- ♦ Removing and installing hydraulic control unit (hydraulic unit -N55- with control unit -J104-) ⇒ page 45-196
- ♦ Hydraulic pump -V64- and valve block must not be separated
- ♦ Servicing hydraulic control unit ⇒ page 45-200

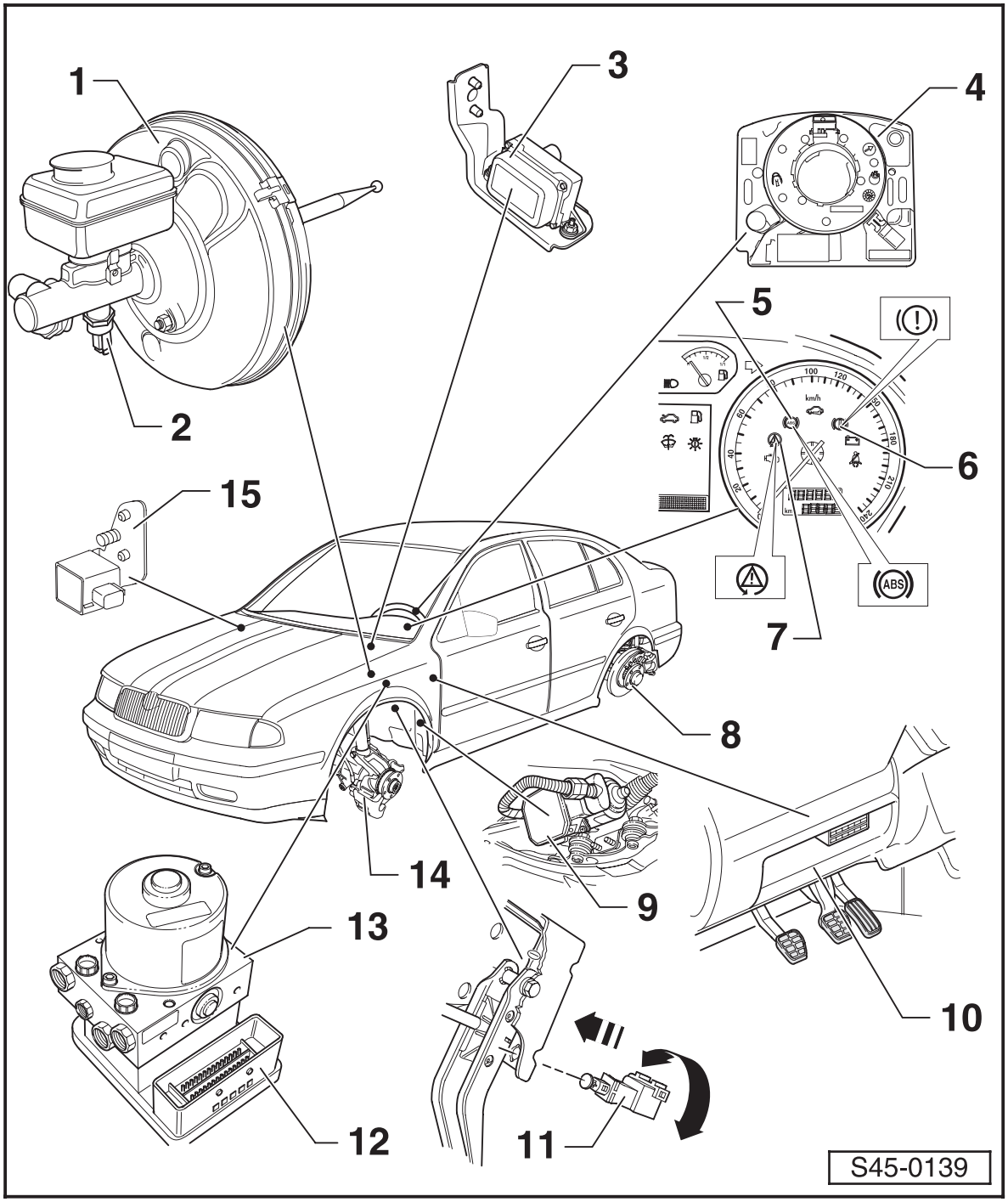
15 - Parts of ABS system at front suspension

- ♦ Front right and left wheel speed sensors -G45/G47- 1)
- - Removing and installing ⇒ page 45-60
- - Installing wheel speed sensor cables ⇒ page 45-201
- ♦ Pulse rotor for front right and left wheel speed sensors
- - Testing ⇒ page 45-61
- - Removing and installing: pulse rotor is replaced together with wheel hub ⇒ page 40-13.

16 - Longitudinal acceleration sender -G251- 1)

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

Electric/Electronic components and installation locations ABS/EDS/ASR/ESP Mark 60 MY 02 ➤



All the components marked[1)] with are detected by the self-diagnosis

1 - Brake booster
- ♦ with master brake cylinder and brake fluid reservoir
- ♦ removing and installing brake booster ⇒ page 47-32

2 - Brake pressure sender -1- -G201-[1)]
- ♦ removing and installing ⇒ page 47-28

3 - ESP -G419- sender unit
- ♦ 4 x 4 vehicles RHD without -G251-
- ♦ Installation location: next to the steering column below the dash panel

4 - Steering angle sender -G85-[1)]
- ♦ Installation location: on steering column between steering wheel and steering column switch

5 - Warning lamp for ABS -K47-
- ♦ Installed location: in the dash panel insert
- ♦ Function ⇒ Page 45-219

6 - Warning lamp for the handbrake and brake fluid level -K14/33-
- ♦ Installed location: in the dash panel insert
- ♦ Function ⇒ Page 45-219

7 - Warning lamp for the ESP -K155-
- ♦ Installed location: in the dash panel insert
- ♦ Function ⇒ Page 45-219

8 - Parts of the ABS system on the rear axle
- ♦ The rotational speed at the rear on the right and the left -G44/G46- 1)
- - Removing and installing ⇒ Page 45-65
- - Mounting of the rotational speed sensor lines ⇒ Page 45-67
- ♦ Impulse wheel for the rotational speed sensor at the rear on the right and the left
- - checking ⇒ Page 45-66
- - removing and installing: the impulse wheel should be changed along with the wheel hub ⇒ Page 42-23 and 42-28

9 - Vacuum pump for the brake -V192- 1)
- ♦ Only for vehicles with an automatic gearbox in connection with exhaust gas limit values according to EU-4
- ♦ Installed location: on the assembly carrier on the left
- ♦ Is checked by the self-diagnosis in the engine control unit

⇒ Engine, Injection and Ignition System; Rep. Gr. 01
- ♦ Removing and installing ⇒ Page 47-38

10 - Connection for diagnosis
- ♦ Installed location: in the storage compartment on the driver's side

11 - Brake light switch -F- 1)
- ♦ Is open in the idle state
- - adjusting ⇒ Page 45-69.1
- - remove by turning through 90° to the left ⇒ Page 45-69.1
- - remove by turning through 90° to the right ⇒ Page 45-69.1
- ♦ Testing: measuring value block 003 ⇒ Page 45-238

12 - Control unit for ABS/EDL/ESP -J104-
- ♦ Installed location: on the hydraulic unit in the engine compartment on the left
- ♦ Is checked by the self-diagnosis
- ♦ Check the multiple plug connection to the control unit ⇒ Page 45-251
- ♦ The ignition should be switched off before disconnecting the plug connection

13 - Hydraulic unit for ABS/EDL/ESP -N55- 1)
- ♦ Installed location: in the engine compartment on the left
- ♦ The hydraulic unit -N55- consists of the hydraulic pump -V64- and the valve block with the inlet and outlet valves
- ♦ When replacing an old part one must absolutely close it off with stops from the assembly set; spare part no. ⇒ spare parts catalogue
- ♦ The hydraulic control unit (hydraulic unit -N55- with control unit -J104- ⇒ Page 45-196
- ♦ The hydraulic pump -V64- and the valve block must be not be separated
- ♦ Repairing the hydraulic control unit ⇒ Page 45-200

14 - Parts of the ABS system on the front axle
- ♦ The rotational speed at the rear on the right and the left -G45/G47-1)
- - removing and installing ⇒ Page 45-60
- - mounting of the rotational speed sensor lines ⇒ Page 45-201
- ♦ Impulse wheel for the rotational speed sensor at the front on the right and the left
- - checking ⇒ Page 45-61
- - removing and installing: the impulse wheel should be changed along with the wheel hub ⇒ Page 40-13

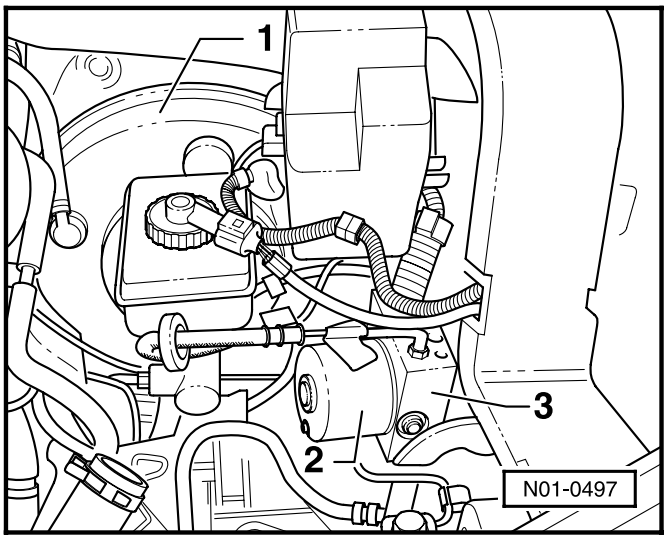
15 - Sender for the longitudinal acceleration -G251- 1)
- ♦ Installed location:
- - only for vehicles 4 x 4 RHD ⇒ on the central pipe on the right near the A column on the right

Distinguishing features of ABS/EDL/TCS Mark 60 and of ABS/EDL/TCS/ESP Mark 60

General information

⇒ page 45-89

Fitting location of ABS/EDL/TCS/ ESP Mark 60

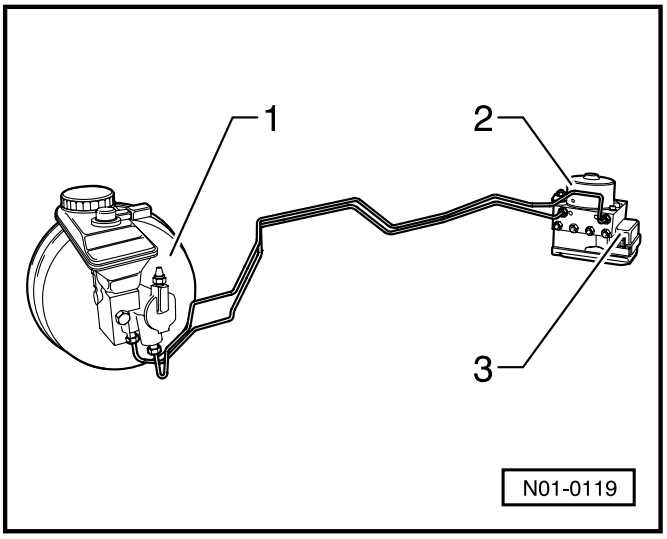


◄ **LHD models**

1 - Brake servo unit 10”

2 - Hydraulic unit

3 - Control unit, 47-pin, bolted to hydraulic unit



◄ **RHD models**

1 - Brake servo unit 9”/8”

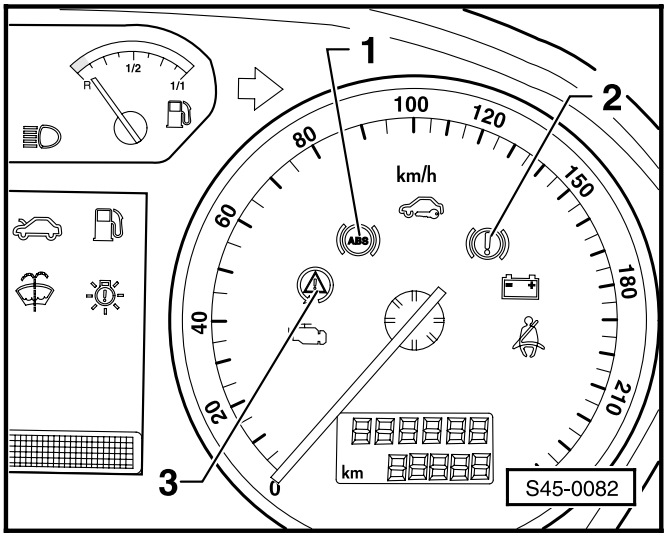
2 - Hydraulic unit

3 - Control unit, 47-pin, bolted to hydraulic unit

Self-diagnosis of the ABS/EDL/TCS/ESP Mark 60

Function

⇒ page 45-91



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

◄ **Positioning of warning lights**

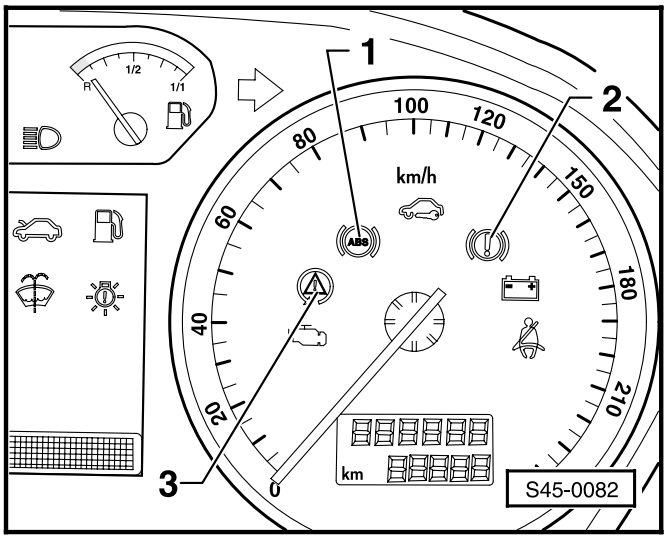
Item	Designation
1	ABS warning light -K47-
2	Handbrake/brake fluid level warning light -K14/33
3	Electronic stability programme warning light -K155-

Warning!

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

Overview

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



◄ **ABS warning light -K47-**

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

  -a- voltage supply is less than 10 V

  -b- there is a fault in the ABS

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

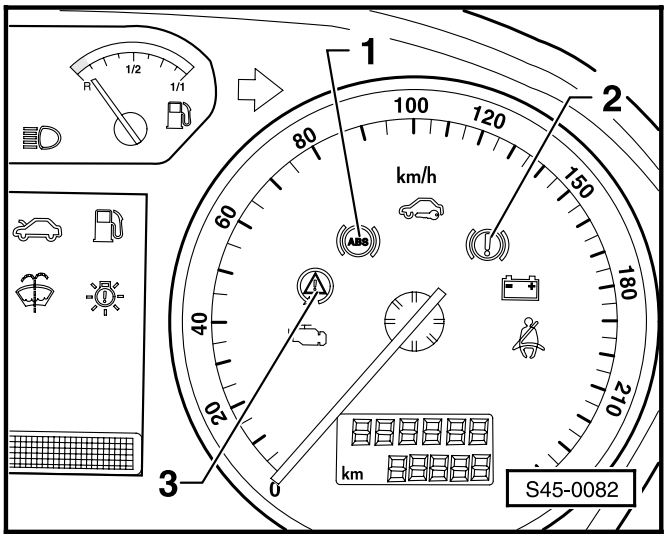
  -c- there was a sporadic wheel speed sensor fault after vehicle last started.

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

-d- open circuit in the link from the ABS control unit -J104- to the dash panel insert -J218-.

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

-e- the dash panel insert is faulty.



◄ **Warning light -K47- and -K14/33-**

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

-a- the brake fluid level is too low.

-b- the handbrake is applied.

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

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

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

♦ If the ABS warning light (K47) -1- and the handbrake/brake fluid level warning light (K14/33) -2- come on, the ABS system and the EBD (electronic brake force distribution) have failed.

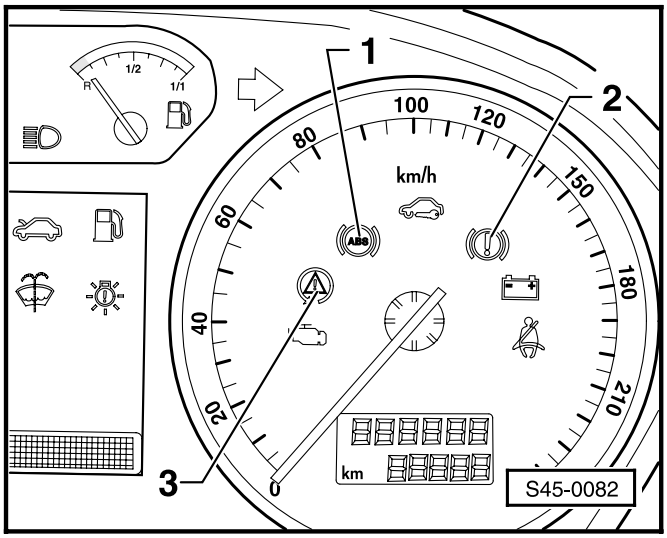
♦ If the ABS warning light (K47) -1- and the handbrake/brake fluid level warning light (K14/33) -2- come on and 3 warning signals sound, the ABS and the EBD (electronic brake force distribution) have failed.

Note:

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

Warning!

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



◄ **Electronic stability programme warning light -K155-**

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

  There is a fault which affects only the ESP safety system. The ABS/EDL and EBD safety systems of the vehicle remain fully operational.
  Interrogate fault memory ⇒ page 45-12.

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

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

  -c- open circuit in the link from the ABS control unit -J104- to the dash panel insert -J218-.
  ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

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

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

Code control unit ⇒ page 45-237.

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

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

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

Code control unit ⇒ page 45-237.

Performing self-diagnosis

Test requirements

⇒ page 45-9

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

Special tools, testers and aids required

⇒ page 45-9

Interrogating control unit version

Test of vehicle systems HELP Enter address word XX

◄ Readout in display:

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

1C0907379E ESP FRONT MK60 0103 → Coding 19970 WSC XXXXX

◄ The following readout then appears (example):

What is displayed is:

- ♦ the control unit identification number, e.g. 1C0907379E
- ♦ the system designation, e.g. ESP FRONT MK60
- ♦ the version number, e.g. 0103
- ♦ the code No. of the control unit, e.g. 19970
- ♦ the workshop code (WSC)

⇒ Operating instructions of vehicle system tester V.A.G 1552

Assignment of control unit
⇒ Parts List

Coding control unit ⇒ page 45-237.

If the control unit identification number is not shown ⇒ page 45-224, List of available functions.

- Press → key.

List of available functions

		Page
00 -	Automatic test sequence	45-13
01 -	Interrogating control unit version	45-223
02 -	Interrogating fault memory	45-12
03 -	Final control diagnosis	45-29
04 -	Basic setting [1)]	45-36
04 -	Basic setting [2)]	45-241
05 -	Erasing fault memory	45-21
06 -	Ending output	45-22
07 -	Coding control unit	45-237
08 -	Reading measured value block	45-238
11 -	Login procedure	45-249

1) Is required only for bleeding the hydraulic unit of vehicles fitted with EDL system.

2) Is required for the zero adjustment of the steering angle sender, lateral acceleration sender, brake pressure sender and of the longitudinal acceleration sender.

Fault table

Notes:

- *In view of the fact that the control units are interlinked over a databus line, always begin fault finding by initiating the "Automatic test sequence" with the key function 0 and 0 at all the control units installed in the vehicle. This ensures that the control units fitted to the vehicle are interrogated for any possible faults.*
- *All the possible faults which can be detected by the ABS control unit (J104) and displayed on V.A.G 1552, are listed below according to the 5-digit fault code.*
- *The fault type may also additionally appear in the fault table.*
- *Reference is made to individual test steps of the electrical test in the column "Rectifying fault".*
- *Before replacing any component which is shown as faulty, test all the corresponding plug connections, cables and earth connections according to the current flow diagram.*

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

- *After completing repairs, always once again interrogate the fault memory with the vehicle system tester V.A.G 1552 and erase it, and then conduct a road test at a speed of more than 20 km/h.*
- *After completing the road test, once again interrogate the fault memory.*

Read out on display of V.A.G 1552	Possible cause of fault	Rectifying fault
no fault detected	If after repair „No fault detected“ is displayed, the self-diagnosis is completed. If despite the display read-out „No fault detected“, the ABS does not operate without fault, proceed as follows: 1. Perform a test drive at a speed above 20 km/h. 2. Interrogate the fault memory again, if still no fault is stored. 3. Continue fault finding without self-diagnosis and completely run through the electrical test ⇒ page 45-205	
00003 (Info in the literature) no signal/no communication defective	♦ Line interruption, short-circuit to positive or earth or loose contact in the wiring to the ESP control unit ♦ ESP control unit defective	- Check wiring and plug connections according to the Current Flow Diagram. ⇒ Binder: Current Flow Diagrams, Electrical Fault Finding and Fitting locations - Replacing ESP control unit ⇒ page 45-196.
00283 Speed sensor vl -G47 implausible signal	♦ Line interruption, short-circuit to positive or earth or loose contact in the wiring between speed sensor -G47- and control unit -J104- ♦ Damage to impulse wheel or speed sensor -G47- ♦ Speed sensor -G47- defective ♦ Control unit for ABS -J104- defective	- Check wiring and plug connections according to the Current Flow Diagram. ⇒ Binder: Current Flow Diagrams, Electrical Fault Finding and Fitting locations - Perform electrical test ⇒ page 45-205. - Inspect speed sensor -G47- and impulse wheel for damage. - Replacing impulse wheel if necessary speed sensor -G47- ⇒ page 45-60. If the fault occurs again: - Replacing ESP control unit ⇒ page 45-196.
00283 Speed sensor vl -G47 electrical fault in the circuit	♦ Line interruption, short-circuit to positive or earth or loose contact in the wiring between speed sensor -G47- and control unit -J104- ♦ Electrical malfunctions due to external interference (high frequency irradiation e.g. non insulated ignition cable)	- Check wiring and plug connections according to the Current Flow Diagram. ⇒ Binder: Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Perform electrical test ⇒ page 45-205. - Reading measured value block ⇒ page 45-116, Display group number 001 - Replacing speed sensor -G47- ⇒ page 45-60.

Read out on display of V.A.G 1552	Possible cause of fault	Rectifying fault
00283 Speed sensor vl -G47 mechanical fault[1)]	♦ Air gap is too large between speed sensor -G47- and impulse wheel (signal not OK) ♦ Outlet valves in hydraulic unit -N55- defective	- Inspect installation of speed sensor -G47- and impulse wheel ⇒ page 45-60. - Reading measured value block ⇒ page 45-116, Display group number 002. - Perform actuator diagnosis ⇒ page 45-29. If the fault occurs again: - Replacing ESP control unit ⇒ page 45-196.
00285 Speed sensor vr -G45 implausible signal	♦ Line interruption, short-circuit to positive or earth or loose contact in the wiring between speed sensor -G45- and control unit -J104- ♦ Damage to impulse wheel or speed sensor -G45- ♦ Speed sensor coil -G45- defective ♦ Control unit for ABS -J104- defective	- Check wiring and plug connections according to the Current Flow Diagram. ⇒ Binder: Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Perform electrical test ⇒ page 45-205. - Inspect speed sensor -G45- and impulse wheel for damage. - Replacing impulse wheel if necessary speed sensor -G45- ⇒ page 45-60. If the fault occurs again: - Replacing ESP control unit ⇒ page 45-196.
00285 Speed sensor vr -G45 electrical fault in the circuit	♦ Line interruption, short-circuit to positive or earth or loose contact in the wiring between speed sensor -G45- and control unit -J104- ♦ Electrical malfunctions due to external interference (high frequency irradiation e.g. non-insulated ignition cable)	- Check wiring and plug connections according to the Current Flow Diagram. ⇒ Binder: Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Perform electrical test ⇒ page 45-205. - Reading measured value block ⇒ page 45-116, Display group number 001. - Replacing speed sensor -G45- ⇒ page 45-60.
00285 Speed sensor vr -G45 mechanical fault[1)]	♦ Air gap too large between speed sensor -G45- and impulse wheel (signal not OK) ♦ Outlet valves in hydraulic unit -N55- defective	- Inspect installation of speed sensor -G45- and impulse wheel ⇒ page 45-60. - Reading measured value block ⇒ page 45-116, Display group number 002. - Perform actuator diagnosis ⇒ page 45-29. If the fault occurs again: - Replacing ESP control unit ⇒ page 45-196.

1) Type of fault can only be detected as of 20 km/h (perform test drive).

Readout in display of V.A.G 1552	Possible cause of fault	Rectifying fault
00287 Rear right wheel speed sensor -G44 implausible signal	♦ Open circuit, short to positive or to earth or loose contact in wiring between wheel speed sensor -G44- and control unit -J104-	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205
	♦ Pulse rotor or sensor -G44- damaged	- Inspect sensor -G44- and rotor for damage
	♦ Wheel speed sensor -G44- faulty	- Replace rotor/sensor -G44- ⇒ page 45-65
	♦ ABS control unit -J104- faulty	If the fault occurs once again: - Replace ESP unit ⇒ page 45-196
00287 Rear right wheel speed sensor -G44 electrical fault in circuit	♦ Open circuit, short to positive or to earth or loose contact in wiring between wheel speed sensor -G44- and control unit -J104	- Test wiring and plug connections according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Perform electrical test ⇒ from page 45-205
	♦ Electrical interference caused by external sources (high-frequency radiation, e.g. ignition cables not insulated)	- Read measured value block ⇒ page 45-116, display group number 001 - Replace wheel speed sensor -G44- ⇒ page 45-65
00287 Rear right wheel speed sensor -G44 Mechanical fault[1)]	♦ Excessive gap between wheel speed sensor -G44- and rotor (signal not o.k.)	- Inspect installation of sensor -G44- and of rotor ⇒ page 45-65 - Read measured value block ⇒ page 45-116, display group number 002 - Perform final control diagnosis ⇒ page 45-29
	♦ Outlet valves in hydraulic unit -N55- faulty	If the fault occurs once again: - Replace ESP unit ⇒ page 45-196

1) Fault type can only be detected from a speed of more than 20 km/h (conduct road test).

Read out on Display of V.A.G 1552	Possible cause of fault	Rectifying fault
00290 Speed sensor hl -G46 Implausible signal	♦ Line interruption, short-circuit to positive or earth or loose contact in the wiring between speed sensor - G46- and control unit -J104- ♦ Damage to impulse wheel or speed sensor -G46- ♦ Speed sensor coil -G46- defective ♦ Control unit for ABS -J104- defective	- Check wiring and plug connections according to the Current Flow Diagram. ⇒ Binder: Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Perform electrical test ⇒ page 45-205. - Inspecting speed sensor -G46- and impulse wheel for damage. - Replacing impulse wheel if necessary speed sensor -G46- ⇒ page 45-65. If fault occurs again: - Replacing ESP control unit ⇒ page 45-196.
00290 Speed sensor hl -G46 electrical fault in the circuit	♦ Line interruption, short-circuit to positive or earth or loose contact in the wiring between speed sensor -G46- and control unit -J104- ♦ Electrical malfunctions due to external interference (high frequency irradiation e.g. non-insulated ignition cable)	- Check wiring and plug connections according to the Current Flow Diagram. ⇒ Binder: Current Flow Diagrams. Electrical Fault Finding and Fitting Locations - Perform electrical test ⇒ as of page 45-205. - Reading measured value block ⇒ page 45-116, Display group number 001. - Replacing speed sensor -G46- ⇒ page 45-65.
00290 Speed sensor hl -G46 mechanical fault[1)]	♦ Air gap too large between speed sensor -G46- and impulse wheel (signal not OK) ♦ Outlet valves in hydraulic unit -N55- defective	- Inspect installation of speed sensor -G46- and impulse wheel ⇒ page 45-65. - Reading measured value block ⇒ page 45-116, Display group number 002. - Perform actuator diagnosis ⇒ page 45-29. If fault occurs again: - Replacing ESP control unit ⇒ page 45-196.
00474 (Info in the literature) no signal/no communication	♦ Line interruption, short-circuit to positive or earth or loose contact in the wiring between reading coil for immobilizer and dash panel insert	- Check wiring and plug connections according to the Current Flow Diagram. ⇒ Binder: Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

[1)] Type of fault can only be detected as of 20 km/h (perform test drive).

Read out on display of V.A.G 1552	Possible cause of fault	Rectifying fault
00493 (Info in the literature) no signal/no communication	♦ Line interruption, short-circuit to positive or earth or loose contact in the wiring between ESP sender -G419- and control unit -J104- ♦ ESP sender -G419- defective	- Inspect installation of sender -G419-. - Check wiring and plug connections according to the Current Flow Diagram. ⇒ Binder: Current Flow Diagrams, Electrical Fault Finding and Fitting Locations. - Replacing ESP sender -G419-.
00494 (Info in the literature)	♦ Line interruption, short-circuit to positive or earth or loose contact in the wiring between ESP sender -G419- and control unit -J104- ♦ ESP sender -G419- defective	- Inspect installation of sender -G419-. - Check wiring and plug connections according to the Current Flow Diagram. ⇒ Binder: Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Replacing ESP sender -G419-.
00495 (Info in the literature) electrical fault in the circuit	♦ Line interruption, short-circuit to positive or earth or loose contact in the wiring between ESP sender -G419- and control unit -J104- ♦ ESP sender -G419- defective	- Inspect installation of sender -G419-. - Check wiring and plug connections according to the Current Flow Diagram. ⇒ Binder: Current Flow Diagram, Electrical Fault Finding and Fitting Locations - Replacing ESP sender -G419-.
00526 Brake light switch -F Implausible signal	♦ Line interruption, short-circuit to positive or earth ♦ Incorrect setting of the brake light switch ♦ Brake light switch defective	- Reading measured value block ⇒ page 45-116, Display group number 002. - Perform electrical test ⇒ page 45-250, Test step 4. - Adjust brake light switch ⇒ page 45-69.1.
00538 electrical fault in the circuit	♦ Short-circuit to positive ♦ Voltage supply is less than 5 V on: - Yaw rate sender -G202- - Lateral acceleration sensor -G200- - Brake pressure sender -1- -G201- - Longitudinal acceleration sender - G251-[1)]	- Check fuses, cables, plug connections as well as voltage supply to the control unit: - Perform electrical test ⇒ page 45-250, Test step 4.

1) Not for 4 Wheel Drive vehicles.

Read out on display of V.A.G 1552	Possible cause of fault	Rectifying fault
00668 El. syst. voltage tml. 30 implausible signal	♦ Line interruption, short-circuit to positive or earth in the wiring ♦ Fuses S162 and S163 defective	- Check fuses, cables, plug connections as well as voltage supply to the control unit: ⇒ Electrical test, page 45-250, Test steps 1 and 2
00778 Steering angle sender -G85 no communication[1)]	♦ Interruption or loose contact in the Data BUS cables between steering angle sender -G85- and control unit -J104- ♦ Incorrect specifications of sender for steering angle -G85- ♦ Steering angle sender -G85- defective	- Check fuses, cables, plug connections as well as voltage supply to the control unit: ⇒ Electrical test, page 45-250, Test step 19 - Reading measured value block ⇒ page 45-116, Display group number 004. - Replacing steering angle sender -G85- ⇒ page 45-174 - Perform null balance: ⇒ Basic setting, page 45-241, Display group number 060
00778 Steering angle sender -G85[1)] no setting or incorrect setting	♦ Steering angle sender -G85- sends no or incorrect setting values	- Perform null balance: ⇒ Basic setting, page 45-241, Display group number 060
00778 Steering angle sender -G85[1)] mechanical fault	♦ Fitting location of the steering angle sender -G85- is not OK ♦ Chassis geometry is not OK ♦ Steering wheel is removed and no null balance is performed	- Inspect fitting location of steering angle sender -G85- ⇒ page 45-174. - Perform vehicle measurement ⇒ Repair Group 44 - Perform null balance: ⇒ Basic setting, page 45-241, Display Group 060
00778 Steering angle sender -G85 implausible signal[1)]	♦ Fitting location of the steering angle sender -G85- is not OK ♦ Chassis geometry is not OK ♦ Non-permissible vibrations in the steering due to wear	- Inspect fitting location of steering angle sender -G86- ⇒ page 45-174. - Perform vehicle measurement ⇒ Repair Group 44 - Perform null balance: ⇒ Basic setting, page 45-241, Display group number 060

1) The data transfer between the control unit -J104- and the steering angle sender -G85- occurs with a data BUS.

Read out on display of V.A.G 1552	Possible cause of fault	Rectifying fault
00778 Steering angle sender -G85 defective[1)]	♦ Steering angle sender -G85- defective	- Replacing steering angle sender -G85- ⇒ page 45-174. - Perform null balance: ⇒ Basic setting, page 45-241, Display group number 060
01044 Control unit wrongly coded	♦ Incorrect or no coding of the control unit	- Check coding of the control unit ⇒ page 45-237.
01130 ABS operation implausible signal[2)]	♦ Electrical malfunctions due to external interference (high frequency irradiation, e.g. non insulated ignition cable ♦ Line interruption, short-circuit to positive or earth or loose contact ♦ Control unit for ABS -J104- defective	- Check all lines and plug connections for short-circuit to positive or earth. ⇒ Binder: Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Erasing fault memory. - Perform test drive with more than 20 km/h. - Interrogate fault memory again. If the fault occurs again: - Replacing ESP control unit ⇒ page 45-196.
01164 (Info in the literature) implausible signal	♦ Line interruption between sender -G419- and ESP control unit	- Check lines and plug connections to Current Flow Diagram. ⇒ Binder: Current Flow Diagram, Electrical Fault Finding and Fitting Locations
01276 ABS Hydraulic pump -V64 Signal outside the tolerance[2)] defective[2)] electrical fault in the circuit	♦ Internal connection E-engine to control unit ♦ Short-circuit to positive or earth or interruption ♦ ABS control unit defective ♦ Pump motor defective	- Check lines and plug connections as well as ground lines to Current Flow Diagram ⇒ Electrical test, page 45-250, Test step no. 1 - Perform functional test: ⇒ Actuator diagnosis, page 45-29 - If the hydraulic pump does not run during the actuator diagnosis, replace control unit for ABS -J104-. If the fault occurs again: - Replacing ESP control unit ⇒ page 45-196.

1) The data transfer between the control unit -J104- and the steering angle sender -G85- occurs with the data BUS.

2) Type of fault can only be detected as of 20 km/h (perform test drive).

Read out on display of V.A.G 1552	Possible cause of fault	Rectifying fault
01279 Longitudinal acceleration sender -G251-[1] electrical fault in the circuit	♦ Inspecting plug connections ♦ Voltage supply is less than 5 V ♦ Line interruption, short-circuit to positive or earth	- Reading measured value block ⇒ page 45-238, Display group number 006. - Check lines and plug connections according to Current Flow Diagram. - Perform electrical test ⇒ page 45-250.
	♦ Longitudinal acceleration sender -G251- defective	- Replacing longitudinal acceleration sender -G251- ⇒ page 45-82. - Perform null balance: ⇒ Basic setting, page 45-241, Display group number 069
01279 Longitudinal acceleration sender -G251-[2] Implausible signal		- Reading measured block value ⇒ page 45-238, Display group number 006.
	♦ The fitting location for the longitudinal acceleration sender -G251- is not OK	- Inspect fitting location of longitudinal acceleration sender -G251-.
	♦ Line interruption, short-circuit to positive or earth	- Check lines and plug connections according to Current Flow Diagram. - Perform electrical test ⇒ page 45-250.
	♦ Longitudinal acceleration sender -G251- defective	- Replacing longitudinal acceleration sender -G251- ⇒ page 45-82. - Perform null balance: ⇒ Basic setting, page 45-241, Display group number 069
01279 Longitudinal acceleration sender -G251-[2] no or incorrect basic setting/adaptation	♦ Longitudinal acceleration sender -G251- sends no setting values or incorrect setting values	- Perform null balance: ⇒ Basic setting, page 45-241, Display group number 069
01299 (Info in the literature) no signal/no communication	♦ Gateway data line defective	- Inspect Gateway data line ⇒ Electrical system; Repair Group 90.

1) Type of fault can only be detected as of 20km/h (perform test drive).

2) Only for 4 Wheel Drive vehicles.

Read out on display of V.A.G 1552	Possible cause of fault	Rectifying fault
01312 Data BUS drive defective[1)]	♦ Line interruption, short-circuit to positive or earth or loose contact in the Data BUS cable	- Inspecting Data BUS cable according to Current Flow Diagram for interruption or short-circuit. ⇒ Electrical system, page 45-253, Test step no. 23
01314 Engine control unit no communication please read out fault memory	♦ Line interruption, short-circuit to positive or earth in the Data BUS cable ♦ Error entry in the engine control unit	- Inspecting Data BUS cable according to Current Flow Diagram for interruption or short-circuit ⇒ Electrical test, page 45-253, Test step no. 23 - Read out fault memory ⇒ Engine, Injection and Ignition system, if necessary Glow plug system; Repair Group 01
01315 Gearbox control unit[2)] no communication	♦ Line interruption, short-circuit to positive or earth in the Data BUS cable	- Inspecting Data BUS cable according to Current Flow Diagram for interruption or short-circuit ⇒ Electrical test, page 45-253, Test step no. 23
01317 Control unit in dash panel insert -J285-	♦ Control unit -J285- wrongly coded	- Check coding of control unit -J285- ⇒ Electrical system; Repair Group 90; dash panel insert
01324 Control unit for 4 Wheel Drive -J492-[3)] no communication	♦ Line interruption, short-circuit to positive or earth or loose contact in the Data BUS cables	- Reading measured value block ⇒ page 45-238 Display group number 125. - Inspecting Data BUS cable according to Current Flow Diagram for interruption or short-circuit ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

1) Occurs only on ESP together with a fault of the steering angle sender -G85- without communication.

2) Only on vehicles with automatic gearbox.

3) Only for 4 Wheel Drive.

Read out on display of V.A.G 1552	Possible cause of fault	Rectifying fault
01423 Lateral acceleration sensor -G200[1)] electrical fault in the circuit	♦ Line interruption, short-circuit to positive or earth or loose contact in the lines between lateral acceleration sensor -G200- and control unit for ABS -J104-	- Inspecting lateral acceleration sensor -G200-. - Reading measured value block ⇒ page 45-116, Display group number 004. - Inspecting lines, plug connections as well as ground lines according to Current Flow Diagram. ⇒ Electrical test, page 45-250, Test step no. 20
	♦ The fitting location of the lateral acceleration sensor -G200- is not OK	- Inspecting fitting location of lateral acceleration sensor -G200- ⇒ page 45-171.
	♦ Lateral acceleration sensor -G200- defective	- Replacing lateral acceleration sensor -G200- ⇒ page 45-172. - Perform null balance: ⇒ Basic setting, page 45-241, Display group number 063
01423 Lateral acceleration sensor -G200[1)] implausible signal	♦ The fitting location of the lateral acceleration sensor -G200- is not OK	- Inspecting lateral acceleration sensor -G200-. - Reading measured value block ⇒ page 45-116, Display group number 004. - Inspecting fitting location of lateral acceleration sensor -G200- ⇒ page 45-171.
	♦ Lateral acceleration sensor -G200- defective	- Replacing lateral acceleration sensor -G200- ⇒ page 45-172. - Perform null balance: ⇒ Basic setting, page 45-241, Display group number 063
01423 Lateral acceleration sensor -G200[1)] no or incorrect basic setting/adaptation	♦ The null balance is not at all or incorrectly performed	- Perform null balance: ⇒ Basic setting, page 45-241, Display group number 063

[1)] Only for 4 Wheel Drive vehicles.

Read out on display of V.A.G 1552	Possible cause of fault	Rectifying fault
01435 Brake pressure sender 1 -G201 electrical fault in the circuit	♦ Interruption or loose contact in the lines between brake pressure sender 1 -G201- control unit for ABS -J104-	- Inspecting brake pressure sender -1- -G201-. - Reading measure value block ⇒ page 45-238, Display group number 005. - Inspecting fuses, lines, plug connections as well as voltage supply to the control unit: ⇒ Electrical test, page 45-250, Test step no. 22
	♦ Brake pressure sender 1 - G201- defective	- Replacing brake pressure sender -1- -G201- ⇒ page 47-28. - Perform null balance: ⇒ Basic setting, page 45-241, Display group number 066
01435 Brake pressure sender 1 -G201 no or incorrect basic setting/adaptation	♦ The null balance was not performed or incorrectly performed	- Perform null balance: ⇒ Basic setting, page 45-241, Display group number 066
01435 Brake pressure sender 1 -G201 implausible signal	♦ Line interruption, short-circuit to positive or earth	- Reading measured value ⇒ page 45-238, Display group number 005. - Check lines and plug connections according to the Current Flow Diagram. - Perform electrical test, page 45-250, Test step no. 22.
	♦ Incorrect setting of the brake light switch ♦ Brake light defective	- Setting brake light switch ⇒ page 45-69.1.
	♦ Brake pressure sender -1- -G201- defective	- Replacing brake pressure sender 1 -G201- ⇒ page 47-28. - Perform null balance: ⇒ Basic setting, page 45-241, Display group number 066

Read out on display of V.A.G 1552	Possible cause of fault	Rectifying fault
01486 (Info in the literature)	♦ The ESP drive test has been activated	- Perform ESP drive test correctly and completely; the fault will then erase itself. - Initiate basic setting ⇒ page 45-241, Display group number 093.
01487 (Info in the literature)	♦ Overrun time of the ESP drive test	- Perform ESP drive test correctly and completely in the given time.
01542 yaw rate sender -G202 implausible signal	♦ Ground connection to yaw rate sender -G202- interrupted	- Inspect yaw rate sender -G202-. - Reading measured value block ⇒ page 45-116, Display group number 004. - Inspect lines, plug connections to control unit. ⇒ Electrical test, page 45-250, Test step no. 21
	♦ The fitting location of the yaw rate sender -G202- is not OK	- Inspect fitting location of the yaw rate sender ⇒ page 45-171.
	♦ Yaw rate sender -G202- defective	- Replacing yaw rate sender -G202- ⇒ page 45-172.
18055 Inspect coding/variants of the control units in the drive	♦ One or several control units wrongly coded	- Check the coding of all control units.
	♦ One or several incorrect control units used	- Check correctness of all used control units.
18056 Read out fault memory of the engine control unit	♦ Fault stored in the fault memory of the engine control unit	- Read out fault memory from engine control unit and after eliminating possible faults erase ⇒ corresponding engine; Injection and Ignition system; Repair Group 01.
	♦ Engine control unit defective	- Replacing engine control unit ⇒ Petrol engine; Injection and Ignition system; Repair Group 24; Diesel engine; Injection and Glow plug system; Repair Group 23.

Read out on Display of V.A.G 1552	Possible cause of fault	Rectifying fault
18258 Databus drive missing message from engine control unit	♦ Interruption of voltage supply, short-circuit to positive or earth or loose contact in the voltage supply to engine control unit ♦ Line interruption, short-circuit to positive or earth or loose contact in the Data BUS cables ♦ Engine control unit defective	- Inspect voltage supply to engine control unit for interruption or short-circuit. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Reading measured value block ⇒ page 45-116, Display group number 125. - Inspect Data BUS cables for interruption or short-circuit. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Replacing engine control unit ⇒ Petrol engine; Injection and Ignition system; Repair Group 24, Diesel engine; Injection and Glow Plug system; Repair Group 23.
18262 Databus drive Hardware defective	♦ One or several incorrect control units used	- Check the correctness of all used control units, if necessary replace incorrect control units.
65535 Control unit defective	♦ Control unit defective	- Replacing ESP control unit ⇒ page 45-196.

Coding the control unit

⇒ page 45-190

1C0907379E	ESP	FRONT	MK60	0103 →
Coding 19970				WSC XXXXX

◀ The control unit identification is shown on the display of the vehicle system tester V.A.G 1552, for example:

Table of codes
⇒ page 45-191

Reading a measuring value block

⇒ Page 45-116

An overview of the selectable display group numbers

Display group number	Display field	Designation
001	1 2 3 4	Wheel speed at the rotational speed sensor at the front on the left -G47- (km/h.) Wheel speed at the rotational speed sensor at the front on the right -G45- (km/h.) Wheel speed at the rotational speed sensor at the rear on the left -G46- (km/h.) Wheel speed at the rotational speed sensor at the rear on the right -G44- (km/h.)
002	1 2 3 4	Starting speed at the rotational speed sensor at the front on the left -G47- (km/h.) Starting speed at the rotational speed sensor at the front on the right -G45- (km/h.) Starting speed at the rotational speed sensor at the rear on the left -G46- (km/h.) Starting speed at the rotational speed sensor at the rear on the right -G44- (km/h.)
003	1 2 3 4	Brake light switch -F- Warning lamp for the handbrake/brake fluid level -K14/33- Warning lamp for the ABS -K47- Warning lamp for the ESP -K155-
004	1 2 3 4	Sender for the steering angle -G85- Sender for transverse acceleration -G200- Sender for the rotational speed -G202- Not used
005	1 2 3 4	Sender for the brake pressure -G201- Not used Not used Not used
006 [1)]	1 2 3 4	Sender for longitudinal acceleration [2)] Not used Not used Not used
125	1 2 3 4	Data-bus for the engine Data-bus for the steering angle Data-bus for the four-wheel drive[2)] Can-bus for the transmission[3)]

1) Not to be taken account of

2) Only for vehicles with four-wheel drive

3) Only for vehicles with an automatic transmission

Checking the allocation of the rotational speed -sensors -G44-, -G45-, -G46-, -G47- in the display group number 1

⇒ Page 45-118

Checking the rotational speed -sensors -G44-, -G45-, -G46-, -G47- in the display group number 002

⇒ Page 45-119

Checking the brake light switch -F- and the warning lamps -K47-, -K14/33-, -K155-

Display group number 003

- Enter 003 and confirm the entry with Q

Read the measuring value block 3 →
→ 1 → 2 → 3 → 4

◄ - There are always four display fields which appear in the measuring value block -arrows- Itemisation of the values 1 to 4 in the individual display fields can be found in the following test table.

Read the measuring value block 3 →
Unactuated Unactuated

◄ Readout shown on the display (with the vehicle stationary)

Read the measuring value block			3 →	**Display group number 003**
Unactuated	Off	Off	Off	Readout shown on the display
				Warning lamp for the ASR/ESP ♦ Off ♦ On
				Warning lamp for the ABS ♦ Off ♦ On
				Warning lamp for the handbrake/brake fluid level ♦ Off ♦ On
				Brake light switch ♦ Unactuated → brake pedal not actuated ♦ Actuated → brake pedal actuated If one can read „unactuated“ on the display screen of the V.A.G 1552 despite the fact that the brake pedal is actuated or „actuated“ despite the fact that the brake pedal is unactuated then undertake test step no. 4 of the electrical testing sequence, page 45-139. It is also possible that the brake light switch is not set up properly ⇒ Adjusting the brake light switch, page 45-69.1

A lower display group number can be selected by pressing the -↓- key while a higher display group number can be selected by pressing the -↑- key.

Press the C-button to enter the next display group number.

If the -→- button is pressed one should then enter 08 afterwards in order to again enter into the „Read measuring value block“ sequence.

Testing steering angle sender -G85-, lateral acceleration sender -G200- and yaw rate sender -G202- in display group number 004

⇒ page 45-121

Testing brake pressure sender -G201-

Display group number 005

- Press keys 0, 0 and 5 and confirm the entry with the key Q.

Read measured value block 5 →	◄ - There are always 4 display blocks -arrows- in the measured value block. Explanation of the readouts 1 to 4 in the individual display blocks are given in the test table below.
→ 1 → 2 → 3 → 4	

Read measured value block 5 →	◄ Readout in display (vehicle stationary):
-1.27 bar	

Read measured value block 5 →	**Display group number: 005**
-1.27 bar	◄ Readout in display (example)
	not assigned
	not assigned
	not assigned
	Brake pressure sender -G201- and -G214- ♦ Specification if brake not depressed: ± 7 bar ♦ ⇒ page 45-250, Electrical Test, test steps 22 and 23

It is possible to consecutively select in turn the next lower display group number with the -↓- key.

Press the key C in order to enter the next display group number.

If the → key is pressed, it is then necessary after this to re-enter function ”Read measured value block” by pressing keys 0 and 8.

Testing longitudinal acceleration sender -G251-

⇒ page 45-76

Testing databus line

⇒ page 45-123

Initiating basic setting

Special tools, testers and aids required

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

Tasks of function 04 „Initiating basic setting“

Function 04 „Initiating basic setting“ performs several tasks in the case of the ESP:

- -1- Display group number 001 is required for bleeding the hydraulic unit.
- -2- Display group number 040 is required for switching off the longitudinal acceleration sender -G251-, for example for checking the brake system on a chassis dynamometer ⇒ page 45-76.
- -3- Display group numbers 060, 063, 066 and 069 are required for the zero adjustment of the steering angle sender, lateral acceleration sender, brake pressure sender and longitudinal acceleration sender.
- -4- Display group number 093 is required for the driving test ⇒ page 45-247. It is designed to check the plausibility of the signals from the steering angle sender -G85-, lateral acceleration sender -G200-, yaw rate sender -G200- and the brake pressure sender -G201-.

-1- The hydraulic unit on vehicles fitted with the ESP system is bled by selecting the display group number 001. Initiate basic setting ⇒ page 45-36.

Basic setting 04, display group number 001, is only required if at least one chamber of the brake fluid replenishing reservoir has run completely empty.

Also initiate the basic setting after repairing any leaks in the brake system.

Function 11 „Login procedure“ is not required in this case.

-2- The longitudinal acceleration sender -G251- on 4x4 vehicles is switched off by means of display group number 040 ⇒ page 45-76.

Function 11 „Login procedure“ is not required in this case.

-3- A zero adjustment is performed using the display group numbers 060, 063, 066 and 069.

- The zero adjustment of the steering angle sender -G85- is performed using display group number 060 ⇒ page 45-243.
- The zero adjustment of the lateral acceleration sender -G200- is performed using display group number 063 ⇒ page 45-245.
- The zero adjustment of the brake pressure sender -G201- is performed using display group number 066 ⇒ page 45-246.
- The zero adjustment of the longitudinal acceleration sender -G251- is performed using display group number 069 ⇒ page 45-77.

Performing the zero adjustment of display group numbers 060, 063 and 066 necessitates that function 11 „Login procedure“ has been successfully carried out first of all with the vehicle system tester ⇒ page 45-249.

Note:

The „Login procedure“ should be carried out separately for each display group number before then initiating the basic setting.

Zero adjustment requires to be performed if:

- the control unit -J104- or the steering column is replaced,
- the steering angle sender -G85- is replaced,
- settings at the running gear are modified as part of a chassis alignment,
- the lateral acceleration sender -G200- is replaced,
- the brake pressure sender -G201- is replaced,

- the longitudinal acceleration sender -G251- is replaced,

- if the text in the fault table relating to a fault entry in the fault memory of control unit -J104-, instructs you to perform the zero adjustment,

- the steering wheel has been taken off.

-4- Display group number 093 is used for checking the plausibility of the signals supplied by the steering angle sender -G85-, lateral acceleration sender -G200-, yaw rate sender -G200- and the brake pressure sender -G201-.

Activation of the ESP driving test.

After replacing control unit -J104-, it is necessary to carry out a zero adjustment for the following components:

- Lateral acceleration sender -G200-

- Steering angle sender -G85-

- Brake pressure sender 1 -G201-

If individual senders are replaced, it is only necessary to carry out a zero adjustment for the component replaced.

Display group number 060: zero adjustment of steering angle sender -G85.

- Start the engine.

- Conduct a short road test on a flat road. Drive straightahead and not faster than 20 km/h; pay attention to the following point:

  - If the steering wheel is not in the centre position when driving straightahead, correct the position of the steering wheel as part of a chassis alignment and carry out the zero adjustment of the steering angle sender.

- If the steering wheel is properly centred during the road test, bring the vehicle to a stop from straightahead running.

Ensure that the position of the steering wheel is no longer altered. Do not switch off the ignition!

- Check zero adjustment with function 08 „Read data block“ ⇒ page 45-116, display group number 004.

- First of all, perform function 11 „Login procedure“ with vehicle system tester V.A.G 1552 ⇒ page 45-249.

Test of vehicle systems HELP Select function XX	◄ Readout in display:

- Press keys 0 and 4 for the function „Basic setting“ and confirm entry with the key Q.

Basic setting HELP Enter display group number XXX	◄ Readout in display:

- Press keys 0, 6 and 0 and confirm entry with the key Q.

ABS indicator lamp -K47- flashes.

Function is not known or cannot be carried out at the moment - →	◄ If this readout appears in the display, the login procedure has not been successfully performed.
Basic setting 60 OFF <4-ON> → Adjustment o.k. 0.0°	◄ Readout in display:

If zero adjustment is successfully set, the value 0.0° once again appears in the display.

or:

Basic setting 60 OFF <4-ON> → Adjustment n. possible 12.0°	◄ If this readout appears in the display, the measured values are not within the permitted range of ± 10° for the zero adjustment.

1. Interrogate fault memory (function 02)

2. Erase fault memory (function 05)

3. End output (function 06)

4. Switch ignition off.

5. Switch ignition on.

6. Once again perform zero adjustment.

- Press → key.

Test of vehicle systems HELP Select function XX	◄ Readout in display:

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

ABS indicator lamp -K47- and ESP indicator lamp -K155- light up for about 2 seconds.

- Switch engine off.

Display group number 063: zero adjustment of lateral acceleration sender -G200-

- Vehicle is parked on level ground.

- Switch ignition on.

- Check measured values with function 08 „Read data block“ ⇒ page 45-116, display group number 004.

- First of all, perform function 11 „Login procedure“ with vehicle system tester V.A.G 1552 ⇒ page 45-249.

Test of vehicle systems HELP Select function XX

◄ Readout in display:

- Press keys 0 and 4 for the function „Basic setting“ and confirm entry with the key Q.

Basic setting HELP Enter display group number XXX

◄ Readout in display:

- Press keys 0, 6 and 3 and confirm the entry with the key Q.

The ABS indicator lamp -K47- flashes.

Function is not known or cannot be carried out at the moment - →

◄ If this readout appears in the display, the login procedure has not been successfully performed.

Basic setting 63 OFF <4-ON> → Adjustment o.k. 0.6m/s2

◄ Readout in display:

If zero adjustment is successfully set, the value 0.0m/s² no longer appears in the display.

or:

Basic setting 63 OFF <4-ON> → Adjustment n. possible 5.0m/s2

◄ If this readout appears in the display, the measured values are not within the tolerance range of ± 2.5 m/s².

1. Interrogate fault memory (function 02)

2. Erase fault memory (function 05)

3. End output (function 06)

4. Switch ignition off.

5. Switch ignition on.

6. Once again perform zero adjustment.

- Press → key.

Test of vehicle systems HELP Select function XX

◄ Readout in display:

- End output (function 06) ⇒ page 45-22.
- ABS indicator lamp -K47- and ESP indicator lamp -K155- light up for about 2 seconds.

Display group number 066: zero adjustment of brake fluid pressure sender -G201-

- Brake pedal not depressed.
- Switch ignition on.
- Check measured values with function 08 „Read data block“ ⇒ page 45-240, display group number 005.
- First of all, perform function 11 „Login procedure“ with vehicle system tester V.A.G 1552 ⇒ page 45-249.

Test of vehicle systems HELP Select function XX

◄ Readout in display:

- Press keys 0 and 4 for the function „Basic setting“ and confirm entry with the key Q.

Basic setting HELP Enter display group number XXX

◄ Readout in display:

- Press keys 0, 6 and 6 and confirm entry with the key Q.

ABS indicator lamp -K47- flashes.

Function is not known or cannot be - → carried out at the moment

◄ If this readout appears in the display, the login procedure has not been successfully performed.

Basic setting 66 OFF <4-ON> → Adjustment o.k. -0.85bar

◄ Readout in display:

If zero adjustment is successfully set, the value 0.00 bar no longer appears in the display.

or:

Basic setting 66 OFF <4-ON> → Adjustment n. possible -10.85bar

◄ If this readout appears in the display, the measured values are not within the permitted range of -2 bar up to 8 bar for the zero adjustment.

1. Interrogate fault memory (function 02)
2. Erase fault memory (function 05)

3. End output (function 06)

4. Switch ignition off.

5. Switch ignition on.

6. Repeat the zero adjustment.

- Press → key.

Test of vehicle systems HELP Select function XX	◄ Readout in display:

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

ABS warning light -K47- and ESP warning light -K155- come on for about 2 seconds.

Display group number 093: activating the ESP driving test

The ESP driving test is used for checking the plausibility of the signals supplied by the lateral acceleration sender -G200-, the yaw rate sender -G202- and the brake pressure sender 1 -G201-.

The ESP driving test should be carried out each time parts of the ESP system are removed or replaced.

- Switch the ignition on.

Test of vehicle systems HELP Select function XX	◄ Readout in display:

- Press keys 0 and 4 for the function “Basic setting” and confirm the entry with the key Q.

Basic setting HELP Enter display group number XXX	◄ Readout in display:

- Press keys 0, 9 and 3 and confirm the entry with the key Q.

Basic setting 93 ON <8> → Syst. test activated	◄ Readout in display:

ABS warning light -K47- comes on.

- Press → key.

Test of vehicle systems HELP Select function XX	◄ Readout in display:

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

Note:

Warning light -K47- remains on.

- Separate diagnostic plug connection.

- Start engine.

- Depress brake firmly (brake pressure of more than 35 bar) until the ESP warning light -K155- flashes.

The stationary adjustment is thus completed.

- Now, conduct a road test lasting not more than 50 seconds at a speed of 15 km/h...30 km/h:

Warning:

Priority must always be given to observing the rules of the road and paying proper attention to traffic conditions.

  - The vehicle must be driven in such a way that no ABS, EDL, TCS or ESP control is necessary.

  - Drive a curve with a steering turn of at least 90°.

The ABS warning light -K47- and the ESP warning light -K155- go out, which indicates that the ESP driving test has been successfully completed.

If the ABS warning light -K47- does not go out, the ESP driving test has not been correctly performed.

- If the ABS warning light -K47- does not go out and the ESP warning light -K155- comes on again, interrogate fault memory ⇒ page 45-13.

Login procedure

Special tools, testers and aids required

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

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

Procedure

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

Test of vehicle systems HELP Select function XX	◄ Readout in display:

- Press key 1 twice for the function „Login procedure“ and confirm the entry with the key Q.

Coding 2 HELP Enter code number xxxxx	◄ Readout in display:

- Enter the code number 40168 and confirm the entry with the key Q.

Test of vehicle systems HELP Select function XX	◄ Readout in display:

Electrical test of ABS/EDL/ TCS/ESP Mark 60

Special tools, testers and aids required

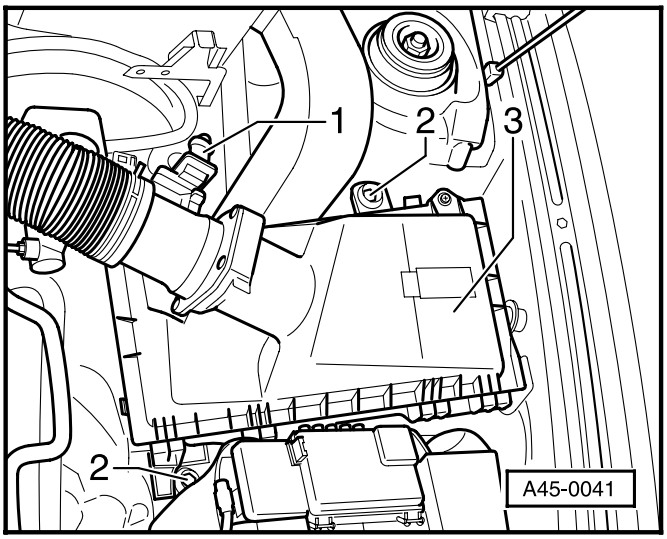
- Handheld multimeter, e.g. V.A.G 1526 A
- Adapter cable set V.A.G 1594/A
- Test box V.A.G 1598/A
- Adapter V.A.G 1598/36

The test steps ⇒ from page 45-253 apply only to models with ABS/EDL/TCS/ESP

- on which the self-diagnosis does not provide an indication of the source of the fault. In this case, perform the complete electrical test.
- on which the self-diagnosis provides a direct indication of the source of the fault. In this case, perform only the test step recommended in the fault table (specific testing).

Test requirements

⇒ page 45-133



Note:

The following 2 steps do not apply to the 1.6 l/ 55 kW engine.

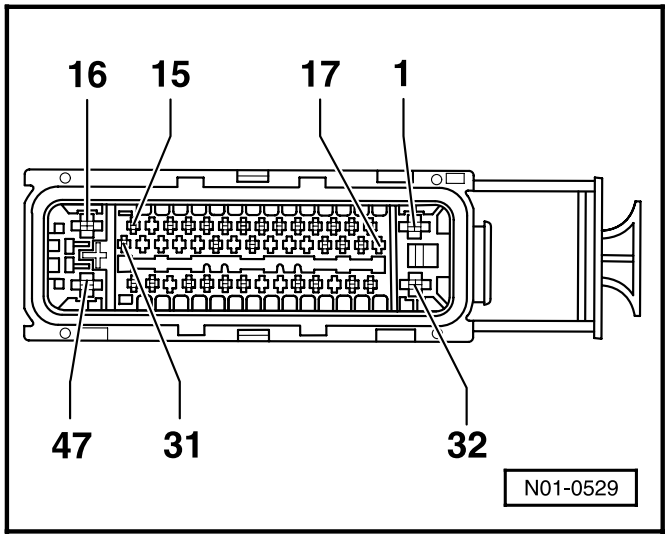
Removing air filter

◄ - Unplug connector of the air mass meter -1- from the air guide pipe of the air filter.

- Remove screws -2- at the air filter -3- and place this down to the side.

Connecting test box V.A.G 1598 A with adapter V.A.G 1598/36

⇒ page 45-134



Multipin plug connection with contact assignment

Contact assignment of plug connection T16a (diagnosis socket) to vehicle system tester V.A.G 1552

⇒ page 45-134

◄ **Contact assignment of plug connection T47a wiring loom/control unit -J104**

Note:

Plug contacts not listed are not assigned.

1 - Voltage supply of battery + (through S162)

2 - Plug connection T16a/7, K wire

3 - Signal wire of longitudinal acceleration sender -G251- 4x4 models

4 - Voltage supply terminal 15 (through S9)

5 - Earth cable of longitudinal acceleration sender -G251- 4x4 models

6 - Lateral acceleration sender -G200- (signal)

7 - Voltage supply of longitudinal acceleration sender -G251- 4x4 models

8 - Only models fitted with Navigation system

9 - Coding bridge to contact 12 4x4 models

10 - Only on models fitted with Navigation system and gas discharge headlights

11 - Databus line
⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder

12 - Coding bridge to contact 38 FWD
Coding bridge to contact 9 4x4

13 - TCS/ESP pushbutton -E256-

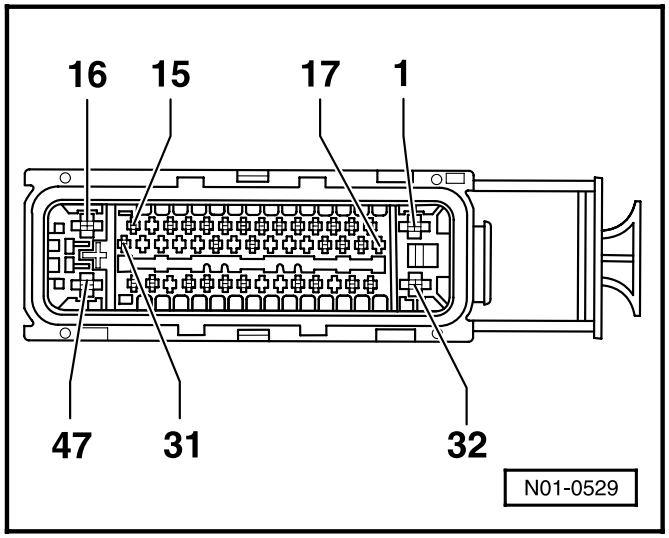
14 - Coding bridge to contact 38 only TCS

15 - Databus line
⇒ „Current Flow Diagrams, Electrical Fault Finding and Fitting Locations“ binder

16 - Earth

17 - Not assigned

18 - Voltage supply of brake pressure sender 1 -G201-



19 - Earth cable of brake pressure sender 1 -G201-

20 - Signal cable of brake pressure sender 1 -G201

20 - to 23 - not assigned

24 - Earth cable of lateral acceleration sender -G200- and of yaw rate sender -G202-

25 - not assigned

26 - Voltage supply of lateral acceleration sender -G200- and of yaw rate sender -G202-

27 to 30 - not assigned

32 - Voltage supply of battery + (through S163)

33 - Front right wheel speed sensor -G45-

34 - Front right wheel speed sensor -G45-

36 - Rear left wheel speed sensor -G46-

37 - Rear left wheel speed sensor -G46-

38 - Coding bridge to contact 12 FWD models and ESP
Coding bridge to contact 14 FWD models and TCS

39 and 40 - not assigned

41 - Brake light switch -F-

42 - Rear right wheel speed sensor -G44-

43 - Rear right wheel speed sensor -G44-

45 - Front left wheel speed sensor -G47-

46 - Front left wheel speed sensor -G47-

47 - Earth

List of test steps

Component to be tested	
Voltage supply of ABS hydraulic pump -V64	- Perform test step 1
Voltage supply of valves in hydraulic unit	- Perform test step 2
Voltage supply of control unit -J104	- Perform test step 3
Operation of brake light switch -F	- Perform test step 4
Coding bridges	- Perform test step 5
Resistance of front right wheel speed sensor -G45	- Perform test step 6
Resistance of front left wheel speed sensor -G47	- Perform test step 7
Resistance of rear right wheel speed sensor -G44	- Perform test step 8
Resistance of rear left wheel speed sensor -G46	- Perform test step 9
Voltage signal of front right wheel speed sensor -G45	- Perform test step 10
Voltage signal of front left wheel speed sensor -G47	- Perform test step 11
Voltage signal of rear right wheel speed sensor -G44	- Perform test step 12
Voltage signal of rear left wheel speed sensor -G46	- Perform test step 13
Operation of ABS warning light -K47	- Perform test step 14
Operation of handbrake/brake fluid level warning light -K14/33-	- Perform test step 15
Operation of ESP stability programme warning light -K155	- Perform test step 16
Operation of ESP pushbutton -E256	- Perform test step 17
Actuation of steering angle sender -G85	- Perform test step 18
Actuation of lateral acceleration sender -G200	- Perform test step 19
Actuation of yaw rate sender -G202	- Perform test step 20
Actuation of brake pressure sender -1- -G201	- Perform test step 21
Actuation of longitudinal acceleration sender -G251-	- Perform test step 22
Test of databus line	- Perform test step 23
Voltage supply of V.A.G 1552, plug connection T16a	- Perform test step 24
Resistance of K wire for self-diagnosis, plug connection T16a	- Perform test step 25

Test table

Notes on the test table

- *The socket designations of test box V.A.G 1598 A with adapter V.A.G 1598/36 are identical to the contact designations of control unit -J104- in the current flow diagram.*

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

- *If the measurements obtained differ from the specifications, carry out the measures stated in the right-hand column of the table in order to rectify the faults.*

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

- *Use adapter cable set V.A.G 1594 A to conduct continuity tests (bridges).*
- *If the measurements obtained differ only slightly from the specifications, then clean the sockets and connectors of the testers and the test cables (with contact spray G 000 700 04) and repeat the test. Before replacing the particular components, test the wiring and connections and repeat the resistance measurement at the component, particularly in the case of specifications of less than 10 Ω.*

Switch on measuring range: Voltage measurement (20 V =)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
1	1 + 47	Voltage supply for hydraulic pump -V64- (terminal 30) at control unit -J104	• Ignition switched off	10.0 - 14.5 V	- Test cable from contact T47a/1 through fuse S163 to battery +. - Test cable from contact T47a/47 to earth. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
2	32 + 16	Voltage supply for valves in hydraulic unit -N55- (terminal 30) at control unit -J104	• Ignition switched off	10.0 - 14.5 V	- Test cable from contact T47a/32 through fuse S162 to battery +. - Test cable from contact T47a/16 to earth. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
3	4 + 47	Voltage supply (terminal 15) of control unit -J104	• Ignition switched on	10.0 - 14.5 V	- Test cable from contact T47a/4 through fuse S13, and ignition/starter switch. - Test cable from contact T47a/47 to earth. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

Switch on measuring range: Voltage measurement (20 V =) in test step 4, resistance measurement (200 Ω)/(20 MΩ) in test step 4a					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
4	41 + 47	Brake light switch -F-	• Ignition switched off • Brake pedal not operated	0.0 - 0.5 V	- Set brake light switch, if necessary ⇒ page 45-69.1. - Replace brake light switch ⇒ page 45-69.1. - Read measured value block ⇒ page 45-238, display group number 003.
			- Brake pedal operated	10.0 - 14.5 V	- Test contact 1 of brake light switch -F- to fuse S13.
4a		Brake light switch -F-	• Set measuring range 200 Ω - Unplug multipin connector T47a from control unit -J104. - Unplug multipin connector from brake light/ brake pedal switch. - Test wiring for open circuit. - Test cable from contact 41 (control unit) to contact 1 (brake light switch).	max. 1.5 Ω	- Test wiring for open circuit. - Repair cable connections according to current flow diagram. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Set measuring range 20 MΩ - Remove fuse S13. - Test wiring for short to positive or to earth.	∞ Ω	

Switch on measuring range: Resistance measurement (20 Ω)/(20 MΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
5	12 + 38 14 + 38 9 + 12	Coding bridge	• Ignition switched off - Unplug multipin connector T47a - Connect test box V.A.G 1598 A with adapter V.A.G 1598/36 - Test wiring for open circuit	max. 1.5 Ω	- Test cable from contact 9/12/14 to contact 12/38 for open circuit.

Switch on measuring range: Resistance measurement (2 kΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
6	33 + 34	Resistance of front right wheel speed sensor -G45-	• Ignition switched off	1.0...1.3 kΩ	- Separate plug connection at wheel speed sensor. - Test wiring according to CFD. - Move cables during test. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder If no fault is found in the wiring: - Replace wheel speed sensor -G45- ⇒ page 45-60.
7	45 + 46	Resistance of front left wheel speed sensor -G47-	• Ignition switched off	1.0...1.3 kΩ	- Separate plug connection at wheel speed sensor. - Test wiring according to CFD. - Move cables during test. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder If no fault is found in the wiring: - Replace wheel speed sensor -G47- ⇒ page 45-60.

Switch on measuring range: Resistance measurement (2 kΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
8	42 + 43	Resistance of rear right wheel speed sensor -G44-	• Ignition switched off	1.0...1.3 kΩ	- Separate plug connection at wheel speed sensor. - Test wiring according to CFD. - Move cables during test. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder If no fault is found in the wiring: - Replace wheel speed sensor -G44- ⇒ page 45-65.
9	37 + 36	Resistance of rear left wheel speed sensor -G46-	• Ignition switched off	1.0...1.3 kΩ	- Separate plug connection at wheel speed sensor. - Test wiring according to CFD. - Move cables during test. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder If no fault is found in the wiring: - Replace wheel speed sensor -G46- ⇒ page 45-65.

Switch on measuring range: Voltage measurement (2 V ~)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
10	33 + 34	Voltage signal of front right wheel speed sensor -G45	• Vehicle raised • Ignition switched off - Rotate front right wheel at approx. 1 rev/sec.	min. 65 mV alternating voltage	- Inspect installation of wheel speed sensor and of rotor. - Inspect wheel speed sensor -G45- for incorrect connection and read measured value block ⇒ page 45-116, display group number 001.
11	45 + 46	Voltage signal of front left wheel speed sensor -G47-	• Vehicle raised • Ignition switched off - Rotate front left wheel at approx. 1 rev/sec.	min. 65 mV alternating voltage	- Inspect installation of wheel speed sensor and of rotor. - Inspect wheel speed sensor -G47- for incorrect connection and read measured value block ⇒ page 45-116, display group number 001.
12	42 + 43	Voltage signal of rear right wheel speed sensor -G44-	• Vehicle raised • Ignition switched off - Rotate rear right wheel at approx. 1 rev/sec.	min. 190 mV alternating voltage	- Inspect installation of wheel speed sensor and of rotor. - Inspect wheel speed sensor -G44- for incorrect connection and read measured value block ⇒ page 45-116, display group number 001.
13	36 + 37	Voltage signal of rear left wheel speed sensor -G46-	• Vehicle raised • Ignition switched off - Rotate rear left wheel at approx. 1 rev/sec.	min. 190 mV alternating voltage	- Inspect installation of wheel speed sensor and of rotor. - Inspect wheel speed sensor -G46- for incorrect connection and read measured value block ⇒ page 45-116, display group number 001.

Operational test: ABS warning light -K47-					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
14	-	Operation of ABS warning light -K47	• Fault memory interrogated and no fault present in fault memory of control unit -J104. • Ignition switched off • Multipin connector plugged into control unit -J104 and locked. - Switch ignition on.	Warning light -K47- comes on for 2 s and goes out again.	If the ABS warning light does not come on: - Test wiring according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Test dash panel insert, fault in dash panel insert. ⇒ Electrical System; Repair Group 90; Dash Panel Insert

Operational test: Handbrake/brake fluid level warning light -K14/33-					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
15	-	Operation of handbrake/brake fluid level warning light -K14/33-	• Brake fluid at correct level • Ignition switched off • Multipin connector plugged into control unit -J104 and locked. - Switch ignition on.	Warning light -K14/33- comes on for 2 s and goes out again.	- Test brake fluid level warning contact -F34- in cap of brake fluid reservoir. - Test wiring according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Test dash panel insert, fault in dash panel insert. ⇒ Electrical System; Repair Group 90; Dash Panel Insert

Operational test: Electronic stability programme warning light -K155-					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
16	-	Operation of ESP warning light -K155-	• Ignition switched off • Multipin connector plugged into control unit -J104 and locked. - Switch ignition on.	Warning light -K155- comes on for 2 s and goes out again.	- Test wiring for open circuit and short circuit to positive. If the warning light -K155- comes on and remains on: - Test cable at dash panel insert for short to earth. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Test dash panel insert, fault in dash panel insert. - Test ESP button -E256-. - Test voltage supply relay for warning light -K155-. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

Operational test: Warning light K155 for operation of ESP pushbutton -E256- in test step 17; voltage supply (20 V=) in test step 17a					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
17	-	Operation of TCS/ESP button -E256-	• Ignition switched off • Operation of ESP warning light -K155- was checked with test step 17. • Multipin connector plugged into control unit -J104- and locked. - Switch ignition on.	Warning light -K155- comes on for 2 s and goes out again	
			- Operate ESP pushbutton.	Warning light -K155- comes on	- Perform test step 18a
			- Once again operate ESP pushbutton.	Warning light -K155- goes out	
17a	16 + 13	Operation of ESP button -E256-	- Switch ignition off. - Unplug multipin connector from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/36. - Switch ignition on.		- Test cable from contact T47a/16 (control unit) to earth. - Test cable from contact T47a/13 (control unit) to contact T4f/2 (ESP button) for open circuit and short to positive or to earth.
			- Button -E256- not pressed and warning light -K155- on.	3.5 - 5.0 V	- Test cable connection for open circuit and short to positive or to earth.
			- Hold button -E256- pressed and warning light -K155- on.	8.0 - 14.5 V	- Test voltage supply from contact T4f/1 (ESP button) through fuse S13 for open circuit. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations - Replace ESP button. ⇒ Electrical System; Repair Group 96; Servicing dash panel

Switch on measuring range:
Voltage measurement (20 V =) in test step 18; resistance measurement (200 Ω/20 MΩ) in test step 18a

Test step	V.A.G 1598 A Sockets	Test of	• Test conditions - Additional operations	Specification	Measures if readout differs from specification
18	-	Earth and voltage supply of steering angle sender -G85	• Ignition switched off - Unplug multipin connector T47a from control unit -J104-. - Separate plug connection from steering angle sender. - Test voltage supply of steering angle sender at plug connection T6w. - Test cable between contact T6w/4 and contact T6w/1.	10.0 - 14.5 V	- Test cable from contact T6w/4 (steering angle sender) to fuse S15 for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Ignition switched on - Test cable between contact T6w/5 and contact T6w/1.	10.0 - 14.5 V	- Test cable from contact T6w/5 (steering angle sender) to fuse S13 for open circuit. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
18a	11 + 15	Wiring of steering angle sender -G85	• Measuring range 200 Ω set - Connect test box V.A.G 1598 A with adapter V.A.G 1598/36. - Test the following cables for open circuit: - Cable from contact T6w/3 (steering angle sender) to contact T47a/11 (control unit). - Cable from contact T6w/2 (steering angle sender) to contact T47a/15 (control unit). - Cable from contact T6w/1 to earth.	max. 1.5 Ω	- Test wiring for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Measuring range 20 MΩ set - Remove fuse S15. - Test wiring for short to positive or to earth.	∞ Ω	

Switch on measuring range: Resistance measurement (200 Ω/20 MΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
19	-	Wiring of lateral acceleration sender -G200	• Ignition switched off • Measuring range 200 Ω set - Unplug multipin connector T47a from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/36. - Separate plug connection T3n from lateral acceleration sender.		
			- Test cables for open circuit: - Cable from contact T3n/1 (lateral acceleration sender) to contact T47a/6 (control unit).	max. 1.5 Ω	- Test wiring for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			- Cable from contact T3n/2 (lateral acceleration sender) to contact T47a/24 (control unit).		
			- Cable from contact T3n/3 (lateral acceleration sender) to contact T47a/26 (control unit).	max. 1.5 Ω	
			• Measuring range 20 MΩ set - Test wiring for short to positive or to earth.	∞ Ω	

Switch on measuring range: resistance measurement (200 Ω/20 MΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
20	-	Wiring of yaw rate sender -G202-	• Ignition switched off • Measuring range 200 Ω set - Unplug multipin connector T47a from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/36. - Separate plug connection T3m from yaw rate sender -G202-. - Test wiring for open circuit: - Cable from contact T3m/1 (yaw rate sender) to contact T47a/40 (control unit). - Cable from contact T3m/2 (yaw rate sender) to contact T47a/24 (control unit). - Cable from contact T3m/3 (yaw rate sender) to contact T47a/26 (control unit).	max. 1.5 Ω	- Test wiring for open circuit. - Repair cable connections according to current flow diagram. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Measuring range 20 MΩ set - Test wiring for short to positive or to earth.	∞ Ω	

Switch on measuring range: Resistance measurement (200 Ω/20 MΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
21	-	Wiring of brake pressure sender 1 -G201	• Ignition switched off • Measuring range 200 Ω set - Unplug multipin connector T47a from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/36. - Separate plug connection T30 from brake pressure sender -1- -G201. - Test cables for open circuit: - Cable from contact T30/1 (brake pressure sender) to contact T47a/19 (control unit). - Cable from contact T30/2 (brake pressure sender) to contact T47a/20 (control unit). - Cable from contact T30/3 (brake pressure sender) to contact T47a/18 (control unit).	max. 1.5 Ω	- Test wiring for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Measuring range 20 MΩ set - Test wiring for short to positive or to earth.	∞ Ω	

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

Switch on measuring range: Resistance measurement (200 Ω/20 MΩ)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	• **Test conditions** - **Additional operations**	**Specification**	**Measures if readout differs from specification**
23	11 + 15	Databus lines	• Ignition switched off • Measuring range 200 Ω set - Unplug multipin plug connections from the control units connected over the databus. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/33. - Test wiring for open circuit: - to steering angle sender - to engine control unit - to automatic gearbox control unit[1]. - Cable from contact T47a/11 (control unit) to contact T6w/3 (steering angle sender -G85-). - On to the connected control units. - Cable from contact T47a/15 (control unit) to contact T6w/2 (steering angle sender -G85-). - On to the connected control units.	max. 1.5 Ω	- Test wiring for open circuit. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Measuring range 20 MΩ set - Test wiring for short to positive or to earth.	∞ Ω	

[1] Only models fitted with automatic gearbox.

Switch on measuring range: Voltage measurement (20 V =)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
24	-	Voltage supply of vehicle system tester V.A.G 1552, plug connection T16a	• Ignition switched on - Connect hand-held multimeter, e.g. V.A.G 1526 A, with adapter cable set V.A.G 1594 A to T16a [1]: - Test cable between contact T16a/4 and contact T16a/1	10.0-14.5 V	- Test cable from T16a/4 to earth. - Test cable from T16a/1 through S5. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

[1] Contact assignment of plug connection for voltage supply and self-diagnosis with vehicle system tester V.A.G 1552 ⇒ page 45-251.

Switch on measuring range: Resistance measurement (200 Ω)					
Test step	**V.A.G 1598 A Sockets**	**Test of**	**• Test conditions - Additional operations**	**Specification**	**Measures if readout differs from specification**
25	-	Resistance of K wire for self-diagnosis, plug connection T16a	• Ignition switched off • Measuring range 200 Ω set - Remove fuse S13. - Unplug multipin connector T47a from control unit -J104-. - Connect test box V.A.G 1598 A with adapter V.A.G 1598/33. - Test cable between contact T16a/7 and contact T47a/39.	max. 1.5 Ω	- Test cable from T16a/7 to contact T47a/39. - Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
			• Measuring range 20 MΩ set - Test wiring for short to positive or to earth.	∞ Ω	- Repair cable connections according to CFD. ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

Servicing front brakes

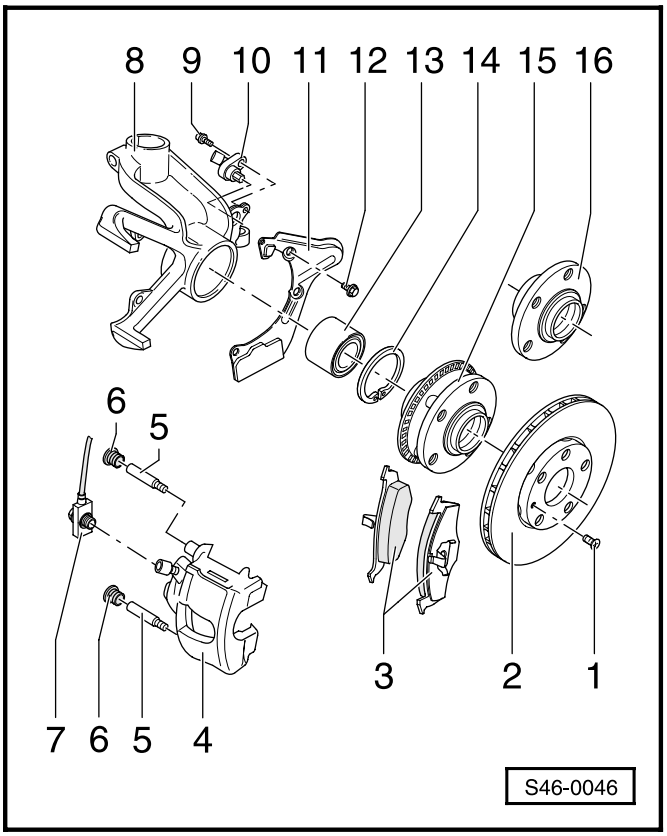
Servicing front brakes, brake caliper FS-III

Special tools, testers and aids required

- Piston resetting device MP 9-403
- Brake pedal depressor, e.g. V.A.G 1238/B
- Brake filling and bleeding appliance, e.g. ROMESS S15
- Bleeder bottle (commercially available)
- Brake fluid ⇒ page 00-8
- Solid lubricating paste G 000 650 (e.g. Wolfrakote Top Paste)

Notes:

- *After replacing brake pads, depress brake pedal firmly several times when vehicle stationary so that the brake pads adopt their seating corresponding to the position when driving.*
- *Insert the brake pedal depressor, e.g. V.A.G 1238/B, before removing a brake caliper or separating a brake hose from the brake caliper.*
- *Use a bleeder bottle which comes into contact only with brake fluid, for extracting brake fluid from the brake fluid reservoir. Brake fluid is toxic and must on no account be sucked out with your mouth through a hose!*
- *Do not re-use brake fluid which has been extracted.*
- *Tightening torque of wheel bolts: 120 Nm*



1 - Philips head screw, 4 Nm

2 - Brake discs
- ♦ thickness: 22 mm
- ♦ wear limit: 19 mm
- ♦ if worn always replace axle-wise
- ♦ before removing unscrew brake caliper
- ♦ do not use force to separate the brake discs from the wheel hub, if necessary use rust solvent as you could otherwise damage the brake dics
- ♦ Technical data ⇒ Brakes; page 00-6

3 - Brake pads
- ♦ with wear indicator
- - with a corresponding wear (limit: 2 to 3 mm) a warning lamp on the dash panel insert lights up
- ♦ thickness 19.5 mm including supporting plate
- ♦ wear limit: 7 mm including supporting plate
- ♦ inspecting thickness

⇒ Inspection and Maintenance
- ♦ always replace axle-wise
- ♦ removing and installing ⇒ page 46-3
- ♦ 05.98 ➤: do not interchange inside and outside brake pads ⇒ page 46-4

4 - Brake caliper
- ♦ removing:
- - removing brake pads -item 3- ⇒ page 46-3
- - fitting brake pedal arrester.
- - unscrew brake hose -item 7- from brake caliper
- ♦ installing:
- - installing brake pads -item 3- ⇒ page 46-3
- - screw brake hose -item 7- onto brake caliper
- - removing brake pedal arrester.
- - bleeding brake system ⇒ page 47-18
- ♦ repairing ⇒ page 47-8

5 - Guide bolts, 28 Nm
- ♦ removing and installing ⇒ page 46-3

6 - Cap

7 - Brake hose with ring fitting and hollow screw
- ♦ cannot be disassembled, must be replaced completely
- ♦ Tightening torque: 35 Nm

8 - Wheel bearing housing

9 - Allan screw, 8 Nm

10 - ABS speed sensor
- ♦ before inserting speed sensor, clean inside surface of hole and coat with solid lubricant paste G 000 650 (e.g. Wolfrakote-Top-Paste)

11 - Cover plate

12 - Screw, 10 Nm

13 - Wheel bearing
- ♦ replacing after each removal
- ♦ pressing out and in ⇒ page 40-16 and further

14 - Circlip

15 - Wheel bearing with pulse rotor
- ♦ only on vehicles with ABS
- ♦ pressing out and in ⇒ page 40-16 and further

16 - Wheel bearing without pulse rotor
- ♦ only on vehicles without ABS

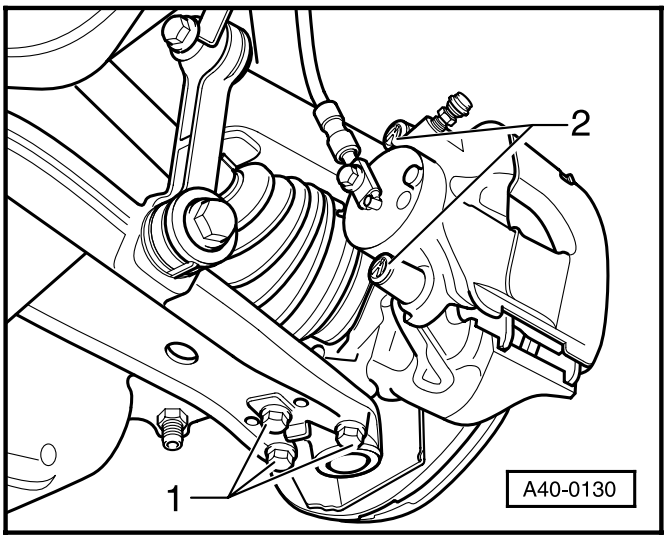
Removing and installing brake linings or the brake calliper (FS-III)

Required special tools, testing and measuring equipment as well auxiliary devices and material

- A piston resetting device MP 9-403
- A brake filling and ventilation device, e.g. ROMESS S 15
- A ventilating bottle (commercially available)
- Brake fluid ⇒ Page 00-8

Removal

- Removing wheels



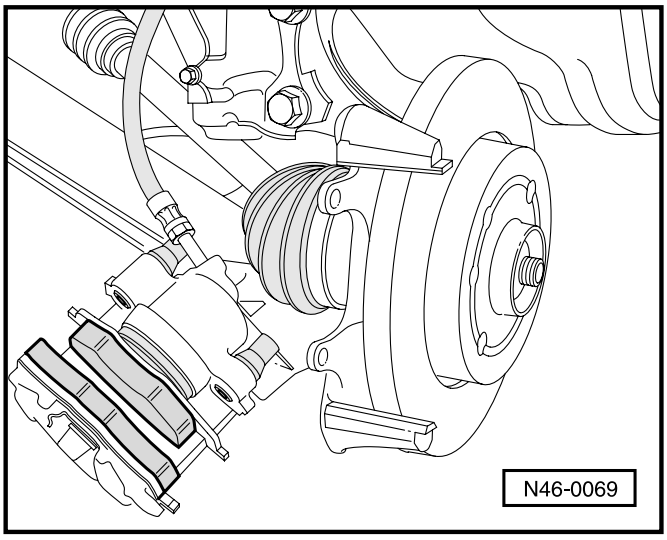
Comments:

- *Mark brake linings which are to be used again when removing. Install at the same location again otherwise uneven braking will result!*
- *Do not unscrew the brake hose to change brake linings.*

- Disconnect the plug connection for the brake lining wear indicator (when the vehicle is fitted with this).

◄- Remove the caps -2-

- Screw out both guide bolts from the brake calliper and remove.
- Remove the brake calliper housing and fix it with a wire in such a way that the weight of the brake calliper does not load down the brake hose or damage it.



◄- Remove the brake linings from the brake calliper housing.

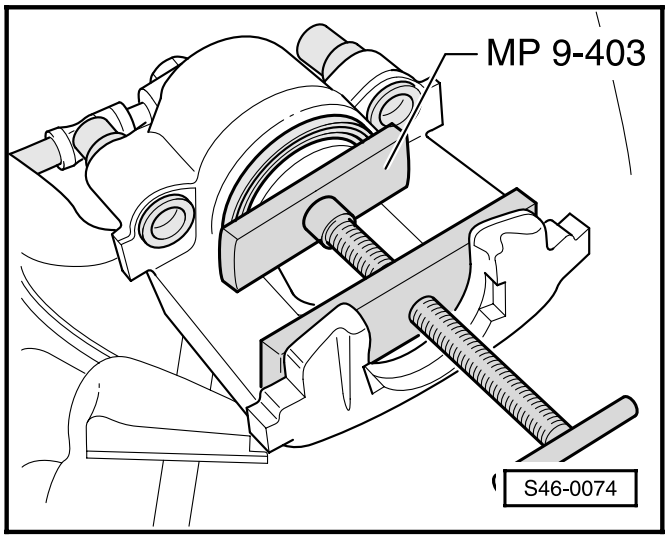
Installing

Comments:

Before inserting new brake linings press the piston into the cylinder using the piston resetting device. Remove some brake fluid from the brake fluid reservoir using a ventilatiion bottle before pressing in again.

Otherwise - if brake fluid has been topped up in the meantime - it may flow out and cause damage.

> ***Take note!***
>
> ***Brake fluid is poisonous and must not under any circumstances be sucked up over a hose by mouth.***



- Clean the brake calliper housing.

Comment:

One should exclusively use white spirits to clean the brake calliper housing.

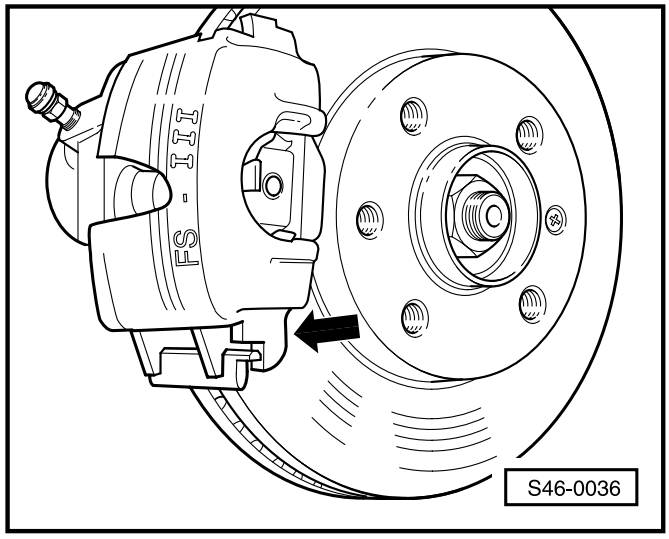
◄- Press back the piston using the piston resetting device MP 9-403.

- Insert the brake linings

  05.98 ➤: do not mix up the inner and outer brake linings

  Outer brake lining: a black coloured three finger clip

  Inner brake lining: white coloured on the piston side



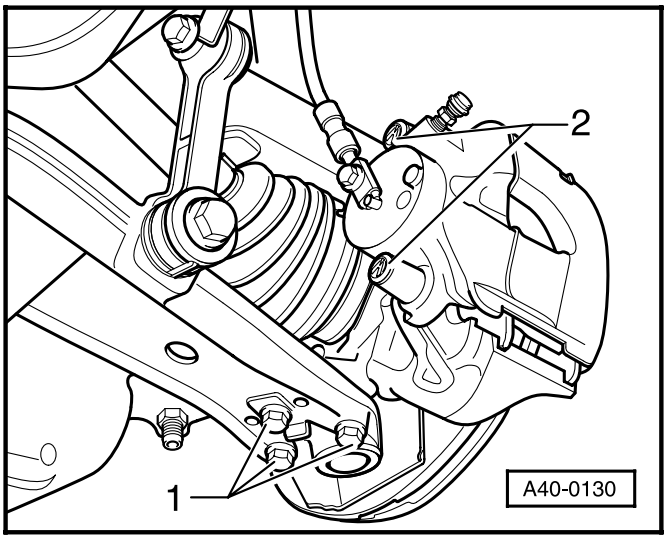
◄- First place the brake calliper housing below -arrow-.

- Mount the brake calliper housing with brake linings on the wheel bearing housing.

  The lugs of the brake calliper housing -arrow- must be behind the guide for the wheel bearing housing.

- Screw the guide bolts into the brake calliper housing and tighten to 28 Nm.

- Disconnect the plug connection for the brake lining wear indicator (when the vehicle is fitted with this).



◄- Fit the two protective caps -2-.

- Mount wheels.

Notes:

After each change of brake pads apply strong pressure repeatedly in standing position, to ensure the brake pads fit into their operating position.

Check the brake fluid level after changing the brake pads, if necessary top up brake fluid.

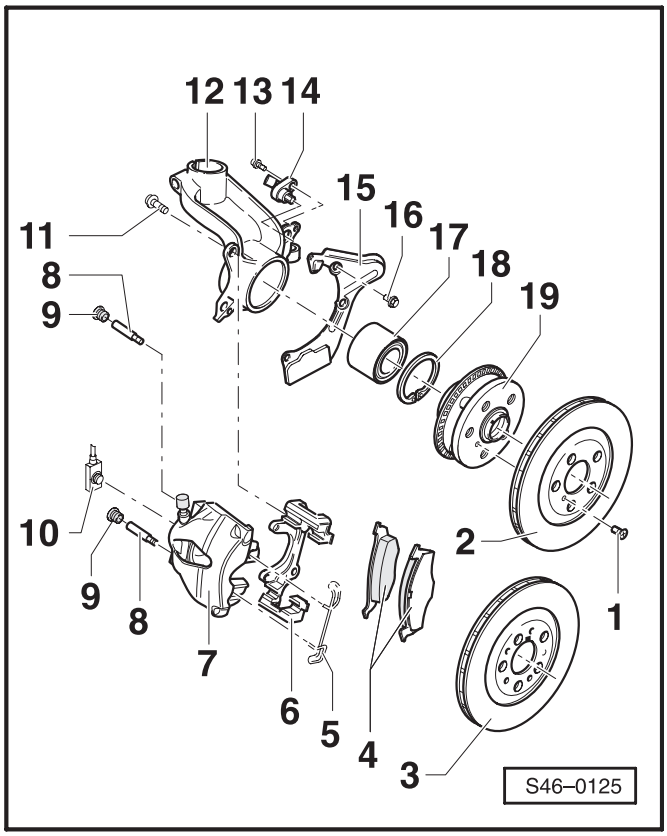
Servicing front brakes with FN-3 brake calliper

Special tools, testers and aids required

- Piston resetting device MP 9-403
- Brake pedal arrester, e.g. V.A.G 1238/B
- Brake filling and bleeding appliance, e.g. ROMESS S15
- Bleeder vessel (commercially available)
- Brake fluid ⇒ page 00-8
- Solid lubricating paste G 000 650 (e.g. Wolfrakote-Top-Paste)

Notes:

- *After each change of brake pads apply strong pressure repeatedly in standing position, to ensure the brake pads fit into their operating position.*
- *Before removing a brake calliper of before disconnecting a brake pipe from the brake calliper use brake pedal arrester (e.g. V.A.G 1238/B.)*
- *To bleed the brake fluid from the brake fluid reservoir use a bleeder vessel that only comes into contact with the brake fluid. Brake fluid is toxic and must under no circumstances be sucked out by mouth via a hose!*
- *Never re-use used brake fluid.*
- *Tightening torque of wheel bolts: 120 Nm.*



1 - Philips head screw, 4 Nm

2 - Brake discs
- ♦ without marking for maximum axial run-out
- ♦ combination of brake disc without marking and wheel hub with marking is permissible
- ♦ with a fixing hole for the wheel hub
- ♦ always replace axle-wise
- ♦ before removing unscrew brake caliper
- ♦ do not use force to separate the brake discs from the wheel hub, if necessary use rust solvent as you could otherwise damage the brake dics
- ♦ Technical data ⇒ Brakes; page 00-6
- ♦ assignment ⇒ Spare Part catalogue

3 - Brake discs
- ♦ with approx. 5 mm wide ink jet mark for marking maximum axial run-out
- ♦ combination of brake disc with marking and wheel hub without marking is permissible
- ♦ with 5 fixing holes for wheel hub
- ♦ always replace axle-wise
- ♦ before removing unscrew brake caliper
- ♦ do not use force to separate the brake discs from the wheel hub, if necessary use rust solvent as you could otherwise damage the brake dics
- ♦ Technical data ⇒ Brakes; page 00-6
- ♦ assignment ⇒ Spare Part catalogue
- ♦ removing and installing ⇒ page 46-5.7

4 - Brake pads
- ♦ with wear indicator
- \- with a corresponding wear (limit: 2 to 3 mm) a warning lamp on the dash panel insert lights up
- ♦ Technical data ⇒ page 00-6
- ♦ inspecting thickness

⇒ Inspection and Maintenance
- ♦ always replace axle-wise
- ♦ removing and installing ⇒ page 46-5.2

5 - Retaining spring
- ♦ insert in both holes of the brake caliper
- ♦ replace after each pad replacement

6 - Brake carrier
- ♦ is installed together with adequate quantity of grease on the guide bolts supplied as a spare part
- ♦ if protective caps or guide bolts are damaged, use the complete repair kit, use the enclosed grease packaging to grease the guide bolts

7 - Brake caliper
- ♦ removing:
- \- removing brake pads -item 4- ⇒ page 46-5.2
- \- fitting brake pedal arrester.
- \- unscrew brake hose -item 10- from brake caliper.
- ♦ installing:
- \- installing brake pads -item 4- ⇒ page 46-5.4
- \- screw brake hose -item 10- onto brake caliper.
- \- removing brake pedal arrester.
- \- bleeding brake system ⇒ page 47-18
- ♦ repairing ⇒ page 47-10.1

8 - Guide pin, 28 Nm
- removing and installing ⇒ page 46-5.2

9 - Cap

10 - Brake hose with union and banjo bolt
- must not be disassembled; always replace complete
- tightening torque 35 Nm

11 - Hexagon bolt with locking collar, 125 Nm
- clean ribbing on underside

12 - Wheel bearing housing

13 - Hexagon socket bolt, 8 Nm

14 - ABS wheel speed sensor
- clean inner surface of hole and coat with solid lubricating paste G 000 650 (e.g. Wolfrakote Top Paste) before inserting the sensor

15 - Splash guard

16 - Hexagon bolt, 10 Nm

17 - Wheel bearing
- replace each time removed
- removing and inserting ⇒ page 40-16

18 - Circlip

19 - Wheel hub with pulse rotor
- with and without marking for minimum runout
- combination of wheel hub without marking and brake disc with marking, or vice versa, is permitted. Reduction of total runout of brake FN-3 is then not effective
- only on models with ABS
- removing and inserting ⇒ page 40-16
- assignment ⇒ Parts List

Removing and installing brake pads/brake caliper (FN-3)

Special tools, testers and aids required

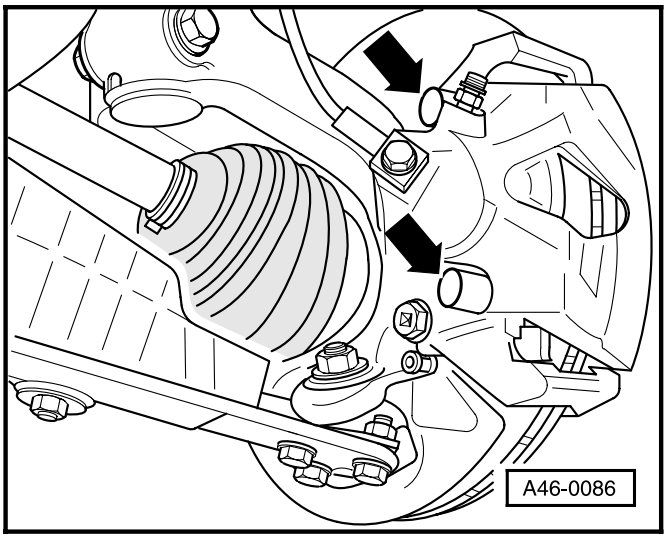
- Piston setback device MP 9-403
- Brake filling and bleeding appliance, e.g. ROMESS S15
- Bleeder bottle (commercially available)
- Brake fluid ⇒ page 00-8

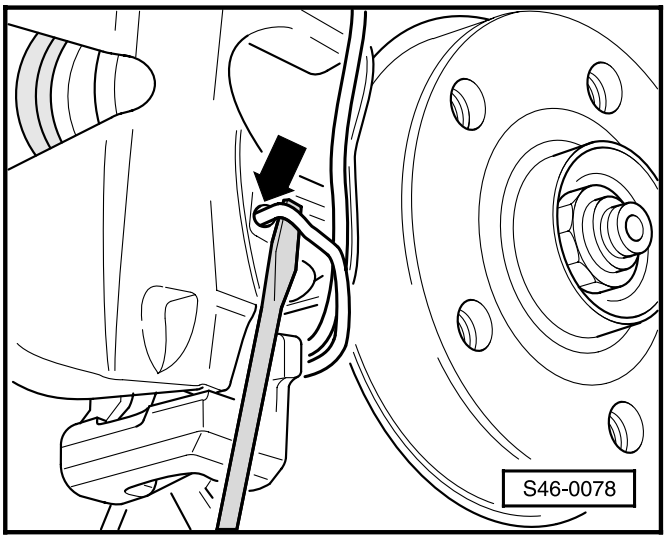
Removing

- Take off wheels.

Notes:
- *Mark brake pads which can be re-used when removing. Re-install at the same point otherwise braking action will be uneven!*
- *Do not disconnect brake hose for replacing pads.*

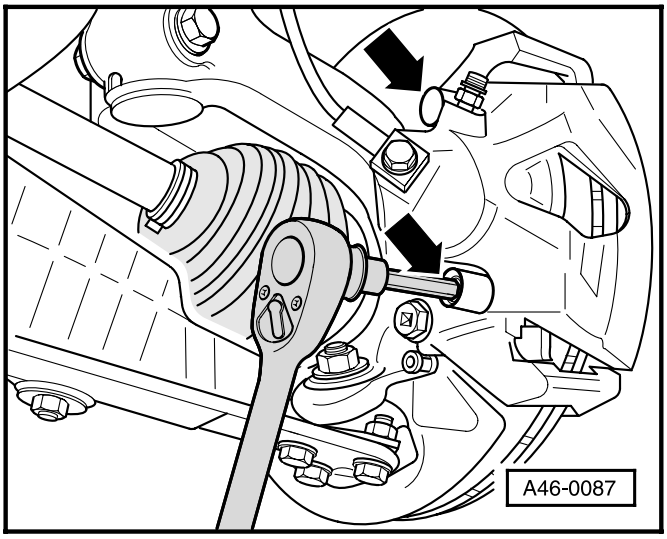
◄ - Take off caps -arrows-.





- Disconnect the plug connection for the brake lining wear indicator (when the vehicle is fitted with this).

◄- Lever out the holding spring for the brake lining from the brake calliper housing -arrow- using a screwdriver and remove it.



◄- Screw out both guide bolts from the brake calliper housing and remove.

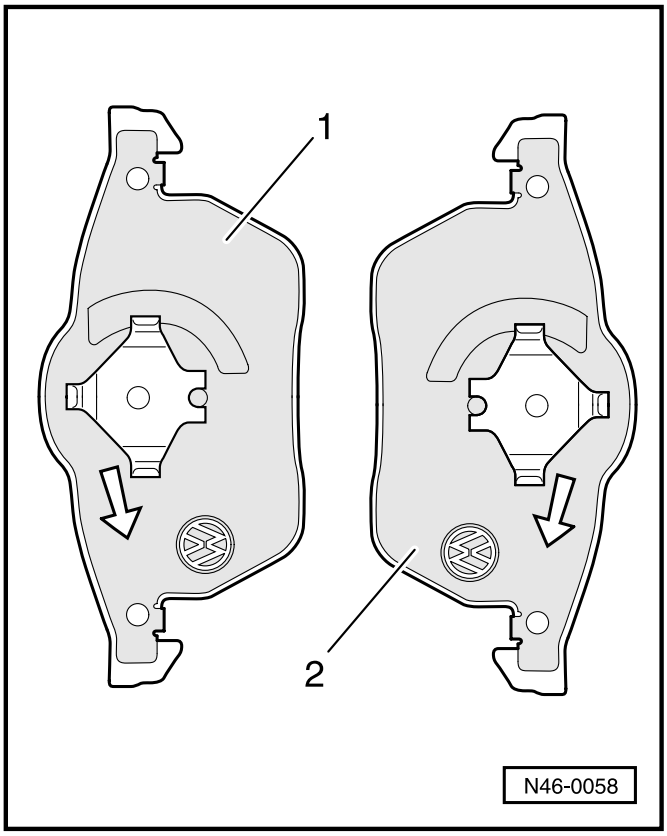
- Remove the brake calliper housing and fix it with a wire in such a way that the weight of the brake calliper does not load down the brake hose or damage it.

- Remove the brake linings from the brake calliper housing.

- Clean the brake calliper housing; one should particularly ensure that the glued contact surfaces for the brake linings are free of adhesive residues

Comment:

One should exclusively use white spirits to clean the brake calliper housing.



Installing

◄ **Directional brake pads**

1 - right piston-side brake pad

2 - left piston-side brake pad

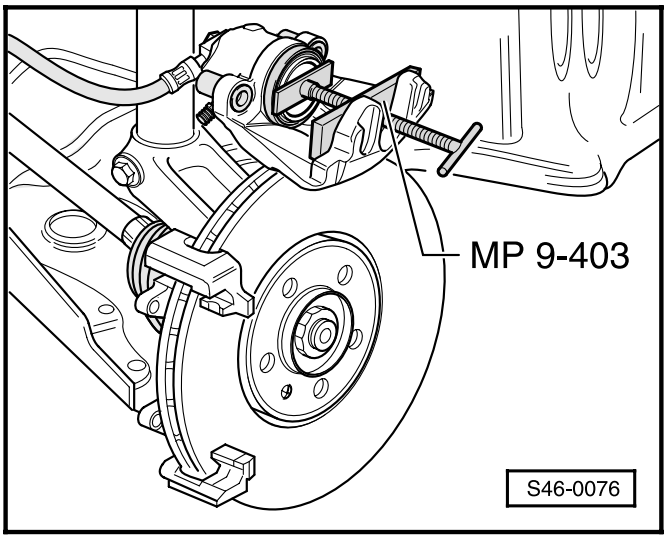
When installed, the arrow on the backplate of the brake pad should point downward. Please check!

Note:

Before inserting new brake pads, push piston into cylinder with piston resetting device. Before pushing back, suck out brake fluid from brake fluid reservoir using a bleeder vessel. Otherwise - if brake fluid has been topped up in the meantime - brake fluid may escape and thus cause damage.

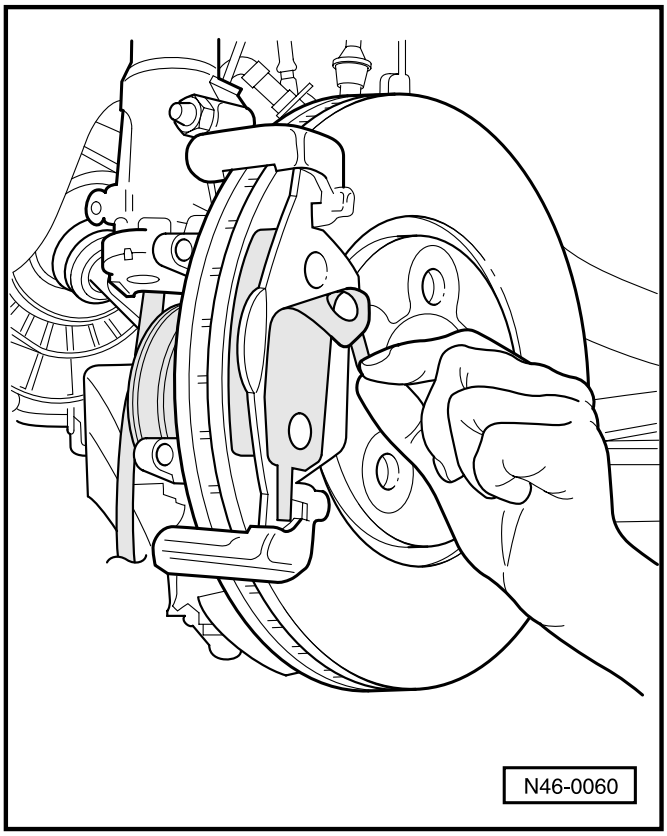
Caution!

Brake fluid is toxic and must under no circumstances be sucked out by mouth via a hose.



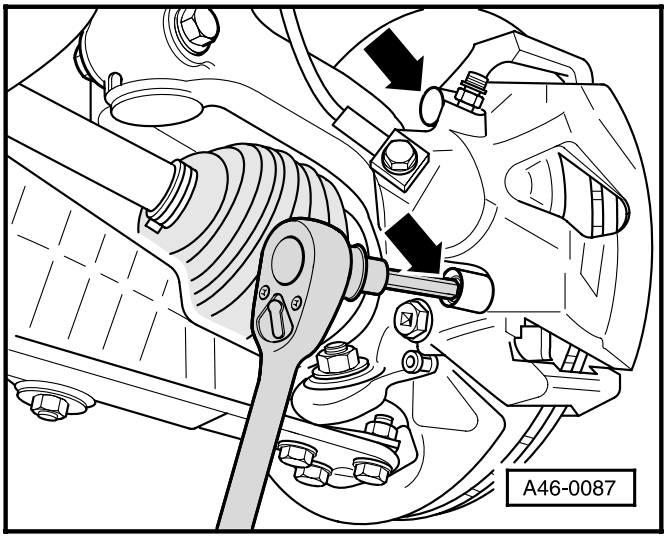
◄ - Push back piston.

- Insert inner brake pad.



◄- Insert the outer brake lining.

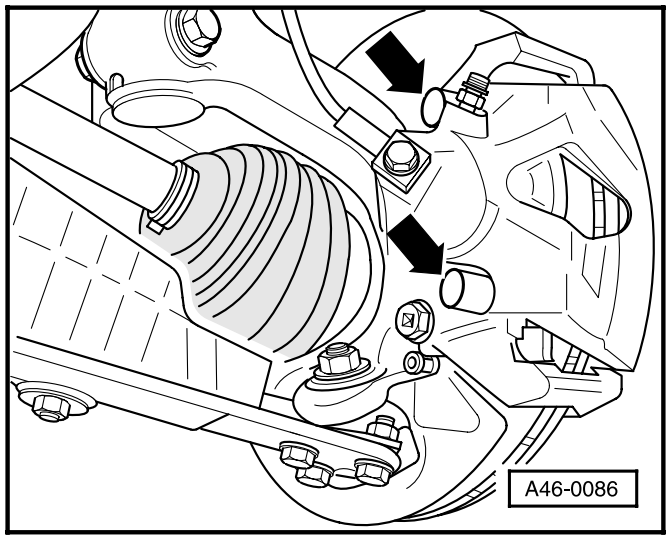
- Remove the protective foil from the back plate of the brake lining.



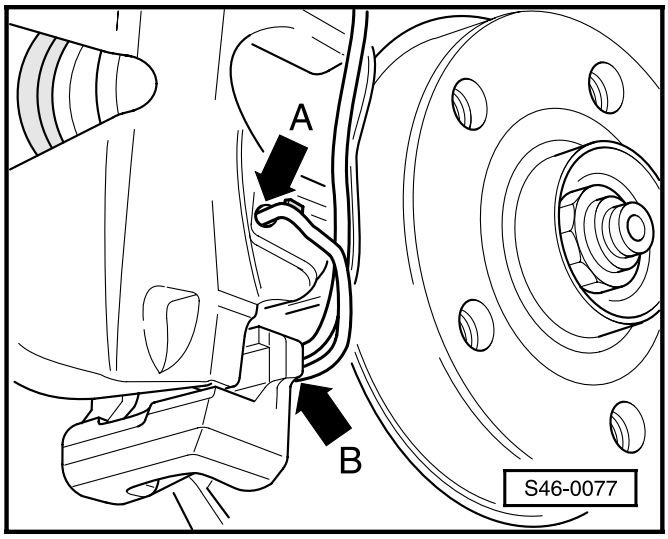
◄- Brake calliper housing with both guide bolts -arrows- on the brake carrier.

Tightening torque: 28 Nm.

- Disconnect the plug connection for the brake lining wear indicator (when the vehicle is fitted with this).



◄- Fit on both caps -arrows-.



◄- Insert the ends of retaining spring into the holes of brake caliper housing -arrow A- and then press spring behind the brake carrier -arrow B-.

- Fit on wheels.

Notes:

- *Each time after replacing brake pads, depress brake pedal firmly several times when car stationary so that the brake pads are properly seated in their normal operating position.*
- *Each time after replacing brake pads, check brake fluid level, and top up brake fluid if necessary.*

Removing and installing brake discs (FN-3)

Notes:

- *In the case of brake FN-3 brake judder, pulsing or steering wheel vibrations may occur. The cause of this is an excessive axial runout in the brake disc - wheel hub system.*
- *To reduce the axial total runout the maximum and minimum runout of the brake disc and the wheel hub are marked by ink jet marking.*
- *When dealing with complaints regarding excessive axial total runout, replace non-marked wheel hubs and brake discs with marked parts. Assignment*

⇒ Parts List

- *If used brake discs with marking and 5-hole attachment for wheel hub are to be re-installed, mark the position of the brake disc to the wheel hub before removing the parts.*
- *It is permitted to use the combination of marked brake disc/unmarked wheel hub, or unmarked brake disc and marked wheel hub.*
- *Also permissible is the combination on the left side of the vehicle of components without a marking, and on the right side of the vehicle components with a marking, or vice versa.*
- *Note that in the case of the combinations listed, the reduction of the total runout at the FN-3 brake is not effective.*
- *Always replace brake discs only on both sides.*
- *Do not use force to separate brake discs from the wheel hub; use rust release agents, if necessary; otherwise risk of damage to the brake discs.*

Removing

- Take off wheel.

Note:

Do not disconnect brake hose from the brake caliper.

- Remove brake carrier together with brake caliper and attach with wire so that the weight of the brake caliper is not pulling on the brake hose, or can damage it.

- Remove cross-head screw.

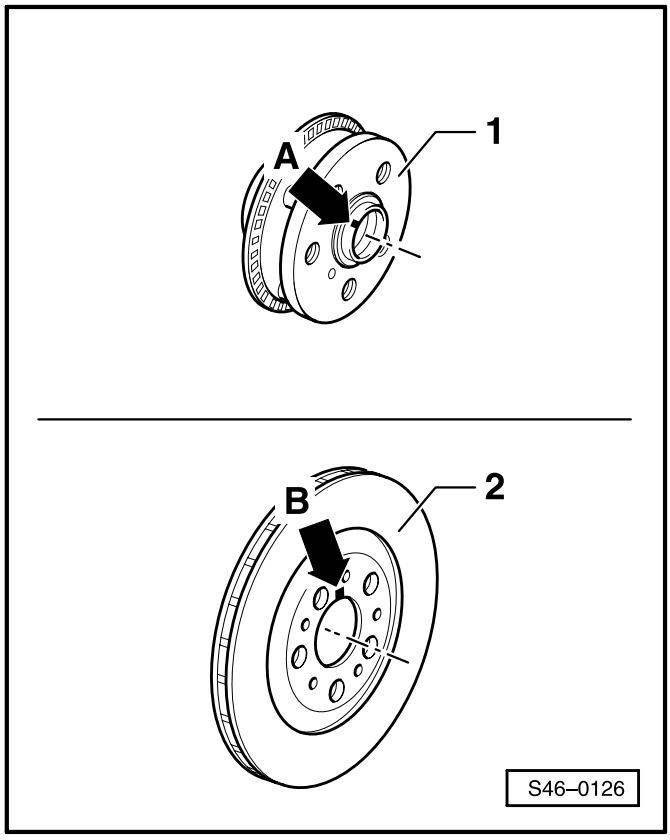
- Take off brake disc.

If dealing with a complaint of excessive axial total runout

- Remove wheel hub ⇒ page 40-16.

Installing

If dealing with a complaint of excessive axial total runout



◄ - Install new wheel hub -1- with ink jet marking about 3 mm wide aligned to marking of minimum runout -arrow A- in the wheel bearing housing ⇒ page 40-16.

- Install new brake disc -2- with 5 holes for attaching wheel hub and an ink jet marking about 5 mm wide aligned with the marking of the maximum runout -arrow B-.

Installation position:

Install brake disc on wheel hub so that the markings of the minimum runout (wheel hub) and of the maximum runout (brake disc) are positioned opposite.

Vehicles without complaint

♦ On vehicles which have already been driven, it is not possible to achieve a minimising of the axial runout after replacing the brake discs (old wheel hub/new brake disc).

♦ Brake discs can be installed without any special installation position.

- Install brake discs.

Continued for all models

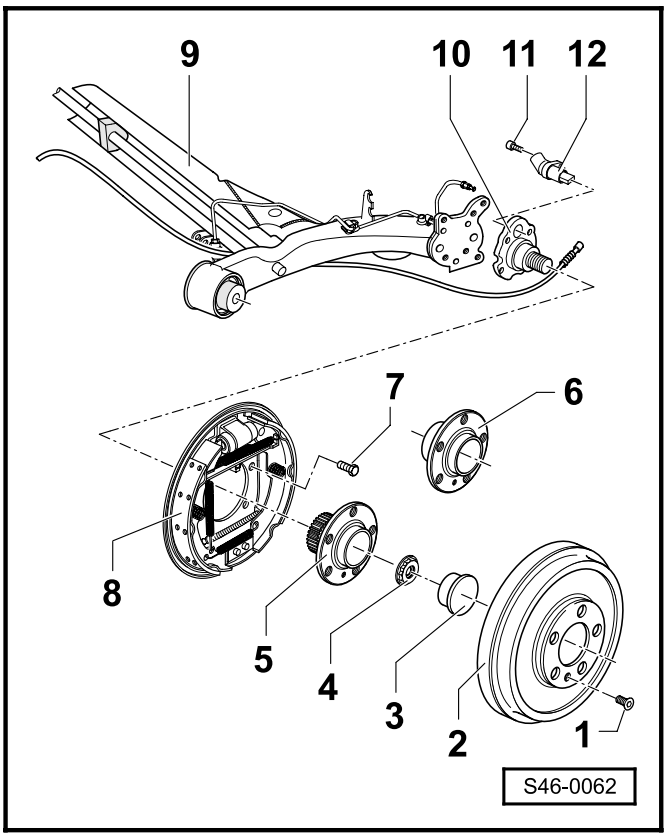
- The remaining installation is carried out in the reverse order.

Tightening torques:

Brake disc to wheel hub	4 Nm
Brake carrier with brake caliper to wheel bearing housing	125 Nm
Wheel bolt	120 Nm

Servicing rear brakes - FWD models/drum brakes

Removing and installing rear brake



Special tools, testers and aids required

- Measuring instrument for brake drum MP 5-407
- Dial gauge (range 0 - 10 mm)
- Bleeder bottle (commercially available)
- Brake filling and bleeding appliance, e.g. ROMESS S15
- Brake pedal depresser, e.g. V.A.G 1238/B
- Brake fluid ⇒ page 00-8
- Solid lubricating paste G 000 650 (e.g. Wolfrakote Top Paste)

Notes:

- *After replacing wheel brake cylinder, brake carrier and brake shoes, depress brake pedal firmly once when vehicle stationary so that the brake shoes are properly seated to match their operating position.*
- *Use a bleeder bottle which comes into contact only with brake fluid, to extract brake fluid from the brake fluid reservoir. Brake fluid is poisonous and must on no account be extracted by sucking it out through a hose with your mouth!*
- *Before removing a wheel brake cylinder, brake carrier or separating a brake pipe from the brake cylinder, insert the brake pedal depresser, e.g. V.A.G 1238/B.*
- *Brake fluid drained from the system must not be re-used.*
- *Tightening torque of wheel bolts: 120 Nm*

1 - Cross-head screw, 4 Nm

2 - Brake drum
- Brake drum diameter 230 mm
- Wear limit ∅ 231.0 mm
- Clean carefully, inspect for wear, damage, dimensional tolerance and proper braking surface
- Check out-of-roundness with special tool MP 5-407 and dial gauge (range 0 - 10 mm)

- Permissible out-of-roundness 0.03 mm; if measurement obtained is greater than 0.03 mm, replace brake drum.

⇒ Inspection and Maintenance

3 - Cap
- Pressing off ⇒ page 42-25
- Inserting ⇒ page 42-27

4 - Twelve-pointed nut, self-locking, 70 Nm + torque a further 40°
- Replace each time removed

5 - Wheel hub with wheel bearing and pulse rotor
- ♦ Only on models with ABS
- ♦ Replace each time removed
- ♦ Always replace complete
- ♦ Removing and inserting ⇒ from page 42-23

6 - Wheel hub with wheel bearing without pulse rotor
- ♦ Only on models without ABS
- ♦ Replace each time removed
- ♦ Always replace complete
- ♦ Removing and inserting ⇒ from page 42-23

7 - Bolt + washer, 50 Nm + torque a further 60°
- ♦ Replace each time removed

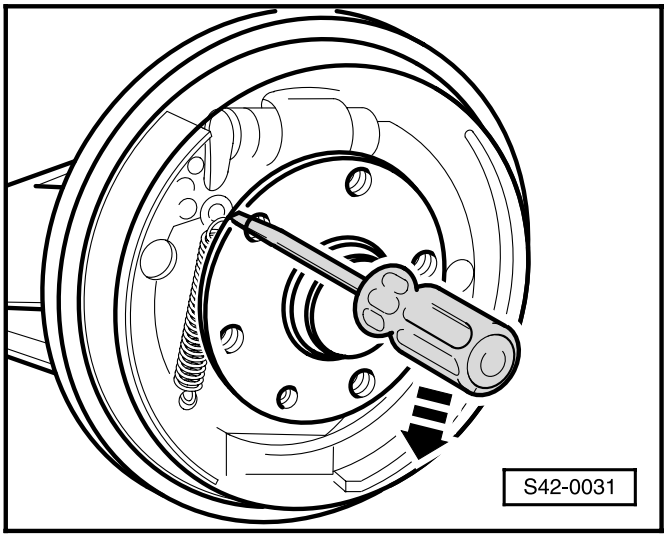
8 - Brake carrier with brake shoes
- ♦ Removing:
- Setting back brake ⇒ page 46-7
- Remove brake drum
- Insert brake pedal depresser
- Unbolt brake tube
- Remove brake carrier
- ♦ Installing:
- Install brake carrier
- Bolt on brake tube
- Remove brake pedal depresser
- Install brake drum
- Bleed brake system ⇒ page 47-18
- ♦ Servicing ⇒ page 46-8

9 - Axle beam

10 - Axle stub

11 - Hexagon socket bolt, 8 Nm

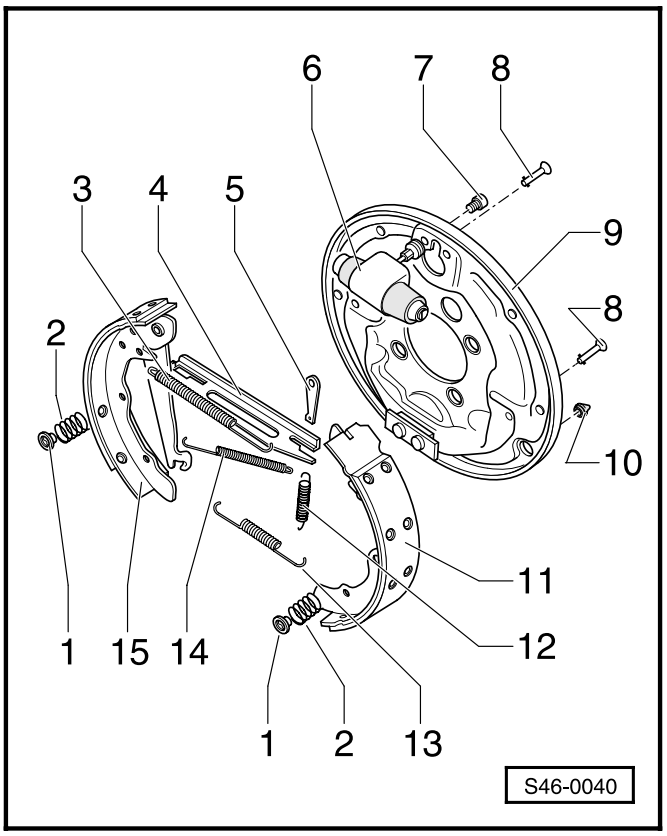
12 - ABS wheel speed sensor
- ♦ Only on vehicles with ABS
- ♦ Before inserting the sensor, clean inner surface of hole and coat with solid lubricating paste G 000 650 (e.g. Wolfrakote Top Paste)



Moving back brake

◄- Insert a screwdriver through a hole of the wheel bolts in the brake drum and push the wedge up.

Repairing rear wheel brake



Special tools, testers and aids required

- Hook (commercially available)
- Brake filling and ventilation device, e.g. ROMESS S 15
- Brake pedal arrester, e.g. V.A.G 1238/B or V.A.G 1869/2
- Plastic wedge 3409
- Brake fluid ⇒ page 00-8
- Solid lubricant paste G 000 650 (e.g. Wolfrakote top paste)

Note:

After working on the rear wheel brake

- *Release hand brake.*
- *Activate brake pedal forcefully once.*

1 - Spring cap
- to remove push against pressure spring and turn 90°

2 - Pressure spring

3 - Locating spring

4 - Pressure rod
- grease points of contact with solid lubricant paste G 000 650 (e.g. Wolfrakote-Top-Paste)

5 - Wedge
- when removing and installing the brake drum push up through a hole for the wheel bolt ⇒ page 46-7

6 - Wheel brake cylinder
- inspecting for leaks ⇒ Fig. 1
- repairing is not permissible
- removing:
  - fitting brake pedal arrester
  - unscrew brake pipe
  - removing wheel brake cylinder
- installing:
  - installing wheel brake cylinder
  - screw on brake pipe.
  - removing brake pedal arrester.
  - bleeding brake system ⇒ page 47-18

7 - Allan screw, 8 Nm

8 - Tensioning pin

9 - Brake carrier

10 - Cap
- for checking the removed brake pad thickness ⇒ Fig. 2

11 - Brake shoes
- removing and installing ⇒ page 46-10
- minimum pad thickness without supporting plate 2.5 mm
- inspecting thickness ⇒ Fig. 2, visual inspection through the inspection hole in the brake carrier as well as repair manual of Inspection and Maintenance

⇒ Inspection and Maintenance
- always replace brake pads axle-wise

12 - Tension spring

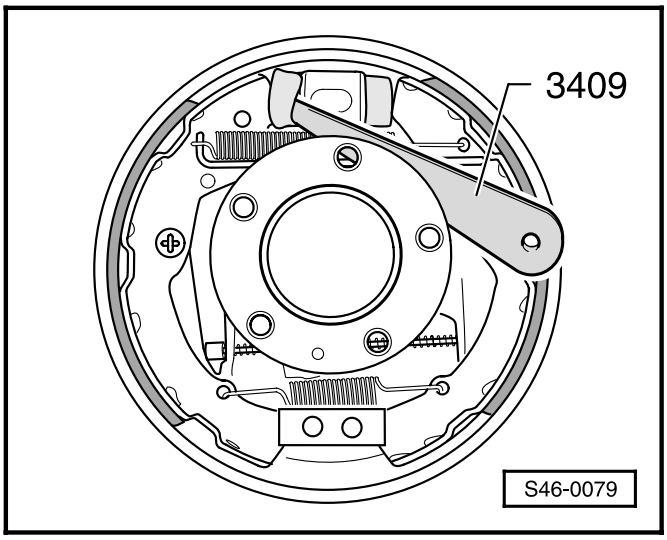
13 - Bottom restoring spring

- Grease contact points with solid lubricating paste G 000 650 (e.g. Wolfrakote Top Paste)

14 - Top restoring spring

15 - Brake shoe with lever for handbrake

- Removing and installing ⇒ page 46-10
- Adjusting handbrake ⇒ page 46-12



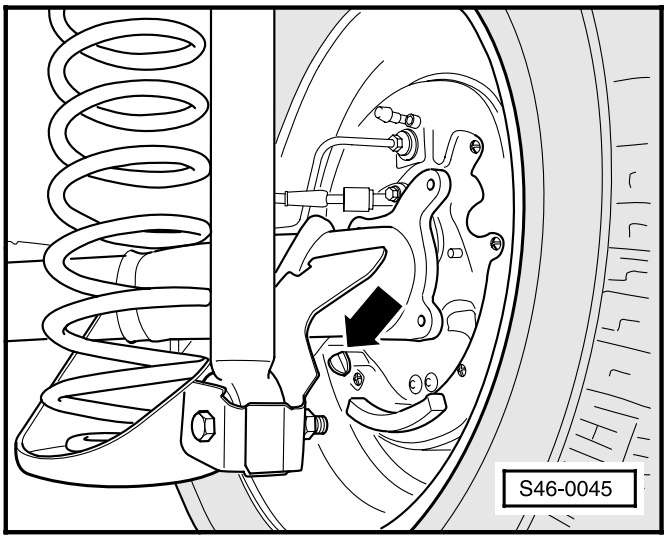
◄ **Fig. 1 Inspecting wheel brake cylinder for leaks**

- Lift off dust seal.

  Use plastic wedge 3409 for this step.

- If brake fluid is present in dust seal, replace wheel brake cylinder.

When lifting off dust seal, ensure that the seal is not damaged.



◄ **Fig. 2 Inspecting thickness of brake linings through hole in brake carrier**

- Unclip cap from brake carrier -arrow-.

- Inspect thickness of brake linings through inspection hole in brake carrier.
  Minimum thickness without supporting shoe (wear limit) 2.5 mm.

Note:

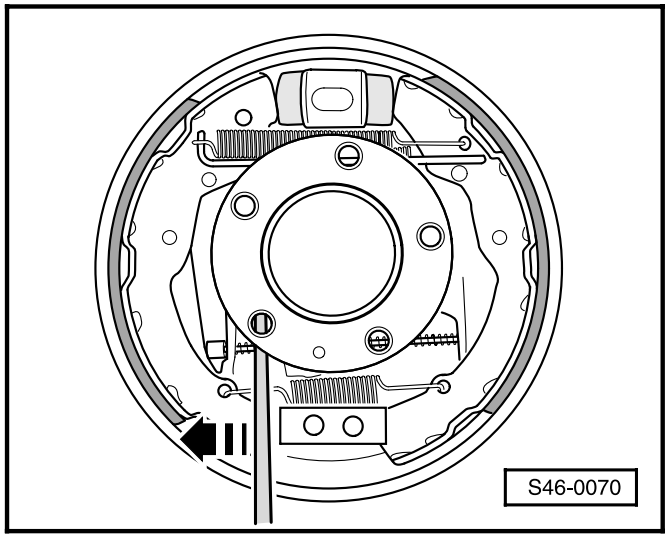
Check to determine whether linings are smeared by brake fluid or grease.

Removing and installing brake shoes

Special tools, testers and aids required

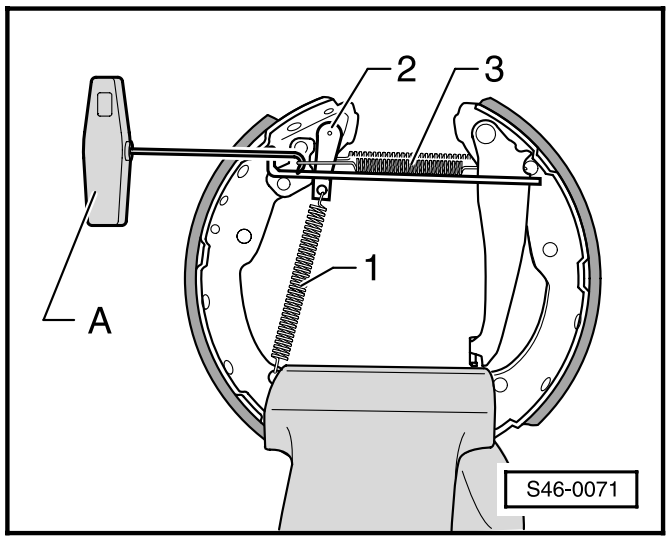
- Hook (commercially available)
- Solid lubricating paste G 000 650 (e.g. Wolfrakote Top Paste)

Removing



- Take off wheels.
- Remove brake drum ⇒ page 46-6, Removing and installing rear brakes.
- Remove spring retainer together with compression springs.

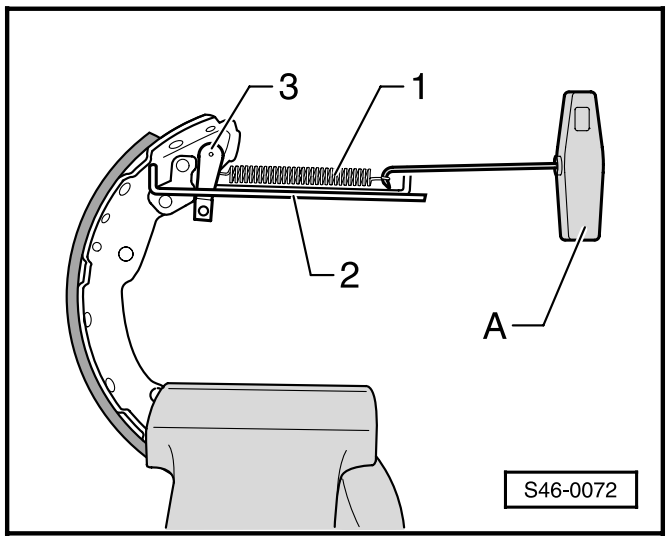
◄ - Use a screwdriver to lever the brake shoes down in direction of arrow behind the supporting plate.



- Place brake shoes down on the supporting plate.
- Detach restoring spring at bottom.
- Detach handbrake cable.
- Guide the brake shoes out between the wheel hub and the brake carrier.
- Clamp brake shoe in a vice.

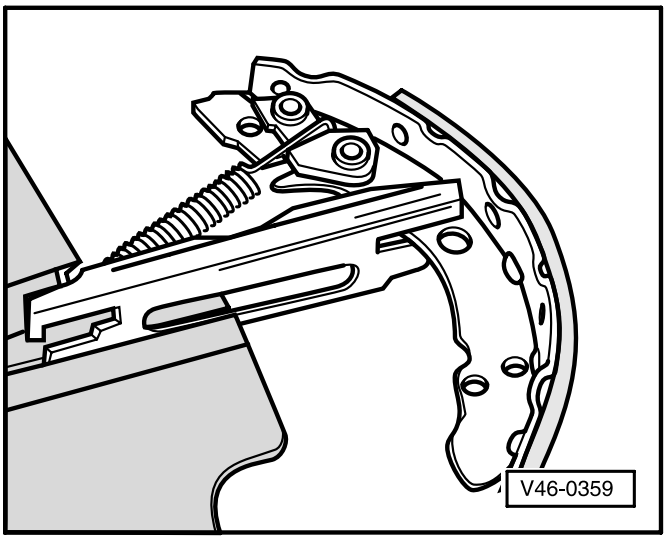
◄ - Remove tension spring -1- for wedge -2-.

- Use hook -A- to release top restoring spring -3-.



◄ - Use hook -A- to release contact spring -1-.

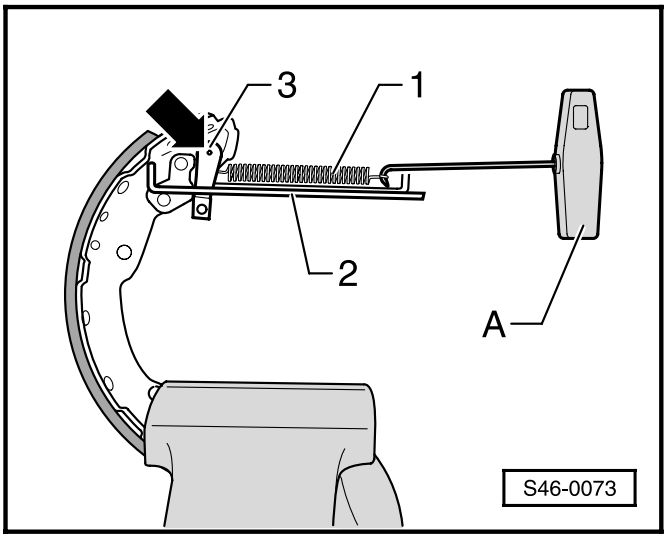
- Take the pull rod -2- and the wedge -3- off the brake shoe.



Installing

◄ - Attach contact spring at the brake shoe and place brake shoe onto the pull rod.

- Grease contact point of pull rod with solid lubricating paste G 000 650 (e.g. Wolfrakote Top Paste).



◄ - Use hook -A- to attach contact spring -1- in the pull rod -2-.

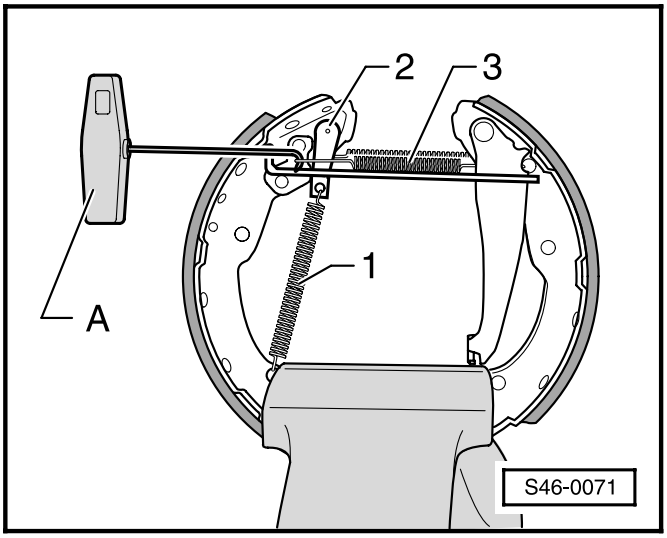
- Insert the wedge -3- at the same time.

Installation position:

Raised face -arrow- should remain visible when installed.

- Insert brake shoe with brake lever into pull rod.

- Grease contact point of pull rod with solid lubricating paste G 000 650 (e.g. Wolfrakote Top Paste).



◄ - Use hook -A- to attach top restoring spring -3-.

- Attach tension spring -1- for wedge -2-.

- Guide the brake shoes in between the wheel hub and the brake carrier.

- Place brake shoes onto the piston of the wheel brake cylinder.

- Attach handbrake cable at the brake lever.

- Insert bottom restoring spring and lever brake shoe behind the bottom support.

- Grease contact points of bottom restoring spring at the brake shoes with solid lubricating paste G 000 650 (e.g. Wolfrakote Top Paste).

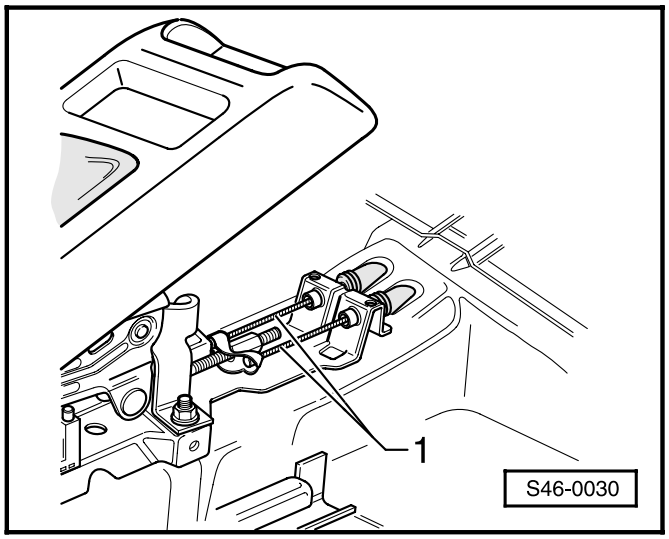
- Insert compression spring with spring retainer.
- Install brake drum.
- Depress brake pedal firmly once.
- Adjust handbrake.
- Fit on wheels.

Adjusting handbrake (drum brakes)

The automatic slack adjuster of the rear wheel brakes makes it unnecessary to re-set the handbrake. Re-setting should only be performed after replacing the handbrake cables, the brake carrier or after fitting new brake linings/brake shoes.

Note:

Always replace the self-locking slack adjuster nut.



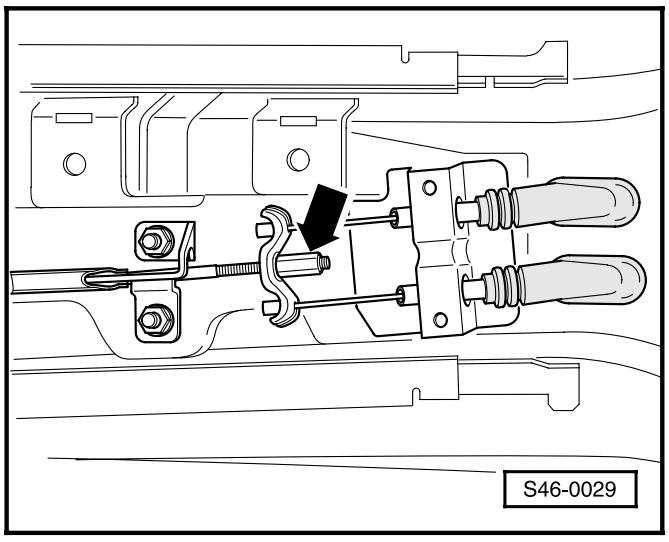
- Release handbrake.
- Remove ashtray in centre console.
- Take out cross-head screws.

◄- Raise centre console at rear, or remove if necessary

⇒ Body Fitting Work; Repair Group 68; Interior Equipment

1 - Handbrake cables

- Depress brake pedal firmly once.
- Apply handbrake lever to 4th detent.

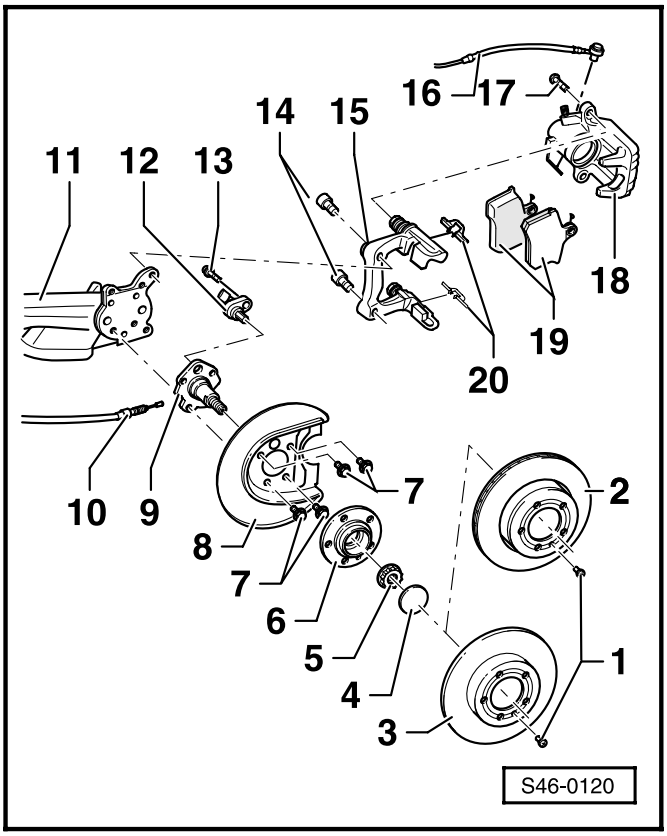


◄- Tighten slack adjuster nut -arrow- sufficiently until it is difficult to turn both wheels by hand.

- Release handbrake and check whether both wheels rotate freely; turn back slack adjuster nut slightly, if necessary.

Servicing rear brake - front-wheel drive/disc brake

Removing and installing rear brake



Special tools, testers and aids required

- Brake filling and bleeding appliance, e.g. ROMESS S15
- Brake pedal depresser, e.g. V.A.G 1238/B
- Bleeder bottle (commercially available)
- Brake fluid ⇒ page 00-8
- Solid lubricating paste G 000 650 (e.g. Wolfrakote Top Paste)

Notes:

- *After replacing the brake pads, depress brake pedal firmly several times when vehicle stationary so that the brake pads are properly seated according to their position in operation.*
- *Use a bleeder bottle which comes into contact only with brake fluid for extracting brake fluid from the brake fluid reservoir. Brake fluid is toxic and must on no account be extracted by sucking out through a hose with your mouth!*
- *Insert the brake pedal depresser, e.g. V.A.G 1869/2, before removing a brake cylinder or separating a brake hose from the brake cylinder.*
- *Do not re-use brake fluid which was in the system.*
- *Tightening torque of wheel bolts: 120 Nm*

1 - Cross-head screw, 4 Nm

2 - Brake disc, internally ventilated
- Diameter 256 mm
- Thickness 22 mm
- Wear limit 20 mm
- If worn, replace on both sides of axle

3 - Brake disc
- Diameter 232 mm
- Thickness 9 mm
- Wear limit 7 mm
- If worn, replace on both sides of axle

4 - Cap
- Pressing off ⇒ page 42-29
- Knocking in ⇒ page 42-31

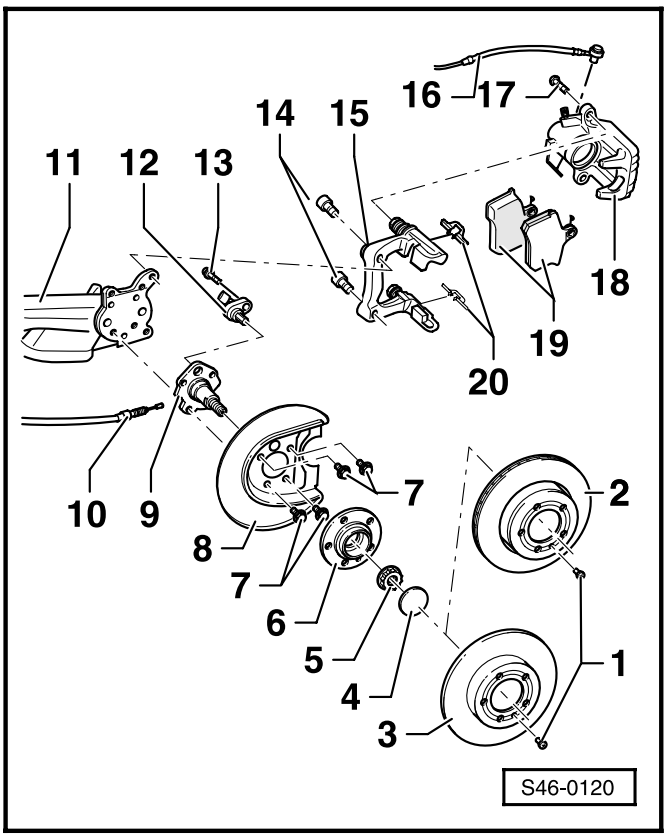
5 - Twelve-point nut, self-locking
- Replace each time removed
- Tightening ⇒ page 42-74

6 - Wheel hub with wheel bearing and pulse rotor
- Fitted only to models with ABS
- Replace each time removed
- Always replace complete
- Pressing out and in ⇒ page 42-28

7 - Hexagon, 60 Nm
- With dished washer

8 - Splash guard

9 - Axle stub



10 - Handbrake cable
- ♦ Adjusting handbrake ⇒ page 46-17
- ♦ Removing and installing ⇒ page 46-17.3

11 - Axle beam

12 - ABS wheel speed sensor
- ♦ Clean inner surface of hole and coat with solid lubricating paste G 000 650 (e.g. Wolfrakote Top Paste) before inserting the sensor

13 - Hexagon socket bolt, 8 Nm

14 - Hexagon socket bolt, 65 Nm

15 - Brake carrier with guide pins and protective caps
- ♦ Is supplied as replacement part, assembled, with adequate quantity of grease on guide pins
- ♦ If damage exists at the protective caps or the guide pins, install repair kit. Use enclosed grease packing for greasing the guide pins.

16 - Brake hose with banjo union and banjo bolt
- ♦ Must not be disassembled; always replace complete
- ♦ Tightening torque of banjo bolt: 35 Nm
- ♦ Do not detach brake hose for replacing brake pad

17 - Hexagon bolt, self-locking, 35 Nm
- ♦ Always replace

18 - Brake caliper
- ♦ Do not detach brake hose for replacing brake pad
- ♦ Removing:
- Remove brake pads -item 19- ⇒ page 46-15
- Insert brake pedal depresser
- Detach brake hose -item 16- from brake caliper
- ♦ Installing:
- Install brake pads -item 19- ⇒ page 46-15
- Attach brake hose -item 16- to brake caliper
- Remove brake pedal depresser
- Bleed brake system ⇒ page 47-18
- ♦ Servicing ⇒ page 47-11
- ♦ After servicing or replacement, it is first of all necessary to adjust the handbrake cable
  Do not operate the footbrake before this!
- ♦ Adjusting handbrake ⇒ page 46-17

19 - Brake pads
- ♦ Thickness 17 mm including supporting plate
- ♦ Wear limit: 7.5 mm including supporting plate
- ♦ Inspecting thickness:

⇒ Inspection and Maintenance
- ♦ Always replace on both sides of axle
- ♦ Removing and installing ⇒ page 46-15

20 - Brake pad retaining spring
- ♦ Install new spring if pad replaced

Removing and installing brake pads

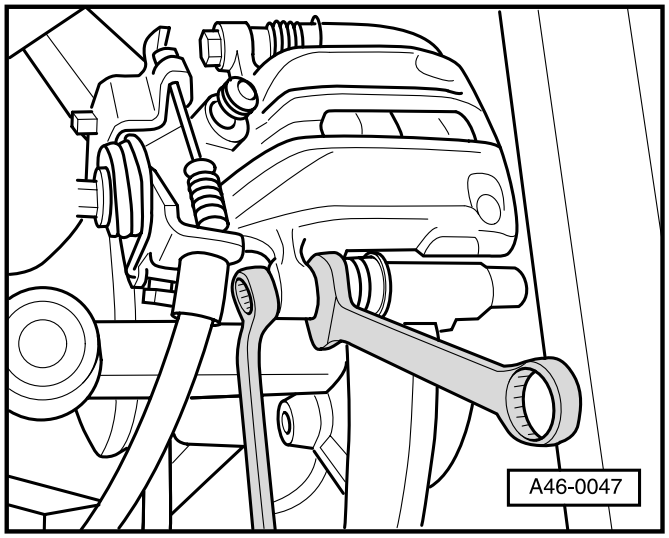
Special tools, testers and aids required

- Bleeder bottle (commercially available)
- Resetting and removal tool MP 9-401
- Brake filling and bleeding appliance, e.g. ROMESS S15
- Brake fluid ⇒ page 00-8

Notes:

- *Mark brake pads which are to be re-used, when removing. Install again at the same point otherwise braking action will be uneven.*
- *Do not disconnect brake hose for changing pads.*

Removing



- Take off wheels.
- Detach handbrake cable at brake caliper ⇒ page 46-17.3.

◄ - Unscrew bolts attaching brake caliper housing; counterhold at guide pin for this step.

- Take off brake caliper housing and attach with wire so that the weight of the brake caliper is not pulling on the brake hose, and cannot damage it.
- Remove brake pads and pad retaining springs.

Note:

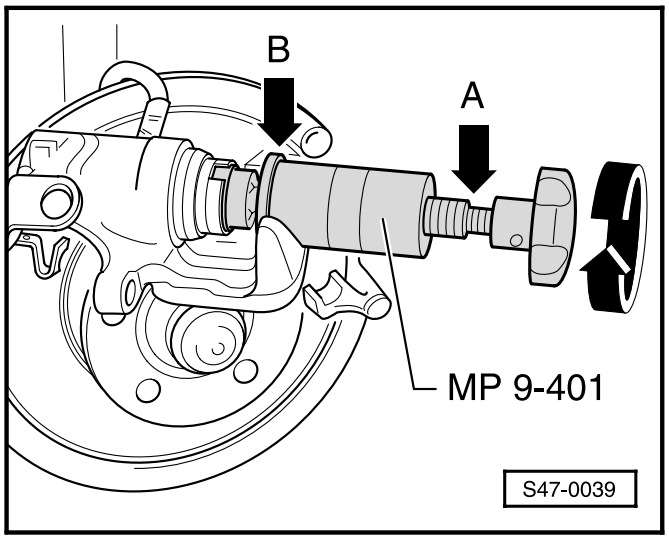
Use only methylated spirits for cleaning the brake caliper housing.

- Clean brake caliper housing, in particular the area for bonding the brake pad. It must be free of adhesive residues and grease.

Installing

Notes:

Before inserting new brake pads, use resetting and removal tool MP 9-401 to press piston into the cylinder. Before pressing back, extract brake fluid from the brake fluid reservoir with a bleeder bottle otherwise - if brake fluid has been topped up in the meantime - it may flow out and cause damage.



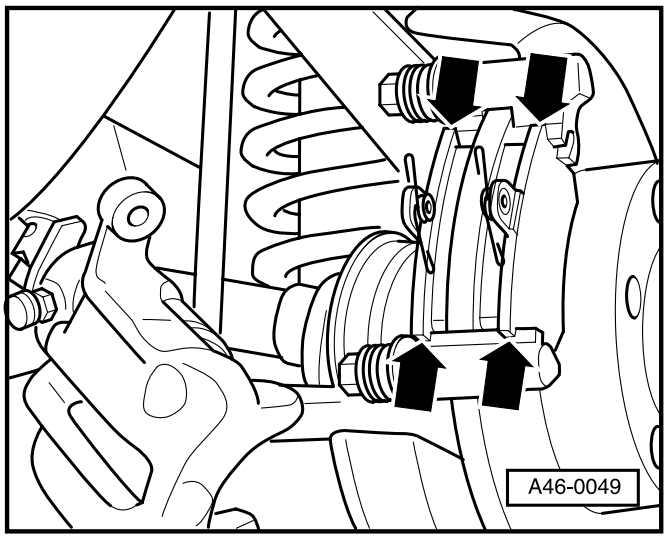
Warning!

Brake fluid is toxic and must on no account be sucked out with your mouth through a hose.

◄ ♦ *Insert special tool MP 9-401 so that the collar (arrow B) of the tool is resting against the brake caliper.*

♦ *If piston is stiff, an open-end wrench waf 13 can be positioned at the wrench faces (arrow A) provided for this purpose.*

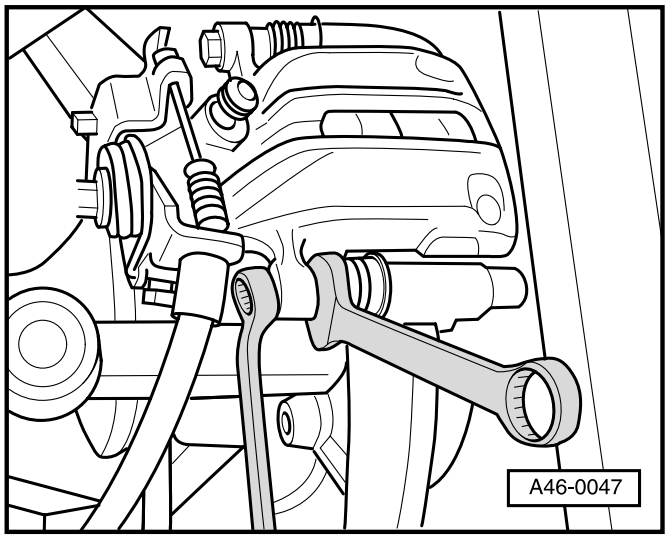
♦ *If the position of the piston is altered with a piston resetting device, the automatic adjuster in the brake caliper is destroyed.*



- Screw in piston by turning knurled wheel of special tool MP 9-401 to the right.

◄ - Insert new pad retaining springs -arrows- and brake pads into the brake carrier.

- Remove protective sheet from the supporting plate of brake pad.



Note:

The repair kit contains four self-locking hexagon bolts which must always be installed.

◄ - Attach brake caliper housing with new self-locking bolts.

Counterhold at guide pin when tightening.

Tightening torque: 35 Nm.

- Attach handbrake cable to brake caliper ⇒ page 46-17.3.

- Adjust handbrake ⇒ page 46-17.

- Fit on wheels.

Notes:

Each time after replacing the brake pads, depress brake pedal firmly several times when vehicle is stationary so that the brake pads are properly seated to match their operating position.

After replacing brake pads, check brake fluid level and top up brake fluid if necessary.

Adjusting handbrake (disc brakes)

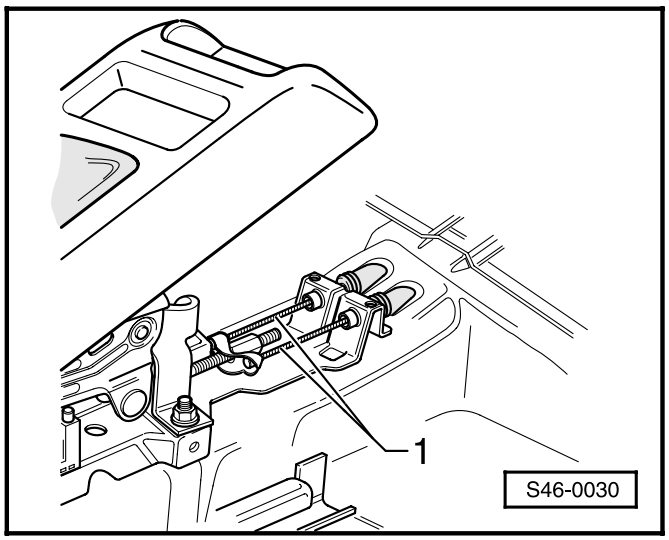
The automatic slack adjuster of the rear wheel brakes makes it unnecessary to re-set the handbrake. Re-setting should only be performed if the handbrake cables, brake calipers and brake discs are replaced.

Notes:

- ♦ *The footbrake must be bled and be in proper operating condition.*
- ♦ *Always replace self-locking slack adjuster nut.*

- Release handbrake.

- Remove ashtray in centre console.

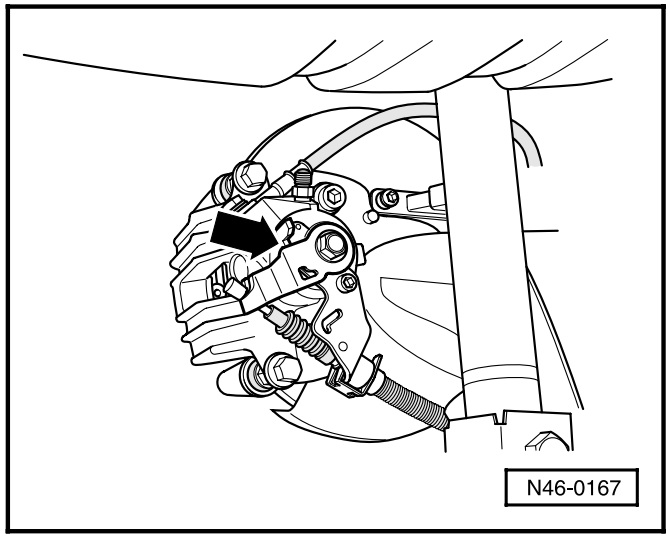


- Take out cross-head screws.

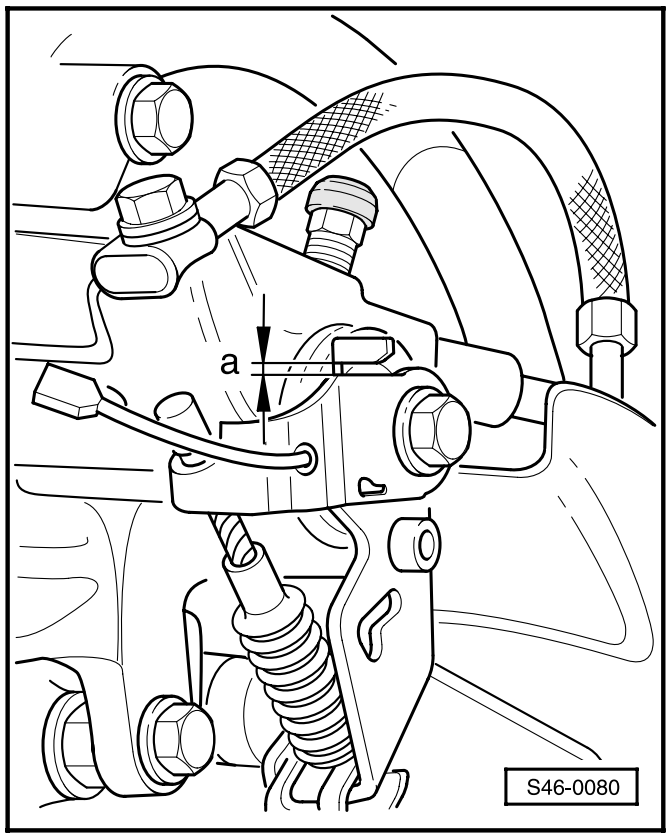
◄- Raise centre console at rear or remove, if necessary
⇒ Body Fitting Work; Repair Group 68; Interior Equipment

1 - Handbrake cables

- Depress footbrake firmly once.



◄- Handbrake lever in off position. Tighten slack adjuster nut sufficiently until the levers (arrow) at the brake calipers lift off from the stops.



◄- Use a feeler gauge to check clearance between lever and stop at left and right brake caliper.

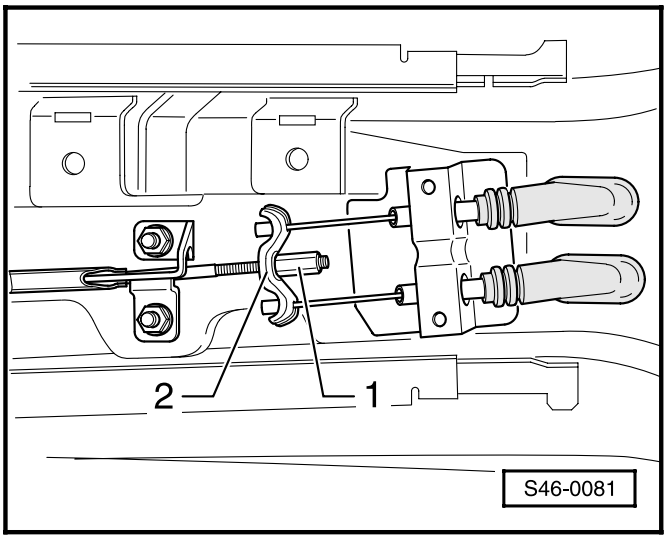
The distance -a- between lever and stop at the left and right brake calipers must in total be at least 1 mm; it must not be less or more than 3 mm.

- Tighten handbrake firmly and release again 3x. This ensures that the components are properly positioned and settled.

- With handbrake lever in off position, check whether both wheels rotate freely; turn back slack adjuster nut slightly, if necessary.

Removing and installing handbrake cable (FWD models/drum brakes)

Removing



- Remove rear centre console.

⇒ Body Fitting Work; Repair Group 68; Interior Equipment

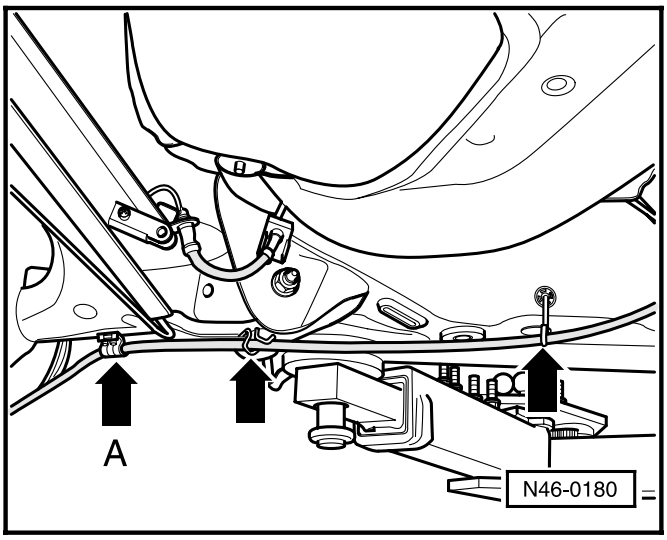
- Release handbrake.

◄ - Slacken adjusting nut -1- sufficiently until it is possible to take the handbrake cable out of the compensating bar -2-.

- Raise vehicle.

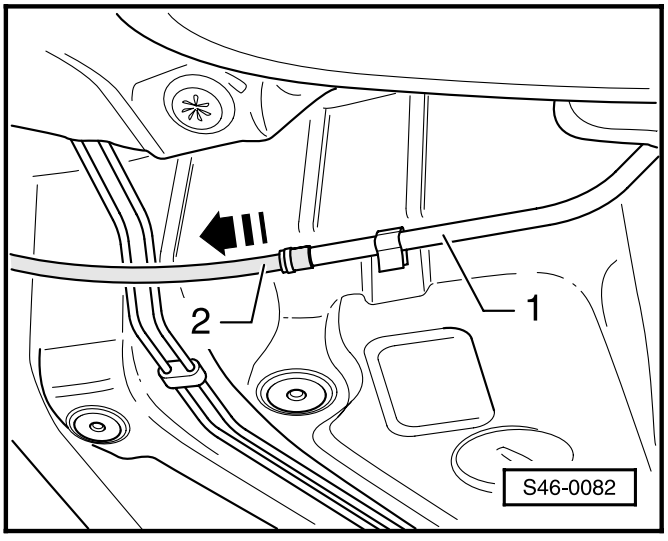
- Take off wheel.

- Remove brake drum.



- Release handbrake cable from the brake lever at the brake shoe.

◄ - Take handbrake cable out of the clip at the rear axle beam -arrow A- and release it from the fixtures -arrows-.



◄ - Pull handbrake cable -2- out of the guide tube -1- in direction of arrow.

Installing

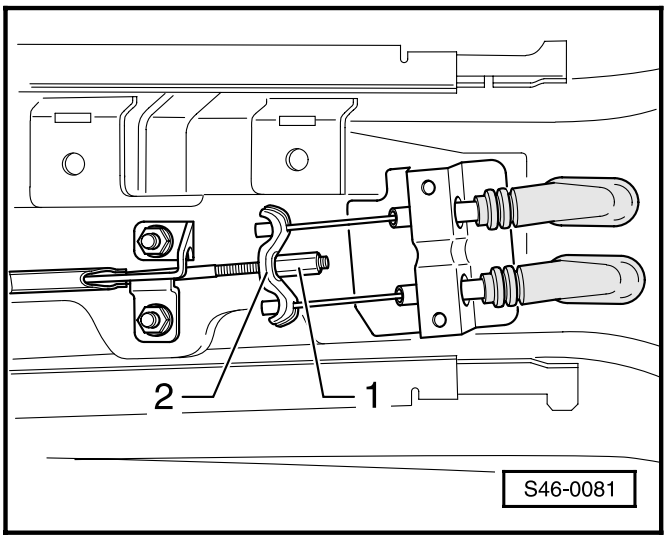
Installation is carried out in the reverse order.

Notes:

- *Pay attention to installation position when installing handbrake cables ⇒ page 46-18.*
- *Before adjusting the handbrake, pretension handbrake cable with the adjusting nut at the compensating arm.*
- *Adjusting handbrake ⇒ page 46-12.*

Removing and installing handbrake cable (FWD models/disc brakes)

Removing



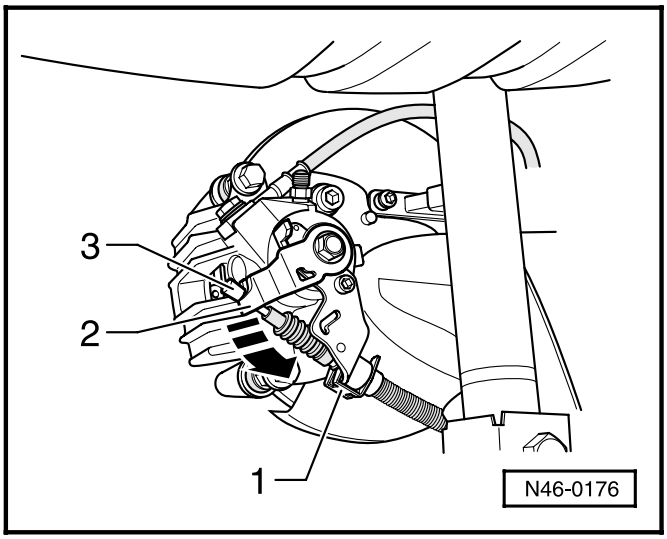
- Remove rear centre console.

⇒ Body Fitting Work; Repair Group 68; Interior Equipment

- Release handbrake.

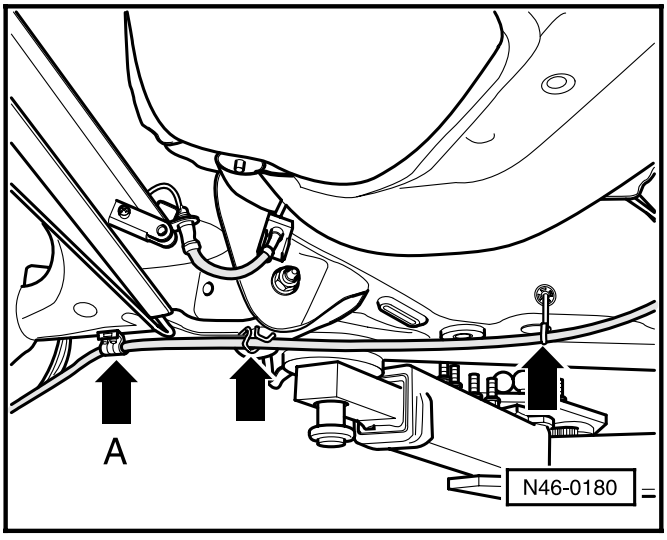
◄- Slacken adjusting nut -1- sufficiently until it is possible to take the handbrake cable out of the compensating bar -2-.

- Raise vehicle.

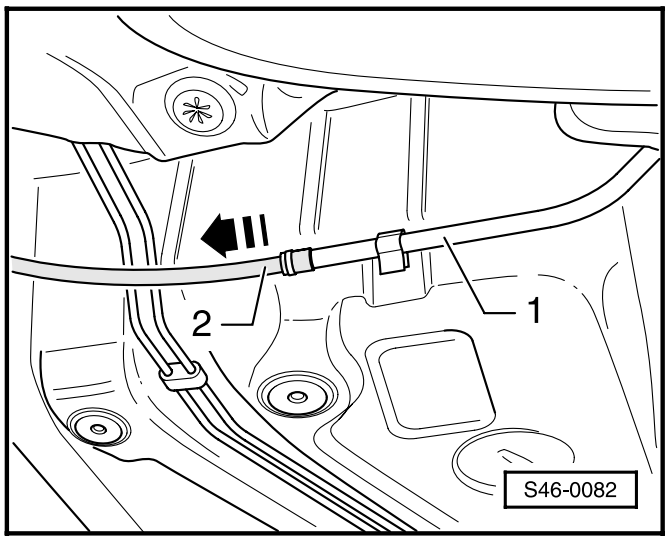


◄- Use a screwdriver to lever out clip -1- and pull down and off.

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



◄- Take handbrake cable out of the clip at the rear axle beam -arrow A- and release it from the fixtures -arrows-.



◄ - Pull handbrake cable -2- out of the guide tube -1- in direction of arrow.

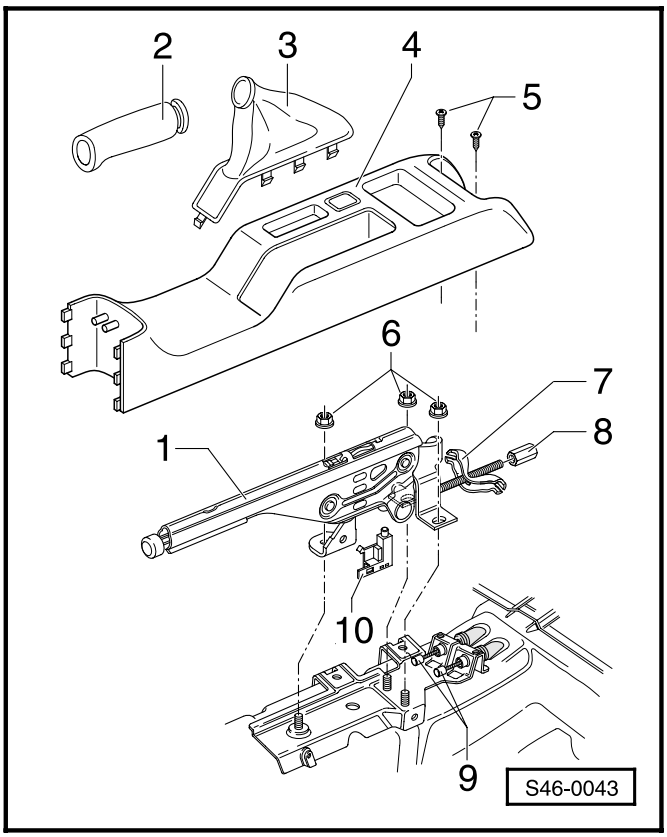
Installing

Installation is carried out in the reverse order.

Notes:

- *Pay attention to installation position when installing the handbrake cables ⇒ page 46-18.*
- *Before adjusting the handbrake, pretension handbrake cable with the adjusting nut at the compensating bar.*
- *Adjusting handbrake cable ⇒ page 46-17.*

Summary of components of handbrake lever



1 - Handbrake lever
- ♦ Take out centre console before removing

⇒ Body Fitting Work; Repair Group 68; Interior Equipment

2 - Handle
- ♦ Pull off to the front; to do this, use screwdriver to first of all press down catch below handle

3 - Trim cover for handbrake lever
- ♦ Removing:

⇒ Body Fitting Work; Repair Group 68; Interior Equipment

4 - Centre console
- ♦ Removing:

⇒ Body Fitting Work; Repair Group 68; Interior Equipment

5 - Cross-head screw, 1.4 Nm

6 - Hexagon nut, 25 Nm

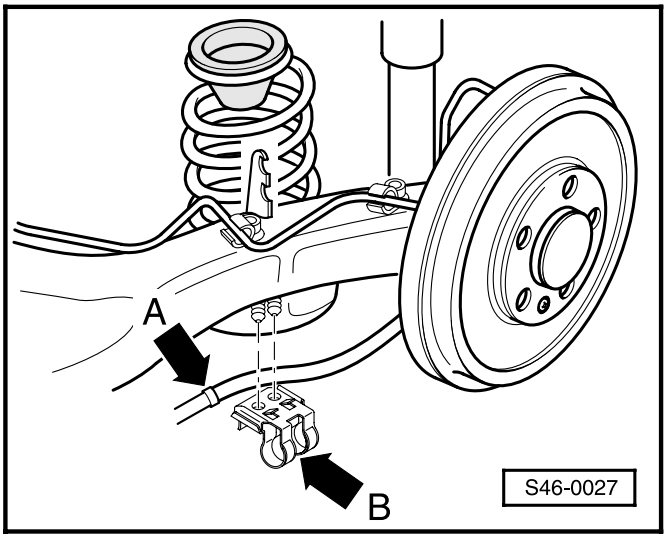
7 - Compensating bar

8 - Slack adjuster nut, self-locking
- ♦ Replace each time removed
- ♦ Adjusting handbrake:
- - Models with drum brakes ⇒ page 46-12
- - Models with disc brakes ⇒ page 46-17

9 - Handbrake cable
- ♦ Installation position of handbrake cables ⇒ Fig. 1
- ♦ Removing and installing (drum brakes) ⇒ page 46-17.2
- ♦ Removing and installing (disc brakes) ⇒ page 46-17.3
- ♦ Different versions for rear drum and disc brakes

⇒ Parts List

10 - Handbrake indicator switch
- ♦ Clipped in place
- ♦ Replace if faulty



◄ **Fig. 1 Installation position of handbrake cables**

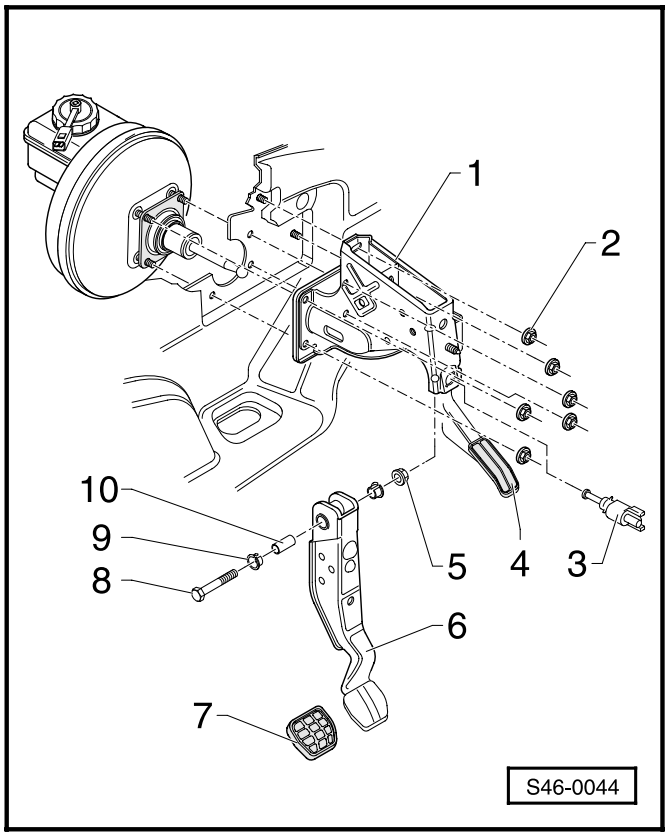
Note:

The installation position of handbrake cables is identical on models fitted with drum or disc brakes (illustration shows version with drum brakes).

- The handbrake cables are attached to the axle beam with clips.

- The clamping ring -arrow A- at the handbrake cable must be positioned in the middle of the clip -arrow B-.

Summary of components: foot lever system, the brake pedal



Take note!

The travel distance of the brake pedal must not be shortened by use of additional floor coverings.

Comments:

- *Grease the bearing and the contact surfaces with MoS_2 grease (Molykote grease)*
- *Replace self-locking nuts*
- *When using mechanical gas actuation detach the gas actuation system from the accelerator pedal before removing the bearing support.*

⇒ Engine-mechanics, Rep. Gr. 20; repairing the gas actuation system

1 - Bearing support
- Removing and installing ⇒ Page 46-22

2 - Hexagonal nut, self-locking, 28 Nm
- Replace
- 4 pieces for fixing the bearing support to the brake booster
- 2 pieces for fixing the bearing support to the assembly plate

3 - Brake light switch
- The brake pedal should be clipped onto the push rod of the brake booster before mounting the brake light switch ⇒ Page 46-21
- Removing and installing ⇒ Page 45-69
- Allocation ⇒ spare parts catalogue

4 - The accelerator pedal
- Removing and installing

⇒ Engine-mechanics, Rep. Gr. 20

5 - Hexagonal nut, self-locking, 25 Nm

6 - The brake pedal
- Disconnect from the brake booster ⇒ Page 46-20
- Removing and installing ⇒ Page 46-22

7 - Cap

8 - Hexagonal nut

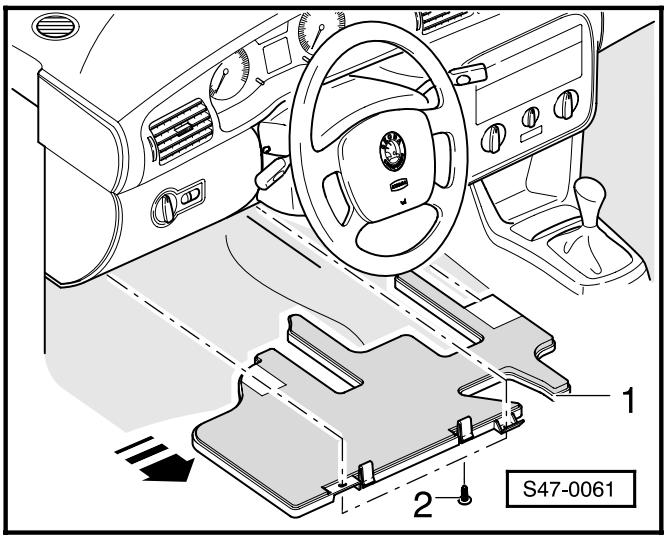
9 - Bearing bush

10 - Bearing bolts

Separating brake pedal from brake servo unit, clipping together

Special tools, testers and aids required

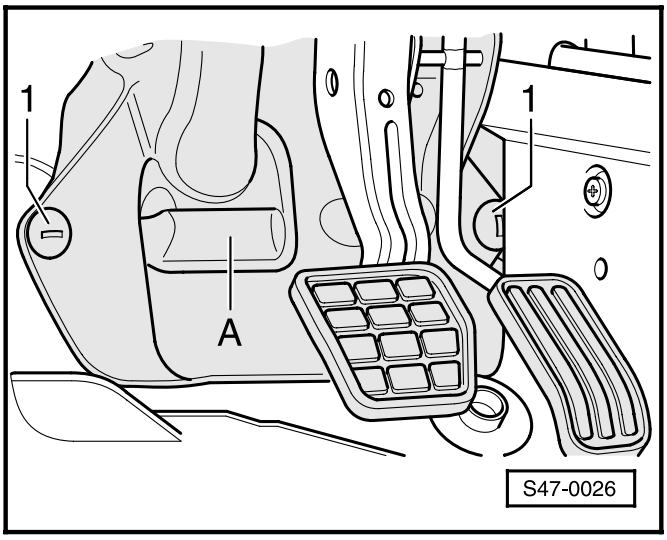
♦ Release tool T30021



Separating brake pedal from brake servo unit

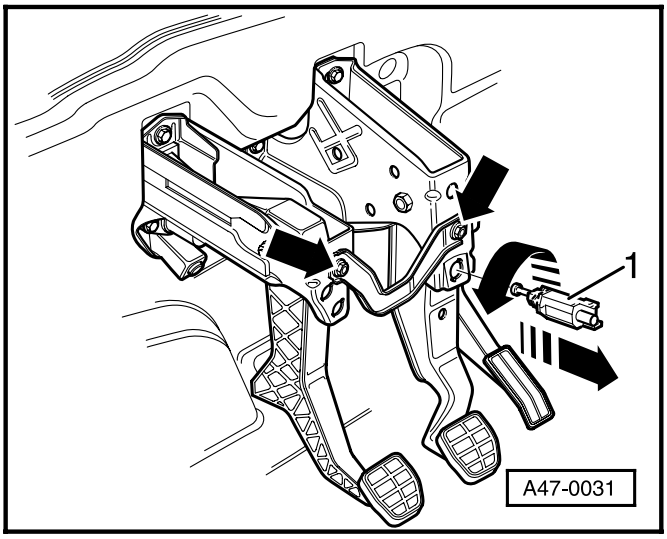
◄- Take out screws -2-.

- Pull footwell panel -1- out of fixtures.



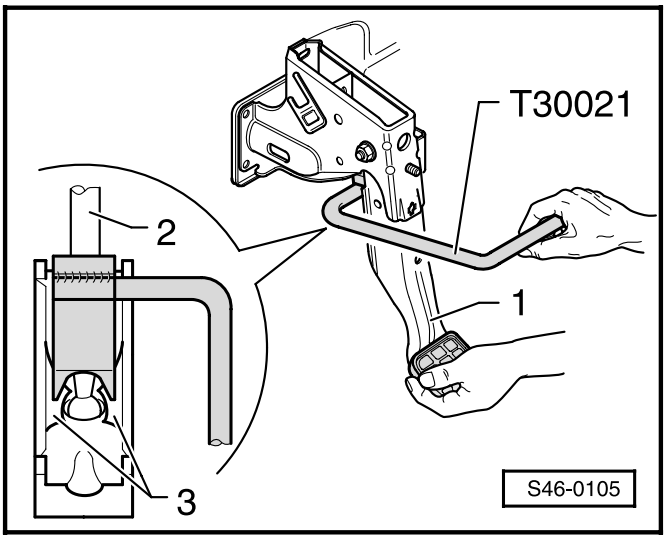
◄- Remove screws -1-.

- Remove cover -A-.



◄- On models with manual gearbox, remove connecting plate between clutch and brake pedal -arrows-.

- Remove brake light switch -1- ⇒ page 45-69.



Note:

Illustration shows how to separate brake pedal from brake servo unit with pedal assembly removed, to simplify illustration.

◄- Press brake pedal toward brake servo unit and hold tight.

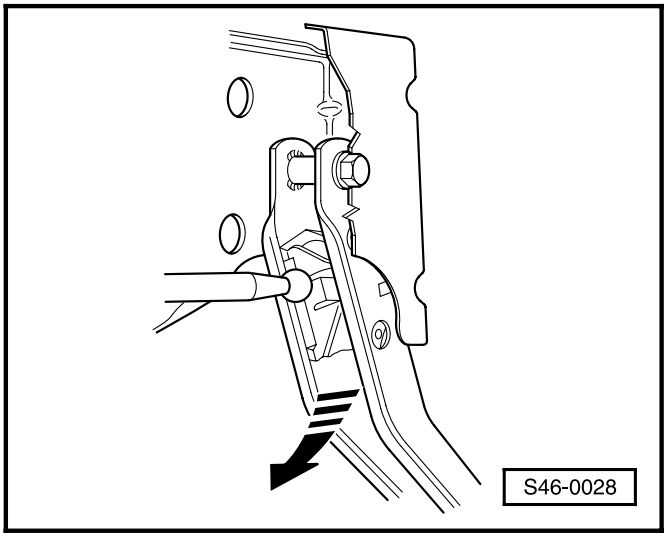
1 - Brake pedal

2 - Pushrod

3 - Retaining lugs

- Insert release tool T30021 and pull toward driver seat; counterhold at brake pedal for this step (pedal must not move back at this moment).
  When this is done, the retaining lugs -3- of the mount are pressed off at the ball head of the pushrod -2-.

- Pull release tool T30021 and brake pedal together toward driver seat (the brake pedal is pulled off at the ball head of the pushrod when this is done).



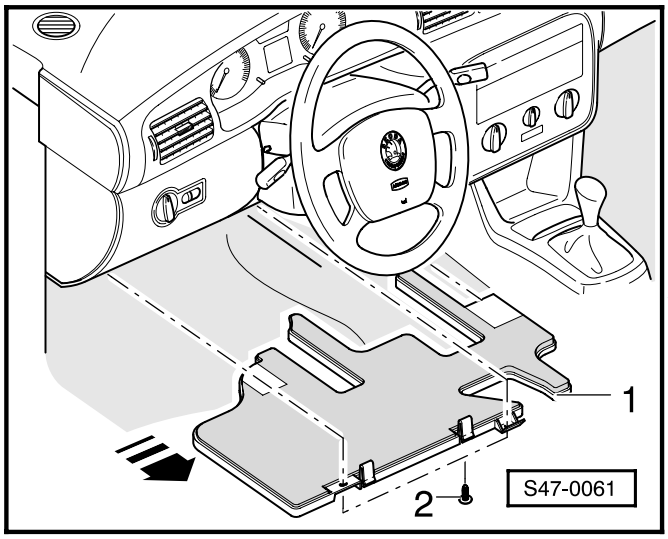
Clipping brake pedal to brake servo unit

◄- Hold ball head of pushrod in front of the mount and depress brake pedal toward brake servo unit so that the ball head is heard to engage properly.

Further installation is carried out in the reverse order.

- Install brake light switch and set
  ⇒ page 45-69.

Removing and installing brake pedal



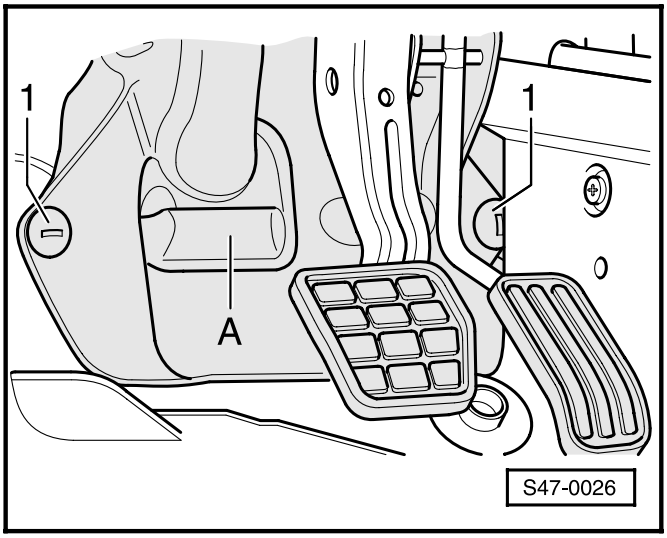
Special tools, testers and aids required

- Release tool T30021
- MoS_2 grease (Molykote grease)

Removing

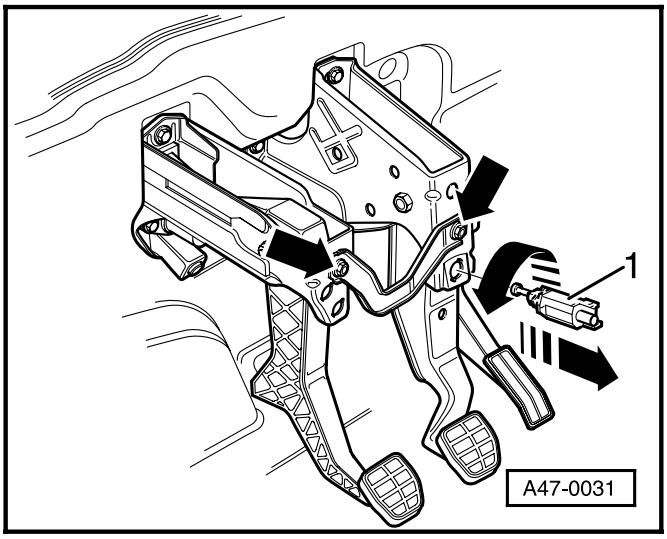
◄ - Take out screws -2-.

- Pull footwell panel -1- out of fixtures.



◄ - Remove screws -1-.

- Remove cover -A-.



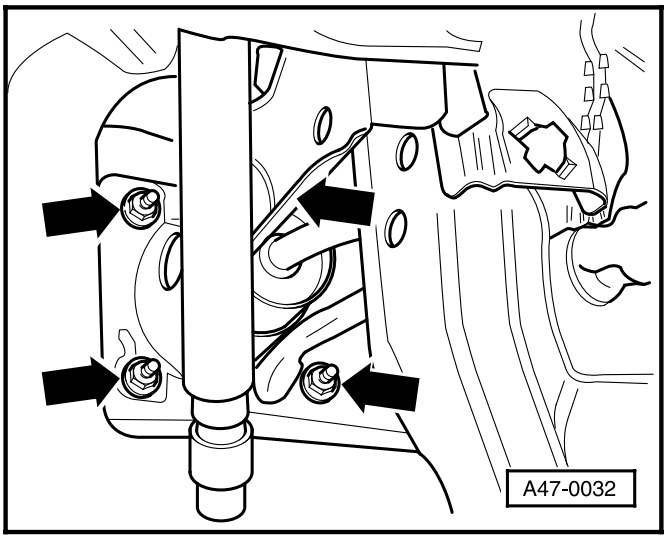
◄ - On models with manual gearbox, remove connecting plate between clutch and brake pedal -arrows-.

- Remove brake light switch -1- ⇒ page 45-69.

- Detach accelerator cable.

- On models fitted with accelerator pedal position sender, detach plug connection below dash panel.

- Separate brake pedal from brake servo unit ⇒ page 46-20.



◄- Remove hexagon nuts for attaching pedal assembly -arrows- (top right hexagon nut not visible in illustration).

- Take out pedal assembly.

- Remove bolted connection of bearing bracket - brake pedal.

- Remove brake pedal.

Installing

Note:

Grease all bearing and contact surfaces with MoS_2 grease.

Installation is carried out in the reverse order.

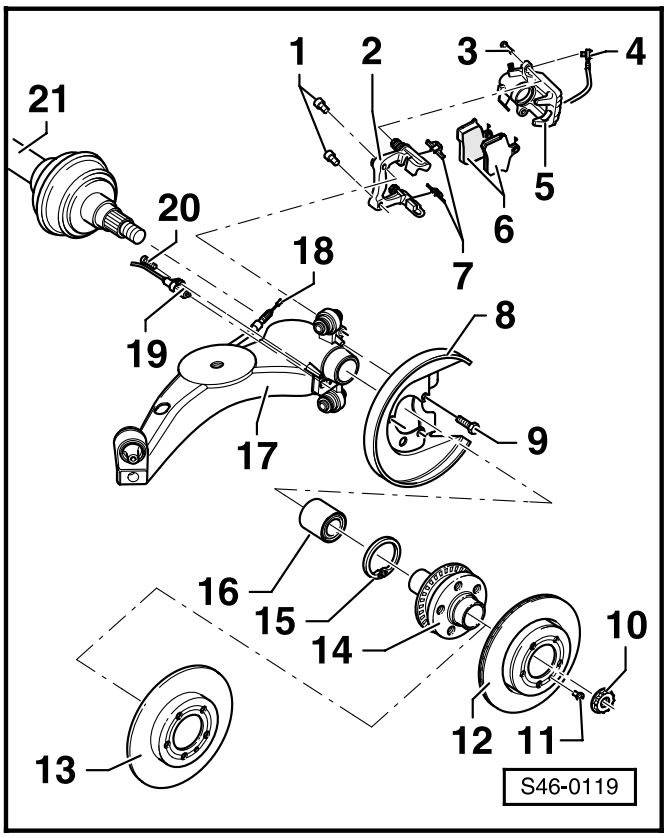
- Install brake light switch and set ⇒ page 45-69.

Tightening torques:

Brake pedal to bearing bracket **Fit new nut and bolt!**	28 Nm
Brake servo unit to bearing bracket **Fit new nuts!**	28 Nm

Servicing rear brake - 4x4/disc brake

Removing and installing rear brake



Special tools, testers and aids required

- Brake filling and bleeding appliance, e.g. ROMESS S15
- Brake pedal depresser, e.g. V.A.G 1238/B
- Bleeder bottle (commercially available)
- Brake fluid ⇒ page 00-8
- Solid lubricating paste G 000 650 (e.g. Wolfrakote Top Paste)

Notes:

- *After replacing the brake pads, depress brake pedal firmly several times when vehicle stationary so that the brake pads are properly seated according to their position in operation.*
- *Use a bleeder bottle which comes into contact only with brake fluid for extracting brake fluid from the brake fluid reservoir. Brake fluid is toxic and must on no account be extracted by sucking out through a hose with your mouth!*
- *Insert the brake pedal depresser, e.g. V.A.G 1238/B, before removing a brake cylinder or separating a brake hose from the brake cylinder.*
- *Do not re-use brake fluid which was in the system.*
- *Tightening torque of wheel bolts: 120 Nm*

1 - Hexagon socket bolt, 65 Nm

2 - Brake carrier with guide pins and protective caps
- Is supplied as replacement part, assembled, with adequate quantity of grease on guide pins
- If damage exists at the protective caps or the guide pins, install repair kit. Use enclosed grease packing for greasing the guide pins.

3 - Hexagon bolt, self-locking, 35 Nm
- Always replace

4 - Brake hose with banjo union and banjo bolt
- Must not be disassembled; always replace complete
- Tightening torque of banjo bolt: 35 Nm
- Do not detach brake hose for replacing brake pad

5 - Brake caliper
- ♦ Do not detach brake hose for replacing brake pad
- ♦ Removing:
- - Remove brake pads -item 6- ⇒ page 46-25
- - Insert brake pedal depresser
- - Detach brake hose -item 4- from brake caliper
- ♦ Installing:
- - Install brake pads -item 6- ⇒ page 46-26
- - Attach brake hose -item 4- to brake caliper
- - Remove brake pedal depresser
- - Bleed brake system ⇒ page 47-18
- ♦ Servicing ⇒ page 47-11
- ♦ After servicing or replacement, it is first of all necessary to adjust the handbrake cable
  Do not operate the footbrake before this!
- ♦ Adjusting handbrake ⇒ page 46-29

6 - Brake pads
- ♦ Thickness 17 mm including supporting plate
- ♦ Wear limit: 7.5 mm including supporting plate
- ♦ Inspecting thickness:

⇒ Inspection and Maintenance
- ♦ Always replace on both sides of axle
- ♦ Removing and installing ⇒ page 46-26

7 - Brake pad retaining spring
- ♦ Install new spring if pad replaced

8 - Splash guard

9 - Hexagon, 10 Nm

10 - Twelve-point nut, self-locking
- ♦ Replace each time removed
- ♦ Tightening ⇒ page 42-74

11 - Cross-head screw, 4 Nm

12 - Brake disc, internally ventilated
- ♦ Diameter 256 mm
- ♦ Thickness 22 mm
- ♦ Wear limit 20 mm
- ♦ If worn, replace on both sides of axle

13 - Brake disc
- ♦ Diameter 232 mm
- ♦ Thickness 9 mm
- ♦ Wear limit 7 mm
- ♦ If worn, replace on both sides of axle

14 - Wheel hub with pulse rotor
- ♦ Removing and inserting ⇒ page 42-44

15 - Circlip
- ♦ Replace each time removed

16 - Wheel bearing
- ♦ Replace each time removed
- ♦ Removing and inserting ⇒ page 42-44

17 - Semi-trailing arm

18 - Handbrake cable
- ♦ Adjusting handbrake ⇒ page 46-29
- ♦ Removing and installing ⇒ page 46-31

19 - ABS wheel speed sensor
- ♦ Clean inner surface of hole and coat with solid lubricating paste G 000 650 (e.g. Wolfrakote Top Paste) before inserting the sensor

20 - Hexagon socket bolt, 8 Nm

21 - Drive shaft
- ♦ Removing and installing ⇒ page 42-72

Removing and installing brake pads

Special tools, testers and aids required

- Resetting and skimming tool MP 9-401
- Brake filling and bleeding appliance, e.g. ROMESS S15
- Bleeder bottle (commercially available)
- Brake fluid ⇒ page 00-8

Notes:

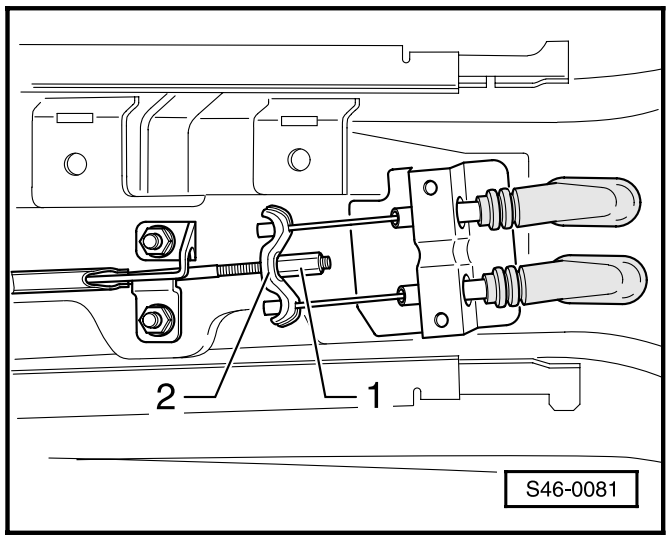
- *Mark brake pads which are to be re-used, when removing. Re-install at the same point otherwise braking action will be uneven!*
- *Do not disconnect brake line for replacing brake pads.*

Removing

- Remove rear centre console.

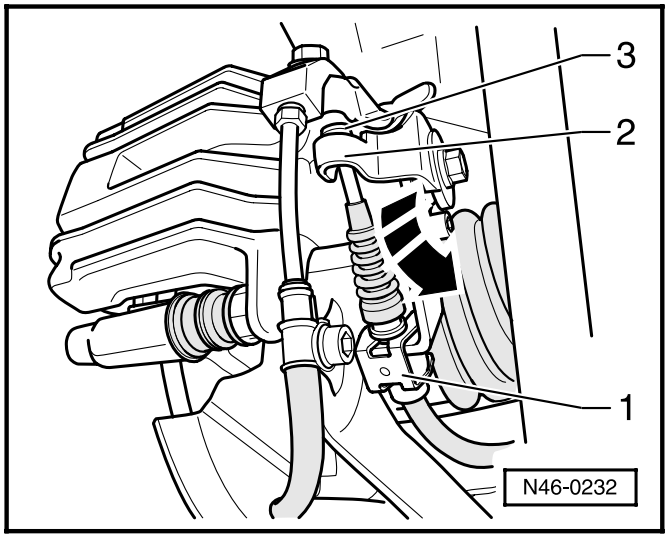
⇒ Body Fitting Work; Repair Group 68; Interior Equipment

- Release handbrake.



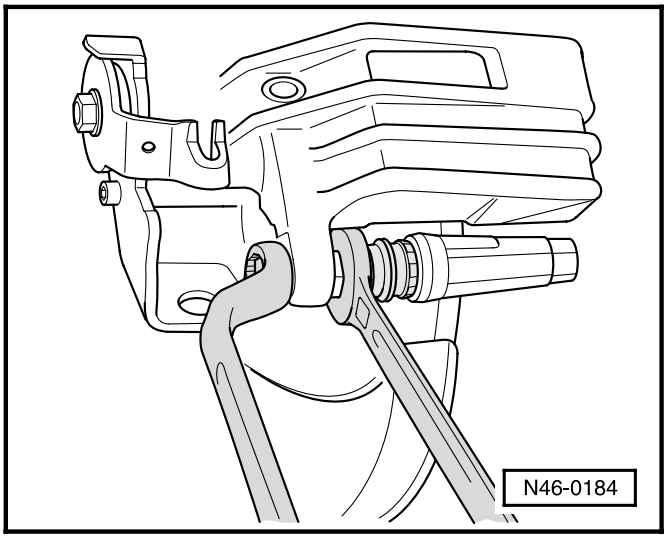
◄- Slacken adjusting nut -1- sufficiently until it is possible to take the handbrake cable out of the compensating bar -2-.

- Raise vehicle.
- Take off wheels.



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

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

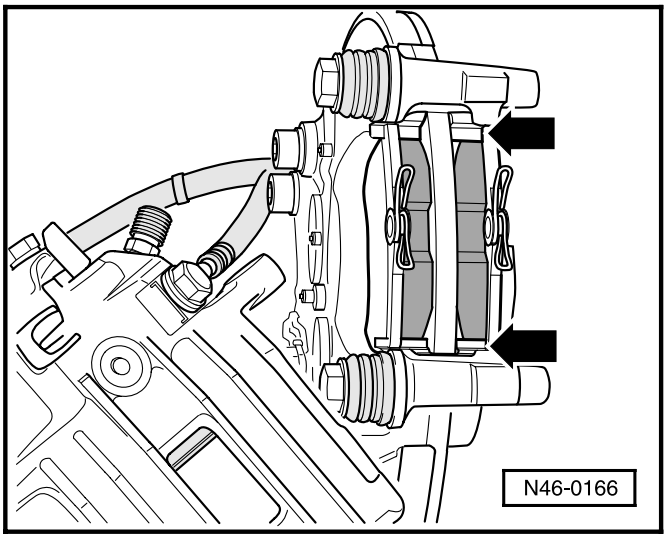


◄- Unscrew bolts attaching brake caliper housing; counterhold at guide pin for this step.

Note:

The brake line and the surrounding area are not shown in the figure in order to simplify the illustration.

- Take off brake caliper housing and attach with wire so that the weight of the brake caliper is not pulling on the brake line or can damage it.



◄- Remove brake pads and pad retaining springs -arrows-.

Note:

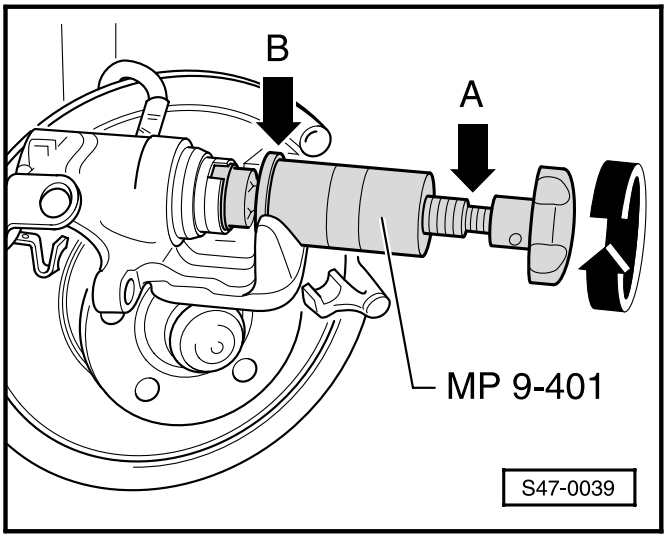
Use only methylated spirits for cleaning the brake caliper housing.

- Clean brake caliper housing, particularly the bonded surface for the brake pad. It must be free of adhesive residues and grease.

Installing

Notes:

Before inserting new brake pads, press piston into the cylinder with resetting and skimming tool MP 9-401. Before pushing back, extract brake fluid from the reservoir with the bleeder bottle otherwise - if brake fluid has been replenished in-between - brake fluid may flow out and cause damage.



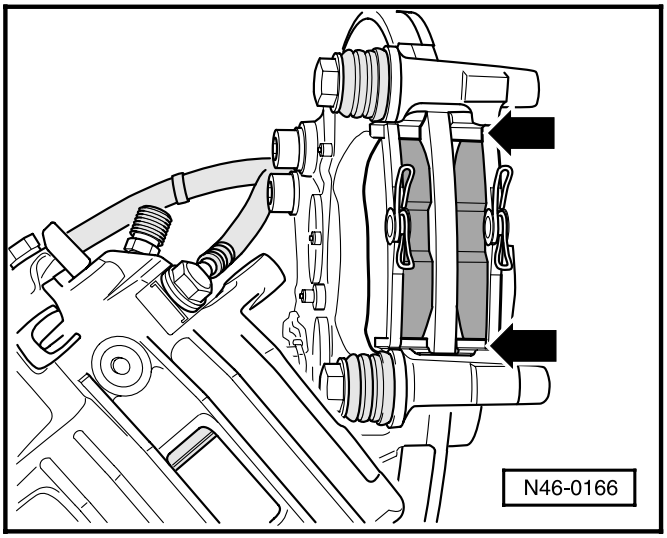
Warning!

Brake fluid is poisonous and must on no account be sucked out through a hose with your mouth.

◄♦ *Insert special tool MP 9-401 so that the collar (arrow B) of the tool is resting against the brake caliper.*

♦ *If piston is stiff, an open-end wrench size 13 can be positioned against the flats (arrow A) provided for this purpose.*

♦ *When the piston is moved with a piston resetting device, the automatic adjuster in the brake caliper is destroyed.*



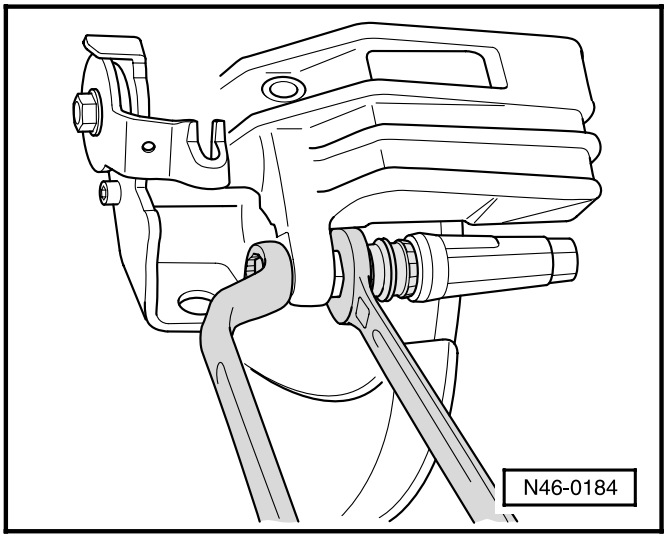
- Screw in piston by turning to the right at the knurled wheel of the special tool MP 9-401.

◄- Insert new pad retaining springs and brake pads -arrows- into the brake carrier.

- Pull protective sheeting of the supporting plate of the brake pad.

Note:

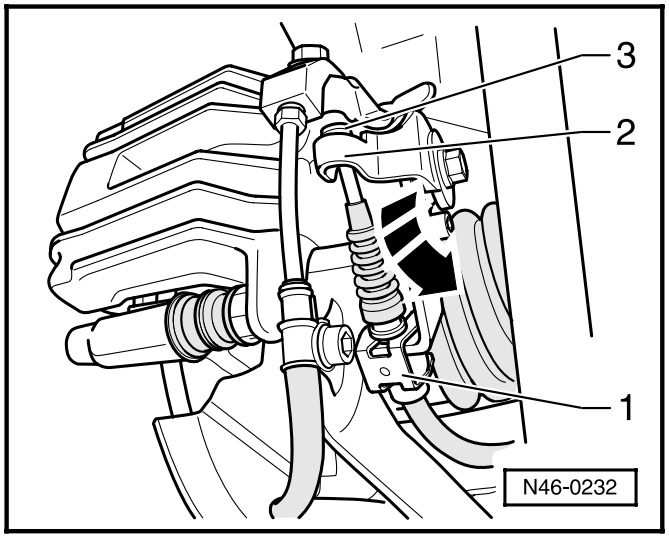
The repair kit contains four self-locking hexagon bolts which must always be installed.



◄- Attach brake caliper housing with new self-locking bolts.

Counterhold at guide pin when tightening.

Tightening torque: 35 Nm.



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

- Install clip -1-.

- Adjust handbrake ⇒ page 46-29.

- Fit on wheels.

- Lower vehicle.

Notes:

- *Each time after replacing the brake pads, depress brake pedal firmly several times with vehicle stationary so that the brake pads adopt their position corresponding to the normal operating state.*
- *Inspect the brake fluid level each time after replacing the brake pads.*

Adjusting handbrake

It is not normally necessary to adjust the handbrake because of the automatic slack adjuster of the rear brakes. A re-setting is only necessary if the handbrake cables, the brake calipers and the brake discs are replaced.

Notes:

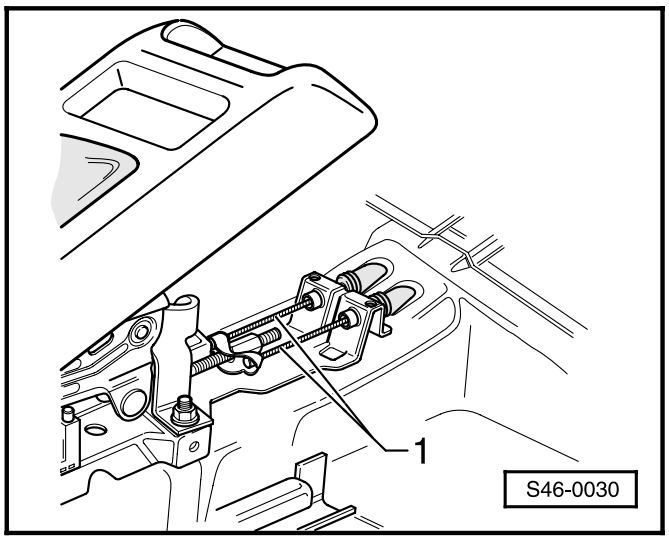
- *The footbrake must be bled and be operating properly.*
- *Always replace self-locking adjusting nut.*

- Release handbrake.

- Remove ashtray in centre console.

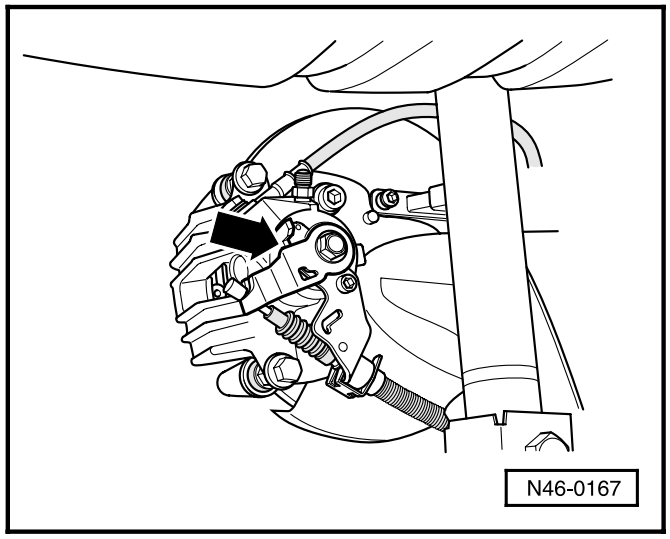
- Take out cross-head screws.

◄ - Raise rear centre console; remove if necessary.
⇒ Body Fitting Work; Repair Group 68; Interior Equipment

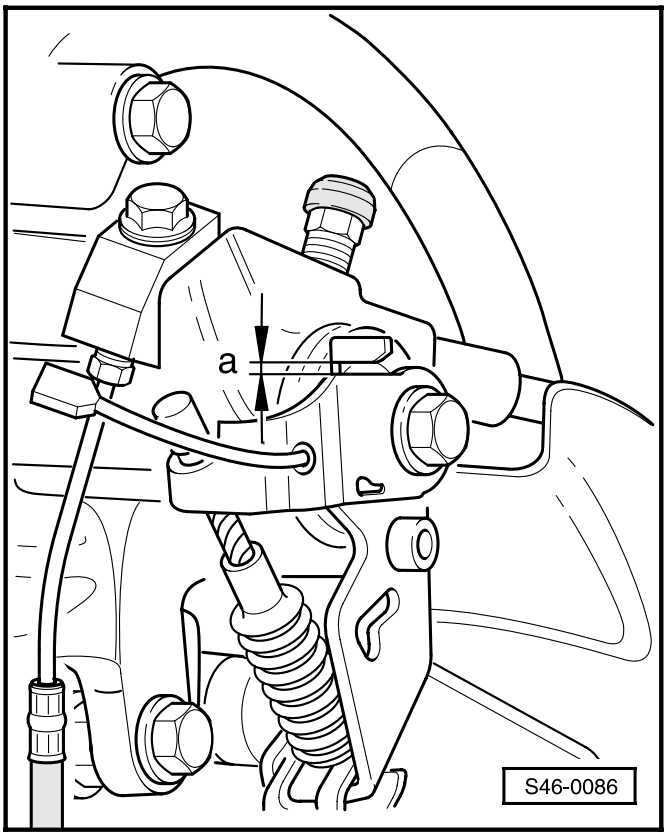


1 - Handbrake cables

- Depress footbrake once firmly.



◄ - Handbrake lever in off position. Tighten adjusting nut sufficiently until the levers (arrow) lift off from the stops at the brake calipers.



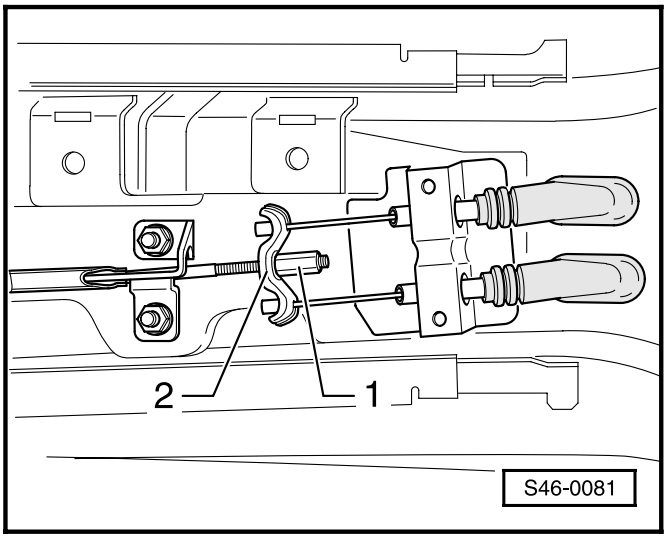
◄- Inspect clearance between lever and stop at the left and right brake caliper with the feeler gauge.

The clearance -a- between lever and stop must in total be at least 1 mm at the left and right brake caliper, but must not be more or less than 3 mm in total.

- Apply handbrake 3x firmly and release again. This ensures that the components are properly positioned and settled.

- With the handbrake lever in the off position, check whether both wheels rotate freely; turn back adjusting nut slightly, if necessary.

Removing and installing handbrake cable, 4x4 models/disc brakes



Removing

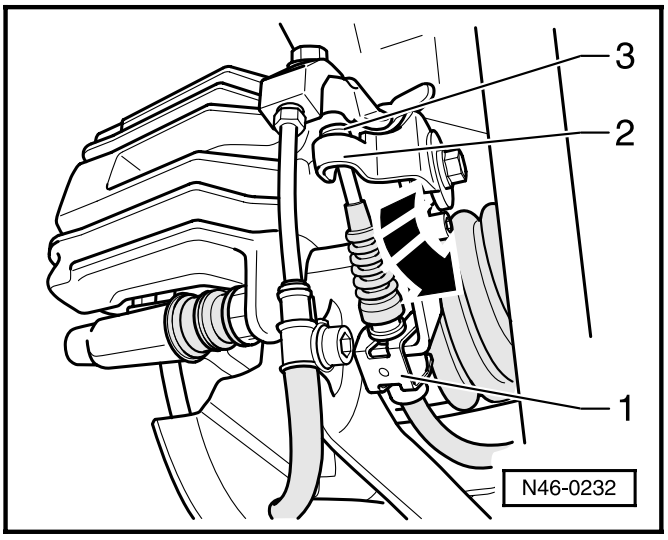
- Remove rear centre console.

⇒ Body Fitting Work; Repair Group 68; Interior Equipment

- Release handbrake.

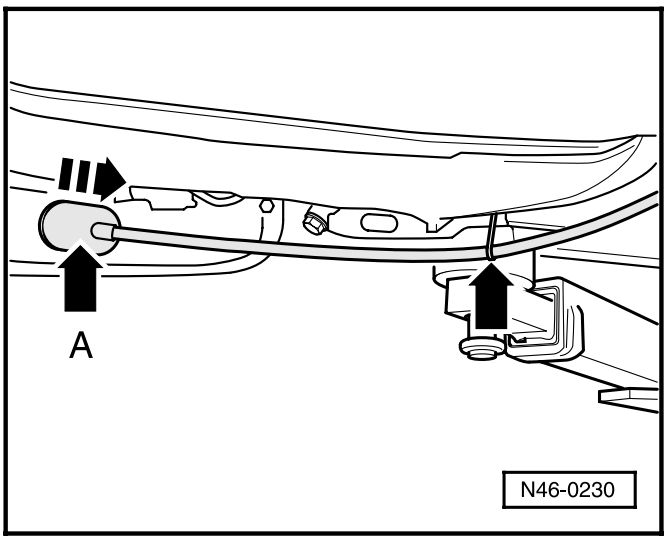
◄- Slacken adjusting nut -1- sufficiently until it is possible to take the handbrake cable out of the compensating bar -2-.

- Raise vehicle.



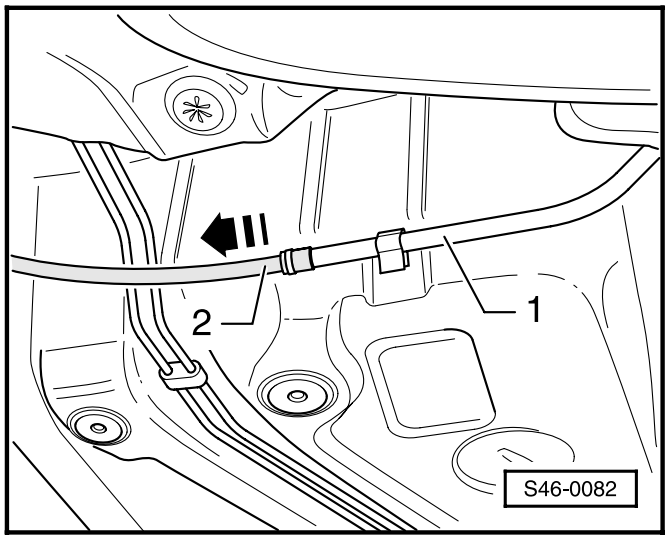
◄- Use a screwdriver to lever out clip -1- and pull down and off.

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



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

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



◄- Pull handbrake cable -2- out of guide tube -1- in direction of arrow.

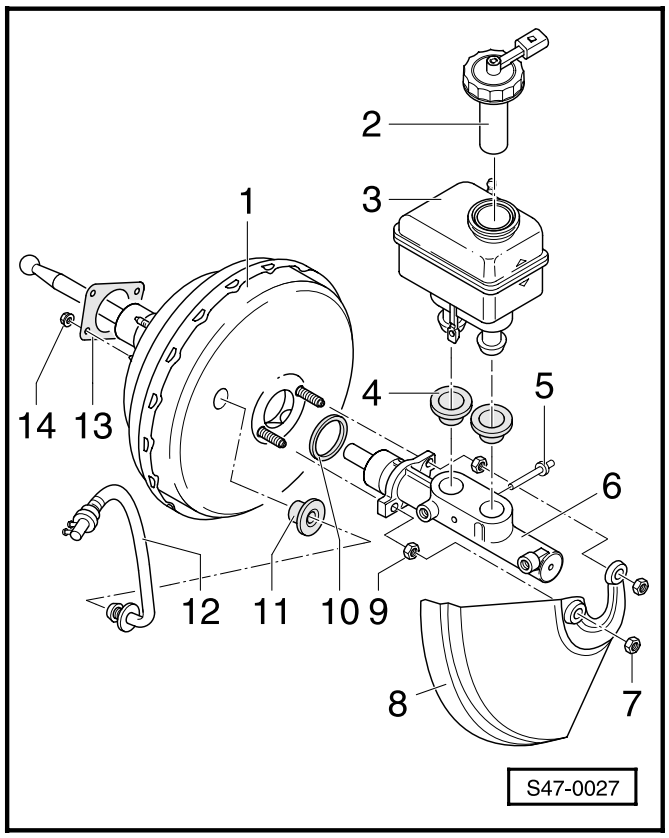
Installing

Installation is carried out in the reverse order.

Notes:

- *Before adjusting the handbrake, pretension handbrake cable with the adjusting nut at the compensating arm.*
- *Adjusting handbrake ⇒ page 46-29.*

Assembly overview: brake servo unit/brake master cylinder for models without ABS and for models with ABS, ABS/EDL Mark 20



Note:

Complete brake master cylinders and brake servo units can be replaced separately from each other.

1 - Brake servo unit without mechanical brake assist
- ♦ all models without ABS
- ♦ RHD models with ABS, ABS/EDL
- ♦ LHD models with ABS, ABS/EDL up to and including Model Year 2001

- Brake servo unit with mechanical brake assist
- ♦ LHD models with ABS, ABS/EDL from Model Year 2002
- ♦ mechanical brake assist integrated in brake servo unit
- ♦ brake assist is recognisable only from the part number of the brake servo unit
- ♦ assignment ⇒ Parts List
- ♦ brake assist cannot be serviced; if complaints exist, replace complete brake servo unit ⇒ page 47-4.1

- Continued for all brake servo units
- ♦ operational check ⇒ page 47-4
- ♦ removing and installing ⇒ page 47-4.1
- ♦ if fault exists, replace complete
- ♦ separating from brake pedal ⇒ page 46-20
- ♦ on petrol engines, vacuum required is drawn from intake manifold
- ♦ on diesel engines, vacuum pump fitted to produce vacuum
- ♦ non-return valve (in vacuum hose of vacuum pump) ⇒ page 47-7

Operational check
- It must be possible to blow through valve in direction of arrow.
- The valve must be leaktight in opposite direction of arrow.

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

3 - Brake fluid reservoir
- ♦ locked into retaining pin with side catches

4 - Sealing plug
- ♦ moisten with brake fluid and press in reservoir

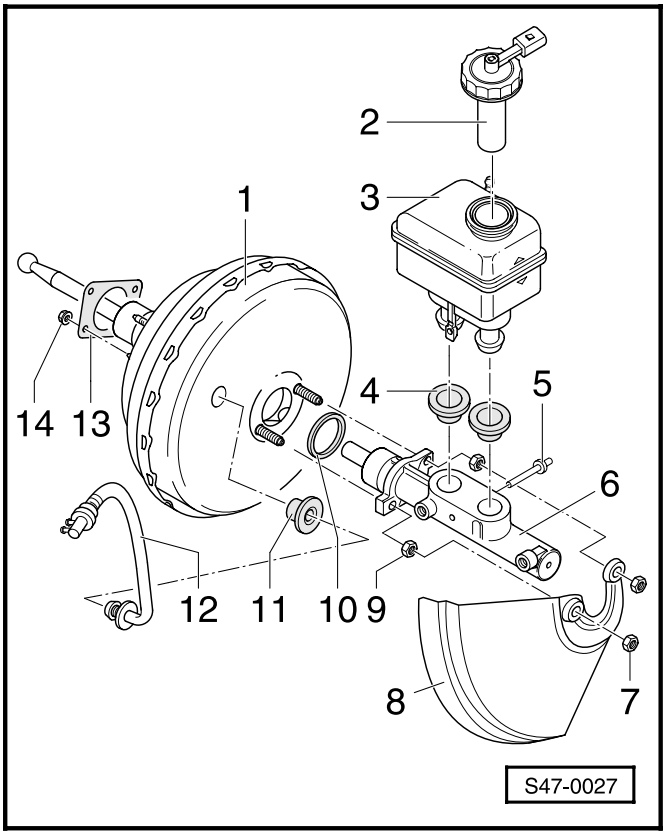
5 - Retaining pin
- ♦ insert through brake master cylinder

6 - Brake master cylinder
- ♦ on models with ABS/EDL/ESP two brake pressure senders (G201 and G214) are installed additionally ⇒ page 47-28
- ♦ must not be serviced; if fault exists, replace complete
- ♦ leak test ⇒ page 47-24

7 - Self-locking hexagon nut, 20 Nm
- ♦ only on models with 74 kW, 92 kW and 110 kW engine

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

9 - Self-locking hexagon nut, 20 Nm
- ♦ replace



10 - Seal
- ♦ replace

11 - Sealing plug

12 - Vacuum hose
- ♦ with non-return valve

13 - Gasket
- ♦ for brake servo unit
- ♦ install between brake servo unit and bulkhead

14 - Self-locking hexagon nut, 25 Nm
- ♦ replace

Removing and installing brake master cylinder

Special tools, testers and aids required

- ♦ Hose clamp MP 7-602
- ♦ Extraction bottle (commercially available)
- ♦ Brake fluid ⇒ page 00-8
- ♦ Repair kit Part No. 1H0 698 311 A

Notes:

- ♦ *Before disconnecting the battery, determine the code of radio sets fitted with anti-theft coding.*
- ♦ *When re-connecting the battery, check the vehicle equipment:*
  - encode radio,
  - re-set clock,
  - initialise power windows.

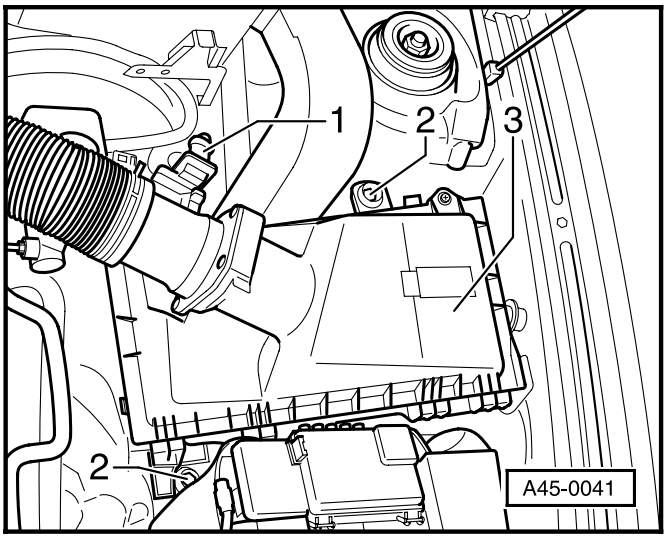
⇒ Inspection and Maintenance

Removing

- Disconnect battery.

Note:

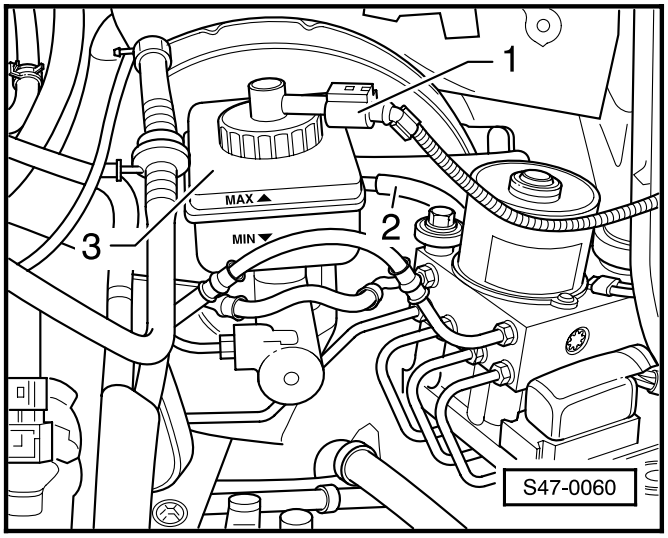
The following 2 steps do not apply to the 1.6 l/ 55 kW engine:



◄ - Unplug connector -1- of air mass meter from air guide pipe of air filter.

- Take out the screws -2- at the air filter -3- and place this down to the side.

- On diesel engines, remove relay carrier above brake servo unit.



◄- Unplug connector -1- from brake fluid level warning contact -F34-.

- Extract as much brake fluid as possible from the brake fluid reservoir with extraction equipment or extraction bottle.

- Use special tool MP 7-602 to pinch off feed line of clutch master cylinder -2-.

- Detach feed line of clutch master cylinder -2- from brake fluid reservoir -3- and place up.

- Detach brake lines from tandem brake master cylinder, seal brake lines with plugs from repair kit Part No. 1H0 698 311 A.

- On 74 kW, 92 kW and 110 kW engines, unbolt heat shield.

- Unbolt tandem brake master cylinder from brake servo unit.

Installing

Installation is carried out in the reverse order.

- Replace the seal between brake master cylinder and brake servo unit.

- When fitting together brake master cylinder and brake servo unit, ensure the pushrod is correctly located in the brake master cylinder.

- After installing, pour in only fresh brake fluid.

- Connect battery ⇒ page 47-2.

- Bleed brake system ⇒ page 47-18.

- Bleed clutch (manual gearbox).

⇒ Manual Gearbox; Repair Group 30; Servicing clutch mechanism

⇒ Inspection and Maintenance

- On models with EDL, initiate basic setting ⇒ page 45-36.

- Interrogate fault memory ⇒ page 45-12.

- Erase fault memory ⇒ page 45-21.

Testing brake servo unit

Brake servo unit without brake assist

Operational check

- With engine switched off, depress brake pedal firmly several times (this reduces the pressure in the brake servo unit).

- Now, hold the brake pedal in the braking position with moderate foot force and start engine.

  If the brake servo unit is operating properly, the brake pedal will now be felt to yield under your foot (servo assistance is active).

- If a problem exists, replace brake servo unit.

Brake servo unit with mechanical brake assist

Operational check of brake servo unit

⇒ Brake servo unit without brake assist, page 47-4.

Operational check of brake assist

- With engine running (full vacuum assistance must be assured), depress brake pedal firmly. When this is done, a “clicking” must be audible (brake assist is activated).

If no “clicking” can be heard, there is a fault in the brake assist and the brake servo unit must be replaced complete.

When the brake pedal is then released, a considerably reduced force from the brake pedal acts on the foot than is the case when braking.

Removing and installing brake servo unit

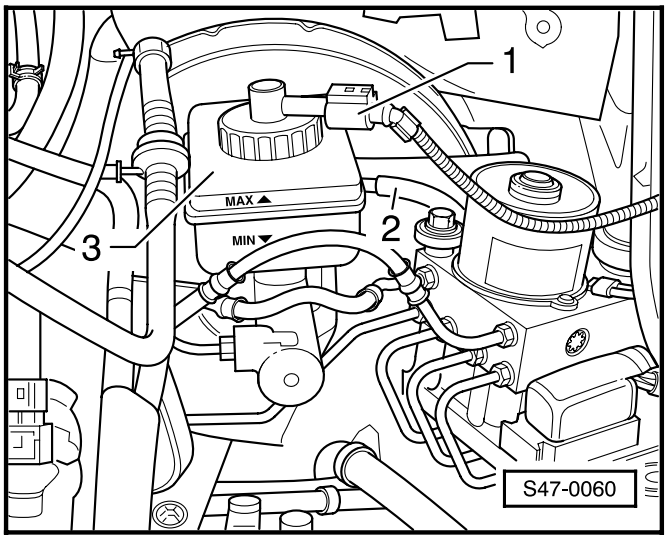
Special tools, testers and aids required

- Hose clamp MP 7-602
- Brake pedal depresser, e.g. V.A.G 1238/B
- Vehicle system tester V.A.G 1552
- Diagnostic cable V.A.G 1551/3, 3A, 3B or 3C
- Release tool T30021
- Extraction bottle (commercially available)
- Repair kit Part No. 1H0 698 311 A
- Brake fluid ⇒ page 00-8

Notes:

- *Before disconnecting the battery, determine the code of radio sets fitted with anti-theft coding.*
- *When re-connecting the battery, check the vehicle equipment:*
  - encode radio,
  - re-set clock,
  - initialise power windows.

⇒ Inspection and Maintenance



Removing

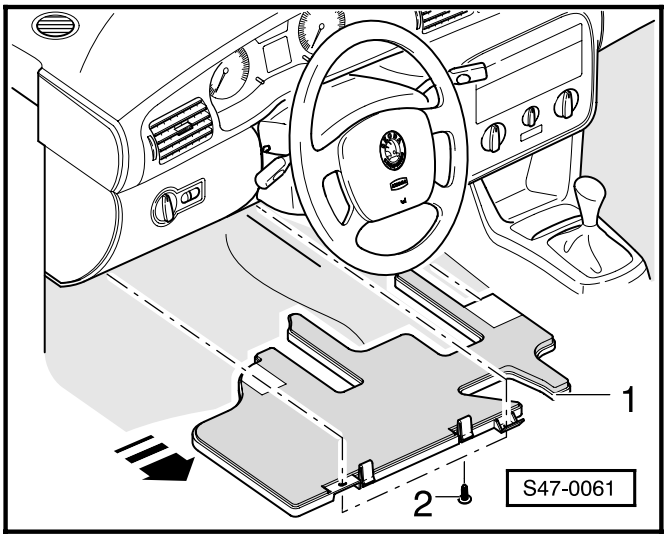
- Remove hydraulic control unit ⇒ page 45-52.

◄ - Unplug connector -1- from brake fluid level warning contact -F34-.

- Use hose clamp MP 7-602 to pinch off feed line of clutch master cylinder -2-.

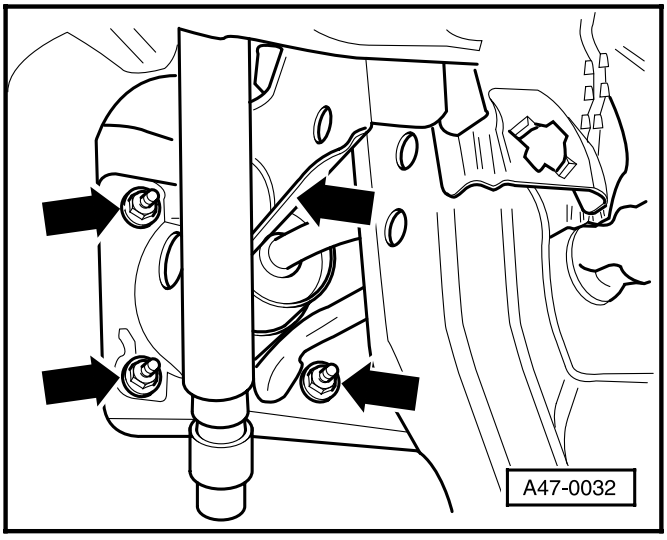
- Detach feed line of clutch master cylinder -2- from brake fluid reservoir -3- and place up.

- Detach vacuum hose from brake servo unit.



◄ - Remove screws -2-.

- Pull footwell panel -1- out of the fixture.

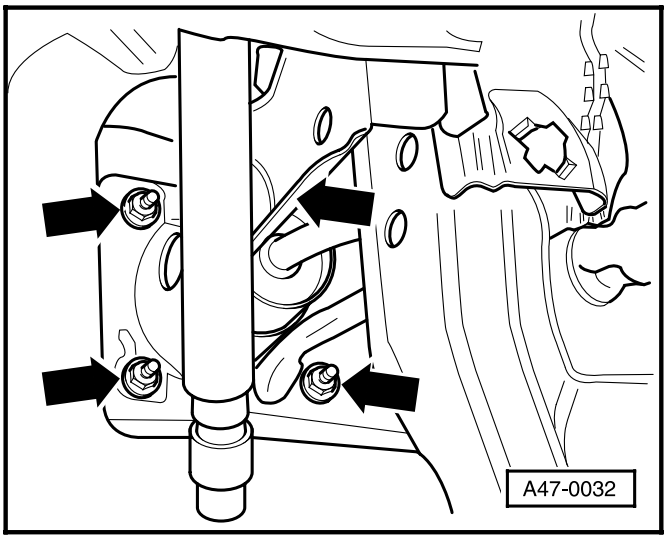


- Separate brake pedal from brake servo unit ⇒ page 46-20.

◄ - Unscrew hexagon nuts for brake servo unit -arrows-.

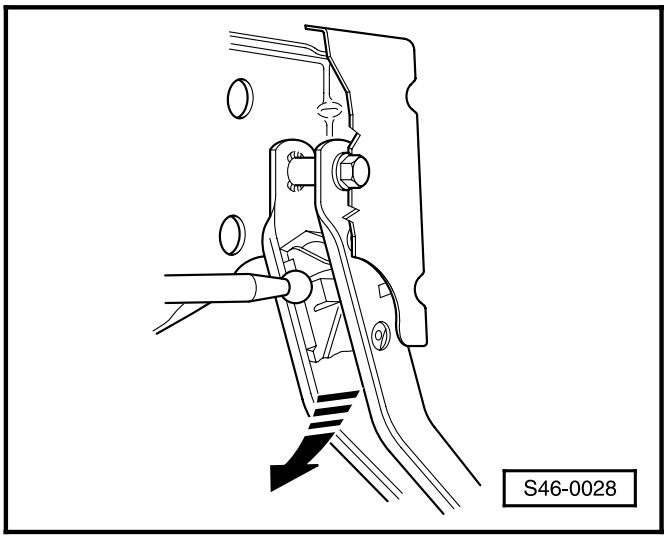
Top right nut not visible in illustration.

- Guide brake servo unit and brake master cylinder out to the front and remove.



Installing

◄ - Install brake servo unit and brake master cylinder and tighten new hexagon nuts to final torque of 28 Nm -arrows-.



◄ - Clip brake pedal to brake servo unit ⇒ page 46-20.

- Install brake light switch and set ⇒ page 45-69.

The remaining installation is carried out in the reverse order.

- Pour in fresh brake fluid ⇒ page 00-8.

- Connect battery ⇒ page 47-2.

- Bleed brake system ⇒ page 47-18.

- Bleed clutch (manual gearbox).
⇒ Manual Gearbox; Repair Group 30; Servicing clutch mechanism
⇒ Inspection and Maintenance

- On models fitted with EDL, initiate basic setting ⇒ page 45-36.

- Interrogate fault memory ⇒ page 45-12.

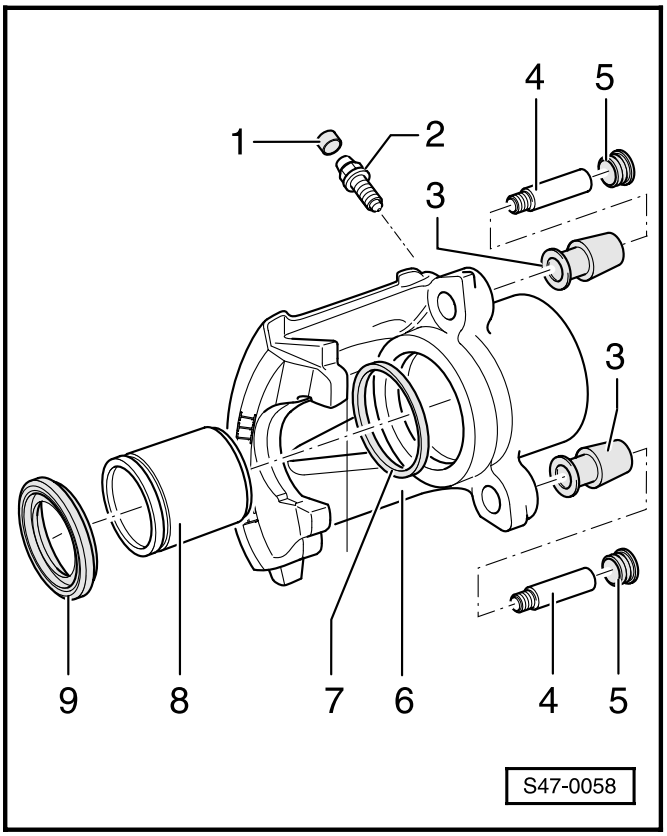
- Erase fault memory ⇒ page 45-21.

Removing and installing vacuum pump for brake servo unit

Models with diesel engine
⇒ Engine, Mechanical Components; Repair Group 15; Removing and installing cylinder head

Servicing front brake caliper, brake caliper FS-III

Summary of components of brake caliper FS-III



Notes:

- *Always install complete repair kit when carrying out repairs.*
- *New brake calipers are filled with brake fluid and pre-bled.*
- *Apply a thin coat of brake fluid or assembly paste to brake cylinder, piston and seal.*

1 - Dust cap

2 - Bleeder valve, 10 Nm
- Before inserting, apply a thin coat of brake fluid or assembly paste to thread

3 - Bearing bush
- Insert into brake caliper housing

4 - Guide pin, 28 Nm

5 - Cap
- Insert into bearing bush

6 - Brake caliper housing

7 - Seal
- Removing and installing ⇒ from page 47-9

8 - Piston
- Removing and installing ⇒ from page 47-9
- First of all, apply a thin coat of assembly paste or brake fluid to piston

9 - Protective cap
- Do not damage when inserting piston

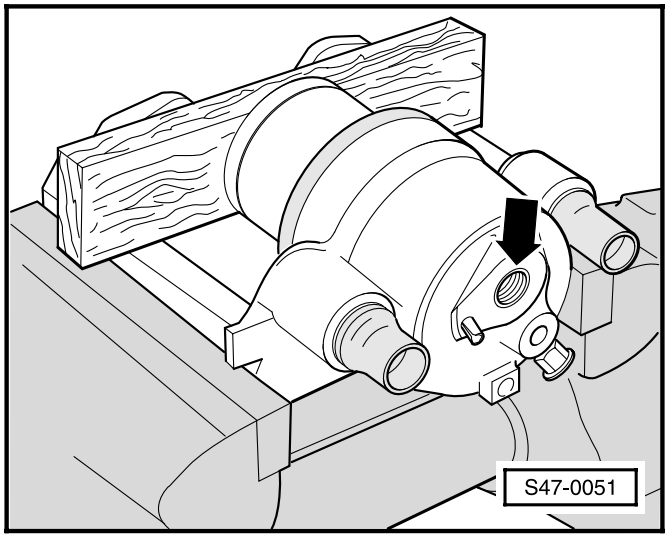
Special tools, testers and aids required

- Piston resetting device MP 9-403
- Plastic wedge 3409
- Brake fluid ⇒ page 00-8
- Assembly paste G 052 150 A2

Removing and installing piston for front brake caliper

Special tools, testers and aids required

- Piston resetting device MP 9-403
- Plastic wedge 3409
- Brake fluid ⇒ page 00-8
- Assembly paste G 052 150 A2

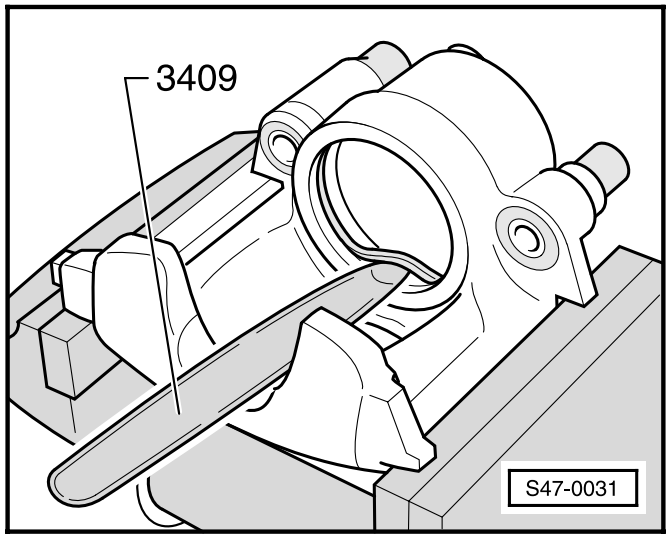


Removing

◄ - Use compressed air to press piston out of the brake caliper housing -arrow-.

Note:

Place a wooden block in the recess so that the piston is not damaged.



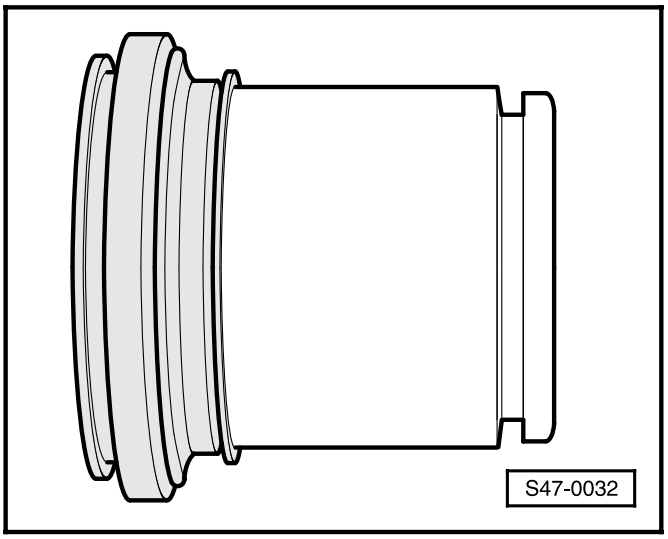
◄ - Remove seal.

Use plastic wedge 3409 for this step.

Note:

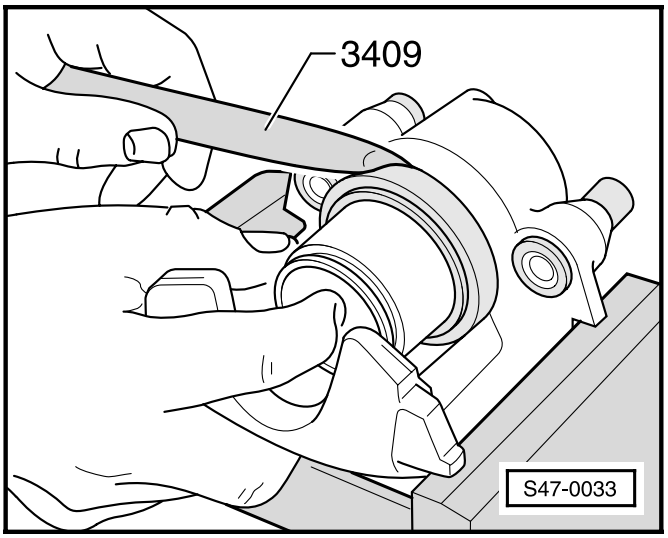
When removing, ensure that the surface of the cylinder is not damaged.

Installing



- Clean surfaces of piston and seal with methylated spirits and then dry.
- Apply a thin coat of brake fluid or assembly paste G 052 150 A2 to the piston and seal before inserting into brake caliper housing.
- Insert new seal into the groove of the brake caliper.

◄- Fit new protective cap with the outer sealing lip onto the piston.

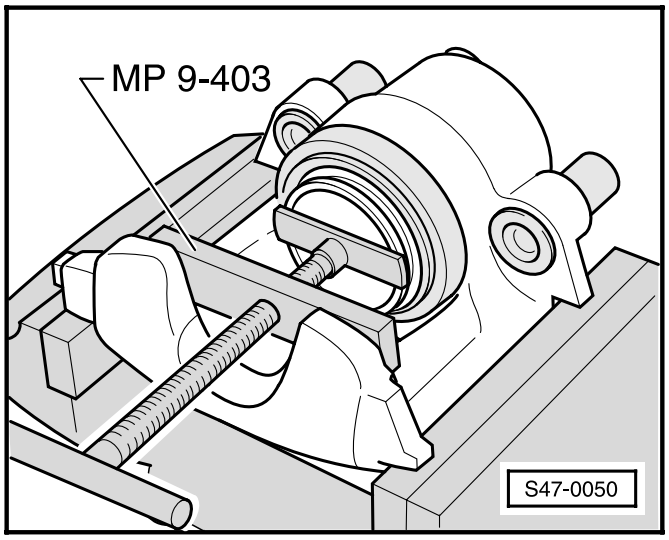


◄- Use a plastic wedge to insert inner sealing lip of the protective cap into the groove of the cylinder.

Use plastic wedge 3409 for this step.

Note:

Hold piston in front of brake caliper housing for this step.



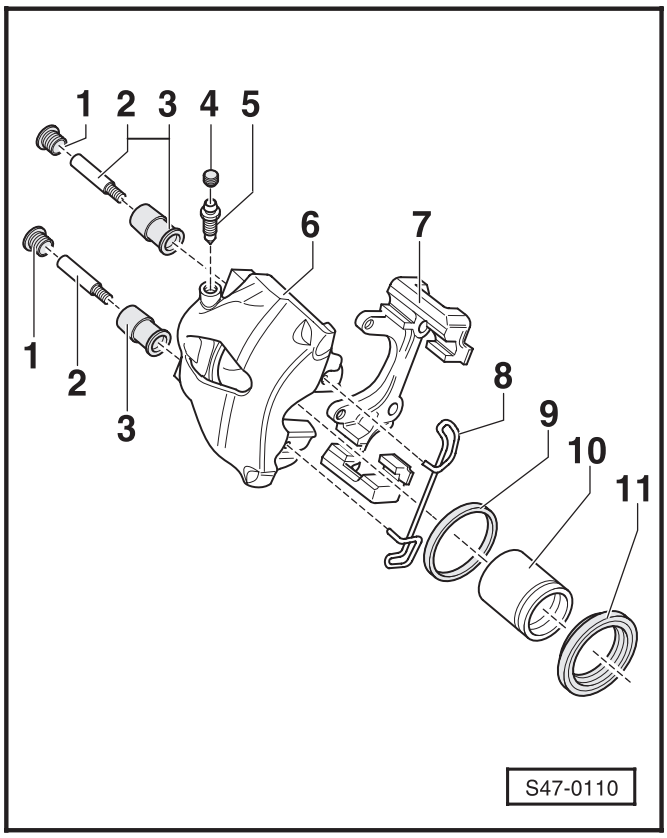
◄- Use piston resetting device MP 9-403 to press piston into brake caliper housing.

Note:

The outer sealing lip of the protective cap jumps into the groove on the piston when this is done.

Repairing the front brake calliper, brake calliper FN-3

Summary of Components of Brake Caliper FN-3



Special tools, testers and aids required

- Piston jig MP 9-403
- Plastic wedge 3409
- Brake fluid ⇒ page 00-8
- Assembly paste G 052 150 A2

Notes:

- *Install the complete repair set when undertaking repairs.*
- *New brake calipers are filled with brake fluid and are pre-bled.*
- *Thinly coat brake cylinder, piston and gasket ring with brake fluid or assembly paste*

1 - Cap
- insert into bushing

2 - Guide bolts, 28 Nm

3 - Bushing
- insert into brake caliper housing

4 - Dust cap

5 - Bleeder screw, 10 Nm
- thinly coat thread with brake fluid or assembly paste before screwing in

6 - Brake caliper

7 - Brake carrier
- screwed to the brake caliper

8 - Pad retaining spring
- insert with both ends in the bores of the brake caliper.

9 - Gasket ring
- removing and installing ⇒ page 47-10.2

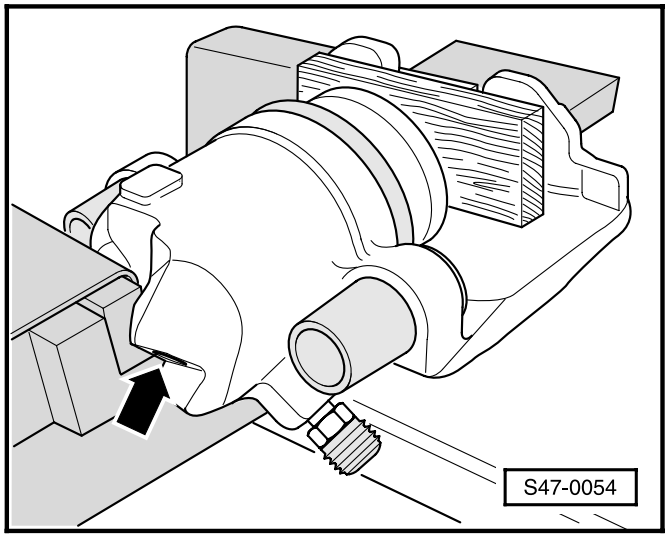
10 - Piston
- removing and installing ⇒ page 47-10.2
- thinly coat piston with brake fluid or assembly paste before fitting
- piston diameter: 54 mm

11 - Protective cap
- do not damage when inserting the piston
- pull with the outer sealing lip onto the piston
- insert with the inner sealing lip into the groove of the brake caliper ⇒ page 47-10.3

Removing and installing piston for front brake calliper

Special tools, testers and aids required

- Piston resetting device MP 9-403
- Plastic wedge 3409
- Brake fluid ⇒ page 00-8
- Brake cylinder paste, e.g. G 052 150 A2

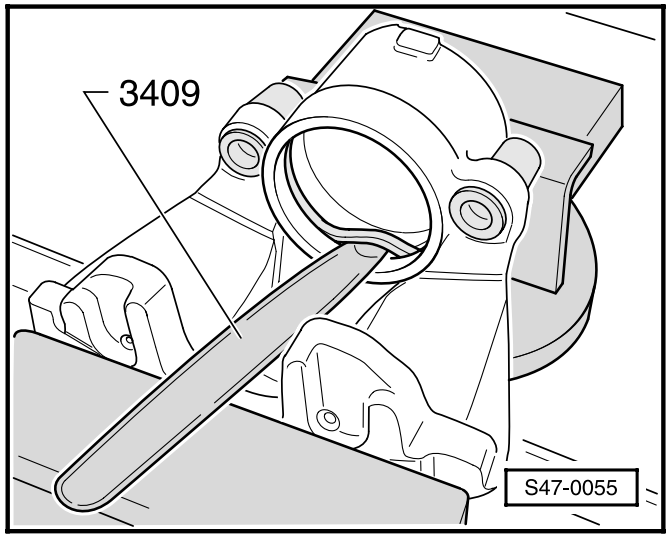


Removing

◄ - Use compressed air to press piston out of brake calliper housing -arrow-.

Note:

Insert wooden block into the shaft so that the piston is not damaged.



◄ - Remove seal.

Use plastic wedge 3409 for this step.

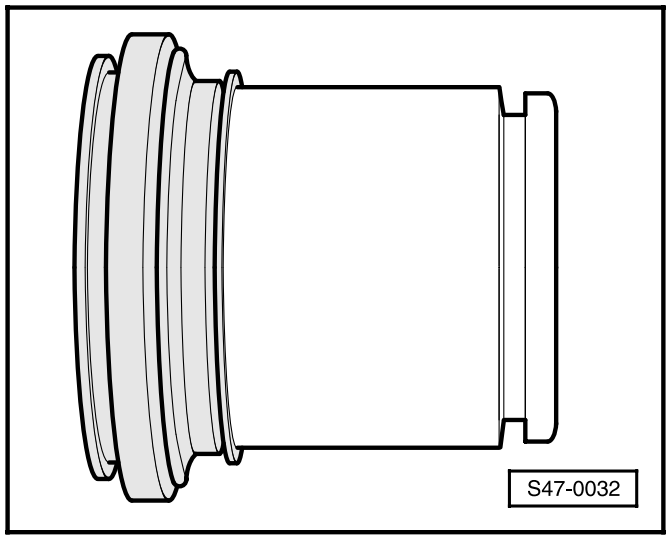
Note:

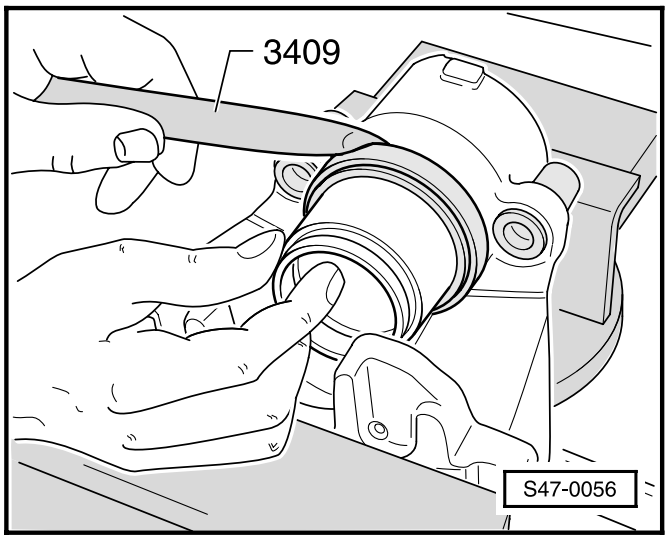
When removing, ensure that the surface of the cylinder is not damaged.

Installing

- Clean the surface on the piston and seal with spirit and dry.
- Before inserting the piston and seal into the brake cylinder, apply a thin coat of brake fluid or brake cylinder paste, e.g. G 052 150 A2, to all the parts.
- Insert new seal into the groove of the brake calliper.

◄- Fit new protective cap with outer sealing lip onto the piston.



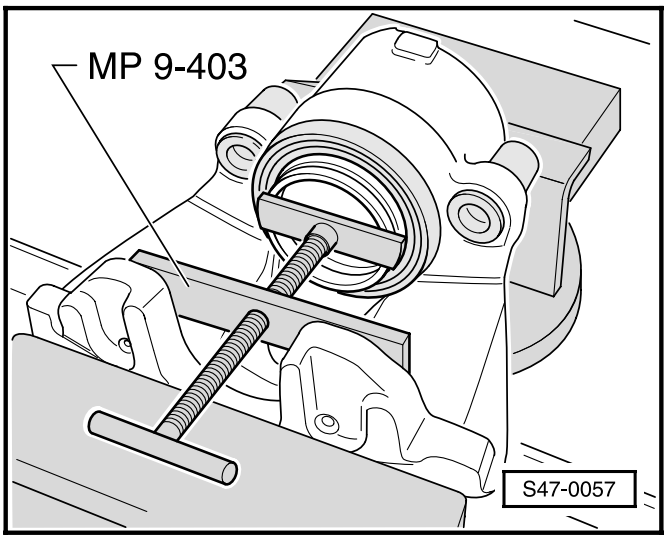


◄- Use a plastic wedge to insert inner sealing lip of the protective cap into the groove of the cylinder.

Use plastic wedge 3409 for this step.

Note:

Hold piston in front of brake calliper housing for this step.



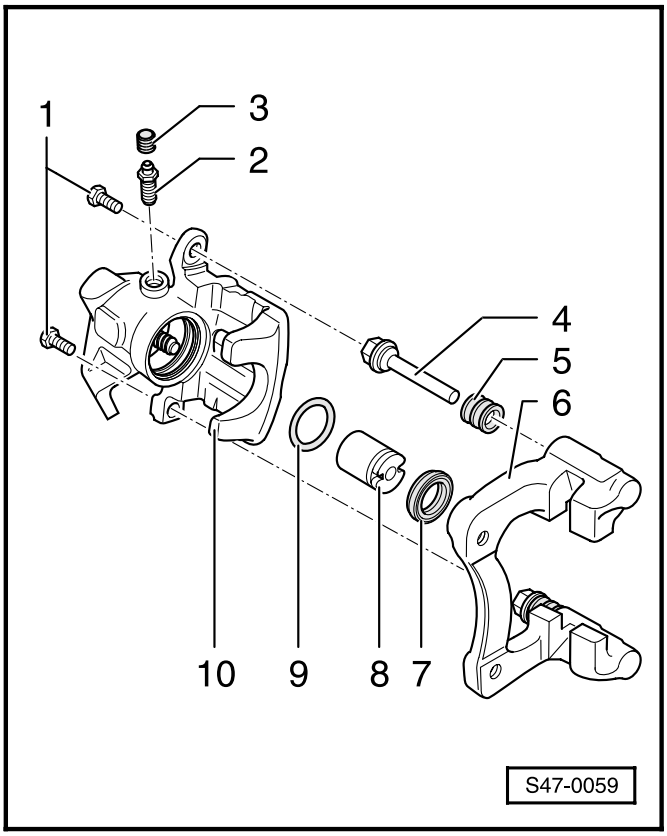
◄- Use piston resetting device MP 9-403 to press piston into brake calliper housing.

Note:

The outer sealing lip of the protective cap jumps into the groove on the piston when this is done.

Servicing rear brake calipers

Summary of components of brake caliper



Special tools, testers and aids required

- Resetting and removal tool MP 9-401
- Plastic wedge 3409
- Bleeder bottle (commercially available)
- Brake fluid ⇒ page 00-8
- Assembly paste G 052 150 A2

Notes:

- *When carrying out repairs, always install the complete repair kit.*
- *New brake calipers are filled with brake fluid and pre-bled.*
- *When carrying out repairs, it is essential to pre-bleed the brake calipers accordingly before installing them in the vehicle (without brake pads) ⇒ page 47-14.*
- *Apply a thin coat of brake fluid or assembly paste to brake cylinder, piston and seal.*

1 - Self-locking hexagon bolt, 35 Nm
- Replace
- Counterhold at guide pin when slackening and tightening

2 - Bleeder valve, 10 Nm
- Before screwing in, apply a thin coat of brake fluid or assembly paste G 052 150 A2 to the thread

3 - Dust cap

4 - Guide pin
- Grease before fitting on protective cap

5 - Protective cap
- Fit onto brake carrier and guide pin

6 - Brake carrier with guide pins and protective cap
- Is supplied as a replacement part assembled with adequate quantity of grease on the guide pins
- If the protective caps or guide pins are damaged, install repair kit; use enclosed grease packing for greasing the guide pins

7 - Protective cap
- Fit with outer sealing lip onto the piston
- Insert with inner sealing lip into the groove of the brake caliper housing ⇒ page 47-13

8 - Piston with automatic slack device
- Removing and installing ⇒ from page 47-12
- Apply a thin coat of brake fluid or assembly paste G 052 150 A2 to piston before installing

9 - Seal
- Use plastic wedge for removing ⇒ page 47-12

10 - Brake caliper housing with lever for handbrake cable
- If leaks exist at lever for handbrake cable, replace brake caliper housing
- After servicing, pre-bleed brake caliper housing ⇒ page 47-14

Removing and installing piston for rear brake caliper

Special tools, testers and aids required

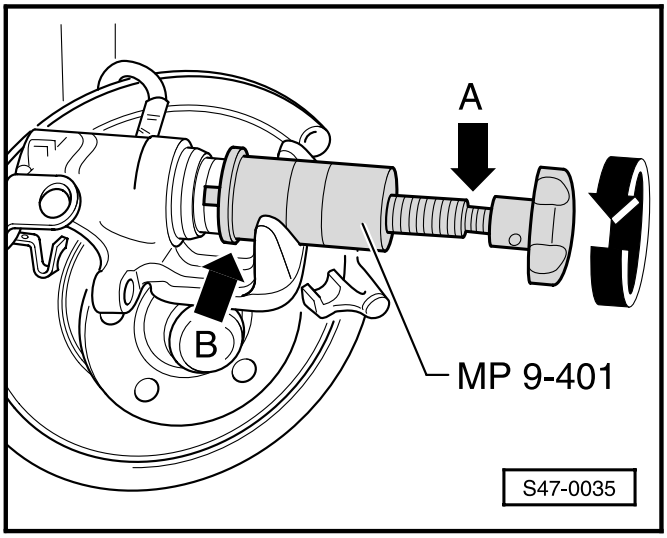
- Resetting and removal tool MP 9-401
- Plastic wedge 3409
- Bleeder bottle (commercially available)
- Brake fluid ⇒ page 00-8
- Assembly paste G 052 150 A2

Removing

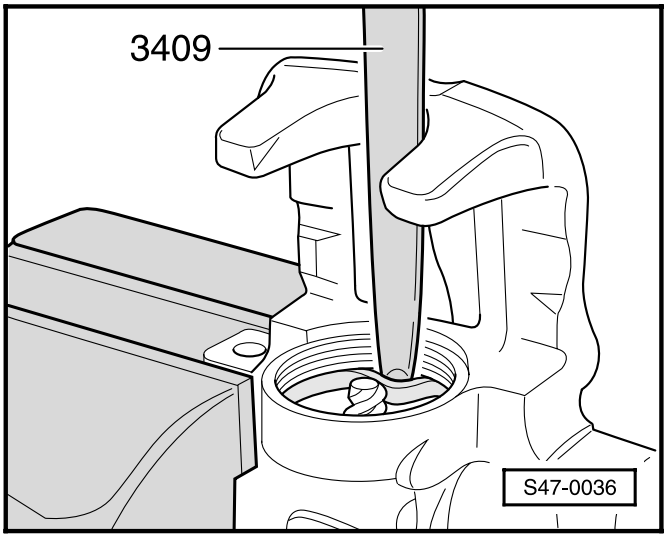
Notes:

◄ ♦ *Insert special tool MP 9-401 so that the collar (arrow B) is positioned in front of the piston.*

♦ *If piston is stiff, an open-end wrench waf 13 can be positioned at the wrench faces provided for this purpose (arrow A).*



- Remove piston from the brake caliper housing by turning the knurled wheel to the left.

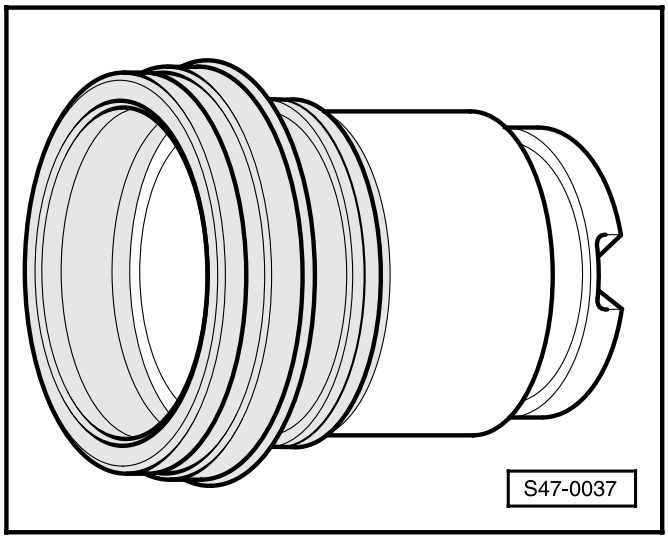


◄ - Take out seal.

Use plastic wedge 3409 for this step.

Note:

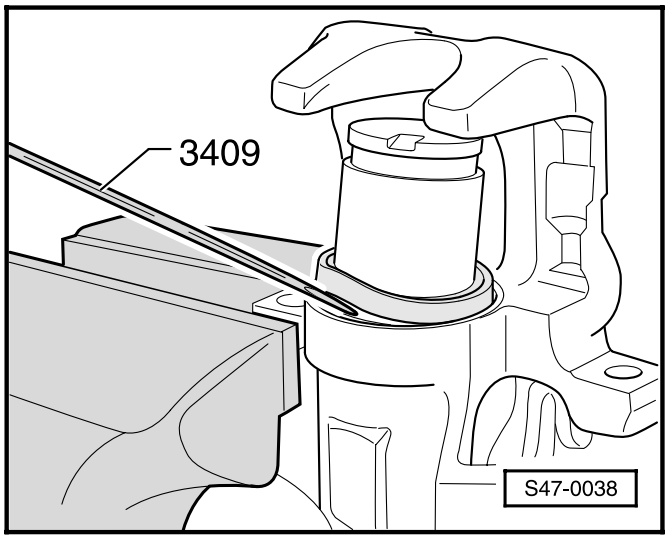
When removing, ensure that the surface of the cylinder is not damaged.



Installing

- Clean surfaces of piston and seal with methylated spirits and then dry.
- Apply a thin coat of brake fluid or assembly paste G 052 150 A2 to piston and seal before inserting into the brake caliper housing.

◄ - Fit protective cap with outer sealing lip onto the piston.

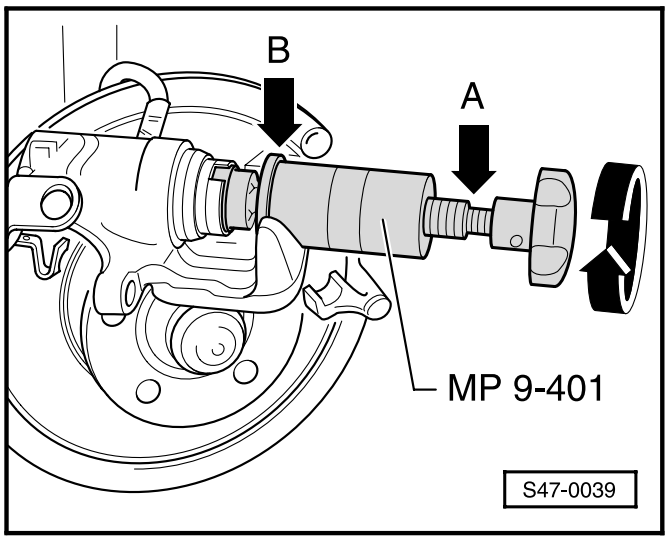


◄ - Insert inner sealing lip into the groove of the cylinder with a plastic wedge.

Use plastic wedge 3409 for this step.

Note:

Hold piston in front of brake caliper housing for this step.



Notes:

◄ ♦ *Insert special tool MP 9-401 so that the collar (arrow B) of the tool is resting against brake caliper.*

♦ *If piston is stiff, an open-end wrench waf 13 can be positioned at the wrench faces provided for this purpose (arrow A).*

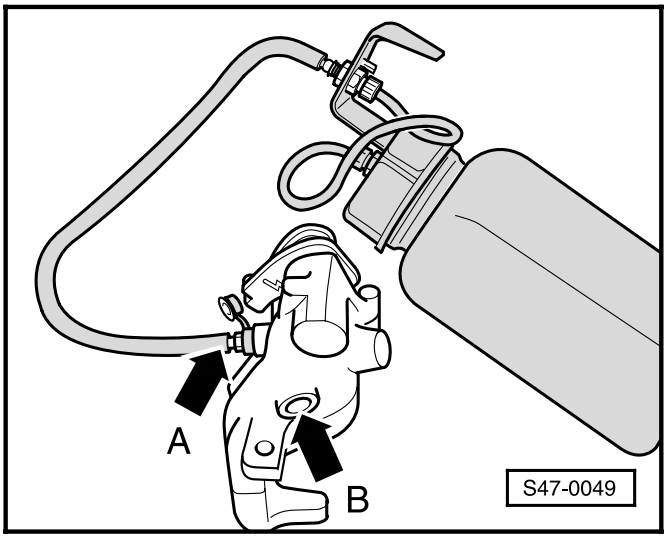
♦ *If the position of the piston is altered with a piston resetting device or by depressing the footbrake, the automatic slack adjuster in the brake caliper is destroyed.*

- Insert piston by turning knurled wheel to the right.
- Insert brake pads.

Pre-bleeding brake caliper

Note:

Position brake caliper upright for pre-bleeding.

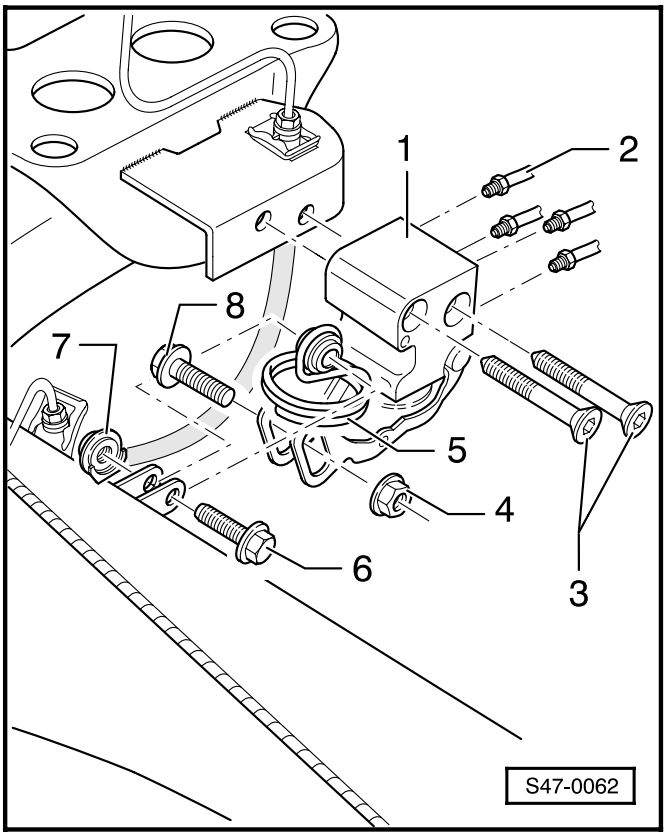


◄ - Open bleeder bottle -arrow A-.

- Use a commercially available bleeder vessel to pour in brake fluid long enough until brake fluid flows out of the threaded hole (brake hose connection) -arrow B- free of bubbles.

- Close bleeder screw.

Summary of components of brake pressure regulator



1 - Load-dependent brake pressure regulator
- ♦ Testing and setting ⇒ from page 47-16

2 - Brake line with screw union
- ♦ Tightening torque of screw union 14 Nm

3 - Recessed machine screw, 21 Nm

4 - Hexagon nut, self-locking, 21 Nm
- ♦ Replace each time removed

5 - Tensile spring

6 - Hexagon bolt, 16 Nm

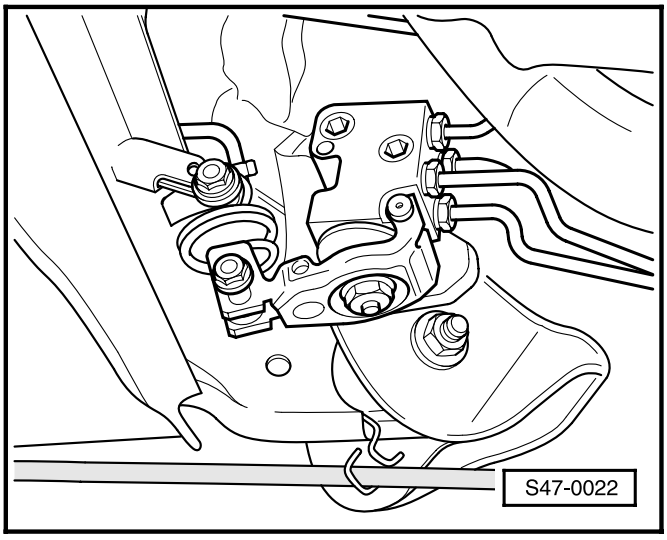
7 - Push-in nut

8 - Hexagon bolt
- ♦ Replace each time removed

Testing and setting brake pressure regulator

Special tools, testers and aids required

- Tester for brake pressure regulator and brake systems, e.g. V.A.G 1310 or V.A.G 1310 A



◄ The brake pressure regulator is attached to a bracket positioned at the bearing bracket for the rear axle, and is controlled by means of a spring in line with the movement of the rear axle.

Inspecting operation

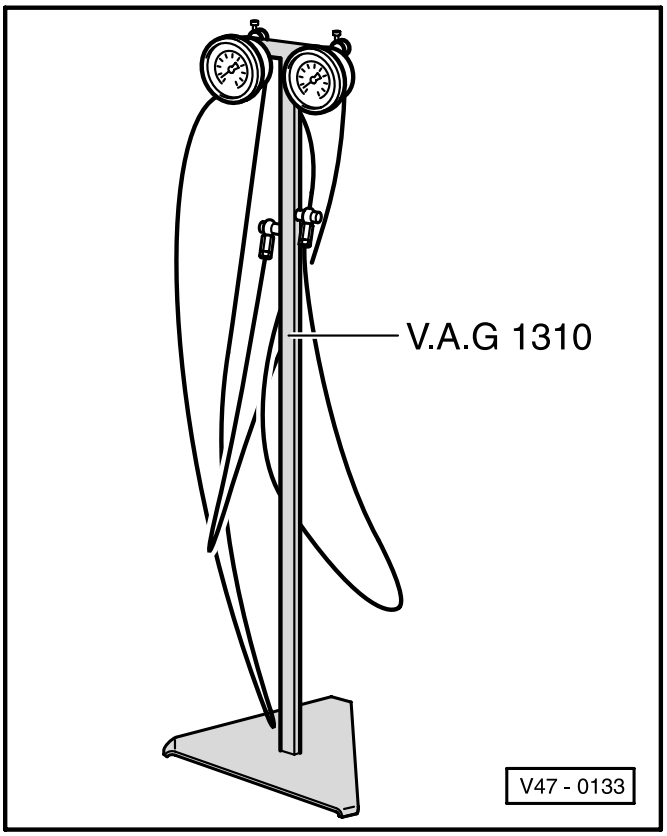
Fully depress brake pedal firmly and release quickly (vehicle standing on its wheels). When this is done, the lever of the brake pressure regulator must move.

Testing pressure and setting

Note:

The brake pressure regulator is set when the vehicle is at its unladen weight.

Unladen weight refers to:
Weight of unladen vehicle (fuel tank empty or not more than 5 litres, no driver, with spare wheel, vehicle tool kit, vehicle jack).



◄ - Raise vehicle and connect pressure gauge to brake caliper (left front wheel) and to wheel brake cylinder (right rear wheel).

- Bleed both pressure gauges.
- Lower vehicle and bounce several times at the rear wheels.
- Apply pressure to brake pedal and measure pressures.
- Compare pressure readings obtained with the specified settings ⇒ page 47-17.
- Set brake pressure regulator, if necessary ⇒ page 47-17.

Setting of load-dependent brake pressure regulator

Model / Version		bar	MPa		bar	MPa
Rear drum brakes	Front wheels	70	7	Front wheels	100	10
Rear wheels	Rear wheels	41 ... 47	4.1 ... 4.7	Rear wheels	54 ... 60	5.4 ... 6.0

Setting brake pressure regulator

Test pressure at rear wheels too high:

- Slacken tensile spring at brake pressure regulator.

Test pressure at rear wheels too low:

- Tension tensile spring at brake pressure regulator.

Note:

Do not carry out setting with load applied to brake pedal; pay attention to the following sequence:

- Read off pressures.
- Take load of brake pedal.
- Set tensile spring at brake pressure regulator.
- Once again apply pressure to brake pedal.
- Read off pressures and correct setting, if necessary.
- Detach pressure gauges.
- Bleed brake system ⇒ from page 47-18.

Bleeding brake system, models with and without ABS or ABS/EDL Mark 20 and Mark 60

Notes:

- *Use only fresh brake fluid complying with the Standard ⇒ page 00-8.*
- *When system is open, do not work with compressed air and do not move vehicle.*

Special tools, testers and aids required

- Brake filling and bleeding appliance, e.g. ROMESS S15
- Brake pedal depressor, e.g. V.A.G 1238/B
- Vehicle system tester V.A.G 1552 (only for models fitted with ABS/EDL)

Warning!

- ***Brake fluid is hygroscopic, in other words it absorbs moisture from the surrounding air and should therefore always be stored in airtight sealed containers.***
- ***On no account allow brake fluid to come into contact with fluids containing mineral oil (oil, petroleum, cleaning products).***
  Mineral oils damage the plugs and seals of the brake system.
- ***Do not re-use brake fluid which has been extracted (which was in the system).***
- ***Pay attention to disposal regulations!***
- ***Brake fluid is poisonous, avoid contact with skin.***
- ***Do not allow brake fluid to come into contact with the paintwork because of its caustic effect.***
- ***If brake fluid spills, flush with plenty of water.***
- ***Disposal of brake fluid in accordance with the applicable environmental regulations.***

Vehicles not fitted with ABS or ABS/EDL

- Connect the brake filling and bleeding appliance.

Bleeding sequence ⇒ page 47-20

- After fitting on hose of bleeder bottle, leave bleeder screws opened until brake fluid flows out free of bubbles.

Vehicles fitted with Mark 20 or Mark 60

- Connect the brake filling and bleeding appliance.

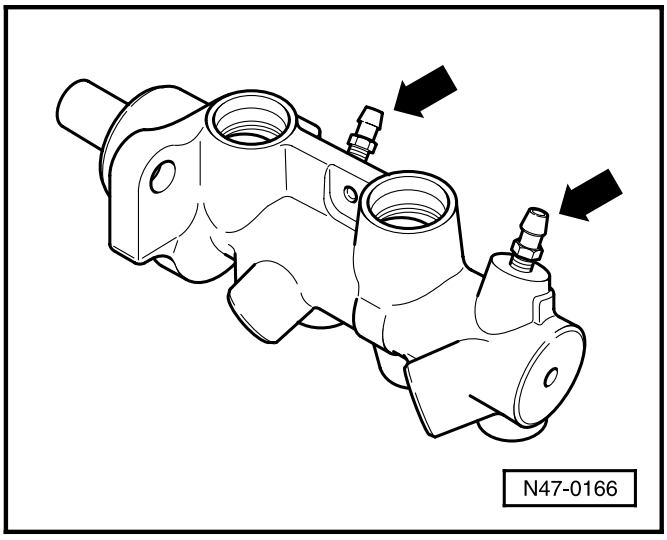
- Insert brake pedal depresser.

If a chamber of the brake fluid reservoir has been run completely empty (e.g. because of a leak in the brake system), it is then necessary to first of all pre-bleed the brake system.

Bleeding sequence for vehicles fitted with Mark 20 ⇒ page 47-20

Bleeding sequence for vehicles fitted with Mark 60 ⇒ page 47-23

After this, it is then necessary to bleed the hydraulic unit with the function “Basic setting” and the vehicle system tester V.A.G 1552.



Special note for RHD models

◄ If a chamber of the brake fluid reservoir has been run completely empty (e.g. because of a leak in the brake system), or after replacing the hydraulic unit, it is then necessary to bleed the system at the bleeder screws -arrows- after carrying out the basic setting of the brake master cylinders.

Continued for models fitted with Mark 60

After bleeding the brake system, it is necessary to carry out the zero adjustment or brake pressure sender 1 -G201- ⇒ page 45-194.

Continued for all models

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

For this reason, the brake fluid pressure must be reduced accordingly to 0.1 MPa (1 bar) at the brake filling and bleeding appliance Þ Operating Instructions of ROMESS S15.

If the filling pressure of 0.1 MPa (1 bar) is exceeded, proper bleeding of the hydraulic unit is not assured.

- On vehicles fitted with Mark 20, initiate basic setting ⇒ page 45-36.

- On vehicles fitted with Mark 60, initiate basic setting ⇒ page 45-194.

After bleeding is completed, conduct a road test. This must include at least one ABS control cycle!

Bleeding brake system with brake filling and bleeding appliance, e.g. ROMESS S15, on models fitted with Mark 20

Special tools, testers and aids required

- Brake filling and bleeding appliance, e.g. ROMESS S15
- Vehicle system tester V.A.G 1552 (only for models fitted with ABS/EDL)
- Brake fluid ⇒ page 00-8

It is not permitted to open the bleeder screws at the hydraulic unit on vehicles fitted with ABS, ABS/EDL!

- Connect brake filling and bleeding appliance.

- Remove dust caps at the bleeder screws of the brake calipers/wheel brake cylinders.

- Open bleeder screws in the specified order and bleed brake calipers and wheel brake cylinders.

Bleeding sequence

1- Rear right wheel brake cylinder/brake caliper

2 - Rear left wheel brake cylinder/brake caliper

3 - Front right brake caliper

4 - Front left brake caliper

- After bleeding, close the appropriate bleeder screw and fit on protective cap.

Vehicles fitted with ABS or ABS/EDL

A road test of these vehicles must be carried out after bleeding the brake system. At least one ABS control cycle must be activated during the road test!

Note:

When bleeding the rear wheel brake on vehicles fitted with a brake force regulator, move the lever of the regulator.

Changing brake fluid ⇒ Inspection and Maintenance

Bleeding brake system without brake filling and bleeding appliance

Special tools, testers and aids required

- Bleeder bottle (commercially available)
- Brake fluid ⇒ page 00-8

It is not permitted to open the bleeder screws at the hydraulic unit on vehicles fitted with ABS, ABS/EDL.

Note:

During the bleeding operation, always check brake fluid level in the reservoir; top up brake fluid to the "MAX" marking if necessary.

- After fitting on hose to bleeder bottle, open bleeder screw.

- Pump brake fluid through brake system by pumping the brake pedal.

- With brake pedal depressed, close bleeder screws.

- Perform pumping operation with brake pedal at least 10x for each wheel brake and repeat operation as often as necessary until no further air flows out.

Bleeding sequence for vehicles fitted with Mark 20

1 - Rear right wheel brake cylinder/brake caliper

2 - Rear left wheel brake cylinder/brake caliper

3 - Front right brake caliper

4 - Front left brake caliper

Bleeding operation for vehicles fitted with Mark 60

1 - Front left brake caliper

2 - Front right brake caliper

3 - Rear left brake caliper

4 - Rear right brake caliper

Vehicles fitted with ABS or ABS/EDL

A road test of these vehicles must be carried out after bleeding the brake system. At least one ABS control cycle must be activated during the road test!

Note:

When bleeding the rear wheel brake on vehicles fitted with a brake force regulator, move the lever of the regulator.

Changing brake fluid ⇒ Inspection and Maintenance

Bleeding brake system with brake filling and bleeding appliance, e.g. ROMESS S15, vehicles fitted with ABS Mark 60

Special tools, testers and aids required

- ♦ Brake filling and bleeding appliance, e.g. ROMESS S15
- ♦ Brake pedal depresser, e.g. V.A.G 1238/B

- Connect the brake filling and bleeding appliance.
- Insert brake pedal depresser.
- Open bleeder screws in the specified sequence and bleed brake calipers and wheel brake cylinders.

Bleeding sequence

1 - Front left brake caliper

2 - Front right brake caliper

3 - Rear left brake caliper

4 - Rear right brake caliper

- After fitting hose onto bleeder bottle, leave bleeder screws open long enough until brake fluid flows out free of bubbles.

After completing bleeding, it is necessary to carry out a road test. At least one ABS control cycle must be activated during the road test!

Pre-bleeding the brake system if a chamber of the brake fluid reservoir has been run completely empty (e.g. because of a leak in the brake system).

Bleeding sequence

1 - Bleed front left and front right brake calipers at the same time

2 - Bleed rear left and rear right brake calipers at the same time

- After fitting hose onto bleeder bottle, leave bleeder screws open long enough until brake fluid flows out free of bubbles.

Testing brake master cylinder for leaks

Special tools, testers and aids required

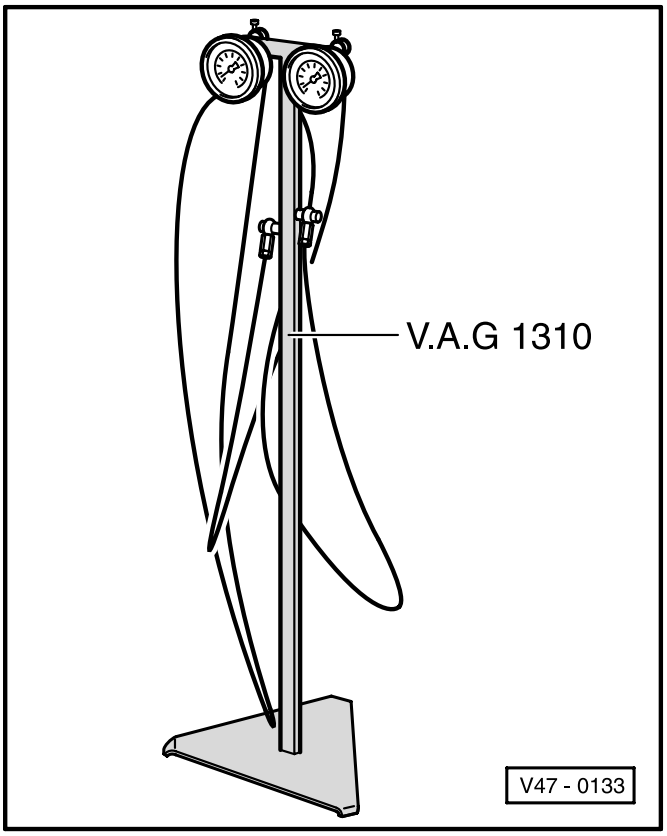
- Tester for brake pressure regulator and brake systems, e.g. V.A.G 1310 or V.A.G 1310 A
- Brake fluid ⇒ page 00-8
- Assembly paste G 052 150 A2

Test requirement

- Brake system operating properly and free of leaks

The brake system includes:

- Hydraulic control unit or load-dependent brake pressure regulator, as appropriate
- Brake lines, brake hoses and their connections
- Brake calipers and wheel brake cylinders



Testing

- Remove bleeder screw at one of the front brake calipers.

◄- Connect pressure gauge of tester V.A.G 1310 or V.A.G 1310 A and bleed.

- Apply load to brake pedal until pressure gauge at tester indicates a pressure of 5 MPa (50 bar).
- Duration of test: 45 seconds.
- The pressure drop during the duration of the test must not be more than 0.40 MPa (4 bar).

  If the pressure drop is more than 0.40 MPa (4 bar), replace brake master cylinder ⇒ page 47-2.

- After replacing the brake master cylinder, repeat test.

- Detach pressure gauge of tester V.A.G 1310 or V.A.G 1310 A from brake caliper.

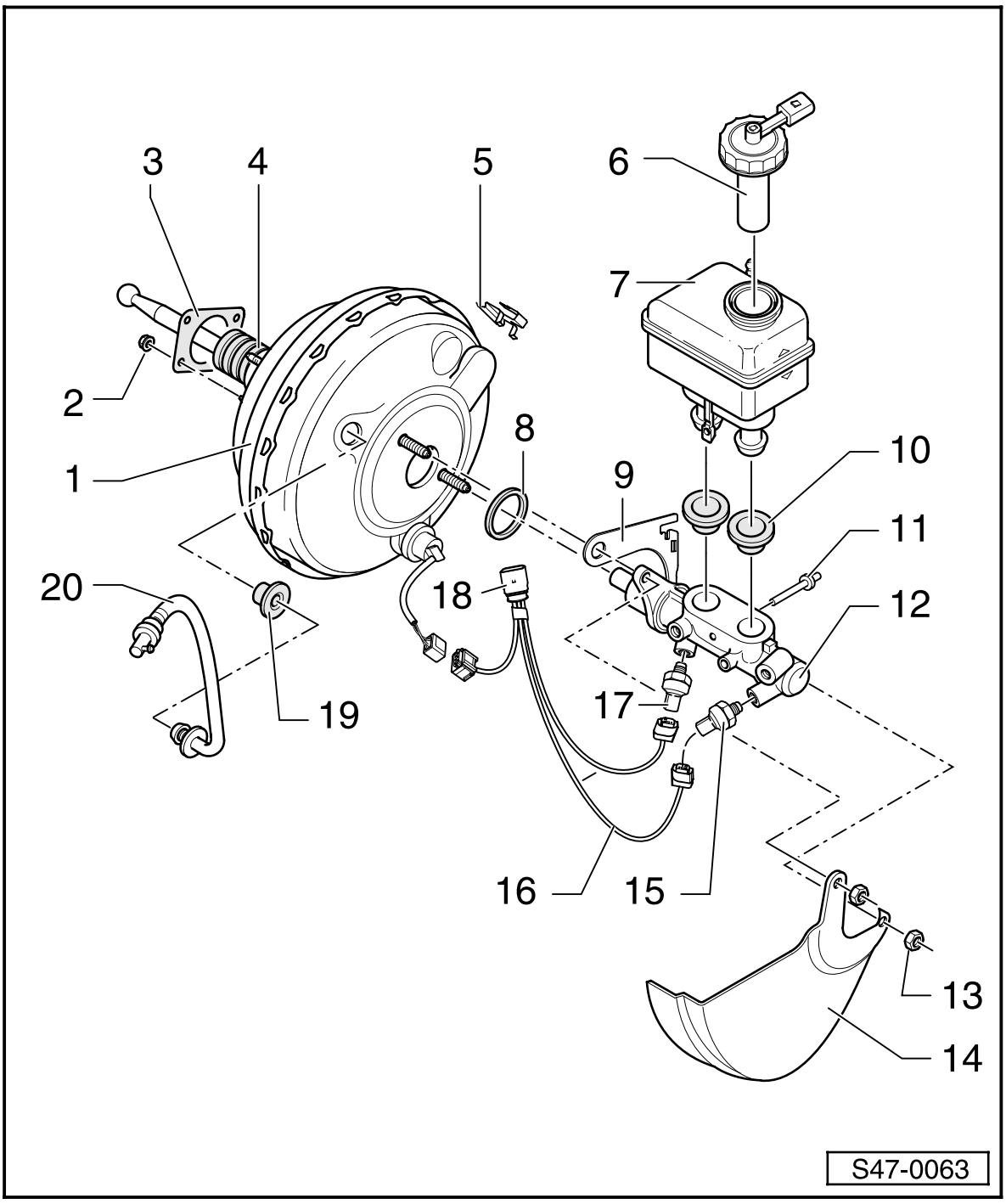
- Apply a thin coat of brake fluid or assembly paste G 052 150 A2 to thread of bleeder valve.

- Screw bleeder valve into brake caliper and tighten fully.

  Tightening torque: 10 Nm

- Bleed brake system ⇒ from page 47-18.

Assembly overview: brake servo unit/brake master cylinder for vehicles fitted with ABS/ EDL/ESP Mark 20



Note:

Complete brake master cylinders and brake servo units can be replaced separately from each other.

1 - Brake servo unit

- ♦ operational check ⇒ page 47-4
- ♦ removing and installing ⇒ page 47-32
- ♦ if fault exists, replace complete
- ♦ separating from brake pedal ⇒ page 46-20
- ♦ assignment ⇒ Parts List

- ♦ On petrol engines, vacuum required is drawn from intake manifold.
- ♦ On diesel engines, a vacuum pump is fitted for producing vacuum.
- ♦ check valve (in vacuum hose of vacuum pump)

Operational check

- It must be possible to blow through the valve in direction of arrow.
- The valve must be leaktight in opposite direction of arrow.

2 - Self-locking hexagon nut, 28 Nm
- replace

3 - Gasket
- for brake servo unit
- installed between brake servo unit and bulkhead

4 - Boot
- ensure correctly installed, risk of suction noises

5 - Fixture
- is attached to the edge of the brake servo unit
- is designed for mounting the connector -item 18-

6 - Cap
- with integrated brake fluid level warning contact -F34-

7 - Brake fluid reservoir
- locked into retaining pin with side catches

8 - Seal
- replace

9 - Retaining plate
- for fixing wiring loom -item 16- in place

10 - Sealing plug
- moisten with brake fluid and press in reservoir

11 - Retaining pin
- insert through brake master cylinder

12 - Brake master cylinder
- must not be serviced, if fault exists, replace complete
- leak test ⇒ page 47-24

13 - Self-locking hexagon nut, 20 Nm
- replace

14 - Heat shield
- only on models with 74 kW, 92 kW and 110 kW engine

15 - Brake pressure sender -1- -G201-
- in floating piston circuit
- removing and installing ⇒ page 47-28

16 - Wiring loom

17 - Brake pressure sender -2- -G214-
- in pushrod piston circuit
- removing and installing ⇒ page 47-28

18 - Connector
- connection of dash panel/engine compartment wiring loom

19 - Sealing plug

20 - Vacuum hose
- with non-return valve
- insert into brake servo unit

Removing and installing brake pressure sensor -1- -G201- and brake pressure sensor -2- -G214-

Special tools, testers and aids required

- Bleeder bottle (commercially available)
- Brake fluid ⇒ page 00-8
- Torque wrench 5...50 Nm, e.g. V.A.G 1331
- Open ring wrench waf 27, e.g. Stahlwille 737/ 10-10 waf 27, Code No. 9154 00709

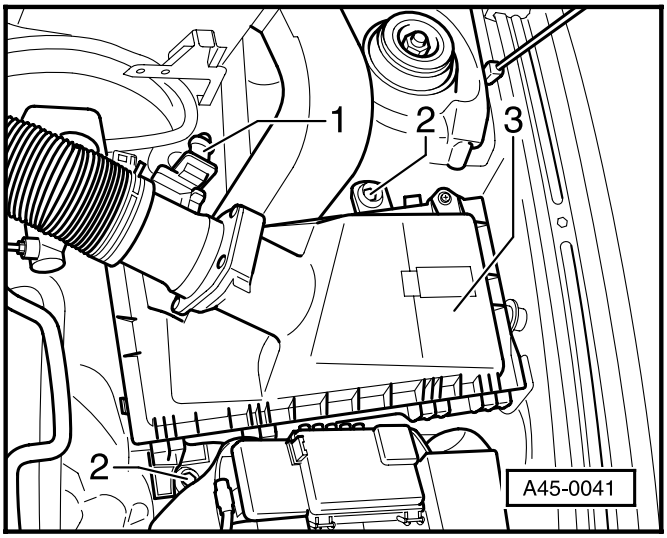
Notes:

- *It is prohibited to carry out any repairs to the screened cables of the ABS system.*
- *Before disconnecting the battery, determine the code of a radio set fitted with anti-theft coding.*
- *When re-connecting the battery, check the vehicle equipment:*
  - Encode the radio,
  - set the clock,
  - initialise the power windows.

⇒ Inspection and Maintenance

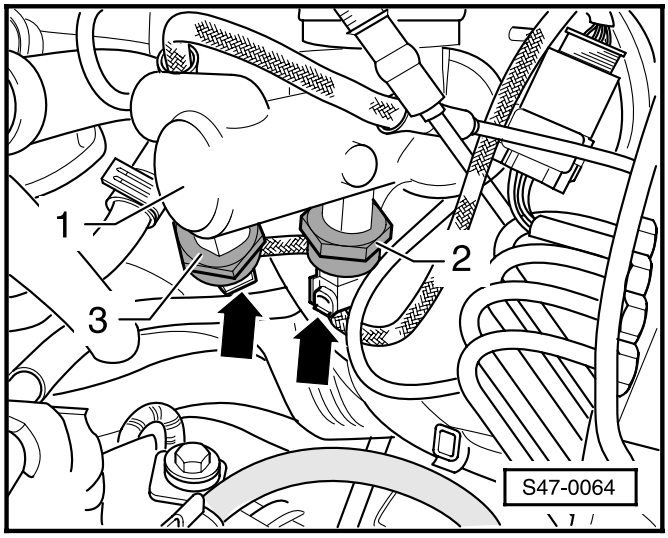
Removing

- Disconnect battery.



◄- Unplug the connector -1- of the air mass meter from the air guide tube of the air filter.

- Unscrew the bolts -2- at the air filter -3- and place the filter to the side.
- On diesel engines, remove relay carrier above the brake servo unit.
- Lay out adequate non-woven cloths in the area of the plenum chamber, of the engine and gearbox.
- Extract as much brake fluid as possible with a bleeder bottle or extraction equipment from the brake fluid reservoir.



- Fit hose of bleeder bottle onto the bleeder screw of the left front brake caliper and open bleeder screw.

- Operate the brake pedal at least 15 times so that the brake master cylinder is pumped dry.

- Depress the brake pedal and close the front left bleeder screw.

◄ - Unplug the connector -arrow- of the brake pressure sensor which is to be removed.

1 - Brake master cylinder

2 - Brake pressure sensor -2- -G214- in pushrod piston circuit

3 - Brake pressure sensor -1- -G202- in floating piston circuit

- Unbolt brake pressure sensor -1- -G202- or brake pressure sensor -2- -G214-, respectively.

Installing

Installation is carried out in the reverse order.

- Connect up battery ⇒ page 47-28.

- After installing, pour in only fresh brake fluid.

- Bleed brake system ⇒ page 47-18.

- Bleed clutch (manual gearbox)
⇒ 5-Speed Manual Gearbox 02J; Repair Group 30; Servicing clutch mechanism

- Carry out basic setting of brake pressure sensor -G201- and -G214- ⇒ page 45-124.

- Interrogate fault memory ⇒ page 45-101.

- Erase fault memory ⇒ page 45-113.

Tightening torques:

Brake pressure sensor -1-	25 Nm
Brake pressure sensor -2-	25 Nm

Removing and installing brake master cylinder

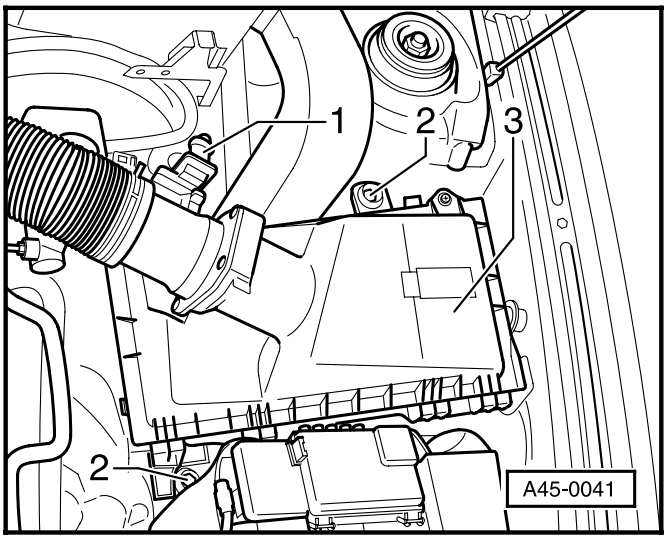
Special tools, testers and aids required

- Hose clamp MP 7-602
- Bleeder bottle (commercially available)
- Brake fluid ⇒ page 00-8
- Repair kit Part No. 1H0 698 311 A

Notes:

- *Before disconnecting the battery, determine the code of a radio set fitted with anti-theft coding.*
- *When re-connecting the battery, check the vehicle equipment:*
  - Encode the radio,
  - set the clock,
  - initialise the power windows.

⇒ Inspection and Maintenance



Removing

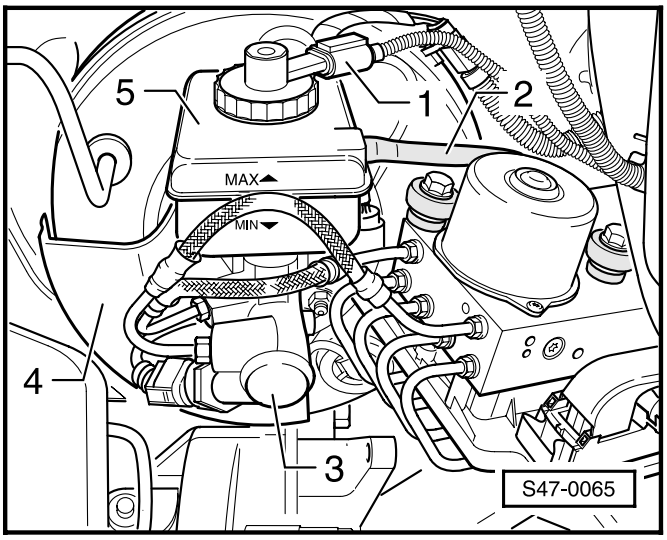
- Disconnect battery.

◄- Unplug the connector -1- of the air mass meter from the air guide tube of the air filter.

- Unscrew the bolts -2- at the air filter -3- and place the filter to the side.

- On diesel engines, remove relay carrier above the brake servo unit.

- Lay out adequate non-woven cloths in the area of the plenum chamber, of the engine and gearbox.



◄- Unplug connector -1- of the brake fluid level warning contact -F34-.

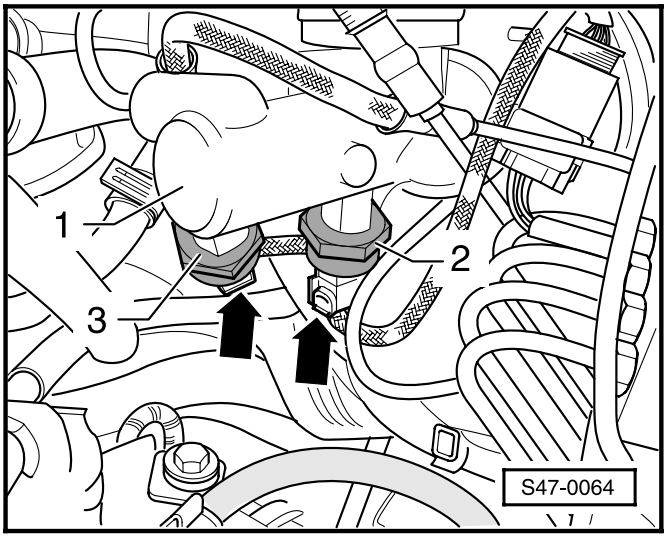
- Extract as much brake fluid as possible with a bleeder bottle or extraction equipment from the brake fluid reservoir -5-.

- Pinch off feed line of clutch master cylinder -2- with special tool MP 7-602.

- Detach feed line of clutch master cylinder -2- from brake fluid reservoir -5- and place up.

3 - Brake master cylinder

4 - Heat shield



◄- Unplug the connectors -arrows- of the brake pressure sensors -2- and -3-.

- Unscrew nuts of brake master cylinder -1-.

- Take off heat shield, if fitted.

- Carefully take brake master cylinder -1- off the brake servo unit.

Installing

Installation is carried out in the reverse order.

- Replace the seal between brake master cylinder and brake servo unit.

- When fitting together the brake master cylinder and the brake servo unit, ensure the pushrod in the brake master cylinder is correctly located.

- After installing, pour in only fresh brake fluid.

- Re-connect battery ⇒ page 47-30.

- Bleed brake system ⇒ page 47-18.

- Bleed clutch (manual gearbox).

⇒ 5-Speed Manual Gearbox 02J; Repair Group 30; Servicing clutch mechanism

⇒ Inspection and Maintenance

- Initiate basic setting ⇒ page 45-124.
- Interrogate fault memory ⇒ page 45-101.
- Erase fault memory ⇒ page 45-113.

Tightening torques:

Brake master cylinder to brake servo unit	20 Nm

Testing brake servo unit

⇒ page 47-4

Removing and installing brake servo unit

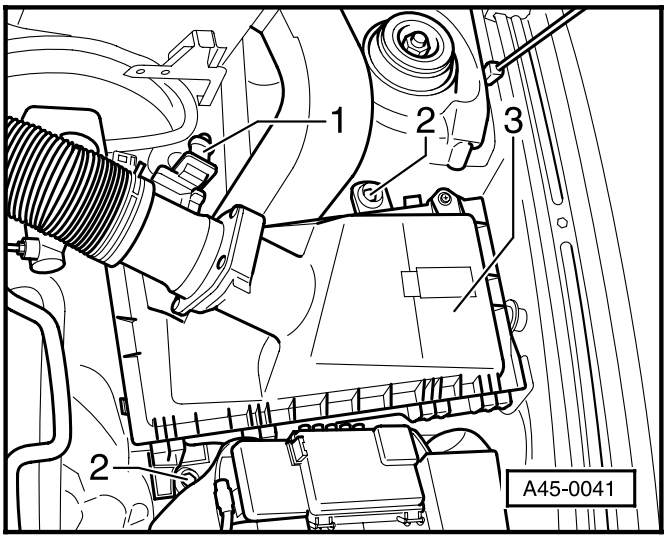
Special tools, testers and aids required

- Hose clamp MP 7-602
- Brake pedal depresser, e.g. V.A.G 1238/B
- Vehicle system tester V.A.G 1552
- Diagnostic cable V.A.G 1551/3, 3A, 3B or 3C
- Release tool T30021
- Extraction bottle (commercially available)
- Repair kit Part No. 1H0 698 311 A
- Brake fluid ⇒ page 00-8

Notes:

- *Before disconnecting the battery, determine the code of radio sets fitted with anti-theft coding.*
- *When re-connecting the battery, check the vehicle equipment:*
  - encode radio,
  - re-set clock,
  - initialise power windows.

⇒ Inspection and Maintenance



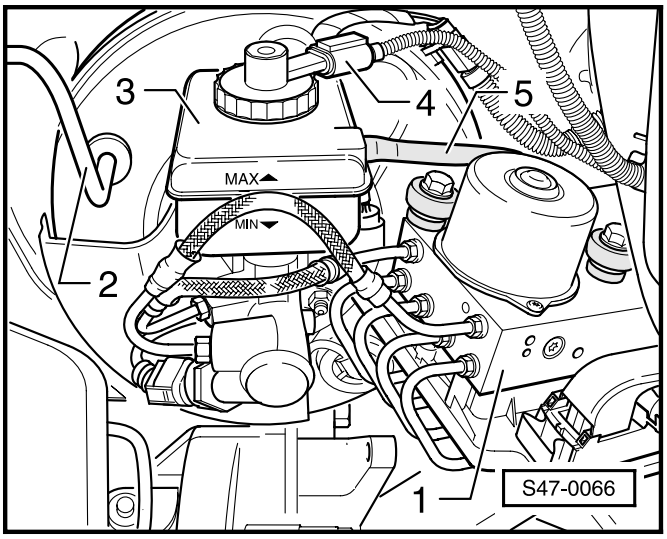
Removing

- Disconnect battery.

◄- Unplug the connector -1- of the air mass meter from the air guide tube of the air filter.

- Unscrew the bolts -2- at the air filter -3- and place the filter to the side.

- On diesel engines, remove relay carrier above the brake servo unit.



- Lay out adequate non-woven cloths in the area of the plenum chamber, of the engine and gearbox.

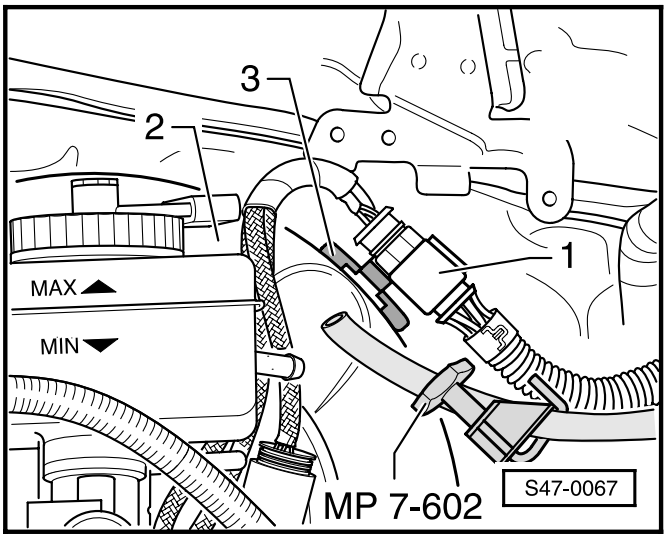
- Remove hydraulic control unit -1- ⇒ page 45-158.

◄- Unplug connector -4- from brake fluid warning contact -F34-.

- Pinch off feed line of clutch master cylinder -5- with hose clamp MP 7-602.

- Detach feed line of clutch master cylinder -5- from brake fluid reservoir -3- and place up.

- Detach vacuum hose -2- from brake servo unit.

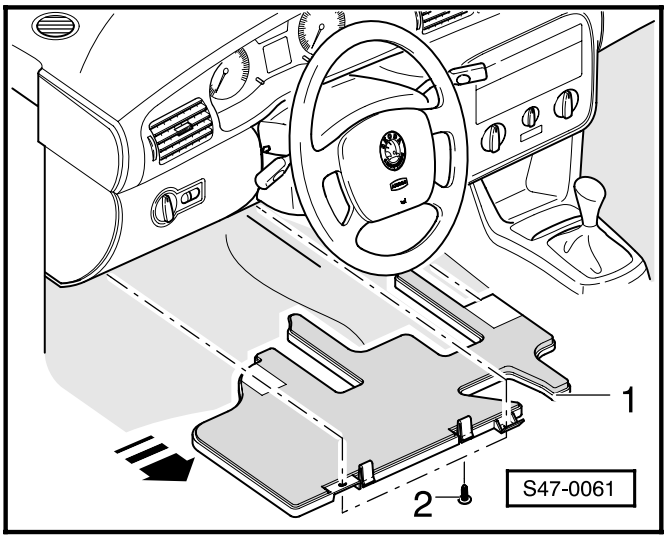


◄- Press plug connection -1- off the fixture -3-.

Push the plug connection -1- toward the bulkhead for this step.

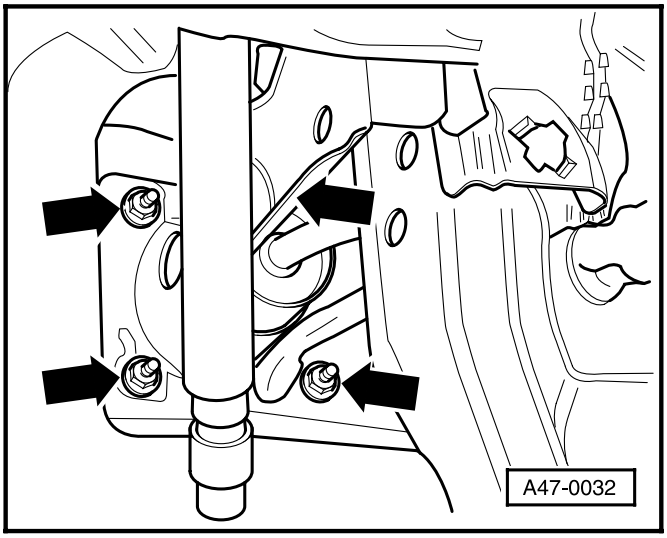
2 - Brake servo unit

- Separate plug connection -1-.



◄ - Remove screws -2-.

- Pull footwell panel -1- out of the fixtures.

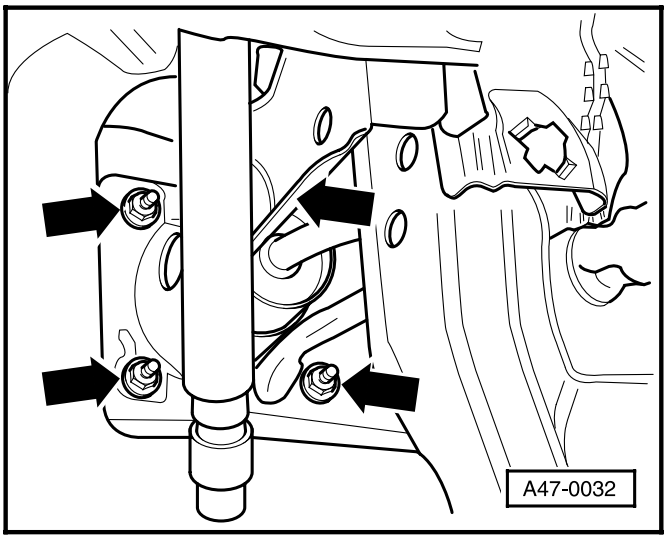


- Separate brake pedal from brake servo unit ⇒ page 46-20.

◄ - Unscrew hexagon nuts of brake servo units -arrows-.

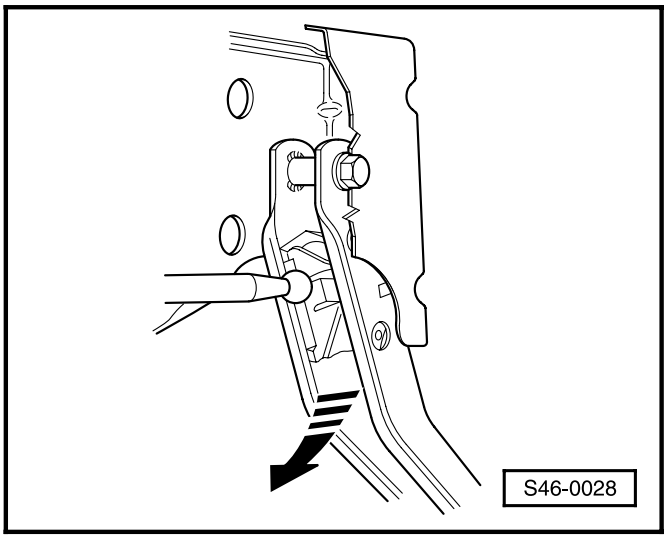
Top right nut not visible in illustration.

- Feed out brake servo unit together with brake master cylinder to the front and remove.



Installing

◄ - Install brake servo unit together with brake master cylinder and tighten the new hexagon nuts -arrows-.



◄- Clip brake pedal to brake servo unit ⇒ page 46-20.

- Install brake light switch and set ⇒ page 46-69.

The remaining installation is carried out in the reverse order.

- Pour in only fresh brake fluid ⇒ page 00-8.

- Re-connect battery ⇒ page 47-32.

- Bleed brake system ⇒ page 47-18.

- Bleed clutch (manual gearbox).
⇒ 5-Speed Manual Gearbox 02J; Repair Group 30; Servicing clutch mechanism
⇒ Inspection and Maintenance

- Carry out basic setting ⇒ page 45-124.

- Interrogate fault memory ⇒ page 45-101.

- Erase fault memory ⇒ page 45-113.

Tightening torques:

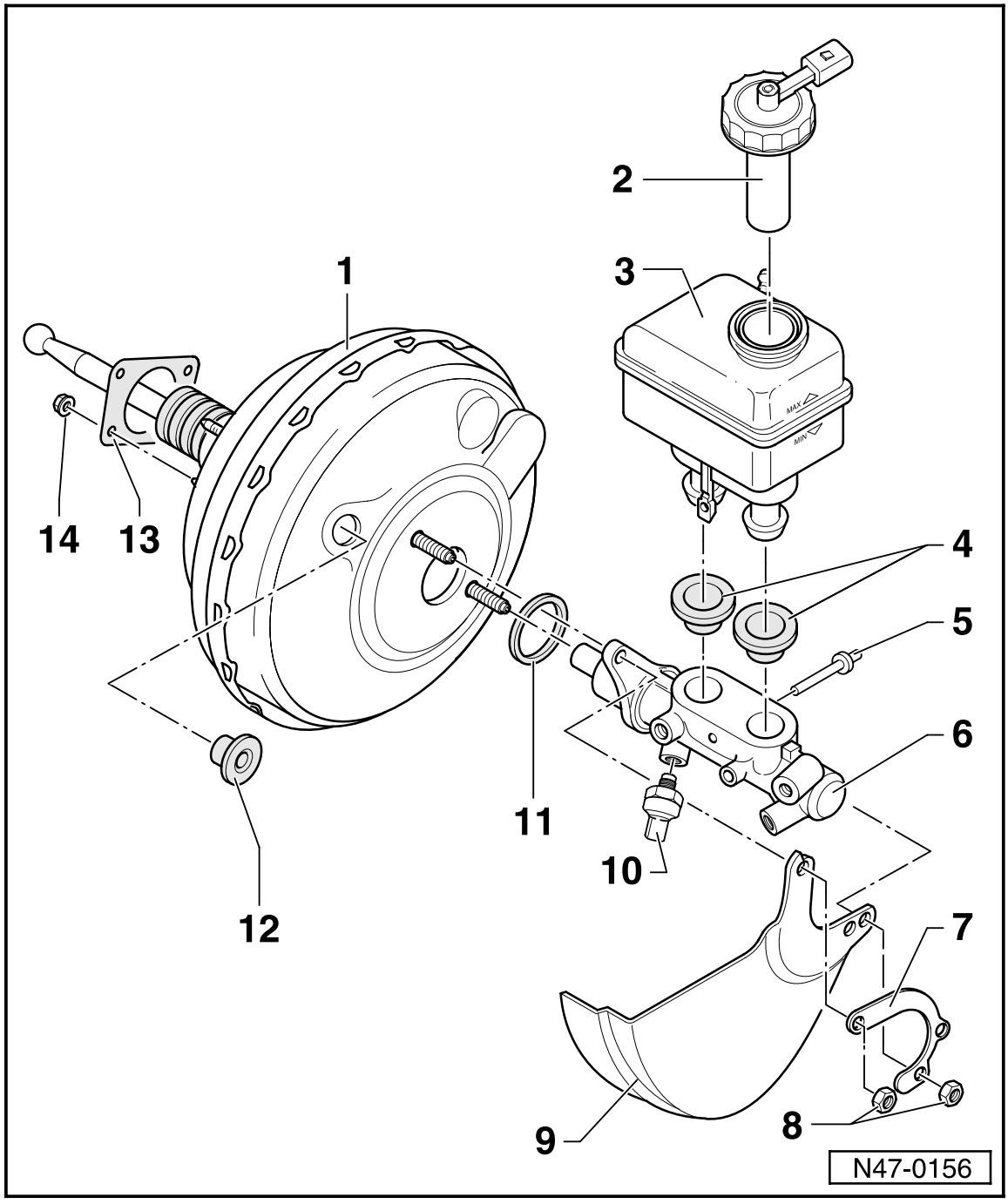
Brake servo unit to pedal assembly	28 Nm

Removing and installing vacuum pump for brake servo unit

Models fitted with diesel engine

⇒ Engine, Mechanical Components; Repair Group 15; Removing and installing cylinder head

Assembly overview: brake servo unit/brake master cylinder for models without ABS and for models with ABS/EDL/TCS/ESP Mark 60



Note:

Complete brake master cylinders and brake servo units can be replaced separately from each other.

1 - Brake servo unit without mechanical brake assist

- RHD models with ABS/EDL/TCS/ESP Mark 60
- LHD models with ABS/EDL/TCS/ESP Mark 60 up to and including Model Year 2001

- Brake servo unit with mechanical brake assist

- LHD models with ABS/EDL/TCS/ESP Mark 60 from Model Year 2002
- mechanical brake assist integrated in brake servo unit
- brake assist is recognisable only from the part number of the brake servo unit
- brake assist cannot be serviced; if complaints exist, replace complete brake servo unit ⇒ page 47-32

- Continued for all brake servo units

- ♦ operational check ⇒ page 47-4
- ♦ removing and installing ⇒ page 47-32
- ♦ if fault exists, replace complete
- ♦ separating from brake pedal ⇒ page 46-20
- ♦ on petrol engines, vacuum required is drawn from intake manifold
- ♦ on diesel engines, vacuum pump fitted to produce vacuum
- ♦ on models with automatic gearbox and in combination with EU4 engines, the electric vacuum pump for brakes -V192- is installed additionally
- ♦ operational check of -V192- ⇒ page 47-38
- ♦ removing and installing vacuum pump for brake -V192- ⇒ page 47-39
- ♦ non-return valve (in vacuum hose of vacuum pump)

Operational check

- It must be possible to blow through valve in direction of arrow.
- The valve must be leaktight in opposite direction of arrow.

2 - Cap

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

3 - Brake fluid reservoir, LHD models

- ♦ locked into retaining pin with side catches

4 - Sealing plug

- ♦ moisten with brake fluid and press in reservoir

5 - Retaining pin

- ♦ insert through brake master cylinder

6 - Brake master cylinder

- ♦ must not be serviced; if fault exists, replace complete

7 - Retaining plate

- ♦ is designed to fix wiring loom in place

8 - Self-locking hexagon nut, 20 Nm

- ♦ always replace

9 - Heat shield

- ♦ only on models with 74 kW, 92 kW,110 kW and 132 kW engine

10 - Brake pressure sender -1- -G201-

- ♦ removing and installing ⇒ page 47-28

11 - Seal

- ♦ always replace

12 - Sealing plug

- ♦ connection for vacuum hose
- ♦ insert into brake servo unit

13 - Gasket

- ♦ for brake servo unit
- ♦ installed between brake servo unit and bulkhead
- ♦ always replace

14 - Self-locking hexagon nut, 20 Nm

- ♦ always replace

Removing and installing brake pressure sender -1- -G201-

With introduction of the hydraulic control unit Mark 60 the brake master cylinder has only one brake pressure sender.

Removing and installing ⇒ page 47-30

Removing and installing brake master cylinder

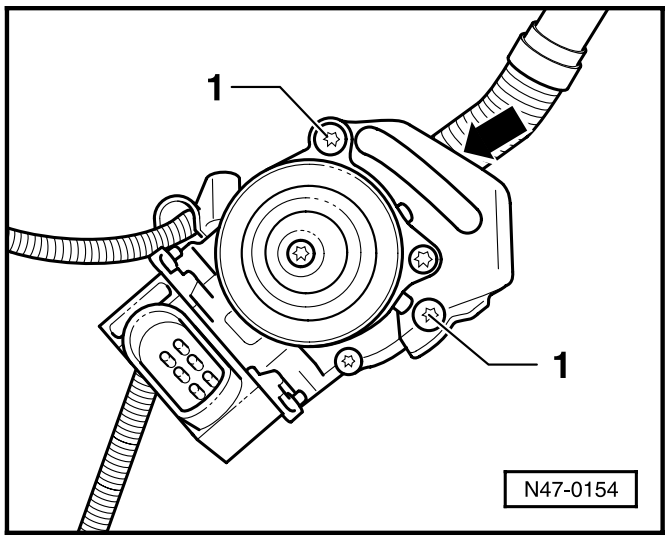
⇒ page 47-30

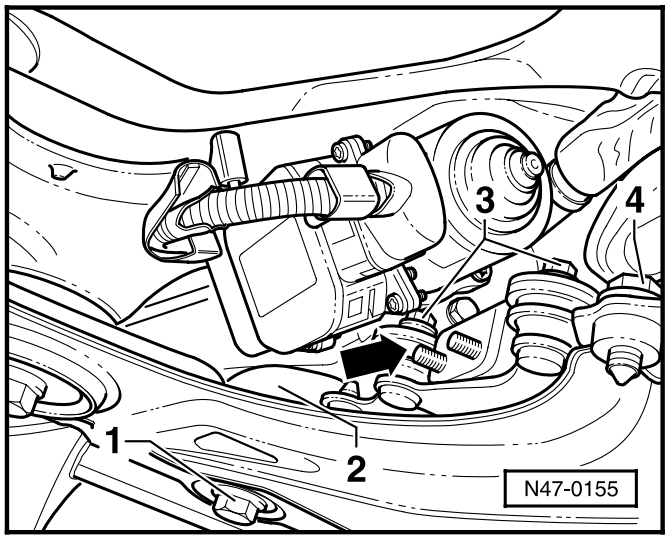
Testing brake servo unit

⇒ page 47-4

Removing and installing brake servo unit

⇒ page 47-32





Removing and installing brake vacuum pump -V192-

No provision is made for repairing the brake vacuum pump -V192-. If a fault exists, the brake vacuum pump -V192- should be replaced.

The brake vacuum pump -V192- is installed at the bottom left of the subframe.

Removing

◄ - Unscrew bolts -1- at bracket of brake vacuum pump -V192-.

- Detach vacuum hose -arrow- from brake vacuum pump -V192-.

- Take out brake vacuum pump -V192-.

- Unlock plug connection and separate from the vacuum pump.

◄ Bracket -arrow- for brake vacuum pump -V192-.

- Unscrew lock nut -2- from bolt -1-.

- Unscrew bolt -4-.

- Take out bracket.

- Unscrew bolts -3- for disassembling the bracket -arrow- further.

Installing

Installation is carried out in the reverse order.

Tightening torques

Nut -2- to bracket	20 Nm
Bolts -3- to bracket	8 Nm
Bolt -4- to bracket	20 Nm
Internal Torx bolt for brake vacuum pump -V192- to bracket	8 Nm

Testing brake vacuum pump -V192-

When the engine is started, the brake vacuum pump -V192- must run for a short time.

Procedure

- Drive vehicle onto a lift platform and switch off engine.

- Start engine.

- A second person must check the operation of the brake vacuum pump -V192- by feeling with his hand.

If the brake vacuum pump -V192- does not run:

- Read out fault memory of engine control unit.

⇒ Engine, Fuel Injection and Ignition System; Repair Group 01

Steering column and steering wheel with airbag

Inspecting steering column for damage

Special tools, testers and aids required

♦ Locking drift T10060

Visual inspection

- Inspect steering column components for damage.

- If damage is present, replace complete steering column.

Inspection requirement

● Universal joint of steering column detached from steering gear

Operational check

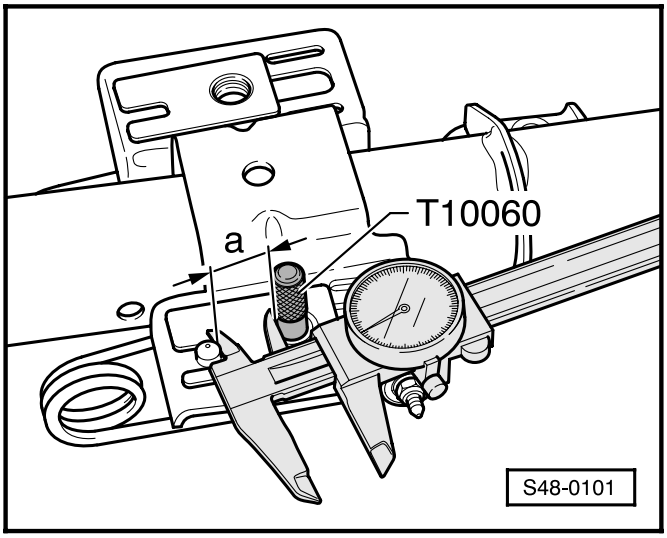
- Check whether steering column can be turned freely and without catching.

- Check whether the steering column can be adjusted forward/back and for height.

If an accident has occurred, so-called deformation elements at the steering column may have been shifted out of place.

They are located at the two top bolted connections of the steering column.

If such damage is suspected, remove the steering column sufficiently until dimension -a- can be checked.



◄ - Insert locking drift T10060.

- Use slide gauge to check dimension -a-.

  Dimension -a-: not more than 23 mm

If any defect is found during any of these inspections, the steering column is damaged.

- In this case, replace complete steering column.

Removing and installing steering column

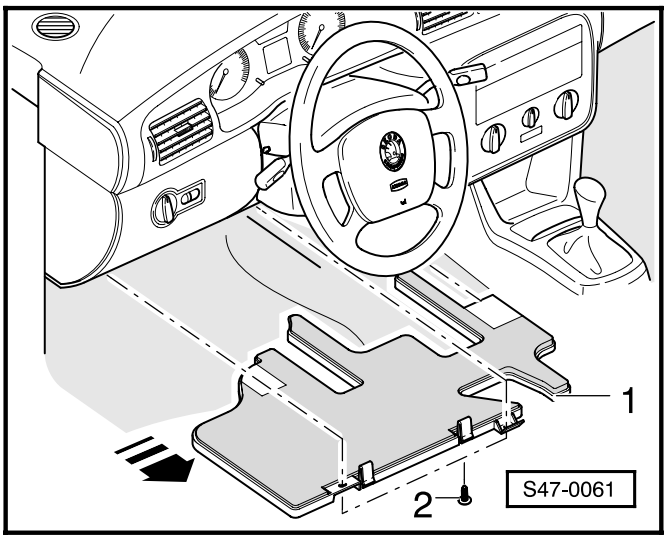
Notes:

- *New steering columns which are supplied as a replacement part, are provided with a transport protection. Remove this transport protection after installing the steering column.*
- *The steering column is supplied as a replacement part only complete with ignition lock housing and without lock cylinder and also ignition/starter switch.*
- *The existing ignition lock housing can be used.*
- *Removing and installing ignition lock housing ⇒ page 48-6, Fig. S48-0094.*
- *For new steering columns which are supplied as replacement parts, fit the existing lock cylinder and ignition/starter switch from the old steering column or procure as replacement part and install.*

⇒ Electrical System; Repair Group 94; Servicing lock cylinder and ignition/starter switch

- *No provision is made for repairing the steering column.*
- *Always replace self-locking nuts and bolts.*
- *It is not permitted to carry out any welding and straightening work on steering components.*
- *Before disconnecting the battery, determine the coding of radio sets fitted with anti-theft code.*
- *When the battery is re-connected, check the vehicle equipment:*
  - encode radio,
  - re-set clock,
  - initialise power windows.

⇒ Inspection and Maintenance



Removing

- Disconnect battery.
- Move wheels into straightahead position.

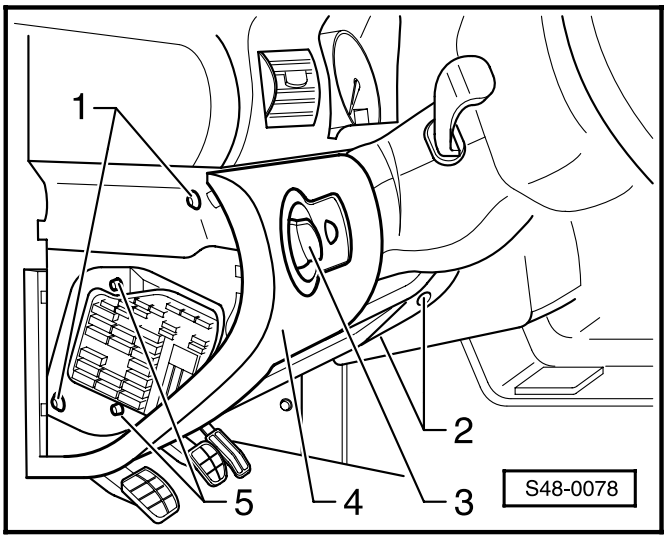
◄ - Remove screws -2-.

- Pull footwell trim panel -1- out of the fixtures.
- Remove airbag on driver side.

⇒ Body Fitting Work; Repair Group 69; Airbag System

- Remove steering wheel.

⇒ Body Fitting Work; Repair Group 69; Airbag System



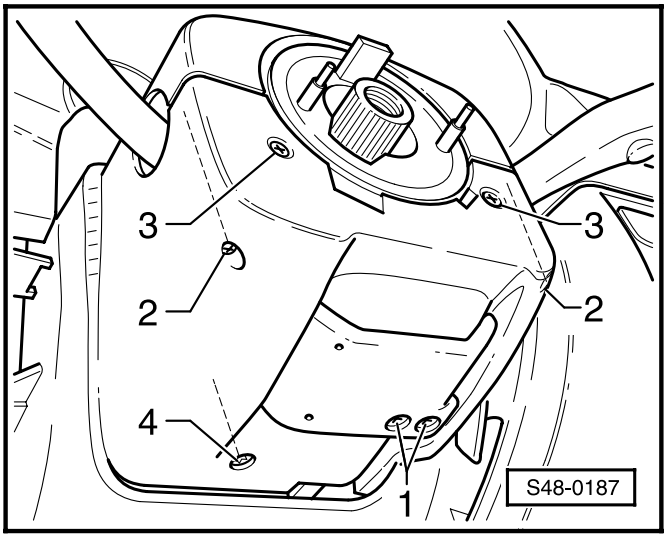
- Unclip cover of fuse carrier.

◄ - Remove light switch -3-.
⇒ Electrical System; Repair Group 96; Removing and installing light switch

- Take out screws -5- for fuse carrier.

- Remove Torx screws -1-.

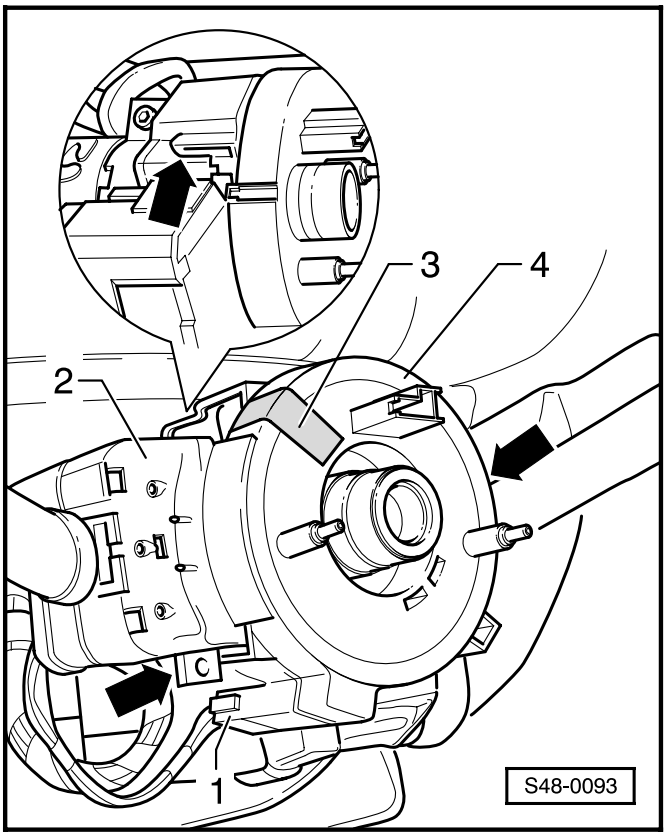
- Remove cross-head screws -2-.



- Take out bottom part of dash panel on left -4-.

◄ - Remove screws -1-, -2-, -3- and -4-.

- Take off steering column adjustment handle as well as top and bottom parts of steering column trim.



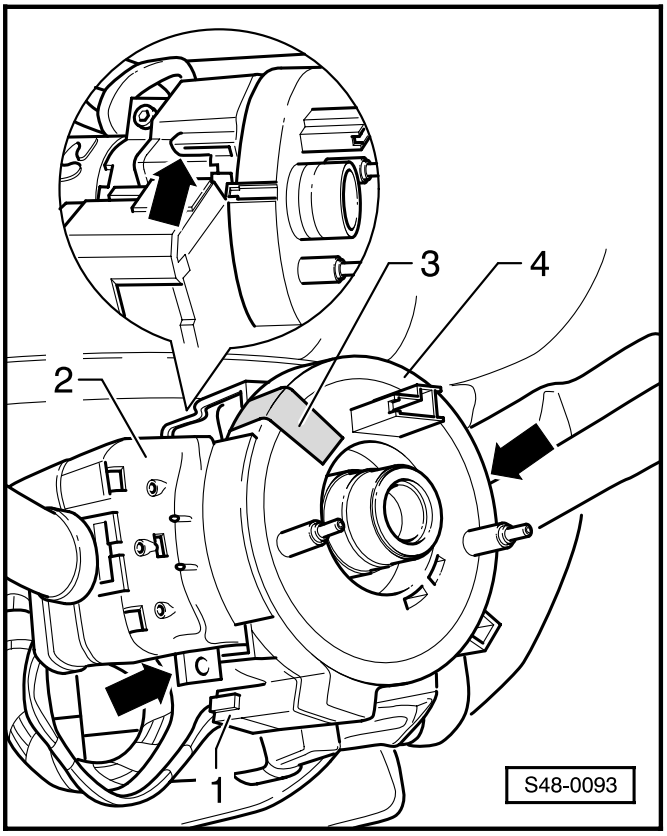
◄ The illustration shows the coil spring contact -4- on a vehicle not fitted with the electronic stability programme (ESP).

- Tape over coil spring -4- with adhesive tape -3- to prevent it being turned unintentionally.

- Unplug connector -1-.

- Carefully separate all the plug connections of the steering column switch.

  Arrows - locking hook of coil spring -4-



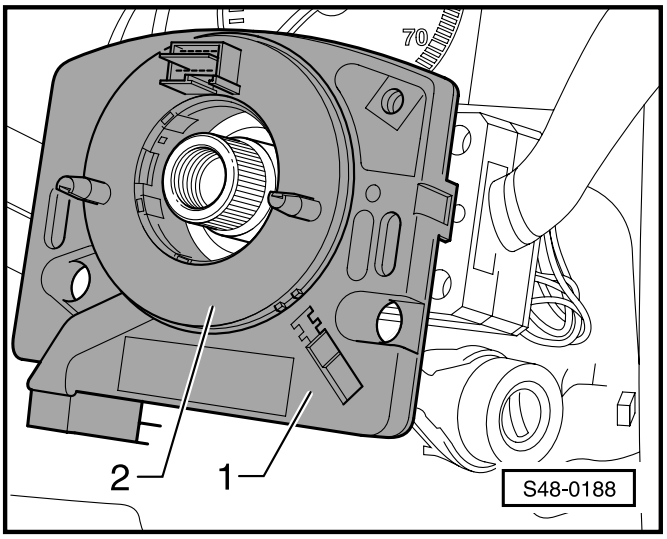
Notes:

- *The next operation only requires to be carried out if the coil spring or the steering column switch is replaced.*
- *The coil spring must only be removed and installed when the steering wheel is in the middle position (wheels in straightahead position).*
- *The coil spring supplied as a replacement part is secured in the middle position by a cable strap.*

◄ - Release locking hook -arrows- and pull coil spring -4- off the steering column switch -2-.

Note:

If the coil spring remains on the steering column switch, ensure that the coil spring is not turned out of the middle position when the steering column switch is placed down.

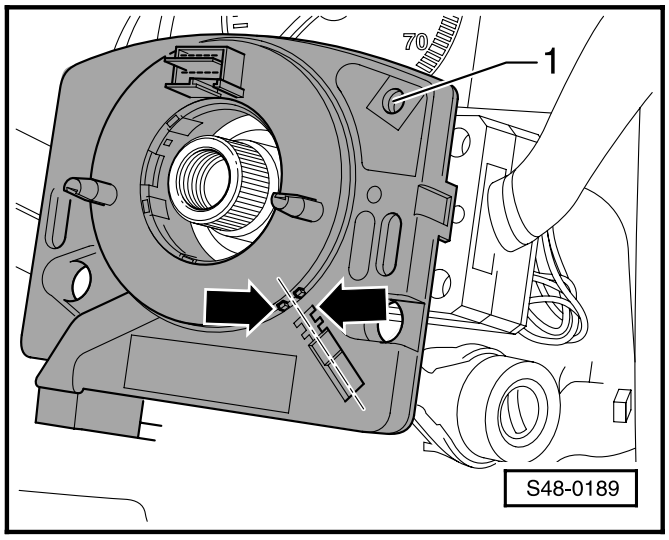


Models fitted with ESP

◄ Models fitted with ESP are additionally equipped with the steering angle sensor -G85-. It is installed in the housing -1- together with coil spring -2-.

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

- **Check to ensure the front wheels are in the straightahead position.**
- If necessary, fit on steering wheel and move front wheels into straightahead position.
- Pull off steering wheel.



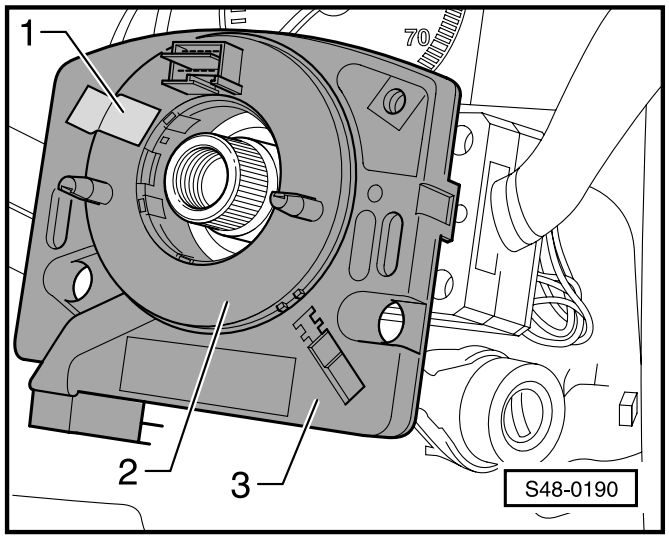
Note:

The next two operations only require to be carried out when subsequently re-installing the same housing with the coil spring.

◄- Position the steering angle sensor in the middle position:

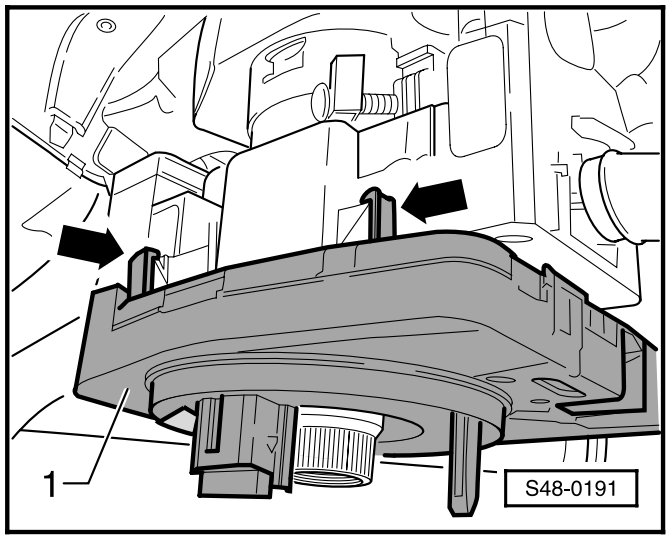
A yellow dot must be visible in the window -1-.

The markings -arrows- must be aligned.



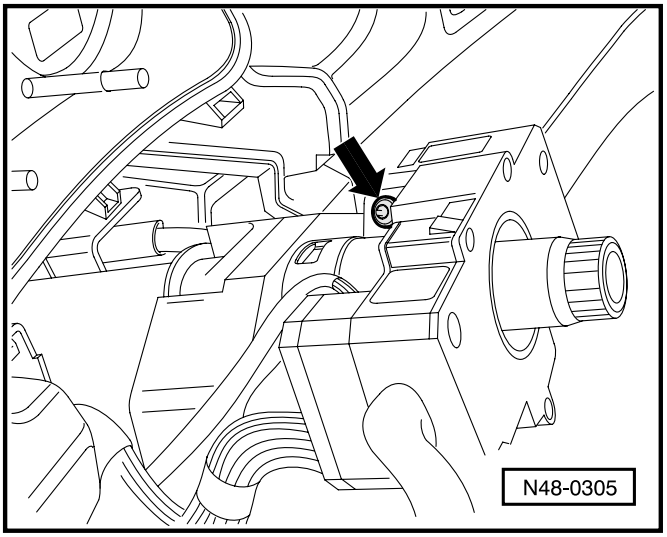
◄- Tape over coil spring -2- with adhesive tape -1- to prevent it turning unintentionally.

3 - Housing



◄- Unplug connector from housing -1-.

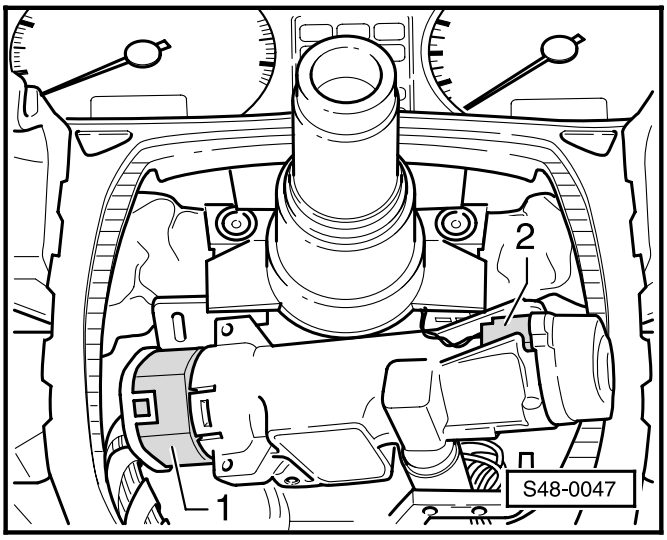
- Carefully release locking hook -arrows- and pull off housing -1- together with steering angle sensor -G85- and coil spring.



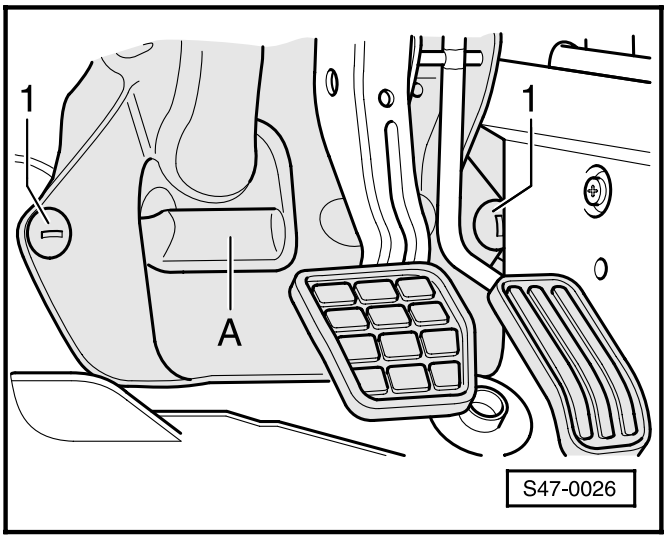
The remaining procedure now applies again to all models.

◄- Slacken screw -arrow- of steering column switch until the steering column switch can be easily moved.

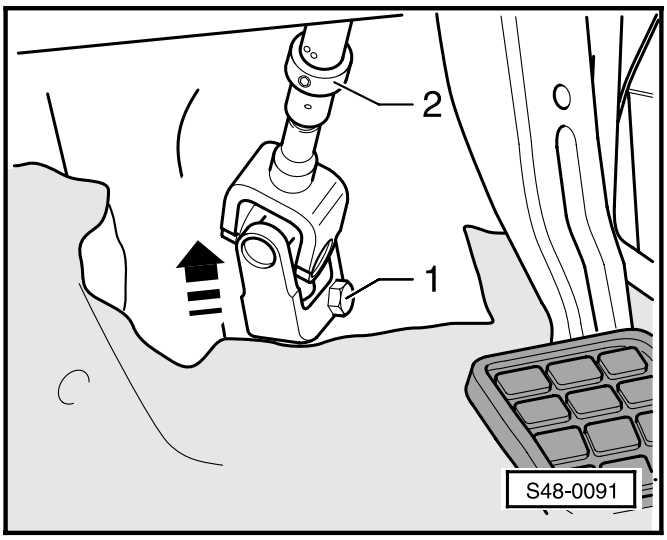
- Take off steering column.



◄- Unplug connectors -1- and -2-.



◄- Unscrew plastic nut -1- and remove cover -A-.



◄- Unscrew hexagon bolt -1-.

02.97 ➤ a clamp ring is fitted.

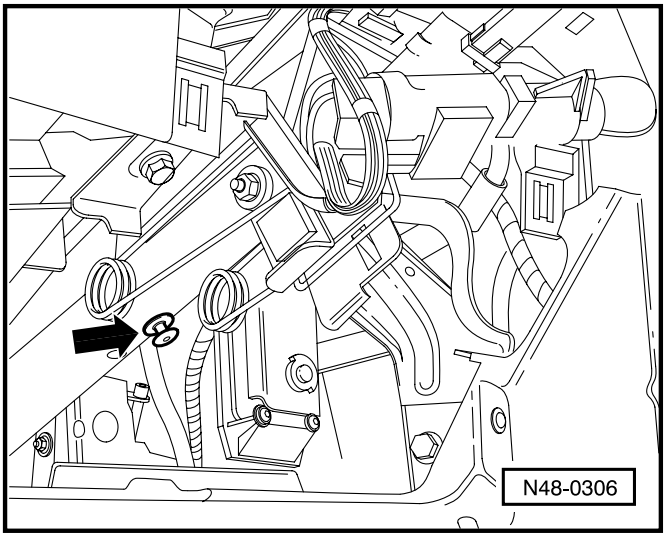
- Slacken hexagon socket screw of clamp ring -2- sufficiently until it is possible to pull the universal joint off the steering gear pinion.

- Pull universal joint off the steering gear pinion -arrow-.

Notes:

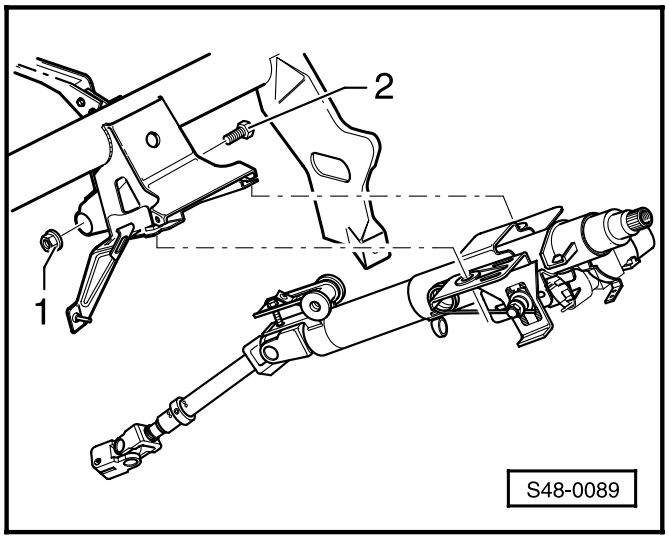
- *An assembly lock is required when pulling the steering column off the steering gear so that the top and bottom parts are not pulled apart.*
- *If the top and bottom parts of the steering column are pulled too far apart or pushed into each other, the splines will be separated. This can result in clattering noises in subsequent operation if the splines are no longer in their original installed position.*

- Secure steering column before removing.

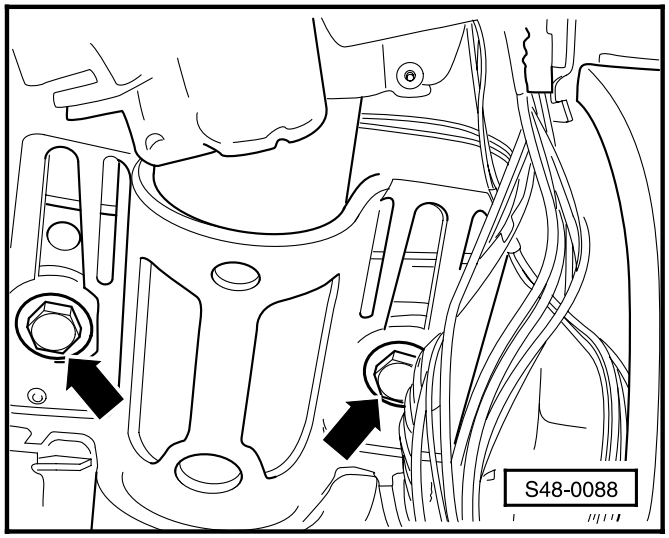


- Push or pull the steering column sufficiently far together or apart until the hole is visible.

◄- Insert, for example, a clip into the hole -arrow-.



◄- Unscrew self-locking hexagon nut -1- at the central tube and pull out hexagon bolt -2-.

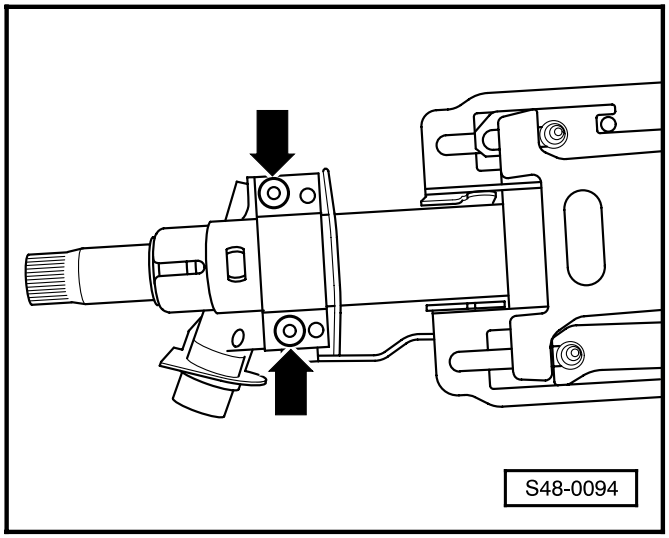


◄- Remove hexagon bolts -arrows-.

- Take out steering column.

Notes:

- *New steering columns are generally supplied as a replacement part without the ignition lock housing.*
- *Ignition lock housings are supplied separately as replacement parts.*



Replacing ignition lock housing

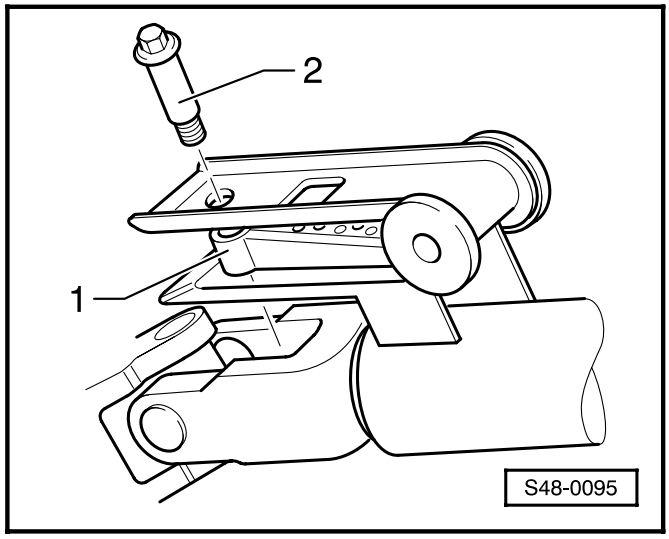
◄- Remove shear bolts -arrows-.

- Take off ignition lock housing.
- Attach ignition lock housing to the steering column.
- Tighten shear bolts -arrows- until the head shears off.

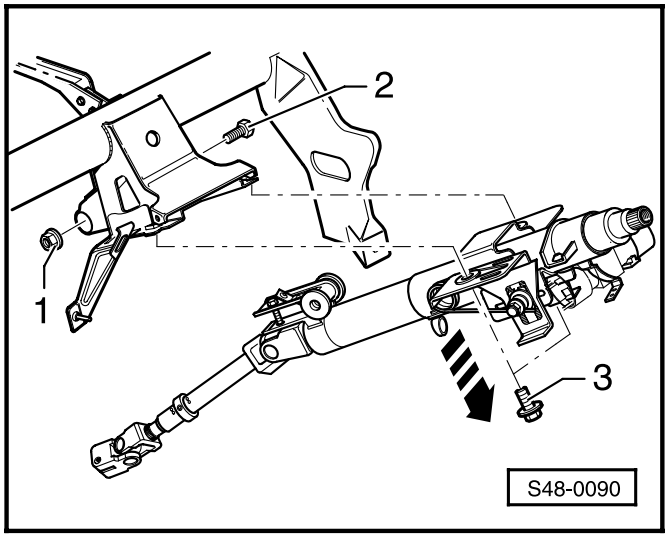
Installing

Notes:

- *New steering columns supplied as replacement parts are protected by a transportation lock.*
- *Remove the transportation lock after installing the steering column.*
- *Before installing new steering columns supplied as replacement parts, fit on a new bearing bush and shear bolt.*
- *The shear bolts and bearing bush must be replaced each time the bearing bush is removed.*

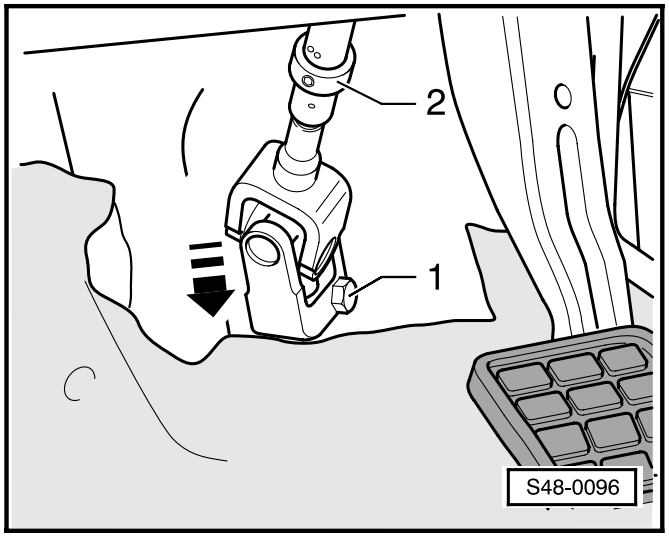


◄ - Insert new bearing bush -1- and install shear bolt -2-.



◄ - Tighten shear bolt -2- until the head shears off.

- Fit steering column onto central tube.
- Screw in hexagon bolt -3- but do not tighten fully at this stage.
- Insert new hexagon bolt -2-.
- Screw on new self-locking hexagon nut -1- and tighten to 10 Nm.
- Tighten hexagon bolt -3- fully to 22 Nm.
- Pull out transportation lock -arrow-.

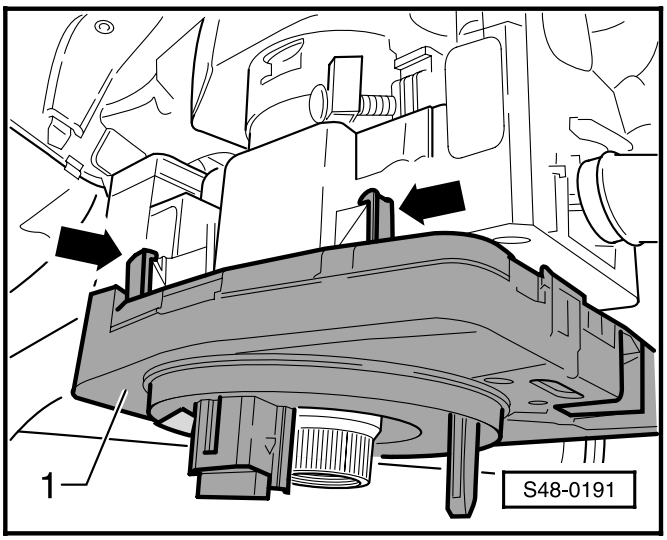


◄ - Push universal joint onto the steering pinion and tighten with new hexagon bolt -1-.

A clamping ring is installed as of 02.97 ➤.

- Tighten hexagon socket bolt of the clamping ring -2- to 17 Nm.
- Install cover of universal joint.
- Plug in connector for ignition/starter lock and immobiliser.

- Push steering column switch onto steering column.



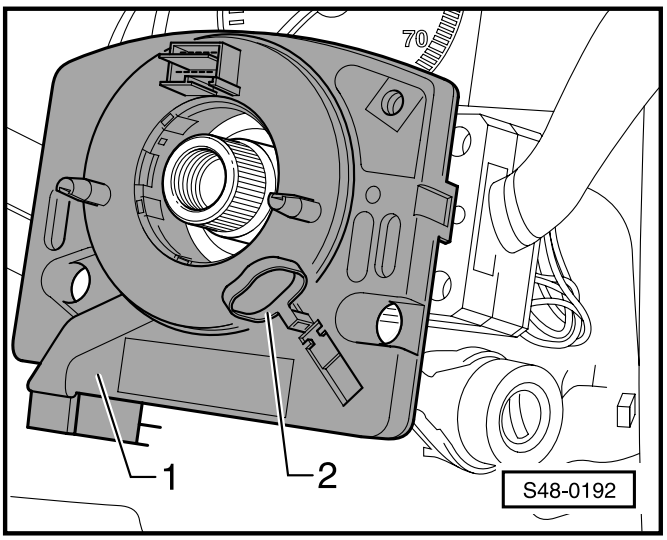
Models not fitted with ESP

- Push coil spring onto the steering column and lock with the steering column switch.

Models fitted with ESP

◄- Push housing -1- together with steering angle sensor -G85- and coil spring onto the steering column and lock with steering column switch -arrows-.

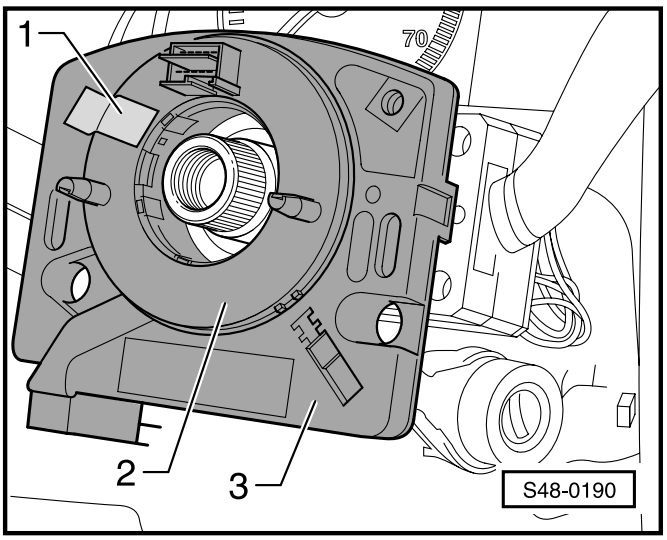
- Plug in connector at housing -1-.



Note:

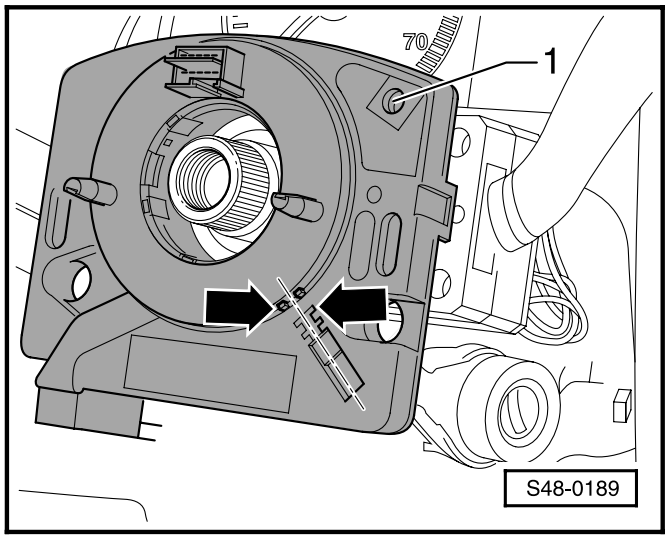
Do not turn the coil spring after removing the transportation lock or the adhesive tape, respectively; it is only permissible to move the steering angle sensor -G85- into the middle position.

◄- Remove transportation lock -2- after installing a new housing -1-.



◄- Remove adhesive tape -1- after installing an existing housing -3-.

2 - Coil spring



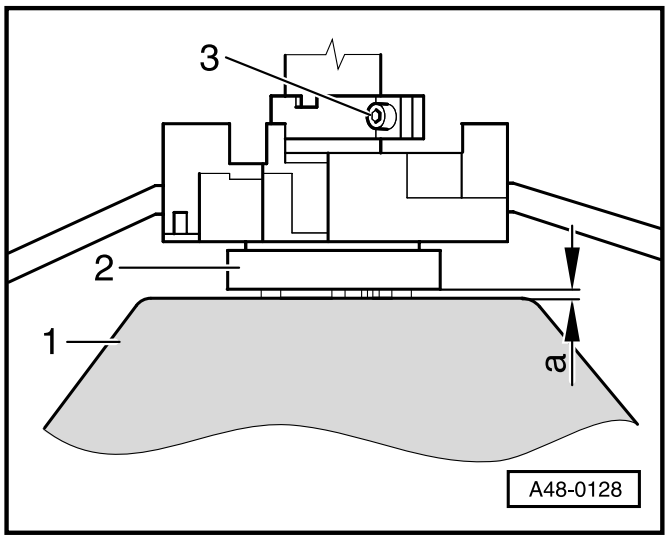
◄- Move the steering angle sensor -G85- into the middle position.

A yellow dot must be visible in the window -1-.

The markings -arrows- must be aligned.

Check to ensure that these two requirements are met.

The remaining procedure now applies again to all models.



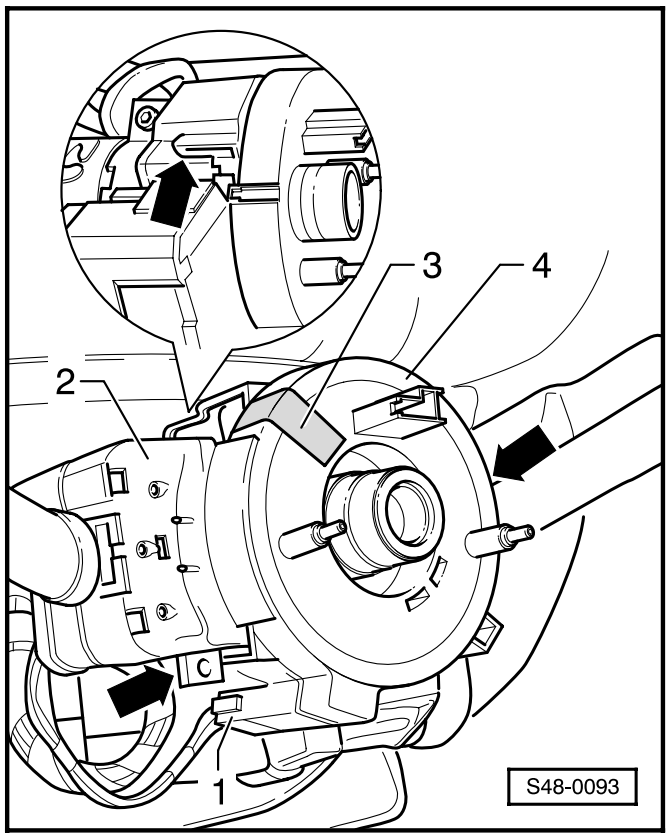
- Fit steering wheel onto the steering column and screw in existing internally serrated bolt and tighten.

Notes:

◄♦ *Fig. shows steering column switch with coil spring -2- and steering wheel -1- on a vehicle not fitted with ESP.*

♦ *On vehicles fitted with ESP the size „a“ between the coil spring integrated in the housing and the steering wheel, is likewise 3 mm.*

- Align steering column switch horizontally and set size -a-; after this, tighten clamping screw -3-.



- Take off steering wheel again.

◄- Plug in connector -1-.

- Fit together plug connections at steering column switch.

Note:

Do not turn coil spring out of the middle position after pulling off the adhesive tape -3-.

- Carefully pull off adhesive tape -3-.

- Install trim for steering column switch.

⇒ Body Fitting Work; Repair Group 70; Dash Panel

- Install bottom part of dash panel on left.
⇒ Body Fitting Work; Repair Group 70; Dash Panel

- Install footwell trim on driver side.
⇒ Body Fitting Work; Repair Group 68; Storage Compartment, Covers and Trim

- Install steering wheel.
⇒ Body Fitting Work; Repair Group 69; Airbag System

- Install airbag on driver side.
⇒ Body Fitting Work; Repair Group 69; Airbag System

Warning!

Ensure that no person is present inside the vehicle when the battery is re-connected.

- Re-connect battery ⇒ page 48-2.

Models not fitted with ESP:

- Interrogate fault memory ⇒ page 45-12.

- Erase fault memory ⇒ page 45-21.

Models fitted with ESP:

- Carry out basic setting of steering angle sensor -G85- ⇒ page 45-124.

- Interrogate fault memory ⇒ page 45-101.

- Erase fault memory ⇒ page 45-113.

Removing and installing ignition lock housing with steering column fitted on

Notes:

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

⇒ Inspection and Maintenance

Removing

- Remove steering wheel.

⇒ Body Fitting Work; Repair Group 69; Airbag System

- Remove bottom part of dash panel on left.

⇒ Body Fitting Work; Repair Group 70; Dash Panel

- Remove trim of steering column switch.

⇒ Body Fitting Work; Repair Group 70; Dash Panel

- Remove ignition/starter switch.

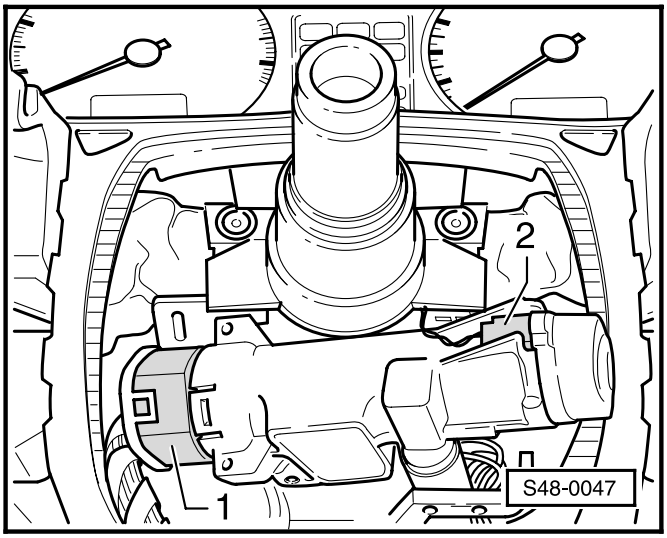
⇒ Electrical System; Repair Group 94; Servicing lock cylinder and ignition/starter switch

- Remove steering column switch.

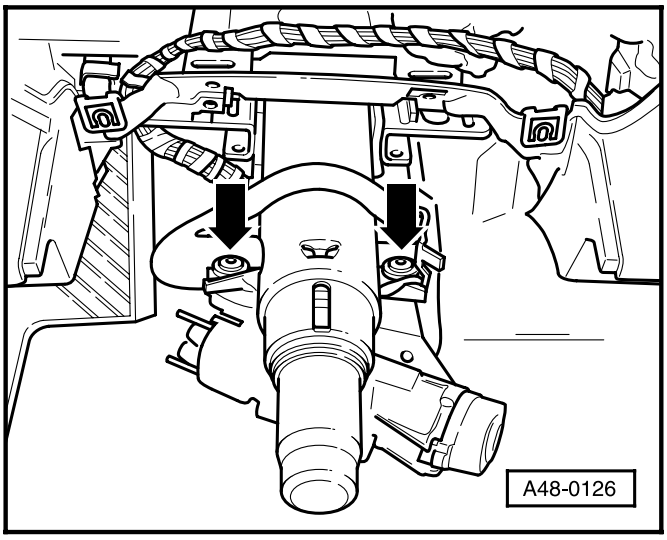
⇒ Electrical System; Repair Group 94; Servicing steering column switch

- Remove dash panel insert.

⇒ Electrical System; Repair Group 90; Dash Panel Insert



◄- Unplug connector -1- for ignition/starter lock and connector -2- for immobiliser.



◄- Remove shear bolts -arrows- and take out ignition lock housing.

Installing

- Insert ignition lock housing and tighten with new shear bolts.
- Tighten shear bolts until the head shears off.
- Install ignition/starter switch.

⇒ Electrical System; Repair Group 94; Servicing lock cylinder and ignition/starter switch

- Install dash panel insert.

⇒ Electrical System; Repair Group 90; Dash Panel Insert

- Plug in connectors for ignition/starter lock and immobiliser.
- Align steering column switch to steering wheel and tighten fully ⇒ page 48-8.
- Install trim for steering column switch and bottom part of dash panel on left.

⇒ Body Fitting Work; Repair Group 70; Dash Panel

- Install steering wheel and airbag on driver side.

⇒ Body Fitting Work; Repair Group 69; Airbag System

Warning!

Ensure that no person is present inside the vehicle when the battery is re-connected.

- Re-connect battery ⇒ page 48-8.3.

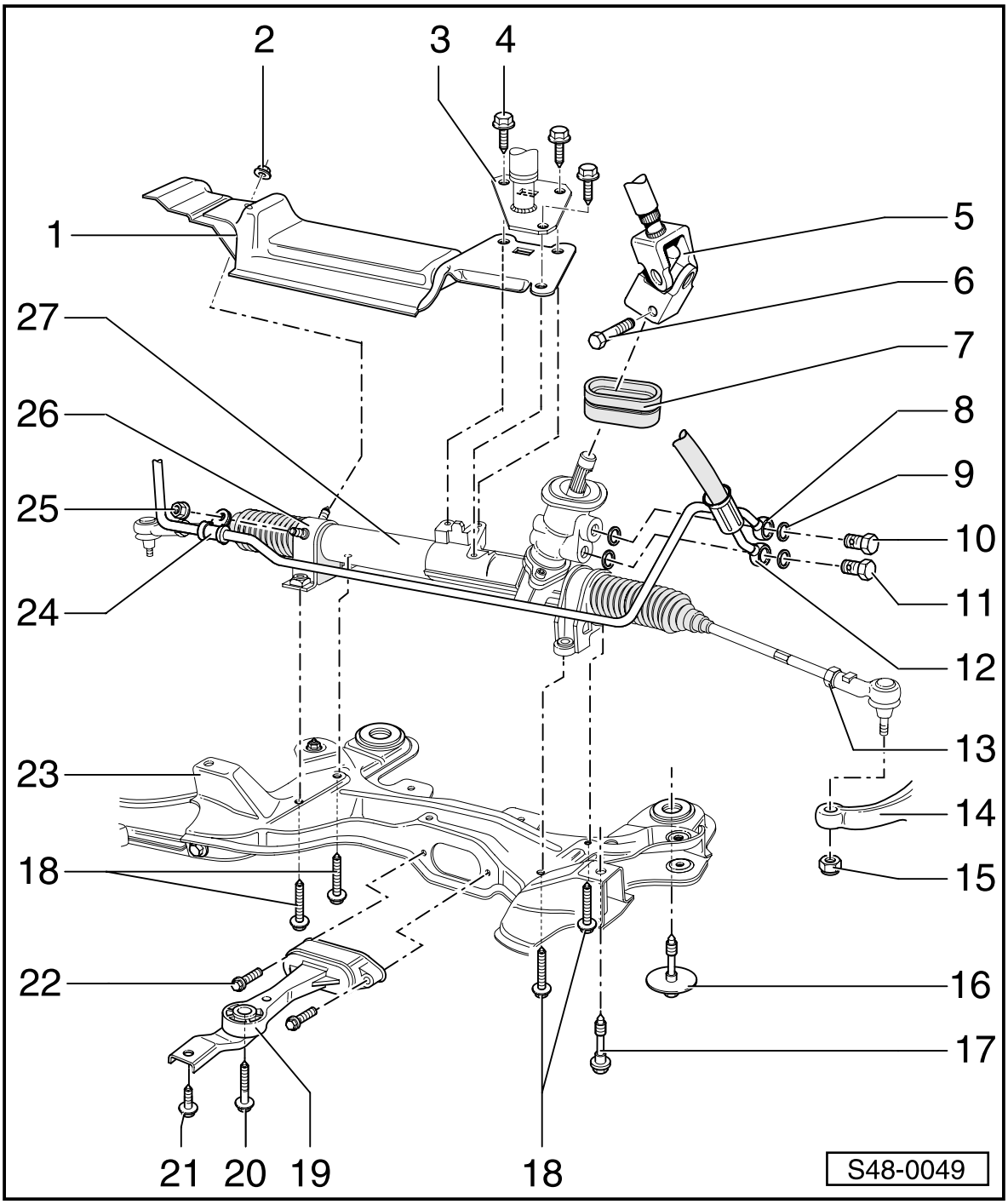
Models not fitted with ESP

- Interrogate fault memory ⇒ page 45-12.
- Erase fault memory ⇒ page 45-21.

Models fitted with ESP

- Carry out basic setting of steering angle sensor -G85- ⇒ page 45-124.
- Interrogate fault memory ⇒ page 45-101.
- Erase fault memory ⇒ page 45-113.

Summary of components of power-assisted steering gear



Notes:

- *It is necessary to replace various components of the steering system following an accident or damage to the front suspension ⇒ page 48-19.*
- *No provision is made for repairing the steering gear. In the event of complaints or problems, replace the steering gear.*
- *Replace self-locking nuts and bolts.*
- *It is not permitted to carry out any welding and straightening work on steering components.*
- *Use only steering gear grease AOF 063 000 04 for greasing the steering rack (quantity 23 ... 27 g).*
- *Oil grade: central hydraulic fluid G 002 000*
- *Quantity of hydraulic fluid in system: 0.7 ... 0.9 ltr.*

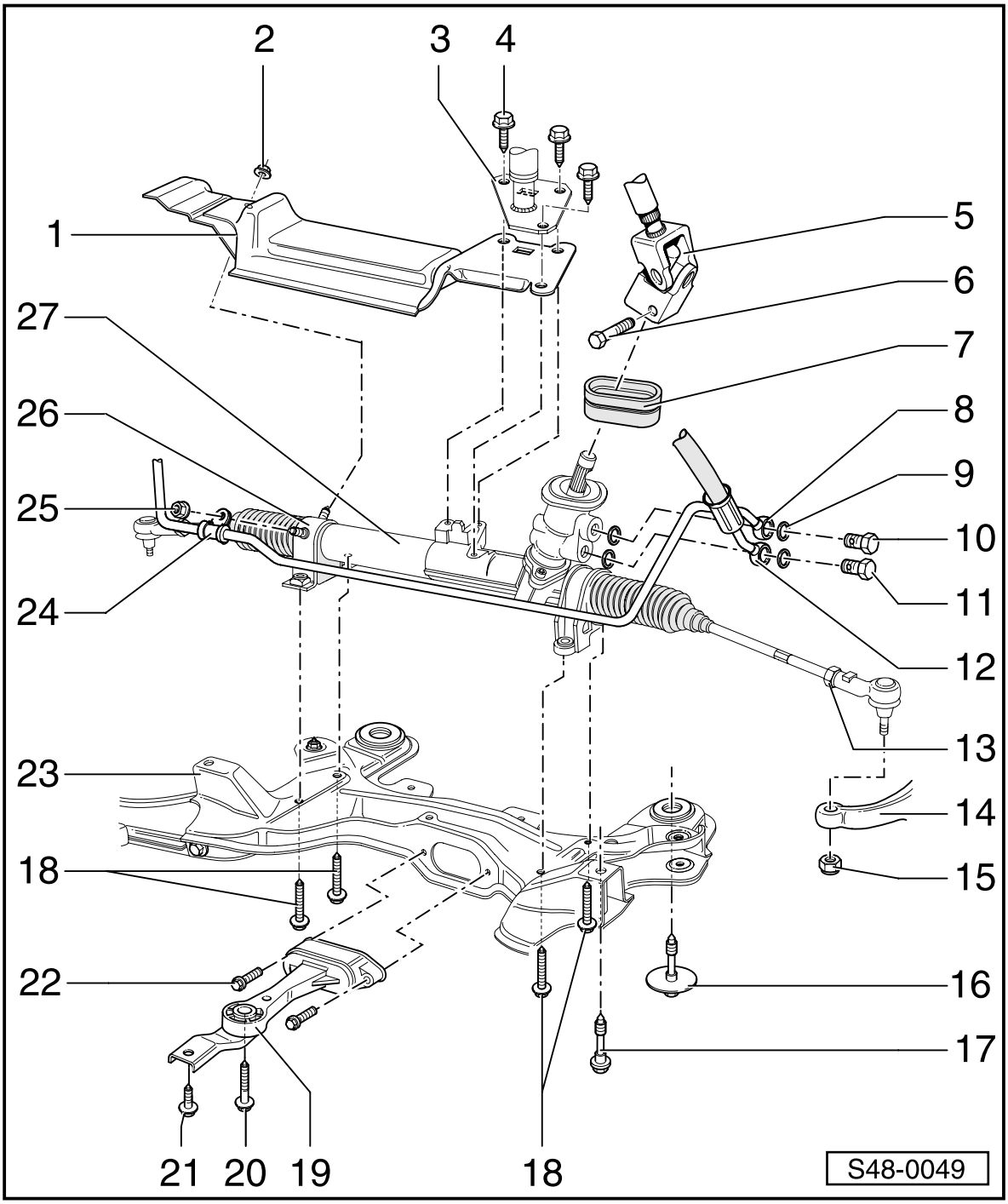
1 - Heat shield
- Centre with bearing bracket on power steering gear

2 - Hexagon nut, 20 Nm

3 - Bearing bracket
- Only on gearbox 02K

4 - Hexagon bolt, 25 Nm

5 - Universal joint of steering column



6 - Hexagon bolt, 30 Nm
- Replace each time removed

7 - Sealing collar
- Pay attention to installation instructions ⇒ page 48-16

8 - Return-flow line
- Power steering gear - reservoir for central hydraulic fluid
- Clearance to power steering gear must be 10 mm

9 - Seals
- Replace each time removed

10 - Banjo bolt, 45 Nm
- M16 x 1.5

11 - Banjo bolt, 45 Nm
- M14 x 1.5

12 - Pressure line (flexible hose)
- Hydraulic pump - power steering gear

13 - Lock nut, 50 Nm

14 - Steering arm of wheel bearing housing

15 - Hexagon nut, self-locking, 45 Nm
- ♦ Replace each time removed

16 - Bolt + washer, 100 Nm and torque a further 90°
- ♦ Replace each time removed

17 - Bolt + washer, 100 Nm and torque a further 90°
- ♦ Replace each time removed

18 - Hexagon bolt, 20 Nm and torque a further 90°
- ♦ Replace each time removed

19 - Pendulum support

20 - Hexagon bolt, 40 Nm and torque a further 90°
- ♦ Replace each time removed

21 - Hexagon bolt, 40 Nm and torque a further 90°
- ♦ Replace each time removed

22 - Hexagon bolt, 20 Nm and torque a further 90°
- ♦ Replace each time removed

23 - Subframe

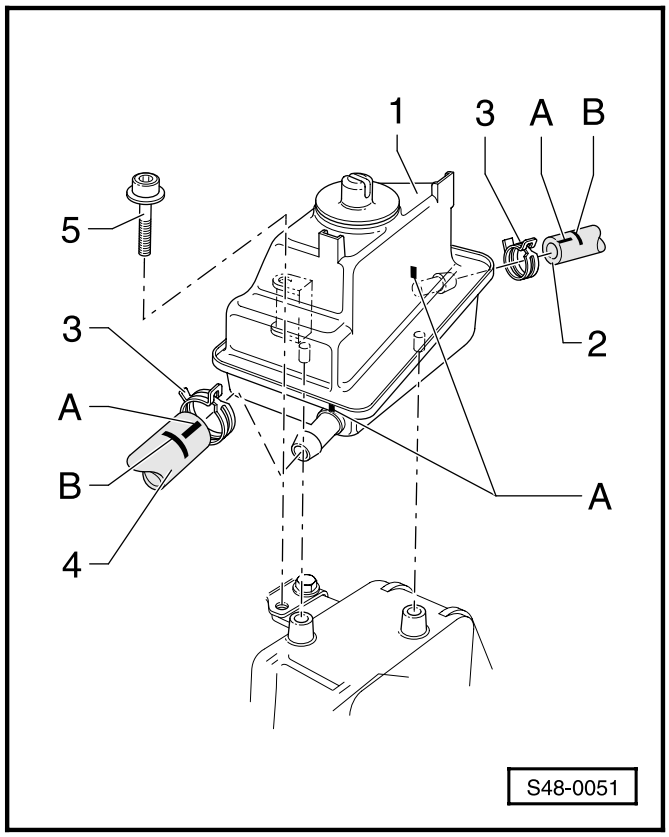
24 - Retaining clip

25 - Hexagon nut, 20 Nm

26 - Clip with rubber insert
Installation position:
- ♦ Arrow on clip points in direction of travel
- ♦ If thread of welded nut is damaged, replace

27 - Power steering gear
- ♦ Setting ⇒ page 48-25
- ♦ Removing and installing ⇒ page 48-12

Removing and installing hydraulic fluid reservoir



- ♦ Central hydraulic fluid
  TL 52 146
  N 052 146 00
  e.g. PENTOSIN CHF 11 S (G 002 000)

1 - Reservoir with cap and dipstick
- ♦ Tighten cap to 2 Nm
- ♦ Inspect hydraulic fluid level, top up if necessary ⇒ page 48-26

2 - Return-flow line
- ♦ Longitudinal markings -A- must be aligned
- ♦ Install spring strap clip max. up to transverse marking -B- on hose

3 - Spring strap clip
- ♦ Use special tool, e.g. Matra V/131, for opening and closing
- ♦ Tensioning eyes must be facing up

4 - Suction line
- ♦ Longitudinal markings -A- must be aligned
- ♦ Install spring strap clip max. up to transverse marking -B- on hose

5 - Bolt + washer, 10 Nm

Special tools, testers and aids required

- ♦ Pliers for spring strap clips, e.g. Matra V/131

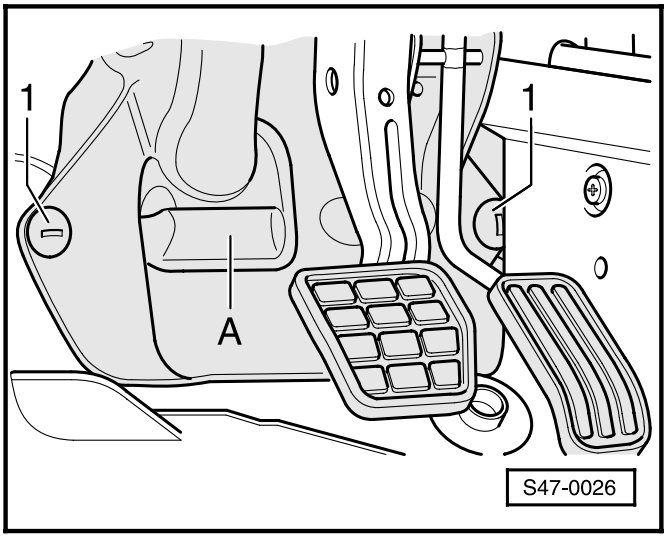
Removing and installing PAS gear

Special tools, testers and aids required

- Hose clamp MP 7-602
- Pliers for spring strap clip, e.g. Matra V/131
- Puller, Matra V 176
- Gearbox jack with adapter, e.g. V.A.G 1383 A with V.A.G 1359/2
- Sealing plug for hydraulic fluid reservoir (commercially available)
- Plastic screw plugs for pipe connections at PAS gear (commercially available)
- Central hydraulic fluid
  TL 52 146
  N 052 146 00
  e.g. PENTOSIN CHF 11 S (G 002 000)

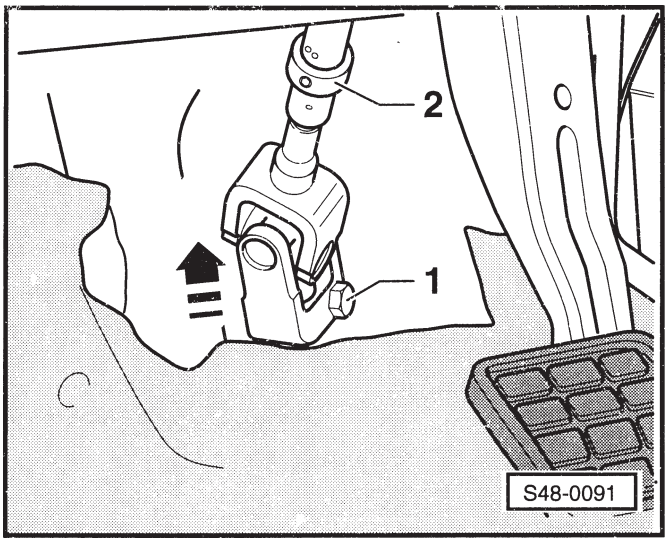
Notes:

- *No provision is made for repairs except replacing the boots and the track rods.*
- *Scrupulous cleanliness is required when carrying out work on the power-assisted steering.*
- *Thoroughly clean connection points and the surrounding area before disconnecting.*
- *Place removed parts down on a clean surface and cover over if repairs are not carried out immediately.*
- *Do not use any fluffing cloth.*
- *Do not remove replacement parts from their wrapping until just before installing.*
- *Use only genuine, wrapped parts.*
- *Do not re-use drained hydraulic fluid.*
- *Replace seals.*
- *Disposal ⇒ page 48-24.*



Removing

◄ - Unscrew plastic nuts -1- and remove cover -A-.



◄ - Unscrew hexagon bolts -1-.

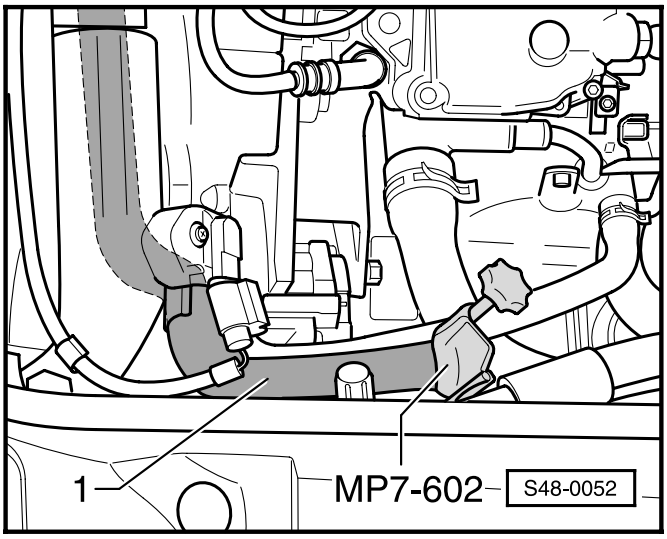
Important!

Move the steering wheel into middle position (wheels straightahead) and do not turn during the repair work otherwise the contact spring of the airbag unit may be damaged.

02.97 ➤ a clamping ring is fitted.

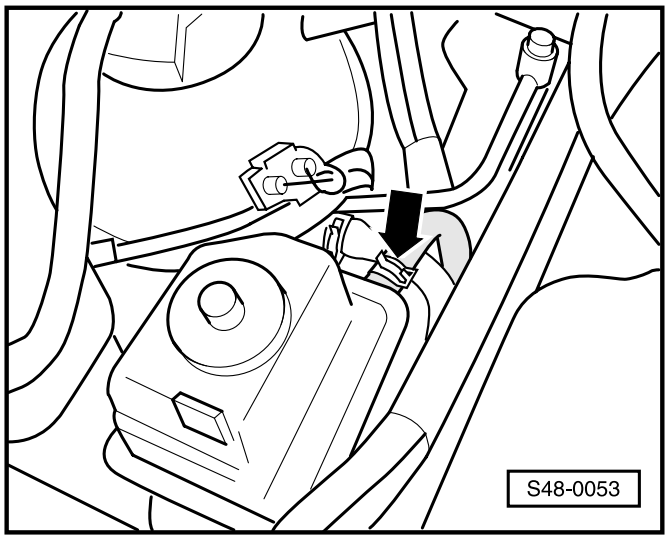
- Slacken hexagon socket screw of the clamping ring -2- sufficiently until the universal joint can be pulled off the steering gear pinion.

- Pull universal joint off steering gear pinion -arrow-.



◄ - Use special tool -MP 7-602- to pinch off suction line -1- (reservoir for hydraulic fluid/ hydraulic pump) close to hydraulic pump.

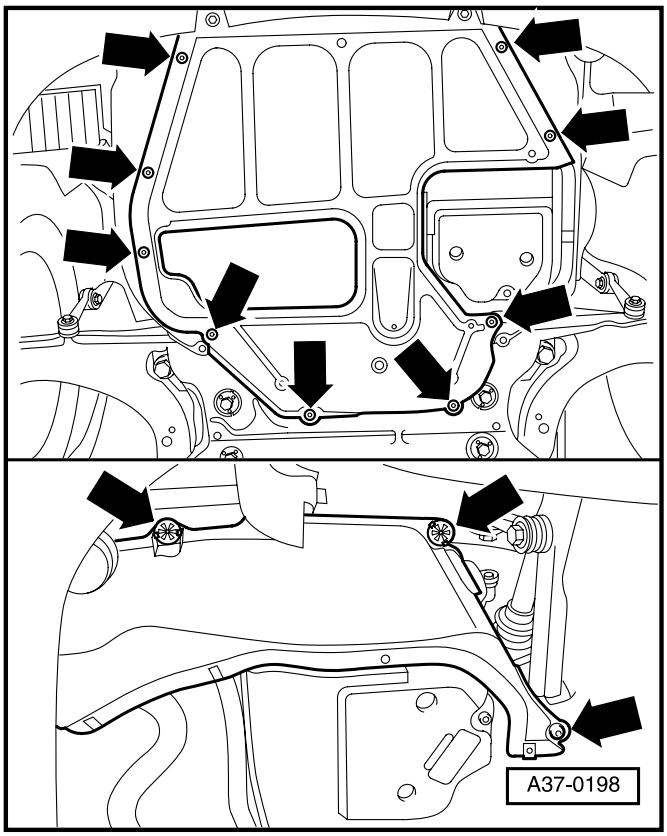
Illustration shows routing of line and pinching off line on 1.9-ltr./66 kW TDI engine. Routing of suction line on other engine differs. Suction line should be pinched off, however, close to hydraulic pump.



◄- Use special tool, e.g. Matra V/131, to open spring strap clip -arrow-.

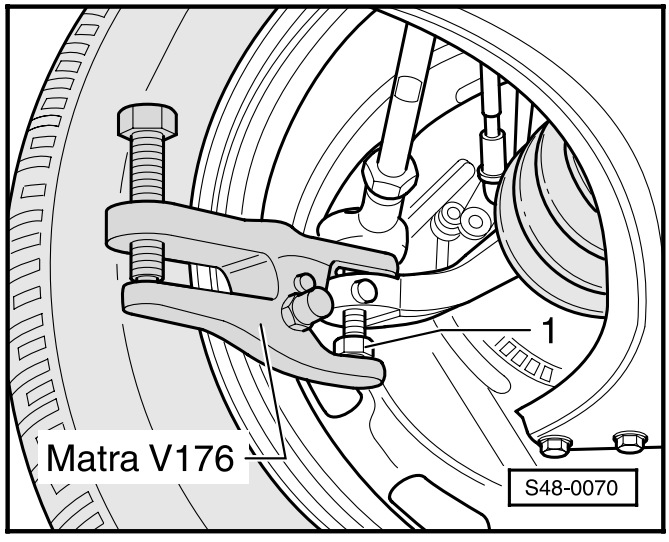
- Detach return-flow pipe from hydraulic fluid reservoir and allow hydraulic fluid to flow into a suitable vessel.

- Use a sealing plug to seal off return-flow opening at the hydraulic fluid reservoir.



◄- Remove noise insulation panelling in the middle and also on left and right -arrows-.

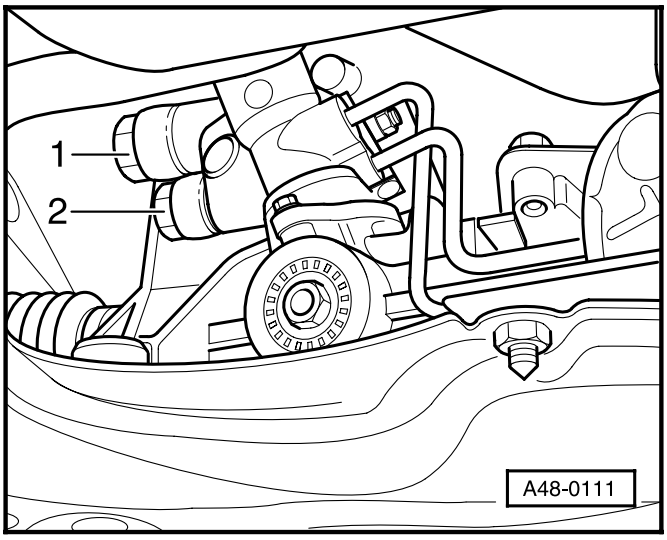
Fig. shows the noise insulation panel on models with 1.9-ltr./66 kW TDI and 1.9-ltr./50 kW SDI engines. The noise insulation panel on other engine versions may differ from that shown in the illustration.



◄- Use puller Matra V176 to press track rods off the pitman arm.

Note:

Screw down hexagon nut -1- sufficiently so that the track rod puller cannot damage the thread.

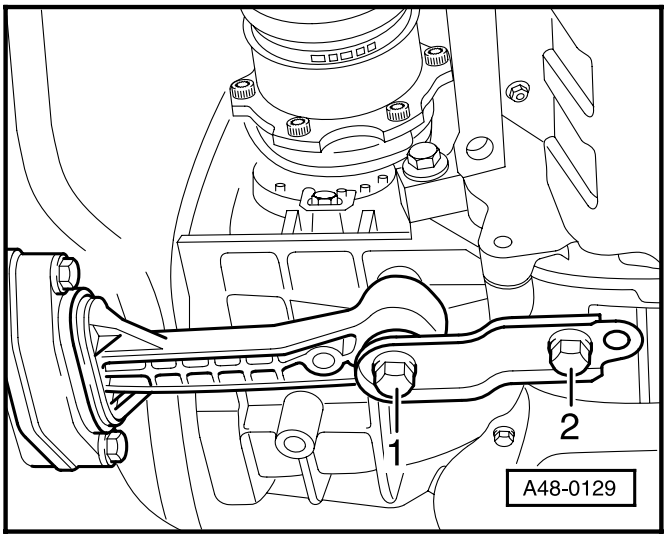


- Place a drip tray below for collecting the hydraulic fluid which flows out.

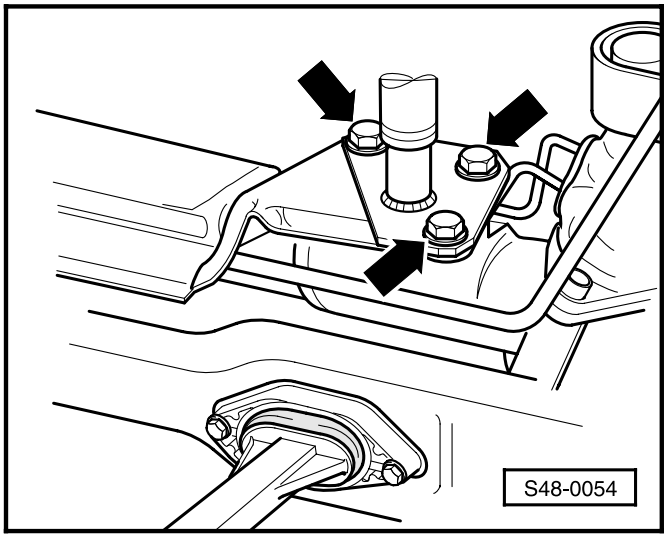
◄- Detach pressure pipe -2- (expansion hose) of PAS gear and seal with a plastic bag and adhesive tape.

- Seal threaded opening for pressure pipe connection -2- at the PAS gear (e.g. with plastic screw plug).

The return-flow pipe -1- can only be disconnected from the PAS gear once the subframe has been lowered.



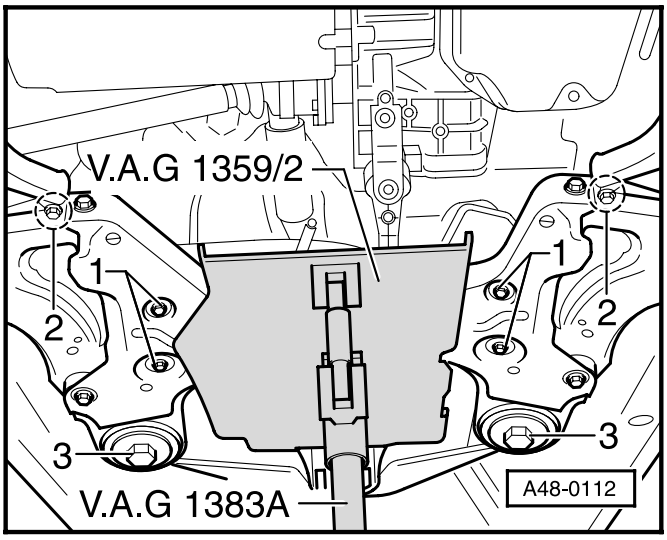
◄- Detach pendulum support at the gearbox side by unscrewing hexagon bolts -1- and -2-.



◄- Unscrew bolts for bearing bracket -arrows-.

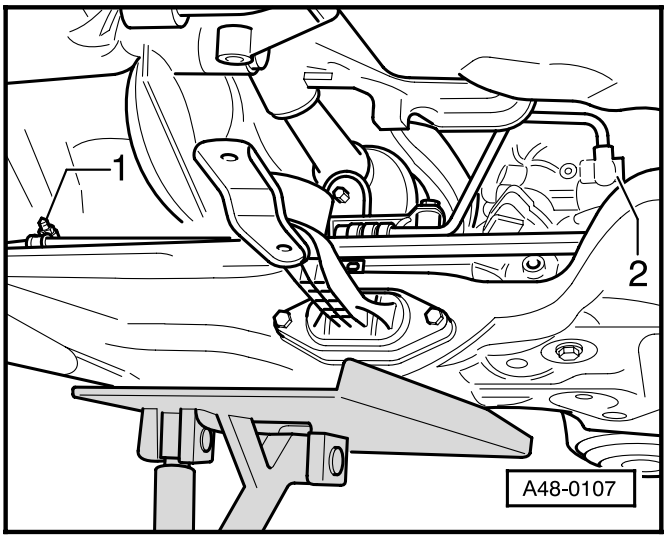
Note:

Only for gearbox 02K.



◄- Position gearbox lift with attachment, e.g. V.A.G 1383 A with V.A.G 1359/2.

- Slacken bolts -1- for power steering gear.
- Take out bolts -2- and -3- of subframe.
- Lower subframe.



◄- Disconnect return-flow line from clip -1- and rotary slide valve housing -2-.

- Seal return-flow line with plastic bag and adhesive tape.
- Seal threaded hole for connection of return-flow line at rotary slide valve housing -2- (e.g. with plastic screw plug).
- Remove bolts attaching power steering gear and take out power steering gear to the rear.

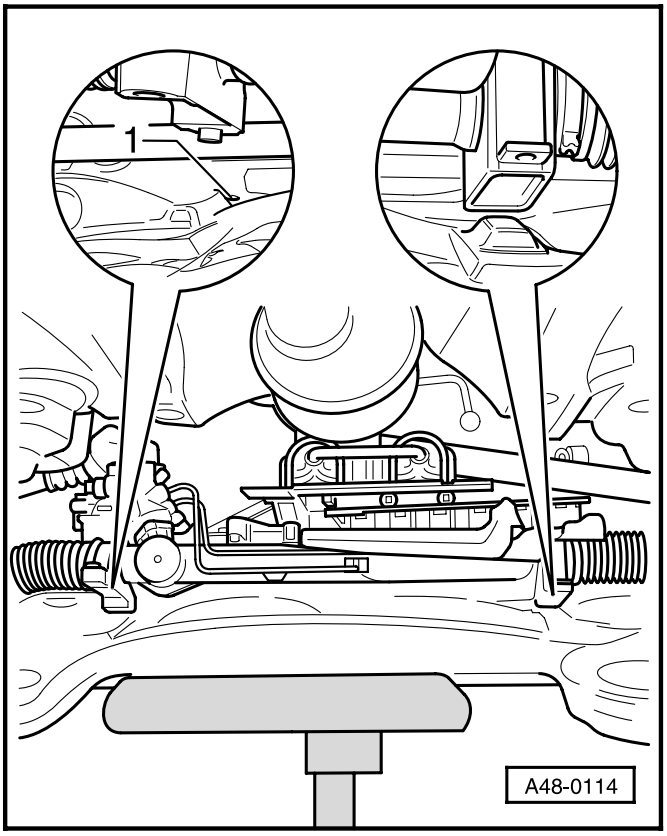
Installing

Warning!

The vehicle alignment must be checked after installing the power steering gear.

Notes:

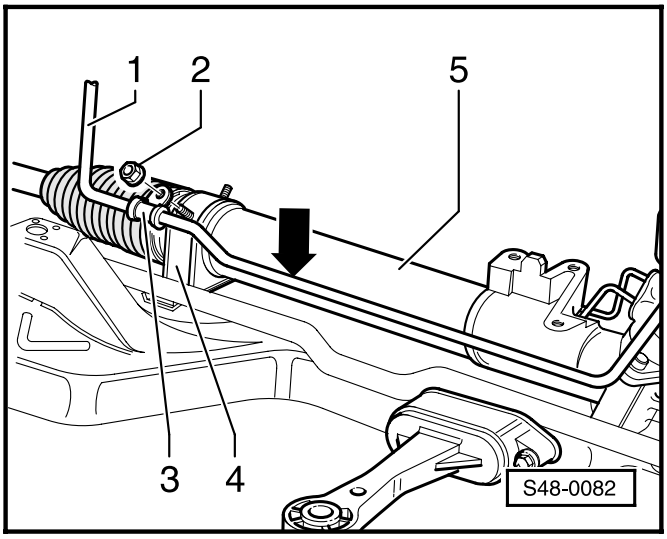
- *When tightening the lines, ensure that the lines cannot touch or chafe against any other part.*
- *Use new seals for the hose/line connections.*
- *Before installing steering gear, coat sealing collar on steering gear with a lubricant, e.g. lubricating soap.*
- *After positioning steering gear against drive shaft, ensure that the sealing collar on the steering gear is resting against the assembly plate without any creases and the opening to the footwell is correctly sealed. Otherwise risk of water leaking in and/or noises.*



- ♦ *Ensure that the sealing surfaces are clean.*
- ♦ *Specified tightening torques ⇒ from page 48-9.*
- ♦ *Before installing power steering gear, check middle position of steering rack ⇒ page 48-23.*

- Check middle position of power steering gear, set if necessary ⇒ page 48-23.

◄- Insert power steering gear with guide sleeve -1- into the subframe and tighten new bolts by hand.



◄- Attach return-flow line -1- with retaining clip -3- and hexagon nut -2- at the clip with rubber insert -4-.

Note:

Maintain a clearance of 10 mm between return-flow line -1- and power steering gear -5- (arrow).

- Attach return-flow line with new seals tight to rotary slide valve housing.

- Ensure sealing collar on steering gear pinion is correctly fitted.

- Raise subframe and at the same time insert the steering gear pinion into the opening on the floor of the vehicle.

- Tighten subframe at first with old bolts and to specified torque.

Note:

The old bolts for attaching the subframe should be replaced with new bolts as part of the check of the vehicle alignment.

- Tighten bolts for power steering gear to subframe.

- Attach pressure line with new seals tight to rotary slide valve housing.

- Bolt on pendulum support and fixture for exhaust system.

- Bolt on bearing bracket for shift linkage (only gearbox 02K).

- Insert track rods into steering arm and bolt tight. If the joint stud also rotates when tightening, counter-hold with hexagon socket wrench (waf 6 mm).

- Install return-flow line at hydraulic fluid reservoir.

- Take hose clip off the suction line.

- Push universal joint onto the steering pinion and tighten fully with new hexagon bolt to 30 Nm.

02.97 ➤ clamp ring is fitted.

- Tighten hexagon socket screw of clamp ring to 17 Nm.

- Install cover for universal joint.

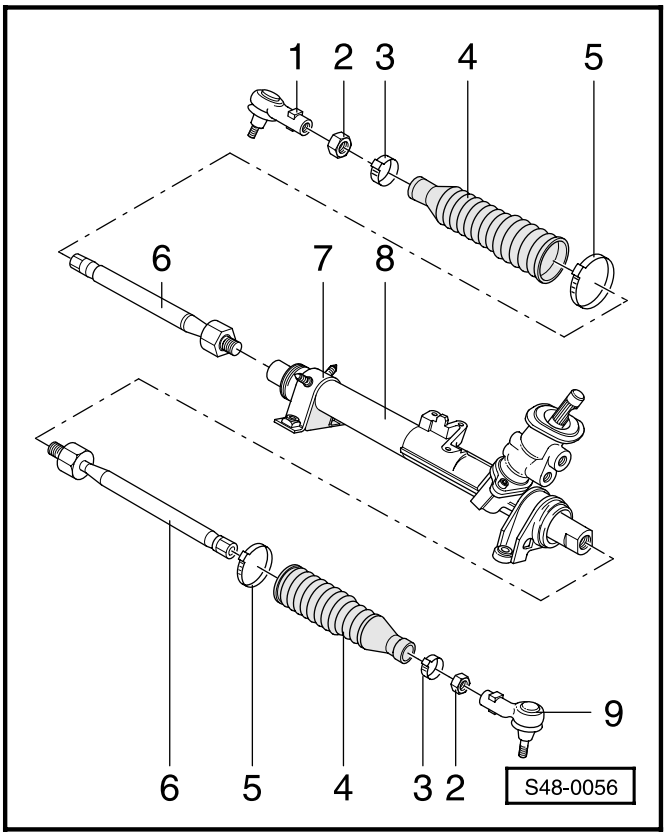
- Pour in hydraulic fluid ⇒ page 48-26.

- Fit on noise insulation.

- Perform check of vehicle alignment ⇒ page 44-1.

- As part of the check of vehicle alignment, replace old bolts attaching subframe with new bolts and tighten fully to the specified torque.

Servicing power steering gear (ZF)



Special tools, testers and aids required

- Puller, Kukko V/176
- Torque wrench, e.g. V.A.G 1332
- Open-end wrench insert, e.g. V.A.G 1332/5
- Caliper gauge
- Clamping pliers for hose straps, e.g. V.A.G 1275
- Gearbox grease
  TL 733
  NO 52733 00
  e.g. DEA ORNA F6 EPO (AOF 063 000 04)

Notes:

- *Following an accident and damage to the front axle, the steering components items 1 to 9 must always be replaced.*
- *No provision is made for servicing the power steering gear. If complaints are received, determine the cause by conducting a pressure test and leaktightness test. If a fault exists, replace the power steering gear.*
- *It is not permitted to carry out any welding or straightening work on steering components.*
- *Always replace self-locking nuts and bolts.*
- *Use only genuine clamp-type clips.*
- *Use only steering gear grease AOF 063 000 04 for greasing the steering rack (quantity 23 ... 27 g).*

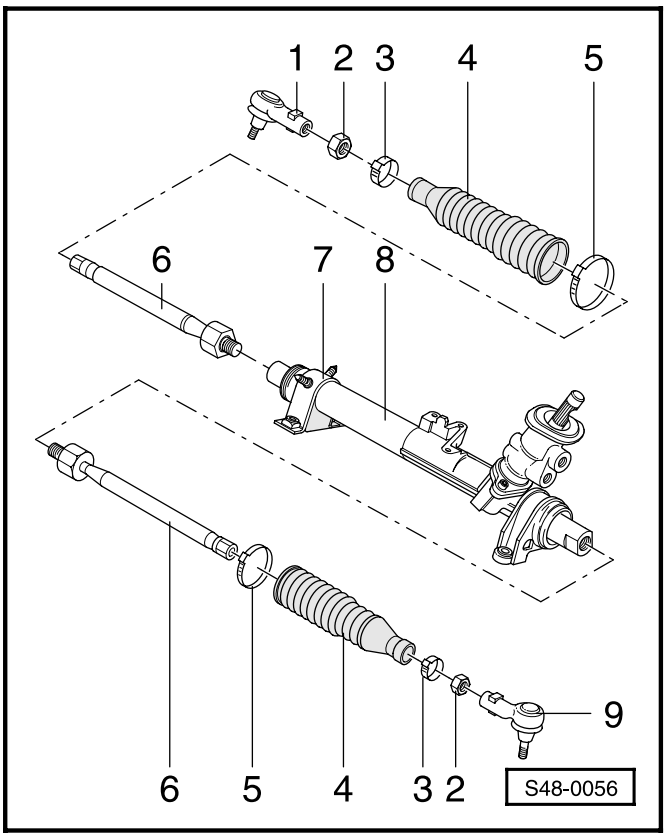
1 - Right track rod end
- Pressing off from steering arm ⇒ page 48-14
- Inspecting ⇒ page 48-21
- Removing and installing ⇒ page 48-21
- Pay attention to installation position
- Modified from vehicle ident No. TMBZZZ1U12W2074066 ⇒ page 48-23.1

2 - Lock nut, 50 Nm

3 - Clamp-type clip
- Replace
- Open with cutting pliers for removing
- Tensioning ⇒ page 48-23

4 - Boot
- Boot can only be replaced with power steering gear removed
- Before taking off boot, detach track rod end ⇒ page 48-21
- Inspect for wear (splits, slits), inspect whether sealing surfaces and sealing lips clean and undamaged

5 - Clamp-type clip
- Replace
- Open with cutting pliers for removing
- Tensioning ⇒ page 48-23



6 - Track rod

- Tightening torque to steering rack: 75 Nm
- Left and right track rods can be adjusted
- Removing and installing ⇒ page 48-22
- Modified from vehicle ident No. TMBZZZ1U12W2074066 ⇒ page 48-23.1

7 - Clip with rubber insert

8 - Power steering gear

- No provision for servicing
- Removing and installing ⇒ page 48-12
- Setting ⇒ page 48-25
- Inspecting middle position ⇒ page 48-23

9 - Left track rod end

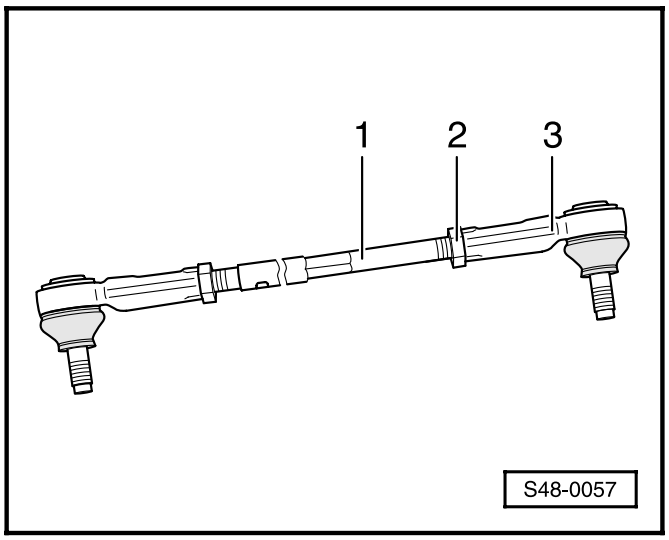
- Pressing off from steering arm ⇒ page 48-14
- Inspecting ⇒ page 48-20
- Removing and installing ⇒ page 48-21
- Pay attention to fitting location
- Modified from vehicle ident No. TMBZZZ1U12W2074066 ⇒ page 48-23.1

Inspecting play, attachment and sealing boots of track rod ends

- With vehicle raised (wheels clear of ground), inspect play by moving track rods and wheels.
  Specified play: no play

- Inspect attachment.

- Inspect sealing boots for damage and correct installation.



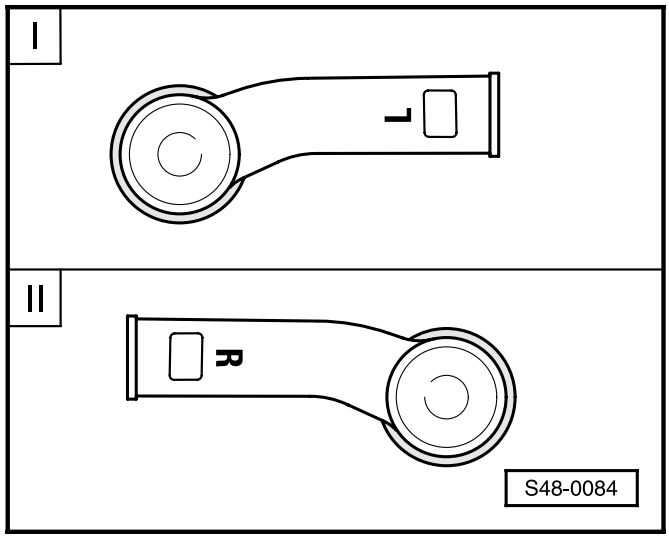
Removing and installing track rod ends

Removing

- Press track rod off steering arm ⇒ page 48-14.

◄ - Slacken hexagon nut -2- and turn track rod end -3- off the track rod -1-.

Installing



Notes:

- *From vehicle ident No. TMBZZZ1U12W2074066 modified track rod ends and track rods ⇒ page 48-23.1.*
- *It is not permitted to install mixed (old and modified) track rod ends or track rods ⇒ page 48-23.3.*
- *Install track rod ends at the correct side.*

◄ ♦ *When installing, pay attention to marking on track rod end*
*I - Left track rod end - **L***
*II - Right track rod end - **R***

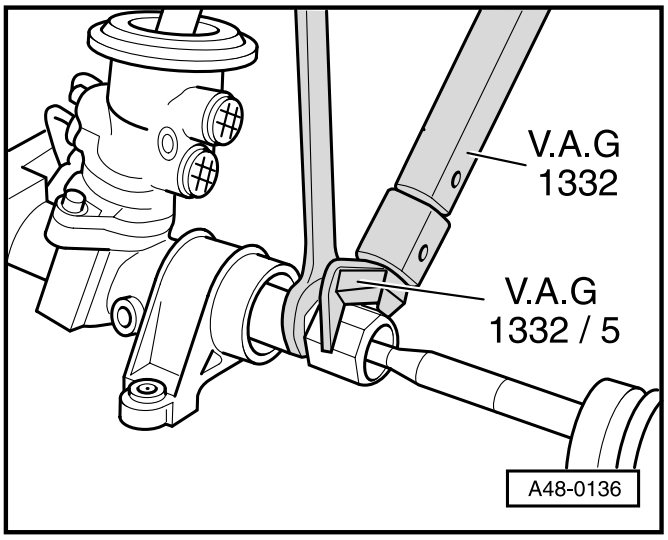
- *Pay attention to new marking on modified track rod ends ⇒ page 48-23.1.*

- Turn track rod end onto the track rod as far as the stop and align so that the stud of the track rod end is in the installed position.

- Tighten lock nut to 50 Nm.

- Insert track rod into steering arm and tighten self-locking hexagon nut to 45 Nm. If the joint stud also turns when tightening, counter-hold with a hexagon socket wrench (waf 6 mm).

- Check toe-in of front wheels and position of steering wheel, and align if necessary.



Removing and installing track rods

Note:

The track rods can only be removed and installed with the power steering gear removed.

Removing

- Clean outside of power steering gear in the area of boot.

- Open clip and push back boot.

◄- Turn track rod off the steering rack. Use torque wrench with open-end wrench insert waf 34, e.g. V.A.G 1332 with V.A.G 1332/5, for this step. An open-end wrench (waf 21) must be used for counter-holding when slackening.

Installing

Notes:

- *From vehicle ident No. TMBZZZ1U12W2074066 modified track rod ends and track rods ⇒ page 48-23.1.*
- *It is not permitted to install mixed (old and modified) track rod ends or track rods ⇒ page 48-23.2.*
- *If it is necessary to replace a track rod, always replace both track rods ⇒ page 48-23.2.*

- Turn track rod onto steering rack and tighten to 75 Nm. Use torque wrench with open-end wrench insert waf 34, e.g. V.A.G 1332 with V.A.G 1332/5, for this step. An open-end wrench (waf 21) must be used for counter-holding when slackening.

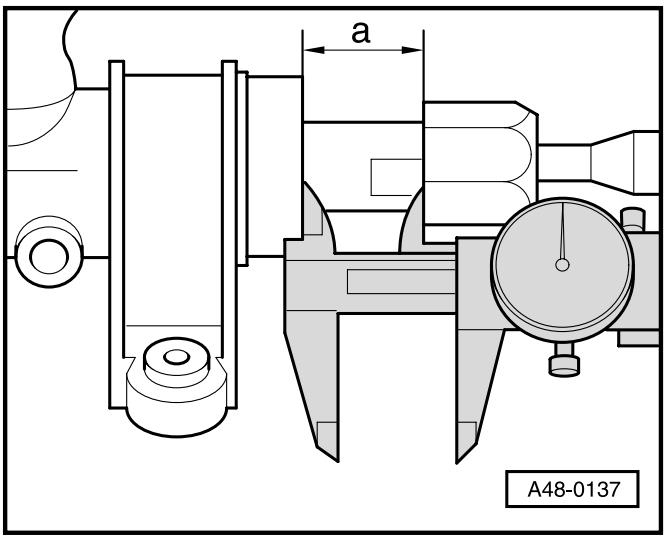
Note:

Turn track rod so that the stud of the track rod end is in the installed position.

- Inspect middle position of power steering gear ⇒ page 48-23.

- Install boot ⇒ page 48-23.

Inspecting middle position of steering rack of power steering gear, adjusting if necessary

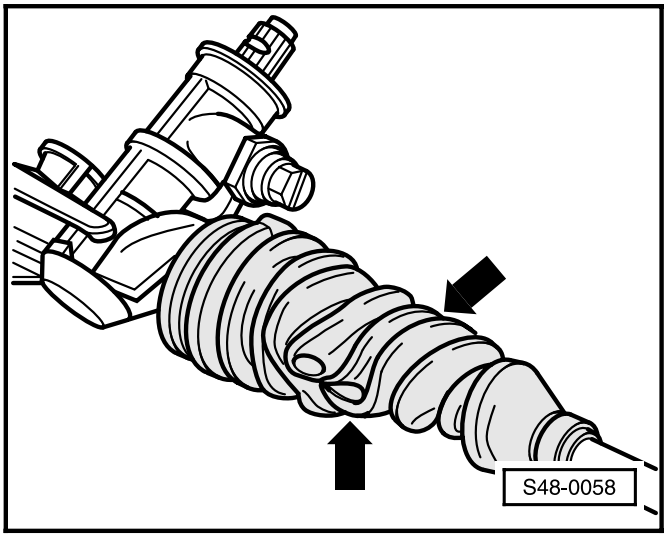


Notes:

- *Move the steering rack into the middle position before installing the power steering gear.*
- *The dimension -a- must be identical on the right and left sides of the power steering gear. If the dimension is not identical on both sides, set distance -a- to correct dimension.*

◄ - Check dimension -a- and set if necessary.

a = 30.5 mm

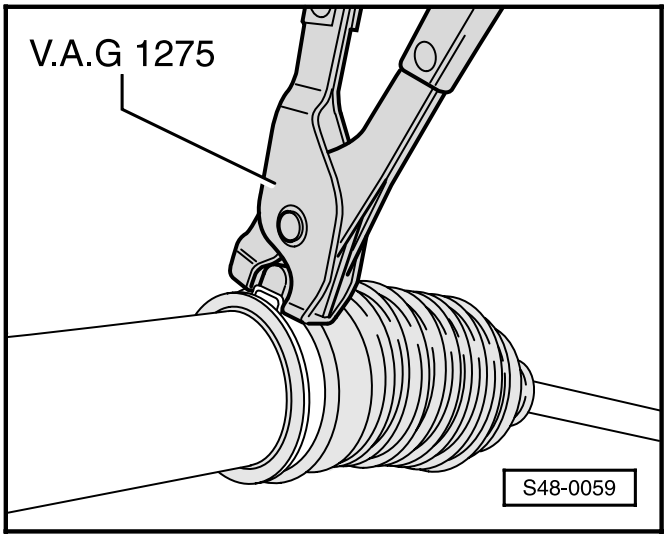


Installing boot

- Inspect boot for wear (splits, slits) and ensure sealing surfaces of boot are clean.

Note:

◄ *The boot must on no account be installed twisted (illustration shows negative example).*

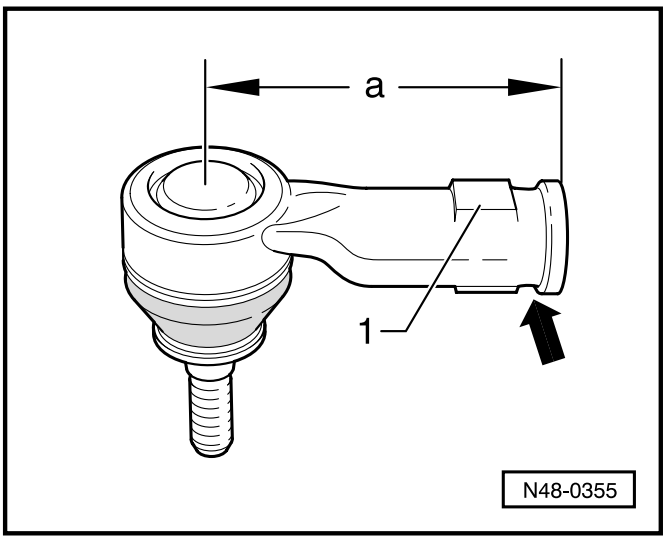


◄ - Use hose strap pliers, e.g. V.A.G 1275 to tension clip.

Modified track rod ends

The production process for the track rod ends has been optimised. There is no change in this case to the exterior shape and the length of the threaded shank.

The track rods have been matched to the modified track rod ends ⇒ page 48-23.2.



Introduction from:

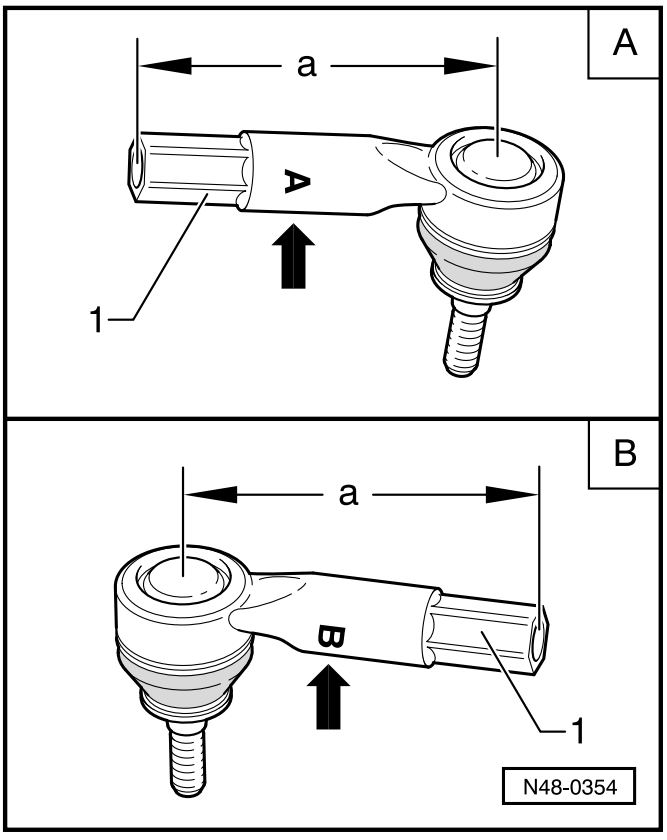
Vehicle ident No. TMBZZZ1U12W2074066

◄ **Recognition features of previous track rod ends**

1 - Wrench face on shank, with marking „R“ or „L“
Width across flats 22 mm
Dimension -a- = 74 -1 mm
The shank -arrow- is round.

Warning!

These track rod ends must not be attached to track rods which have a length -a- = 318.9 mm ⇒ page 48-23.2.



◄ **Recognition features of modified track rod ends**

A - Right track rod end

1 - Hexagon on threaded shank, width across flats 19 mm
Dimension -a- = 94 ± 0.5 mm
Marking „A“ for right-hand

B - Left track rod end

1 - Hexagon on threaded shank, width across flats 19 mm
Dimension -a- = 94 ± 0.5 mm
Marking „B“ for left-hand

Warning!

These track rod ends must not be attached to track rods which have a length -a- = 343.1 mm ⇒ page 48-23.2.

Modified track rods

The track rods have been matched to the modified track rod ends.

The track rods have been shortened compared to the previous version.

Introduction from:

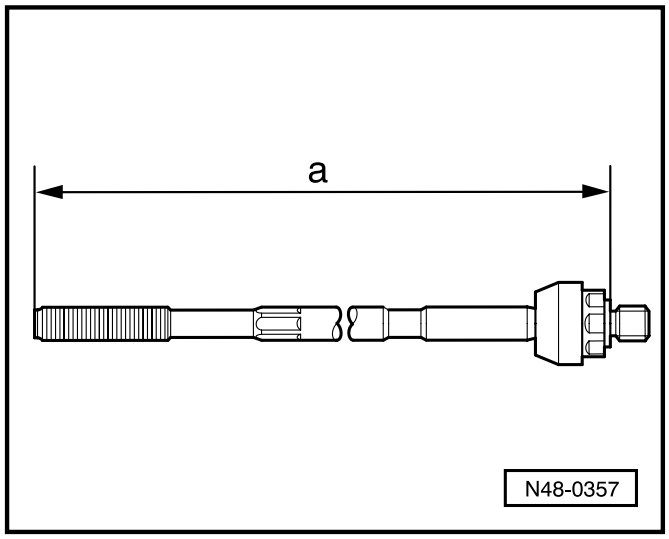
Vehicle ident No. TMBZZZ1U12W2074066

◄ **Recognition feature of previous track rod**

Dimension -a- = 343.1 mm

Recognition feature of modified track rod

Dimension -a- = 318.9 mm



Warning!

It is not permitted to install the track rods mixed (previous and modified versions).

Both track rods should always be replaced at the same time.

In addition, the modified track rods must not be fitted with the previous track rod ends.

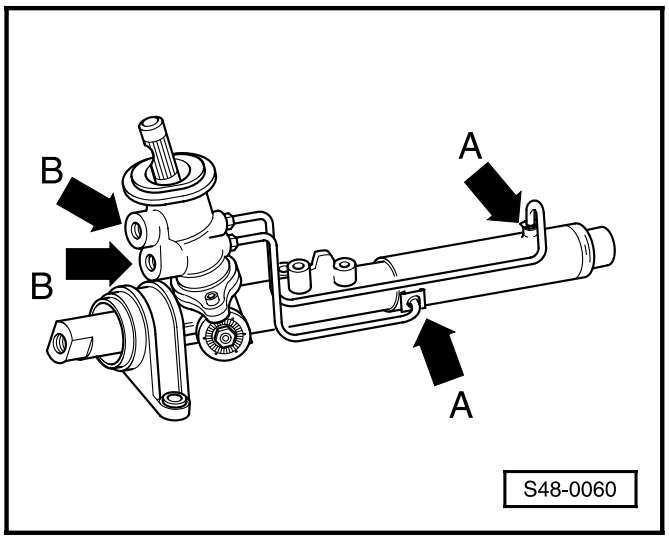
Disposing of PAS gear

Special tools, testers and aids required

- Hydraulic fluid vessel

Notes:

- *The oils used in the PAS gears do not contain any harmful substances. These oils can be disposed of together with old oil from engines and gearboxes.*
- *Dispose of old oils in conformity with the relevant environmental protection regulations.*
- *Old oils (the term old oils refers to used engine and gearbox oils incl. ATF and also mineral hydraulic oils), which are suitable for processing, must on no account be mixed with brake fluid, antifreeze agent, synthetic resin or nitro thinner, chemicals etc.*
- *After „emptying“, the old parts should be allowed to drip adequately.*
- *When disposing of old parts, pay attention to legal provisions as slight residual quantities of hydraulic fluid remain in the PAS gear.*



◄- Detach pipes -arrows A- from the PAS gear by pulling off the clips. The clips must not be re-used.

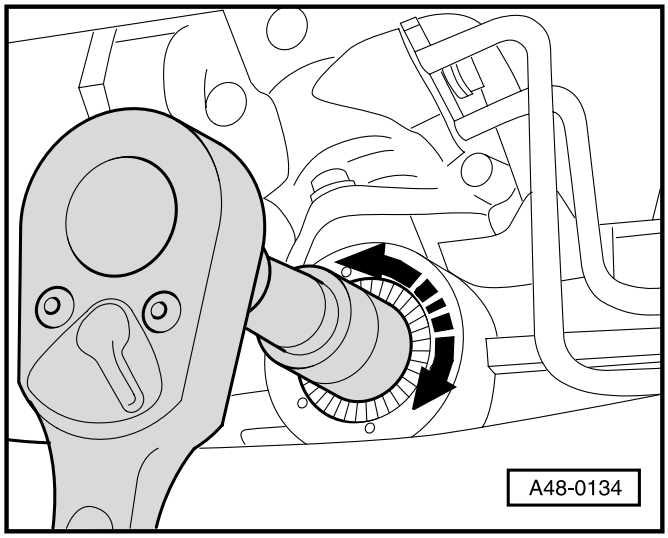
- Hold PAS gear over a collecting vessel and turn steering pinion several times from full lock to full lock until no further hydraulic fluid flows out of the holes.
  Holes -arrows B- must not be sealed.

- Dispose of PAS gear.

Setting PAS gear (ZF)

Note:

Two mechanics are required for setting the steering gear. The setting should be carried out with the engine switched off.

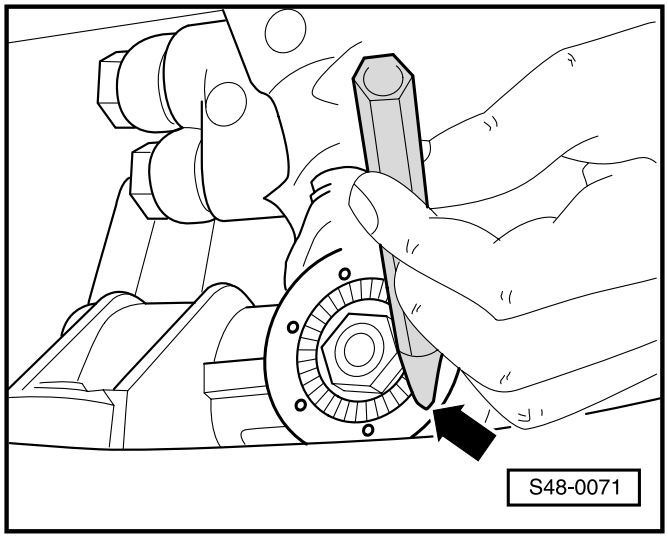


- Raise vehicle with lift platform.

● Wheels in straightahead position.

- A rattling noise can be heard when the steering wheel is moved alternately around the centre axis (about 30°) if steering play is excessive.

◄ - The second mechanic turns the adjusting screw (arrow) carefully into the cover to the point at which the rattling noise is no longer heard in the interior.



- Carry out a road test and check to ensure that the steering moves back by itself into the straightahead position, without sticking, after a parking manoeuvre or cornering. Correct setting if necessary.

◄ - Secure adjusting nut against turning by striking with a chisel in the collar of the steering gear housing.

Inspecting hydraulic fluid level of power-assisted steering, replenishing if necessary

Special tools, testers and aids required

- Central hydraulic fluid
  TL 52 146
  N 052 146 00
  e.g. PENTOSIN CHF 11S (G 002 000)

Notes:

- *Delivery Inspection:*
  Oil level at „MAX“ marking

⇒ Inspection and Maintenance

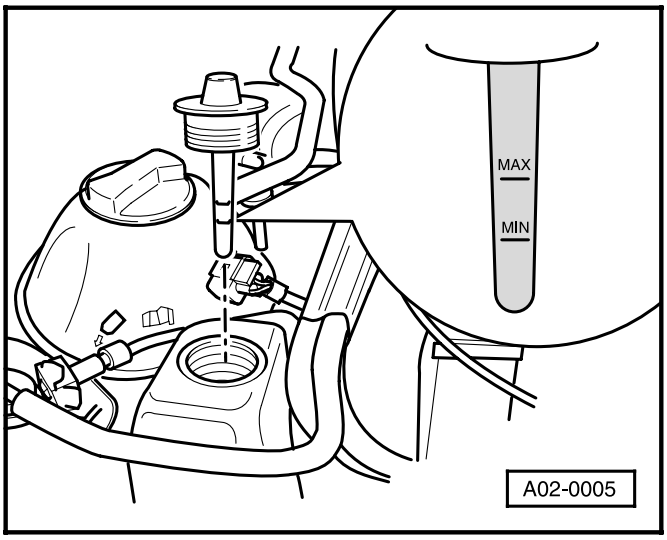
- *Inspection Service:*
  Oil level between „MIN“ and „MAX“ markings

⇒ Inspection and Maintenance

Hydraulic fluid when cold:

- Do not run engine, and move front wheels into straightahead position.
- Unscrew cap.
- Wipe off dipstick with a clean cloth.
- Screw in cap by hand and remove again.

Only the oil level indicated when the cap has first of all been fully inserted, is correct.



◄ - Inspect oil level: The oil level must be within the range of the „MIN“ marking (up to 2 mm above or the lower marking).

Notes:

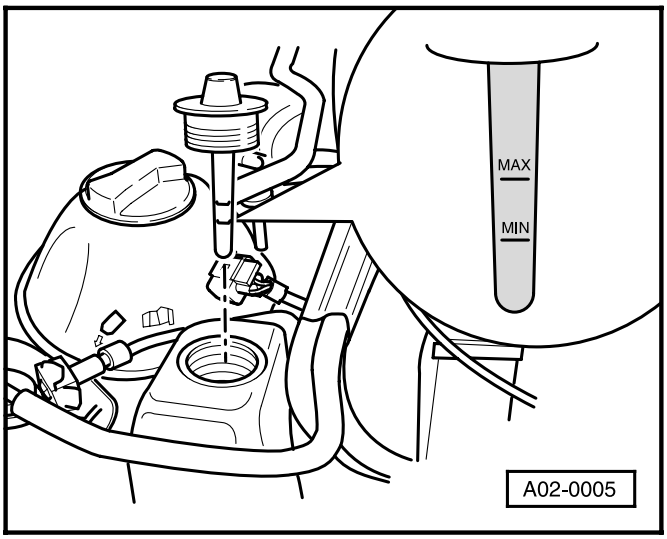
- *If the oil level is above the range indicated, oil must be extracted.*
- *If the oil level is below the range indicated, the hydraulic system must be inspected for leaks ⇒ page 48-30. It is not sufficient merely to replenish the oil.*

- Screw in cap and tighten to 2 Nm.

Hydraulic fluid at operating temperature (from about 50 °C):

- Engine idling, front wheels at straightahead position, run for about 2 minutes.
- Unscrew cap.
- Wipe off dipstick with a clean rag.
- Screw in cap by hand and remove again.

The hydraulic fluid level which applies is that for a cap which has previously been fully inserted.



◄- Check fluid level: The fluid level should be between the MIN and MAX markings.

Notes:

- *If the fluid level is above the stated range, fluid should be extracted.*
- *If the fluid level is below the stated range, it is then necessary to inspect the hydraulic system for leaks ⇒ page 48-30. It is not sufficient simply to top up the hydraulic fluid.*

- Screw in cap and tighten to 2 Nm.

Draining, filling and bleeding PAS system

Special tools, testers and aids required

♦ Central hydraulic fluid
TL 52 146
N 052 146 00
e.g. PENTOSIN CHF 11S (G 002 000)

Draining

- Do not run engine and raise vehicle sufficiently until the front wheels are clear.
- Place basin below for collecting hydraulic fluid.
- Open hydraulic system at suction and return sides and allow hydraulic fluid to flow out.
- Force out remaining quantity of hydraulic fluid by turning the steering several times from full lock to full lock.
- Lower vehicle and re-connect hydraulic pipes.

Notes:

♦ *Do not re-use drained hydraulic fluid.*

♦ *Dispose of hydraulic fluid in accordance with the applicable environmental protection regulations.*

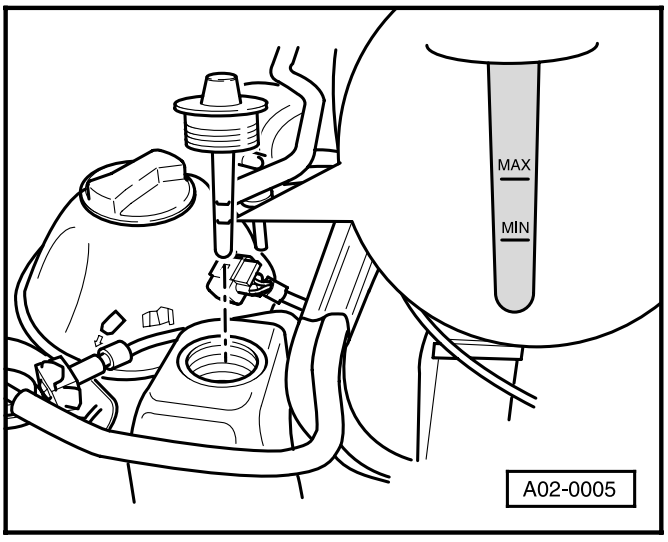
Filling and bleeding

Notes:

♦ *A drained hydraulic system should only be filled when engine is cold.*

♦ *Central hydraulic fluid G 002 000.*

♦ *Quantity of hydraulic fluid in system: 0.7 ... 0.9 ltr.*



- Refilling a hydraulic system ⇒ page 48-26.

◄ - If the hydraulic system is drained, fill up hydraulic fluid reservoir sufficiently until „MAX“ marking on dipstick is reached.

- Raise vehicle sufficiently until the front wheels are clear. Move front wheels into straightahead position.

- With engine switched off, turn steering wheel 10 x from full lock to full lock.

- Check hydraulic fluid level and top up if necessary ⇒ page 48-26.

- Lower vehicle.

- Start engine and run for about 5 seconds. Hydraulic pump draws in hydraulic fluid.

- Switch off engine.

- Check hydraulic fluid level and top up if necessary ⇒ page 48-26.

- Start engine.

- Turn steering wheel 10 x from full lock to full lock.

- When doing this, have a second mechanic observe hydraulic fluid level in the reservoir and top up if necessary so that no air can be drawn in. If no air bubbles in the reservoir flow out of the return-flow pipe, the hydraulic system is bled. If air bubbles repeatedly occur, it is then necessary to repeat the bleeding operation.

- Switch off engine.

- Inspect hydraulic fluid level and top up if necessary ⇒ page 48-26.

Any air which remains in the steering system escapes by itself after driving about 10...20 km.

Inspecting PAS system for leaks

Notes:

- *If metal swarf is found in the hydraulic fluid and/or in the reservoir, the reservoir, suction and pressure pipe should be carefully flushed out and replaced, if necessary.*
- *The PAS system has to be inspected for leaks after carrying out removal and installation work and if there is a loss of hydraulic fluid in the reservoir.*

- Start engine.

- Turn steering wheel alternately to full lock and hold tight for a short time.

  This builds up the maximum possible pressure.

- Inspect all hose and pipe connections for tight fit and leaks.

- If leaks are present, retighten hose or pipe connection to the specified maximum tightening torques or replace seal or pipe.

- Inspect hoses and pipes for leaks. If leaks are present, replace the relevant hose or pipe.

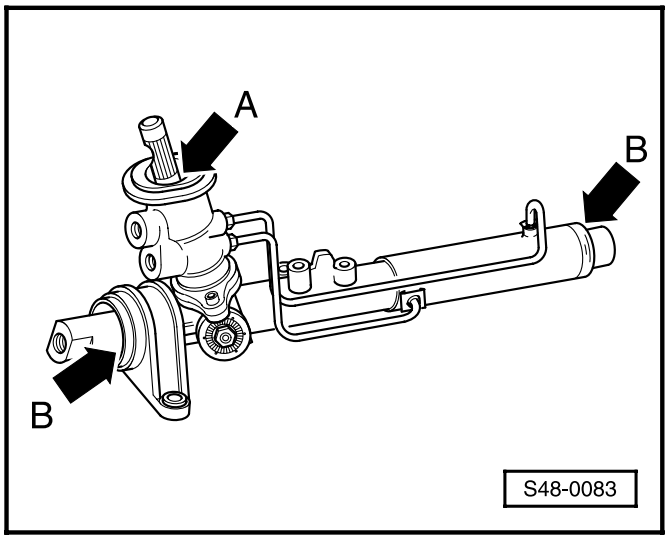
- Inspect hydraulic pump for leaks. If leaks are present, replace hydraulic pump.

- Inspect hydraulic fluid reservoir for leaks. If leaks are present, replace reservoir.

- Inspect hydraulic fluid level and top up if necessary ⇒ page 48-26.

Note:

If a loss of hydraulic fluid in the reservoir occurs repeatedly and an intensive inspection has been carried out several times of the hoses and pipes and also their connections, the hydraulic pump and the reservoir, the PAS gear should be removed and inspected.



- Remove power steering gear ⇒ page 48-12.

◄ - Inspect seal for steering pinion at valve housing of power steering gear -arrow A- for leaks.

- Open clip of boot and push back boot.

- Inspect steering rack seals -arrows B- for leaks.

If hydraulic fluid is visible in the steering gear housing and/or in the boots, the power steering gear must be replaced.

- Install power steering gear ⇒ page 48-12.

Note:

If there is no further hydraulic fluid in the reservoir, the hydraulic pump may possibly have run „dry" and have been damaged.

- Replace hydraulic pump ⇒ page 48-37, Removing and installing hydraulic pump

Noises from power steering system

A closed hydraulic system will always produce operating noises.

Hissing noises always occur when the steering wheel is turned slowly when the car is stationary and the engine running, or if the steering is turned to full left or right lock (must only be done for a short time!).

The increased pump noise at full lock of the steering (when parking) is system-related and is technically unavoidable.

If noises occur which differ from the usual, and technically unavoidable operating noises, carry out the following measures:

- Inspect hydraulic fluid level in reservoir ⇒ page 48-26.

- Test delivery pressure of hydraulic pump ⇒ page 48-36.

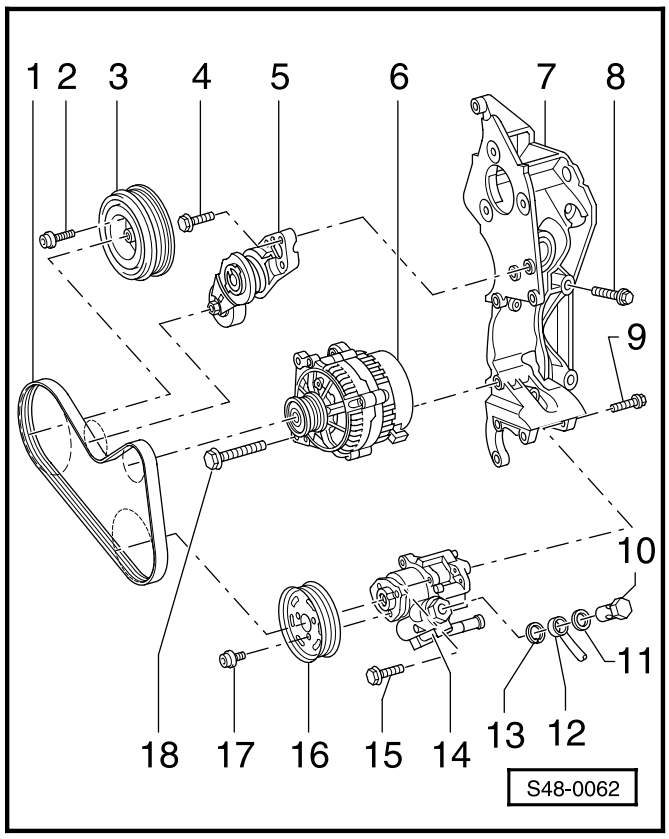
- Inspect connections for leaks (air in the system).
- Check tension of V-belt.
- Check routing of the suction and delivery pipes (pipes pinched or touching other vehicle parts).
- Inspect the steering gear attachment at the subframe.
- Inspect the bolt connection of the hydraulic pump to bracket/engine.
- Inspect bolt connection of belt pulley.

Note:

In order to determine whether the noises originate from the PAS system, it is recommended to take off the V-belt of the hydraulic pump and to run the engine without the hydraulic pump.

Assembly overview: hydraulic pump

Assembly overview for horizontal and vertical hydraulic pump



Note:

The illustration shows a version with horizontal hydraulic pump.

The same tightening torques apply for the bolts for attaching the hydraulic pump of the vertical version and for the banjo bolt for connecting the pressure to the hydraulic pump.

1 - Ribbed V-belt
- ♦ Before removing, mark direction of running
- ♦ Assignment ⇒ Parts List
- ♦ Removing and installing

⇒ Engine, Mechanical Components; Repair Group 13; Disassembling and assembling engine

2 - Hexagon socket bolt, 10 Nm + torque a further 90°

3 - Vibration damper
- ♦ With belt pulley for ribbed V-belt

4 - Hexagon bolt, 25 Nm

5 - Tensioning element

6 - Alternator

7 - Bracket
- ♦ Fig. shows bracket for models without air conditioning
- ♦ Install free of stress ⇒ item 8

8 - Hexagon bolt, 45 Nm
- ♦ For attaching bracket -item 7- to engine block
- ♦ Installing

⇒ Engine, Mechanical Components; Repair Group 13; Disassembling and assembling engine

9 - Hexagon bolt, 25 Nm

10 - Banjo bolt, 38 Nm

11 - Seal
- ♦ Replace

12 - Pressure line (flexible hose)

13 - Seal
- ♦ Replace

14 - Hydraulic pump
- ♦ For power-assisted steering
- ♦ Testing delivery pressure ⇒ page 48-35
- ♦ Fill with hydraulic oil before installing ⇒ page 48-37
- ♦ Removing and installing ⇒ page 48-37, Notes

15 - Hexagon bolt, 25 Nm

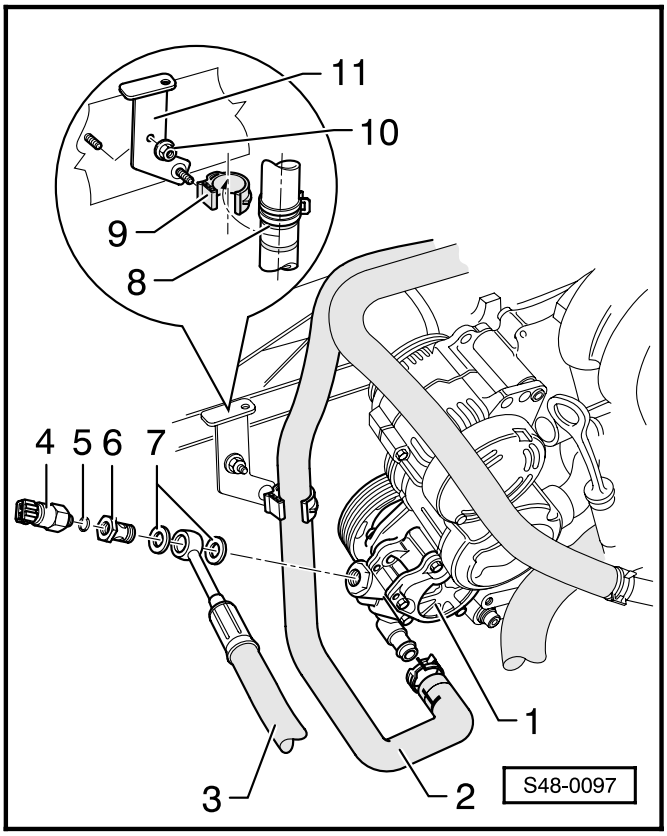
16 - Belt pulley
- ♦ For hydraulic pump

Models with 1.4-ltr./44 kW engine:
- ♦ Before removing, mark front of belt pulley. Belt pulley must not be installed with the front on the hydraulic pump.

17 - Hexagon socket bolt, 25 Nm

18 - Hexagon bolt, 25 Nm

Power steering pressure switch



Note:

The pressure switch integrated in the hydraulic pump is used for stabilising the idling speed of the engine during steering actions when the vehicle is stationary.

1 - Hydraulic pump

2 - Suction line

3 - Pressure line

4 - Pressure switch, 15 Nm
- Switches at 4.0 MPa (40 bar)
- Testing signal

⇒ Simos Fuel Injection and Ignition System; Repair Group 24; Testing additional signals

5 - Seal
- Replace

6 - Banjo bolt, 38 Nm

7 - Seal
- Replace

8 - Coloured marking on suction line
- White or yellow all round; must be positioned within holder (item 9)

9 - Holder

10 - Hexagon nut

11 - Bracket

Testing delivery pressure of hydraulic pump

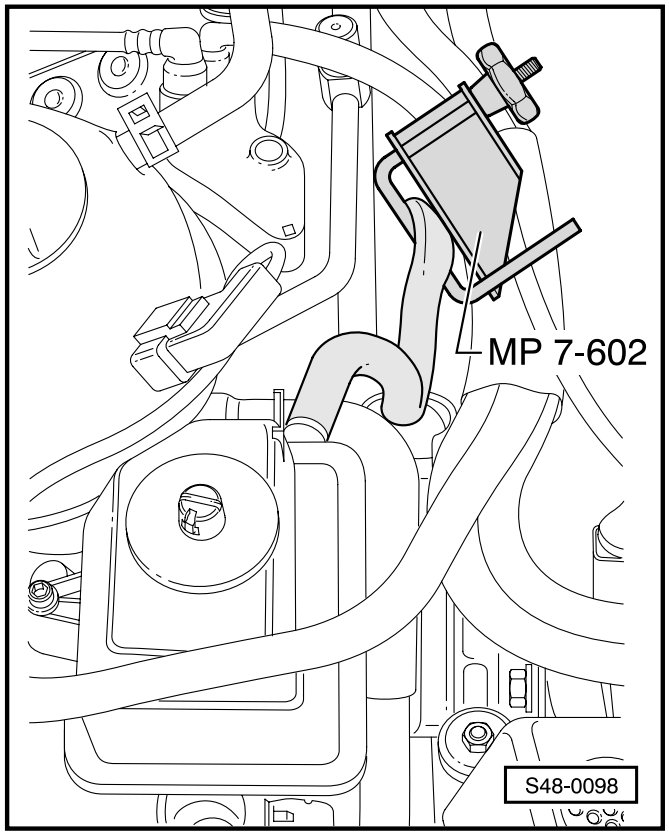
Models with low-mounted or high-mounted hydraulic pump

Special tools, testers and aids required

- Tester for power steering, e.g. V.A.G 1402
- Adapter, e.g. V.A.G 1402/1 A
- Adapter, e.g. V.A.G 1402/2
- Adapter, e.g. V.A.G 1402/3
- Hose from adapter set, e.g. V.A.G 1402/6
- Hose clamp MP 7-602

Notes:

- *If hydraulic fluid in reservoir is below minimum level, always inspect power steering system for leaks ⇒ page 48-30.*
- *If leaks exist at power steering gear, first of all inspect the lines and line connections for leaks, re-tighten, if necessary, and wipe dry.*
- *Inspecting seal at steering pinion and steering rack seal ⇒ page 48-30. If leaks exist at seal or at steering rack seal, replace power steering gear.*
- *Disposing of power steering gear ⇒ page 48-24.*

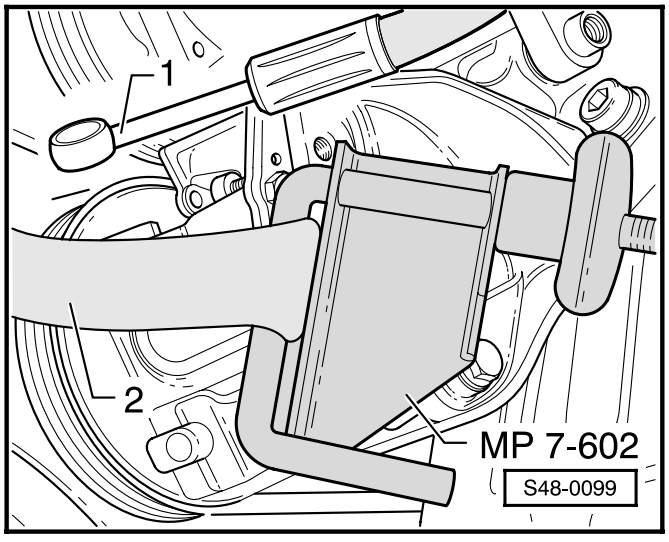


Models with low-mounted hydraulic pump

◄ - Pinch off return-flow line with hose clamp MP 7-602.

- Remove noise insulation in middle.

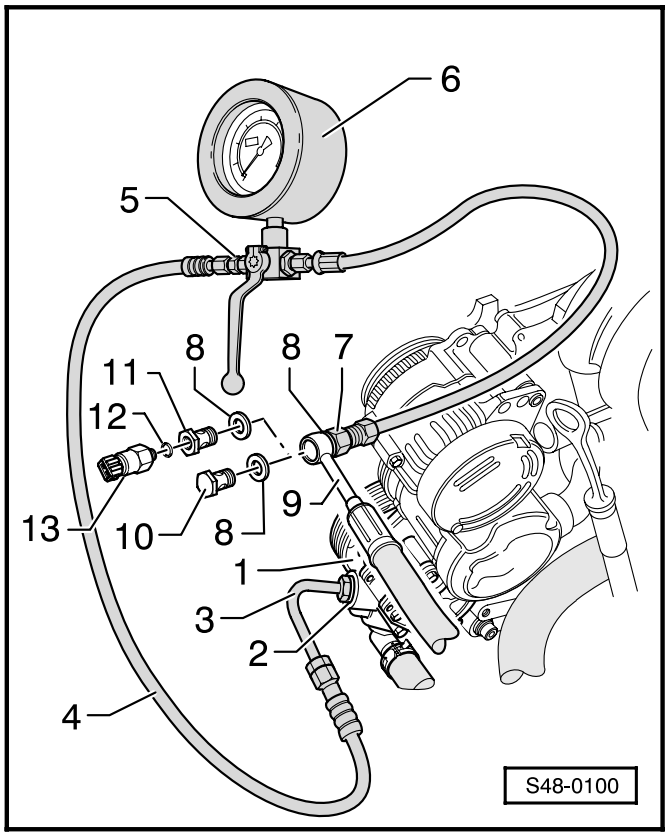
- Place drip tray for hydraulic fluid which flows out, below hydraulic pump.



◄ - Pinch off suction line -1- with hose clamp MP 7-602.

- On models with pressure switch, unplug connector of pressure switch.

- Detach pressure line -2- at hydraulic pump.



Note:

The surrounding area is not shown in the figure in order to simplify the illustration.

◄- Connect tester for power-assisted steering, e.g. V.A.G 1402.

1 - Hydraulic pump

2 - Seal
- Replace each time removed

3 - Adapter, e.g. V.A.G 1402/1 A

4 - Hose from adapter set, e.g. V.A.G 1402/6

5 - Adapter, e.g. V.A.G 1402/3

6 - Tester for power-assisted steering, e.g. V.A.G 1402

7 - Adapter, e.g. V.A.G 1402/2

8 - Seal
- Replace each time removed

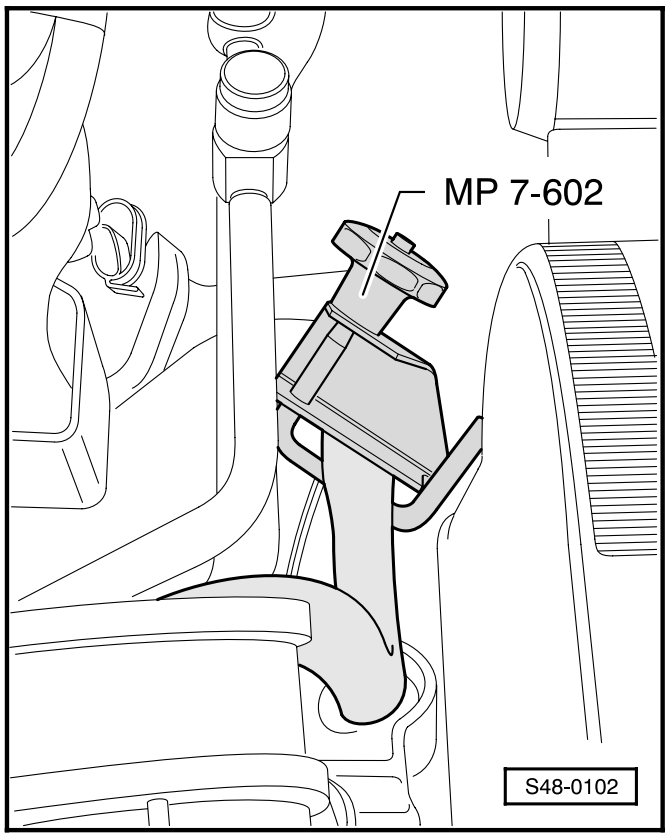
9 - Pressure line with ring union

10 - Banjo bolt
- For hydraulic pump without pressure switch

11 - Banjo bolt
- For hydraulic pump with pressure switch

12 - Seal
- For hydraulic pump with pressure switch
- Replace each time removed

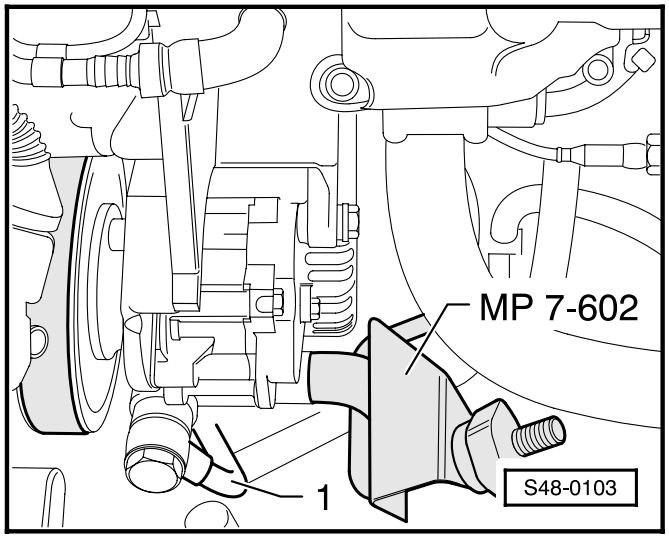
13 - Pressure switch



Models with high-mounted hydraulic pump

- Remove engine trim panel, as appropriate.

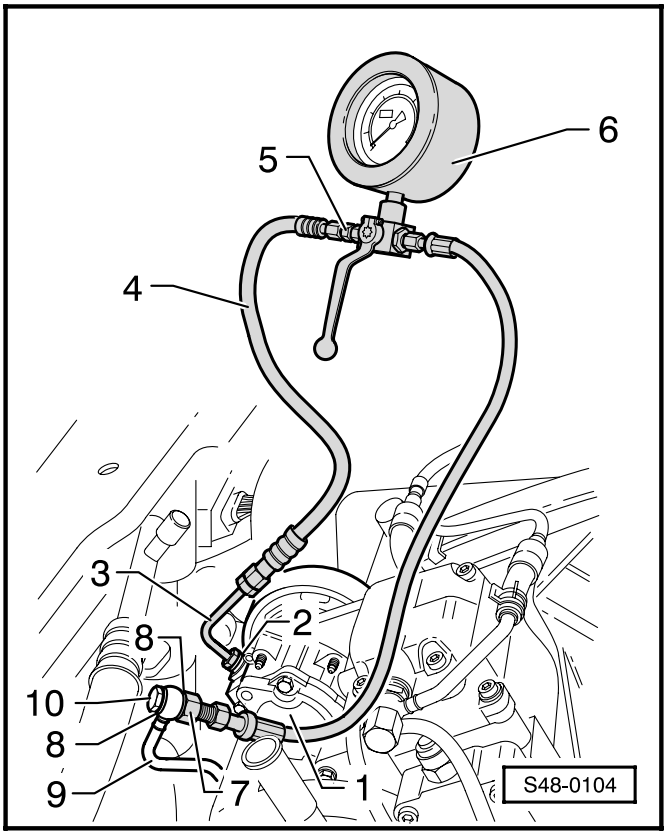
◄- Pinch off return-flow line with hose clamp MP 7-602.



◄- Pinch off suction line with hose clamp MP 7-602.

- Place drip tray for hydraulic fluid which flows out below hydraulic pump.

- Detach pressure line -1- at hydraulic pump.



Note:

The surrounding components are not shown in the figure in order to simplify the illustration.

◄- Connect power steering tester, e.g. V.A.G 1402.

1 - Hydraulic pump

2 - Seal
- ♦ Replace each time removed

3 - Adapter, e.g. V.A.G 1402/1 A

4 - Hose from adapter set, e.g. V.A.G 1402/ 6

5 - Adapter, e.g. V.A.G 1402/3

6 - Power steering tester, e.g. V.A.G 1402

7 - Adapter, e.g. V.A.G 1402/2

8 - Seal
- ♦ Replace each time removed

9 - Pressure line with banjo union

10 - Banjo bolt

Test requirements:

- V-belt in correct condition and correctly tensioned
- No leak in system
- Hoses/lines not kinked or caught in-between

Testing:

- Take hose clamps MP 7-602 off the suction and return-flow lines.
- Open shut-off valve at pressure gauge.
- Start engine and, if necessary, top up hydraulic fluid level in reservoir.
- Turn steering wheel 10x from lock to lock.
- Test delivery pressure.
- When engine is idling, close shut-off valve (not longer than 5 seconds), read off pressure at full steering lock and compare with specified pressure in the table below.

Engine	Rated pressure of hydraulic pump		Specified pressure	
	MPa	bar	MPa	bar
Petrol engines	9.0	90	8.5 ... 9.5	85 ... 95
Diesel engines	9.0	90	8.5 ... 9.5	85 ... 95

Notes:

If the pressure is lower or higher than the specified pressure, replace hydraulic pump.

Removing and installing high-mounted hydraulic pump ⇒ page 48-37.1

Removing and installing low-mounted hydraulic pump ⇒ page 48-41.

Disposing of hydraulic pump ⇒ page 48-45

- Switch off engine.
- Pinch off suction line and return-flow line with hose clamps MP 7-602.
- Disconnect power steering tester, e.g. V.A.G 1402.

Removing and installing hydraulic pump

Notes:

- *No provision is made for repairing the hydraulic pump. If a complaint exists, carry out the pressure and leaktightness test in order to determine the cause. If a fault exists, replace the hydraulic pump.*
- *Pumps supplied as replacement parts are not filled with oil. For this reason, it is essential to fill the pump with hydraulic oil G 002 000 and to rotate it by hand before it is installed; if this is not done, noise problems may occur when driving or the pump may be damaged.*
- *Grade of oil: central hydraulic oil G 002 000*
- *Quantity of oil in system: 0.7 ... 0.9 ltr.*
- *Do not remove replacement parts from their wrapping until just before installing.*
- *Use only genuine wrapped parts.*
- *Do not re-use drained hydraulic oil.*
- *Always replace seals.*
- *Before removing the ribbed V-belt, mark the direction of running. If a used belt is fitted on again to run in the opposite direction, it may be destroyed. When installing the belt, ensure it is correctly located in the belt pulleys.*
- *Disposal ⇒ page 48-45.*
- *Version and attachment of hydraulic pump as well as bracket may differ from the illustration depending on engine version and whether vehicle is equipped with air conditioning or not.*

Vehicles fitted with 1.4-ltr./44 kW engine:

- *Mark installation position of belt pulley before removing.*

  If the belt pulley of the hydraulic pump is installed in the opposite direction, this will result in an offset to the other belt pulleys. The ribbed V-belt will be damaged as a result of this offset running.

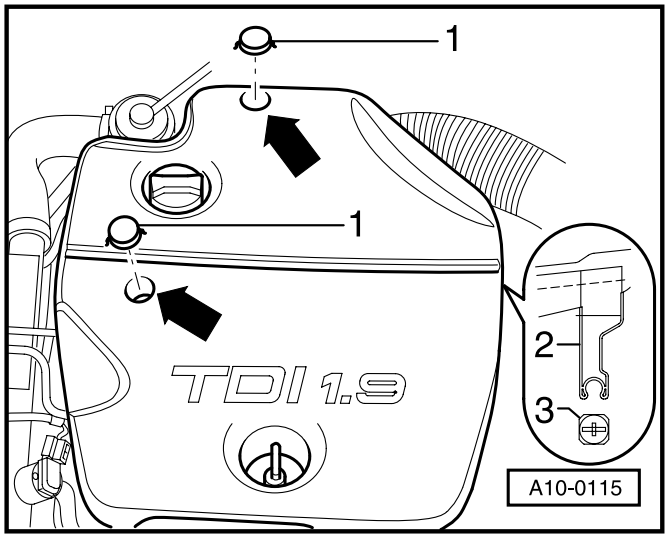
Models with high-mounted hydraulic pump

Special tools, testers and aids required

- Hose clamp MP 7-602
- Pliers for spring strap clip, e.g. Matra V/131
- Central hydraulic fluid
  TL 52 146
  N 052 146 00
  e.g. PENTOSIN CHF 11 S (G 002 000)

Removing

Illustration shows engine trim panel of the 1.9-ltr./66 kW (TDI) engine. Other engine versions have a trim panel which differs from the illustration.



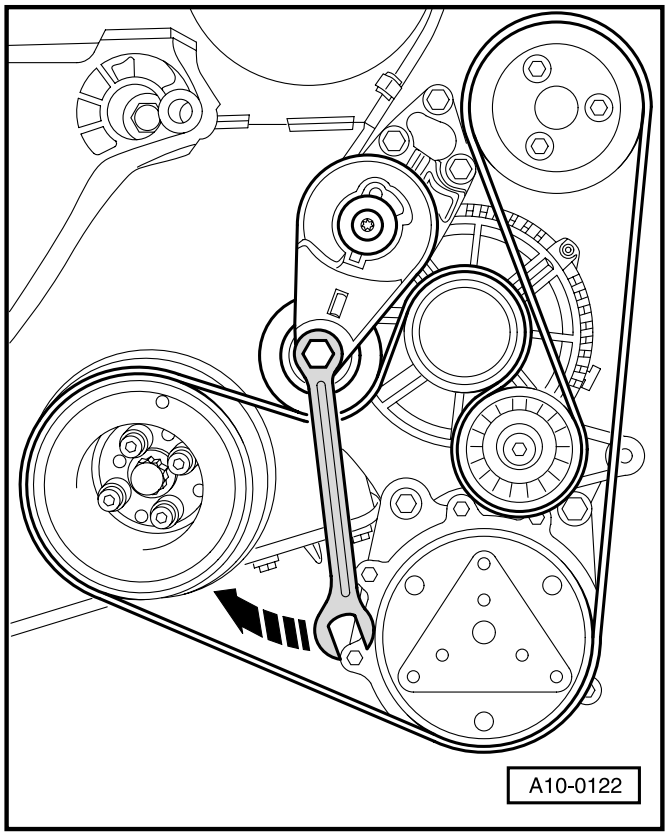
◄- Remove engine trim pane.

1 - Plug

2 - Clip

3 - Pin

Illustration shows ribbed V-belt version on models with air conditioning. Different routing of ribbed V-belt on models without air conditioning.



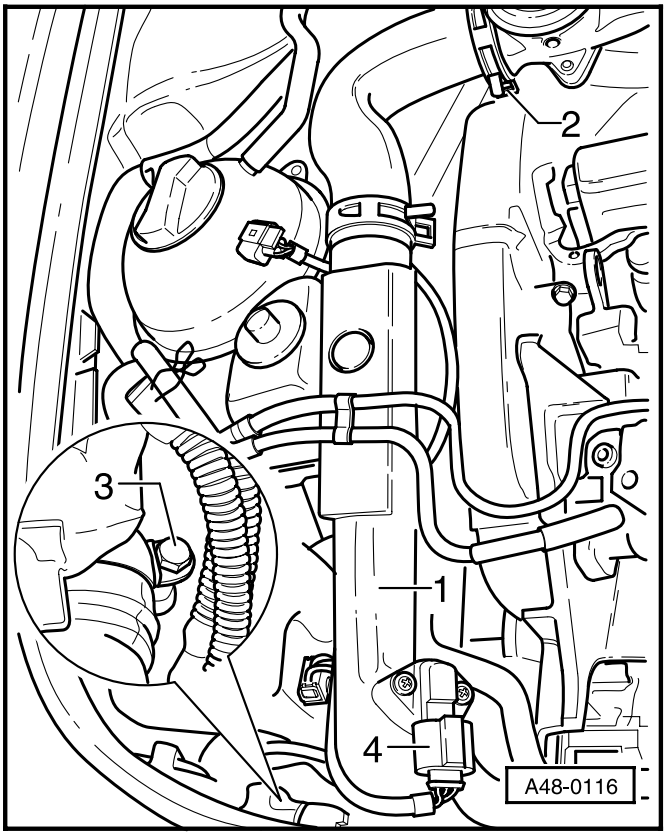
Note:

Before removing the ribbed V-belt, mark the direction of running. If a used belt is fitted on again to run in the opposite direction, it may be destroyed. When installing the belt, ensure it is correctly located in the belt pulleys.

◄ - Position flat ring wrench waf 16 against hexagon of tensioning pulley.

- Swivel tensioning pulley in direction of arrow in order to slacken the ribbed V-belt.

- Take off ribbed V-belt.



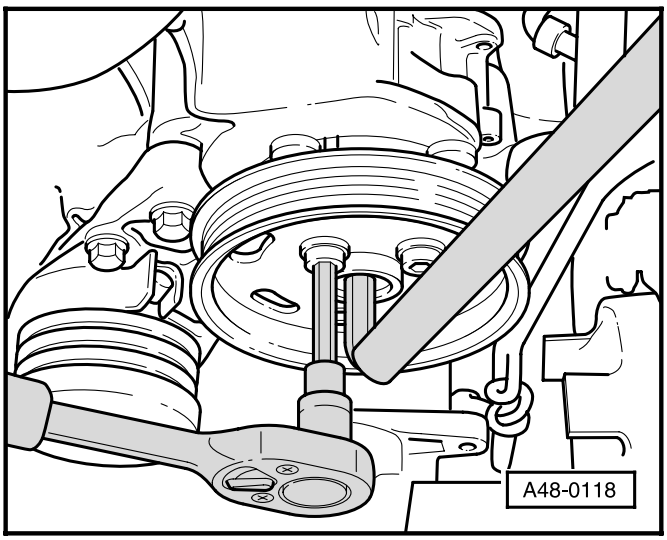
The illustration shows the routing of the intake manifold on the 1.9-ltr./66 kW TDI engine. The steps described below should only be carried out on this engine version.

◄- Use special tool, e.g. Matra V/131, to open spring strap clip -2-.

- Open screw-type clamp -3-.

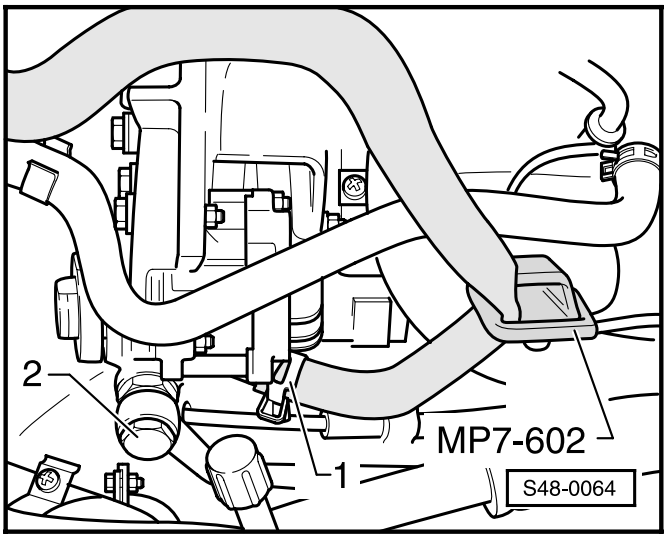
- Unplug connector -4-.

- Remove intake manifold -1-.



Valid for all engine versions with and without air conditioning.

◄- Unbolt belt pulley; counter-hold with hexagon socket wrench (size 9 mm).

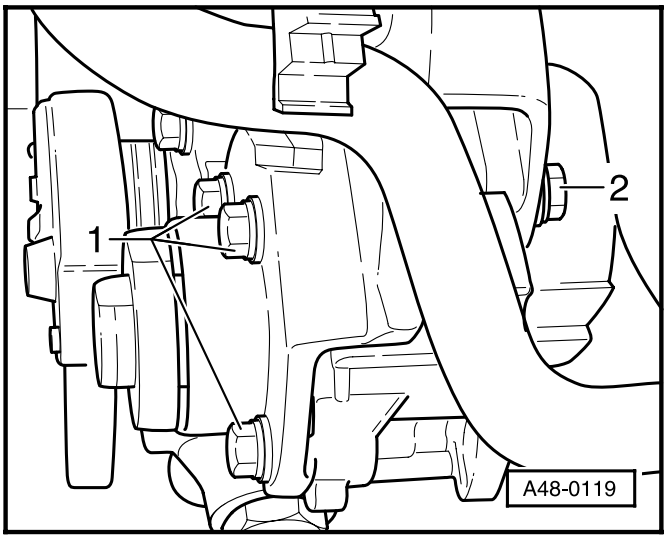


Valid for all models with air conditioning and hydraulic pump positioned at top.

◄- Use special tool MP 7-602 to pinch off suction pipe of hydraulic fluid reservoir/hydraulic pump.

- Use special tool, e.g. Matra V/131, to open spring strap clip -1- and detach suction pipe from the hydraulic pump.

- Detach pressure pipe (flexible hose) -2-.



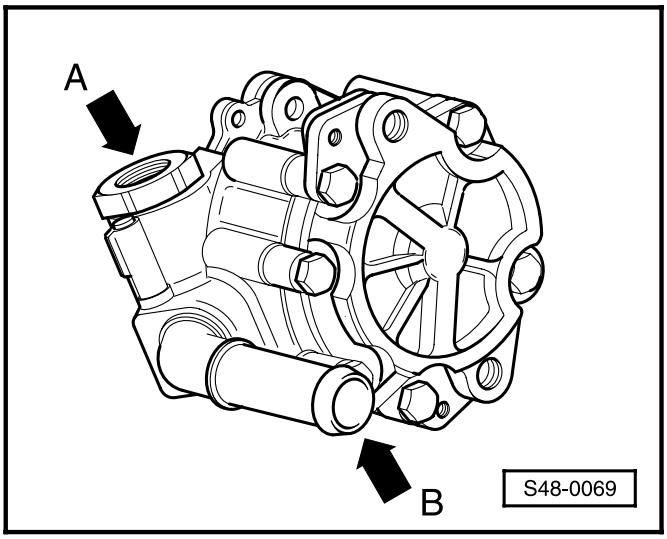
◄- Unscrew bolts -1- and -2-.

- Take hydraulic pump out of bracket.

Installing

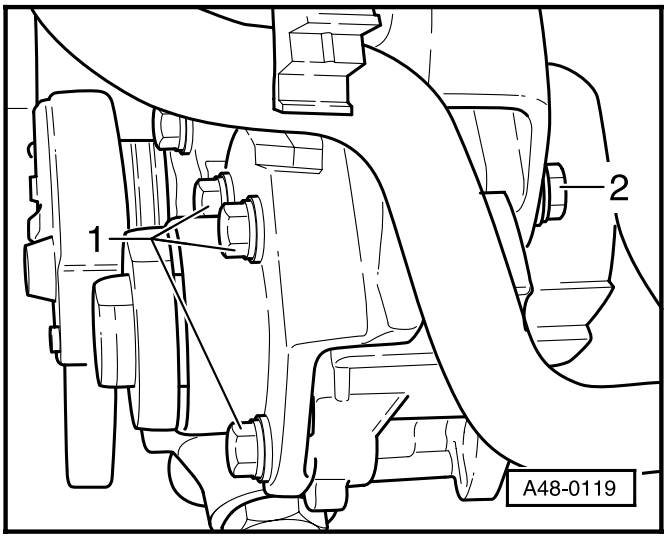
Notes:

- *Hydraulic pumps supplied through the Parts Sector are not filled with hydraulic fluid. For this reason, it is essential to fill pump with hydraulic fluid G 002 000 before installing and to rotate it by hand otherwise noises may occur in operation or the pump may be damaged.*
- *Contact surfaces and threads on both sides of hydraulic pump must be free of paint.*
- *Do not re-use drained hydraulic fluid.*
- *Replace seals.*



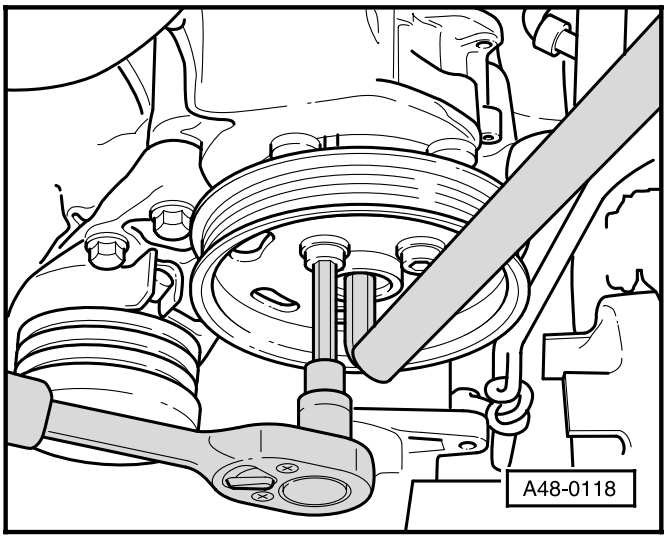
◄- Fill hydraulic pump with hydraulic fluid through the suction connection -arrow B-.

- Rotate hub of hydraulic pump by hand until hydraulic fluid flows out of the pressure connection -arrow A-.



◄- Insert hydraulic pump into bracket and insert bolts -1- and -2-.

Tightening torque: 25 Nm



◄- Fit belt pulley onto hydraulic pump with hexagon socket bolt, counter-hold with hexagon socket wrench (size 9 mm).

Tightening torque: 25 Nm

- Install ribbed V-belt.

⇒ Engine, Mechanical Components; Repair Group 13; Disassembling and assembling engine

Note:

When installing ribbed V-belt, ensure it is correctly located in the belt pulleys.

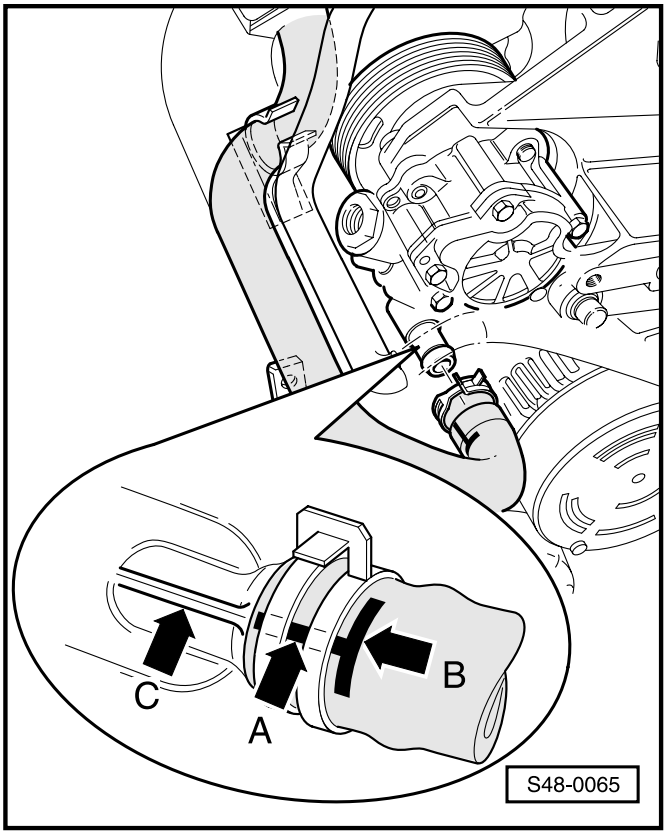
- Engine 1.9-ltr./66 kW TDI: install intake manifold.

Note:

Use new seals for connection of pressure line.

- Install pressure line (flexible hose).

Tightening torque of banjo bolt: 38 Nm



◄- Install spring strap clamp and suction line as shown in illustration.

- Longitudinal marking -A- on suction line must be aligned with the shaped seam -C- on the hydraulic pump.

- Install spring strap clamp up to not more than the transverse marking -B-.

- Take hose clamp MP 7-602 off the suction line.

- Replenish hydraulic fluid and bleed power-assisted steering system, if necessary
⇒ page 48-28.

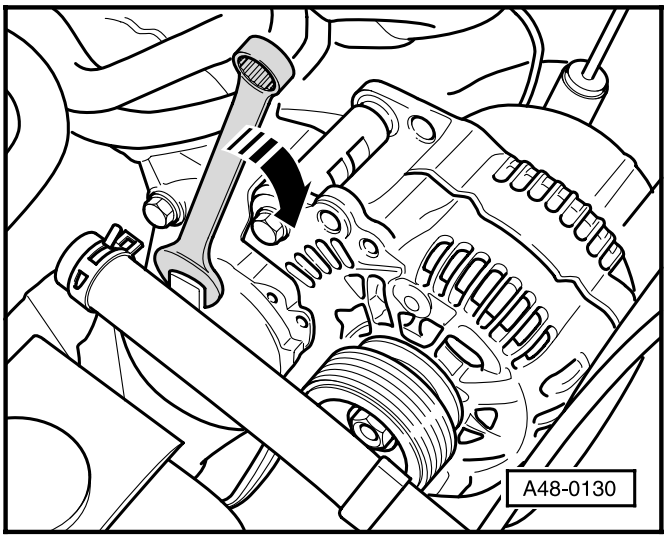
- Inspect line connections for leaks
⇒ page 48-30.

- Install engine trim panel.

Models with low-mounted hydraulic pump

- Hose clamp MP 7-602
- Pliers for spring strap clip, e.g. Matra V/131
- Central hydraulic fluid
  TL 52 146
  N 052 146 00
  e.g. PENTOSIN CHF 11 S (G 002 000)

Removing



Note:

Before removing the ribbed V-belt, mark the direction of running. When installing the belt, ensure it is correctly located in the belt pulleys.

◄- Use open-end wrench to swivel tensioning pulley in direction of arrow.

- Take off ribbed V-belt.

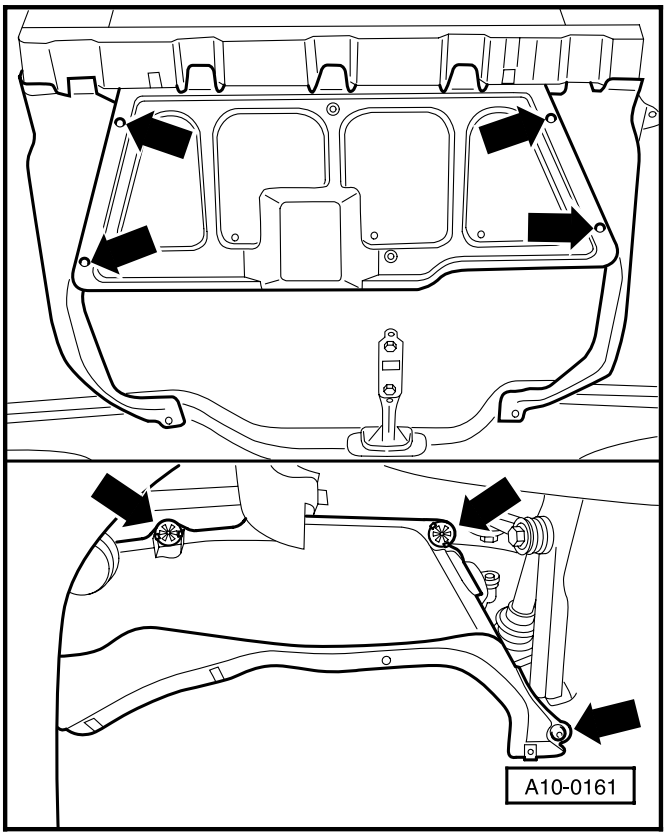


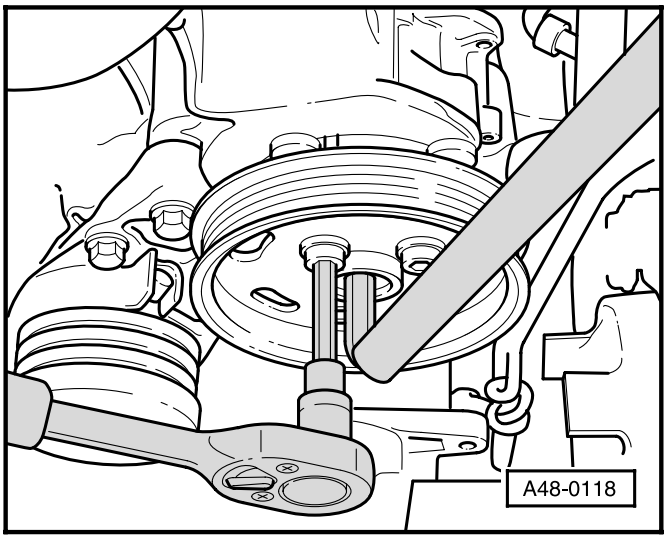
Illustration shows noise insulation in middle and on left on models with petrol engines.

◄- Remove noise insulation in middle -arrows- and on right.

Applies to all petrol engines not fitted with air conditioning.

Vehicles fitted with 1.4-ltr./44 kW engine:

- Mark installation position of belt pulley before removing.

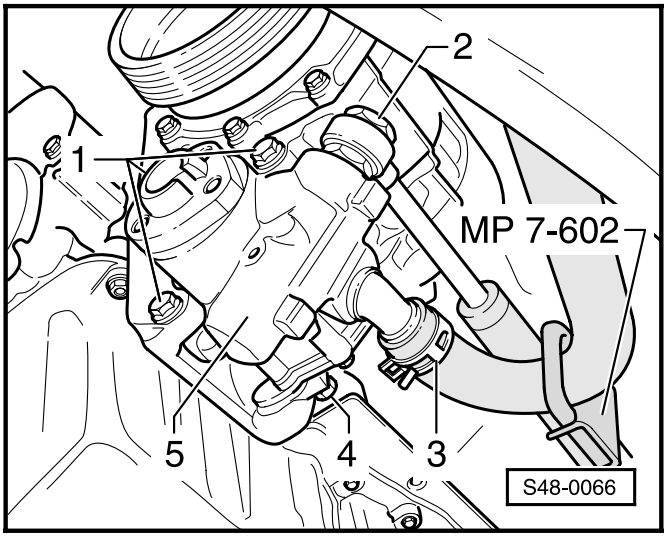


Note:

If the belt pulley of the hydraulic pump is installed in the opposite direction, this will result in an offset to the other belt pulleys. The ribbed V-belt will be damaged as a result of this offset running.

Continued for all models

◄- Unbolt belt pulley; counter-hold with hexagon socket wrench (waf 9 mm).



◄- Pinch off inlet line of hydraulic oil/hydraulic pump reservoir with special tool MP 7-602.

- Open spring strap clip -3- with special tool, e.g. Matra V/131, and detach inlet line from hydraulic pump.

Vehicles without pressure switch (ill.)

- Unscrew banjo bolt -2- and take off pressure line (flexible hose).

Vehicles with pressure switch (not ill.)

- Unplug connector from pressure switch.

- Unscrew pressure switch and take off pressure line (flexible hose).

Continued for all models

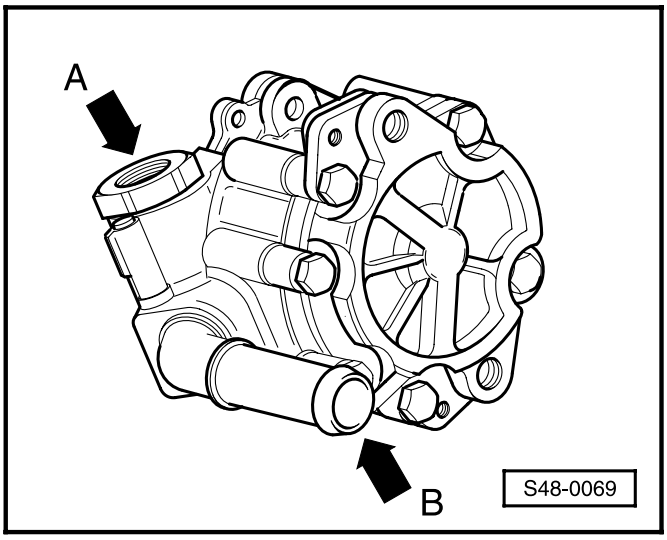
- Unscrew bolts -1- and -4-.

- Take hydraulic pump -5- out of bracket.

Installing

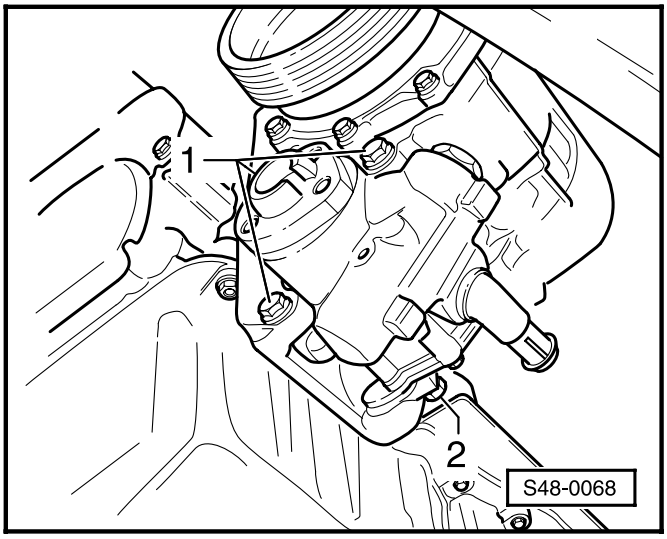
Notes:

- *Hydraulic pumps supplied through the Parts Sector are not filled with hydraulic fluid. For this reason, it is essential to fill pump with hydraulic fluid G 002 000 before installing and to rotate it by hand otherwise noises may occur in operation or the pump may be damaged.*
- *Contact surfaces and threads on both sides of hydraulic pump must be free of paint.*
- *Do not re-use drained hydraulic fluid.*
- *Replace seals.*



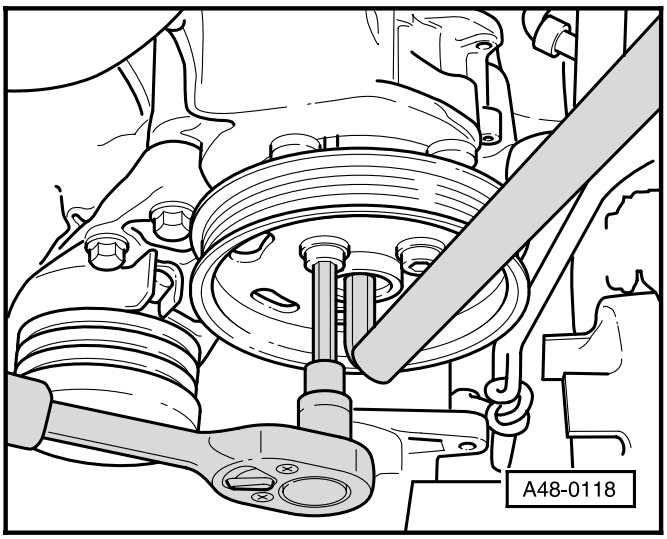
◄- Fill hydraulic pump with hydraulic fluid through the suction connection -arrow B-.

- Rotate hub of hydraulic pump by hand until hydraulic fluid flows out of the pressure connection -arrow A-.



◄- Insert hydraulic pump into bracket and insert bolts -1- and -2-.

Tightening torque: 25 Nm



Models with 1.4 l/44 kW engine:

◄- Attach belt pulley with the hexagon socket bolts to the hydraulic pump according to the marking made; use Allen key (waf 9 mm) to counter-hold.

Tightening torque: 25 Nm

Note:

If the belt pulley of the hydraulic pump is fitted on the wrong way round, this will result in an offset to the other belt pulleys. This offset will result in the ribbed V-belt being damaged.

Continued for all models

- Attach belt pulley to hydraulic pump with hexagon socket bolts; use Allen key (waf 9 mm) for counter-holding.

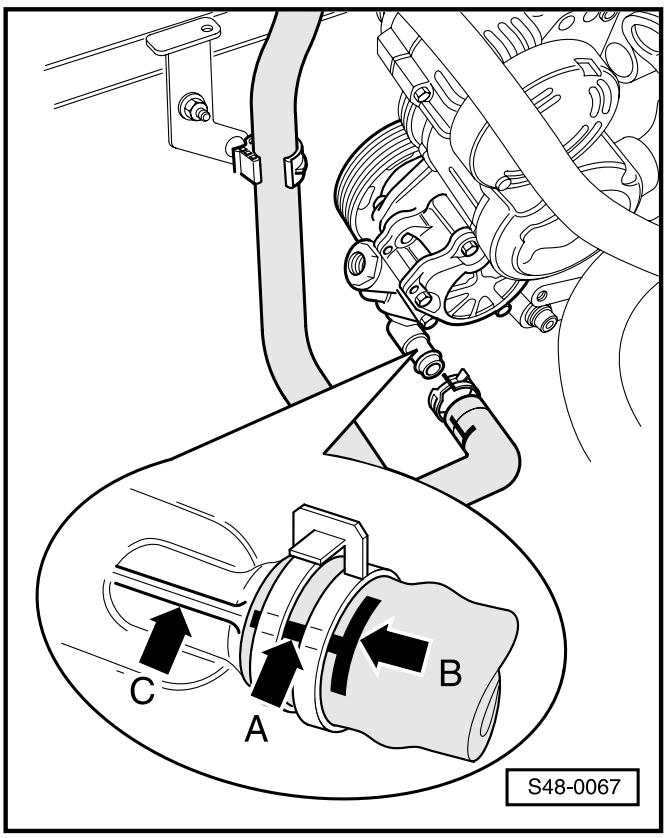
Tightening torque: 25 Nm

- Install ribbed V-belt.

⇒ Engine, Mechanical Components; Repair Group 13; Disassembling and assembling engine

Notes:

- *When installing the ribbed V-belt, ensure it is correctly located in the belt pulleys.*
- *Use new seals for the connection of the pressure line.*



- Install pressure line (flexible hose).

Tightening torque of banjo bolt and of pressure switch: 38 Nm

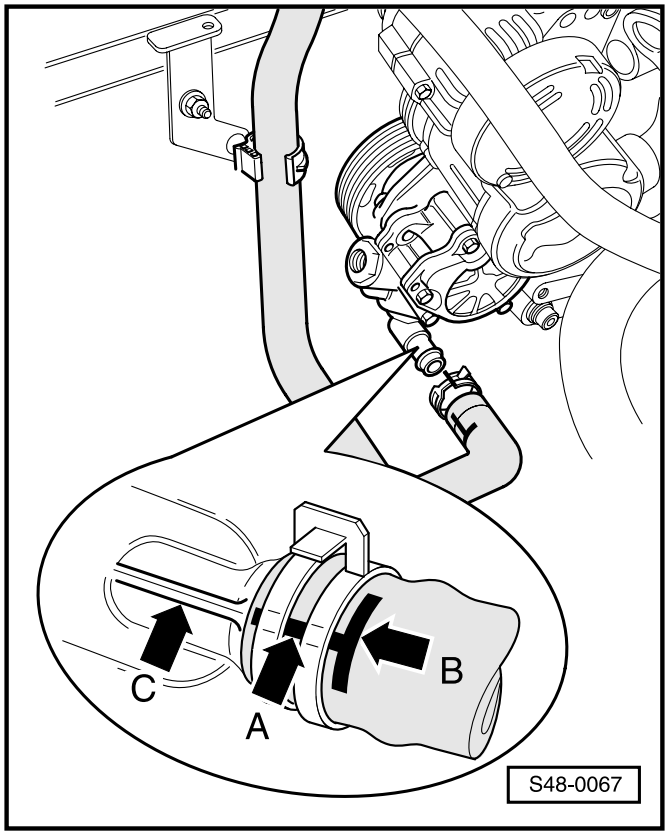
◄- Install spring collar clamp and suction line as shown.

- Lengthwise marking -A- on the suction line must be aligned with the shaped seam -C- on the hydraulic pump.

- Install spring collar clamp up to not more than cross marking -B-.

- Take hose clamp MP 7-602 off the suction line.

- Replenish hydraulic oil and bleed power steering system, if necessary ⇒ page 48-28.



◄- Install spring strap clamp and intake line, as shown in Fig.

- Longitudinal marking -A- on intake line must be aligned with the raised seam -C- on the hydraulic pump.

- Install spring strap clamp so that it is not beyond the cross marking -B-.

- Take hose clamp MP 7-602 off the intake line.

- Replenish hydraulic oil and bleed power steering system, if necessary ⇒ page 48-28.

- Inspect line connections for leaks ⇒ page 48-30.

- Install middle and right noise insulation panels.

- Inspect line connections for leaks ⇒ page 48-30.

- Install noise insulation panel in middle and on right.

Disposing of hydraulic pump

Special tools, testers and aids required

♦ Vessel for connecting hydraulic oil

Notes:

♦ *The oils used in hydraulic pumps do not contain any harmful substances. Such oils can be disposed of together with old oil from engines and gearboxes.*

♦ *Dispose of old oils in accordance with applicable environmental protection regulations.*

♦ *Old oils (the term old oils refer to used engine and gearbox oils incl. ATF as well as mineral hydraulic oils) which are suitable for reprocessing, must on no account be mixed with brake fluid, antifreeze agent, synthetic resin on nitro-thinners, chemicals etc.*

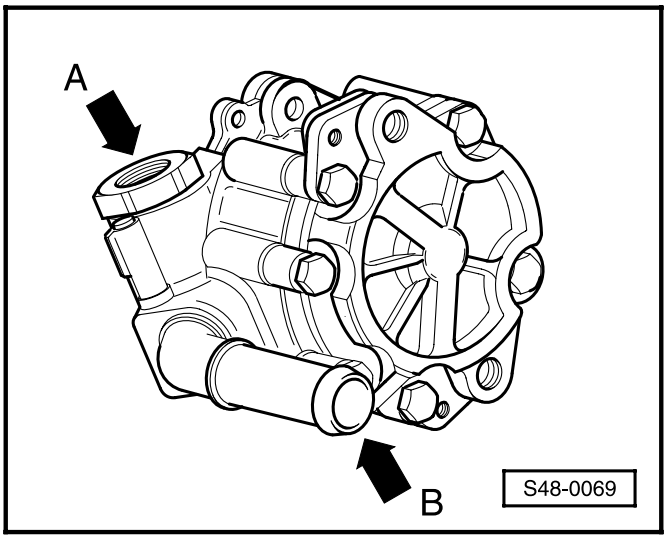
♦ *After "emptying", the old parts must be allowed to drain adequately by dripping.*

♦ *When disposing of old parts, pay attention to the legal regulations as slight quantities of hydraulic oil still remain in the hydraulic pump.*

- Remove hydraulic pump.

♦ Models with top-mounted hydraulic pump ⇒ page 48-37.1

♦ Models with bottom-mounted hydraulic pump ⇒ page 48-41



◄- Hold hydraulic pump above collecting vessel and allow hydraulic oil to flow out by turning or rotating pump several times.

Line connections -arrows A and B- must not be sealed.

- Dispose of hydraulic pump.