

Audi A4 1995 ➤

5-Speed Manual Gearbox 01A (4WD)									
Gearbox ID	CPS	CPU	CTF	CXF	CXW	CXZ	CYA	CZX	DDL
	DGW	DJF	DJJ	DJP	DJR	DJS	DJV	DWM	DWN
	DWQ	DWR	EEP						

Edition 07.1997



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List of Workshop Manual Repair GroupsList of Workshop Manual
Repair GroupsList of Workshop Manual Repair Groups

Audi A4 1995 ➤

5-Speed Manual Gearbox 01A (4WD)

Repair Group

00 - Technical data

30 - Clutch

34 - Controls, Housing

35 - Gears, Shafts

39 - Final drive, Differential rear



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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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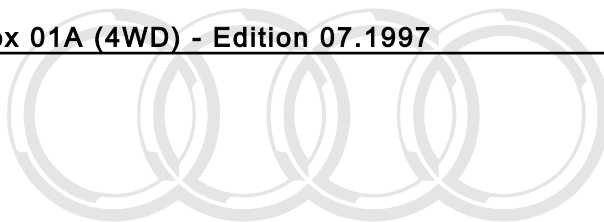
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Audi 5-Speed Manual Gearbox 01A (4WD) - Edition 07.1997



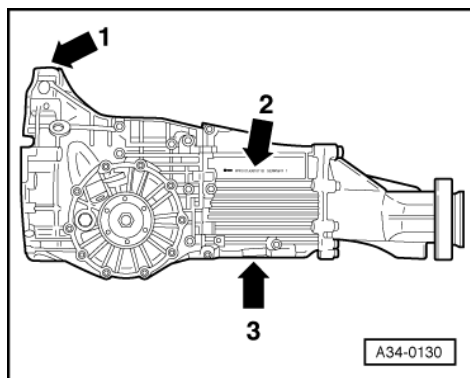
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00 - Technical data

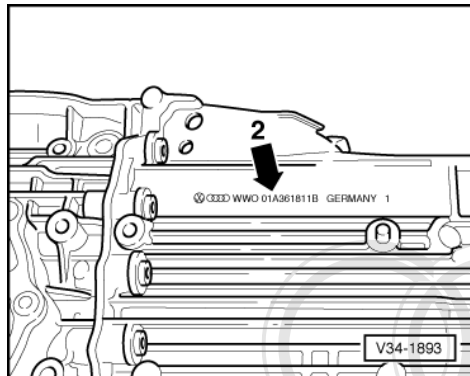
1 - Gearbox identification

1.1 - Gearbox identification

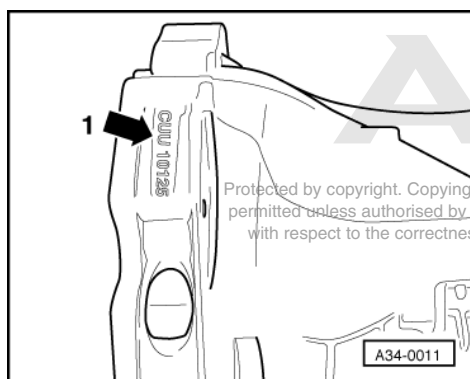


-> Location on gearbox

Code letters and date of manufacture (arrow 1)
Manual gearbox 01A (arrow 2)
Code letters (arrow 3)



-> Manual gearbox 01A (arrow 2)



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-> Code letters and date of manufacture of gearbox (arrow 1)

Example:	CUU	10	12	5
	Code letters	Day	Month	Year (1995) of manufacture

Additional data is production-related

Note:

The code letters of the gearbox are also stamped on lower part of gearbox cover and given on the vehicle data stickers.

1.2 - Code letters, mechanical unit assignment, transmission ratios, capacities

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		CPS	CPU	CTF	CXF
Production	from	04.95	11.94	11.94	11.94
	to	07.96	07.96	07.96	11.94
Allocation	Model Engine	Audi A4 1995 ä 2.6 l - 102 kW GUS, China	Audi A4 1995 ä 1.8 l - 92 kW	Audi A4 1995 ä 1.8 l - 110 kW	Audi A4 1995 ä 2.8 l - 128 kW
Ratio Z2 : Z1=i	Final drive	37 : 9 = 4.111	41 : 9 = 4.556	35 : 9 = 3.889	35 : 9 = 3.889
	1st gear	35 : 10 = 3.500	35 : 10 = 3.500	34 : 9 = 3.778	35 : 10 = 3.500
	2nd gear	36 : 17 = 2.118	36 : 17 = 2.118	37 : 17 = 2.176	35 : 18 = 1.944
	3rd gear	40 : 28 = 1.429	39 : 30 = 1.300	40 : 28 = 1.429	39 : 30 = 1.300
	4th gear	35 : 34 = 1.029	33 : 35 = 0.943	35 : 34 = 1.029	33 : 35 = 0.943
	5th gear	31 : 37 = 0.838	30 : 38 = 0.789	31 : 37 = 0.838	30 : 38 = 0.789
	Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444

Code letters	CPS	CPU	CTF	CXF
Speedometer	electronic			
Capacity	2.75 litres			
Specification	Gear oil G 052 911 A SAE 75-W 90 (synthetic oil)			
Clutch mechanism	hydraulic			
Clutch plate ø	228 mm	228 mm	228 mm	240 mm
Drive shaft flange ø	100 mm			
Overall ratio iov. in top gear	3.444	3.596	3.258	3.070
Assignment of rear final drive Code letters	CKJ	CKK	CKH DAJ	CKH

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		CXW	CXZ	CYA	CZX
Production	from	11.94	11.94	11.94	07.95
	to	07.96	11.94	07.96	07.96
Allocation	Model	Audi A4 1995 ä	Audi A4 1995 ä	Audi A4 1995 ä	Audi A4 1995 ä

Manual gearbox		5-speed 01A four-wheel drive			
Engine		2.8 l - 128 kW	2.6 l - 110 kW	2.6 l - 110 kW	1.8 l - 88 kW GUS, China
Ratio Z2 : Z1=i	Final drive	35 : 9 = 3.889	37 : 9 = 4.111	37 : 9 = 4.111	41 : 9 = 4.556
	1st gear	35 : 10 = 3.500	35 : 10 = 3.500	35 : 10 = 3.500	34 : 9 = 3.778
	2nd gear	35 : 18 = 1.944	35 : 18 = 1.944	35 : 18 = 1.944	37 : 17 = 2.176
	3rd gear	39 : 30 = 1.300	39 : 30 = 1.300	39 : 30 = 1.300	40 : 28 = 1.429
	4th gear	33 : 35 = 0.943	33 : 35 = 0.943	33 : 35 = 0.943	35 : 34 = 1.029
	5th gear	30 : 38 = 0.789	30 : 38 = 0.789	30 : 38 = 0.789	30 : 38 = 0.789
	Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444

Code letters	CXW	CXZ	CYA	CZX
Speedometer	electronic			
Capacity	2.75 litres			
Specification	Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)			
Clutch mechanism	hydraulic			
Clutch plate ø	240 mm	228 mm	228 mm	228 mm
Drive shaft flange ø	100 mm			
Overall ratio iov. in top gear	3.070	3.246	3.246	3.596
Assignment of rear final drive Code letters	CKH	CKJ	CKJ	CKK

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		DDL	DGW	DJF	DJJ
Production	from	03.96	07.96	07.96	07.96
	to	07.96	08.98	07.97	08.98
Allocation	Model	Audi A4 1995 ä	Audi A4 1995 ä	Audi A4 1995 ä	Audi A4 1995 ä
	Engine	2.8 l - 142 kW	1.9 l - 81 kW TDI	2.6 l - 102 kW GUS, China	1.8 l - 110 kW 1.8 l - 132 kW
Ratio Z2 : Z1=i	Final drive	35 : 9 = 3.889	35 : 9 = 3.889	37 : 9 = 4.111	35 : 9 = 3.889
	1st gear	35 : 10 = 3.500	35 : 10 = 3.500	35 : 10 = 3.500	34 : 9 = 3.778
	2nd gear	35 : 18 = 1.944	35 : 18 = 1.944	36 : 17 = 2.118	37 : 17 = 2.176
	3rd gear	39 : 30 = 1.300	38 : 31 = 1.226	40 : 28 = 1.429	40 : 28 = 1.429
	4th gear	33 : 35 = 0.943	31 : 37 = 0.838	35 : 34 = 1.029	35 : 34 = 1.029
	5th gear	30 : 38 = 0.789	27 : 41 = 0.659	31 : 37 = 0.838	31 : 37 = 0.838
	Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444

Code letters	DDL	DGW	DJF	DJJ
Speedometer	electronic			
Capacity	2.75 litres			
Specification	Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)			
Clutch mechanism	hydraulic			
Clutch plate ø	240 mm	228 mm	228 mm	228 mm
Drive shaft flange ø	100 mm	Tripod	100 mm	
Overall ratio iov. in top gear	3.070	2.561	3.444	3.258
Assignment of rear final drive Code letters	CKH DAJ	DAJ	DAK	DAJ



Manual gearbox		5-speed 01A four-wheel drive			
Code letters		DJP	DJR	DJS	DJV
Production	from	07.96	07.96	07.96	07.96
	to	07.97	08.98	08.98	08.98
Allocation	Model Engine	Audi A4 1995 ä 2.8 l - 128 kW	Audi A4 1995 ä 2.8 l - 142 kW	Audi A4 1995 ä 2.4 l - 120 kW 2.4 l - 121 kW 2.6 l - 110 kW	Audi A4 1995 ä 1.8 l - 88 kW GUS, China 1.8 l - 92 kW
Ratio Z2 : Z1=i	Final drive	35 : 9 = 3.889	35 : 9 = 3.889	37 : 9 = 4.111	41 : 9 = 4.556
	1st gear	35 : 10 = 3.500	35 : 10 = 3.500	35 : 10 = 3.500	34 : 9 = 3.778
	2nd gear	35 : 18 = 1.944	35 : 18 = 1.944	35 : 18 = 1.944	37 : 17 = 2.176
	3rd gear	39 : 30 = 1.300	39 : 30 = 1.300	39 : 30 = 1.300	40 : 28 = 1.429
	4th gear	33 : 35 = 0.943	33 : 35 = 0.943	33 : 35 = 0.943	35 : 34 = 1.029
	5th gear	30 : 38 = 0.789	30 : 38 = 0.789	30 : 38 = 0.789	30 : 38 = 0.789
	Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444

Code letters	DJP	DJR	DJS	DJV
Speedometer	electronic			
Capacity	2.75 litres			
Specification	Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)			
Clutch mechanism	hydraulic			
Clutch plate ø	240 mm	240 mm	228 mm	228 mm
Drive shaft flange ø	100 mm			
Overall ratio iov. in top gear	3.070	3.070	3.246	3.596
Assignment of rear final drive Code letters	DAJ	DAJ	DAK	CKK

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		DWM	DWN	DWQ	DWR
Production	from	08.98	08.97	08.97	08.97
	to	-	-	-	-
Allocation	Model Engine	Audi A4 1995 ä 2.8 l - 142 kW 2.8 l - 140 kW	Audi A4 1995 ä 2.4 l - 120 kW 2.4 l - 121 kW	Audi A4 1995 ä 1.8 l - 88 kW GUS, China 1.8 l - 92 kW	Audi A4 1995 ä 1.8 l - 110 kW 1.8 l - 132 kW
Ratio Z2 : Z1=i	Final drive	35 : 9 = 3.889	37 : 9 = 4.111	41 : 9 = 4.556	35 : 9 = 3.889
	1st gear	35 : 10 = 3.500	35 : 10 = 3.500	34 : 9 = 3.778	34 : 9 = 3.778
	2nd gear	35 : 18 = 1.944	35 : 18 = 1.944	37 : 17 = 2.176	37 : 17 = 2.176
	3rd gear	39 : 30 = 1.300	39 : 30 = 1.300	40 : 28 = 1.429	40 : 28 = 1.429
	4th gear	33 : 35 = 0.943	33 : 35 = 0.943	35 : 34 = 1.029	35 : 34 = 1.029
	5th gear	30 : 38 = 0.789	30 : 38 = 0.789	30 : 38 = 0.789	31 : 37 = 0.838
	Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444

Code letters	DWM	DWN	DWQ	DWR
Speedometer	electronic			
Capacity	2.75 litres			
Specification	Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)			
Clutch mechanism	hydraulic			

Clutch plate ø	240 mm	228 mm	228 mm	228 mm
Drive shaft flange ø	100 mm			
Overall ratio iov. in top gear	3.070	3.246	3.596	3.258
Assignment of rear final drive Code letters	DAJ	DAK	CKK	DAJ

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		EEP			
Production	from	08.98			
	to	-			
Allocation	Model	Audi A4 1995 ä 1.9 l - 81 kW TDI			
	Engine				
Ratio Z2 : Z1=i	Final drive	35 : 9 = 3.889			
	1st gear	35 : 10 = 3.500			
	2nd gear	35 : 18 = 1.944			
	3rd gear	38 : 31 = 1.226			
	4th gear	31 : 37 = 0.838			
	5th gear	27 : 41 = 0.659			
	Reverse gear	31 : 9 = 3.444			

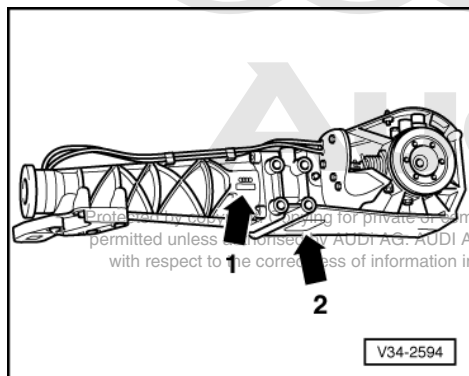
Code letters	EEP			
Speedometer	electronic			
Capacity	2.75 litres			
Specification	Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)			
Clutch mechanism	hydraulic			
Clutch plate ø	228 mm			
Drive shaft flange ø	Tripod			
Overall ratio iov. in top gear	2.561			
Assignment of rear final drive Code letters	DAJ			

2 - Rear final drive identification

2.1 - Rear final drive identification

Final drive 01H is assigned to the manual gearbox 01A, four-wheel drive.

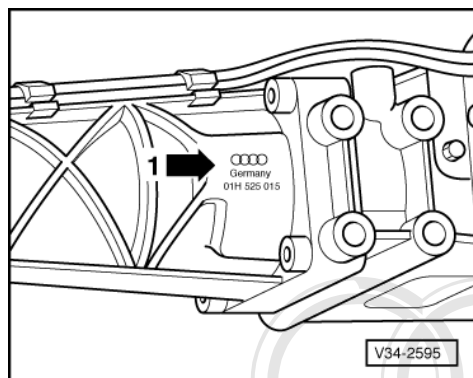
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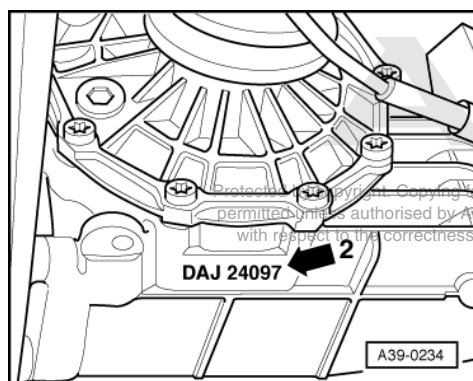


-> Location on final drive

- ♦ Final drive 01H -arrow 1-
- ♦ Code letters and date of manufacture -arrow 2-



-> Final drive 01H -arrow 1-



-> Code letters and date of manufacture of rear final drive -arrow 2-:

Example:	DAJ	24	09	7
	Code letters	Day	Month	Year (1997)
				of manufacture

Note:

The code letters for the rear final drive are also given on the vehicle data plates.

2.2 - Code letters, mechanical unit assignment, transmission ratios, capacities

Rear final drive		01H		
Code letters		CKH	CKJ	CKK
Production	from	07.94	07.94	07.94
	to	06.96	06.96	-
Allocation	Model	Audi A4 1995 ä	Audi A4 1995 ä	Audi A4 1995 ä

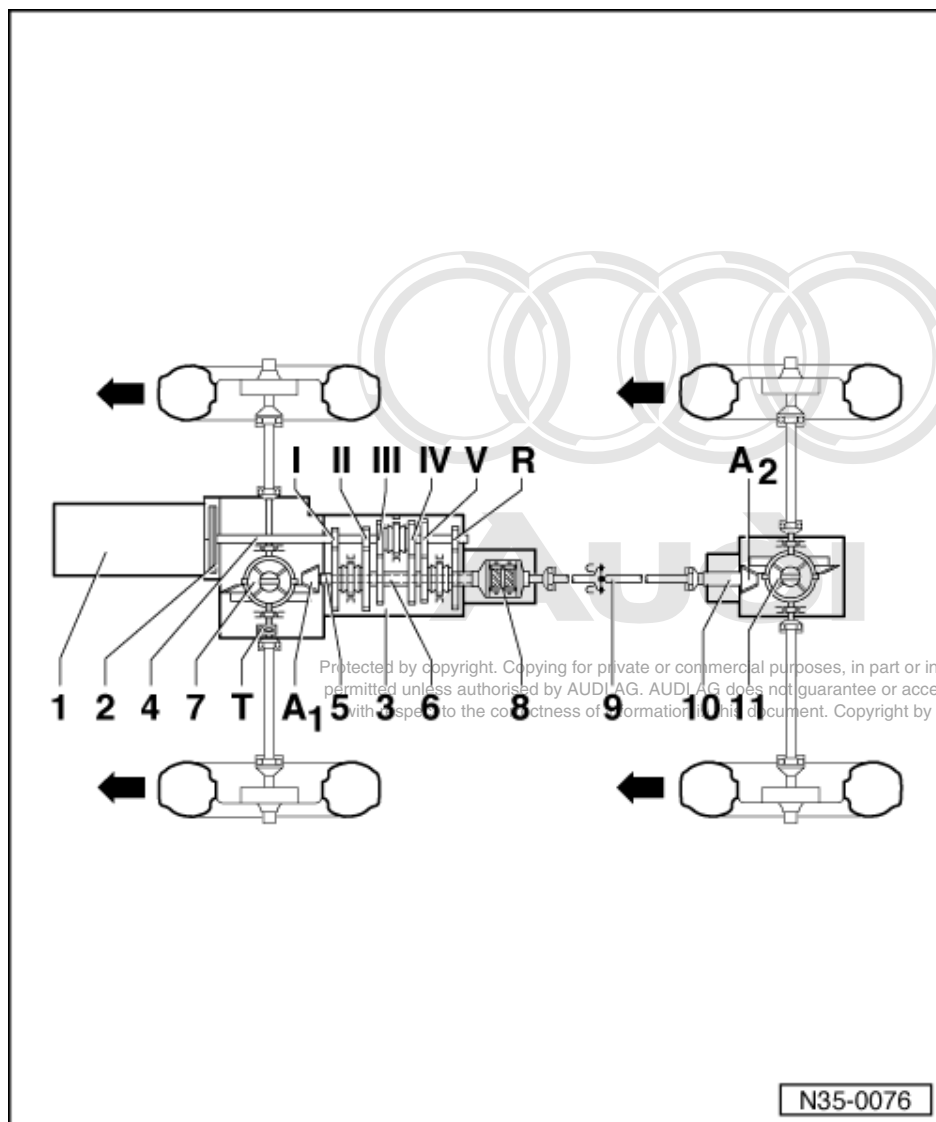
Rear final drive		01H		
Engine		1.8 l - 110 kW 2.8 l - 128 kW 2.8 l - 142 kW	2.6 l - 102 kW GUS, China 2.6 l - 110 kW	1.8 l - 88 kW GUS, China 1.8 l - 92 kW
Ratio	Final drive	35 : 9 = 3.889	37 : 9 = 4.111	41 : 9 = 4.556
Capacity		1,9 litres		
Specification		Gear oil GL 5 SAE 90 (MIL-L 2105 B)		
Drive shaft flange ø		100 mm	100 mm	100 mm
Assignment of manual gearbox Code letters		CTF CXF CXW DDL	CXZ CPS CYA	CZX CPU DJV DWQ

Rear final drive		01H		
Code letters		DAJ	DAK	
Production	from to	05.96 -	06.96 -	
Allocation	Model Engine	Audi A4 1995 ä 1.8 l - 110 kW 1.8 l - 132 kW 1.9 l - 81 kW (TDI) 2.8 l - 128 kW 2.8 l - 142 kW	Audi A4 1995 ä 2.4 l - 120 kW 2.4 l - 121 kW 2.6 l - 102 kW GUS, China 2.6 l - 110 kW	
Ratio	Final drive	35 : 9 = 3.889	37 : 9 = 4.111	
Capacity		1.9 litres		
Specification		Gear oil GL 5 SAE 90 (MIL-L 2105 B)		
Drive shaft flange ø		100 mm	100 mm	
Assignment of manual gearbox Code letters		CTF DJJ DJP DDL DJR DGW DWM DWR EEP	DJS DJF DWN	

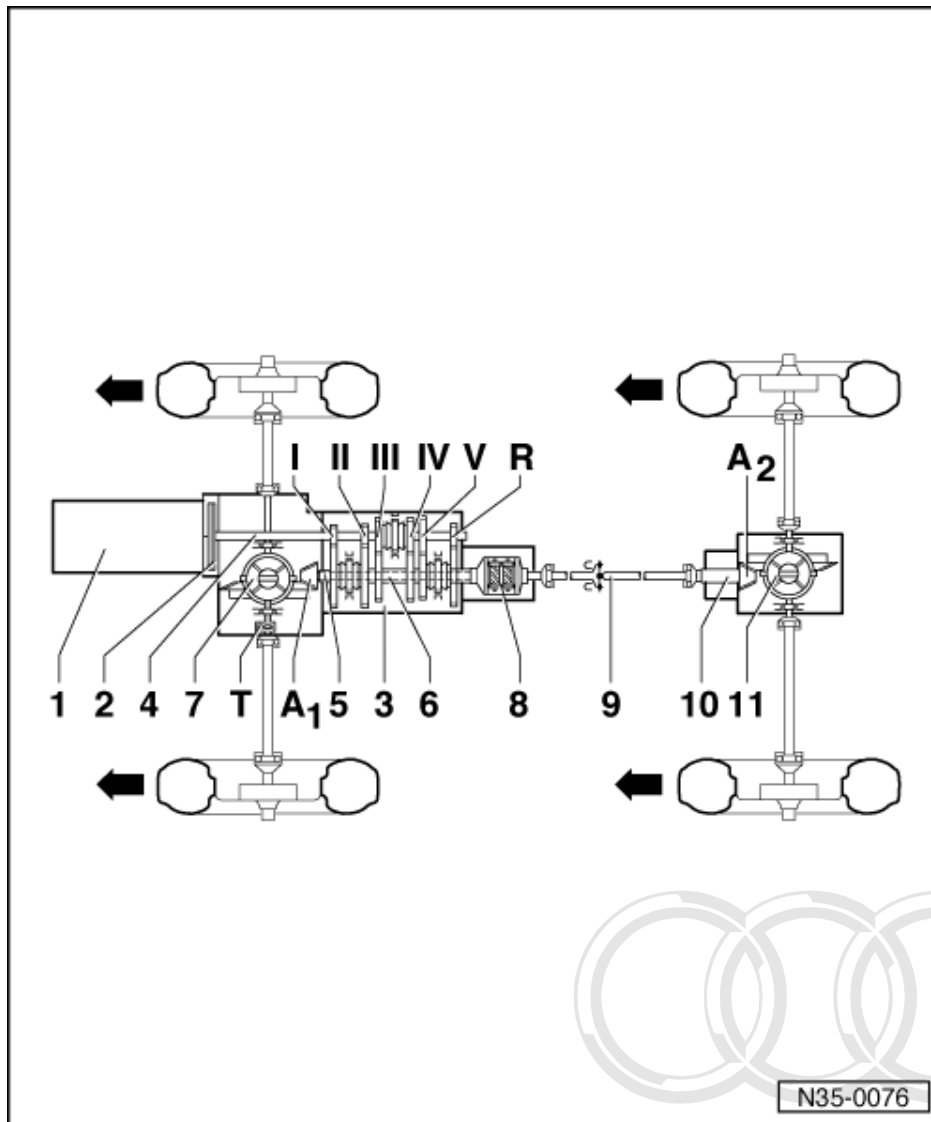
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3 - Transmission layout

3.1 - Transmission layout



- 1 Engine
- 2 Clutch
- 3 Manual gearbox
- 4 Input shaft (main shaft)
- 5 Front drive pinion (output shaft)
- 6 Hollow shaft
- 7 Front differential
- 8 Torsen differential
- 9 Prop shaft
- 10 Rear drive pinion
- 11 Rear differential



- I - 1st gear
- II - 2nd gear
- III - 3rd gear
- IV - 4th gear
- V - 5th gear
- R - Reverse gear
- A1 - Front final drive
- A2 - Rear final drive
- T - Speedometer drive

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Note:

Arrows face in direction of travel.

3.2 - Instructions for performance and brake check and for towing

- ◆ Performance and brake check

=> Special Information Transmission No. 8



- ♦ Tow-starting and towing car

=> Booklet "Maintenance taken seriously"

4 - Calculations

4.1 - Calculations

4.2 - Calculating transmission ratios "i"

Transmission ratio

Transmission ratio	=	No. of teeth on driven gear	:	No. of teeth on drive gear
--------------------	---	-----------------------------	---	----------------------------

Ratios		Formula
iG	= Gear ratio	ZG2 : ZG1
iA	= Axle ratio	ZA2 : ZA1
iov	= Overall ratio	iG x iA

Example:	5th gear	Final drive
Drive gear	ZG1 = 38	ZA1 = 9
Driven gear	ZG2 = 30	ZA2 = 37

Calculations:
iG = 30 : 38 = 0.789
iA = 37 : 9 = 4.111
iov = (30 : 38) x (37 : 9) = 0.789 x 4,111 = 3,246

5 - General repair instructions

5.1 - General repair instructions

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The maximum possible care and cleanliness and proper tools are essential to ensure satisfactory and successful gearbox repairs. The usual basic safety precautions also naturally apply when carrying out vehicle repairs.

A number of generally applicable instructions for individual repair operations, which are otherwise mentioned at various points in the Workshop Manual, are summarised here. They apply to this Workshop Manual.

Special tools

For a complete list of special tools used in this Workshop Manual

=> Booklet; Special tools, Workshop equipment

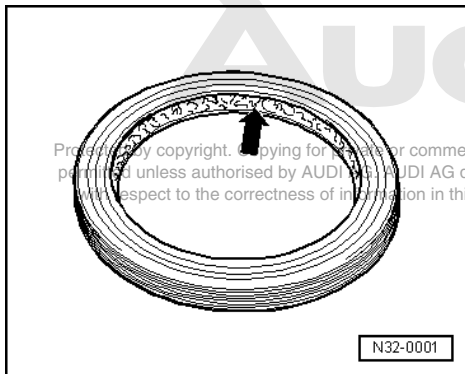
Gearbox

- ♦ When fitting a new gearbox or rear final drive, the oil level must be checked and oil added if necessary => Page 228 .

- ◆ Capacities and specifications =>Page 6 .
- ◆ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ◆ When installing gearbox, ensure that the dowel sleeves are fitted correctly.

O-rings, seals, gaskets

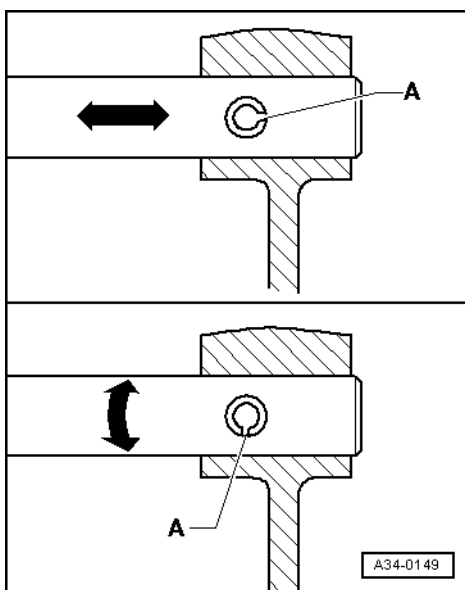
- ◆ Always replace O-rings, sealing rings and gaskets.
- ◆ After removing gaskets and seals, always inspect the contact surface on the housing or shaft for burrs resulting from removal or for other signs of damage.
- ◆ Thoroughly clean housing joint surfaces before assembling.



- ◆ -> Before installing radial shaft oil seals, lightly oil outer circumference and fill space between sealing lips - arrow- with grease.
- ◆ The open side of the oil seals faces toward the side with fluid filling.
- ◆ When replacing oil seals, always vary the point at which the sealing lips make contact (use insertion depth tolerances).
- ◆ Lightly oil O-rings before installing to prevent them being trapped and damaged when assembling.
- ◆ After replacing seals and gaskets check oil level =>Page 228 .

Sealants

- ◆ Thoroughly clean housing joint surfaces before applying sealing paste.
- ◆ Apply sealing paste AMV 188 000 02 or AMV 188 001 02 evenly, taking care to avoid excessively thick coating.
- ◆ Breather holes must remain free of sealing paste.





Locking elements

- ◆ Do not over-stretch circlips.
- ◆ Always renew circlips which have been damaged or over-tensioned.
- ◆ Circlips must be properly seated in the base of the groove.
- ◆ -> Renew spring pins. Installation position: Slot -A- longitudinal to line of force -arrow-.

Nuts, bolts

- ◆ Slacken the nuts and bolts in reverse sequence to the specified tightening sequence.
- ◆ Nuts and bolts which secure covers and housings should be slackened and tightened diagonally.
- ◆ Parts which are particularly sensitive (e.g. clutch pressure plates) must be kept straight and slackened and tightened diagonally in stages.
- ◆ The tightening torques stated apply to non-oiled nuts and bolts.
- ◆ Replace self-locking bolts and nuts.
- ◆ The threads of bolts which are secured by a locking fluid should be cleaned with a wire brush. Then apply AMV 185 101 A1 when inserting.
- ◆ Threaded holes into which self-locking bolts or bolts coated with locking fluid are screwed, must be cleaned (e.g. with a tap). Otherwise there is a danger of bolts shearing when subsequently being removed.

Mounting

- ◆ Attach the needle bearing with the written side (greater plate thickness) to the installing tool.
- ◆ Grease needle roller bearing for gearbox rear input shaft in flywheel.
- ◆ Lubricate all bearings in gearbox housing with gear oil before installing.
- ◆ Heat inner races of taper roller bearings to approx. 100 °C before installing. Press in onto stop when installing so there is no axial clearance.
- ◆ Do not interchange inner or outer races of bearings of the same size.
- ◆ Always replace the taper roller bearings on one shaft together and use new bearings from a single manufacturer.
- ◆ The taper roller bearings for the output shaft and the differential in the gearbox are low-friction bearings. Do not additionally oil new taper roller bearings when measuring friction torque. The bearings are pre-treated at the factory with a special type of oil for this purpose.

Adjustment shims

- ◆ Use a micrometer to measure the shims at several points. Different tolerances make it possible to obtain exact shim thickness required.
- ◆ Check for burrs and damage.
- ◆ Only install perfect, undamaged shims.

Gears, synchro-hubs, inner races for sliding gears

- ◆ Heat gears and synchro-hubs to approx. 100 °C before installing. Press in onto stop when installing so there is no axial clearance.
- ◆ Heat inner races for sliding gears to approx. 100 °C when installing.
- ◆ Temperature can be checked with temperature tester V.A.G 1558.
- ◆ Note installation position.

Sliding gears

- ◆ After installing, check 1st to 5th speed sliding gears and reverse sliding gear for axial clearance of 0.15 ... 0.35 mm and check that they rotate freely.

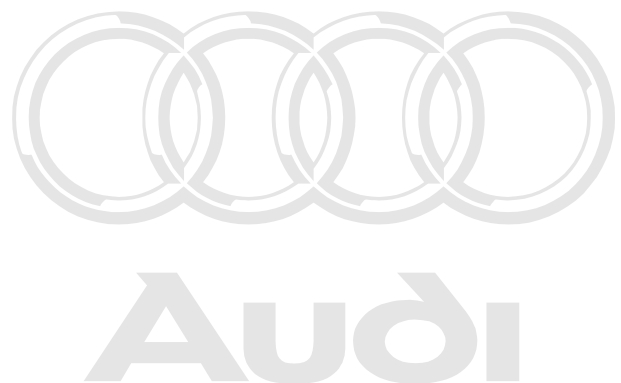
Synchroniser rings

- ◆ Do not interchange synchroniser rings. When reusing always fit to the same gear.
- ◆ Check for wear; replace if necessary.
- ◆ Coat with gearbox oil when installing

Clutch mechanism

- ◆ When removing gearbox, remove clutch slave cylinder without disconnecting pipes.
- ◆ Do not depress the clutch pedal after removing the slave cylinder if the hydraulic pipe is still connected. Otherwise the piston will be pressed out of the slave cylinder.
- ◆ Do not tilt clutch pressure plate, loosen and tighten diagonally in small steps.

- ♦ If the clutch has burnt out, thoroughly clean the bell housing, flywheel and parts of the engine facing the gearbox in order to reduce the smell.



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30 - Clutch

1 - Servicing clutch mechanism

1.1 - Servicing clutch mechanism

Notes:

- ♦ Observe or obtain radio code on vehicles with coded radio.
- ♦ Disconnect battery earth strap with the ignition switched off.
- ♦ Lubricate all bearings and contact surfaces with polycarbamide grease G 052 142 A 2.
- ♦ Before working on pedal cluster, remove cover below dash panel:

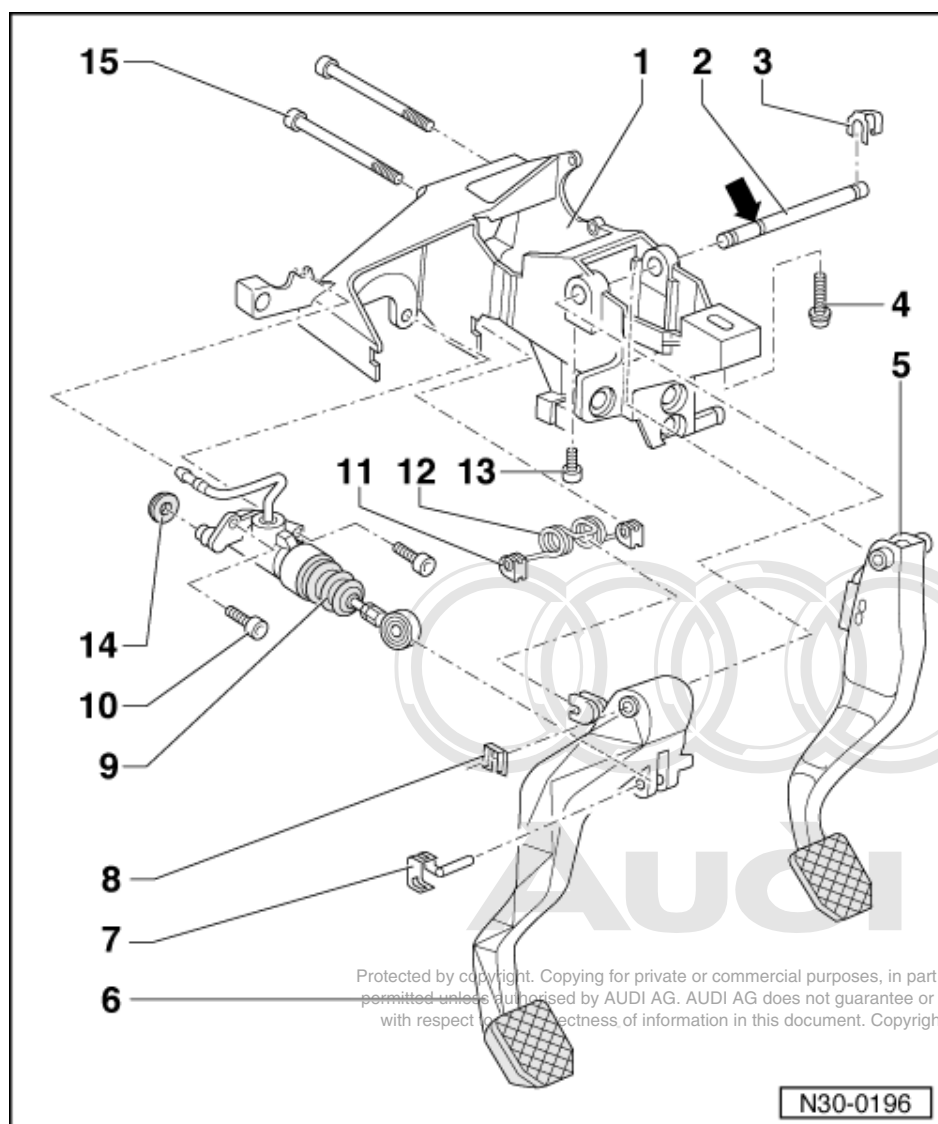
=> General body repairs; Repair Group 68; Shelves/Trim panels; Removing storage compartment on driver's side Shelves/Trim panels Removing storage compartment on driver's side

- ♦ Make sure that no brake fluid escapes into the plenum chamber or onto the gearbox below. If this does happen, clean the affected areas thoroughly.
- ♦ When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.



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1.2 - Assembly overview - Pedal cluster (LHD vehicles)



1 Mounting

- ♦ Removing and installing:

=> Running gear, front-wheel drive and four-wheel drive; Repair Group 46; Removing and installing pedal cluster Removing and installing pedal cluster

2 Fulcrum pin

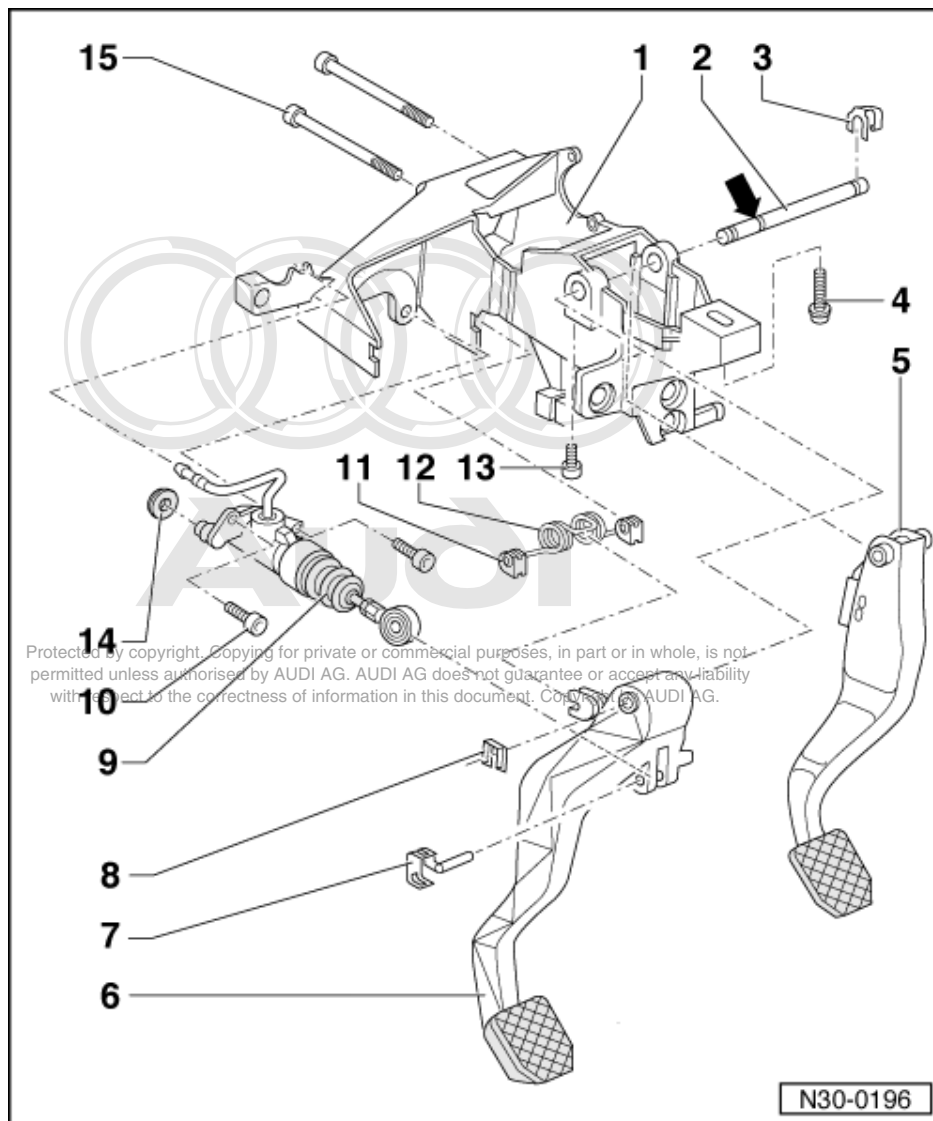
- ♦ For clutch pedal and brake pedal
- ♦ Installation position: groove (arrow) towards clutch pedal

3 Securing clip

4 Hexagon socket-head bolt

- 25 Nm

5 Brake pedal



6 Clutch pedal

- ♦ Removing and installing => Page 18

7 Pin

- ♦ Clip onto clutch pedal

8 Securing clip

9 Master cylinder

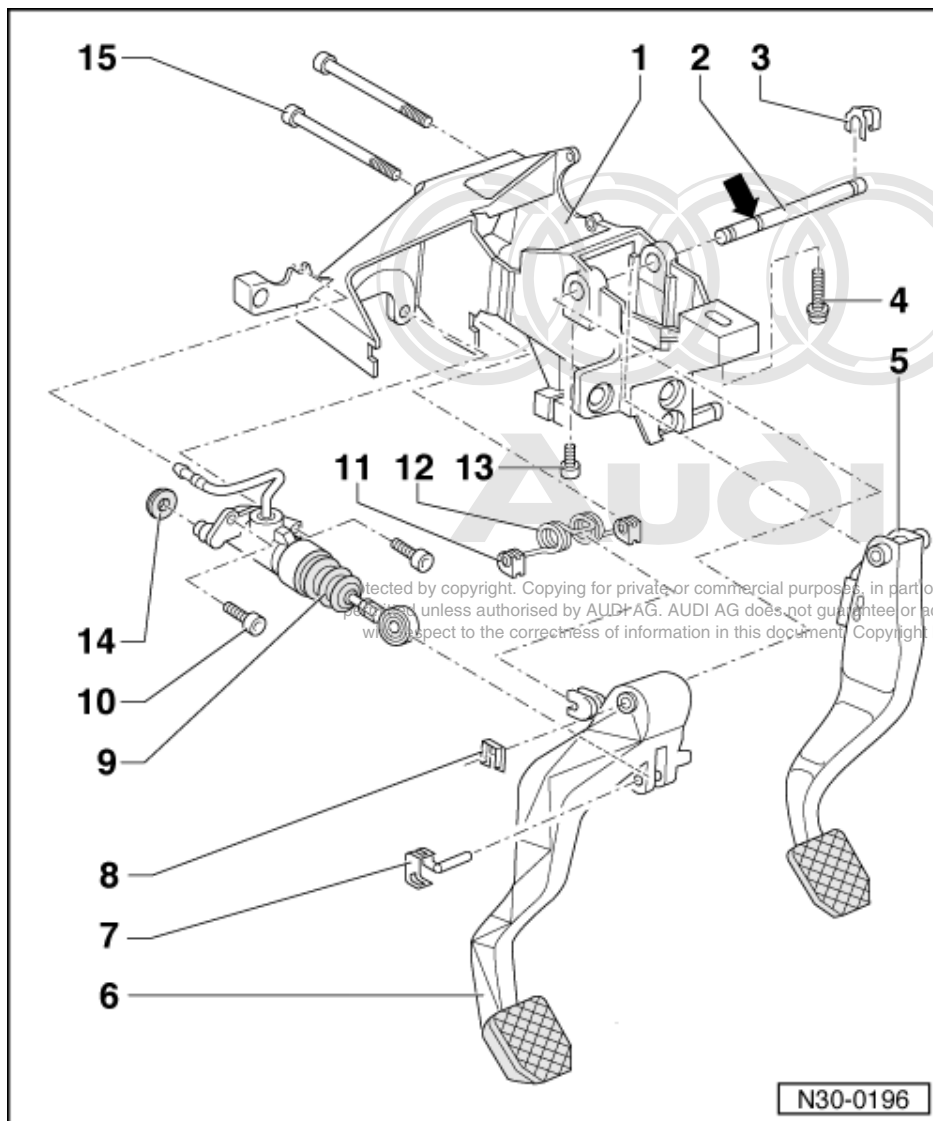
- ♦ Removing and installing => Page 27

10 Hexagon socket-head bolt

- 20Nm

11 Mounting

- ♦ Insert in mounting bracket with over-centre spring



12 Over-centre spring

- ♦ Allocation

=> Parts List

- ♦ Removing and installing with clutch pedal => Page 18

13 Hexagon socket-head bolt

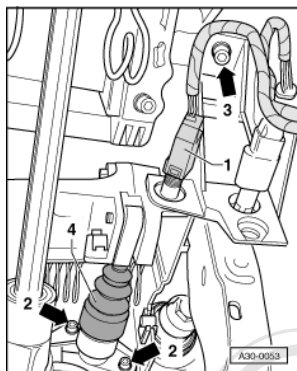
- 5Nm

- ♦ Secures clutch and brake pedal pivot pin

14 Gasket

15 TORX-screw - 25 Nm

- ♦ Also secures the brake master cylinder with brake servo



Removing and installing clutch pedal with over-centre spring

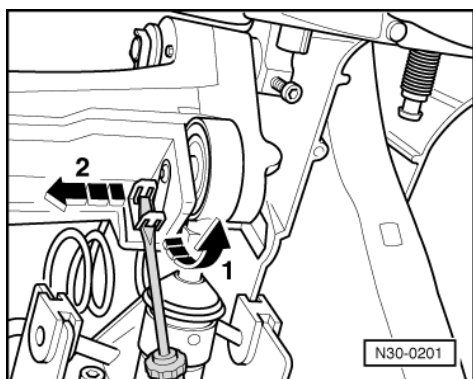
Removing

- Remove driver's side storage compartment.

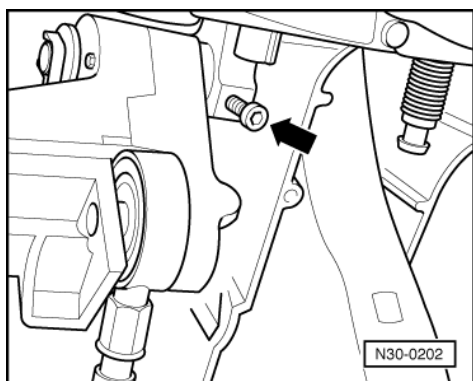
=> General body repairs; Repair Group 68; Shelves/Trim panels; Removing storage compartment on driver's side Shelves/Trim panels Removing storage compartment on driver's side

Note:

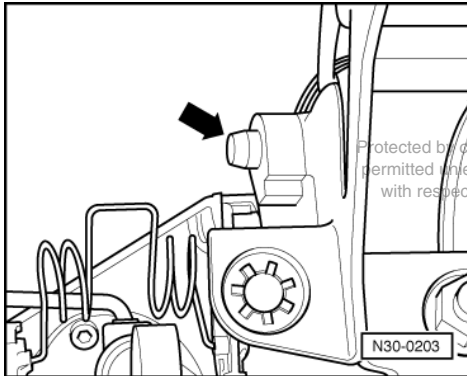
- ♦ -> During the following steps make sure that the clutch pedal does not press the clutch pedal switch -1- out of the retaining clip, as this would damage the thread of the switch, as a result of which the switch would have to be replaced.
- ♦ Switch -1- must only be installed once in order to ensure that it is sufficiently tight.



- -> Detach clutch pedal from master cylinder. To do this, unclip pin using a screwdriver -arrow 1- and pull out pin -arrow 2-.
- Press clutch pedal securing clip off pivot pin with a screwdriver.



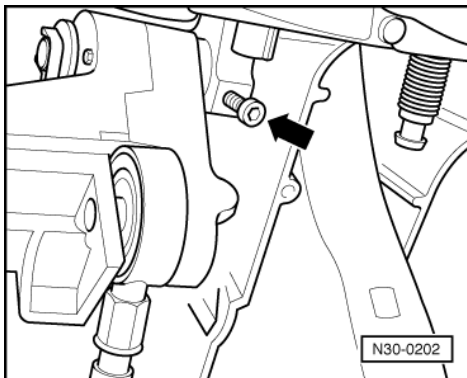
- -> Unscrew bolt (arrow).
- Press clutch and brake pedal pivot pin out to the right, until the clutch pedal can be removed.
- If necessary press brake pedal securing clip off pivot pin with a screwdriver.
- Take out clutch pedal and over-centre spring.



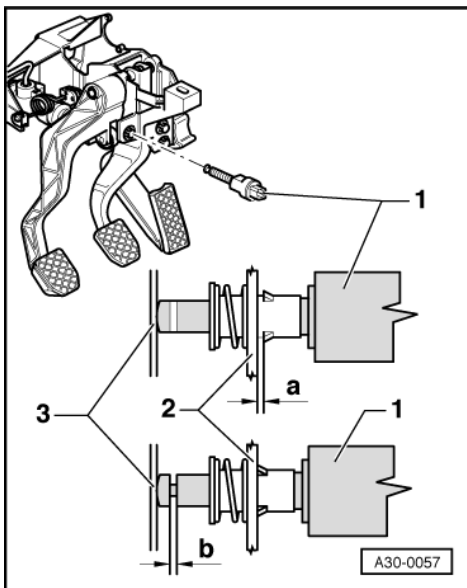
Installing

Installation is carried out in the reverse order, when doing this note the following:

- -> Align the clutch pedal/brake pedal pivot pin so that it protrudes out of the mounting bracket at the clutch pedal side (arrow).
- First hook the clutch pedal into the over-centre spring, then fit onto pivot pin.



- Connect clutch pedal to master cylinder. Clip pin onto clutch pedal.
- -> Do not tighten bolt (arrow) until both securing clips have been fitted on the clutch pedal/brake pedal pivot pin.

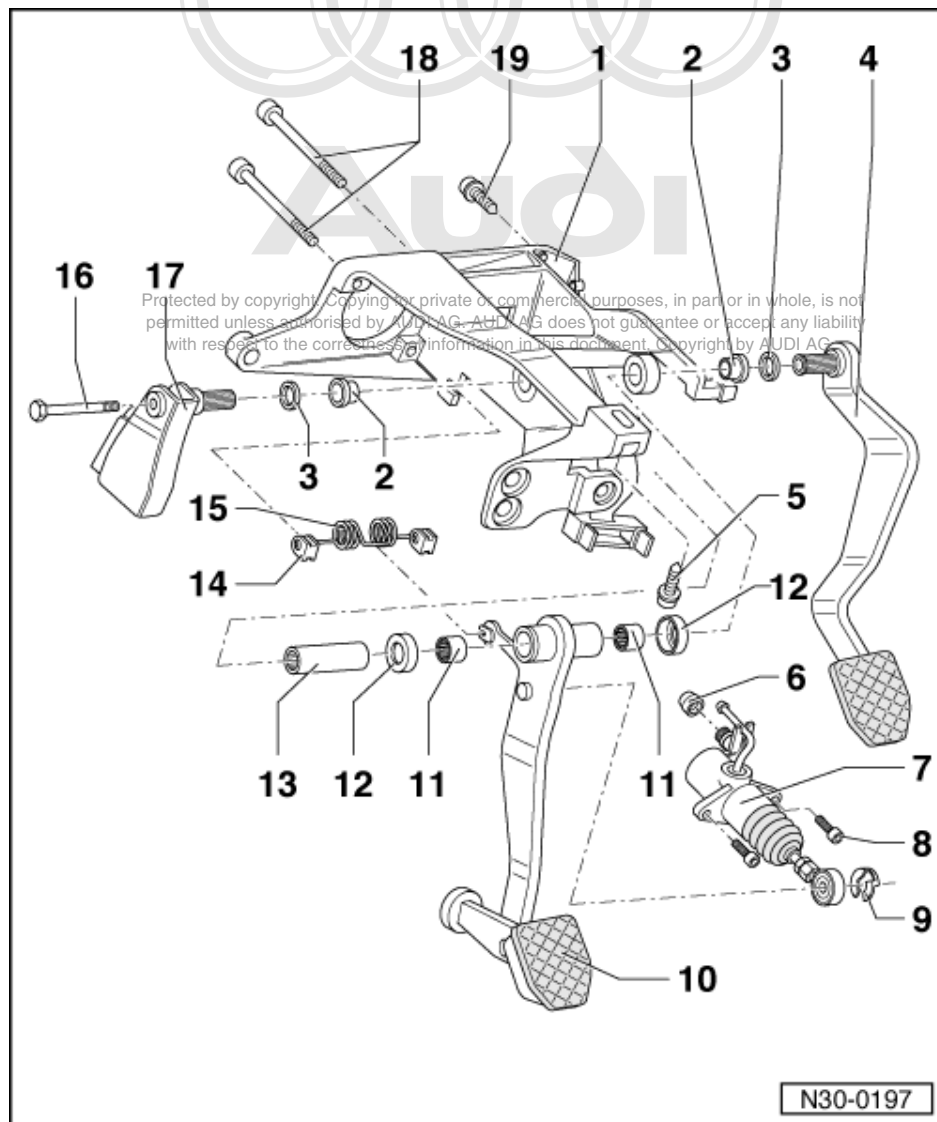


- -> Check the adjustment of the clutch pedal switch -1- above the clutch pedal as follows:
 - Switch -1- should lie completely on the clutch pedal -3- and be fully actuated.
 - Adjustment tolerance gap -a- between retaining clip and mounting bracket -2- and gap -b- on switch -1- must not exceed 0.5 mm.
 - Hold the clip and turn clutch pedal switch -1- to adjust the setting.

Note:

Switch must only be installed once in order to ensure that it is sufficiently tight.

1.3 - Assembly overview - Pedal cluster (RHD vehicles)



1 Mounting

- ♦ Removing and installing:

=> Running gear, front-wheel drive and four-wheel drive; Repair Group 46; Removing and installing pedal cluster Removing and installing pedal cluster

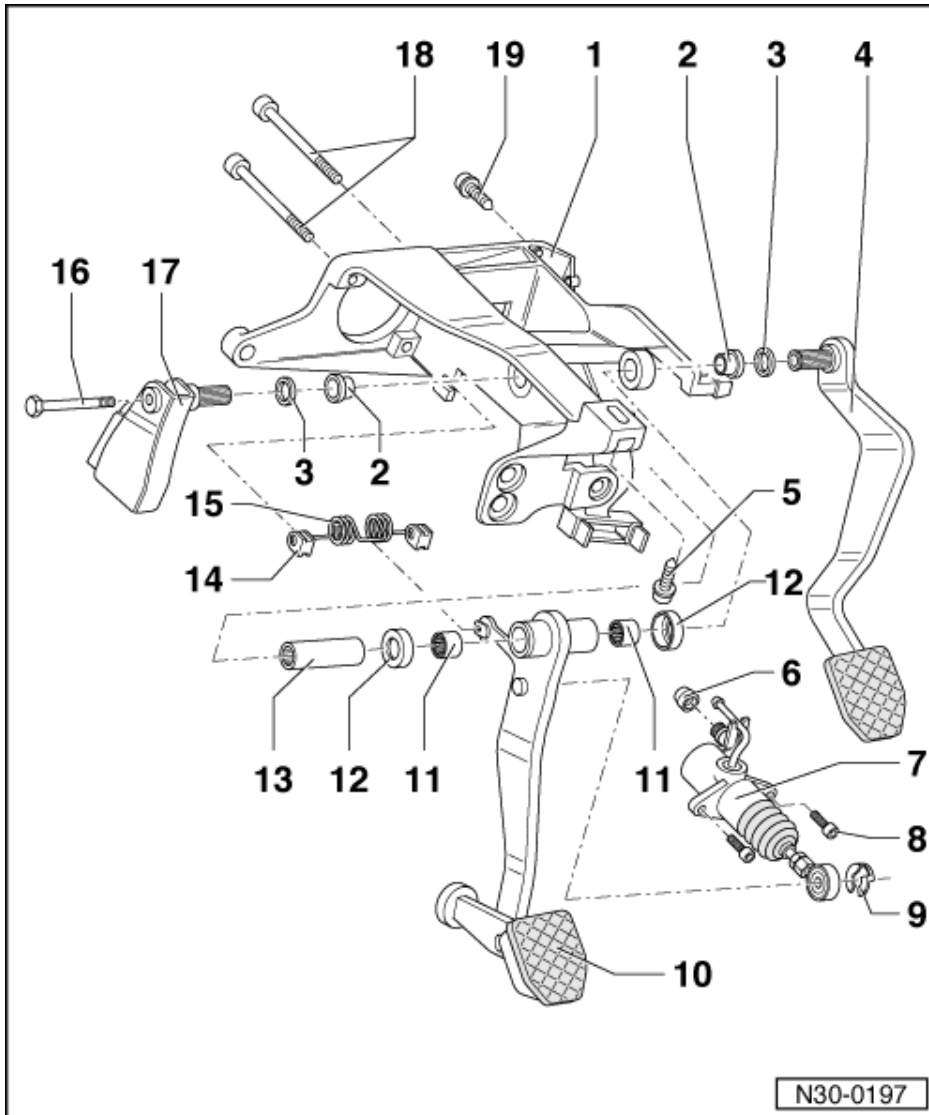
2 Bush

- ♦ Tapping out => Fig. 1
- ♦ Tapping in => Fig. 2

3 Washer

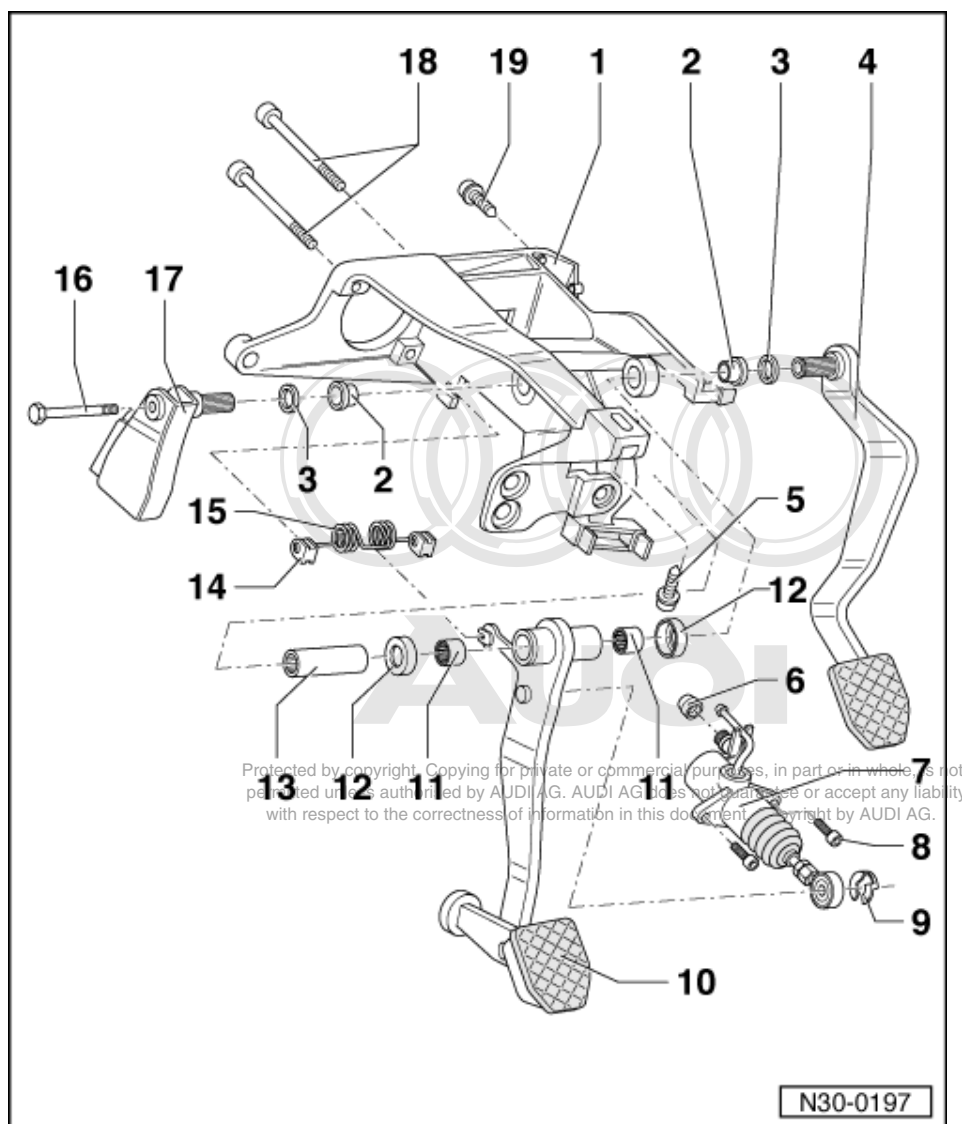
4 Brake pedal

- ♦ Splined shaft will only fit in one position in the mounting bush (Item 13)
- 5 Hexagon socket-head bolt
- 25 Nm



- 6 Gasket
 - ♦ Must not be removed
- 7 Master cylinder
 - ♦ Removing and installing => Page 27
- 8 Hexagon socket-head bolt
- 20Nm
- 9 Securing clip
- 10 Clutch pedal
 - ♦ Removing and installing => Page 18
- 11 Needle bearing
 - ♦ Pulling out => Fig. 3
- 12 Cap
- 13 Bush
 - ♦ Has internal splines to take splined shaft on brake pedal and lever (Item 17)

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14 Mounting

- ◆ Insert in mounting bracket with over-centre spring

15 Over-centre spring

- ◆ Allocation

=> Parts List

16 Release and tighten bolt - 25 Nm

- ◆ Self-locking
- ◆ Replace

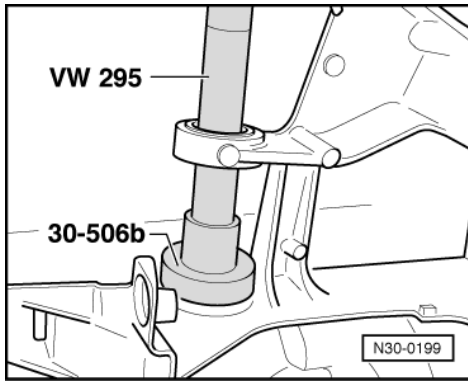
17 Lever

- ◆ Splined shaft will only fit in one position in the mounting bush (Item 13)

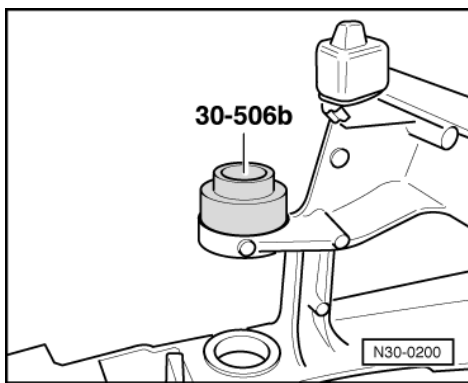
18 TORX-screw - 25 Nm

- ◆ Also secures the brake master cylinder with brake servo

19 Release and tighten bolt - 25 Nm

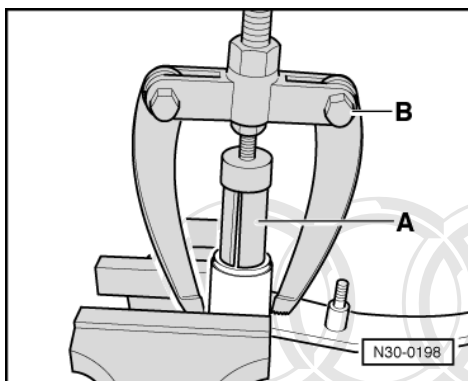


-> Fig.1 Knocking bush out of mounting bracket



-> Fig.2 Knocking bush into mounting bracket

- If the bush is very tight the mounting bracket must be supported in the area of the bore.



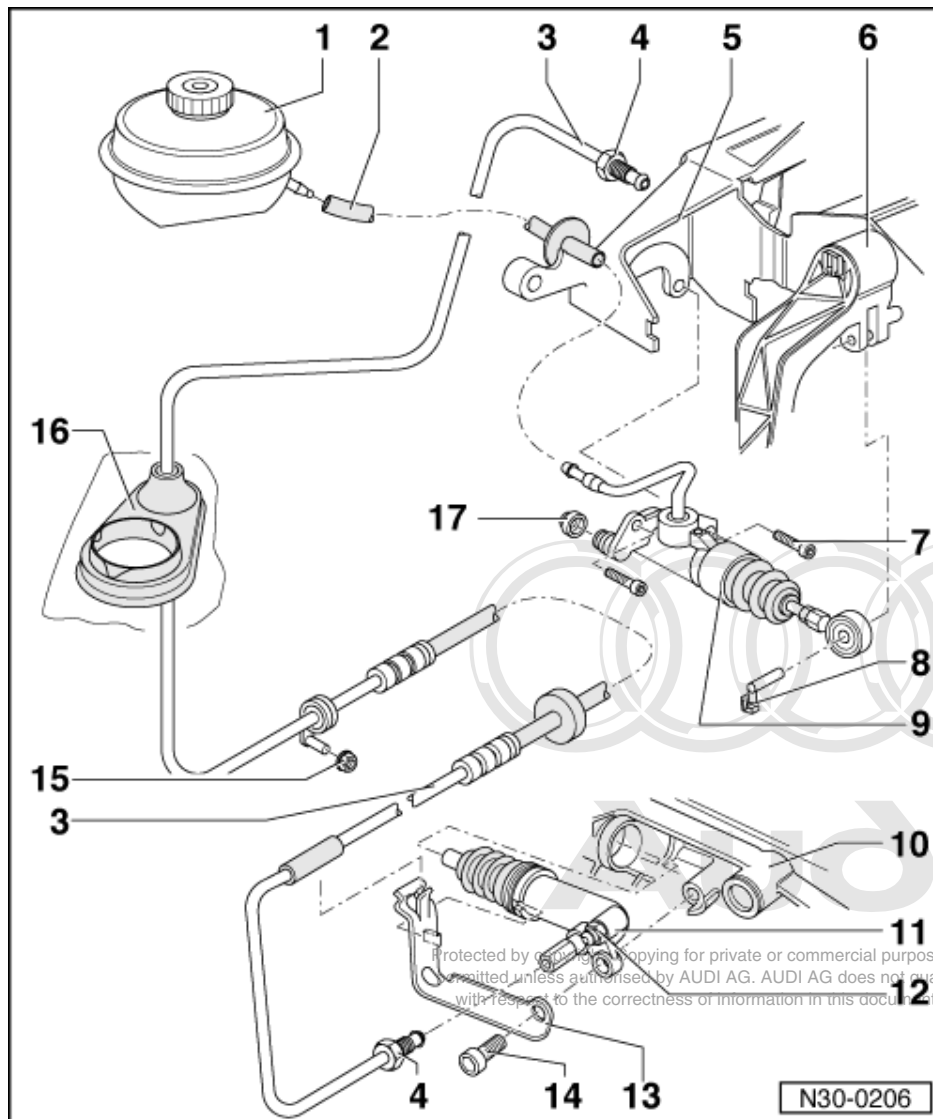
-> Fig.3 Pulling out needle roller bearing

- A - Internal puller 30 ... 37 mm, e.g. Kukko 21/5
- B - Support, e.g. Kukko 22/2

Installing

- Press in the new needle roller bearings using a vice with aluminium protective covers.

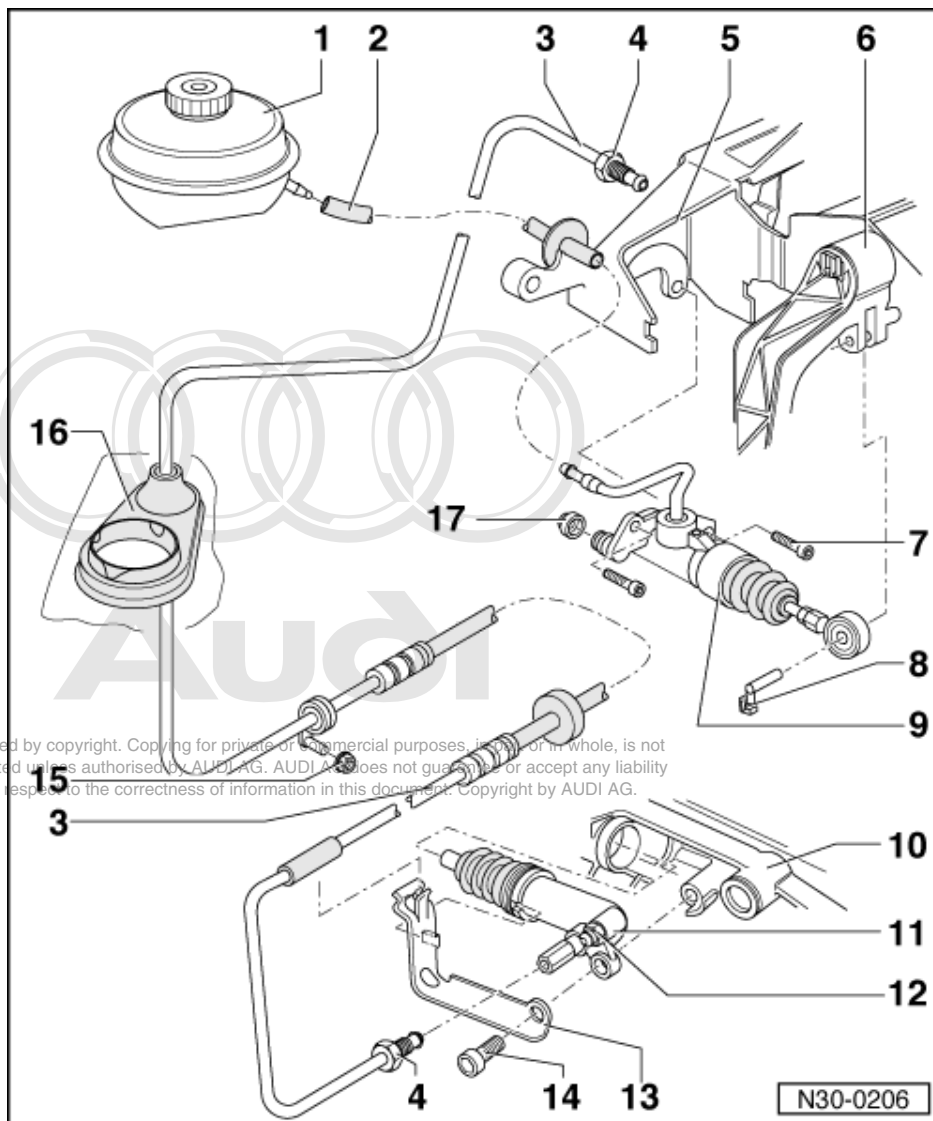
1.4 - Exploded view - Hydraulic system



- 1 Brake fluid reservoir
- 2 Supply hose
 - ◆ For master cylinder
- 3 Hose assembly
 - ◆ Allocation for LHD and RHD vehicles

=> Parts List

- 4 Pipe union nut - 15 Nm
 - ◆ With push-on connection on new version
- 5 Mounting
- 6 Clutch pedal
 - ◆ Removing and installing => Page 18
- 7 Hexagon socket-head bolt
 - 20Nm



8 Pin

9 Master cylinder

- ♦ Removing and installing => Page 27

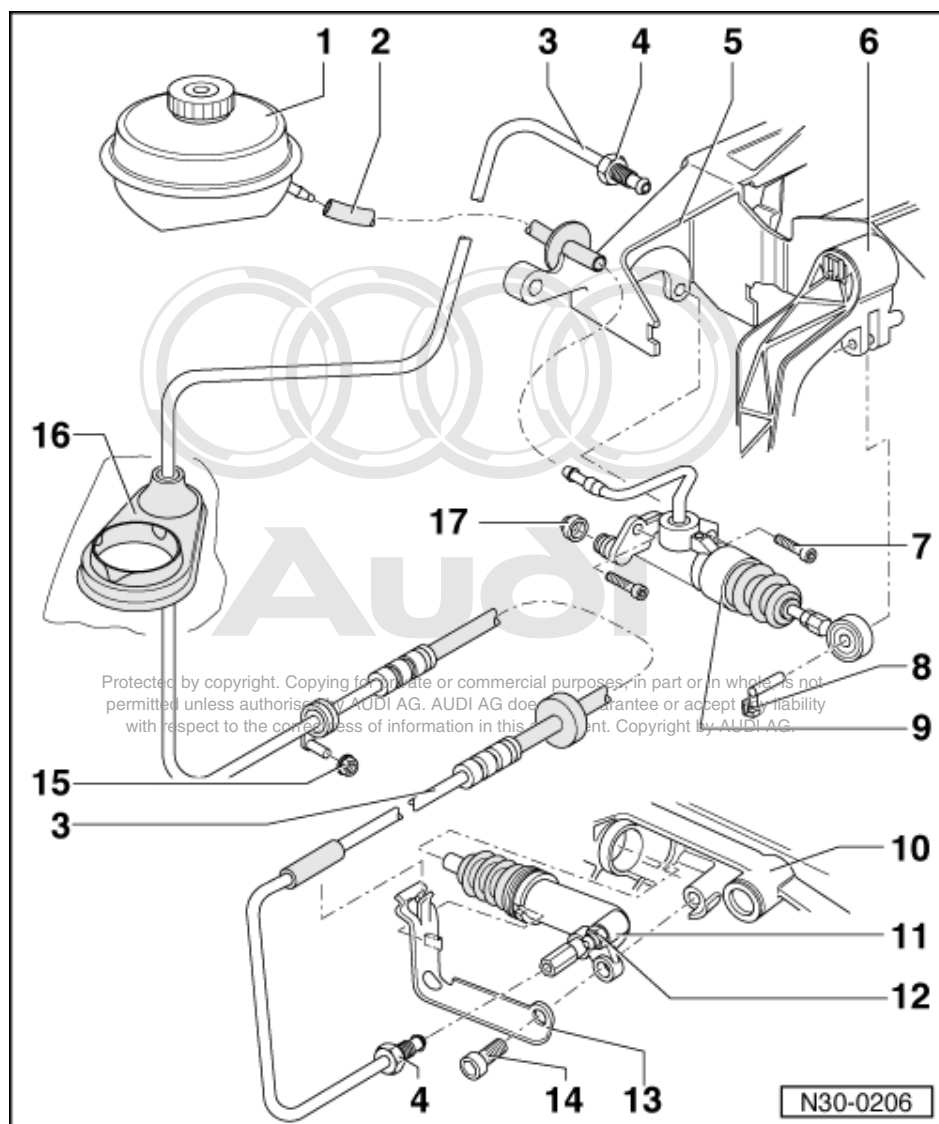
10 Gearbox

11 Slave cylinder

- ♦ Installing => Page 38
- ♦ After working on hydraulic clutch mechanism, bleed slave cylinder => Page 33
- ♦ Do not operate clutch pedal after slave cylinder has been removed.

12 Bleeder valve

- ♦ Tighten to 4.5 Nm
- ♦ Follow correct work sequence when bleeding => Page 33



13 Bracket

- ◆ Secured to gearbox

14 Hexagon socket-head bolt
- 25 Nm

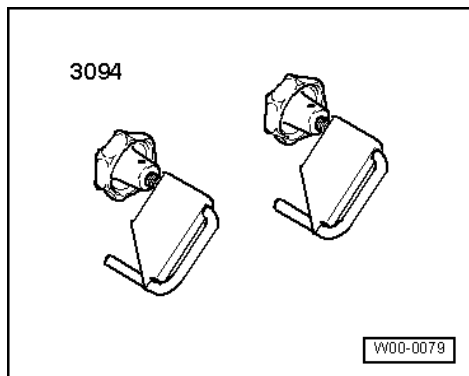
15 Nut - 2 Nm

16 Gasket

17 Gasket

- ◆ Must not be removed

1.5 - Removing and installing master cylinder

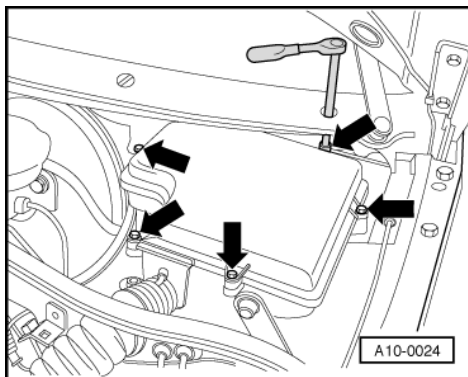


Special tools, testers and auxiliary equipment required

- ◆ Hose clamps 3094

Removing

- Remove cover above plenum chamber where fitted.

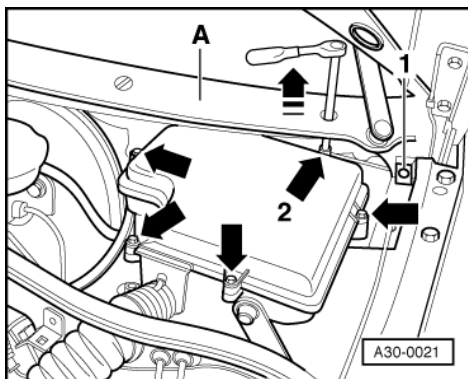


- With the ignition switched off disconnect the battery earth strap.
- Remove the electronics box from the plenum chamber as follows:

Old version with assembly hole in cowl grille:

- -> Unscrew the bolts -arrows- and pull off the sealing cap.

New version without assembly hole in cowl grille:





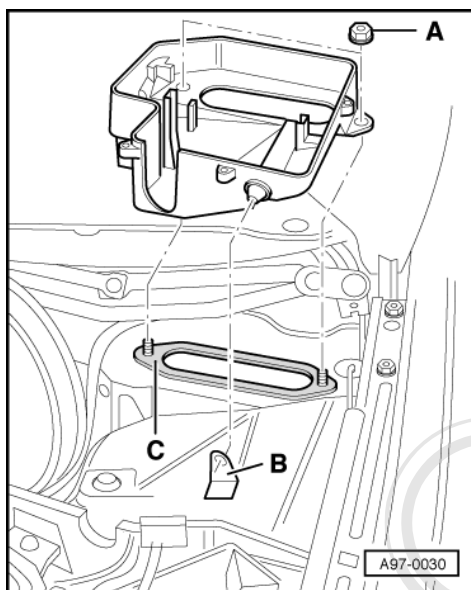
- -> Pull off clip -1- and lift cowl grille -A- slightly. Now unscrew bolt -arrow 2-.
- Unscrew the remaining bolts -arrows- and pull off the sealing cap.

All models:

- Remove the engine control unit, and if necessary also remove the auxiliary relay carrier and the auxiliary fuse box.

=> Electrical system; Repair Group 97; Removing and installing auxiliary relay carrier and auxiliary fuse box
Removing and installing auxiliary relay carrier and auxiliary fuse box

- Unplug connector in connector station.
- Pull engine wiring harness together with rubber grommet through opening in electronics box.

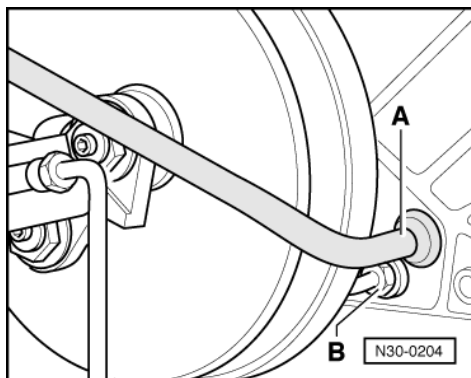


- -> Unscrew both nuts -A-.
- Lift electronics box at rear off threaded pins and then pull off from attachment point -B-.

Notes:

- ♦ In the following steps make sure that no brake fluid escapes into the plenum chamber or onto the gearbox below. If this does happen, clean the affected areas thoroughly.
- ♦ When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.

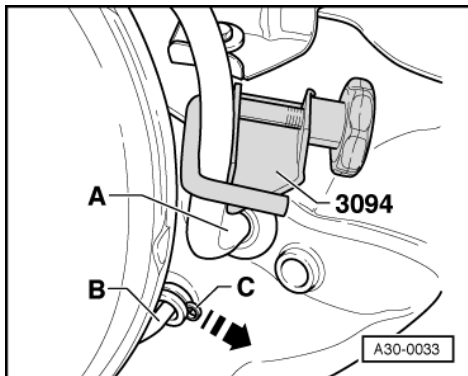
Old version with aluminium master cylinder:



- -> Clamp supply hose -A- leading to brake fluid reservoir using special tool 3094. Pull hose off at master cylinder and plug it.
- Remove rubber grommet from cross panel above connection pipe for supply hose.

- Unscrew pipe -B- from master cylinder and plug off.

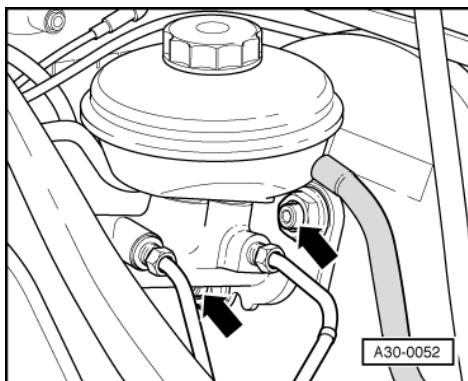
New version with plastic master cylinder:



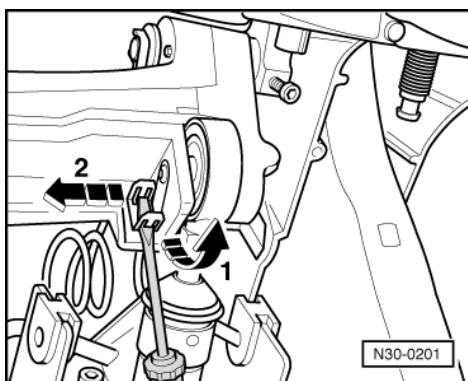
- -> Clamp supply hose -A- leading to brake fluid reservoir using special tool 3094. Pull hose off at master cylinder and plug it.
- Remove rubber grommet from cross panel above connection pipe for supply hose.
- Prise out retaining clip -C- with a screwdriver and then pull out pipe -B- slightly.

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All models:



- -> Unscrew the two torx socket-head bolts -arrows-.



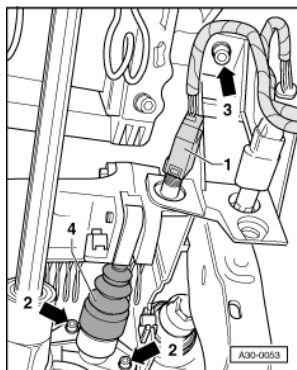
- Remove driver's side storage compartment.

=> General body repairs; Repair Group 68; Shelves/Trim panels; Removing storage compartment on driver's side Shelves/Trim panels Removing storage compartment on driver's side

- -> Detach clutch pedal from master cylinder. To do this, unclip pin using a screwdriver -arrow 1-, pull out pin -arrow 2- and fully depress the clutch pedal.

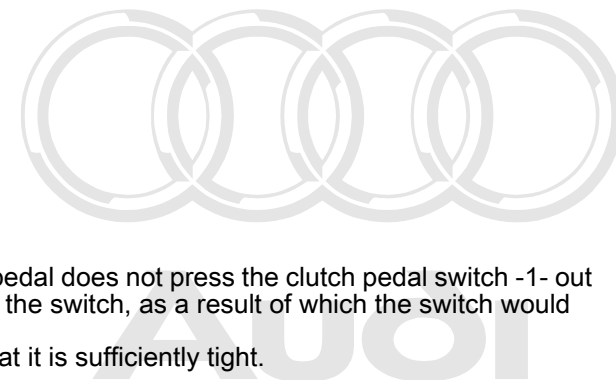


Note:



- ♦ -> During the following steps make sure that the clutch pedal does not press the clutch pedal switch -1- out of the retaining clip, as this would damage the thread of the switch, as a result of which the switch would have to be replaced.
- ♦ Switch must only be installed once in order to ensure that it is sufficiently tight.

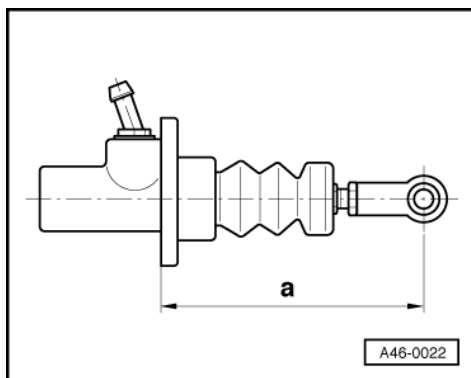
- Unscrew retaining bolts for master cylinder -arrow 2- and mounting bracket -arrow 3-.
- Pull the complete pedal cluster slightly towards the passenger compartment and take out the clutch master cylinder -4-.



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Installing

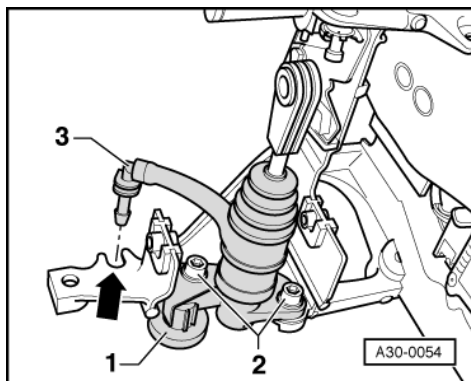
Installation is carried out in the reverse order, when doing this note the following:



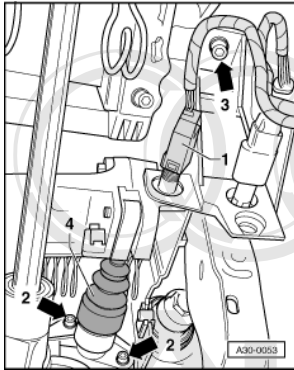
Only for aluminium master cylinder with adjustable push rod joint:

- -> When replacing the master cylinder, measure distance -a- on fully extended push rod joint and adjust if necessary
- LHD vehicles: distance a = 165 ± 0.5 mm
- RHD models distance a = 139 ± 0.5 mm

All models:

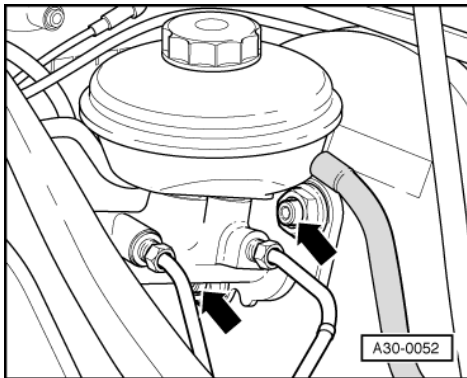


- -> Insert the master cylinder so that seal -1- and the washer lie behind the mounting bracket and tighten bolts -2- to 20 Nm.
- Press connection pipe -3- with guide -arrow A- into recess -arrow B- on mounting bracket.



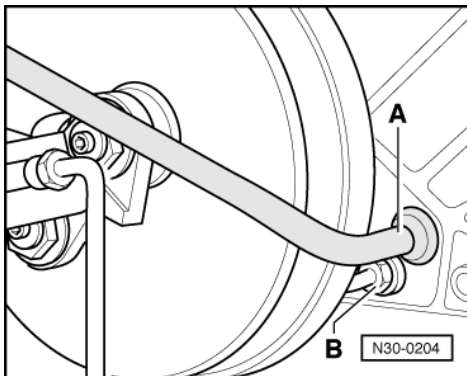
A second mechanic is required for the next step.

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- -> Tighten the retaining bolts for the brake servo -arrows- to 25 Nm.

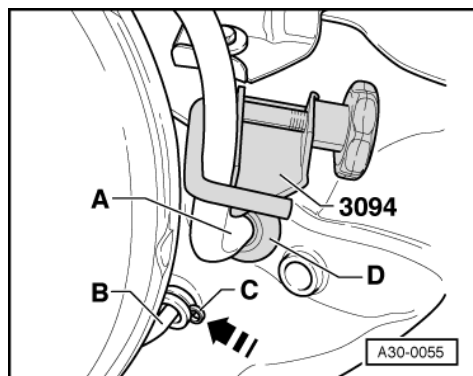
Old version with aluminium master cylinder:



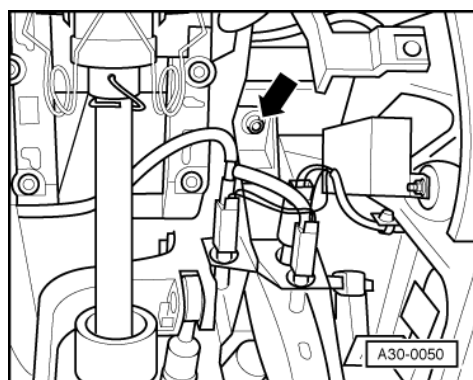
- -> Tighten union nut -B- to 15 Nm on the master cylinder.
- Insert the rubber grommet over connection pipe/supply hose -A- into the cross panel.
- Slide supply hose -A- for the brake fluid reservoir on as far as its stop.
- Remove special tool 3094.



New version with plastic master cylinder:

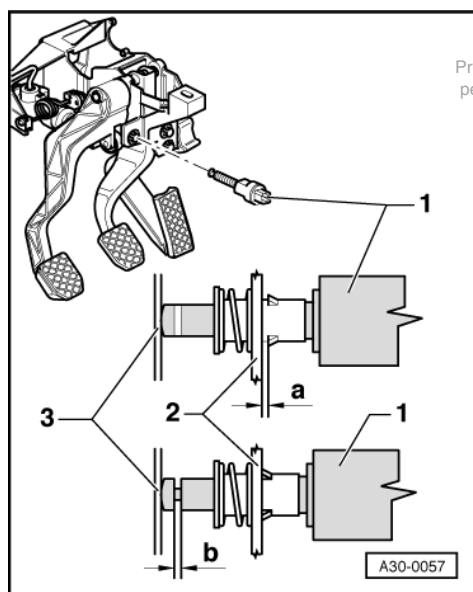


- -> Press retaining clip -C- home.
- Push pipe -B- into master cylinder until it audibly locks in place.
- Insert rubber grommet -D- over connection pipe/supply hose -A- into the cross panel.
- Slide supply hose -A- for the brake fluid reservoir on as far as its stop.
- Remove special tool 3094.



All models:

- -> Tighten the hexagon socket head bolt -arrow- that secures the pedal cluster to the dash panel cross-member to 25 Nm.
- Connect clutch pedal to master cylinder. Clip pin onto clutch pedal.
- After installing the master cylinder, bleed the clutch system =>Page 33.



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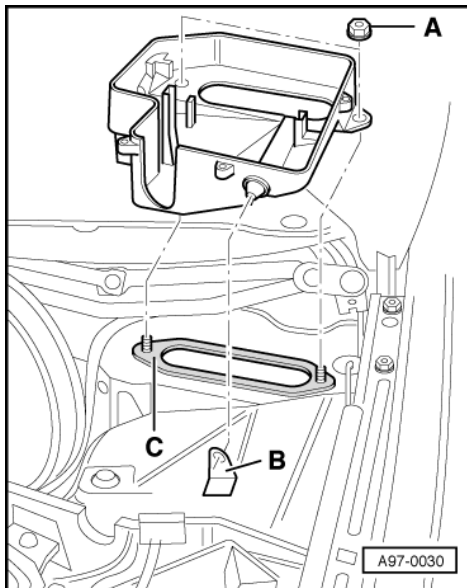
- -> Check the adjustment of the clutch pedal switch -1- above the clutch pedal as follows:
 - Switch -1- should lie completely on the clutch pedal -3- and be fully actuated.
 - Adjustment tolerance Gap -a- between retaining clip and mounting bracket -2- and gap -b- on switch -1- must not exceed 0.5 mm.
 - Hold the clip and turn clutch pedal switch -1- to adjust the setting.

Note:

Switch must only be installed once in order to ensure that it is sufficiently tight.

- Install storage compartment for driver's side:

=> General body repairs; Repair Group 68; Shelves/Trim panels; Removing storage compartment on driver's side Shelves/Trim panels Removing storage compartment on driver's side



- -> Always replace gasket -C-.
- Make sure that the gasket does not obstruct the opening in the body or the metal tab.
- Insert the electronics box into attachment point -B- and tighten nuts -A- to 4 Nm.
- Press on sealing cap hand-tight and tighten bolts crosswise. Tightening torque: 4 Nm (refer also to mark stamped on lid).
- Route the engine wiring harness and join the connector in the connector station.
- Install the engine control unit and, if removed, also the auxiliary relay carrier and the auxiliary fuse box.

=> Electrical system; Repair Group 97; Removing and installing auxiliary relay carrier and auxiliary fuse box
 Removing and installing auxiliary relay carrier and auxiliary fuse box

1.6 - Bleeding clutch system



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Special tools, testers and auxiliary equipment required

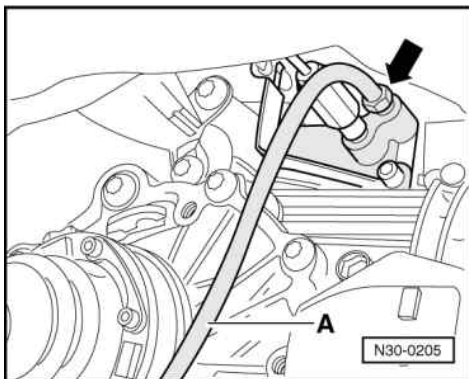
- ♦ Brake filler and bleeder unit V.A.G 1869

or

- ♦ Brake filler and bleeder unit V.A.G 1238 B

Notes:

- ♦ Open the bleeder valve before switching on the bleeder unit.
- ♦ When performing the following steps, make sure that no brake fluid escapes onto the gearbox.
- ♦ The clutch system must be bled after performing work on the hydraulic clutch mechanism.
- ♦ Top up brake fluid reservoir to "max" marking with brake fluid before bleeding clutch system.
- Pull clutch pedal back to its normal rest position.
- Connect brake filler and bleeder unit V.A.G 1238 B or V.A.G 1869, but do not switch on at this stage.



- If fitted, remove noise insulation beneath gearbox.
- -> Connect bleeder hose -A- to slave cylinder (arrow) and open bleeder valve.
- Connect bleeder hose to pressure hose of fluid collector bottle.
- Switch on the bleeder unit and allow about 100 cm³ of brake fluid to drain out.
 - Working pressure 2.5 bar

Note:

Ensure bleeder hose is correctly fitted during bleeding operation.

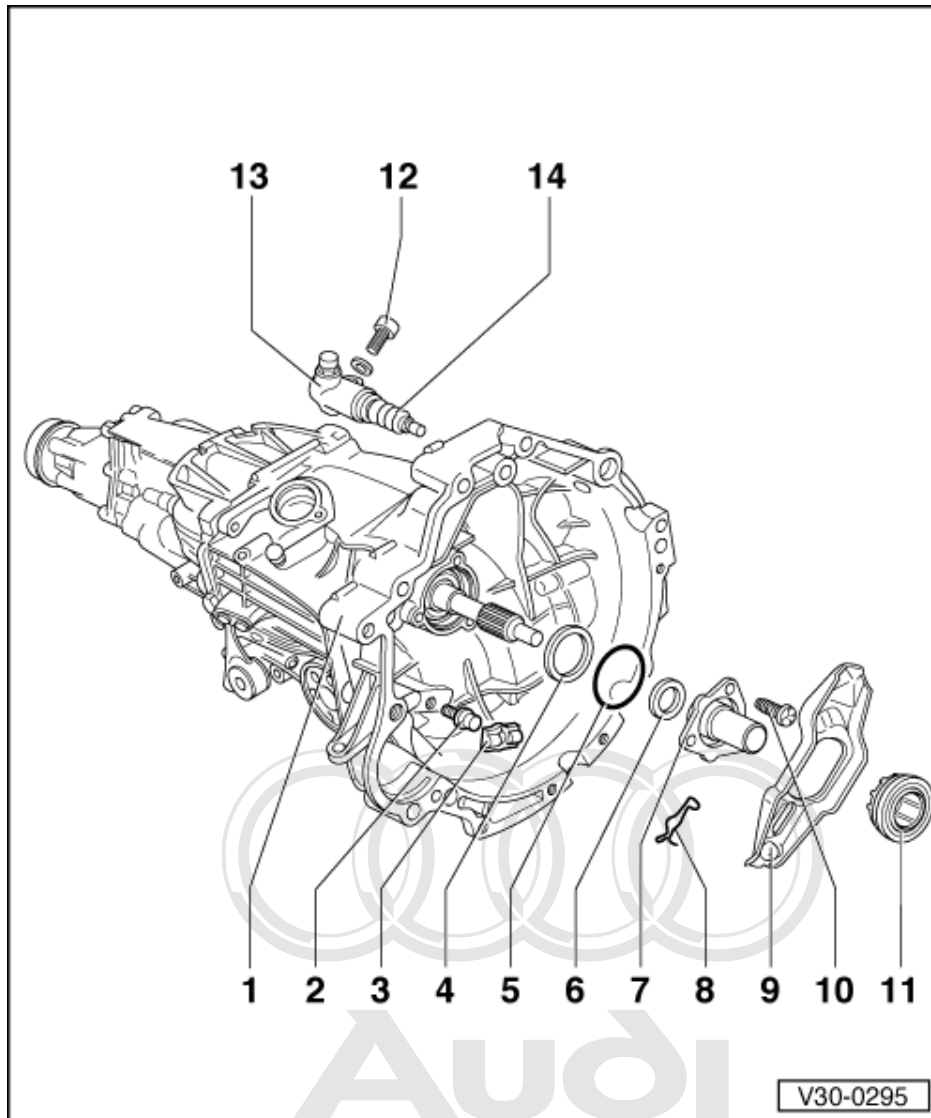
- Close bleeder valve and tighten to 4.5 Nm.
- Depress clutch pedal several times after completion of bleeding process.
- Bleed again if necessary.



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2 - Servicing clutch release mechanism

2.1 - Servicing clutch release mechanism



1 Gearbox

2 Ball stud

- ◆ Tighten to 25 Nm
- ◆ Lubricate with MoS2-grease

3 Intermediate piece

4 Dished washer

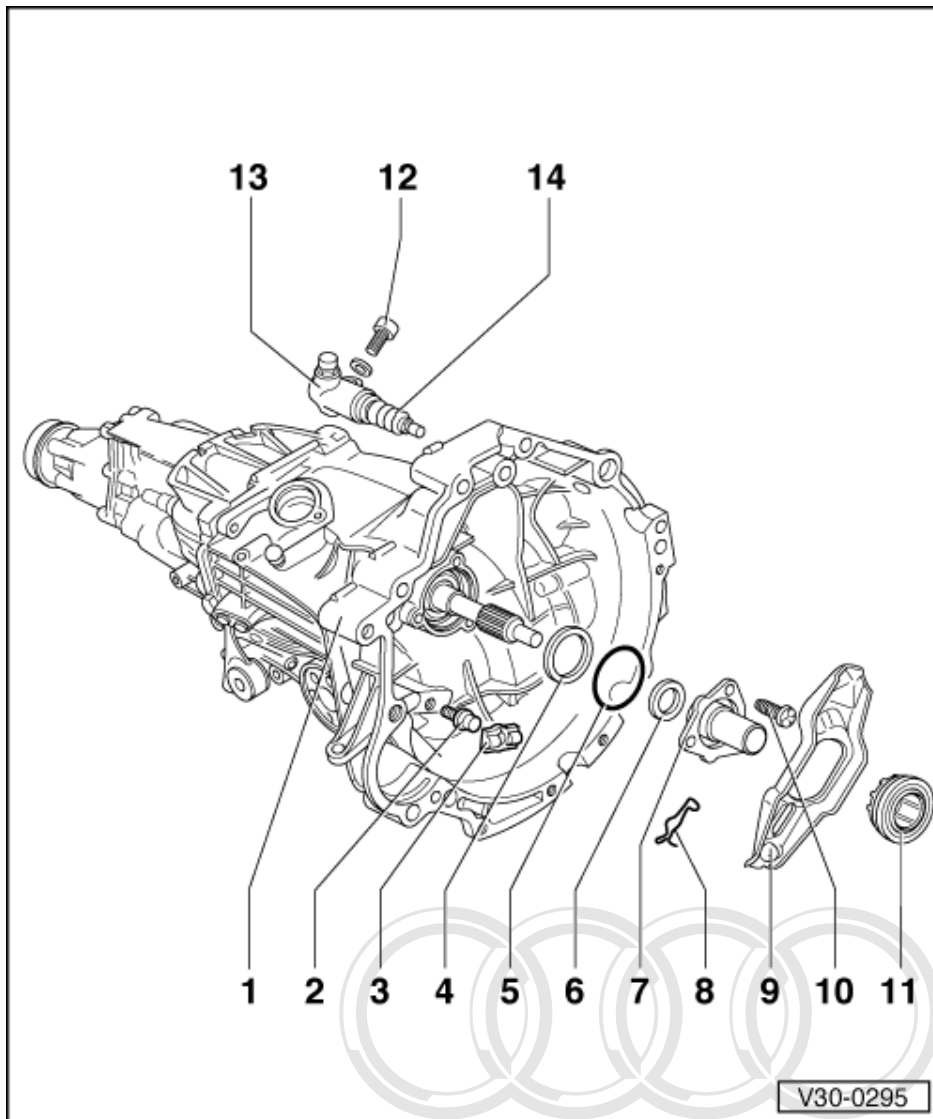
- ◆ Smaller diameter (convex side) to guide sleeve

5 O-ring

- ◆ Replace

6 Input shaft oil seal

- ◆ Pull out of guide sleeve with special tool VW 681
- ◆ Drive home using fitting sleeve VW 192



7 Locating sleeve

- ◆ Before removing and installing, cover input shaft splines with a shrink-fit hose to protect oil seal.

8 Retention spring

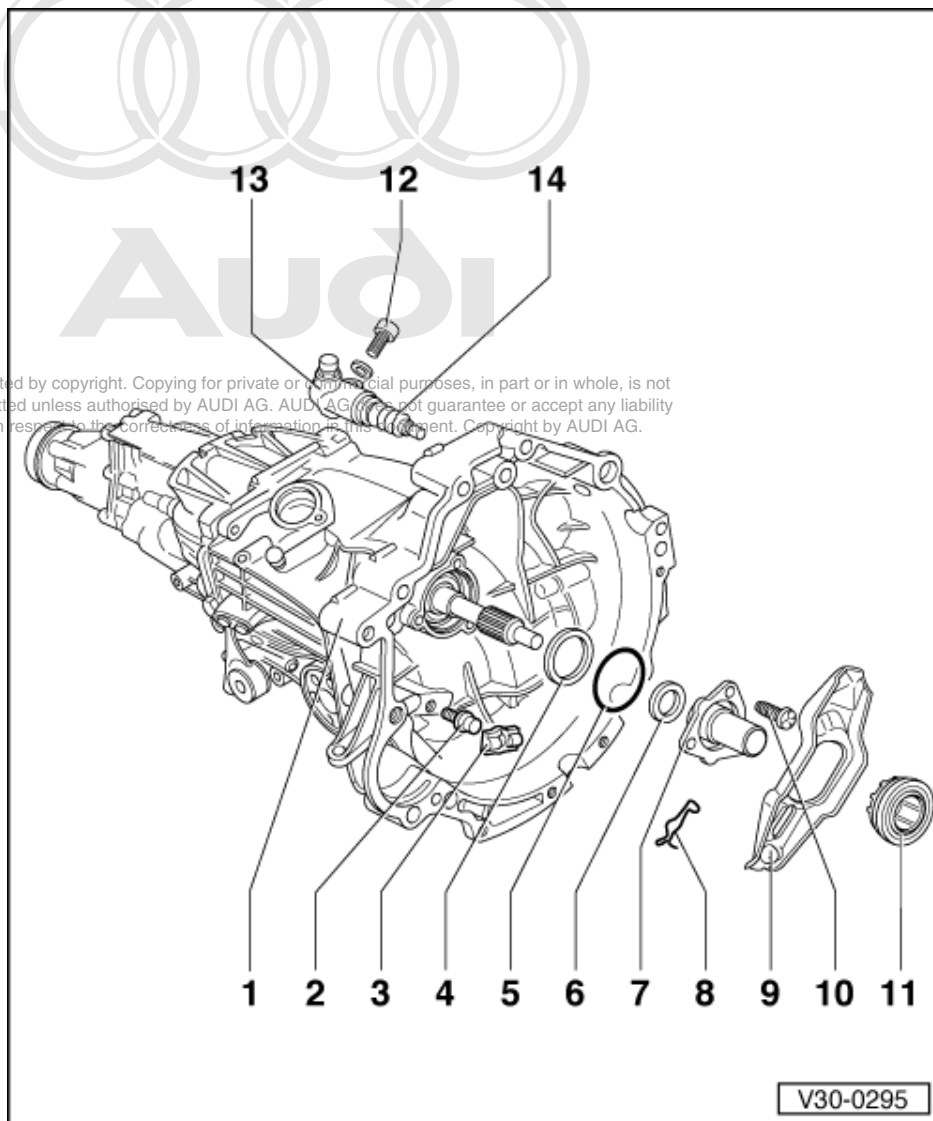
- ◆ Secure to clutch release lever

9 Clutch release lever

- ◆ Before installing, coat contact surface of clutch slave cylinder push rod with copper grease, e.g. Z 381 351 TE.

10 Torx socket head bolt
- 35 Nm

- ◆ Self-locking
- ◆ Replace



11 Release bearing

- ◆ Do not wash out bearing, only wipe
- ◆ Replace noisy bearings
- ◆ Engage retaining latches at the release bearing in contact release lever

12 Bolt

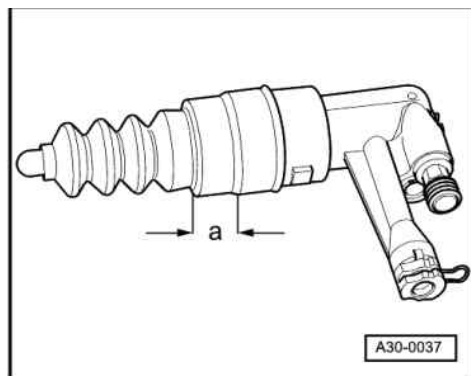
- ◆ Fit hexagon bolt with locking compound D 185 400 A2.
- ◆ Up to ident. no. 8DVA 000 504
Hexagon bolt - 25 Nm
- ◆ As of ident. no. 8DVA 000 505
Hexagon socket-head bolt
- 20 Nm

13 Slave cylinder

- ◆ Do not operate clutch pedal after slave cylinder has been removed.
- ◆ Installing => Fig. 1
- ◆ When installing, press in slave cylinder far enough so that securing bolt can be fitted easily.

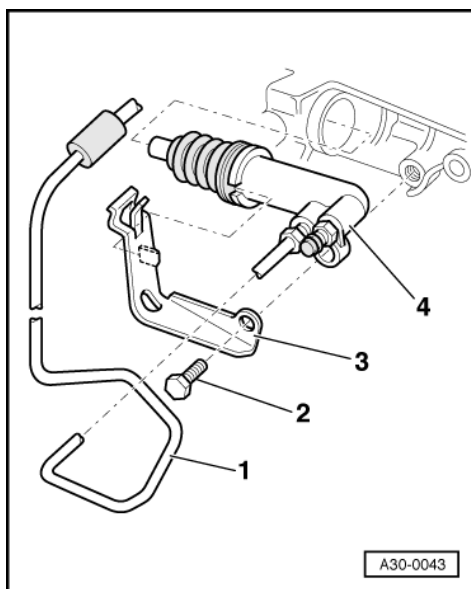
14 Push rod

- ◆ Lubricate end of push rod with copper grease, e.g. Z 381 351 TE



➔ Fig.1 Installing clutch slave cylinder

- Lightly lubricate contact surface for push rod at clutch release lever with copper grease, e.g. Z 381 351 TE.
- Before fitting slave cylinder into gearbox housing, lubricate area -a- on boot with lithium grease G 052 150 A2.



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- ➔ Engage bracket for pressure pipe -3- at the slave cylinder -4- and screw together with slave cylinder at gearbox.
- When inserting the clutch slave cylinder into the mounting hole of the gearbox housing, keep it as far as possible in line with the direction of operation of the push rod.

Notes:

- ♦ If the clutch slave cylinder -4- is inserted off-line there is a danger that the push rod will be guided past the clutch release lever.
- ♦ When installing, press in the clutch slave cylinder far enough so that the securing bolt can be fitted easily.
- ♦ Renew securing bolt -2-.

3 - Servicing clutch

3.1 - Servicing clutch

Notes:

- ♦ Observe the general repair instructions =>Page 10 .

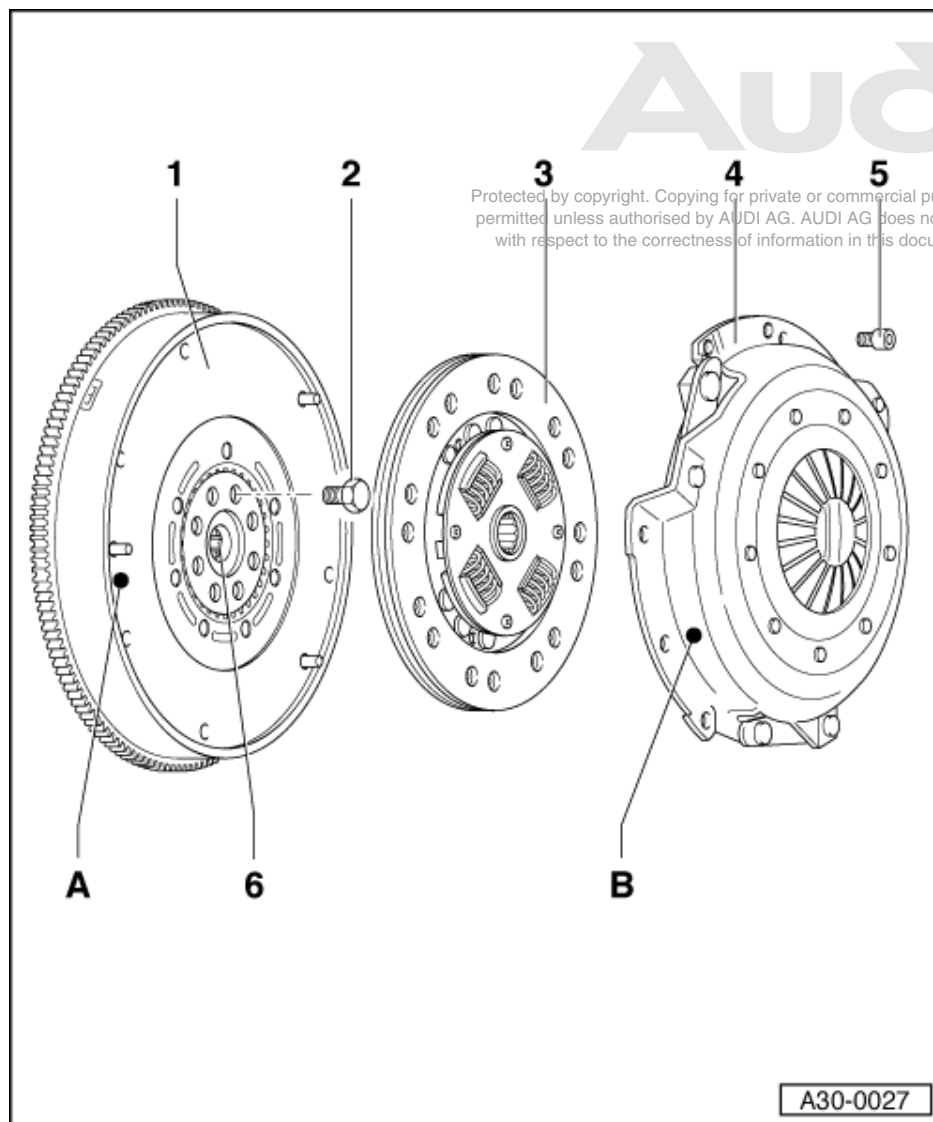
- ◆ Before renewing the clutch plate and pressure plate

=> Fault-finding No. 9 - Defects on the clutch and clutch mechanism.

- ◆ Replace clutch plates and pressure plates with damaged or loose rivets.
- ◆ Select the correct clutch plate and pressure plate according to engine code:

=> Parts List

- ◆ Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease G 000 100 to the splines. Then move clutch plate to and fro on input shaft until hub moves freely on shaft. Excess grease must be removed.
- ◆ Pressure plates are protected against corrosion and greased. Only the contact surface may be cleaned, otherwise the service life of the clutch will be considerably reduced.
- ◆ If the clutch has burnt out, thoroughly clean the bell housing, flywheel and parts of the engine facing the gearbox in order to reduce the smell.



- Remove gearbox to work on clutch => Page 80 .

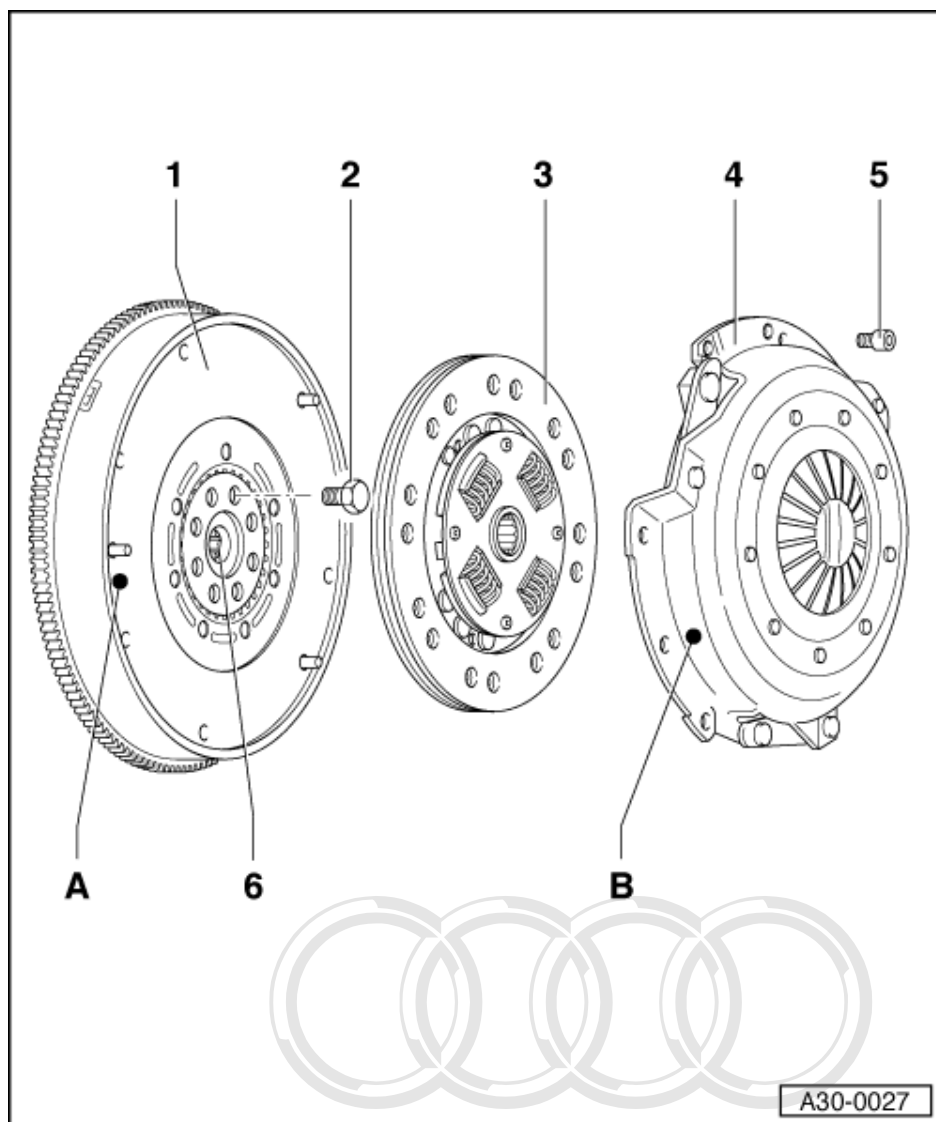
A - Coloured marking on dual mass flywheel

- ◆ If components are marked: white marking -A- on dual mass flywheel must coincide with white marking -B- on pressure plate.

B - Coloured marking on pressure plate



- ♦ If components are marked: white marking -A- on dual mass flywheel must coincide with white marking -B- on pressure plate.

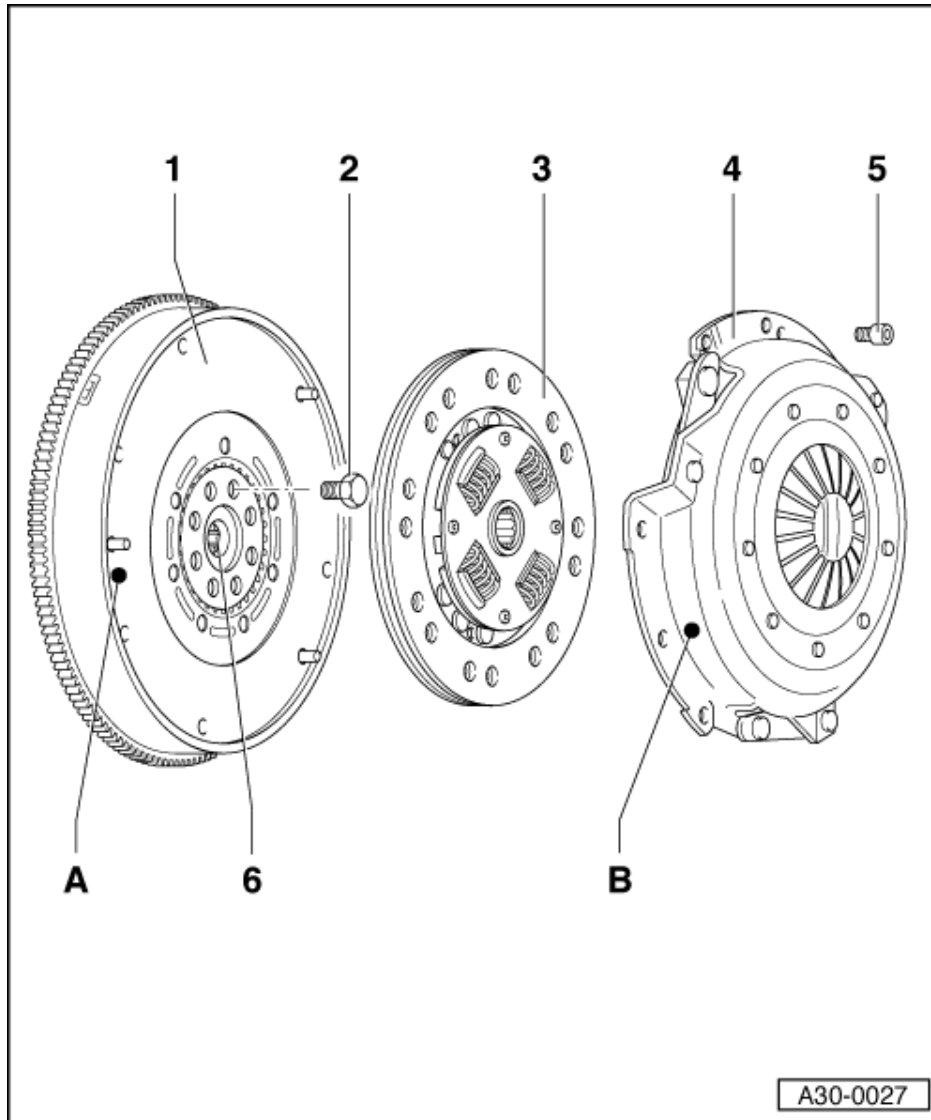


1 Flywheel/dual mass flywheel

- ♦ Make sure that centring pins are a tight fit.
- ♦ Contact surface for clutch lining must be free of grooves, oil and grease
- ♦ Removing and installing:

=> 4-cylinder engine (5-valve), Mechanics; Repair Group 13; Removing and installing sealing flanges and flywheel/drive plate; Removing and installing dual mass flywheel/drive plate Removing and installing sealing flanges and flywheel/drive plate Removing and installing dual mass flywheel/drive plate

=> 4-cylinder engine (5-valve turbo), Mechanics; Repair Group 13; Removing and installing sealing flanges and flywheel/drive plate; Removing and installing dual mass flywheel/drive plate Removing and installing sealing flanges and flywheel/drive plate Removing and installing dual mass flywheel/drive plate



=> 4-cylinder diesel direct injection engine (TDI), Mechanics; Repair Group 13; Removing and installing sealing flanges and flywheel/drive plate Removing and installing sealing flanges and flywheel/drive plate

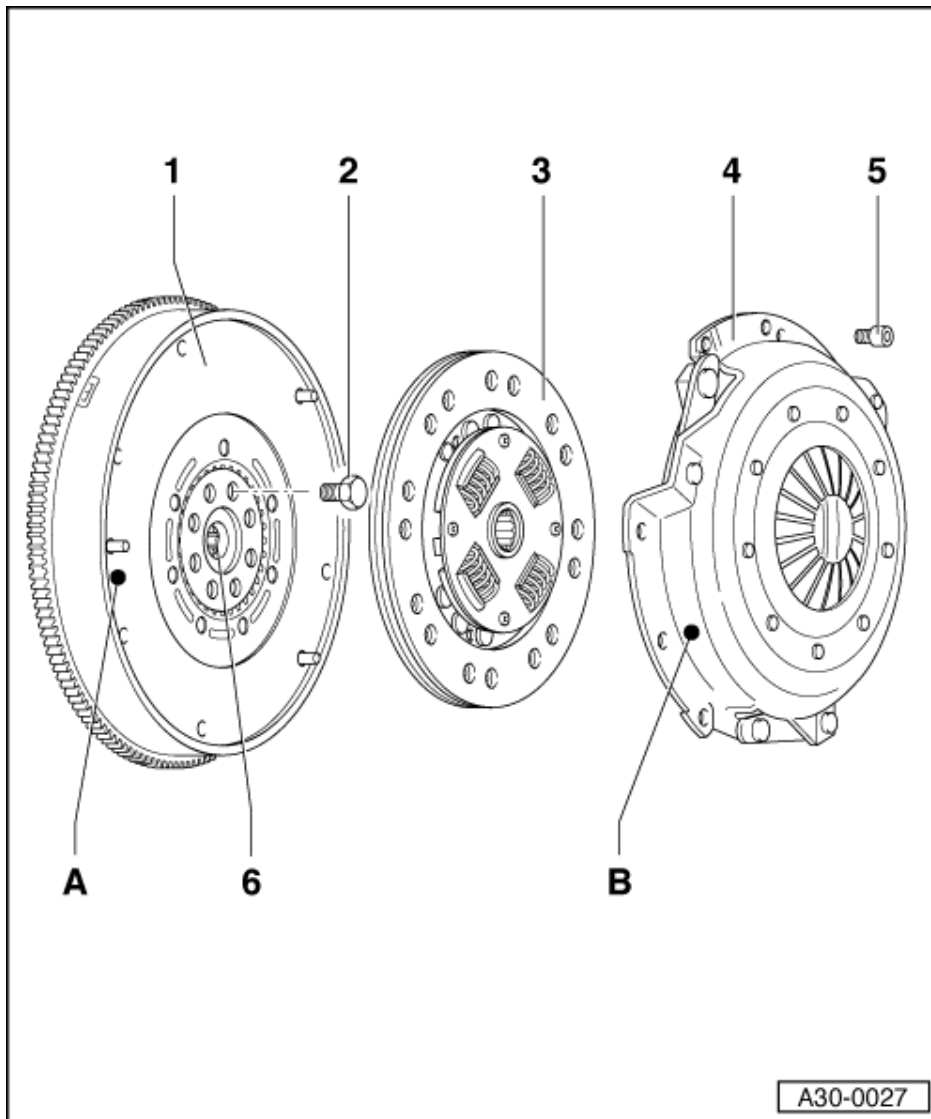
=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 13; Crankshaft group; Removing and installing flywheel/drive plate, Installation dimensions Crankshaft group Removing and installing flywheel/drive plate, Installation dimensions

=> 6-cylinder Engine (5-valve), Mechanics; Repair Group 13; Dismantling and assembling cylinder block, crankshaft and flywheel; Removing and installing flywheel/drive plate, Installation dimensions Dismantling and assembling cylinder block, crankshaft and flywheel Removing and installing flywheel/drive plate, Installation dimensions

2 Bolt for flywheel

- ◆ Replace
- ◆ Vehicles without dual mass flywheel 60 Nm + turn 90° further
- ◆ Vehicles with dual mass flywheel 60 Nm + turn 180° further

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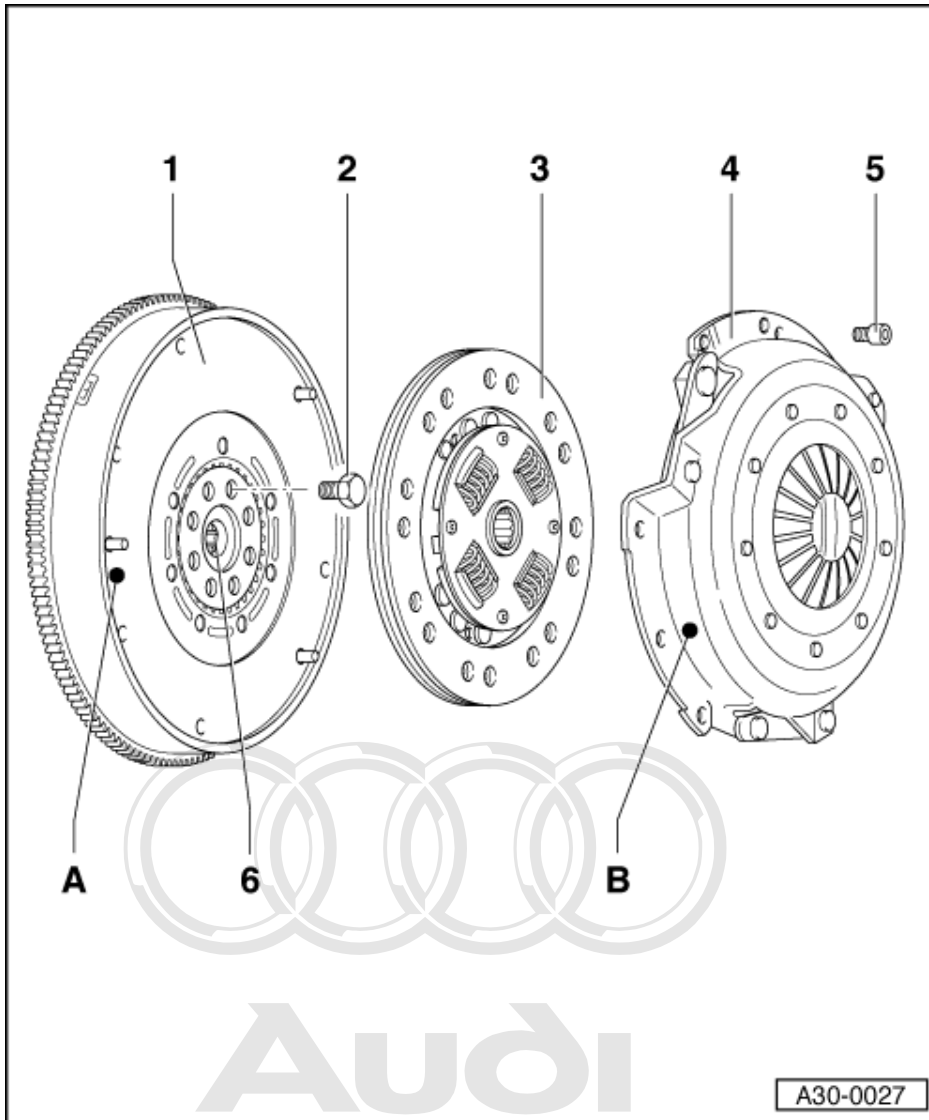


3 Detach clutch plate

- ◆ Installation position:
 - Spring pack (coil springs) towards pressure plate and gearbox
 - Clutch lining must make full contact with flywheel
 - Marking "Getriebeseite" (if present) goes towards pressure plate and gearbox
- ◆ Do not grease
- ◆ Clutch plate diameter => from Page 2
- ◆ Centring => Fig. 1
- ◆ Lightly grease splines



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4 Pressure plate

- ◆ Removing and installing => Fig. 1
- ◆ Check ends of diaphragm spring => Fig. 2
- ◆ Checking spring connection and riveted fastenings => Fig. 3

5 Release and tighten bolt - 25 Nm

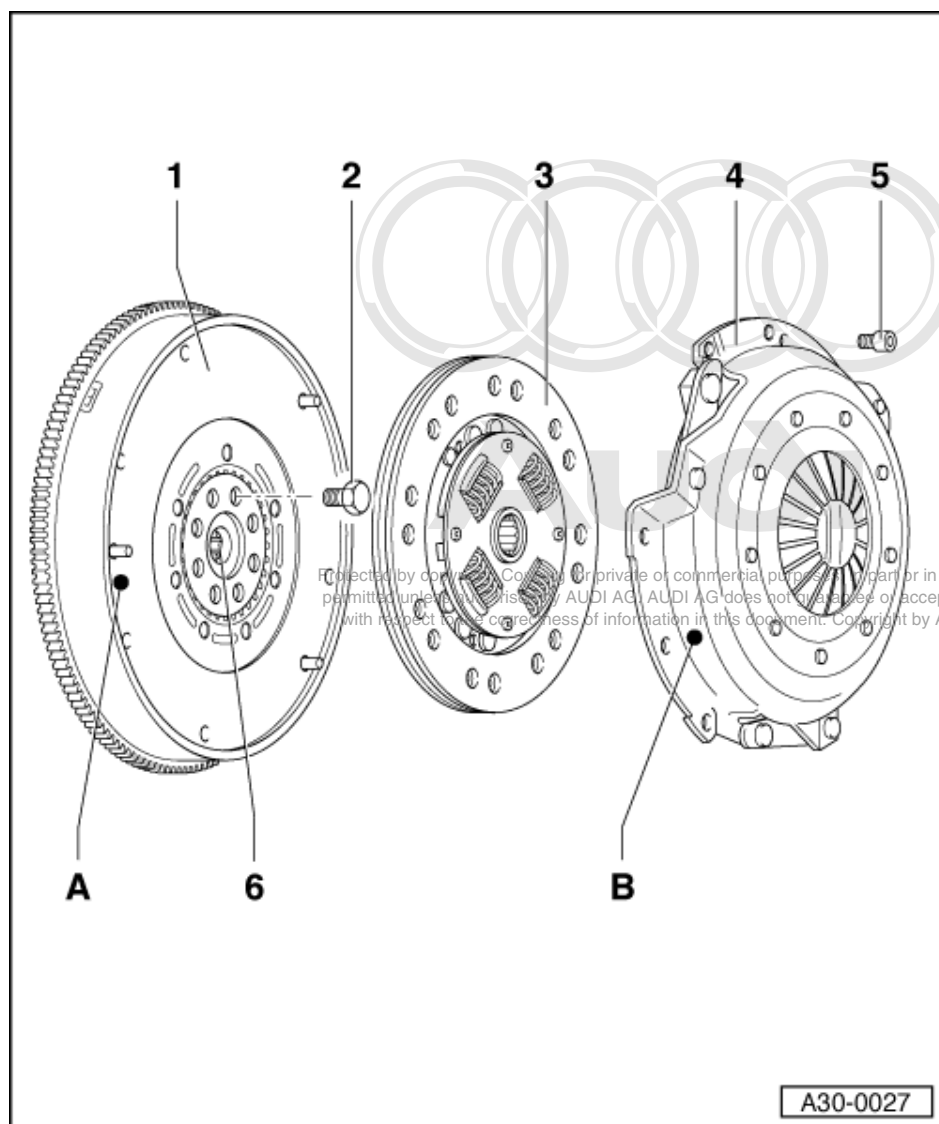
- ◆ Loosen and tighten gradually in several stages working diagonally

6 Needle bearing

- ◆ Removing and installing

=> 4-cylinder engine (5-valve), Mechanics; Repair Group 13; Removing and installing crankshaft; Removing and installing needle roller bearing in crankshaft Removing and installing crankshaft Removing and installing needle roller bearing in crankshaft

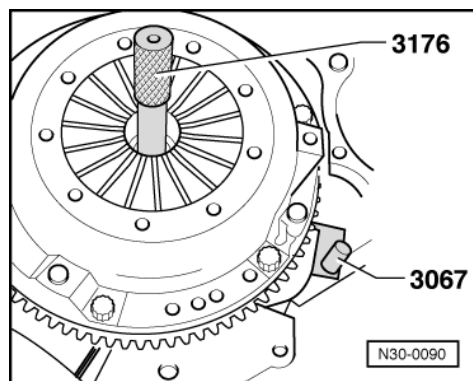
=> 4-cylinder engine (5-valve turbo), Mechanics; Repair Group 13; Removing and installing crankshaft; Removing and installing needle roller bearing in crankshaft Removing and installing crankshaft Removing and installing needle roller bearing in crankshaft



=> 4-cylinder diesel direct injection engine (TDI), Mechanics; Repair Group 13; Removing and installing crankshaft; Removing and installing needle roller bearing in crankshaft Removing and installing crankshaft Removing and installing needle roller bearing in crankshaft

=> 6-cylinder engine (2-valve), Mechanics; Repair Group 13; Crankshaft group; Removing and installing needle bearing in flywheel Crankshaft group Removing and installing needle bearing in flywheel

=> 6-cylinder Engine (5-valve), Mechanics; Repair Group 13; Dismantling and assembling cylinder block, crankshaft and flywheel; Removing and installing needle bearing in flywheel Dismantling and assembling cylinder block, crankshaft and flywheel Removing and installing needle bearing in flywheel

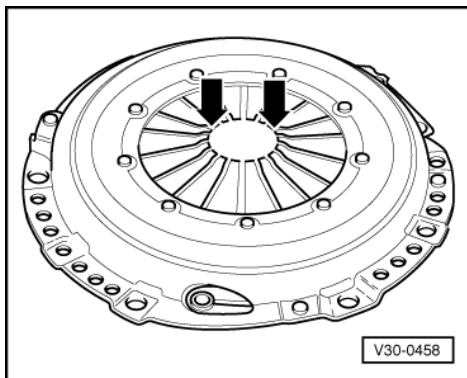


-> **Fig.1 Centring clutch plate and removing and installing pressure plate**

- Installation position of clutch plate: spring pack (coil springs) or marking "Getriebeseite" towards pressure plate and gearbox.

Notes:

- ◆ The clutch plate lining and the contact surface of the pressure plate must make full contact with the flywheel before the securing bolts are inserted.
- ◆ Tighten securing bolts evenly and in diagonal sequence to avoid damaging centring holes in pressure plate and centring pins on flywheel.
- When assembling, ensure that white marking (if provided) on dual-mass flywheel coincides with white marking on pressure plate.
- Loosen and tighten bolts gradually in several stages working diagonally. Tightening torque: 25 Nm.
- Reverse position of retainer 3067 when removing.
- Use mandrel 3176 to centre clutch plate.



-> **Fig.2 Checking ends of the diaphragm spring**

- ◆ Wear up to half the thickness of the diaphragm spring is permitted.

Note:

When performing repairs always match up clutch pressure plate and clutch plate by checking engine code (see Parts Catalogue).

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-> Fig.3 Checking spring connection and riveted fastenings

- Check spring connection between pressure plate and cover for cracks and make sure rivet fastenings are seated tightly.
- Renew clutches with damaged springs or loose riveted fastenings -arrows-.

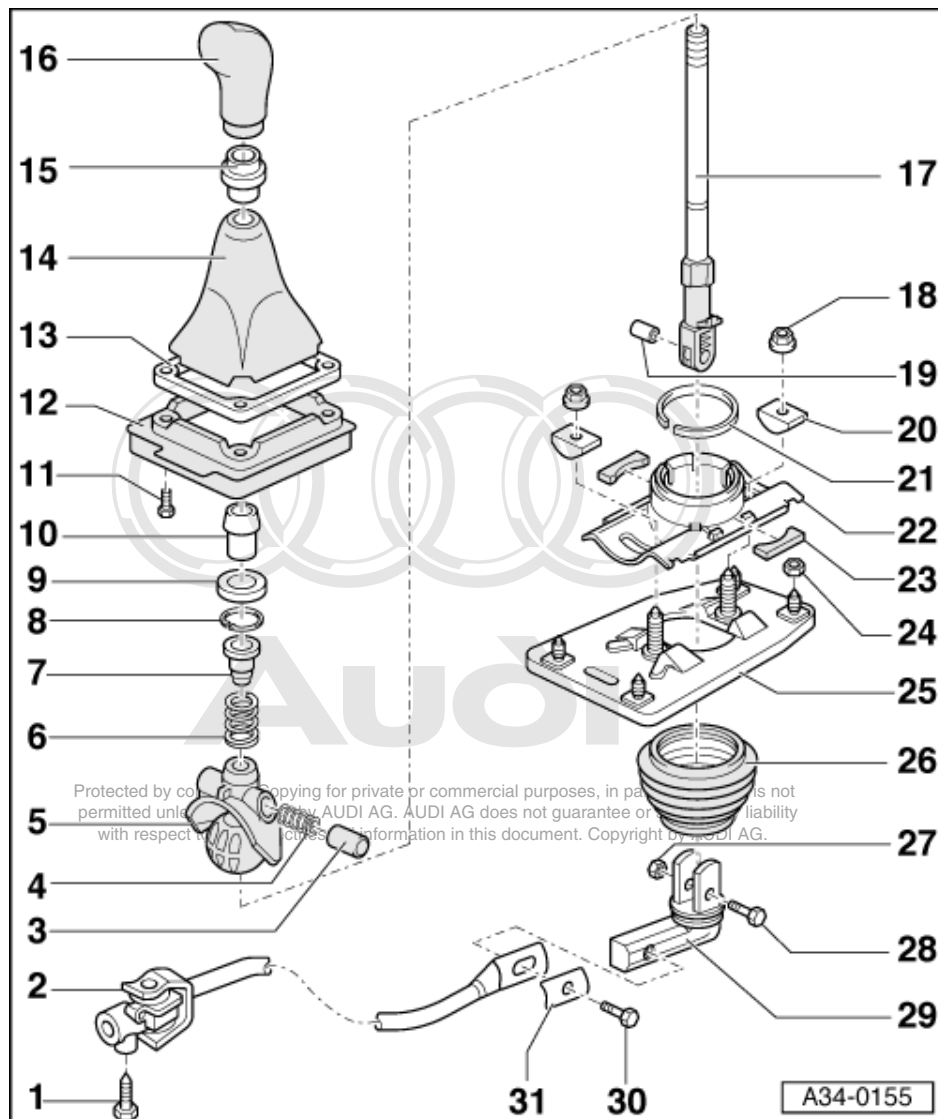


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34 - Controls, Housing

1 - Servicing shift mechanism

1.1 - Servicing shift mechanism



1.2 - Standard-travel shift mechanism

Notes:

- ♦ Lubricate bearings and moving surfaces with polycarbamide grease, part no. G 052 142 A2.
- ♦ Adjust shift mechanism:
=>page 52.

1 Release and tighten bolt -23 Nm

2 Selector rod

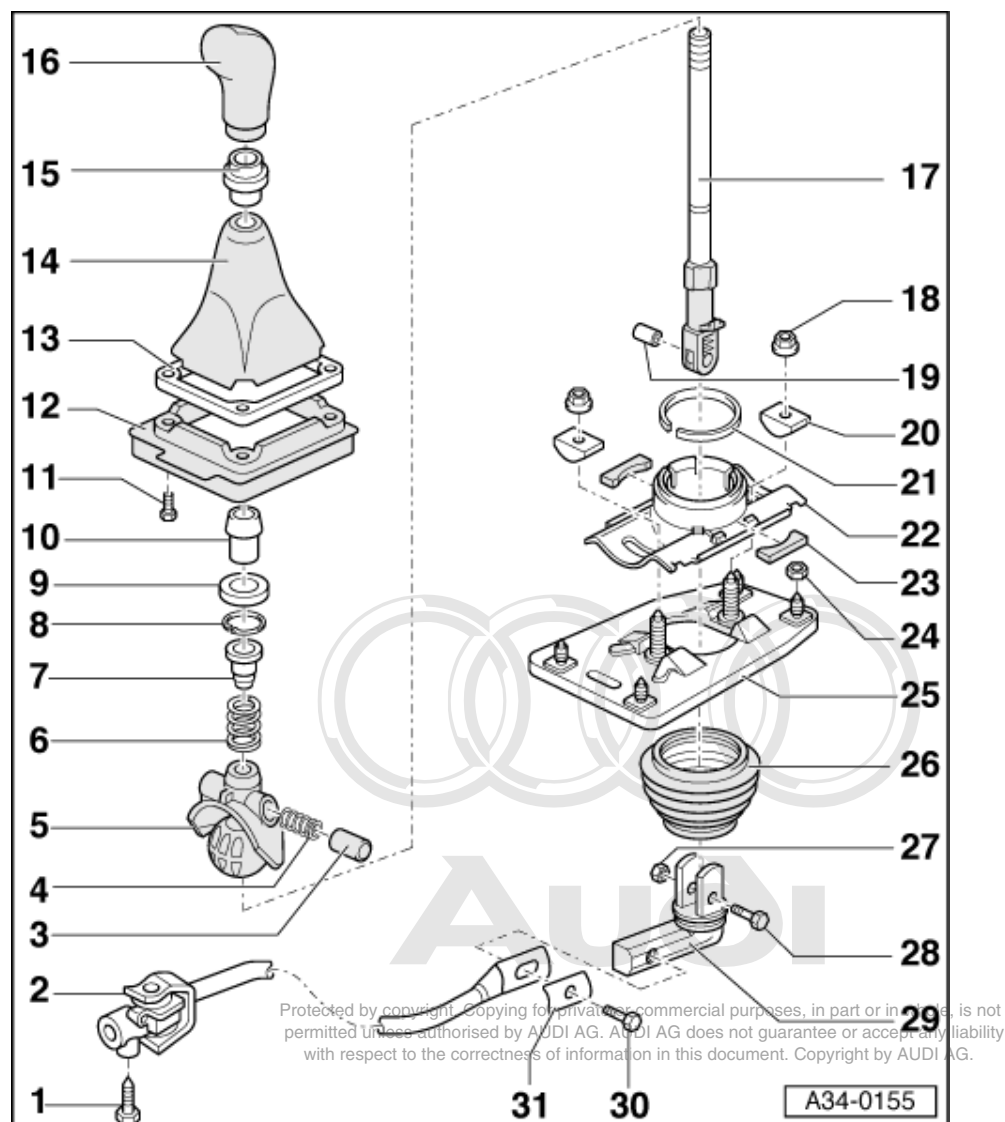
- ♦ With selector joint



3 Bushing

- ♦ Installation position: The rounded end faces the gear stick

4 Spring



5 Ball stop

- ♦ Insert spring and bush in the ball stop and assemble on the gear stick so that the spring and bush are on the right when looking forwards.
- ♦ Install ball stop before fitting circlip (Item 21).

6 Spring

7 Spacer bush

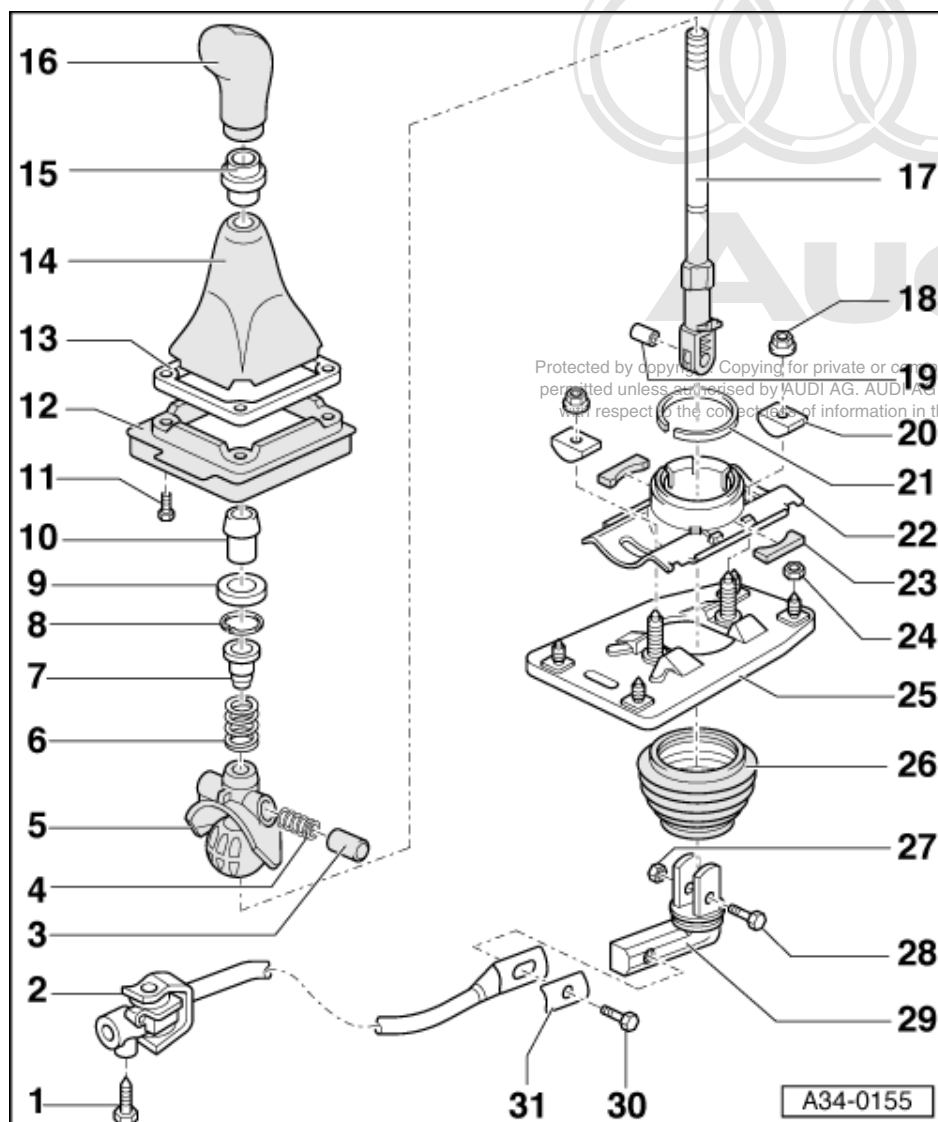
8 Circlip

- ♦ Do not open out too far when fitting

9 Sealing collar

10 Bushing

11 Cross head bolt



12 Retaining frame - lower section

13 Retaining frame - upper section

14 Cover

- ♦ Retainer hook on rear of cover, prise out carefully from centre console

15 Bushing

16 Gear stick knob

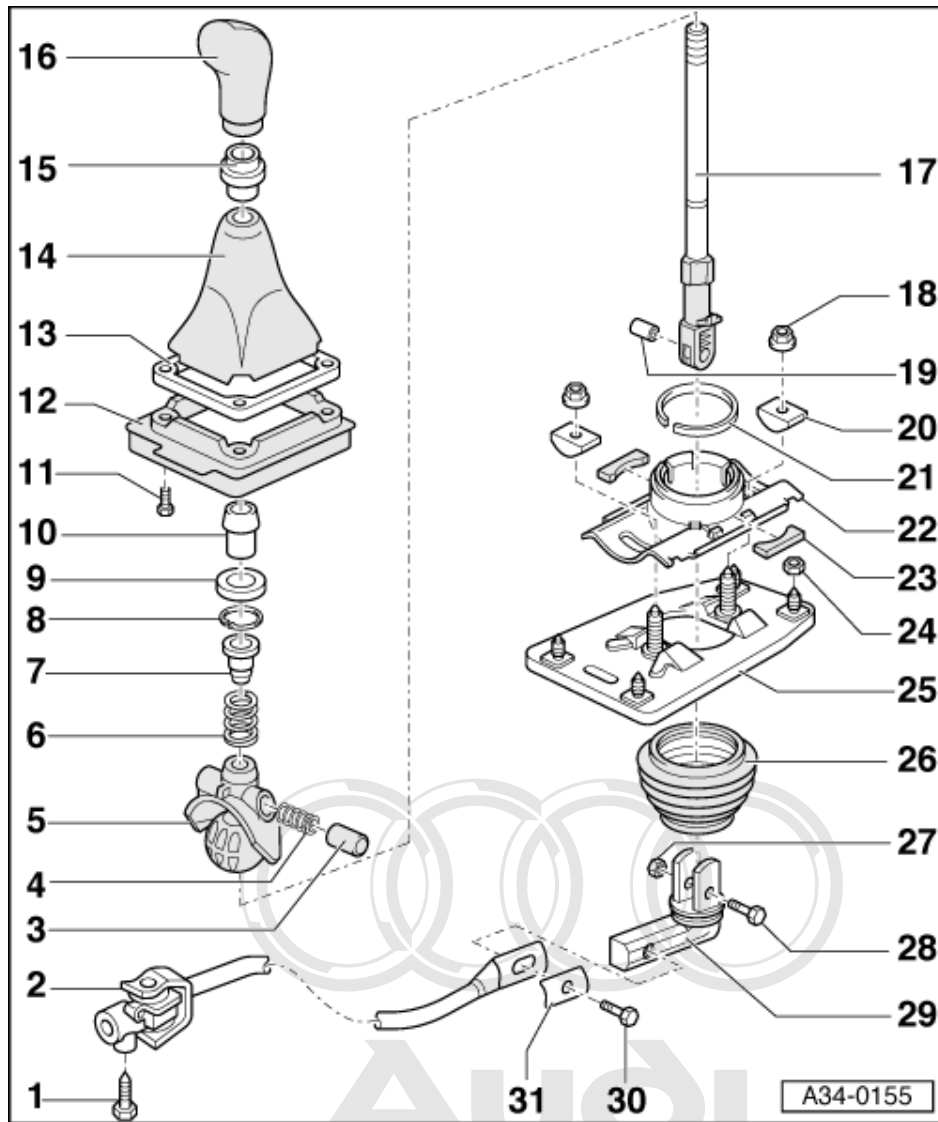
17 Gear stick

- ♦ Can only be fitted into ball housing in one position

18 Nut - 23 Nm

19 Spacer tube

20 Connector

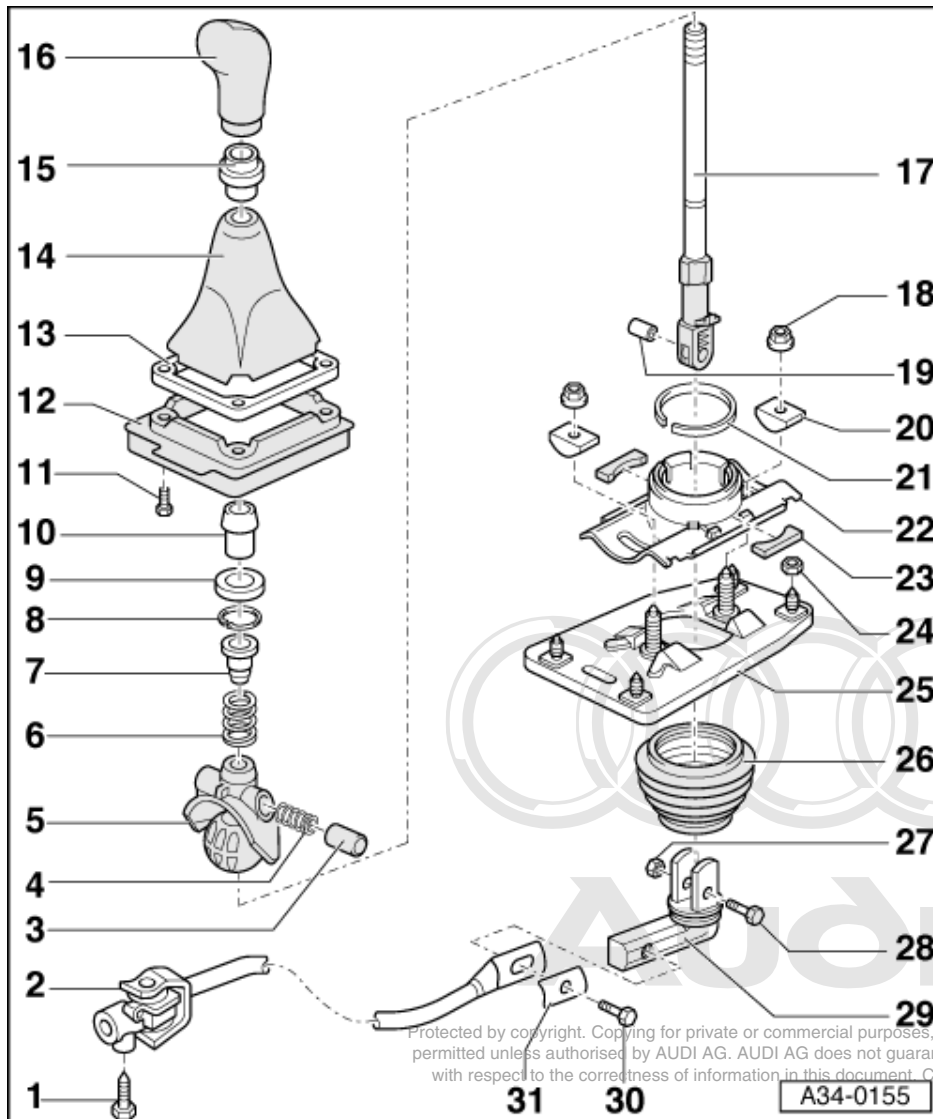
**21 Circlip**

- ◆ Replace
- ◆ Remove before removing the ball stop
- ◆ Installation position: rounded side faces ball housing (Item 22)

22 Ball housing

- ◆ Limit pieces for ball stop on left and right must be engaged.
- ◆ Installation position: reverse detent faces left

23 Buffer**24 Nut - 10 Nm****25 Housing for shift mechanism**



26 Bellows

- ♦ Remove heat shield before removing and installing
- ♦ Pull carefully over selector rod

27 Nut - 10 Nm

- ♦ Self-locking
- ♦ Replace

28 Bolt

29 Selector fork

30 Release and tighten bolt - 23 Nm

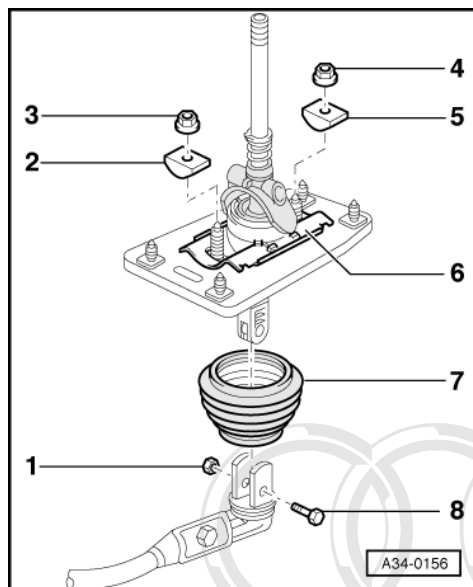
- ♦ Before slackening bolt, take off and push back heat shield

31 Clamp

1.3 - Removing and installing standard-travel shift mechanism

Removing

- Remove heat shield above propshaft.



- -> Pull bellows -7- off underside of shift mechanism.
- Slacken nut -1- securing selector fork to gear stick.
- Take bolt -8- out of selector fork.
- Remove gear stick knob and cover.
- Remove noise insulation.
- Unscrew nuts -3- and -4- securing ball housing and remove the two connecting pieces -2- and -5-.
- Lift ball housing -6- out of centre console together with gear stick.

Installing

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Installation is carried out in the reverse order, when doing this note the following:

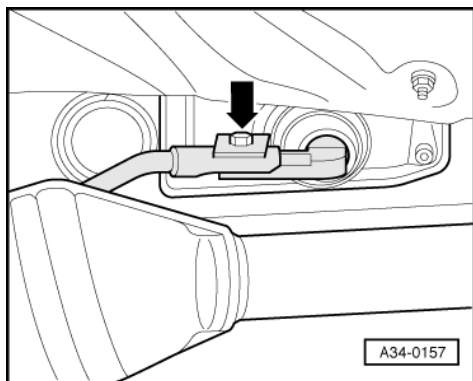
- Adjusting shift mechanism => Page 52

Tightening torques

Component	Nm
Ball housing to housing for shift mechanism	23
Selector fork to gear stick	10
Selector rod to selector fork	23

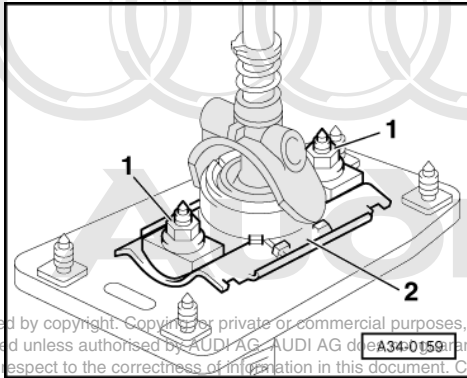
1.4 - Adjusting standard-travel shift mechanism

Preconditions:

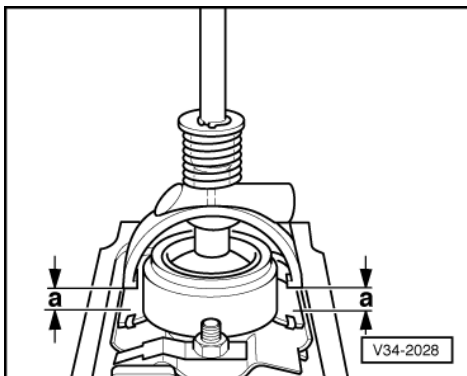


- ◆ Perfect gear linkage operating and transfer elements.
- ◆ Gear shift mechanism moves smoothly.
- ◆ Gearbox, clutch and clutch mechanism must be in proper condition.
- ◆ Gearbox in neutral.

- Remove heat shield above propshaft.
- ➔ Slacken bolt -arrow- for selector rod.
- Remove gear stick knob and cover.



- Remove noise insulation.
- ➔ Loosen ball housing nuts -1-.
- Align ball housing -2- so that it is horizontal.
- Tighten ball housing nuts to 23 Nm.



- Adjust gear stick as follows:
 - Gear stick in vertical position
 - ➔ Distance -a- between ball stop buffers and ball housing should be equal on both sides.

Note:

The illustration shows the gear stick from behind (looking towards the front of the vehicle).

- Align gear stick so that it is positioned slightly to the rear.
- Hold gear stick in this position (second mechanic required).
- Tighten selector rod bolt below vehicle to 23 Nm.

Note:

The gear stick must remain in the same position while the bolt is being tightened.

- Install the heat shield.

1.5 - Checking gear stick alignment

- The gear stick must rest in the 3rd/4th gear gate when the gearbox is in neutral.



- Depress clutch.
- Check that all gears can be engaged.
- Check operation of reverse gear lock.
- Put gear stick into the 5th/reverse gear gate and move stick towards reverse gear (without applying excessive pressure on the gear stick).
 - The amount of travel until contact is made with reverse gear stop should be 5 ... 10 mm (measured at gear stick knob).
- Reduce pressure on gear stick to let it move back.
 - The gear stick should return by itself from the 5th/reverse gear gate into the 3rd/4th gear gate.
- Check fine adjustment if necessary.

Fine adjustment

- If the gear stick setting is incorrect it can be adjusted as follows:
 - Slacken nuts for ball housing.
 - Move gear stick with ball housing to the right towards 5th/reverse gear gate as far as the stop in the gearbox, and hold in this position.
 - When doing this push the ball housing to the left against the gear stick.
 - Then hold gear stick and ball housing in this position and tighten.
 - Fit covers and gear stick knob.

Note:

*If only 5th and reverse gear cannot be engaged, the 5th and reverse gear locking unit should be checked and replaced if necessary =>Page **128**.*

1.6 - Servicing short-travel shift mechanism

Notes:

- ♦ Adjusting shift mechanism =>Page **63**.
- ♦ To remove complete shift mechanism, first remove exhaust system:

=> 4-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts
Removing and installing exhaust system parts

=> 4-cylinder Engine (5-valve turbo), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts
Removing and installing exhaust system parts

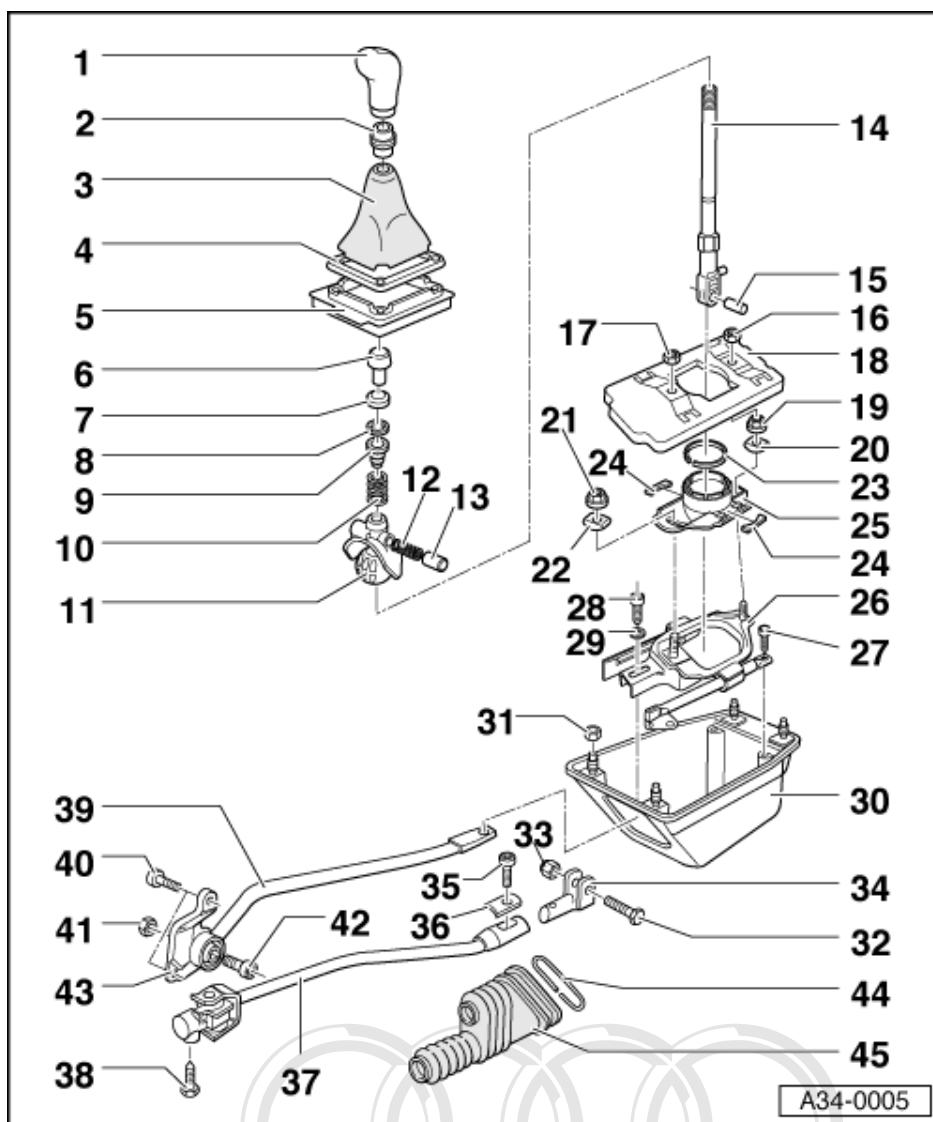
=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system
Removing and installing exhaust system

=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system
Removing and installing exhaust system

=> 6-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts
Removing and installing exhaust system parts

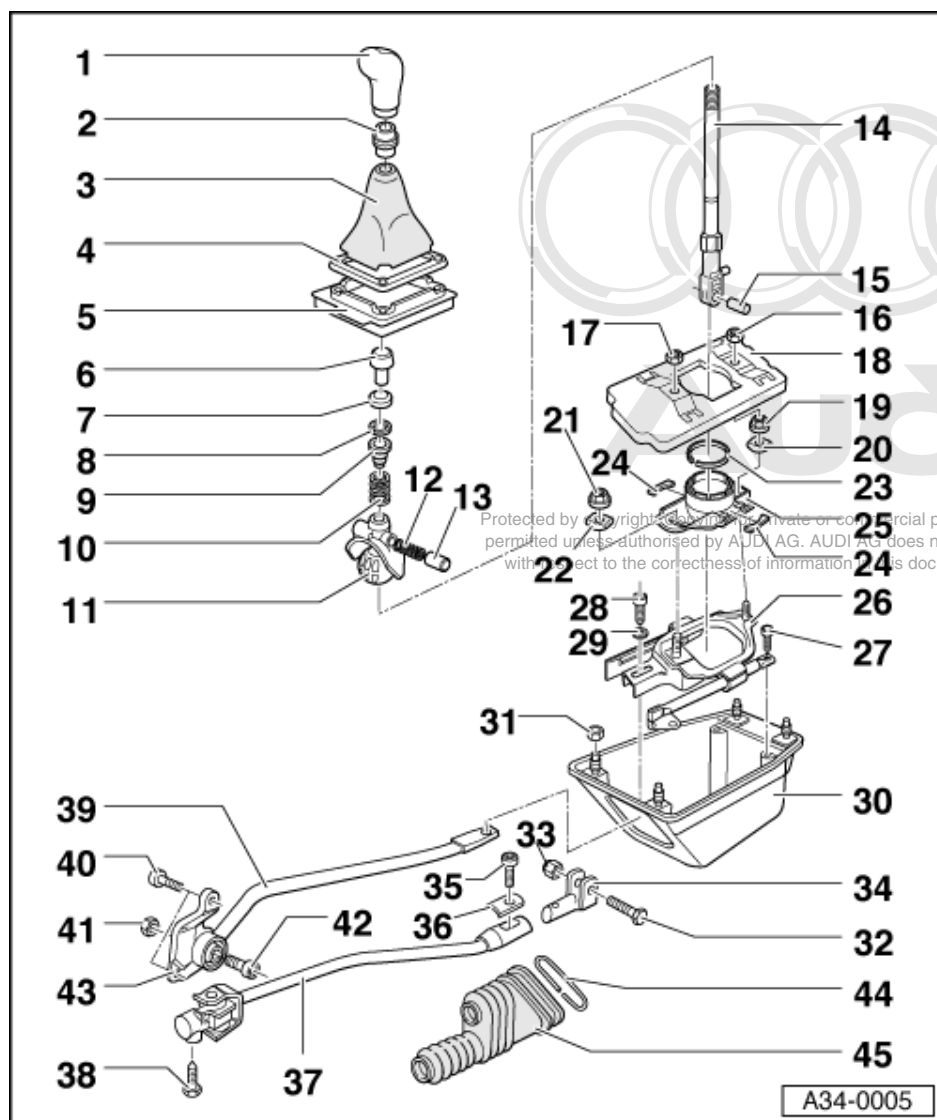
- ♦ The housing for the shift mechanism must be lowered clear if the shift mechanism is to be dismantled with removing it from the vehicle.

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- 1 Gear stick knob
- 2 Bushing
- 3 Cover
 - ♦ Retainer hook on rear of cover, prise out carefully from centre console
- 4 Retaining frame - upper section
- 5 Retaining frame - lower section
- 6 Bushing
- 7 Sealing collar
- 8 Circlip
 - ♦ Do not open out too far when fitting
- 9 Spacer bush
- 10 Spring

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11 Ball stop

- ♦ Insert spring and bush in the ball stop and assemble on the gear stick so that the spring and bush are on the right when looking forwards.
- ♦ Install ball stop before fitting circlip (Item 23).

12 Spring

13 Bushing

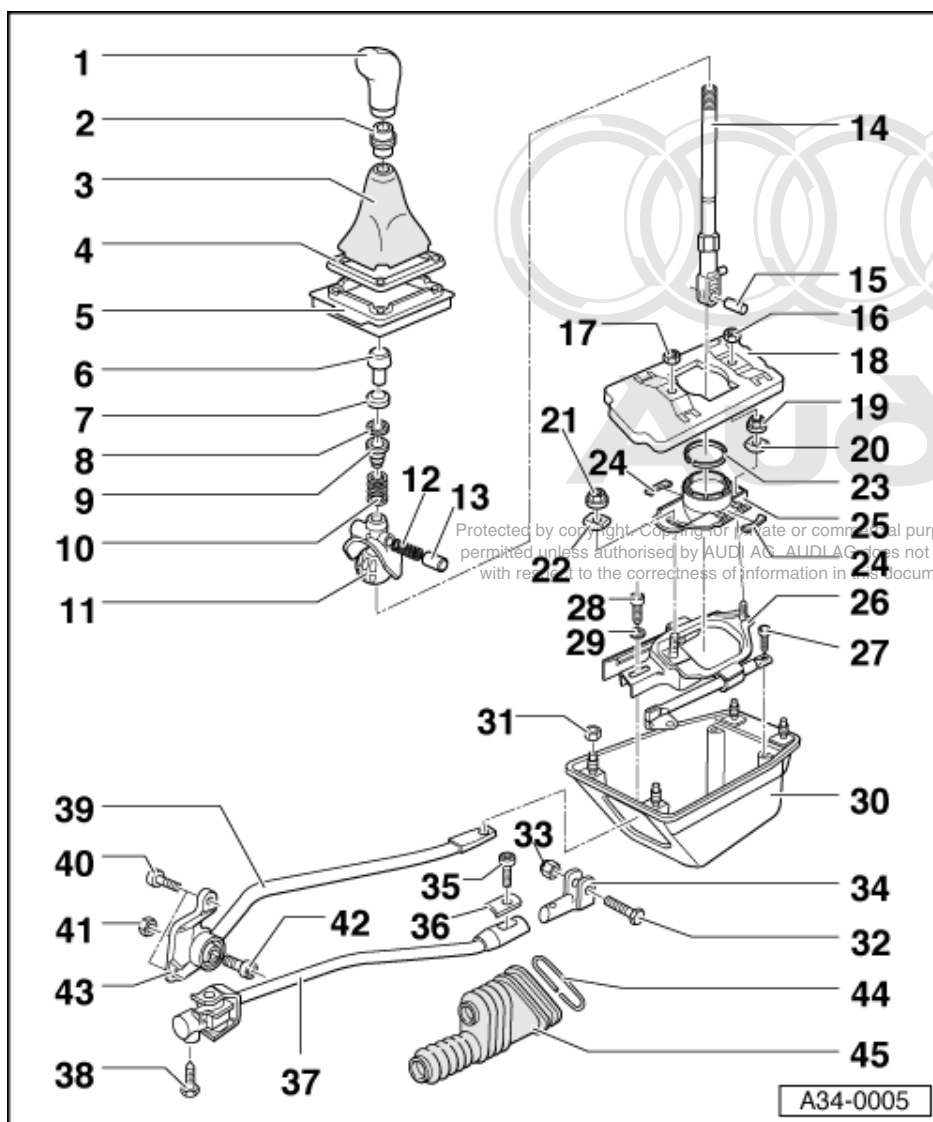
- ♦ Installation position: The rounded end faces the gear stick

14 Gear stick

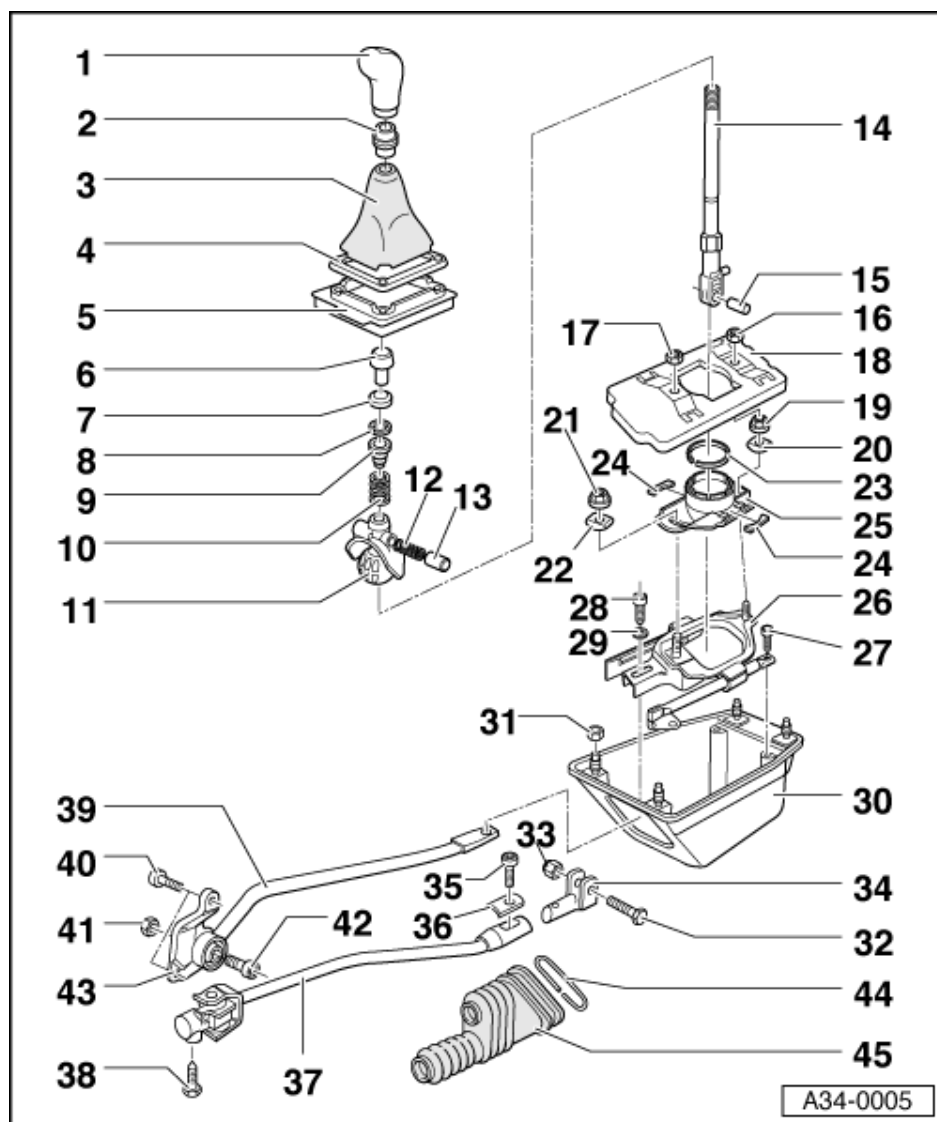
- ♦ Can only be fitted into ball housing in one position

15 Spacer tube

16 Nut - 8 Nm



- 17 Nut - 8 Nm
18 Noise insulation
19 Nut - 10 Nm
20 Connector
21 Nut - 23 Nm
22 Connector
23 Circlip
 ♦ Replace
 ♦ Remove before removing the ball stop
 ♦ Installation position: rounded side faces ball housing (Item 25)
24 Buffer



25 Ball housing

- ◆ Limit pieces for ball stop on left and right must be engaged.
- ◆ Installation position: reverse detent faces left

26 Rear push rod

27 Release and tighten bolt - 10 Nm

28 Release and tighten bolt - 23 Nm

29 Washer

30 Housing for shift mechanism

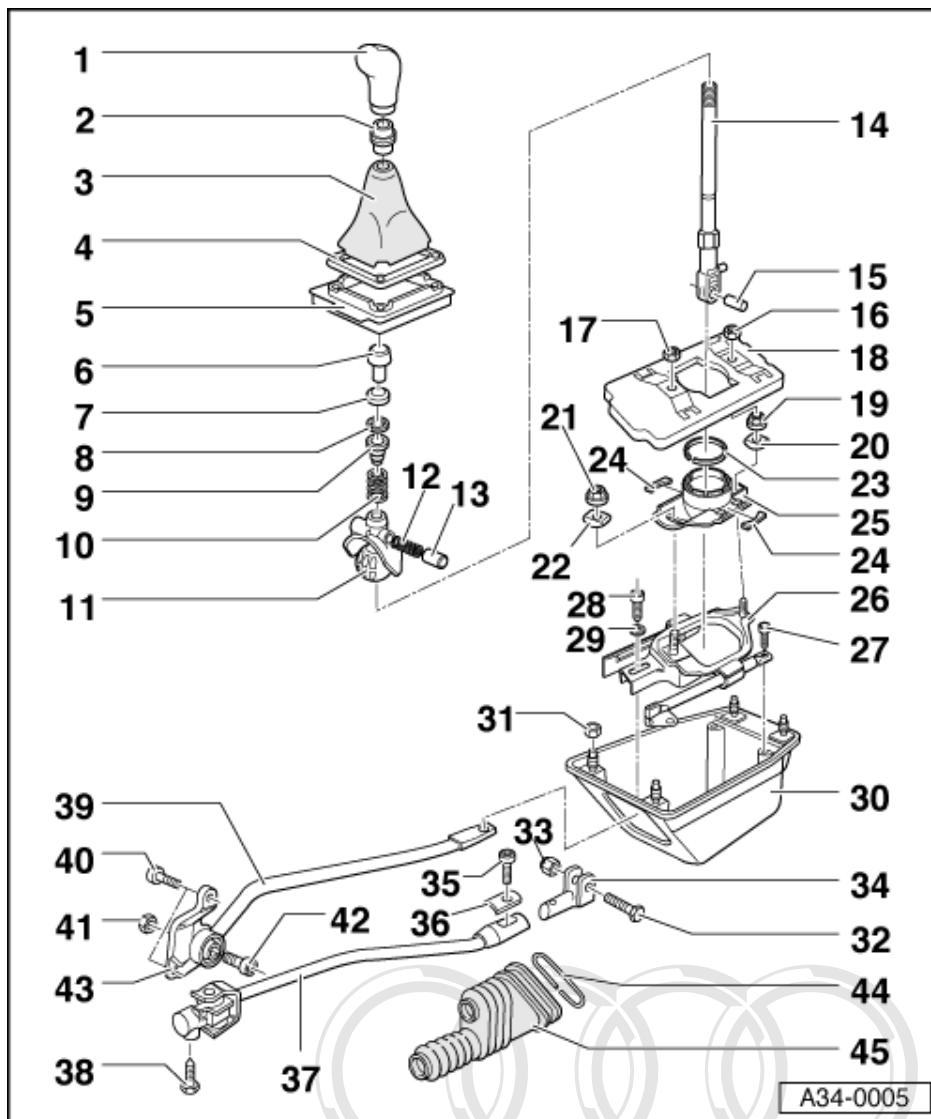
31 Nut - 10 Nm

32 Bolt

33 Nut - 10 Nm

- ◆ Self-locking
- ◆ Replace

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34 Selector fork

35 Release and tighten bolt - 23 Nm

36 Clamp

37 Front selector rod

- ♦ With selector joint

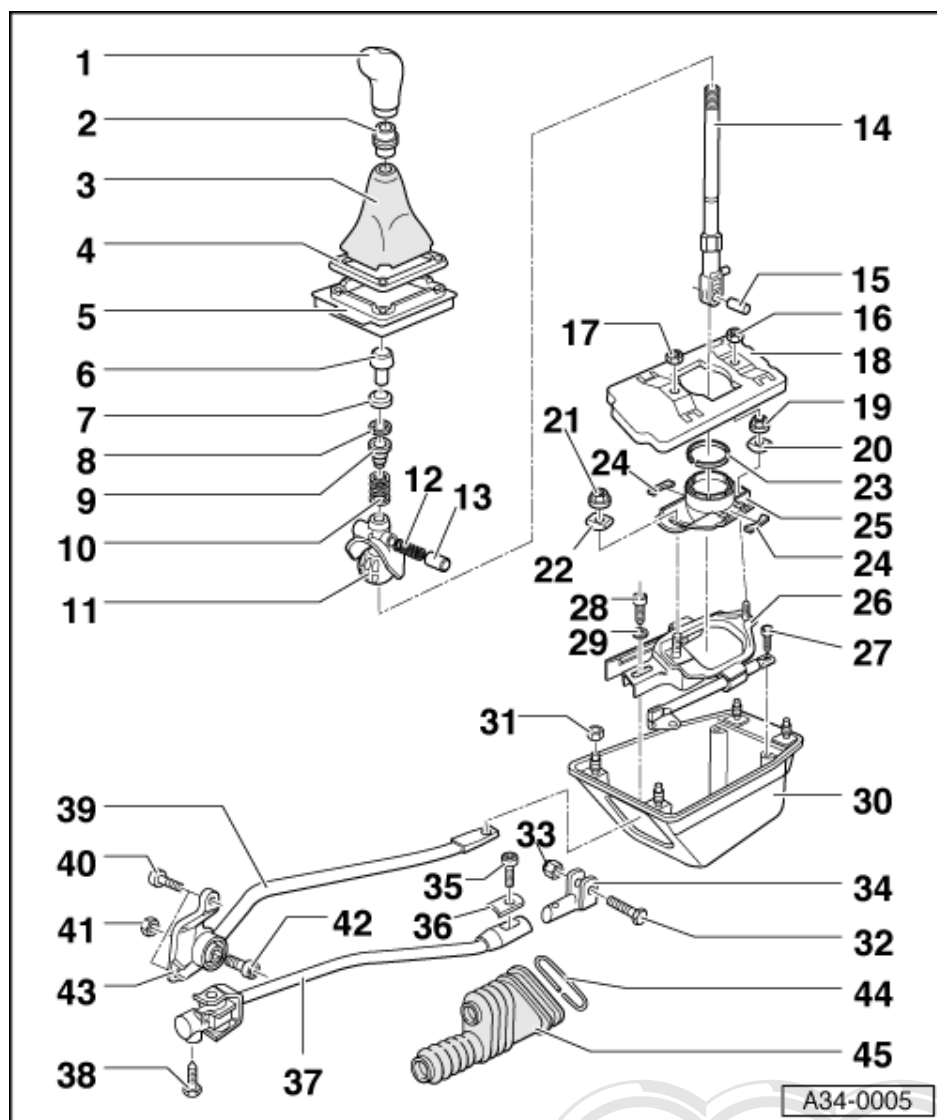
38 Release and tighten bolt - 23 Nm

- ♦ Self-locking
- ♦ Replace

39 Front push rod

- ♦ To avoid tension in linkage, secure front push rod to housing for shift mechanism and rear push rod first
- ♦ Hold bolt -item 42 - to prevent it from turning when tightening nut -item 41 -
- ♦ Securing push rod 06.96 ä => Fig. 1

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40 Release and tighten bolt - 40 Nm

41 Nut - 40 Nm

42 Bolt

43 Retainer for push rod

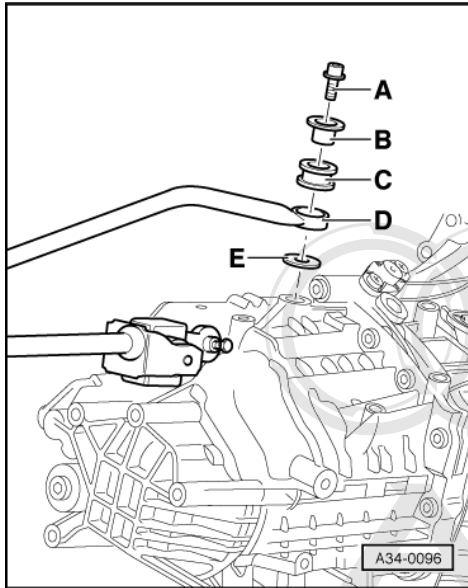
- ♦ Illustration shows method of securing push rod ä 05.96
- ♦ Securing push rod 06.96 ä => Fig. 1

44 Retaining ring

45 Bellows

- ♦ Remove catalytic converter and heat shield before removing and installing
- ♦ Carefully pull over selector rod and push rod
- ♦ Align with markings on selector rod and push rod when installing

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-> Fig.1 Securing push rod on gearbox 06.96 ä For commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

On models from 06.96 onwards the push rod is bolted directly onto the gearbox. The additional retainer -Item **60** and the bolts for the retainer have been discontinued. The gearbox cover has been modified accordingly, and now has an additional mounting boss.

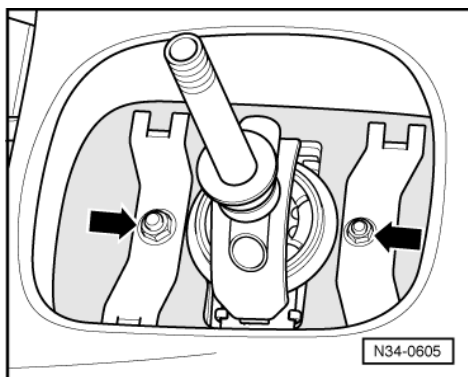
- A - Hexagon socket head bolt - 40 Nm
- B - Washer
- Convex side faces towards push rod
- C - Rubber bush
- D - Front push rod
- E - Washer

Note:

Shown in manual gearbox illustration 012.

1.7 - Removing and installing short-travel shift mechanism

Removing

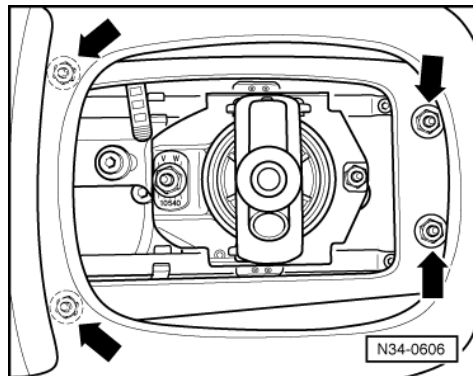


- Remove gear stick knob and cover.
- Remove centre console:



=> General body repairs; Repair Group 70; Dash panel; Removing and installing the front centre console Dash panel Removing and installing the front centre console

- Remove noise insulation.
- -> Remove noise insulation for shift mechanism housing -arrows-.



- -> Unscrew nuts securing shift mechanism housing -arrows-.
- Remove rear section of exhaust system (rearward of exhaust pipe clamp(s)) and remove front exhaust pipe together with catalytic converter if necessary.

=> 4-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

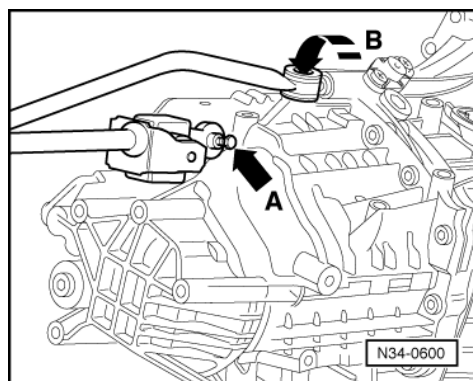
=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing parts of exhaust system Removing and installing parts of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

- Removing propshaft => Page 218 .



- -> Detach selector rod -arrow A-.
- Unscrew hexagon socket head bolt on push rod -arrow B-.

Note:

Shown in illustration with manual gearbox.

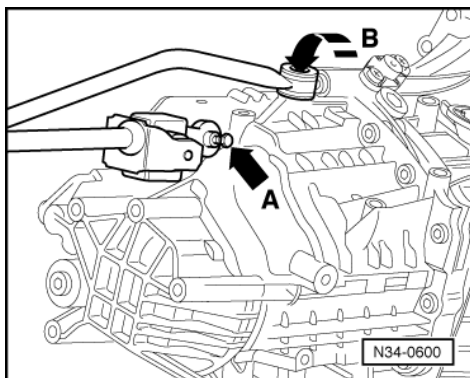
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- Swing housing for shifts mechanism down together with selector rod and push rod, and remove.

Installing

Installation is carried out in the reverse order, when doing this note the following:

- Push selector rod on so that the securing bolt fits in the recess in the selector shaft.



- -> Then secure selector rod -arrow A-.
- Then bolt push rod to gearbox -arrow B-.
- Adjusting shift mechanism => Page 63 .
- Bolt on propshaft => Page 223 .
- Adjust propshaft => Page 225 .
- Stress free alignment of exhaust system

=> 4-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

Tightening torques

Component	Nm
Gear stick housing to body	10
Selector rod to gearbox	23 1)
Push rod to gearbox	40

- 1) Replace bolt

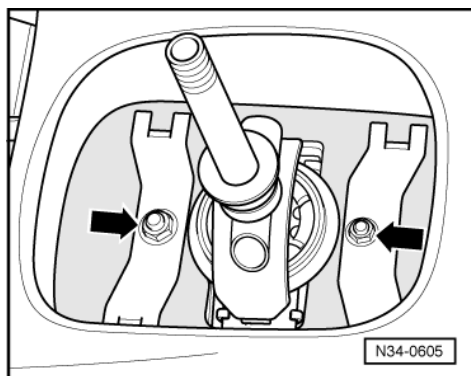
1.8 - Adjusting short-travel shift mechanism

Preconditions:

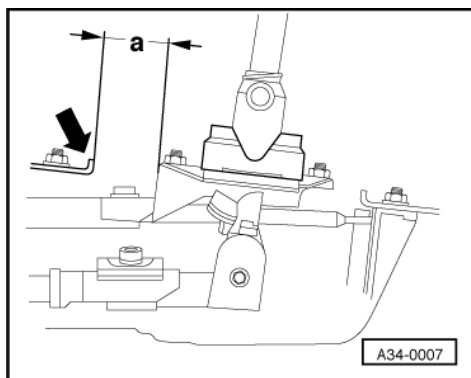
- ◆ Perfect gear linkage operating and transfer elements.
- ◆ Gear shift mechanism moves smoothly.



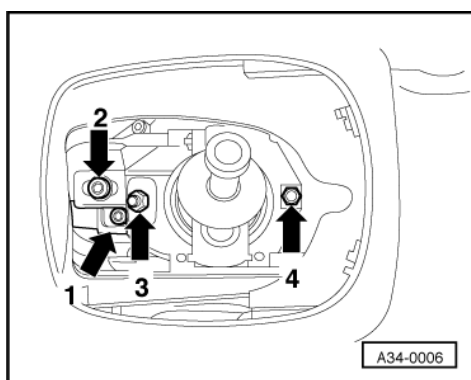
- ♦ Gearbox, clutch and clutch mechanism must be in proper condition.
- ♦ Gearbox in neutral.
- Remove gear stick knob and cover.



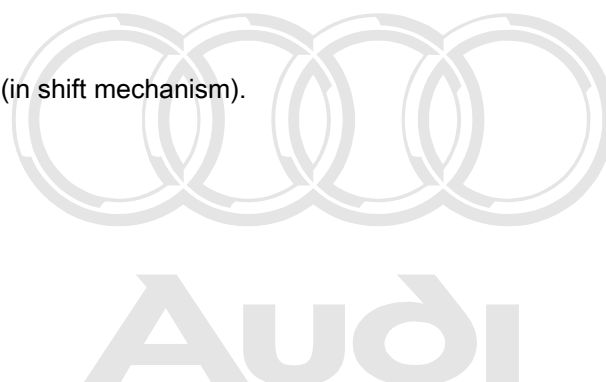
- -> Remove noise insulation for shift mechanism housing -arrows-.



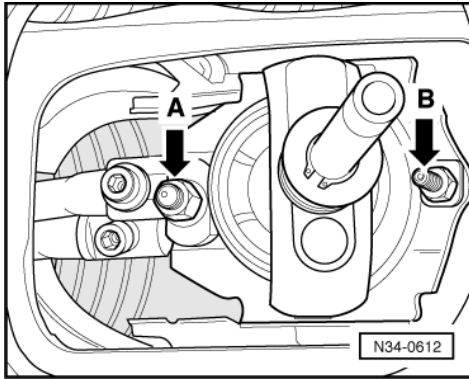
- Measure distance between body and rear push rod (in shift mechanism).
- -> Specified value: Distance a = 37 mm



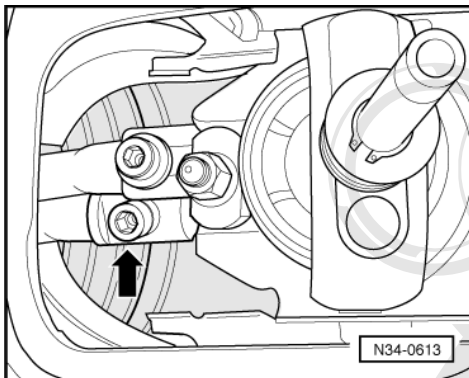
- If this is not the case, adjust distance -a- as follows:
- -> Loosen push rod bolt -arrow 2-.
- Rear push rod (in shift mechanism) should move freely in both directions on slide.
- Set distance -a- by moving rear push rod (in shift mechanism).
- Tighten push rod bolt to 23 Nm.



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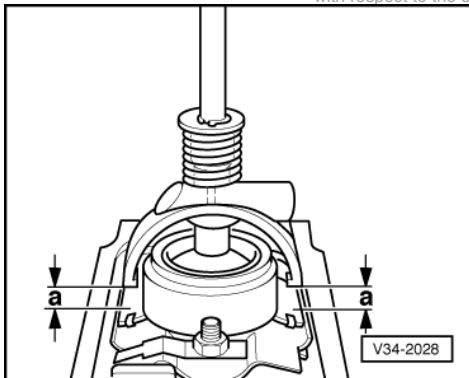
- -> Loosen ball housing nuts -arrow A- and -arrow B-.
- Align ball housing (-Item 58) so that it is horizontal.
- Tighten ball housing nuts: -arrow A- to 25 Nm and -arrow B- to 10 Nm.



- -> Loosen bolt for selector rod -arrow-.
- Connection between selector rod and shift mechanism should move freely.

- Align gear stick so that it is positioned slightly to the rear.

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- -> Distance -a- between ball stop buffers and ball housing should be equal on both sides. Hold gear stick in this position (second mechanic required). Tighten selector rod bolt to 23 Nm.

Note:

The gear stick must remain in the same position while the bolt is being tightened.

1.9 - Checking gear stick alignment

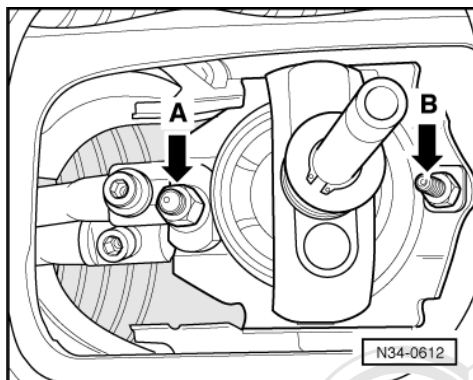
- The gear stick must rest in the 3rd/4th gear gate when the gearbox is in neutral.



- Depress clutch.
- Check that all gears can be engaged.
- Check operation of reverse gear lock.
- Put gear stick into the 5th/reverse gear gate and move stick towards reverse gear (without applying excessive pressure on the gear stick).
 - The amount of travel until contact is made with reverse gear stop should be 5 ... 10 mm (measured at gear stick knob).
- Reduce pressure on gear stick to let it move back.
 - The gear stick should return by itself from the 5th/reverse gear gate into the 3rd/4th gear gate.
- Check fine adjustment if necessary.

Fine adjustment

- If the gear stick setting is incorrect it can be adjusted as follows:



- -> Loosen ball housing nuts -arrow A- and -arrow B-.
- Move gear stick with ball housing to the right towards 5th/reverse gear gate as far as the stop in the gearbox, and hold in this position.
- When doing this push the ball housing to the left against the gear stick.
- Then hold gear stick and ball housing in this position and tighten nuts for ball housing. Tightening torques:
 - arrow A- to 25 Nm and -arrow B- to 10 Nm.
- Fit covers and gear stick knob.

Note:

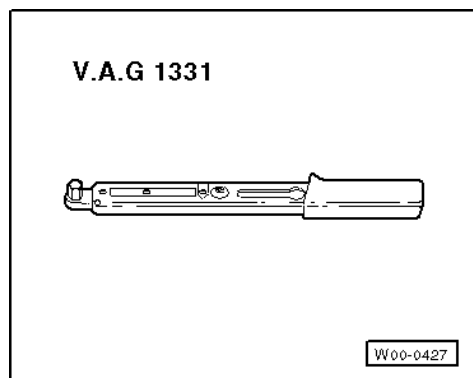
If only 5th and reverse gear cannot be engaged, the 5th and reverse gear locking unit should be checked and replaced if necessary =>Page 128.

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2 - Servicing shift mechanism for vehicles from 05.99, Chassis.-No. 8D-X-260 001 ä

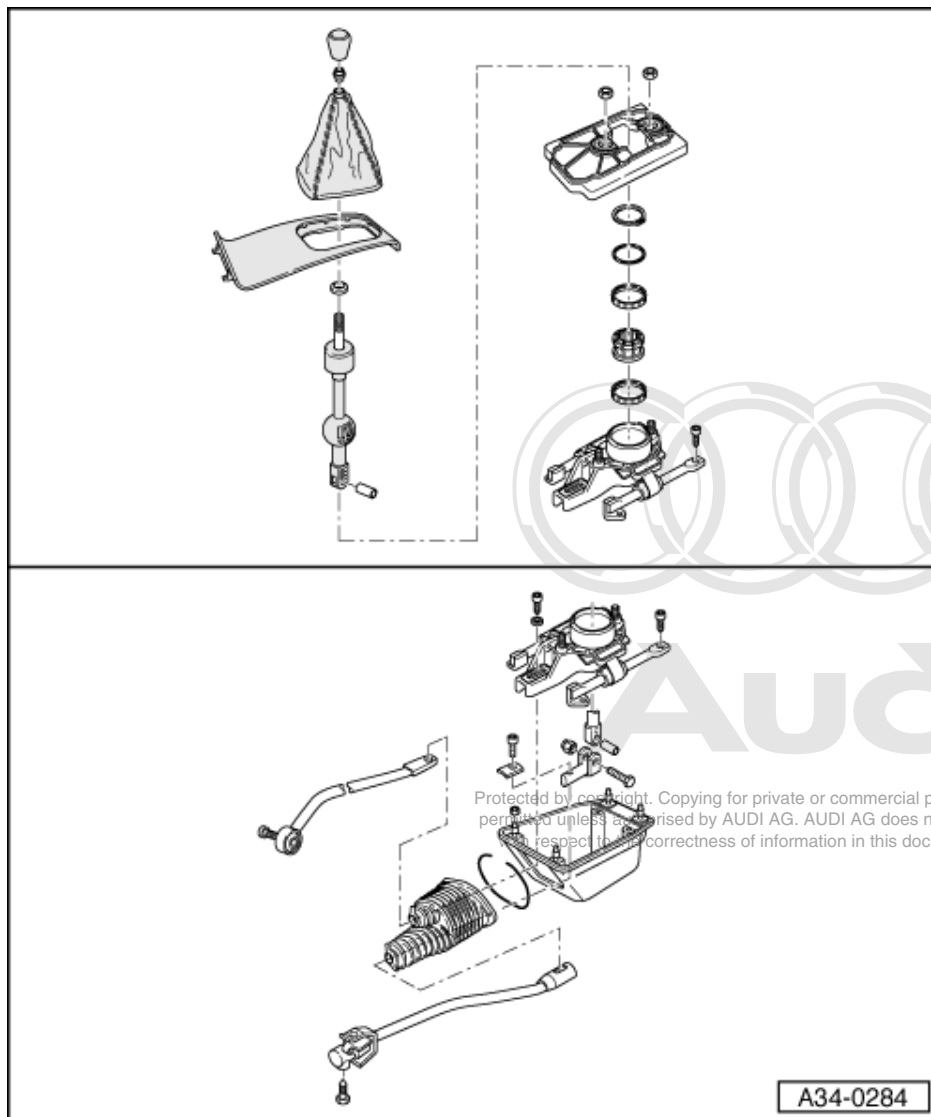
2.1 - Servicing shift mechanism for vehicles from 05.99, Chassis.-No. 8D-X-260 001 ä

Identification: The gear stick lever can no longer be pressed down when engaging reverse gear.



Special tools and workshop equipment required

- ♦ V.A.G 1331 Torque wrench



I - Servicing gear stick knob, cover, gear stick lever and rear push rod
=> Page 68

II - Servicing selector rod and front push rod=> Page 71

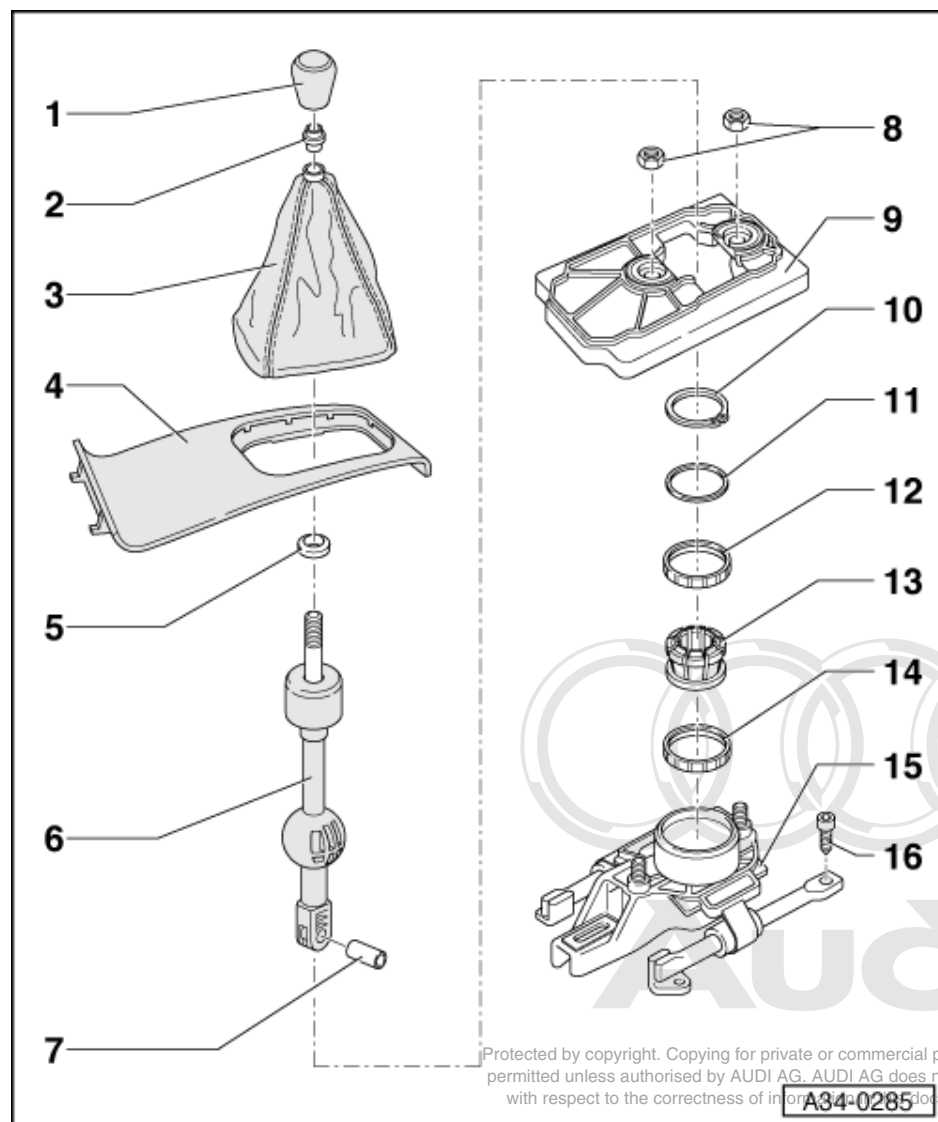
Removing and installing rear gear stick and push rod => Page 74

Removing and installing shift mechanism => Page 75

Adjust shift mechanism:

=>Page 78 .

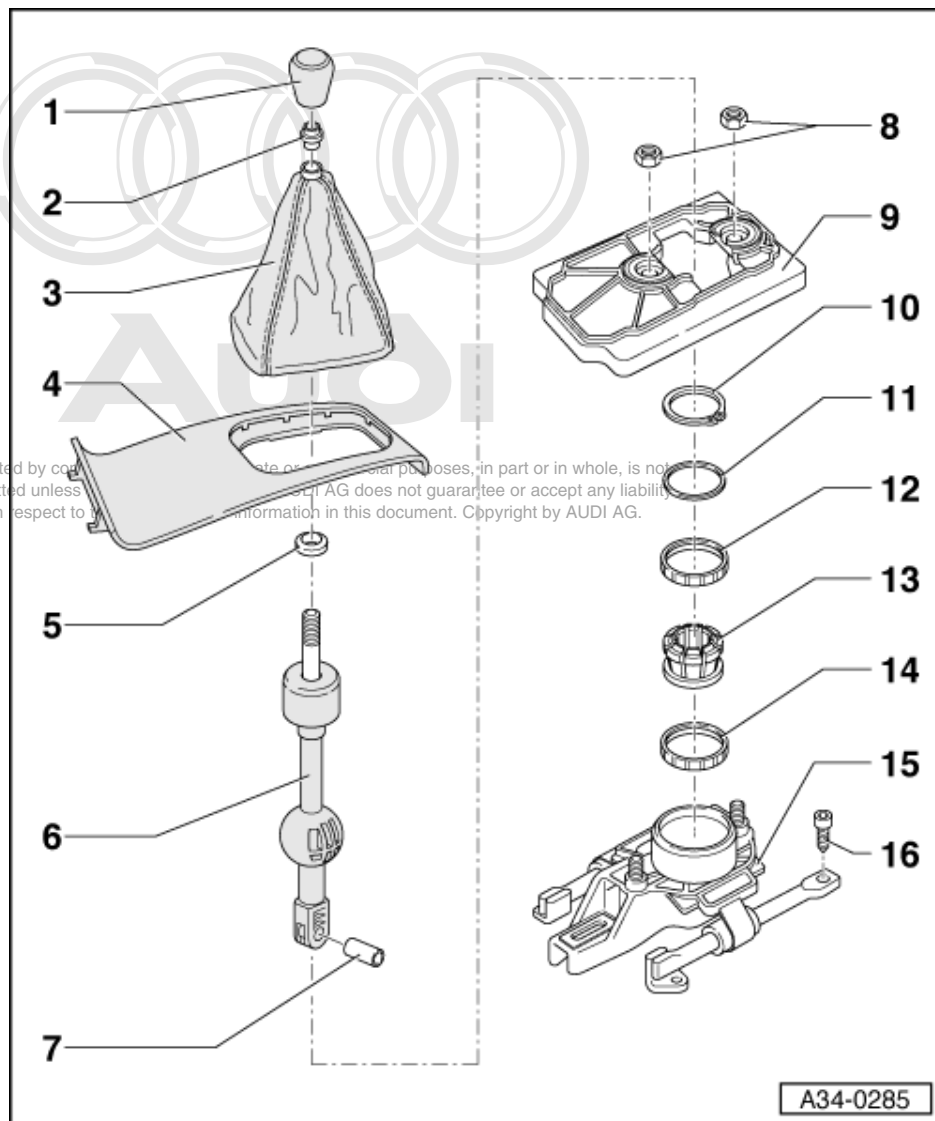
2.2 - Servicing gear stick and rear push rod



Note:

- ♦ Lubricate bearings and moving surfaces with polycarbamide grease, part no. G 052 142 A2.

- 1 Gear stick knob
- 2 Bushing
- 3 Gear stick cover
- 4 Cover for centre console
 - ♦ Retainer hook on rear of cover, prise out carefully from centre console
 - ♦ Removing and installing => Page 74
- 5 Bushing



6 Gear stick

- ◆ Lubricate area around bottom bore with G 052 142 A2
- ◆ Lubricate ball with G 052 142 A2 polycarbamide grease

7 Spacer tube

- ◆ Lubricate with G 052 142 A2 polycarbamide grease

8 Hexagon nut, 10 Nm

9 Noise insulation

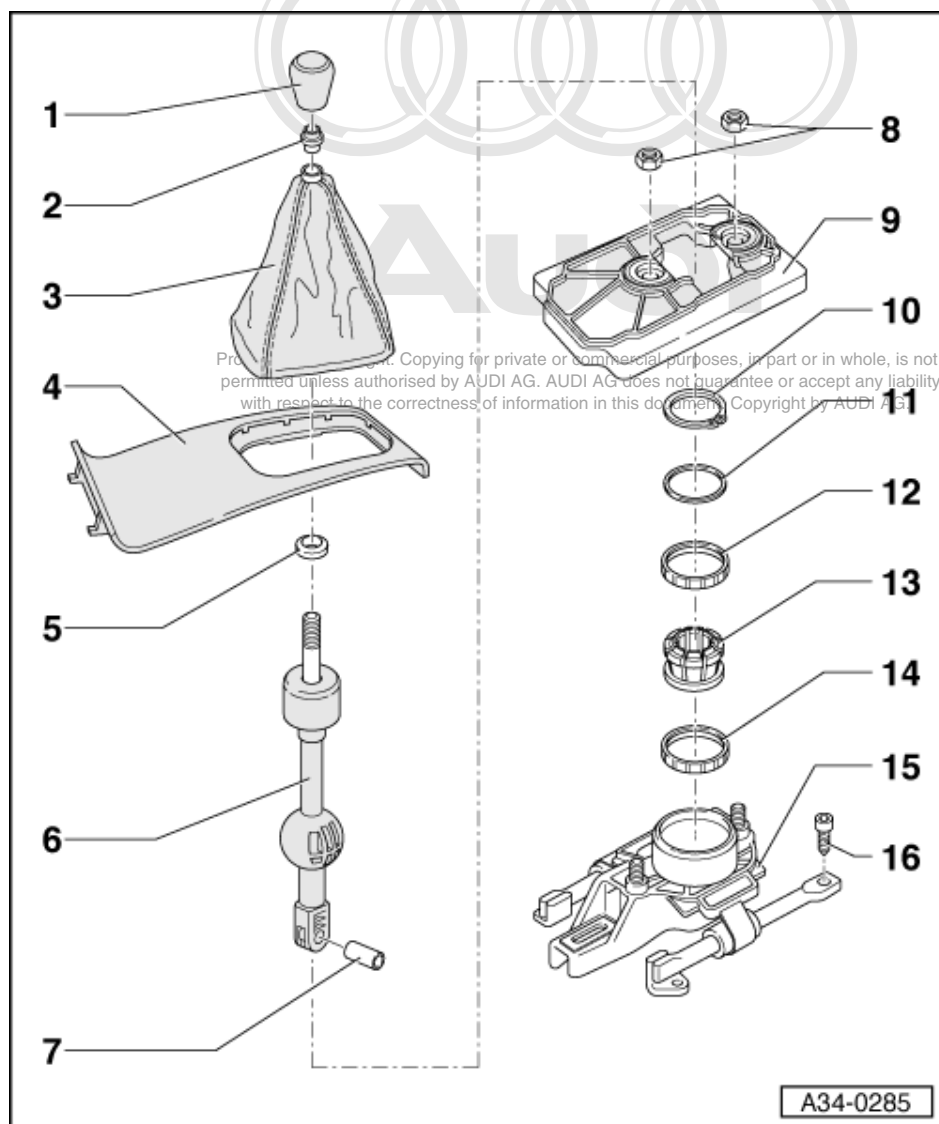
10 Circlip

- ◆ Remove before removing the ball stop

11 Washer

12 Washer

13 Ball housing



14 Washer

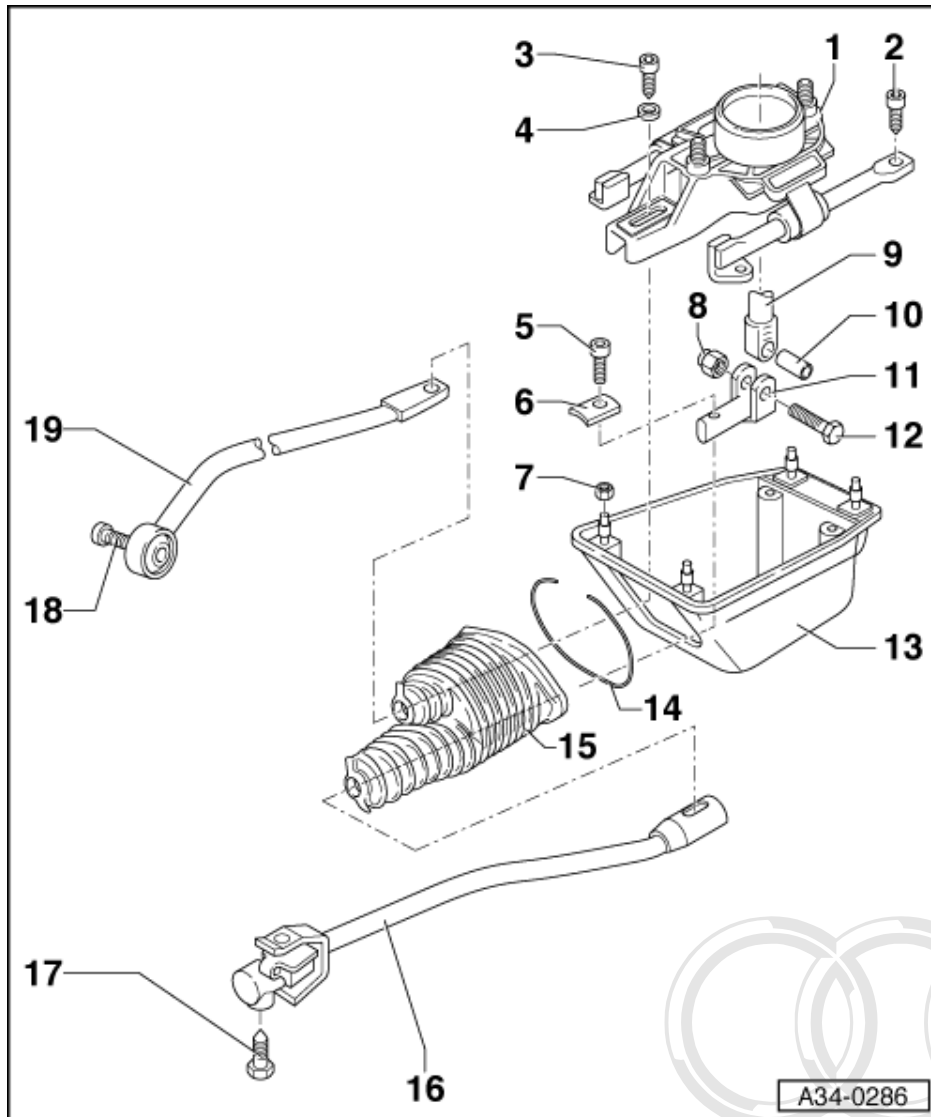
15 Rear push rod

- ♦ With ball housing

16 Bolt, 6 Nm

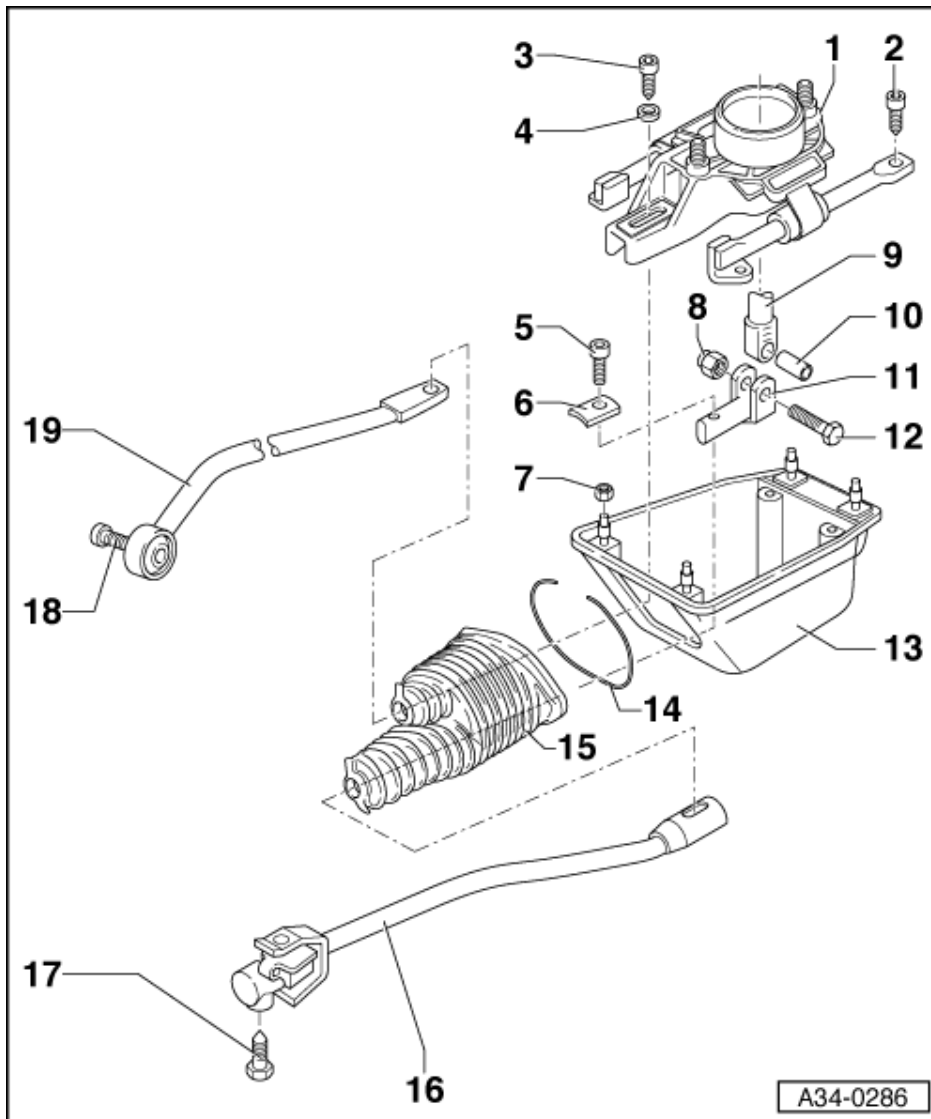
- ♦ 4 pieces
- ♦ For rear push rod to gear stick housing

2.3 - Servicing selector rod and front push rod



- 1 Rear push rod**
 - ◆ With ball housing
- 2 Bolt, 6 Nm**
 - ◆ 4 pieces
 - ◆ Rear push rod to gear stick housing
- 3 Hexagon socket-head bolt, 25Nm**
- 4 Washer**
- 5 Hexagon socket-head bolt, 25Nm**
- 6 Clamp**
- 7 Hexagon nut, 10 Nm**
 - ◆ 4 pieces
 - ◆ For gear stick housing to body

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8 Nut - 10 Nm

- ◆ Secures selector fork
- ◆ Self-locking
- ◆ Replace

9 Gear stick

10 Spacer tube

- ◆ Lubricate with G 052 142 A2 polycarbamide grease

11 Selector fork

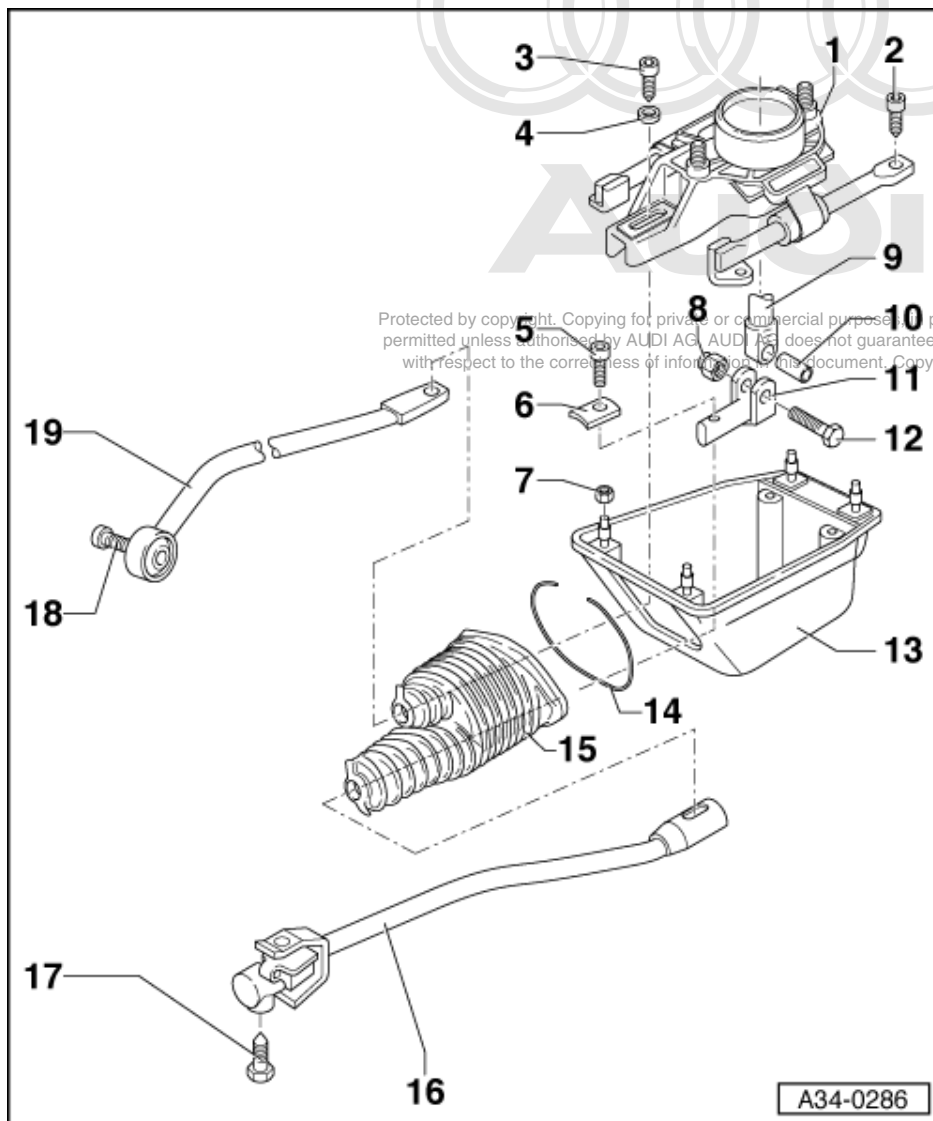
12 Bolt

- ◆ Secures selector fork

13 Gear stick housing

14 Retaining ring

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15 Bellows

- ◆ Remove catalytic converter and heat shield before removing and installing

Notes:

- ◆ Pull bellows carefully over selector rod
- ◆ Align bellows with markings on selector rod and push rod

16 Selector rod

- ◆ With selector joint

17 Release and tighten bolt - 23 Nm

- ◆ Self-locking
- ◆ Replace

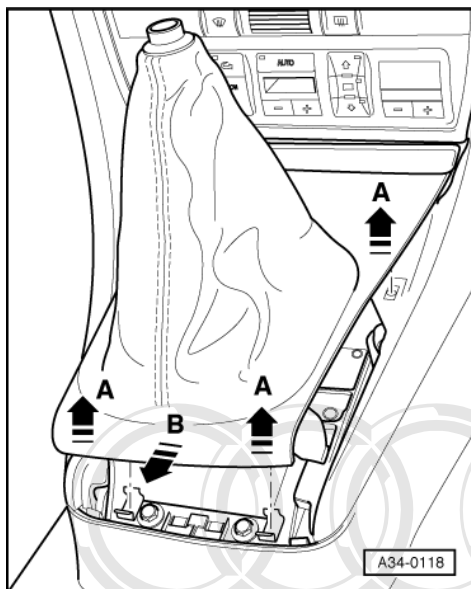
18 Hexagon socket-head bolt - 40Nm

- ◆ Cannot be removed from the bush of the push rod before

19 Front push rod

- ◆ With bushes, bolts and washers

2.4 - Removing and installing rear gear stick with push rod



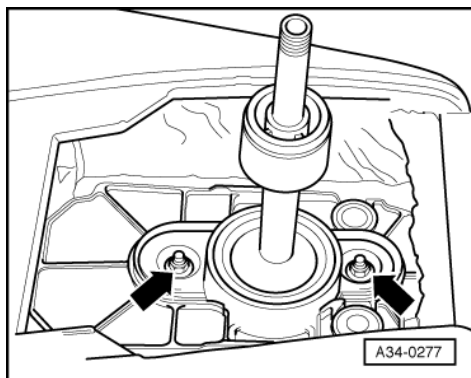
Removing

- Unscrew the gear stick knob from the gear stick lever.

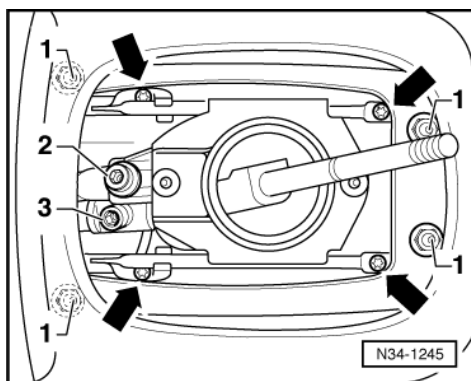
Note:

The cover of the gear stick lever is removed together with the cover for the central console.

- > Lift the cover for the central console upwards -arrows A- a little.
- Pull the cover backwards a little -arrow B- and then pull the complete cover upwards.



- -> Screw out noise insulation for gear stick housing -arrows-.



- -> Now unscrew the fastening nuts -1- for the gear stick housing.

The gear stick housing is thus dismantled.

- Remove push rod, thus unscrewing hexagon socket head bolt -2-.
- Remove selector rod, thus unscrewing hexagon socket head bolt -3-.
- Now loosen the entire rear push rod from the gear stick housing -arrows-.
- Remove the gear stick lever with rear push rod from the gear stick housing.

Installing

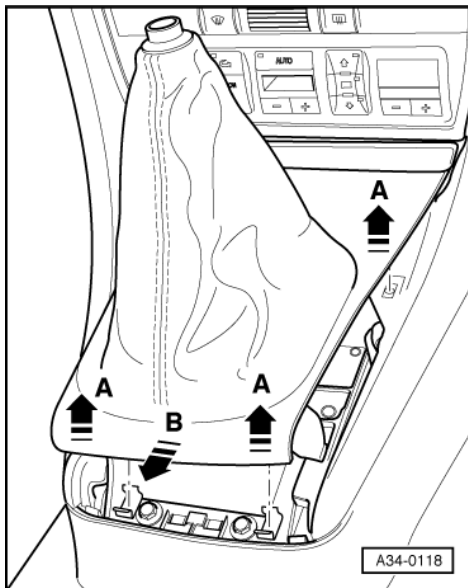
Installation is carried out in the reverse order to removal, noting the following:

- Adjusting shift mechanism => Page 78
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Tightening torques

Rear push rod to gear stick housing	6 Nm
Selector rod to selector fork/gear stick lever	25 Nm
Front push rod to rear pushrod	25 Nm
Gear stick housing to body	10 Nm
Noise insulation for gear stick housing to rear push rod	10 Nm

2.5 - Removing and installing shift mechanism



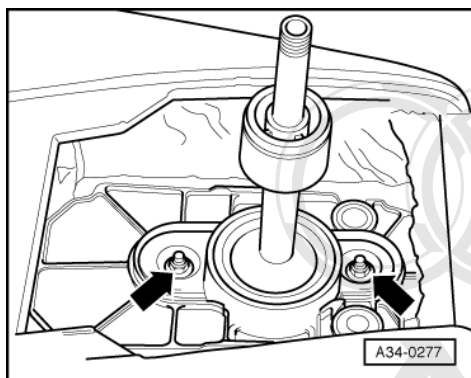
Removing

- Unscrew the gear stick knob from the gear stick lever.

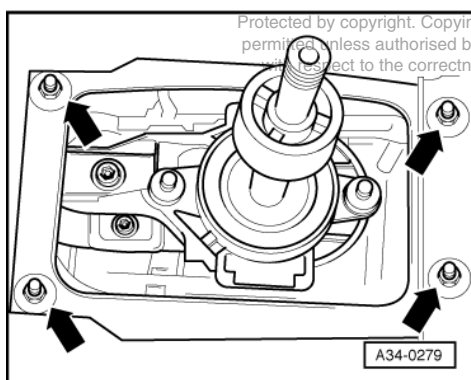
Note:

The cover of the gear stick lever is removed together with the cover for the central console.

- -> Lift the cover for the central console upwards -arrows A- a little.
- Pull the cover backwards a little -arrow B- and then pull the complete cover upwards.



- -> Screw out noise insulation for gear stick housing -arrows-.



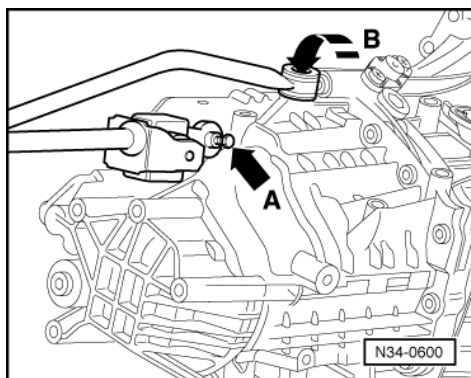
- -> Screw out fastening nuts for gear stick housing -arrows-.
- Remove rear section of exhaust system (rearward of exhaust pipe clamp(s)) and remove front exhaust pipe together with catalytic converter if necessary.

=> 4-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing parts of exhaust system Removing and installing parts of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

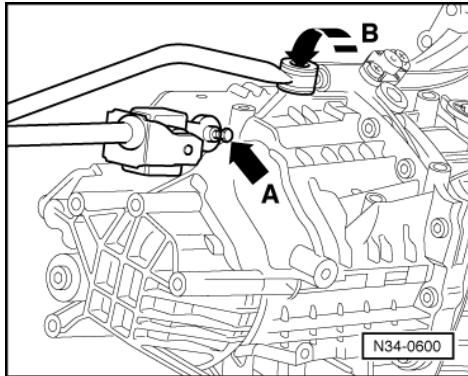
=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system



=> 6-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

- -> Detach selector rod -arrow A-.
- Unscrew hexagon socket head bolt on push rod -arrow B-.
- Remove the front heat shield on the left over the exhaust system.
- Shift mechanism down together with selector rod and push rod and remove.

Installing



Install in reverse order.

- Push selector rod on so that the securing bolt fits in the recess in the selector shaft.
- -> Then secure selector rod -arrow A-.
- Then bolt push rod to gearbox -arrow B-.
- Stress free alignment of exhaust system

=> 4-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing parts of exhaust system Removing and installing parts of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

- Adjusting shift mechanism => Page **78**

Tightening torques

Component	Nm
Gear stick housing to body	10
Selector rod to gearbox	23
Push rod to gearbox	40
Noise insulation for gear stick housing to rear push rod	10

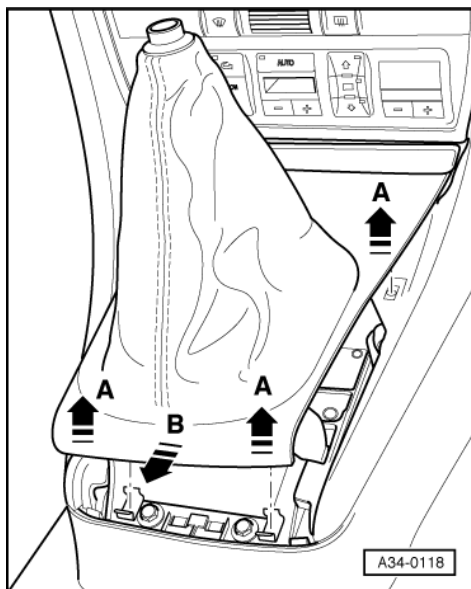
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2.6 - Adjusting shift mechanism

Notes:

The following are prerequisites for correct gear linkage adjustment:

- ♦ Perfect gear linkage operating and transfer elements.
- ♦ Gear shift mechanism moves smoothly.
- ♦ Gearbox, clutch and clutch mechanism must be in proper condition.

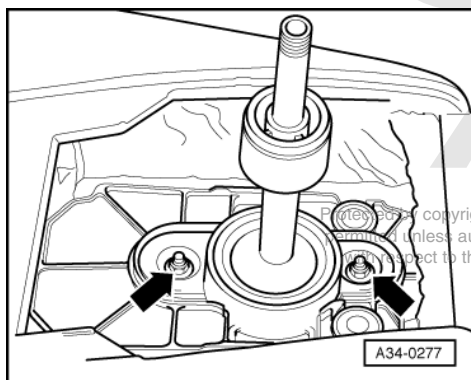


- ♦ Gearbox in neutral.
- Unscrew the gear stick knob from the gear stick lever.

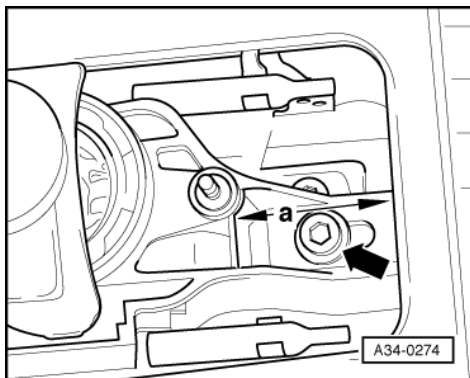
Note:

The cover of the gear stick lever is removed together with the cover for the central console.

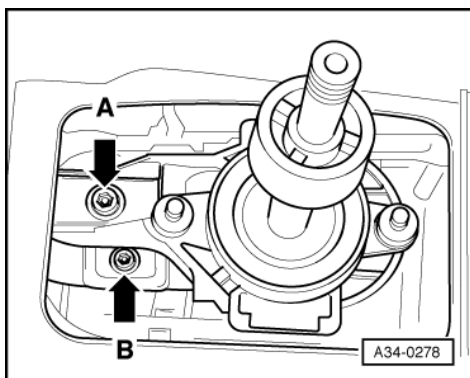
- -> Lift the cover for the central console upwards -arrows A- a little.
- Pull the cover backwards a little -arrow B- and then pull the complete cover upwards.



- -> Screw out noise insulation for gear stick housing -arrows-.
- Measure distance between body and rear push rod (in shift mechanism).



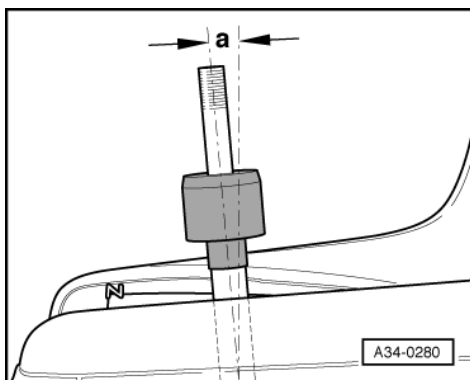
- -> Specified value: Distance $a = 41$ mm
- If this is not the case, adjust distance -a- as follows:
Loosen push rod bolt (arrow).
- Rear push rod (in shift mechanism) should move freely in both directions on slide.
- Set distance -a- by moving rear push rod (in shift mechanism).
- Tighten push rod bolt -arrow- to 25 Nm.



- -> Loosen bolt for selector rod -arrow B-.
- Connection between selector rod and shift mechanism should move freely.

Align the gear stick lever as follows:

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- ◆ Gear stick in vertical position to direction of travel.
- ◆ -> Gear stick inclined slightly to the rear (approx. 5°) towards rear -angle piece a-.

Note:

The illustration shows the gear stick from the right.

- Gear stick held in this position.
- Tighten selector rod bolt to 25 Nm.



Note:

The gear stick must remain in the same position while the bolt is being tightened.

2.7 - Checking gear stick alignment

- The gear stick must rest in the 3rd/4th gear gate when the gearbox is in neutral.
- Depress clutch.
- Check that all gears can be engaged.
- The gear stick should return by itself from the 5th/reverse gear gate into the 3rd/4th gear gate.
- The reverse gear can only then be engaged, if the gear stick lever rests in 3rd/4th gear.
- A direct selection in reverse gear is not possible from 5th gear.

Note:

If a direct selection is possible, only if 5th gear and reverse cannot be engaged, the locking unit for 5th and reverse gear should be checked and if necessary replaced =>Page 128.

- Fit covers and gear stick knob.

3 - Removing and installing gearbox

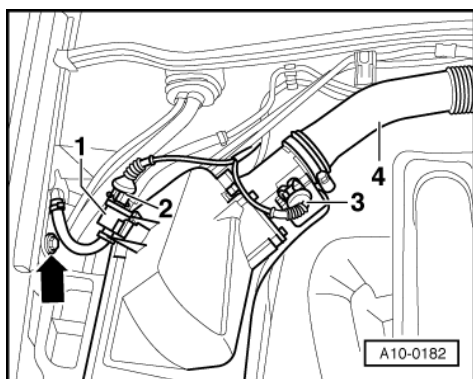
3.1 - Removing and installing gearbox

Special tools, testers and auxiliary equipment required

- ♦ Gearbox support 3282
- ♦ Adjustment plate 3282/10
- ♦ Set of ring spanners for lambda probe 3337
- ♦ Engine/gearbox lifter V.A.G 1383 A

3.2 - Removing

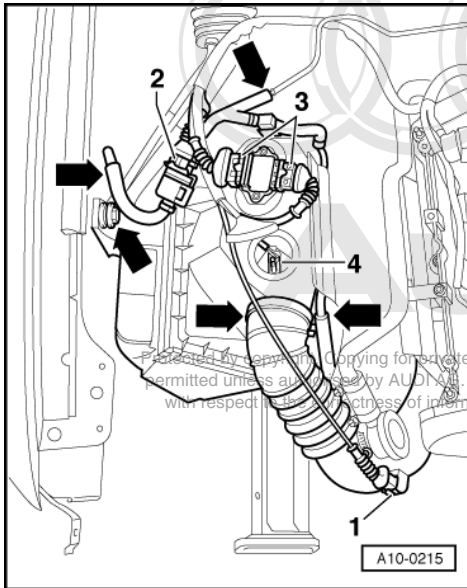
- Observe or obtain radio code on vehicles with coded radio.
 - Disconnect earthing strap at battery with ignition switched off.
 - Removing propshaft => Page 218
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Vehicles with 4-cylinder normally aspirated engine:

- -> Unplug connectors -2- and -3- at air mass meter and ACF valve.
- Pull ACF valve -1- off air cleaner housing.
- Loosen clamps on air duct -4-.

- Remove air cleaner housing -arrow-, but do not remove air duct -4-.



- Unscrew nuts securing front exhaust pipe to exhaust manifold.

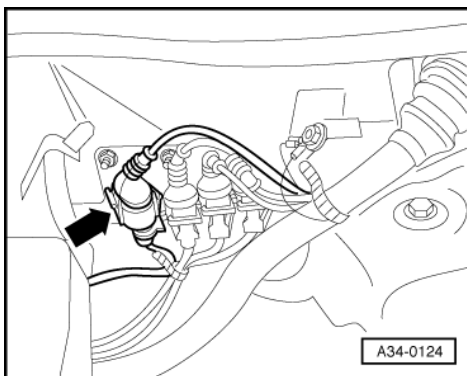
=> 4-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

Note:

Avoid excessive bending of the decoupling element at front exhaust pipe (max. 10°).

Vehicles with 4-cylinder turbo engine:

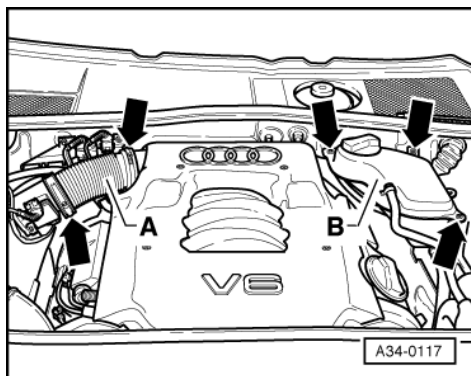
- -> Disconnect wires/unplug connectors as follows:
 - 1 - At solenoid valve for boost pressure control -N75
 - 2 - At ACF valve
 - 3 - At output stage -N122
 - 4 - At air mass meter
- Disconnect hoses and remove air cleaner housing -arrows-.



- Remove coolant system expansion reservoir and lay to one side.
- -> Unplug connector for lambda probe -arrow- and move wiring clear.
- Unscrew nuts securing turbocharger to front exhaust pipe:



=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing parts of exhaust system
Removing and installing parts of exhaust system

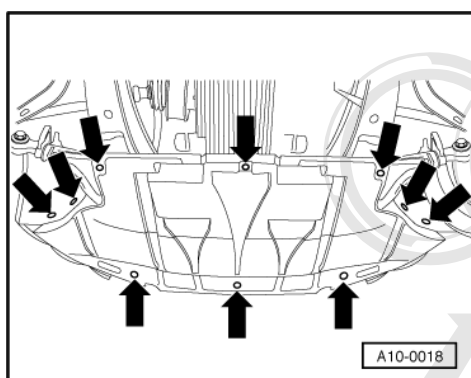


Note:

Avoid excessive bending of the decoupling element at front exhaust pipe (max. 10°).

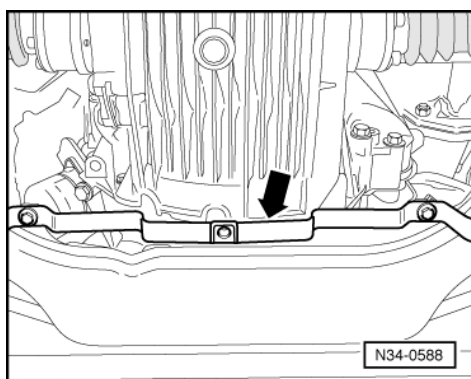
Vehicles with 6-cylinder engine:

- -> Remove intake hose -A- (arrows).
- Unbolt coolant system expansion tank -B- (arrows) and lay to one side.
- Unscrew lambda probes on left and right exhaust pipes with special tool 3337 and move clear to the side.



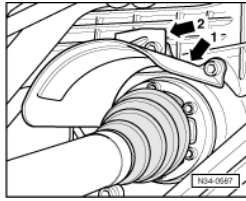
All models:

- Unscrew engine/gearbox securing bolts accessible from above
- -> Remove noise insulation -arrows-.

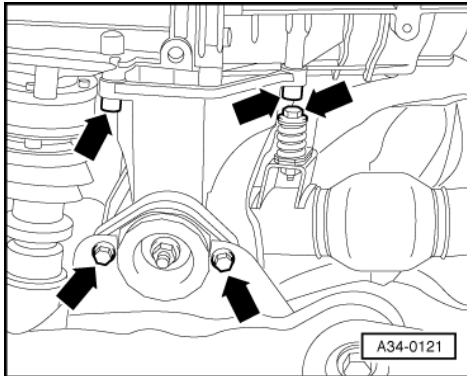


- -> Unbolt bracket for noise insulation -arrow-.

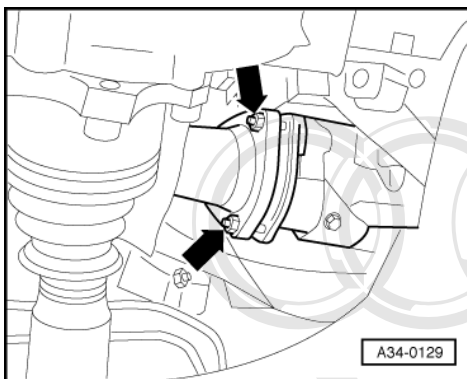
Vehicles with 4-cylinder engine:



- -> Detach heat shields -arrow 1- and -arrow 2- above the right-hand drive shaft.



- -> Unbolt right-hand gearbox support complete with bonded rubber mounting -arrows-.
- Release clamping sleeves on exhaust system and push them towards the catalytic converter.
- Pull out catalytic converter together with exhaust pipe from underneath.



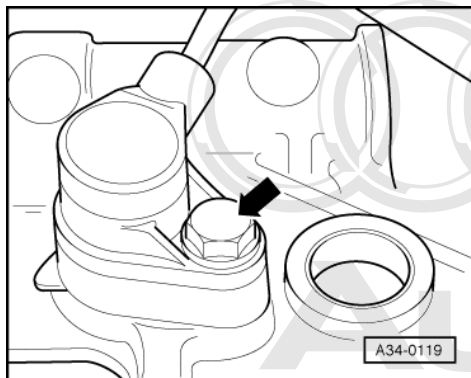
Vehicles with 6-cylinder engine:

- Detach heat shield above left and right drive shafts.
- -> Unbolt front exhaust pipes with catalytic converters from left and right exhaust manifolds (3 nuts on each side) -arrows-.

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=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

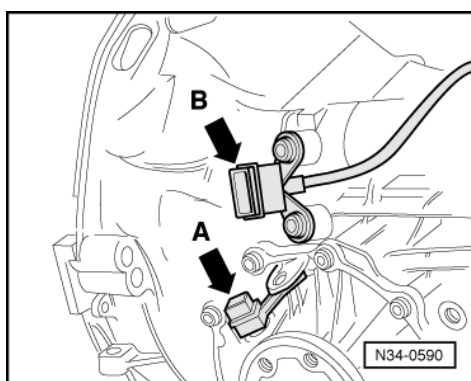
=> 6-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts



- -> Remove engine speed sender -G28 on left of gearbox -arrow- and lay to one side.

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All models:

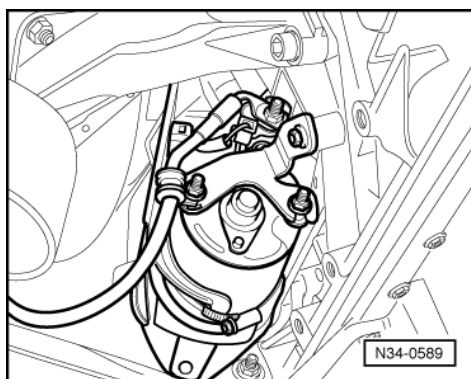


- Detach drive shafts from flange shafts and rest them on suspension links.

Note:

Take care not to damage protective coating on drive shafts.

- -> Pull connector off sender for speedometer -arrow A-.
- Pull off connector on reversing light switch (multi-function sender) -arrow B-.
- Disconnect all other electrical connections and earth wires from gearbox and from the engine/gearbox securing bolts.



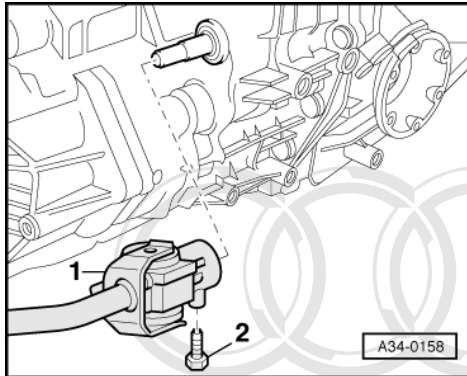
- -> Unbolt starter from engine/gearbox and secure as necessary.

=> Electrical system; Repair Group 27; Removing and installing starter Removing and installing starter

Note:

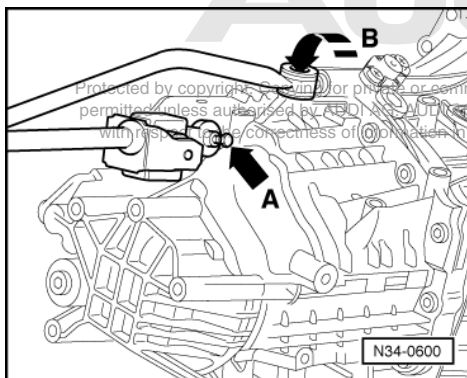
Starter cables do not need to be disconnected.

Vehicles with standard-travel shift mechanism:



- -> Unscrew bolt -2- at selector joint -1- on selector rod.

Vehicles with short-travel shift mechanism:

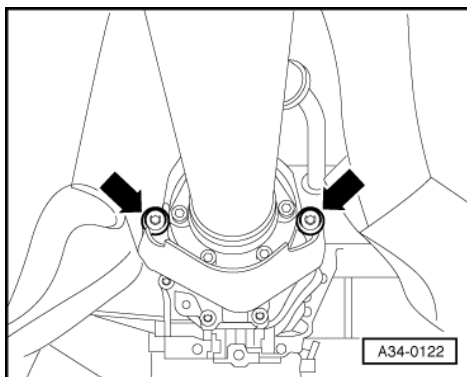


- -> Detach selector rod -arrow A-.
- Unscrew hexagon socket head bolt on push rod -arrow B-.

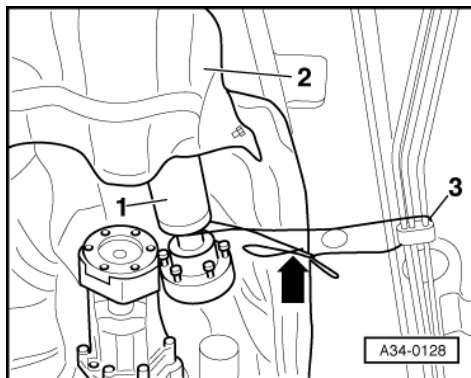
Note:

Shown in illustration on manual gearbox 012.

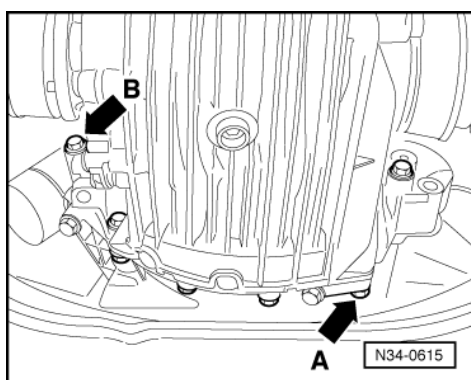
All models:



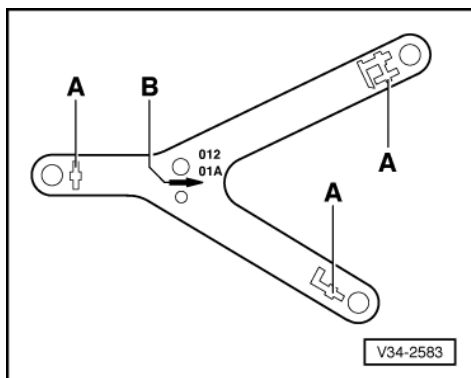
- -> Remove heat shield for propshaft from cover for Torsen differential -arrows-.



- -> Unscrew propshaft -1- from gearbox and place onto heat shield -2-.
- Secure propshaft with wire -arrow- at bracket -3- of fuel lines.



- -> Unscrew bottom engine/gearbox securing bolts, except for bolts indicated by arrows -A- and -B-.



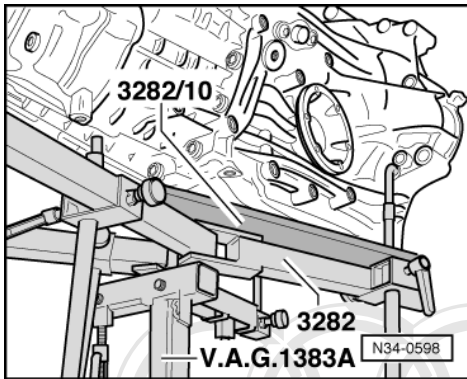
- -> Set up the gearbox support 3282 for removing the manual gearbox 01A (four-wheel drive) with adjustment plate 3282/10 and attach to gearbox lifter V.A.G 1383 A.

A - Attachments

Notes:

- ♦ Attachments -A- are shown in schematic form, arrow -B- points in the direction of travel.
- ♦ Adjustment plate 3282/10 only fits in one position.

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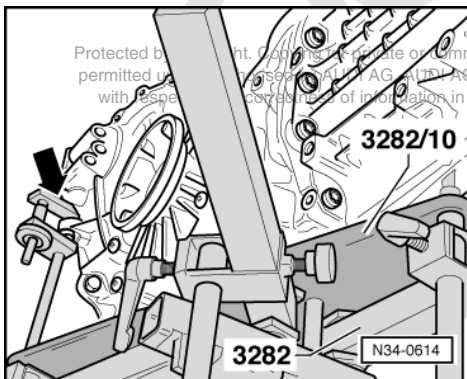


- -> Run gearbox lifter V.A.G 1383 A with gearbox support 3282 in under the gearbox and take up the weight of the gearbox.

Note:

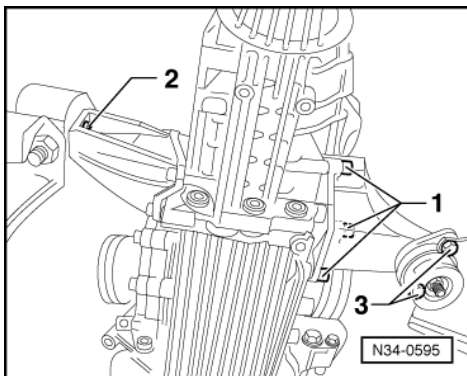
If gearbox support 3282 is not available, gearbox can be removed and installed using gearbox lifter V.A.G 1383 A and universal support V.A.G 1359/2.

- Support gearbox with gearbox lifter V.A.G 1383 A.



- -> Align adjustment plate parallel to gearbox and lock safety support -arrow- on gearbox.

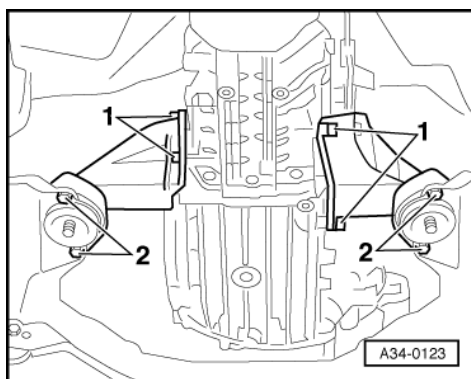
Vehicles with 4-cylinder engine:



- -> Unbolt left gearbox support from bonded rubber mounting -2-.

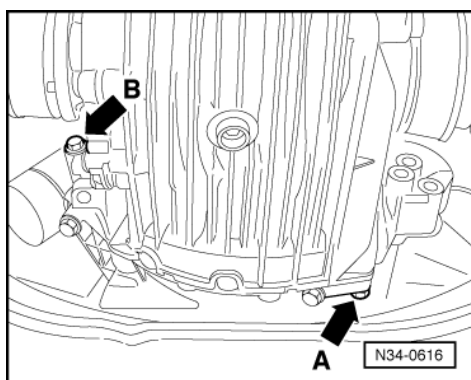


Vehicles with 6-cylinder engine:



- -> Unbolt left and right gearbox supports complete with bonded rubber mountings from gearbox and subframe -1- and -2-.

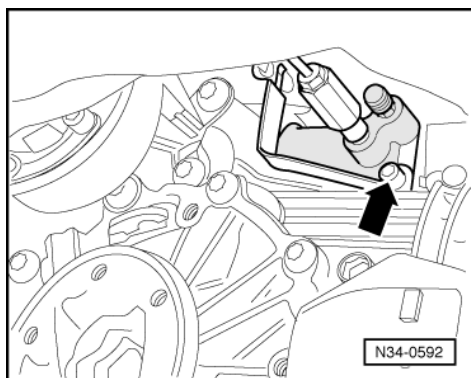
All models:



- -> Remove remaining engine/gearbox securing bolts (arrows -A- and -B-).
- Press gearbox off dowel sleeves and lower carefully with gearbox lifter V.A.G 1383 A just far enough for access to the slave cylinder.

Note:

When lowering gearbox ensure hydraulic pipe/hose to slave cylinder is not damaged.

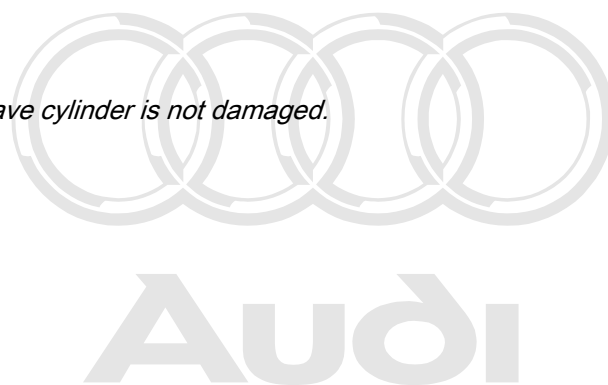


- -> Remove clutch slave cylinder (arrow) and secure with wire, do not disconnect pipes.

Note:

Do not depress clutch pedal after removing slave cylinder.

- Lower gearbox completely.

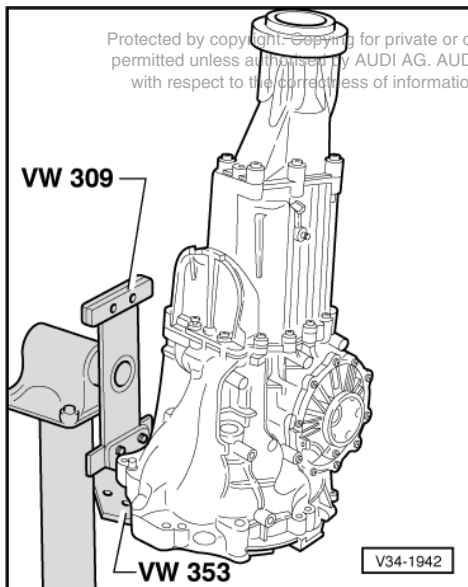


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Note:

When lowering gearbox ensure there is sufficient clearance to drive shafts.

3.3 - Mounting gearbox to assembly stand

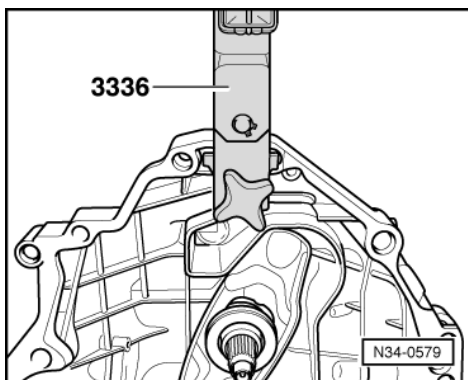


Special tools, testers and auxiliary equipment required

- ♦ Holding plate VW 309
 - ♦ Gearbox support VW 353
- -> Secure gearbox to repair stand with gearbox support VW 353 and holding plate VW 309 to carry out repairs.

3.4 - Transporting the gearbox

Special tools, testers and auxiliary equipment required

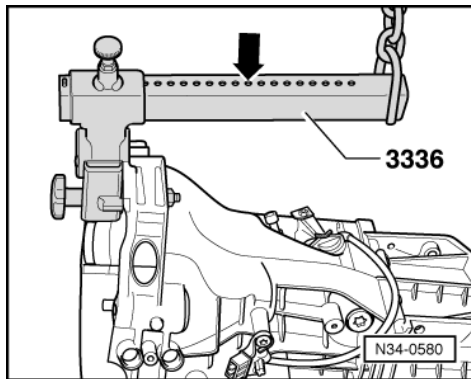


- ♦ Gearbox support 3282
- ♦ Gearbox lifting beam 3336



The gearbox lifting beam can be used to transport the gearbox and when setting up gearbox support 3282.

- -> Bolt gearbox lifting beam 3336 to clutch housing.



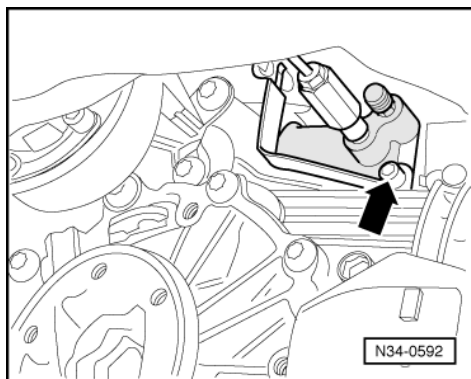
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- -> Set support beam on sliding piece with locking pin (arrow).
- No. of holes visible = 17
- Lift gearbox with workshop crane and gearbox lifting beam 3336.

3.5 - Installing

Installation is carried out in the reverse order, when doing this note the following:

- Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease G 000 100 to the splines. Do not grease guide sleeve.
- Check clutch release bearing for wear, renew if necessary.
- Lightly lubricate contact surface for push rod at clutch release lever with copper grease, e.g. Z 381 351 TE.
- Before installing, use a tap to clean out locking fluid left in the threads of the clutch slave cylinder mounting on the gearbox and the selector lever/selector rod connection.
- Check whether the dowel sleeves for centralising engine/gearbox are in the cylinder block, install if necessary.
- Renew all self locking nuts.



- -> Lift gearbox until clutch slave cylinder with bracket for hose/pipe can be installed (arrow).
- If gearbox has intermediate plate, fit between gearbox and engine onto engine dowel sleeves.
- Ensure that the intermediate plate is correctly positioned on engine.
- Install lower engine/gearbox securing bolts and bolts for starter, to do this insert the starter.

=> Electrical system; Repair Group 27; Removing and installing starter Removing and installing starter

- The threaded bores in the flange shaft of the manual gearbox for the propshaft must be cleaned of remaining locking fluid with a thread tap before assembling
- Replace front gaskets at propshaft => Page 219 and at drive shafts.
- Bolt on propshaft => Page 223

- Check adjustment of shift mechanism, adjust if necessary => Page **63** .
- Stress free alignment of exhaust system

=> 4-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

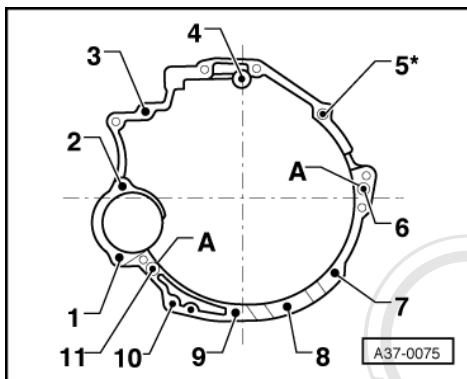
=> 6-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

- Check oil level in gearbox => Page **93** .
- After connecting battery, enter anti theft code for radio.

=> Radio operating instructions

- Close windows fully using electric window switches.
- Then actuate all electric window switches again for at least one second in the "close" direction to activate the automatic open/close function.
- Set clock to correct time.

Tightening torques



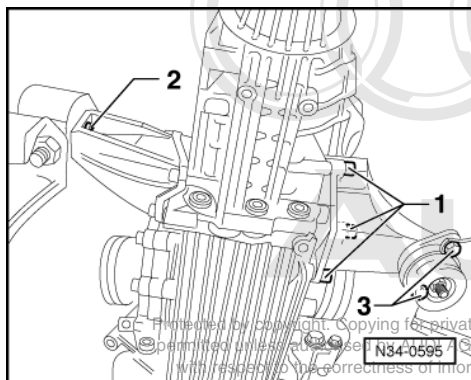
-> Gearbox to engine 4-cylinder

Item	Bolt	Nm
1, 3, 4	M12 x 67	65
2, 6	M12 x 90	65
5, 11	M12 x 110	65
7 ... 10	M10 x 45	45

5* = upper starter bolt

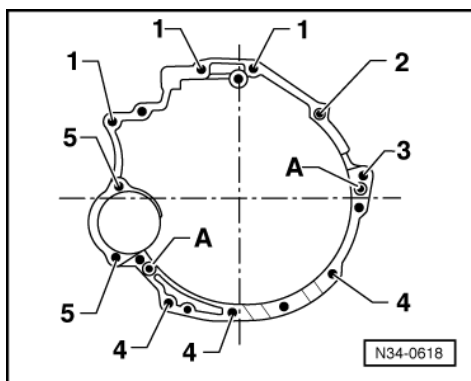
A: Centring sleeves

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-> Gearbox/engine assembly mountings 4 cylinder

Item	Bolt	Qty.	Nm
1	M10 x 30	3	40
2	M10 x 35	1	50
3	M8 x 20	2	23

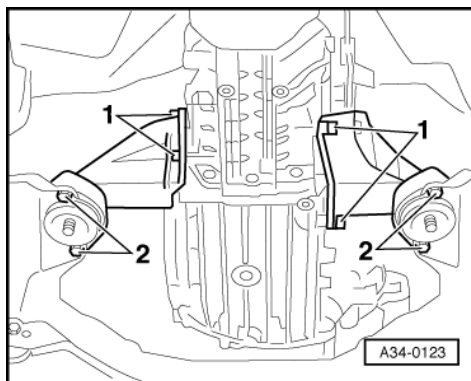


-> Gearbox to engine (6-cylinder)

Item	Bolt	Qty.	Nm
1	M 12 x 67	3	65
2	M 12 x 90	1	65
3	M 12 x 80	1	65
4	M 10 x 45	3	45
5	M 10 x 135	1	45
5 *	M12 x 130	1	65

5*= Also secure the bracket for coolant pipes

A: Centring sleeves



-> Gearbox/engine assembly mountings (6-cylinder)

Item	Bolt	Qty.	Nm
1	M10 x 35	3	40
2	M8 x 20	2	23

Component	Nm
Drive shaft to flange shaft	M8 40 M10 70
Engine speed sender -G28	10
Clutch slave cylinder to gearbox	20
Heat shields over drive shafts to gearbox	23
Selector joint to gearbox 1)	23
Push rod to gearbox	40
Propshaft on gearbox	55
Heat shield for propshaft on Torsen differential cover	25
Catalytic converter to mounting lugs	25
Front exhaust pipe to turbocharger or exhaust manifold	25
Clamp for exhaust pipe	40
Bracket for noise insulation to body	10

1) Replace bolt

4 - Checking oil level in gearbox

4.1 - Checking oil level in gearbox

Special tools, testers and auxiliary equipment required

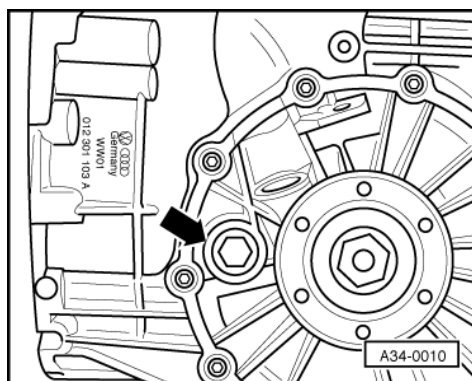
- ♦ 17 mm hexagon socket attachment

or

- ♦ Socket attachment 3357

Notes:

- ♦ The oil filler plug is on the left of the gearbox below the speedometer sender; it may be concealed by the heat shield for the drive shaft.
- ♦ Depending on the version fitted, use either special tool 3357 or a 17 mm Allen key to loosen the oil filler plug.





- ♦ Use special tool 3357 to loosen the oil drain plug.
- -> Unscrew oil filler plug (arrow) to check oil level.
 - Specified value: oil level up to lower edge of filler hole
- Top up with gear oil, if necessary: Specification => from Page 2.
- Fit oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	25

5 - Removing and installing cover with Torsen differential

5.1 - Removing and installing cover with Torsen differential

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- Gearbox installed

Special tools, testers and auxiliary equipment required

- ♦ Set of ring spanners for lambda probe 3337 (only for vehicles with 6 cylinder engine)
- ♦ Drip tray V.A.G 1306

Removing

Vehicles with 4-cylinder engine:

- Remove rear section of exhaust system from clamp(s):

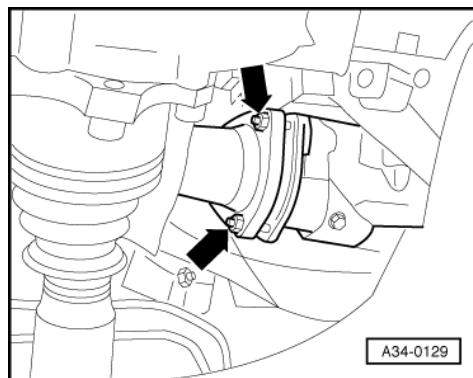
=> 4-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing parts of exhaust system Removing and installing parts of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

Vehicles with 6-cylinder engine:

- Unscrew lambda probes on right exhaust pipes with special tool 3337 and move clear to the side.
- Detach heat shield above right drive shafts.

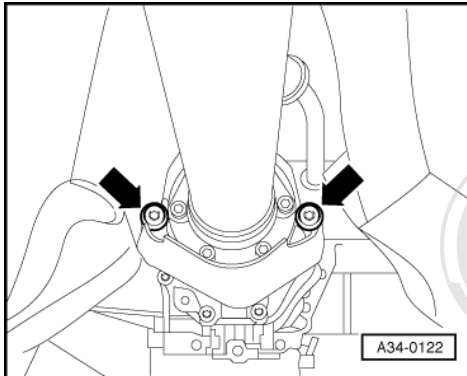


- -> Unbolt front exhaust pipes with catalytic converters from left and right exhaust manifolds (3 nuts on each side) -arrows-:

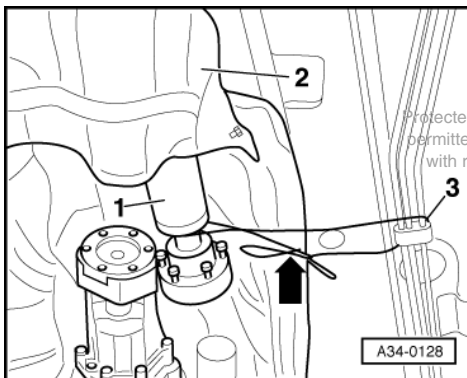
=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

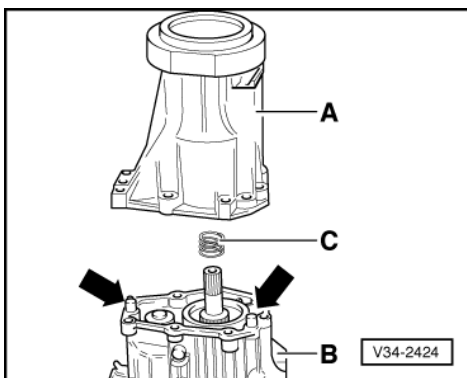
All models:



- -> Remove heat shield for propshaft from cover for Torsen differential -arrows-.



- -> Unscrew propshaft -1- from gearbox and place onto heat shield -2-.
- Secure propshaft with wire -arrow- at bracket -3- of fuel lines.
- Place drip tray V.A.G 1306 underneath and drain gearbox oil.



- -> Unbolt cover -A- with Torsen differential from gearbox cover -B-.

Note:

Shown in illustration with gearbox removed.

- Detach spring -2- from drive pinion.



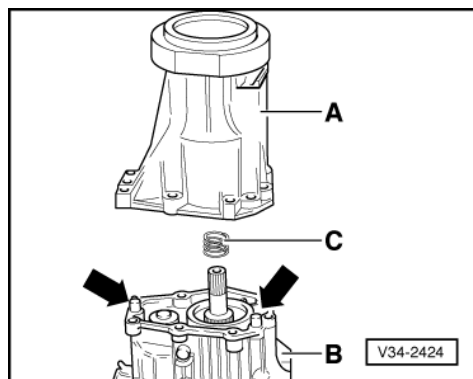
Removing and installing Torsen differential from cover => Page **115**

Servicing cover => Page **115**

Installing

Installation is carried out in the reverse order, when doing this note the following:

- Clean sealing surface and coat with AMV 188 001 02 or AMV 188 001 02.



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- -> Check that dowel sleeves for cover -A- are fitted in gearbox cover -B- (arrows).
- Fit spring -C- onto hollow shaft over drive pinion.
- Bolt on propshaft => Page **223**
- Top up oil in gearbox and check oil level in gearbox => Page **93**.
- Stress free alignment of exhaust system

=> 4-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

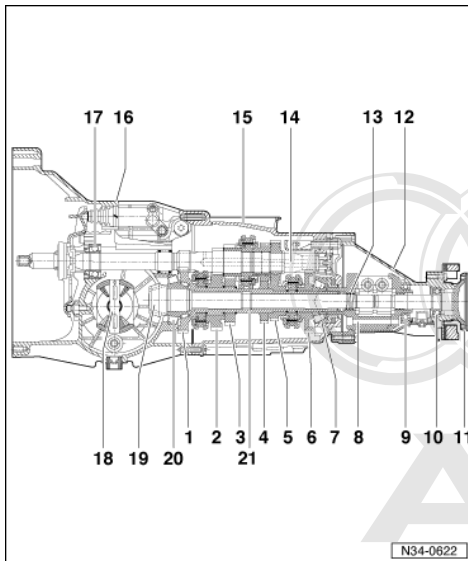
=> 6-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

Tightening torque

Component	Nm
Cover with Torsen differential to gearbox	25
Propshaft on gearbox	55
Heat shield for propshaft on Torsen differential cover	25

6 - Dismantling and assembling gearbox

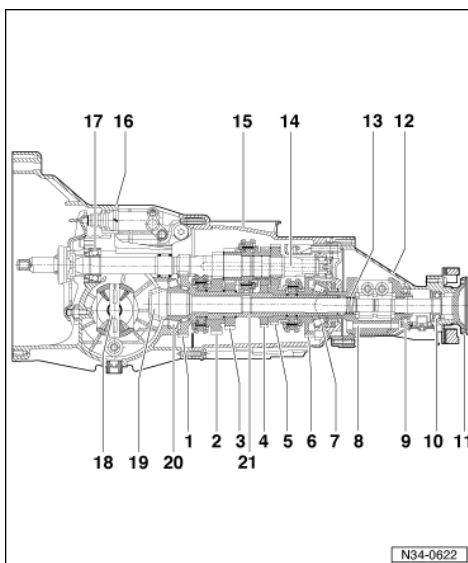
6.1 - Dismantling and assembling gearbox



Assembly sequence => Page 107
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6.2 - Gearbox overview

- 1 1st gear
- 2 2nd gear
- 3 3rd gear
- 4 4th gear
- 5 5th gear
- 6 Reverse gear
 - ♦ Removing and installing reverse idler => Page 170
- 7 Taper roller bearing
 - ♦ Adjusting => from Page 200



8 Torsen differential

- ♦ Servicing only possible at manufacturer
- ♦ Removing and installing with cover => Page 94

9 Ball bearing

10 Ball bearing

11 Flange shaft

12 Cover for Torsen differential

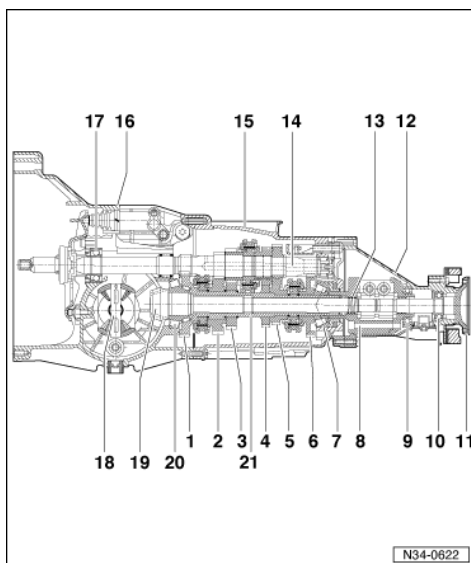
13 Spring

- ♦ Between Torsen differential and hollow shaft

14 Input shaft

- ♦ Dismantling and assembling => Page 131

15 Gearbox cover



16 Gearbox housing

17 Ball bearing

- ♦ Adjusting => adjusting input shaft, Page 145

18 Differential

- ♦ Removing and installing => Page 181
- ♦ Dismantling and assembling => Page 186

19 Pinion shaft

- ♦ Dismantling and assembling hollow shaft and drive pinion => Page 147

20 Radial taper roller bearing

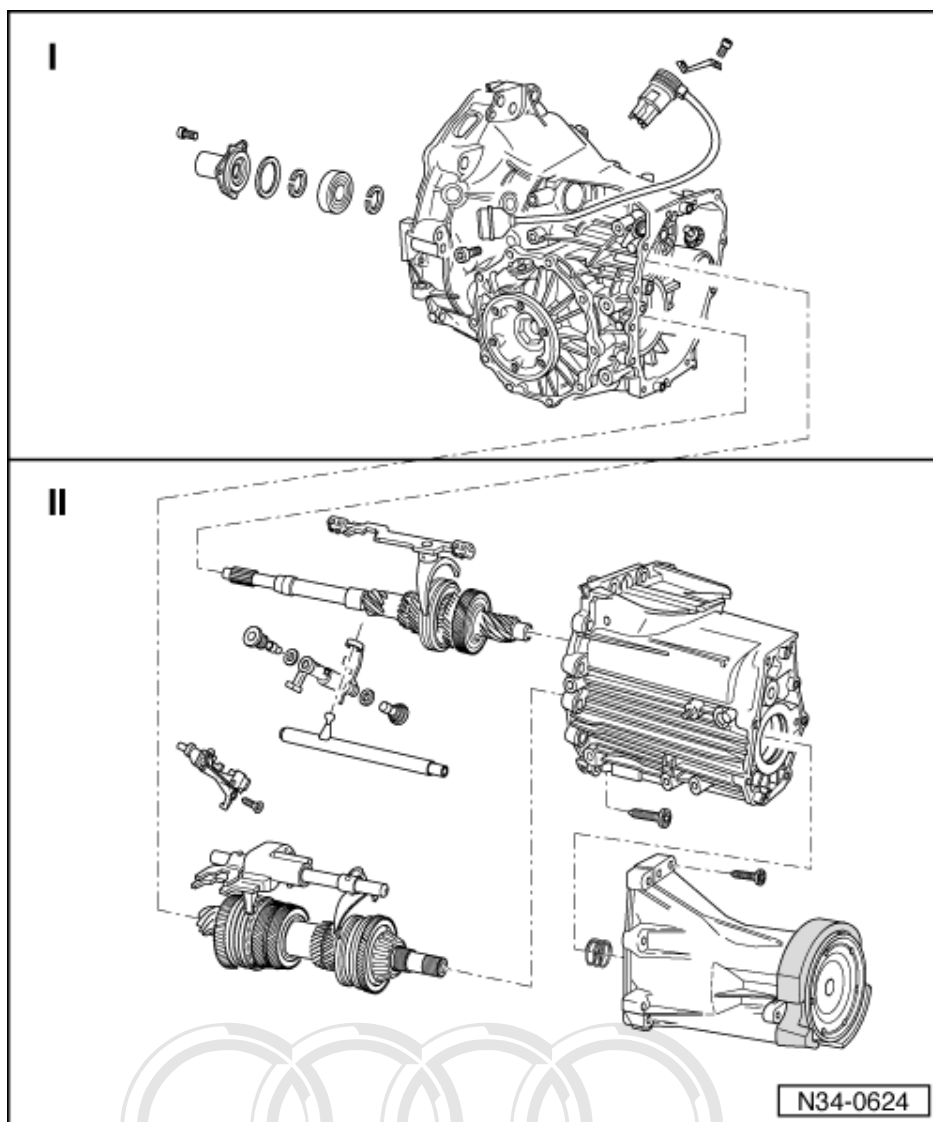
- ♦ Adjusting => from Page 200

21 Hollow shaft

- ♦ Dismantling and assembling hollow shaft and drive pinion => Page 147

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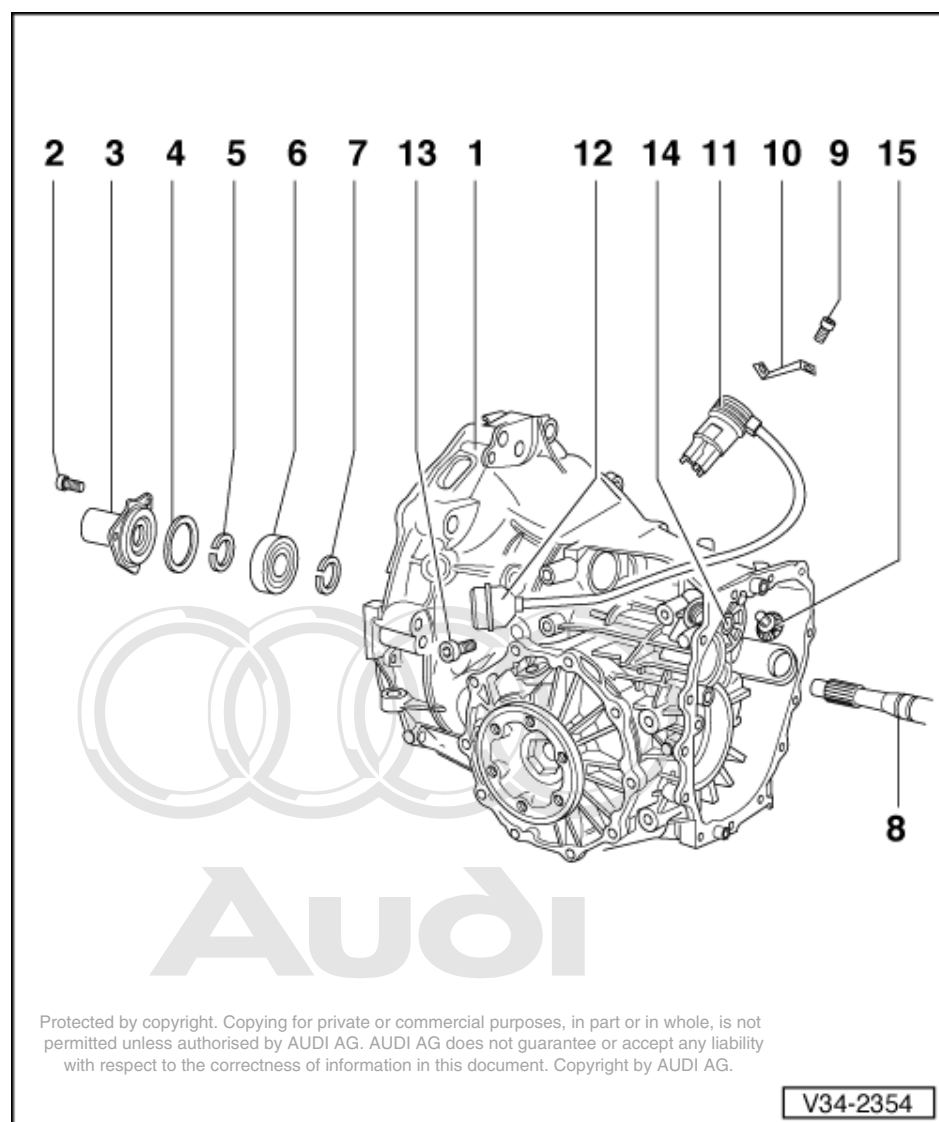
6.3 - Assembly overview



- I - Removing and installing input shaft ball bearing and multi-function sender => Page **100**
II - Removing and installing input shaft, drive pinion, hollow shaft, selector rods, gearbox cover and cover with Torsen differential => Page **104**

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6.4 - Removing and installing input shaft ball bearing and multi-function sender



1 Gearbox housing

- ◆ With differential and flange shafts
- ◆ Removing and installing flange shafts => Page 172
- ◆ Removing and installing differential => Page 181
- ◆ Removing and installing speedometer sender and drive wheel => Page 179
- ◆ Breather installation position => Fig. 1

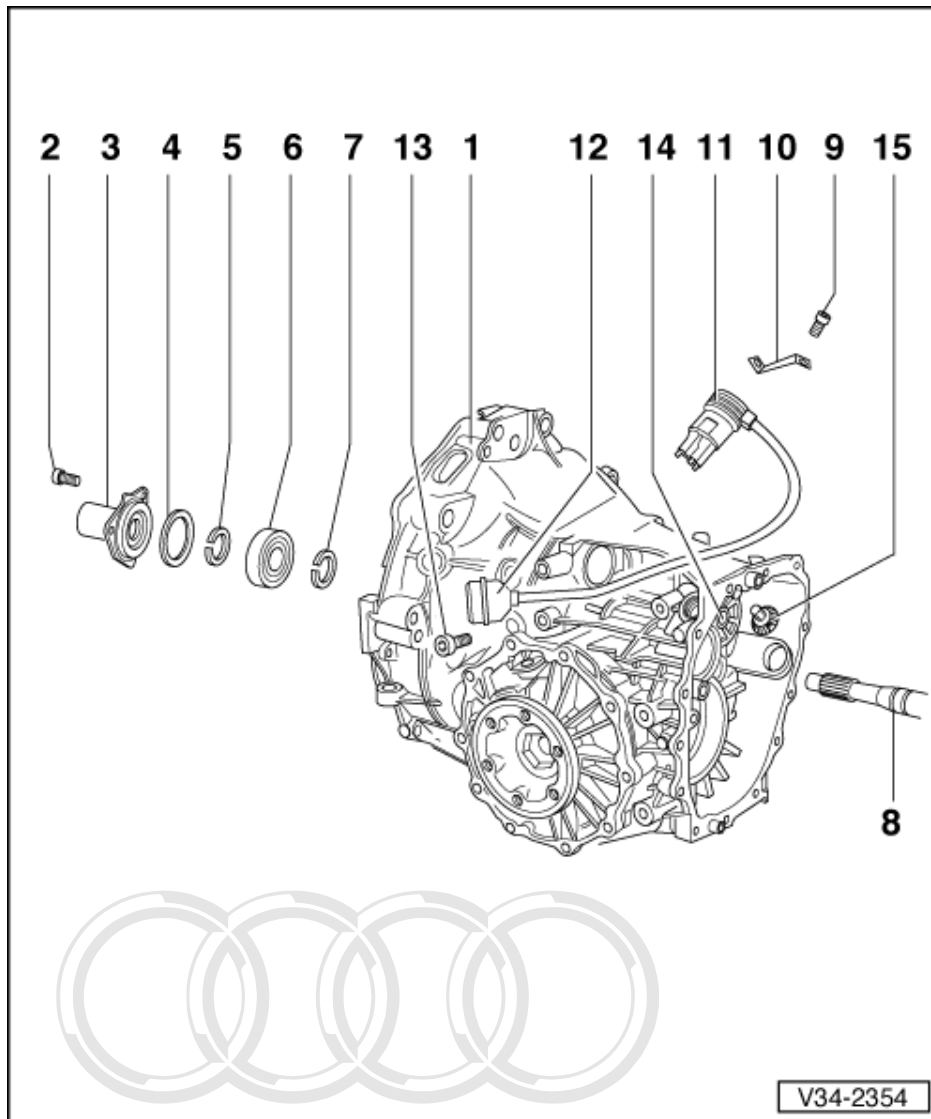
2 Torx socket head bolt

- 35 Nm

- ◆ Self-locking
- ◆ Replace

3 Locating sleeve

- ◆ With O-ring and seal for input shaft => Page 35



4 Dished washer

- ◆ Smaller diameter (convex side) to guide sleeve

5 Circlip

- ◆ Determining thickness => Adjusting input shaft, Page 145

6 Ball bearing

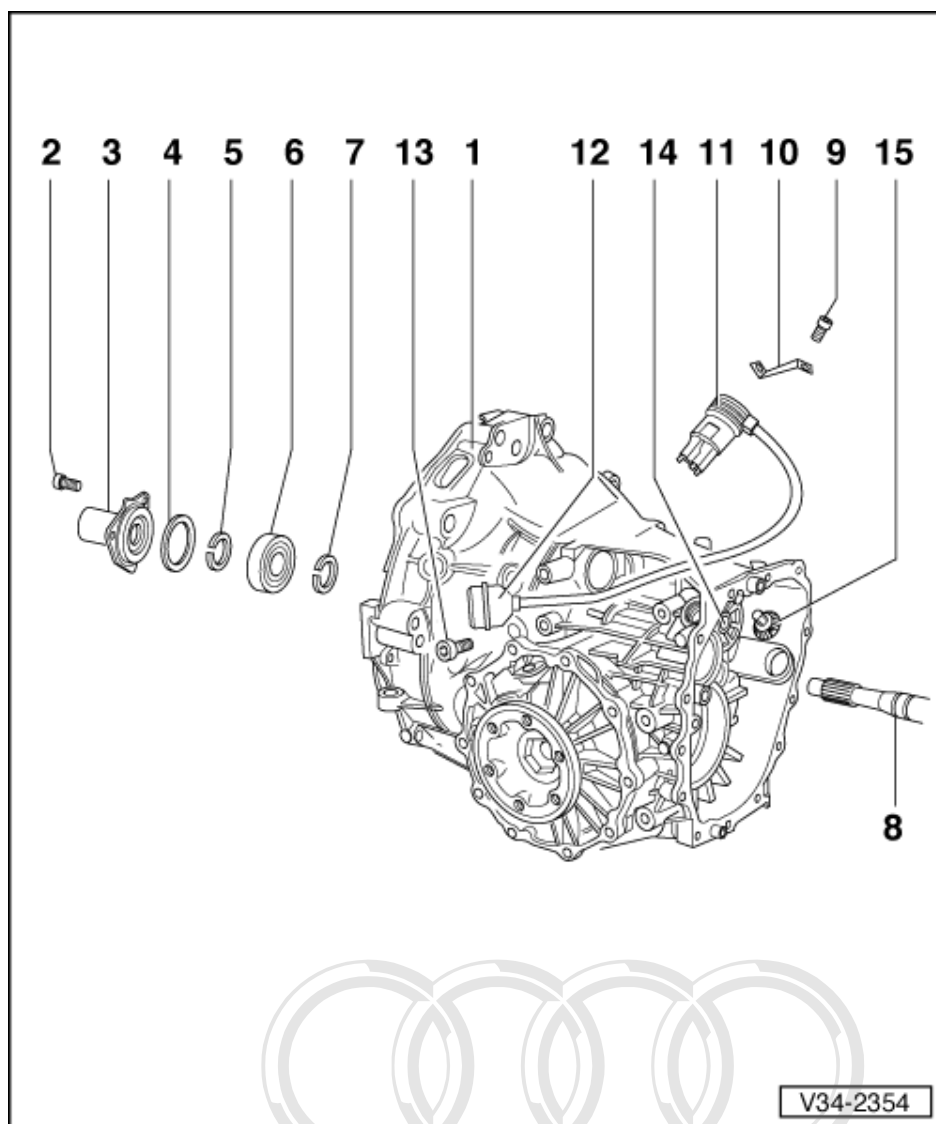
- ◆ Removing and installing => Page 107

7 Circlip

- ◆ Determining thickness => Adjusting input shaft, Page 145

8 Input shaft

- ◆ Removing and installing => Page 104
- ◆ Dismantling and assembling => Page 131
- ◆ Adjusting => Page 145
- ◆ Servicing input shaft bearings => Page 131



9 Release and tighten bolt - 25 Nm

10 Locking plate

- ♦ For multi-function sender

11 Multi-function sender

12 Connector

- ♦ For multi-function sender

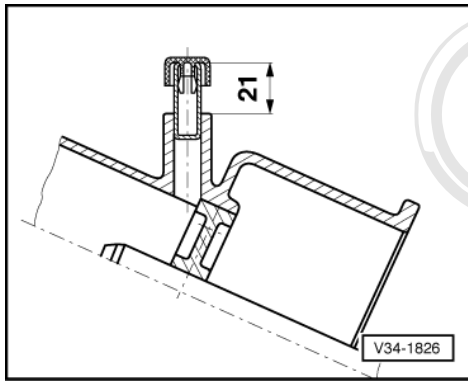
13 Release and tighten bolt - 10 Nm

14 Cover for selector shaft

- ♦ Removing and installing => Page **123**

15 Locking unit for 5th gear and reverse gear

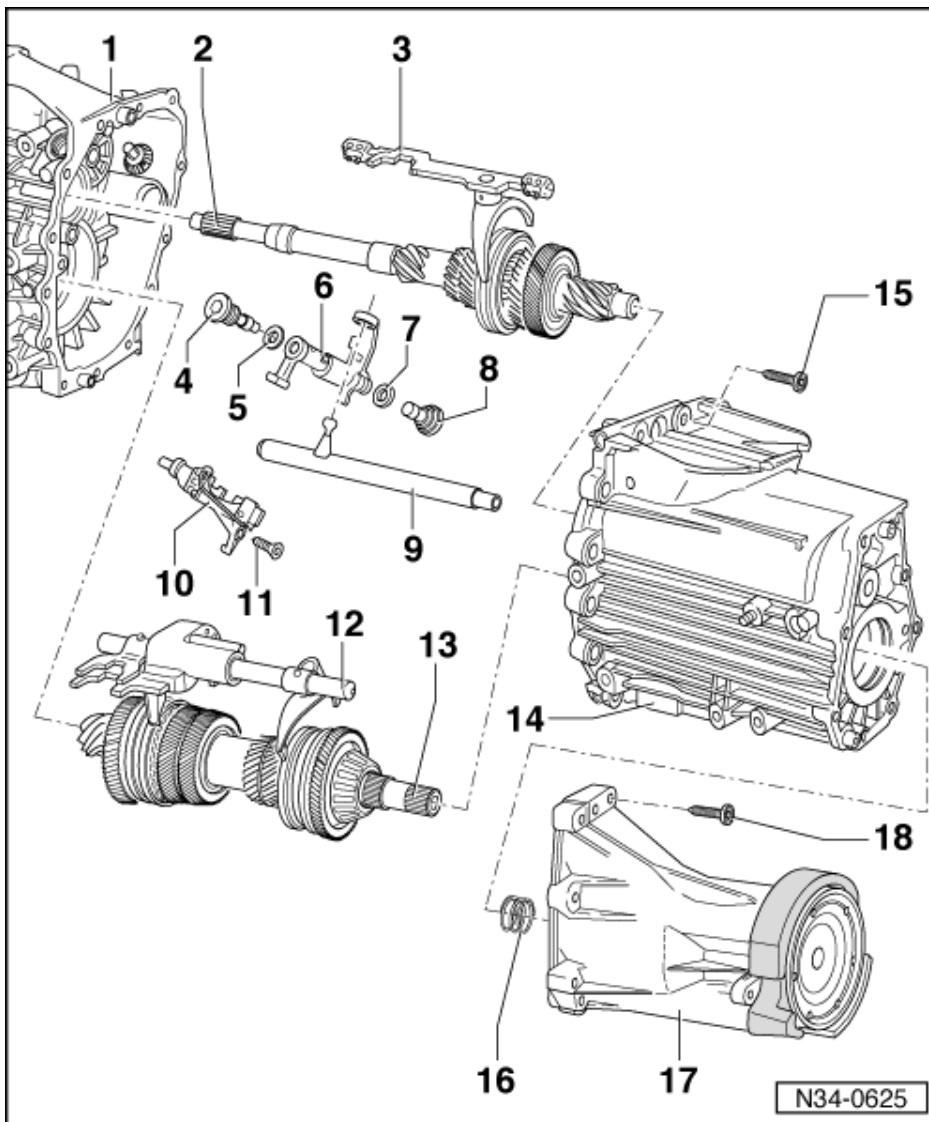
- ♦ Removing and installing => Page **128**



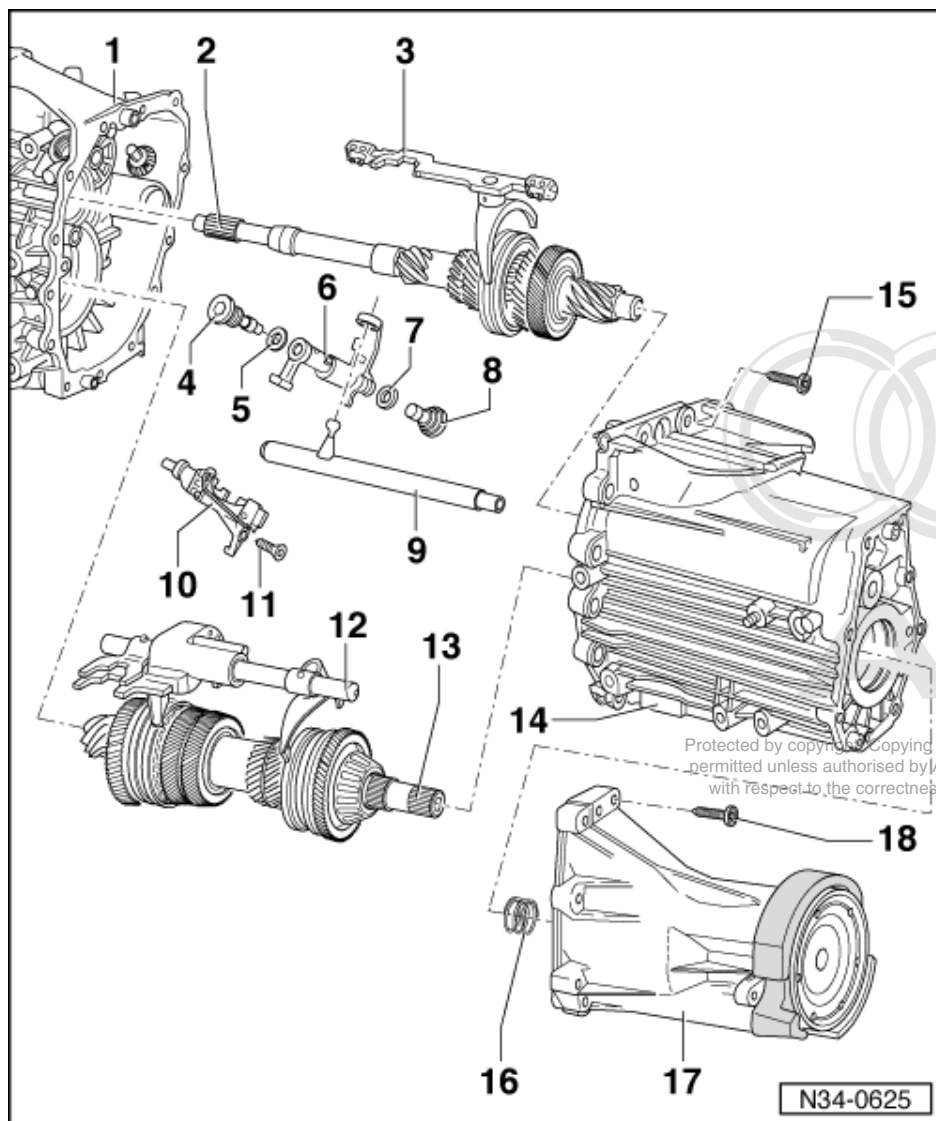
-> Fig.1 Breather installation position

After pressing in, the breather must project 21 mm out of housing.

6.5 - Removing and installing input shaft, drive pinion, hollow shaft, selector rods, gearbox cover and cover with Torsen differential

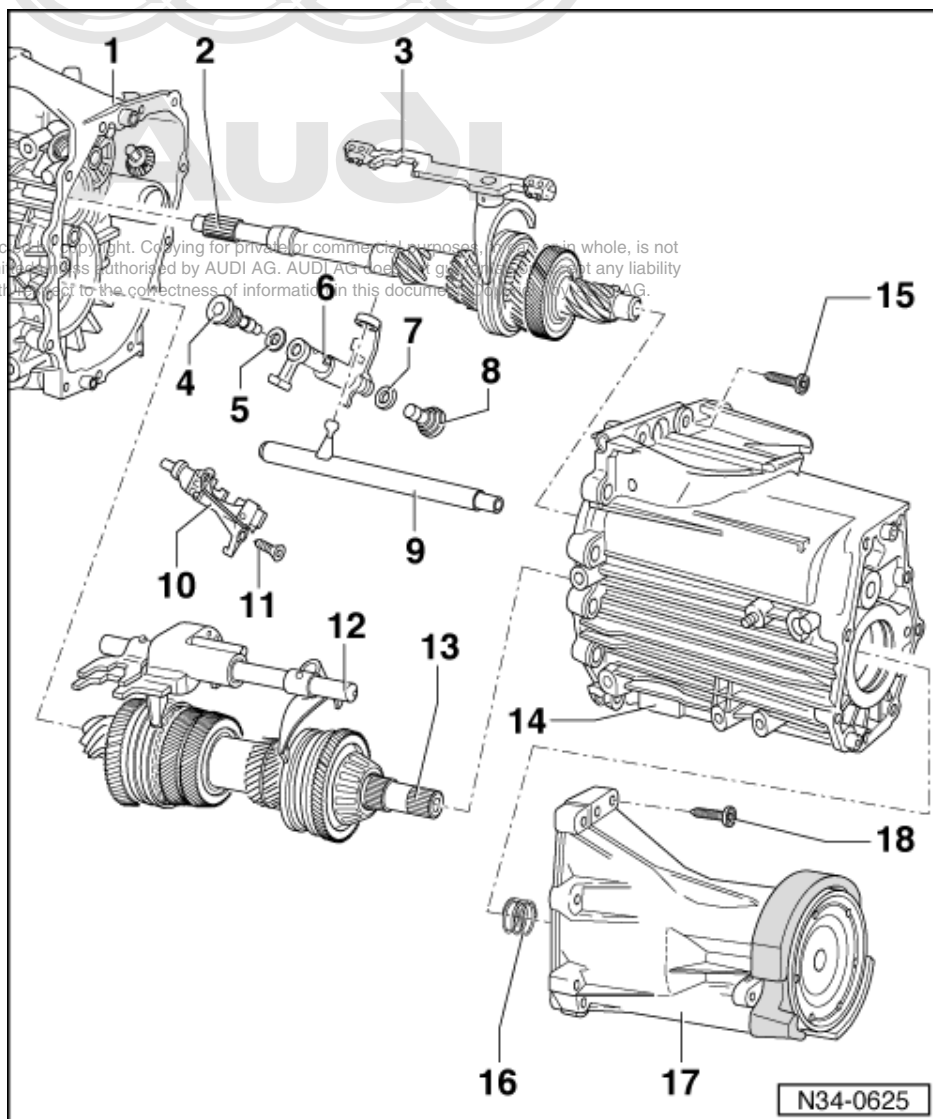


- 1 Gearbox housing
- 2 Input shaft
 - ♦ Dismantling and assembling => Page 131
 - ♦ Adjusting =>Page 145
 - ♦ Servicing input shaft bearings => Page 131
- 3 Selector rod with selector fork for 3rd and 4th gear
 - ♦ Dismantling and assembling => Page 123
 - ♦ Replacing mounting bushes => Page 123



- 4 Left stop bolt
- 40 Nm
- 5 Sealing ring
- 6 Relay shaft
 - ♦ Installation position => Page 124
- 7 Sealing ring
- 8 Right stop bolt
- 40 Nm
- 9 Selector shaft
 - ♦ Installation position => Page 126
 - ♦ Replacing selector shaft sealing ring => Page 126
- 10 Detent segment

- ♦ Installation position => Page 124



11 TORX-screw - 25 Nm

- ♦ With shoulder to secure the detent segment spring

12 Selector rod with selector fork for 1st/2nd/5th and reverse gear

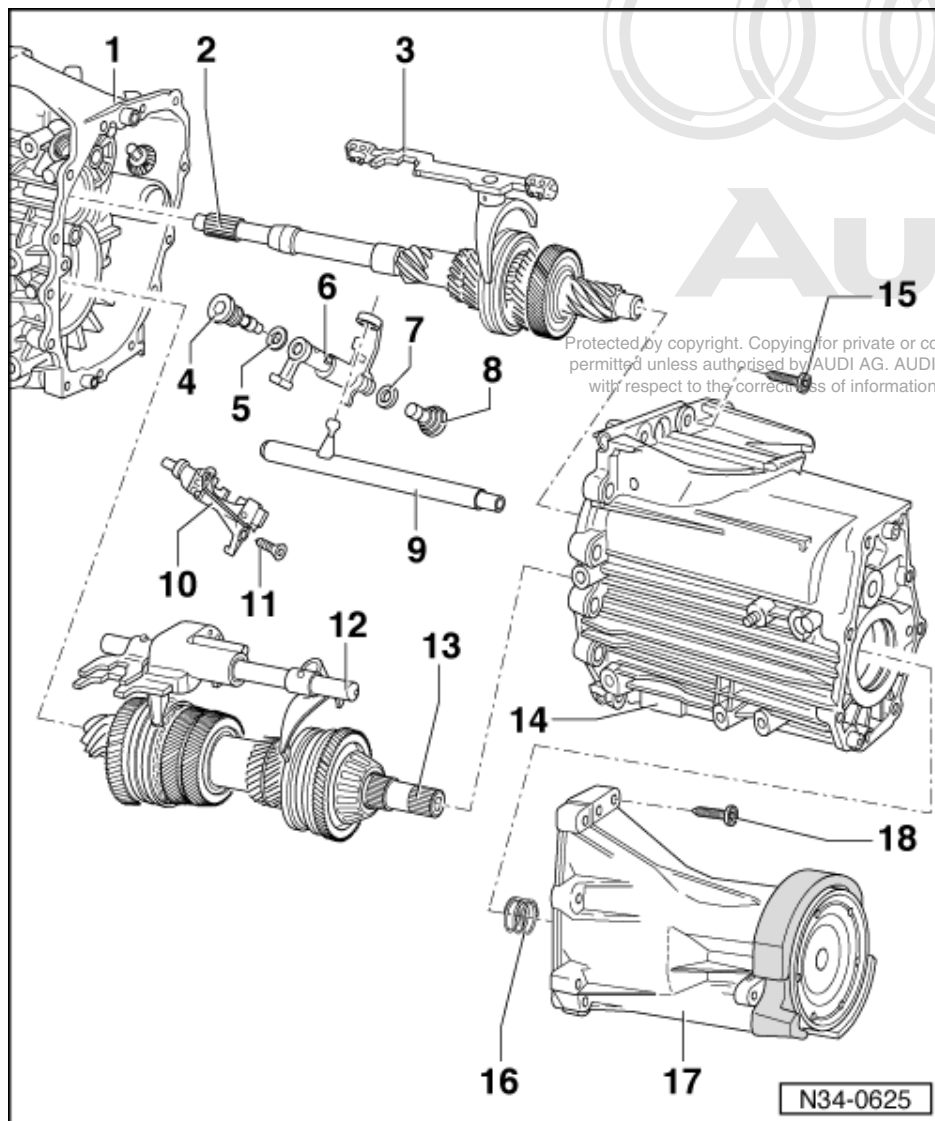
- ♦ Dismantling and assembling => Page 123
- ♦ Removing and installing ball sleeves => Fig. 127

13 Drive pinion with hollow shaft

- ♦ Dismantling and assembling => Page 147
- ♦ Adjusting => Page 195
- ♦ Servicing drive pinion and hollow shaft bearings => Page 147

14 Gearbox cover

- ♦ Removing and installing oil collector => Fig. 1



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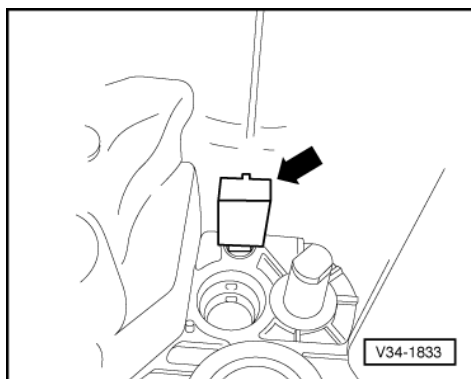
15 TORX-screw - 22 Nm

16 Spring

17 Cover with Torsen differential

- ♦ Removing and installing with gearbox installed => Page 94
- ♦ Removing and installing Torsen differential from cover => Page 115
- ♦ Servicing cover => Page 115

18 TORX-screw - 22 Nm



-> Fig.1 Removing and installing oil collector

Removing

- Turn the oil collector -arrow- and then pull out.

Installing

- Push oil collector into gearbox cover until it snaps in place.
 - Installation position: oil collector faces upwards in gearbox cover

6.6 - Removing and installing input shaft ball bearing, multi-function sender, input shaft, drive pinion, selector rods, gearbox cover and cover with Torsen differential

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Notes:

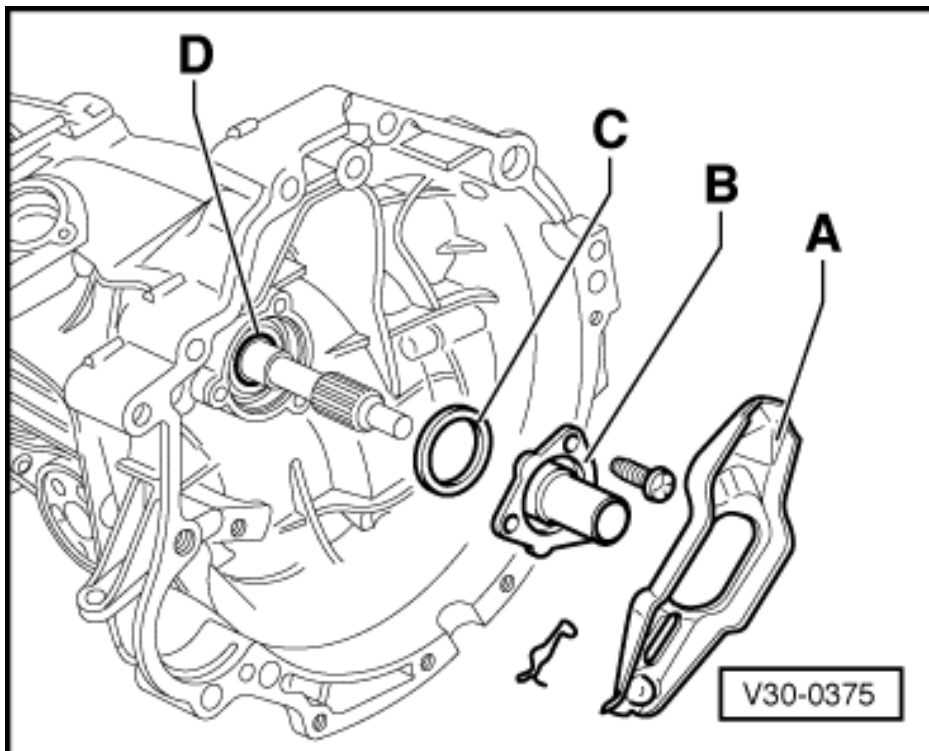
- ♦ It is not necessary to remove the differential to remove the above-mentioned components.
- ♦ Removal is only necessary when adjustments have to be carried out => adjustment overview, Page 198 .

Special tools, testers and auxiliary equipment required

- ♦ Holding plate VW 309
- ♦ Gearbox support VW 353
- ♦ Pressing-in tool 3235
- ♦ Drip tray V.A.G 1306
- ♦ Taper roller bearing extractor V.A.G 1582
- ♦ Clamping piece V.A.G 1582/2

Removing

- Place drip tray V.A.G 1306 underneath the gearbox.
- Drain gear oil.
- Secure gearbox to repair stand => Page 89 .

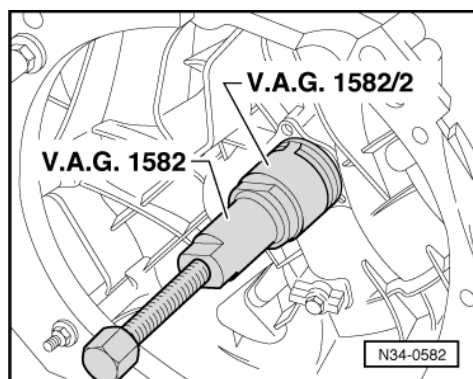




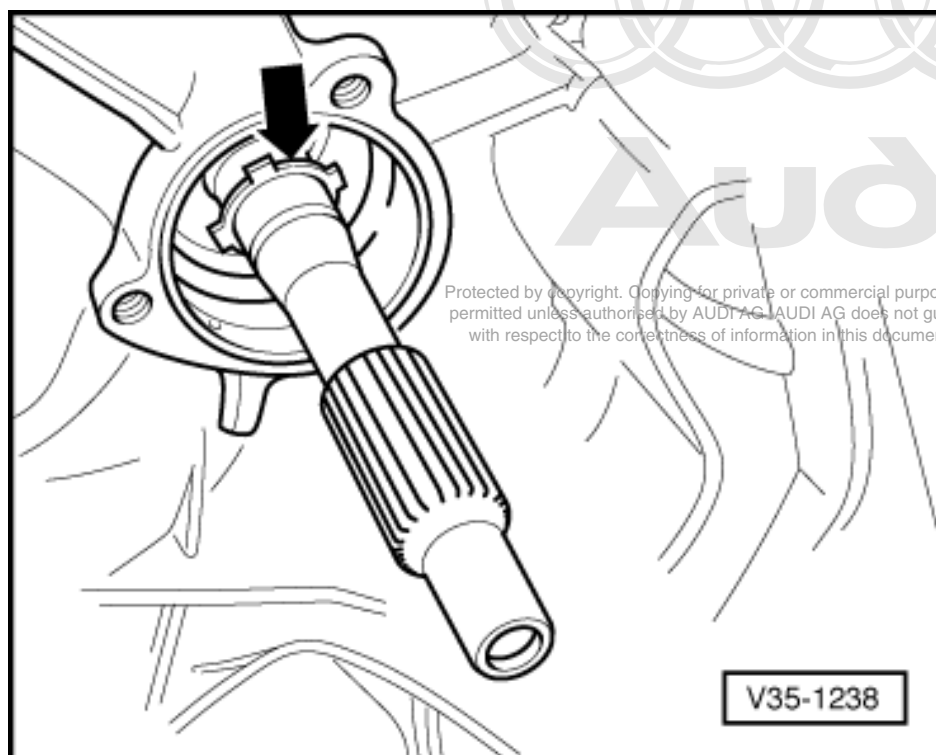
- -> Detach clutch release lever -A- with release bearing.

Notes:

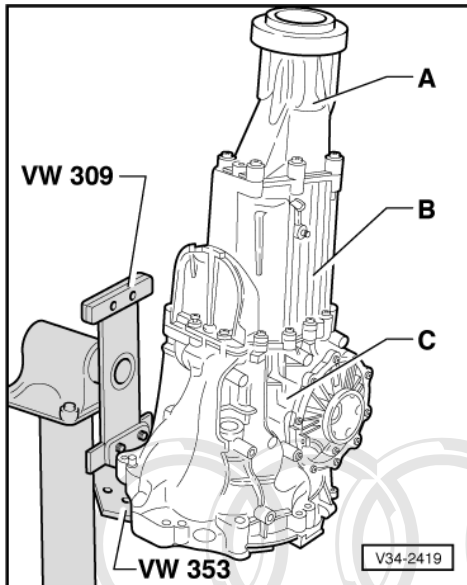
- ♦ Before pulling off guide sleeve, cover input shaft splines with a shrink-fit hose to protect oil seal.
- ♦ Removing oil seal from guide sleeve => Page 35 .
- Unscrew guide sleeve -B-.
- Remove dished washer -C-.
- Remove circlip -D- in front of input shaft ball bearing.
- If the ball bearing, input shaft or gearbox housing is not to be replaced, note the thickness of the circlip.



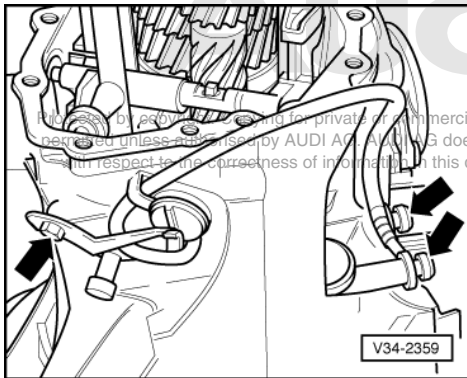
- -> Pull the input shaft ball bearing out of the gearbox housing.



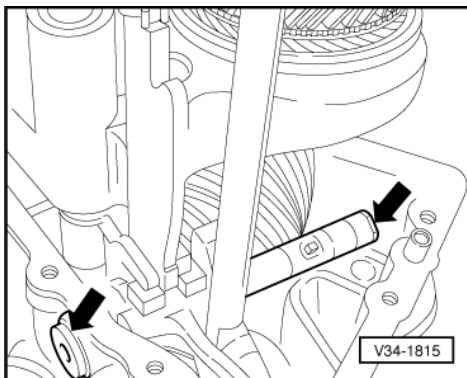
- -> Remove the circlip (arrow) behind the input shaft ball bearing.
- If the ball bearing, input shaft or gearbox housing is not to be replaced, note the thickness of the circlip.



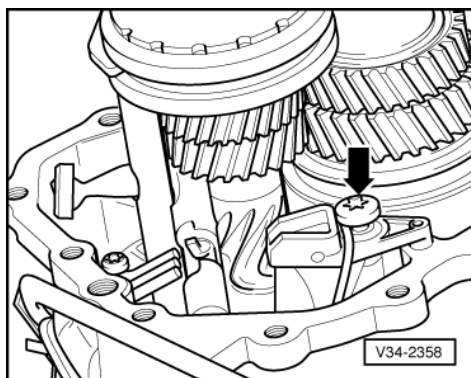
- -> Unbolt cover -A- with Torsen differential from gearbox cover -B-.
- Detach spring from drive pinion.
- Then unbolt gearbox cover -B- from gearbox housing -C-.



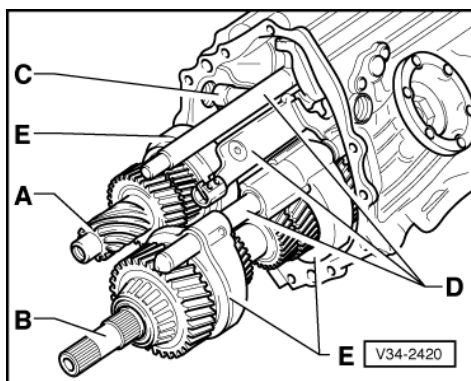
- -> Remove bolts (arrows) and pull out the multi-function sender.



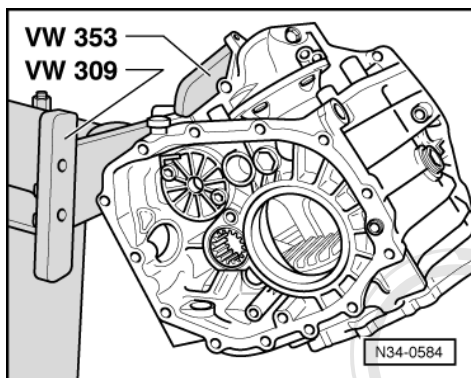
- -> Remove relay shaft bolts (arrows).



- -> Unscrew detent segment (arrow) and swivel it out.



- -> The input shaft -A-, the pinion shaft -B-, the relay shaft -C-, the selector rods -D- with the selector shaft and the selector forks -E- should be carefully pulled out together.



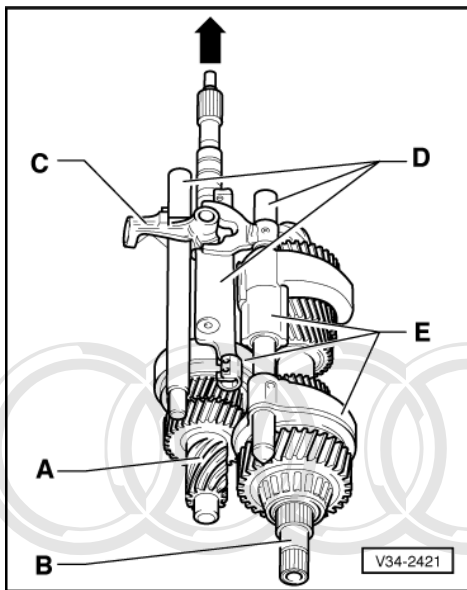
Installing

Note:

If the input shaft ball bearing, the input shaft or the gearbox housing are renewed, it is necessary to re-determine the thickness of the circlips for the input shaft =>Page 145 , adjusting input shaft.

- -> Swing the gearbox housing into the position shown. The components listed below can then be fitted more easily.

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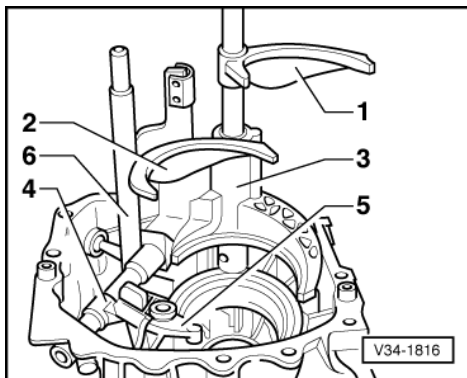


- -> Put the input shaft -A-, the pinion shaft -B-, the relay shaft -C-, the selector rods -D- with the selector shaft and the selector forks -E- together.
- Install these components together into the gearbox housing.

Note:

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Relay shaft -C- and the selector shaft can also be fitted later => Fig. V34-1816, Page 112.

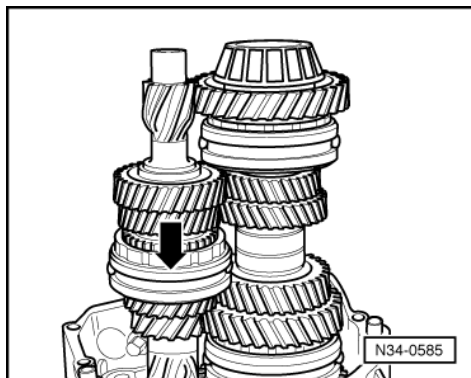


-> Location of shift mechanism in gearbox

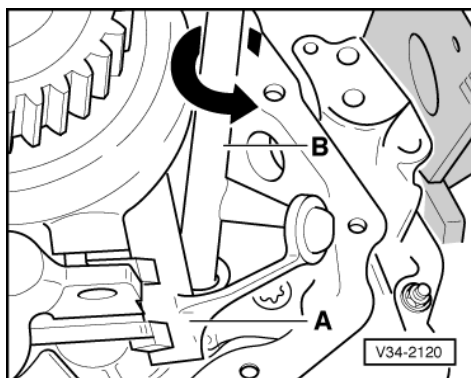
- 1 - Selector fork for 5th gear and reverse gear
- 2 - Selector fork for 3rd gear and 4th gear
- 3 - Selector fork for 1st gear and 2nd gear
- 4 - Relay shaft
- 5 - Detent mechanism
- 6 - Selector shaft

Note:

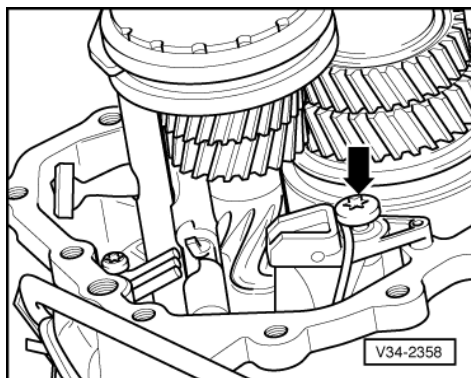
Shown in illustration with input shaft and pinion shaft removed.



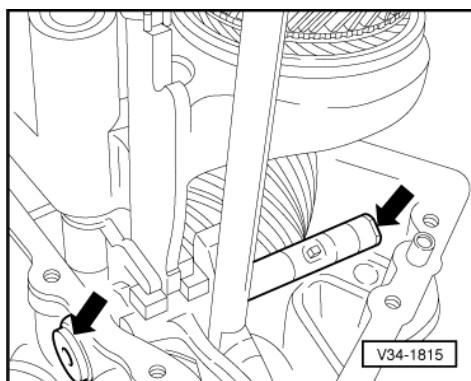
- ➔ Turn gearbox housing and engage 3rd gear (direction of arrow).



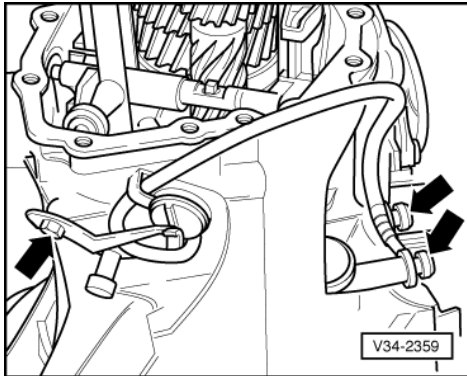
- ➔ Now install relay shaft -A-.
- Insert selector shaft -B- sideways into bore in gearbox housing and assemble into mounting eye.
- Then turn the selector shaft carefully in direction of arrow.



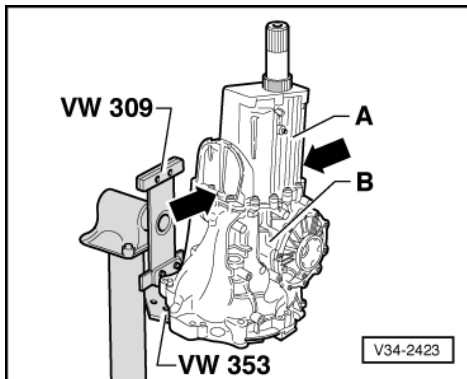
- ➔ Then insert the detent segment and bolt it tight (arrow).



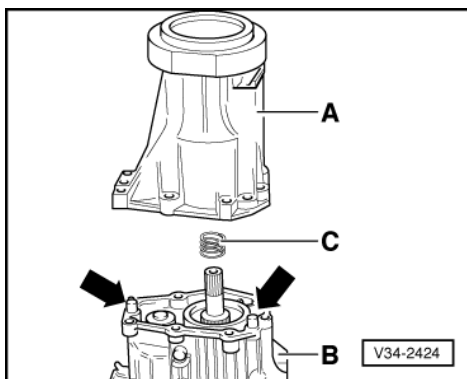
- -> Screw in relay shaft bolts (arrow)



- Replace O-ring for multi-function sender.
- -> Carefully insert multi-function sender and tighten (arrow).

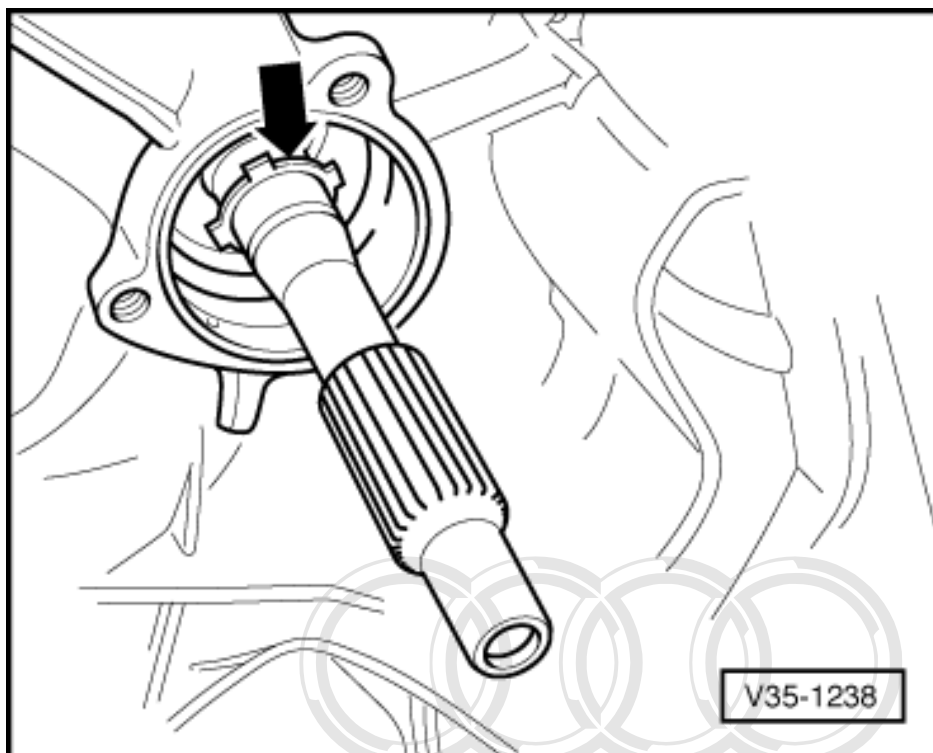


- -> Check that dowel sleeves for gearbox cover -A- are fitted in gearbox housing -B- (arrows).
- Fit gearbox cover onto gearbox housing.

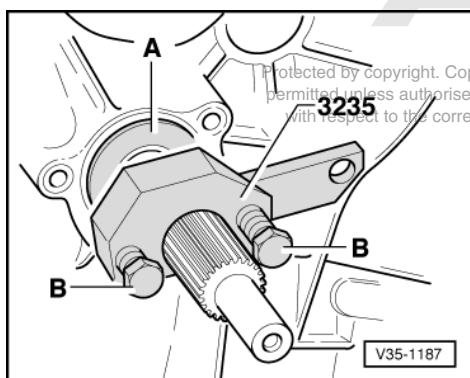


- -> Check that dowel sleeves for cover -A- are fitted in gearbox cover -B- (arrows).
- Fit spring -C-.
- Fit cover with Torsen differential -A- on gearbox cover -B-.

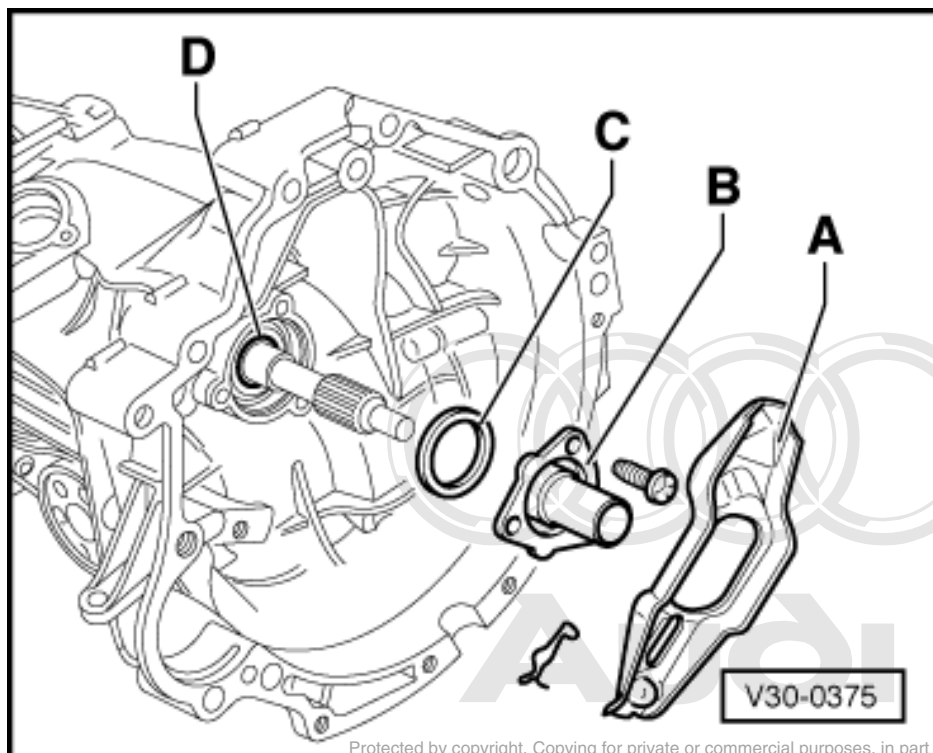
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- -> Fit rear input shaft ball bearing circlip (arrow).
- Slide the ball bearing onto the input shaft.
- Installation position: closed side of ball cage faces towards gearbox housing



- -> Press in ball bearing:
- Slide thrust pad -A- of pressing-in tool onto input shaft.
- Position pressing-in tool behind splines for clutch plate.
- Screw in the bolts -B- until they make contact.
- The bolts bear against the indentations in thrust pad -A-.
- Press in ball bearing onto its seat by alternately tightening the bolts (1/2 turn at a time).



- -> Now fit the front circlip -D- for the input shaft ball bearing
- Then fit dished washer -C-.
 - Installation position: convex side towards guide sleeve -B-

Notes:

- ◆ Before fitting guide sleeve, cover input shaft splines with a shrink-fit hose to protect oil seal.
- ◆ Installing oil seal in guide sleeve => Page 35 .
- Fit guide sleeve -B- for release bearing.
- Fit clutch release lever -A- and release bearing.

7 - Servicing cover for Torsen differential, removing and installing Torsen differential

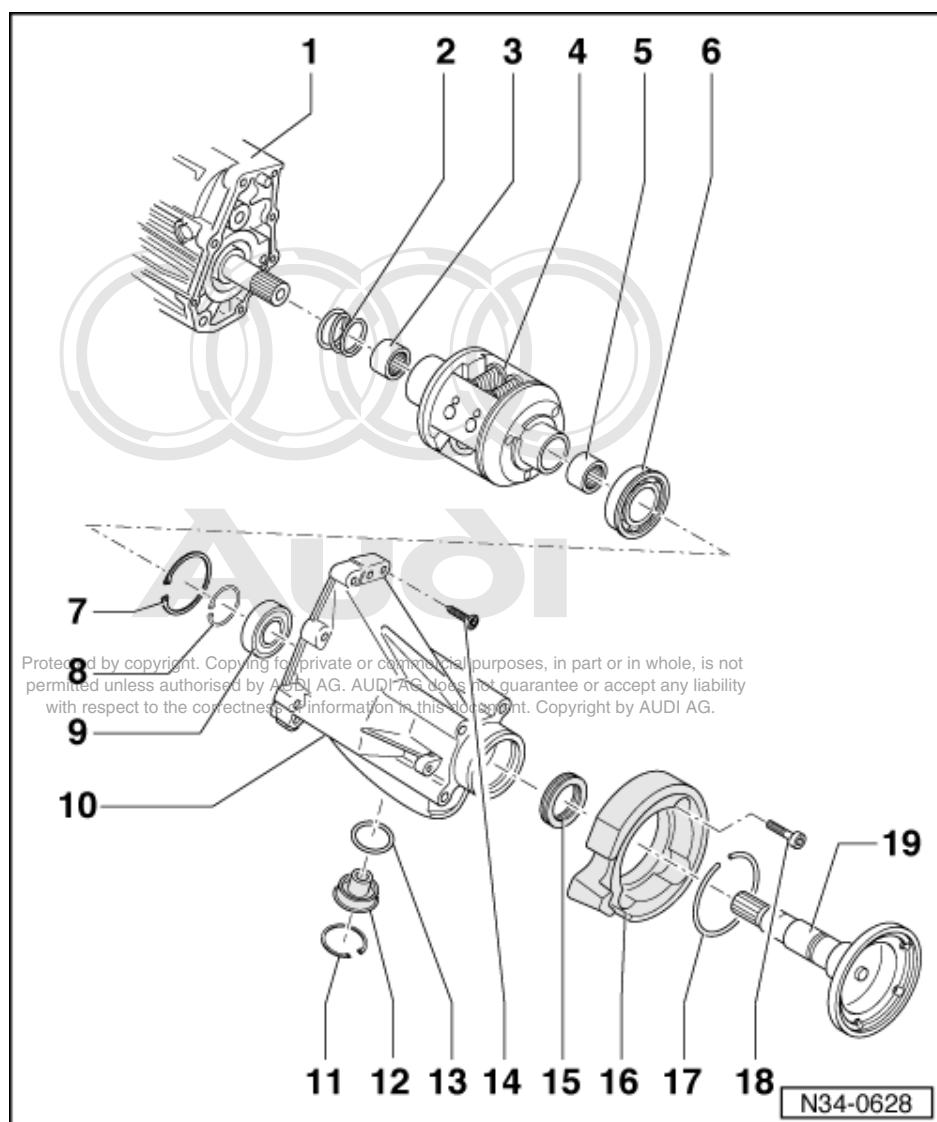
7.1 - Servicing cover for Torsen differential, removing and installing Torsen differential

Special tools, testers and auxiliary equipment required

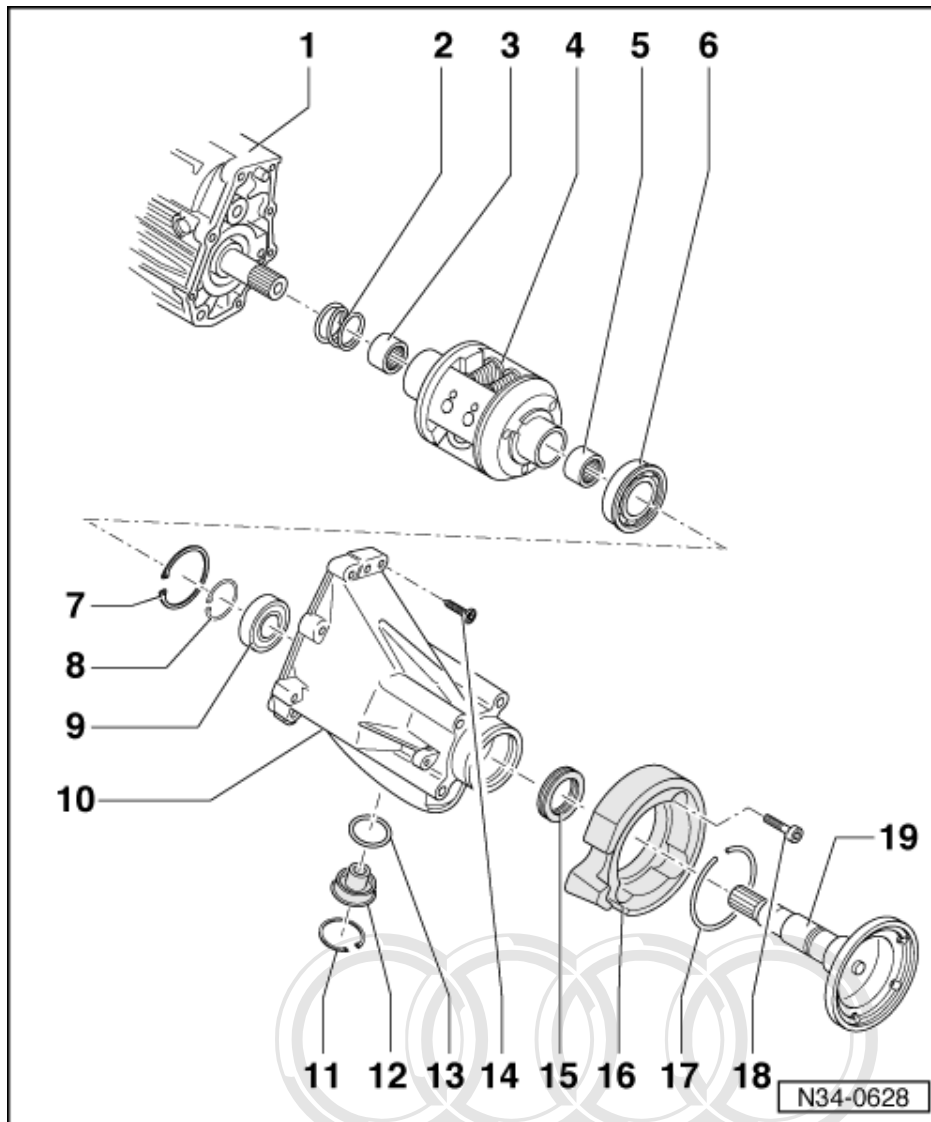
- ◆ Thrust plates VW 401 and VW 402
- ◆ Press tool VW 407
- ◆ Press tool VW 412
- ◆ Tube VW 416 B
- ◆ Tube VW 421
- ◆ Guide piece VW 439
- ◆ Tube VW 519
- ◆ Extractor lever VW 681
- ◆ VW 771/15 from multi-purpose tool set VW 771
- ◆ Sleeve 40-21
- ◆ Tube 2040
- ◆ Thrust piece 3002
- ◆ Separating tool Kukko 17/2



- ♦ Internal puller Kukko 21/4



- 1 Gearbox cover**
- 2 Spring**
- 3 Front needle roller bearing**
 - ♦ Pulling out => Fig. 8
 - ♦ Installation position => Fig. 9
 - ♦ Pressing in => Fig. 11
- 4 Torsen differential**
 - ♦ Do not dismantle
 - ♦ Press out after removing flange shaft => Fig. 3
 - ♦ Replace, if damaged
 - ♦ Pressing in => Fig. 12
- 5 Rear needle roller bearing**
 - ♦ Pulling out => Fig. 8
 - ♦ Installation position => Fig. 10
 - ♦ Pressing in => Fig. 11



6 Ball bearing

- ♦ For Torsen differential
- ♦ Pressing off => Fig. 4
- ♦ Pressing on => Fig. 5

7 Circlip

8 Circlip

- ♦ Remove and install together with flange shaft => Fig. 2

9 Ball bearing

- ♦ For flange shaft
- ♦ Pressing out => Fig. 6
- ♦ Pressing in => Fig. 7

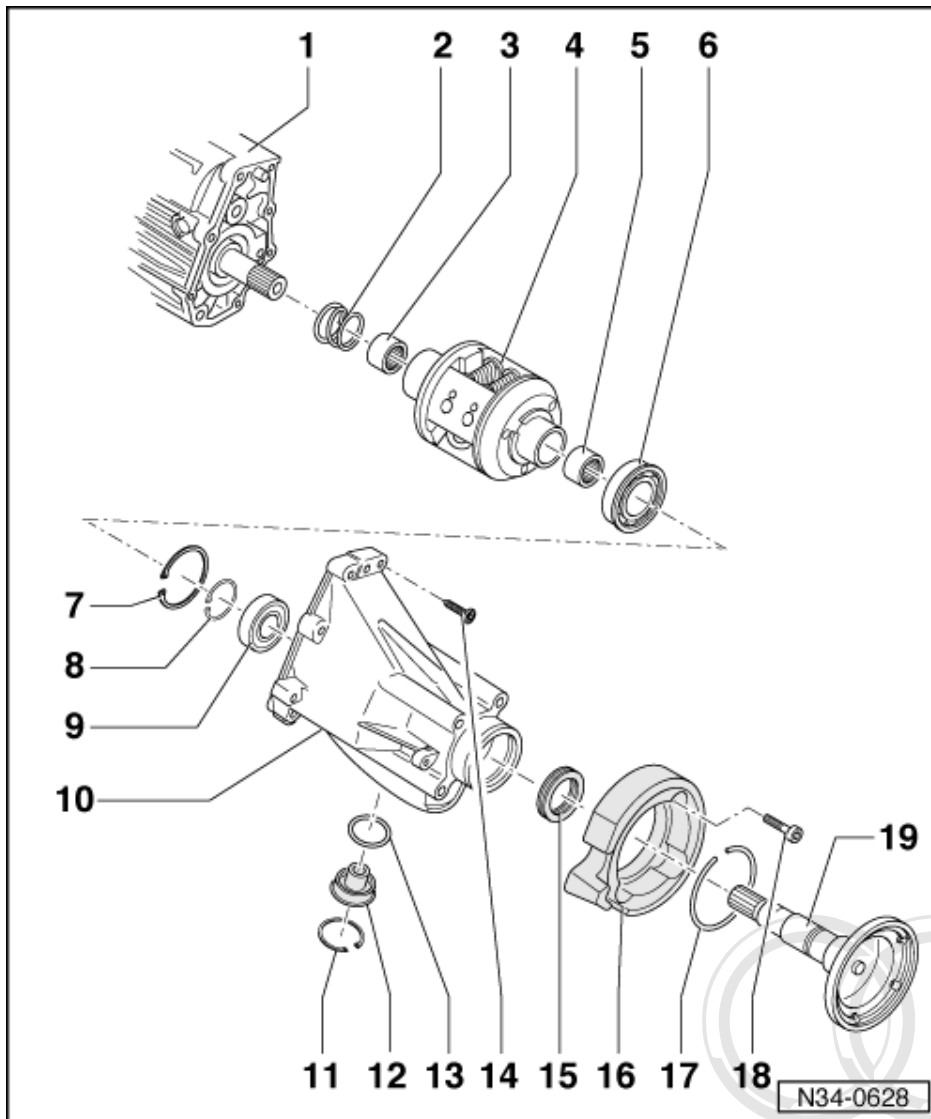
10 Cap

- ♦ For Torsen differential

11 Circlip

12 Cap

- ♦ Removing => Fig. 1



13 O-ring

- ◆ Replace
- ◆ Grease when installing

14 TORX-screw - 22 Nm

15 Sealing ring

- ◆ Pull out with lever VW 681
- ◆ Tapping in => Fig. 13

16 Vibration damper

17 Circlip

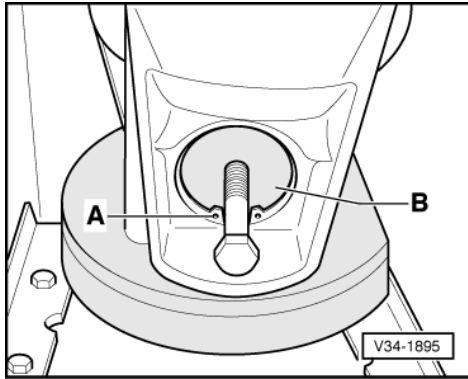
18 TORX-screw - 35 Nm

- ◆ Self-locking
- ◆ Replace

19 Flange shaft

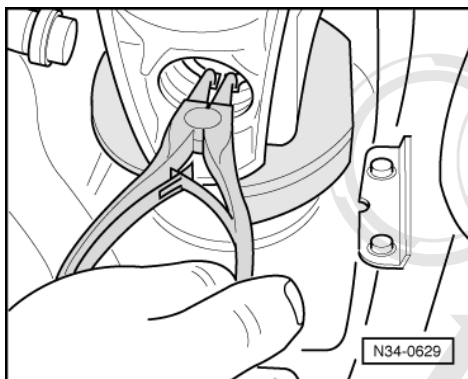
- ◆ Removing and installing => Fig. 2

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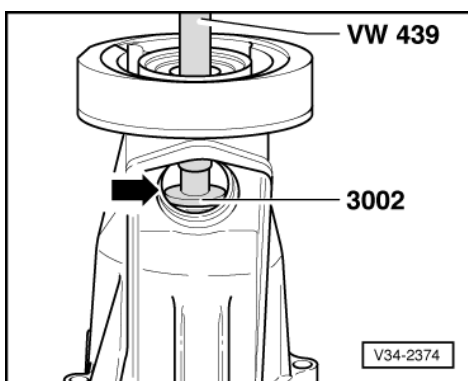
-> Fig.1 Removing sealing cap

- Remove circlip -A-.
- Screw M8 bolt into thread of sealing cap -B-.
- Pull out sealing cap -8- using bolt.



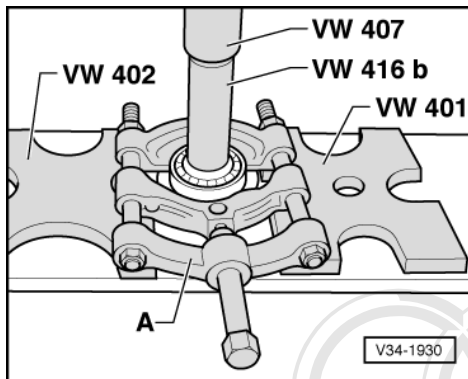
-> Fig.2 Removing and installing flange shaft

- Open out circlip and pull out flange shaft.
- When inserting flange shaft, fit circlip at the same time.
- Circlip must be properly seated in the base of the groove



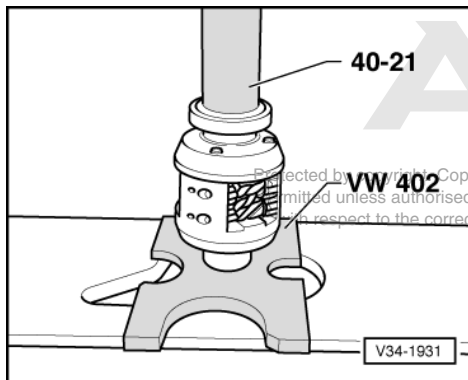
-> Fig.3 Pressing out Torsen differential

- Position thrust piece 3002 directly on Torsen differential through opening (arrow).



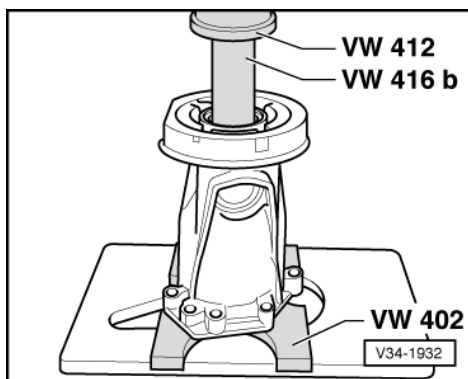
-> Fig.4 Pressing off ball bearing from Torsen differential

A - Separating device 22 ... 115 mm, e.g. Kukko 17/2



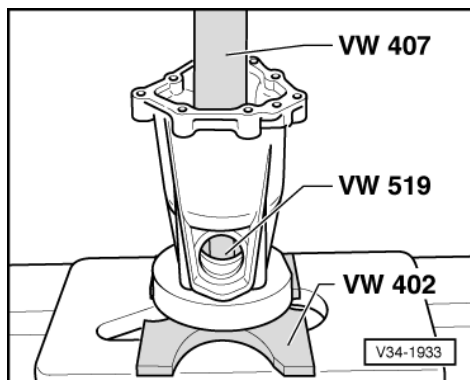
-> Fig.5 Pressing ball bearing onto Torsen differential

- Press the ball bearing on as far as stop.



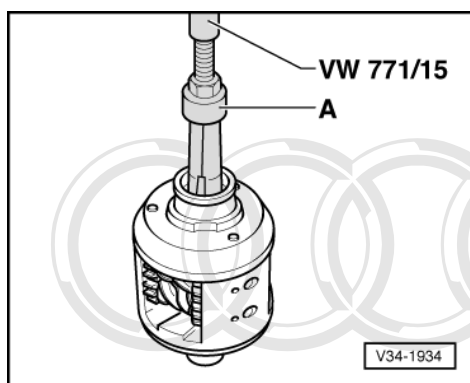
-> Fig.6 Pressing out ball bearing for flange shaft

- Remove circlip before pressing off.



-> Fig.7 Pressing in ball bearing for flange shaft

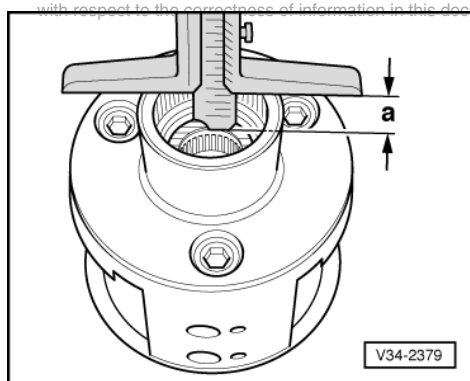
- Fit circlip after pressing in bearing.



-> Fig.8 Pulling out needle roller bearing

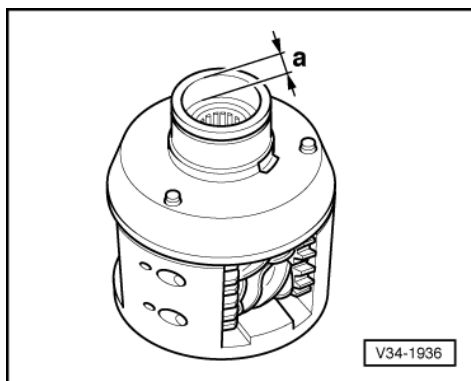
- A - Internal puller 22 ... 28 mm, e.g. Kukko 21/4

~~Both needle roller bearings in Torsen differential are removed with same puller.~~
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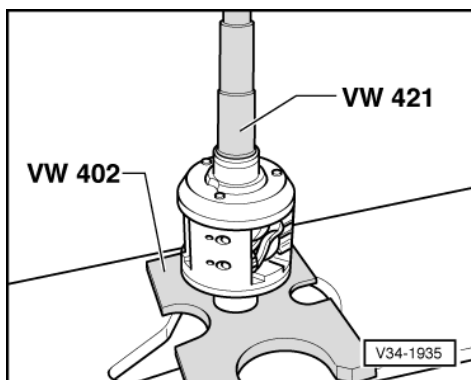
-> Fig.9 Installation position of front needle roller bearing

- ◆ Distance a = 32.5 mm



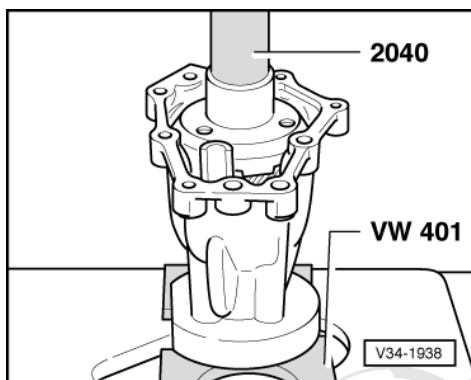
➔ Fig. 10 Installation position of rear needle roller bearing

- ◆ Distance a = 14 mm

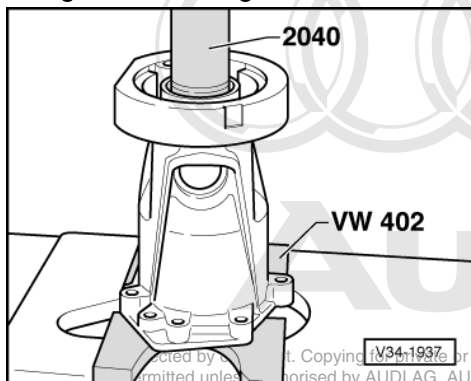


➔ Fig. 11 Pressing in needle roller bearing

- Both needle roller bearings in Torsen differential are pressed in with same special tool.



➔ Fig. 12 Pressing in Torsen differential



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-> Fig.13 Inserting oil seal

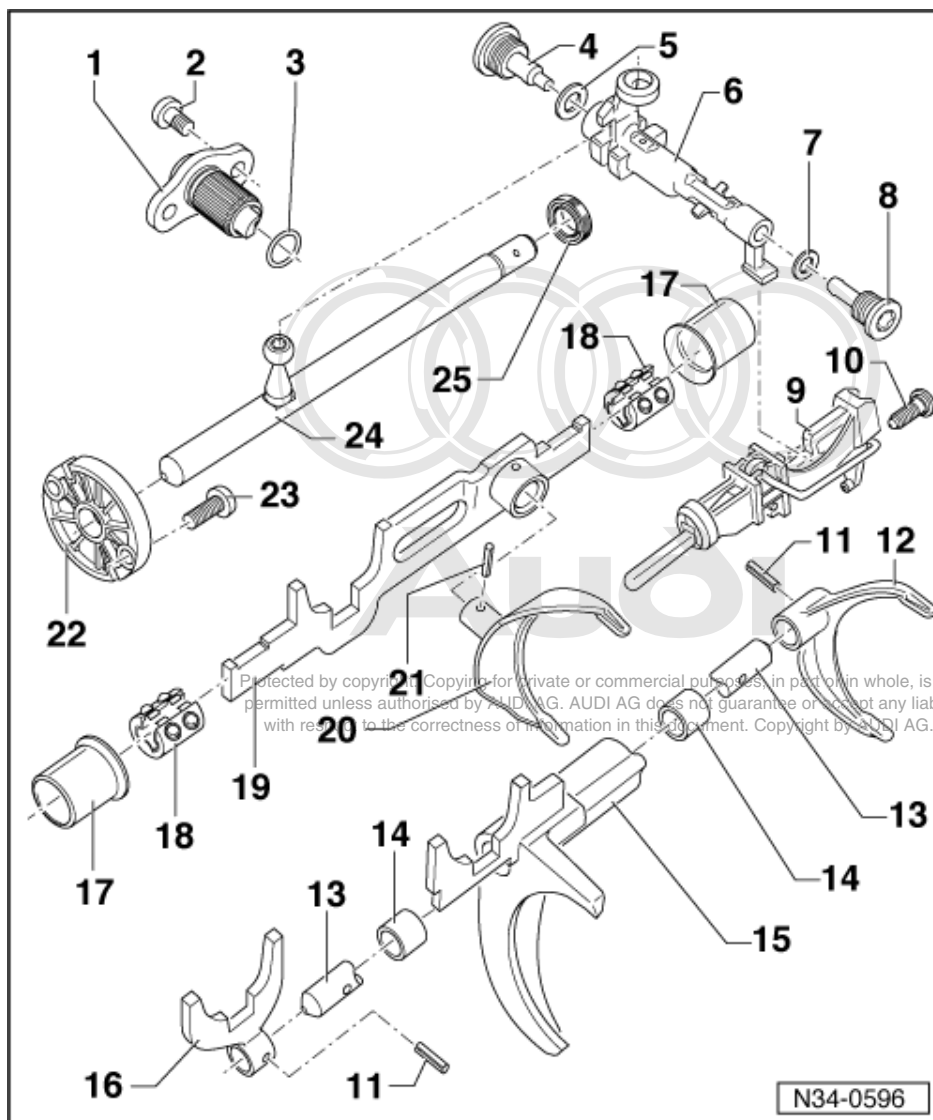
- Fill space between sealing and dust lips with multipurpose grease.
- Lightly oil outer circumference of seal.
- Installation position: 2 mm below surface of cover

8 - Dismantling and assembling shift mechanism in gearbox

8.1 - Dismantling and assembling shift mechanism in gearbox

Special tools, testers and auxiliary equipment required

- ◆ Drift VW 295
- ◆ Adapter VW 295 A
- ◆ Thrust plate VW 401
- ◆ Tube VW 423
- ◆ Spacer sleeve VW 472/2
- ◆ Multi-purpose tool VW 771
- ◆ Internal puller Kukko 21/4





Note:

Installation position of the complete selector mechanism in gearbox => Fig. 6

1 Locking unit for 5th gear and reverse gear

- ♦ Removing and installing => Page 128

2 TORX-screw - 10 Nm

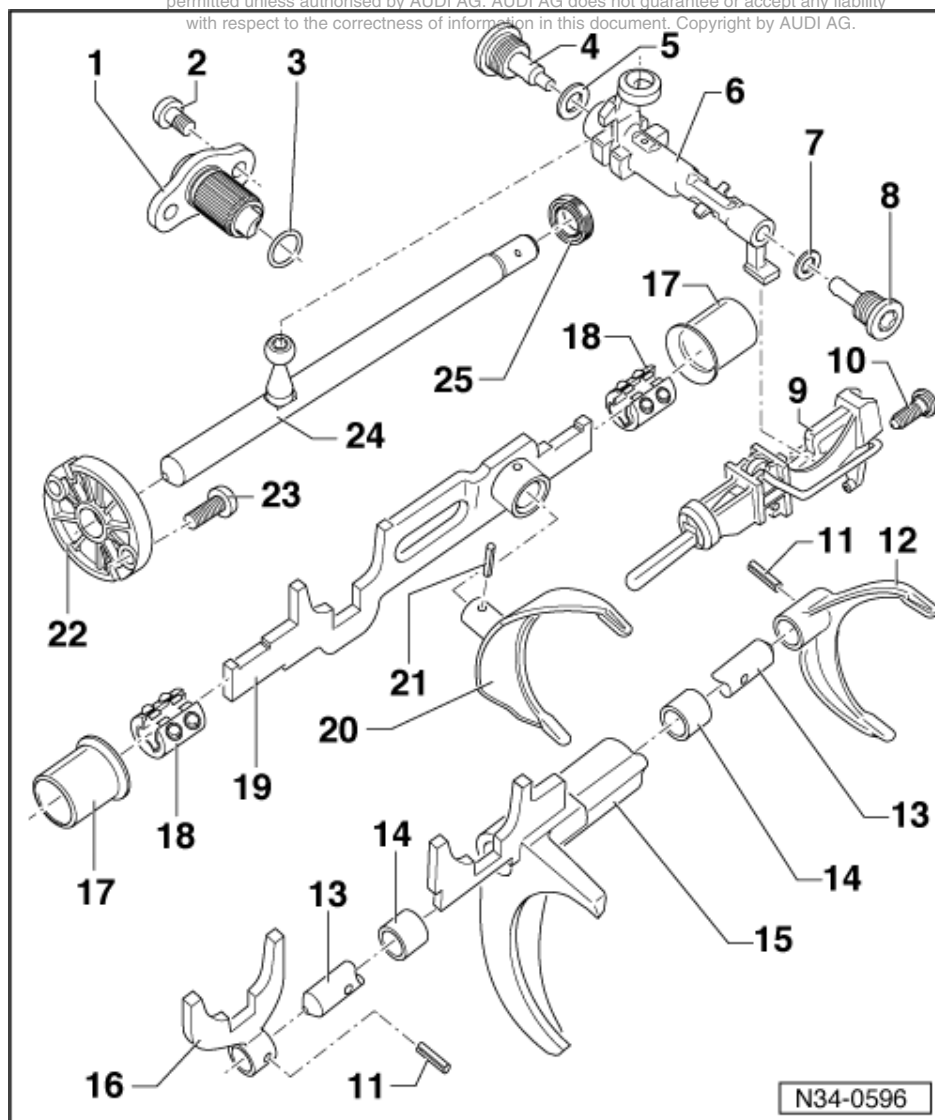
3 O-ring

- ♦ Replace

**4 Right stop bolt
- 40 Nm**

5 Sealing ring

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6 Relay shaft

7 Sealing ring

**8 Left stop bolt
- 40 Nm**

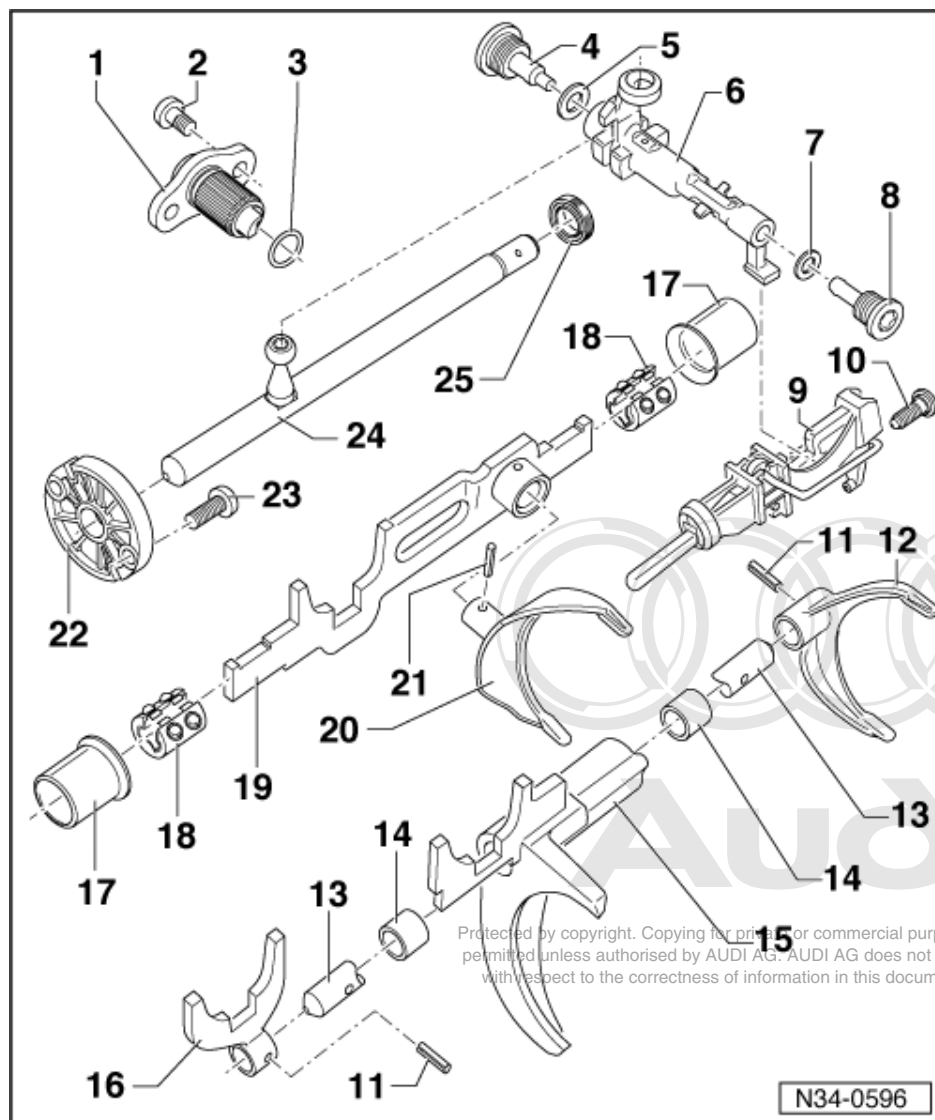
9 Detent segment

10 TORX-screw - 25 Nm

11 Spring pin

12 5th and reverse gear selector fork

- ♦ Installation position => Fig. 1
- 13 Selector rods for 1st/2nd and 5th/reverse gear**



14 Ball sleeve

- ♦ Removing and installing => Fig. 2

15 Selector fork, 1st and 2nd gear

16 Actuating arm

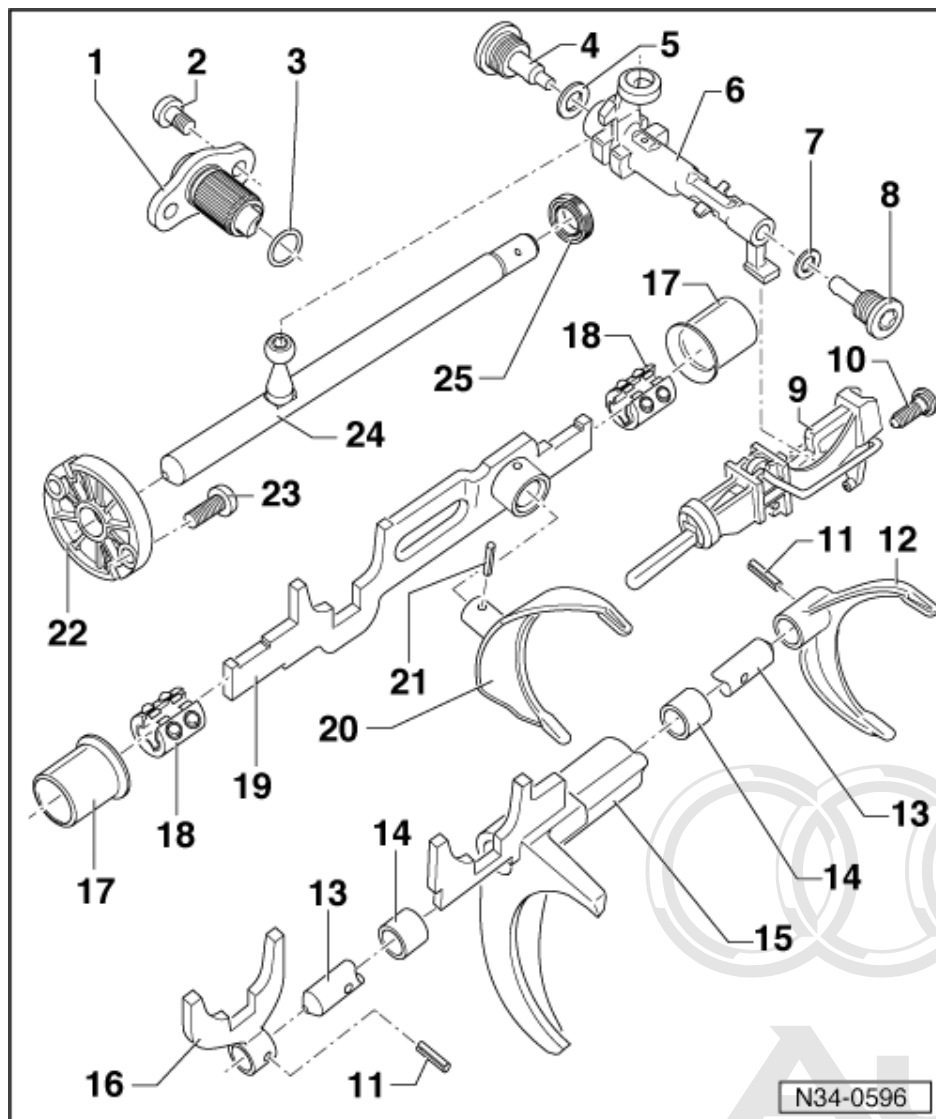
- ♦ Installation position => Fig. 1

17 Mounting bush for 3rd and wheel

- ♦ Pulling out => Fig. 3
- ♦ Tapping in => Fig. 4

18 Ball sleeve

- ♦ Lever off the selector rod with a screwdriver
- ♦ Press onto the selector rod



19 Selector rod for 3rd and 4th gear

20 Selector fork, 3rd and 4th gear

21 Spring pin

22 Cap

- ♦ For selector shaft

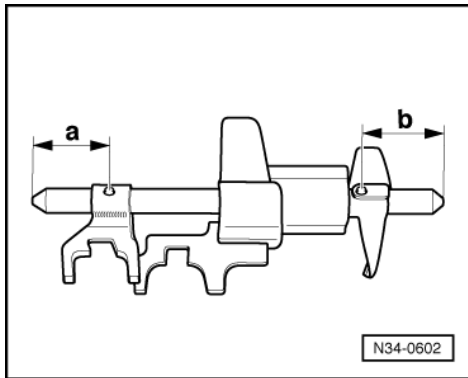
23 TORX-screw - 20 Nm

24 Selector shaft

25 Sealing ring

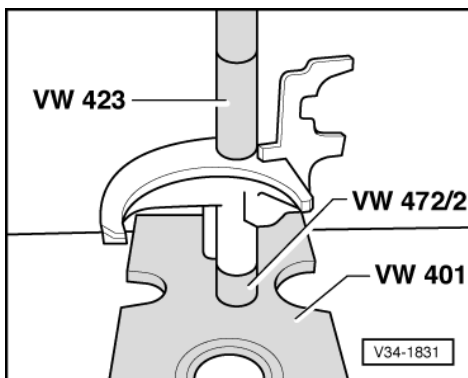
- ♦ Lever out with screwdriver
- ♦ Installation position => Fig. 5.

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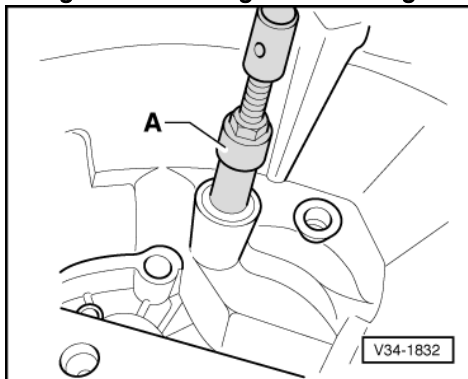


-> Fig.1 Installation position of 5th and reverse gear selector fork and actuating arm for selector rod

- Distance a = 55 mm
- Distance b = 60 mm

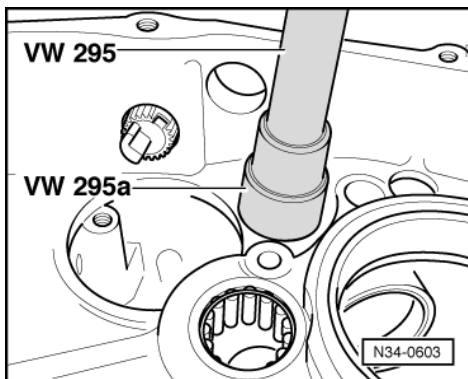


-> Fig.2 Removing and installing ball sleeve



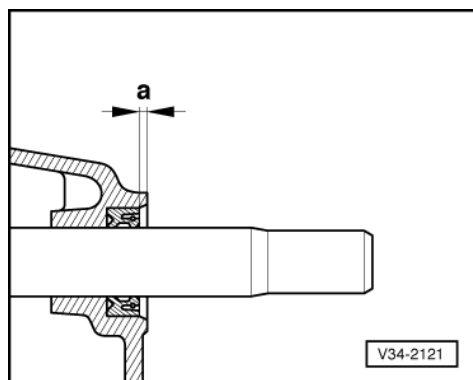
-> Fig.3 Pulling out mounting bush for 3rd and 4th gear selector rod

- A - Internal puller 22 ... 28 mm, e.g. Kukko 21/4, in conjunction with multi-purpose tool VW 771



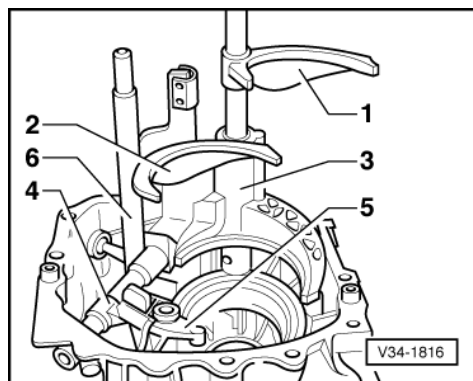
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-> Fig.4 Driving mounting bush for 3rd and 4th gear selector rod home



-> Fig.5 Oil seal installation position

- Fill space between sealing and dust lips with multipurpose grease.
- Lightly oil outer circumference of seal.
 - Distance a = 1 mm

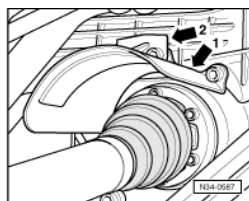


-> Fig.6 Installation position of complete shift mechanism in gearbox

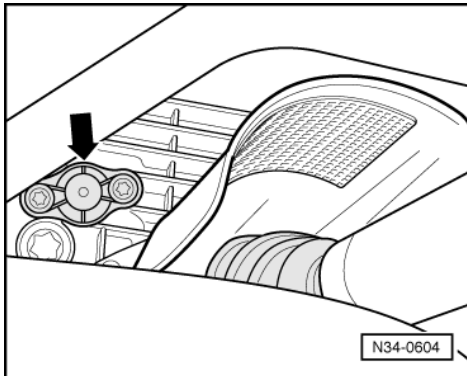
- 1 - Selector fork for 5th gear and reverse gear
- 2 - Selector fork for 3rd gear and 4th gear
- 3 - Selector fork for 1st gear and 2nd gear
- 4 - Relay shaft
- 5 - Detent mechanism
- 6 - Selector shaft

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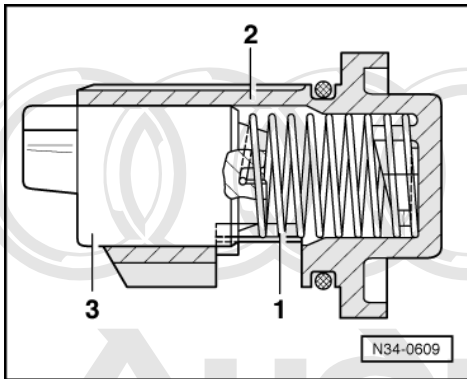
Removing and installing locking unit for 5th gear and reverse gear



- -> Remove heat shield -arrow 2- above right-hand drive shaft.
- Detach heat shield -arrow 1- above right-hand drive shaft and pivot downwards.



- -> Remove locking unit -arrow-.

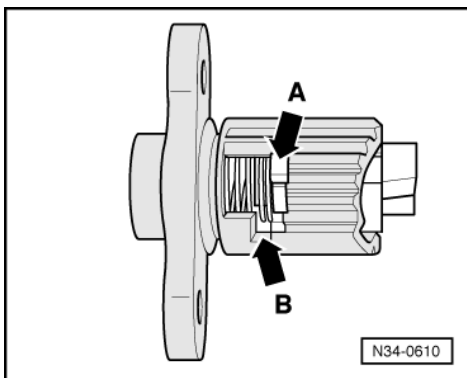


Assembling locking unit:

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> Insert spring 1 into housing 2 and, while exerting light pressure, turn spring to the left until it locates in the base of the housing.

- Insert bush 3 into the spring so that the bent end of the spring locates in the designated groove.
- Push bush against spring and turn approx. one turn to left, until the lug on the bush aligns with the groove in the housing.
- Press lug on bush onto stop in the groove in the housing.
- Turn bush to right and release.
 - The bush will jump into the correct position



-> Installation position of bush:

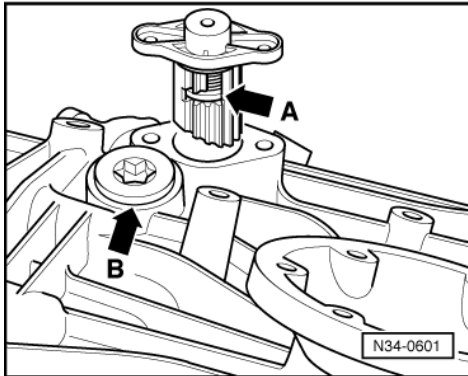
- The lug (arrow -A-) on the bush must always be opposite the groove in the housing (arrow -B-).

Checking installation position:

- Turn bush to left and release.



- The bush should spring back into position; the lug must be against the stop (direction indicated by arrow -A-).



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-> Installation position of complete locking unit in gearbox:

The recess (arrow -A-) faces bolt (arrow -B-).

35 - Gears, Shafts

1 - Dismantling and assembling input shaft

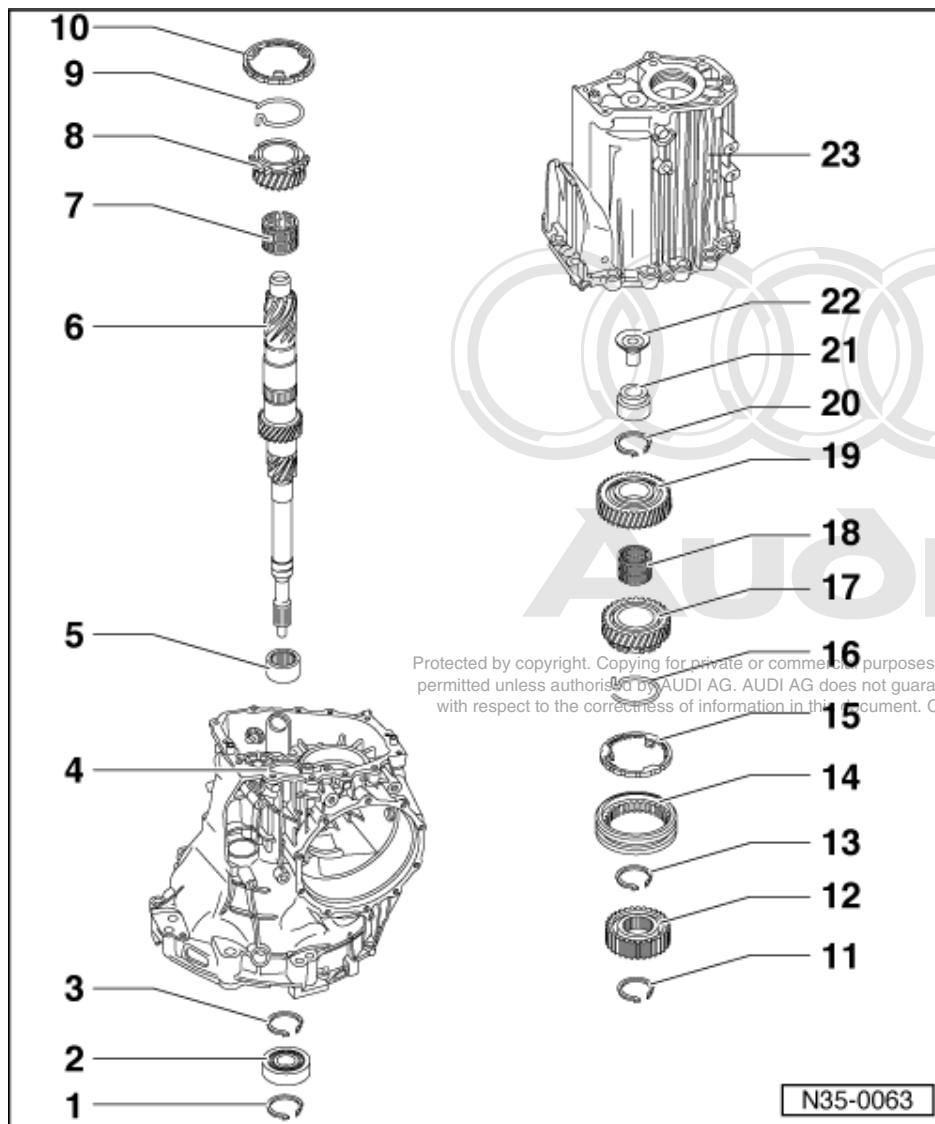
1.1 - Dismantling and assembling input shaft

Special tools, testers and auxiliary equipment required

- ◆ Drift VW 222 A
- ◆ Drift VW 295
- ◆ Adapter VW 295 A
- ◆ Thrust plates VW 401 and VW 402
- ◆ Press tools VW 407 and VW 408 A
- ◆ Tubes VW 415 A and 416 B
- ◆ Thrust pad VW 447 i
- ◆ Multi-purpose tool VW 771
- ◆ Drift 30-24
- ◆ Sleeve 30-100
- ◆ Thrust plate 40-105
- ◆ Press tool 40-202
- ◆ Separating tool Kukko 17/2
- ◆ Internal puller Kukko 21/4



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Notes:

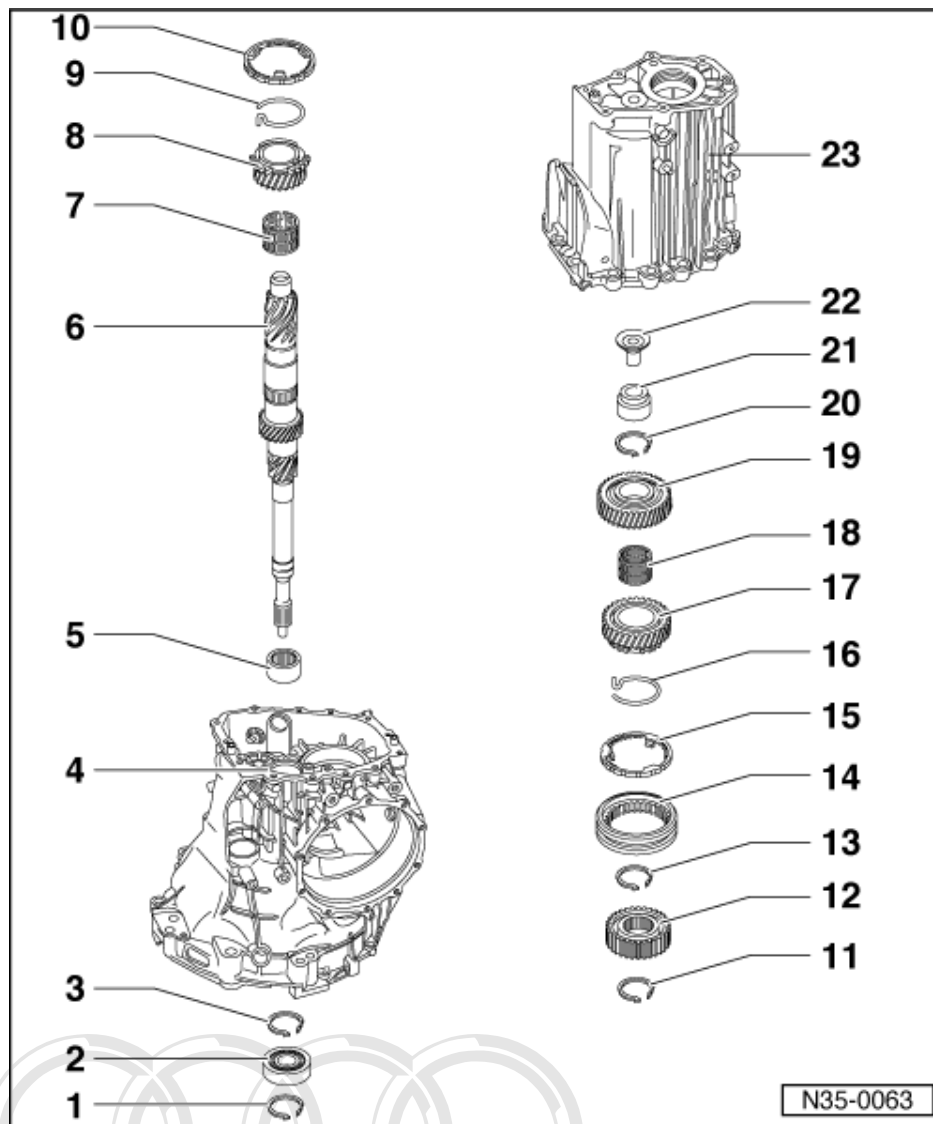
- ♦ When installing new gears or the input shaft consult technical data =>Page 2 .
- ♦ The position of the ball bearing will be affected if -Items 145 .

1 Circlip

- ♦ Mark
- ♦ Installation position => Fig. 14 - Item 1
- ♦ Determining thickness => Adjusting input shaft, Page 145

2 Ball bearing

- ♦ Removing and installing => Page 107



3 Circlip

- ◆ Mark
- ◆ Installation position => Fig. 14 - Item 2
- ◆ Determining thickness => Adjusting input shaft, Page 145

4 Gearbox housing

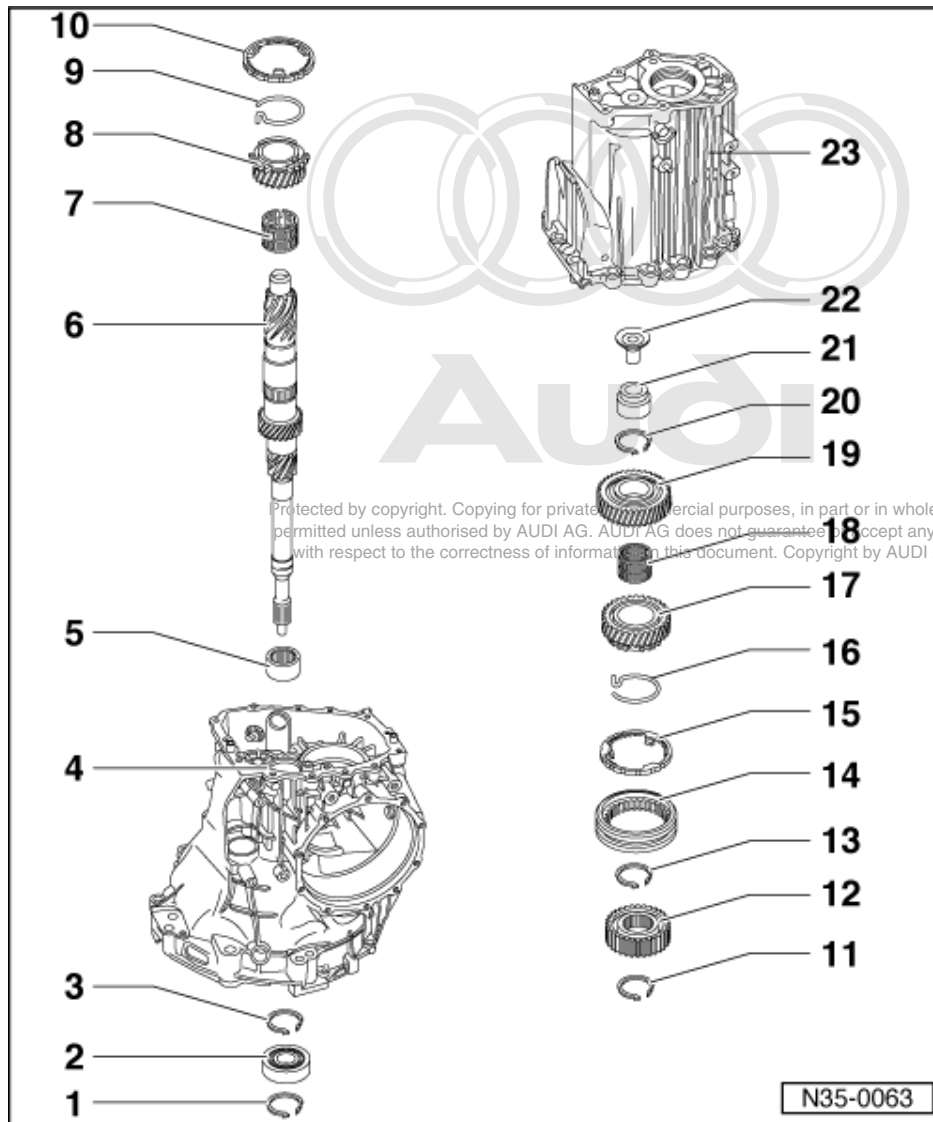
5 Needle bearing

- ◆ Secured with bolt => Fig. 1
- ◆ Tapping out => Fig. 2
- ◆ Selecting correct needle roller bearing for input shaft => Fig. 3
- ◆ Installation position => Fig. 4
- ◆ Pressing in => Fig. 5

6 Input shaft

- ◆ With oil feed sleeve
- ◆ Knocking in oil feed sleeve => Fig. 6
- ◆ Selecting correct needle roller bearing for input shaft => Fig. 3
- ◆ Adjusting => Page 145

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7 Needle roller bearing for 3rd gear

8 3rd speed sliding gear

9 Spring

- ◆ Insert in 3rd speed sliding gear => Fig. 12
- ◆ Allocation of spring to sliding gear

=> Parts List

10 Synchro-ring for 3rd gear

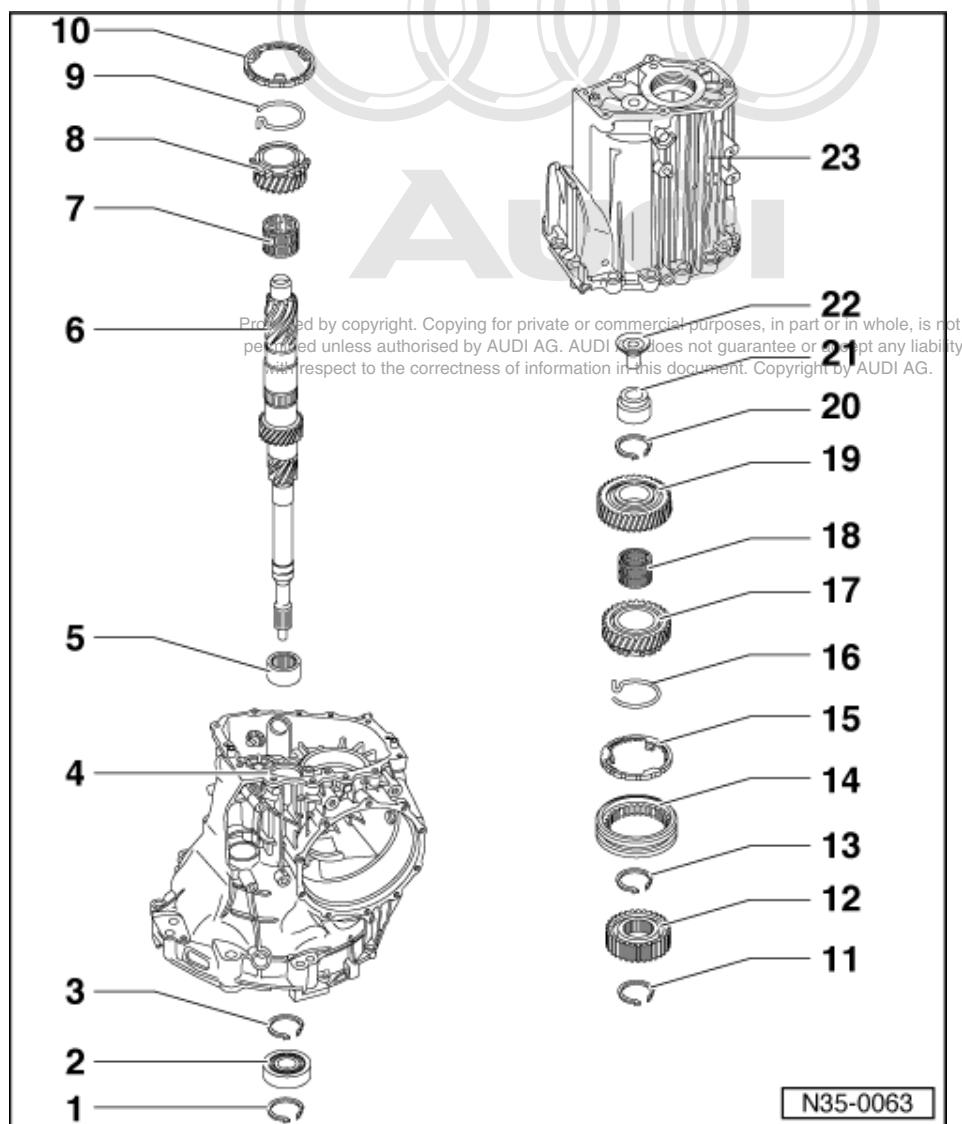
- ◆ Checking for wear => Fig. 13

11 Circlip

- ◆ Mark
- ◆ Installation position => Fig. 14 -Item 3-

12 Synchro-hub for 3rd and 4th gear

- ◆ High collar faces 3rd gear
- ◆ Pressing off => Fig. 11
- ◆ Pressing on => Fig. 16



13 Circlip

- ◆ Mark
- ◆ Installation position => Fig. 14 -Item 4-
- ◆ If the synchro-hub is replaced re-determine thickness =>Fig. 15

14 Locking collar for 3rd and 4th gear

- ◆ Installation position => Fig. 17

15 Synchro-ring for 4th gear

- ◆ Checking for wear => Fig. 13

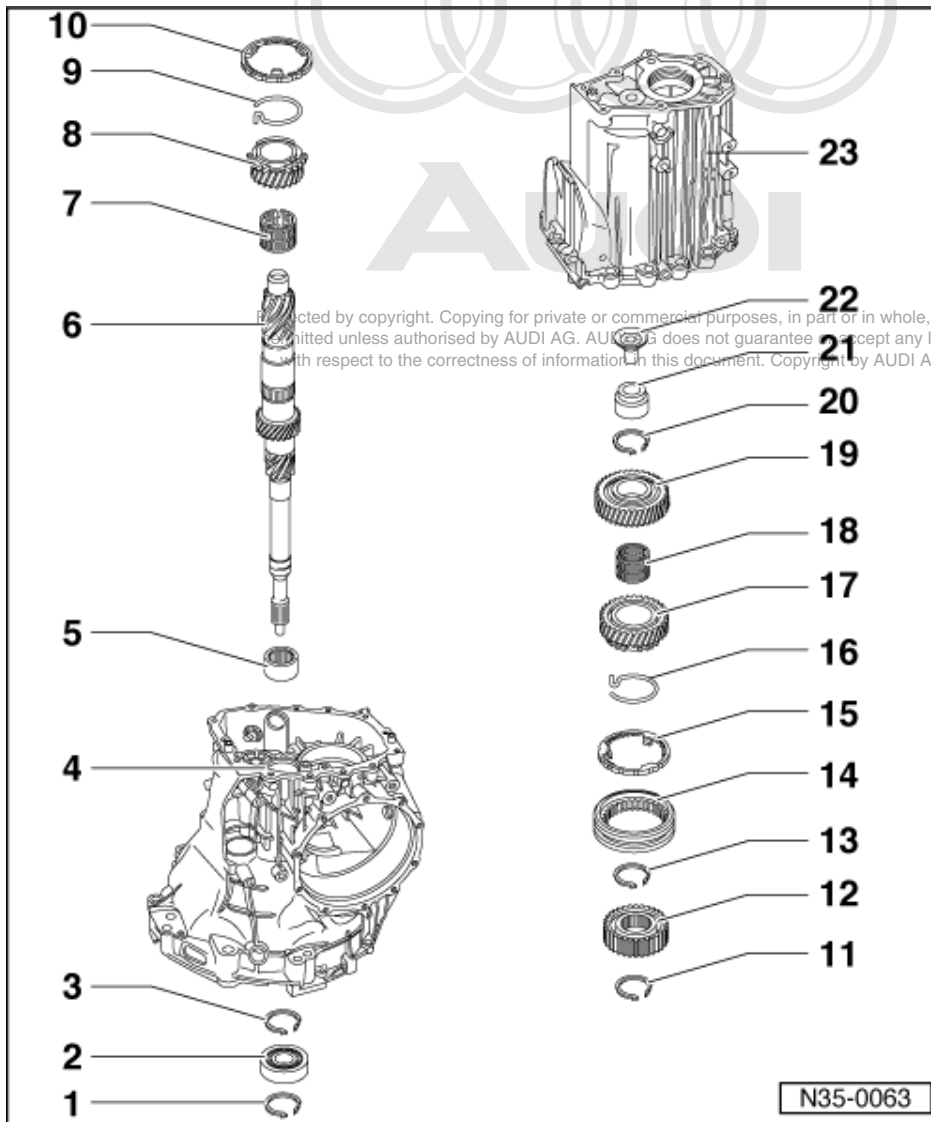
16 Spring

- ◆ Insert in 4th speed sliding gear => Fig. 12
- ◆ Allocation of spring to sliding gear

=> Parts List

17 4th speed sliding gear

18 Needle roller bearing for 4th gear



19 5th gear wheel

- ◆ Pressing off => Fig. 10
- ◆ Pressing on => Fig. 18

20 Circlip

- ◆ Mark
- ◆ Installation position => Fig. 14 -Item 5-
- ◆ If the 5th gear wheel is replaced re-determine thickness => Fig. 15

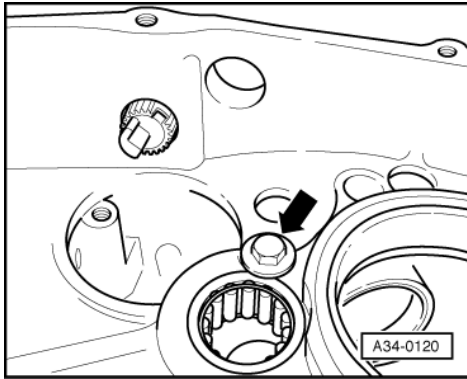
21 Roller sleeve

- ◆ Replace
- ◆ Will be damaged during removal
- ◆ Pulling out => Fig. 7
- ◆ Installation position => Fig. 8
- ◆ Tapping in => Fig. 9

22 Sleeve

- ◆ Made of plastic

23 Gearbox cover

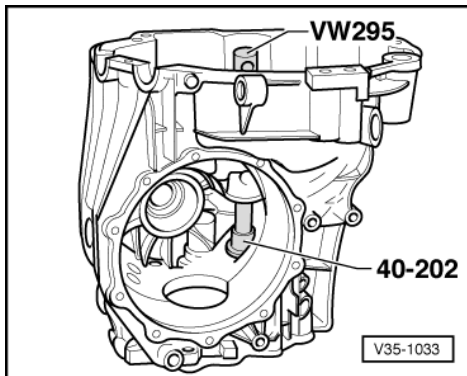


-> Fig.1 Securing bolts for needle rollers

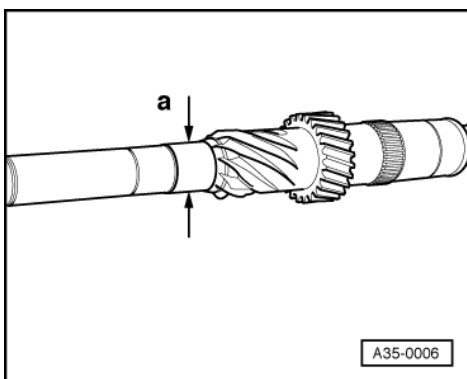
- Unscrew securing bolt -arrow-.

Note:

Bolt is not fitted on all versions.



-> Fig.2 Driving out needle roller bearing



-> Fig.3 Selecting correct needle roller bearing for input shaft

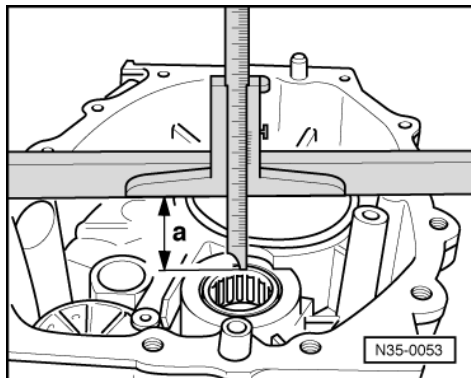
Input shaft dia.	Part no. Needle bearing
a = 27 mm	012 311 123 D
a = 29 mm	012 311 123

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Note:

To avoid damage resulting from incorrect installation, check the following after replacing the input shaft.

- ♦ It must be possible to guide input shaft into place.
- ♦ The input shaft must not have any free play.

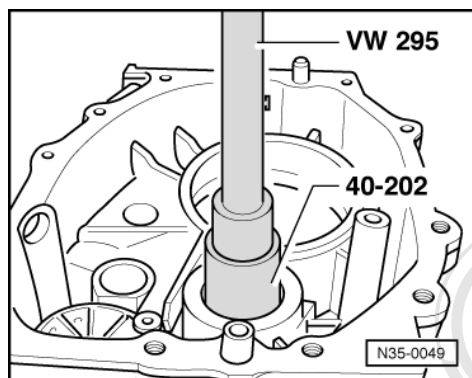


-> Fig.4 Installation position of needle roller bearing

Distance -a- from lower edge of straight-edge to upper edge of needle roller bearing = 39.5 mm

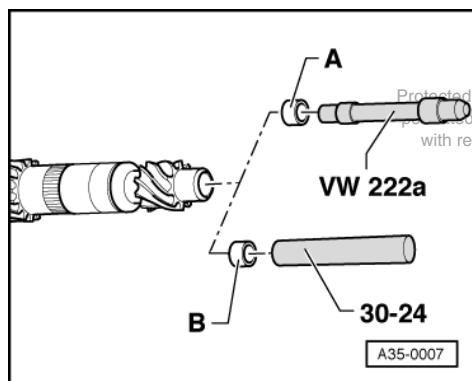
Note:

Measure distance from top edge of straight-edge and subtract the width of the straight-edge from the measured distance.



-> Fig.5 Pressing in needle roller bearing

- Screw in the securing bolts and torque to 25 Nm.



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-> Fig.6 Knocking oil feed sleeve into input shaft

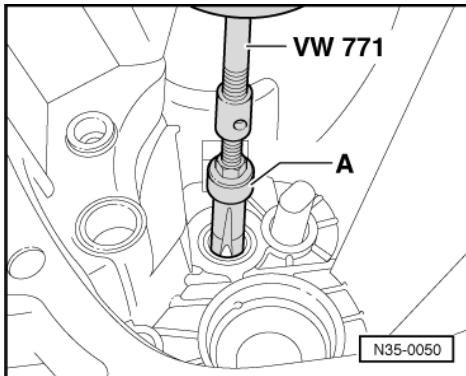
Item	Oil feed sleeve dia.	Fitting tool
A	14 mm	VW 222 A
B	16 mm	30-24

♦ Installation position:

Flanged edge on oil feed sleeve faces towards fitting tool

♦ Installation depth:

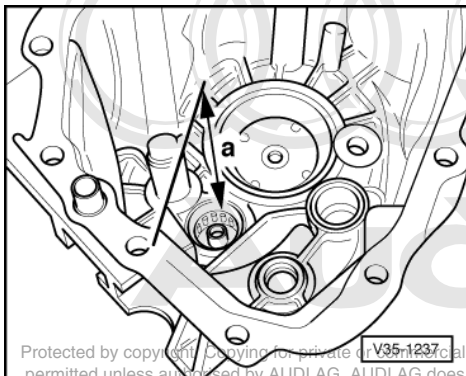
3.5 mm below top edge



-> Fig.7 Pulling out roller sleeve

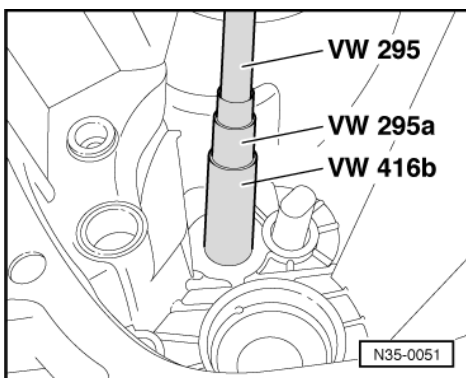
A - Internal puller 22 ... 28 mm, e.g. Kukko 21/4

- Before fitting internal puller destroy the plastic sleeve inside the roller sleeve.

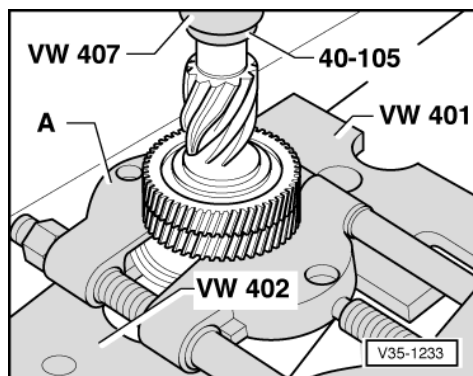


-> Fig.8 Installation position of roller sleeve

- ♦ Distance a = 216 mm



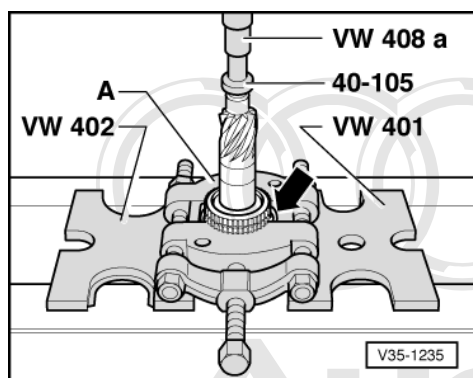
-> Fig.9 Driving in roller sleeve



-> Fig.10 Pressing off 5th gear wheel

- Remove circlip before pressing off.

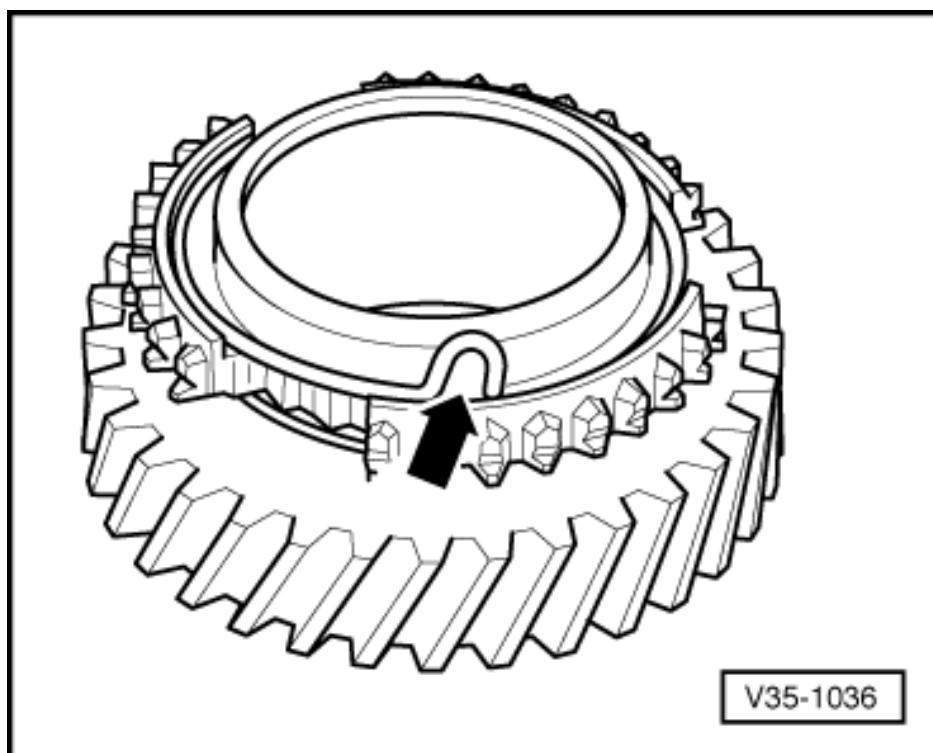
A - Separating device 22 ... 115 mm, e.g. Kukko 17/2



-> Fig.11 Pressing off synchro hub for 3rd and 4th gear

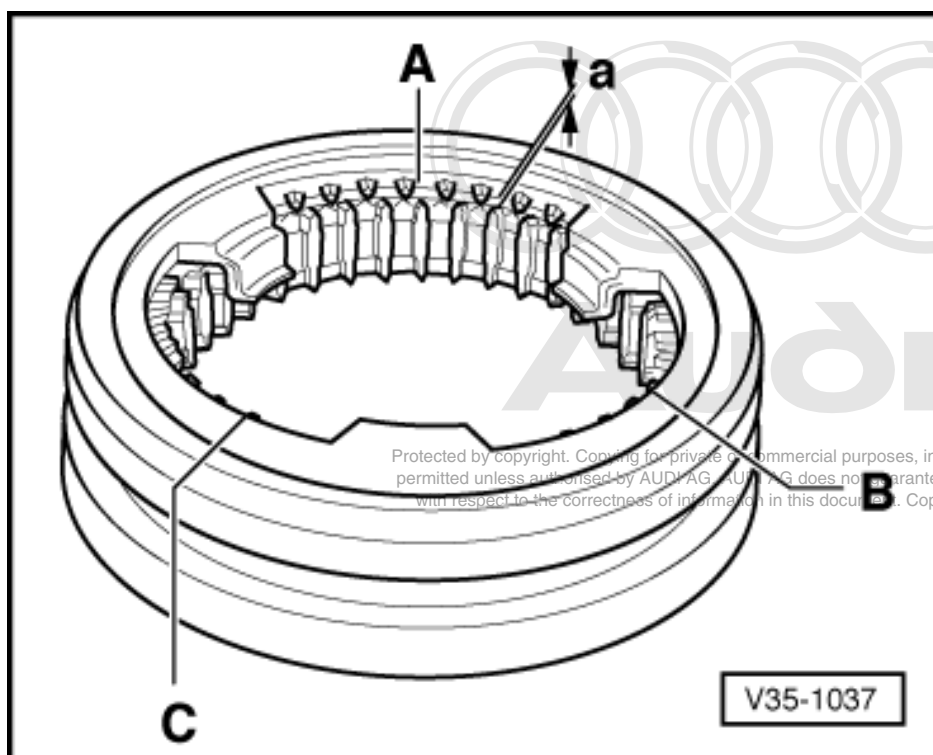
- Remove circlip before pressing off.
- Press 3rd gear synchro ring (arrow) towards 3rd gear wheel, then fit separating device -A-.

A - Separating device 22 ... 115 mm, e.g. Kukko 17/2



-> Fig.12 Inserting spring in sliding gear

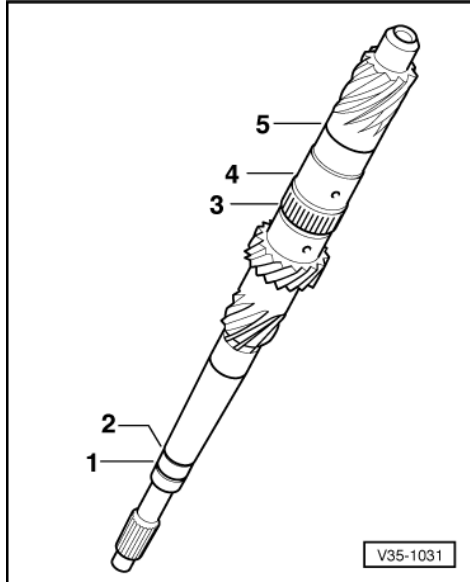
The bent end of the spring (arrow) must be hooked in the hole in the sliding gear.



-> Fig.13 Checking synchro-ring for wear

- Press synchro-ring into locking collar and measure gap -a- with a feeler gauge at positions -A-, -B- and -C-.
- Add the measured values and divide by 3.

The calculated value must not be less than 0.5 mm.



-> Fig.14 Installation position of circlips

- ◆ Circlips -1- and -2- secure the input shaft ball bearing.

Determining thickness => Adjusting input shaft, Page 145 .

- ◆ Circlip -3- secures the 3rd and 4th gear synchro hub.

Thickness: 2.00 mm. Identification: brown colour.

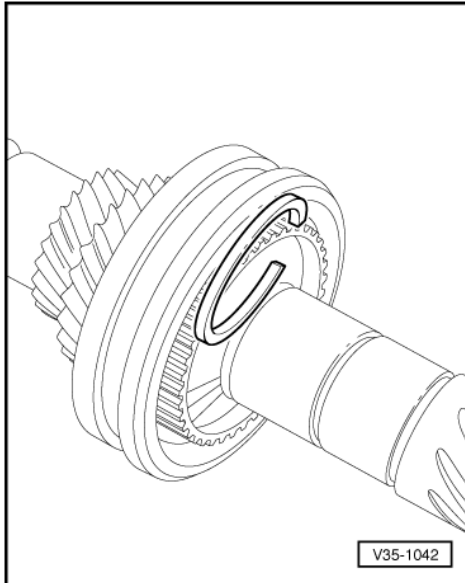
- ◆ Circlip -4- secures the 3rd and 4th gear synchro hub.

Determining thickness => table on Page 143 . Identification: blue colour.

- ◆ Circlip -5- secures the 5th gear wheel.

Determining thickness => table on Page 143 .

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-> Fig.15 Determining thickness of circlip

- Determine the thickest circlip that will just fit and install it.
- Determine circlip as accurately as possible from table. Part numbers

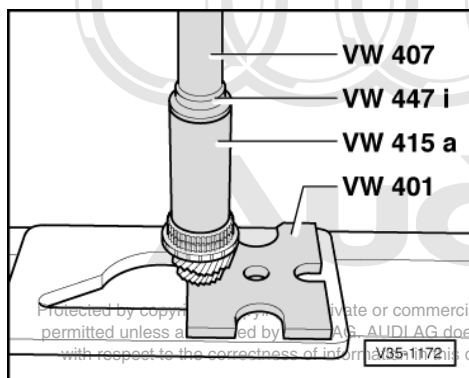
=> Parts List

Available circlips for 3rd and 4th gear synchro-hubs

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

Available circlips for 5th gear wheel

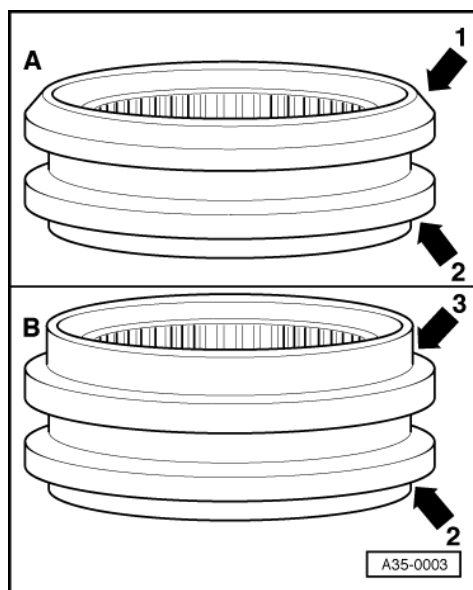
Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	



-> Fig.16 Pressing on synchro-hub for 3rd and 4th gear

- ◆ Installation position:

High inside collar faces 3rd gear



-> Fig.17 Installation position of locking collar

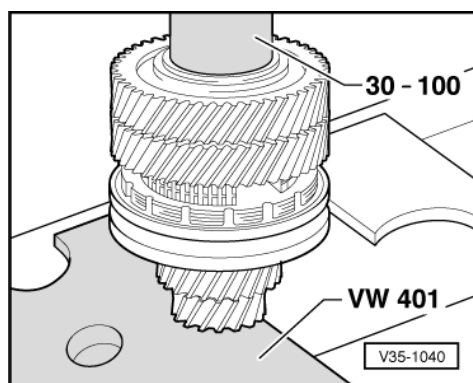
Only locking collars with chamfered edges -A- as well as with large shoulders -B- are fitted.

♦ Installation position:

Bevelled edges -arrow 1- faces 4th gear

Small shoulder -arrow 2- faces 3rd gear

Large shoulder -arrow 3- faces 4th gear



-> Fig.18 Pressing on 5th gear wheel

Important:
Wear protective gloves!

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- Heat 5th gear wheel to approx. 100 °C before pressing on.

♦ Installation position:

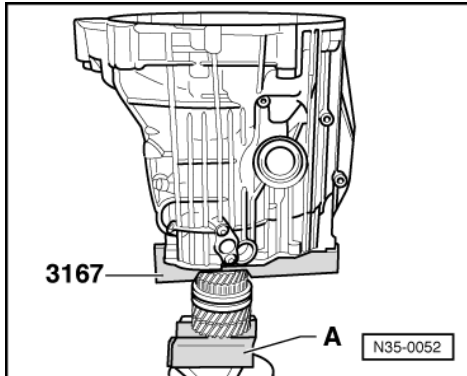
High collar faces reverse gear

2 - Adjusting input shaft

2.1 - Adjusting input shaft

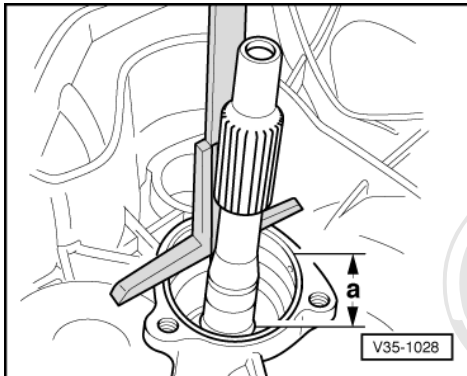
Note:

The input shaft must be readjusted if the gearbox housing, the input shaft or the ball bearing are renewed.



Special tools, testers and auxiliary equipment required

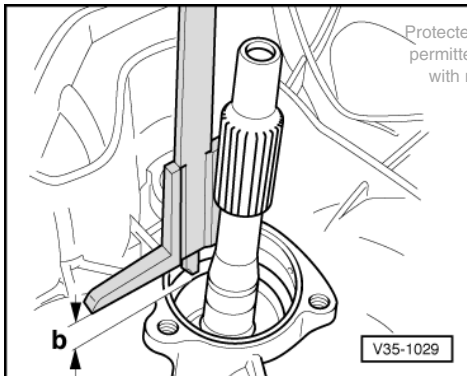
- ◆ Sleeve 30-100
- ◆ Distance gauge 3167
- ◆ Depth gauge
- -> Clamp input shaft in vice using soft jaws -A-.
- Place distance gauge 3167 onto 3rd speed sliding gear.



- Place gearbox housing over input shaft onto the distance gauge.

Calculating dimension "x"

- -> Place depth gauge onto gear housing and measure to the lower circlip groove in the input shaft.
- Measurement in following example: -a- = 28.50 mm



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- -> Place depth gauge onto gearbox housing and measure to seating surface for ball bearing.
- Measurement in following example: -b- = 26.80 mm

Determining circlip behind the input shaft ball bearing

Formula:

$$\text{"x"} = \text{"a"} - \text{"b"}$$

Example:

Distance "a"	28.50 mm
- Dimension "b"	26.80 mm
= Dimension "x"	1.70 mm
(thickness of circlip)	

- Determine circlip from table: Part numbers

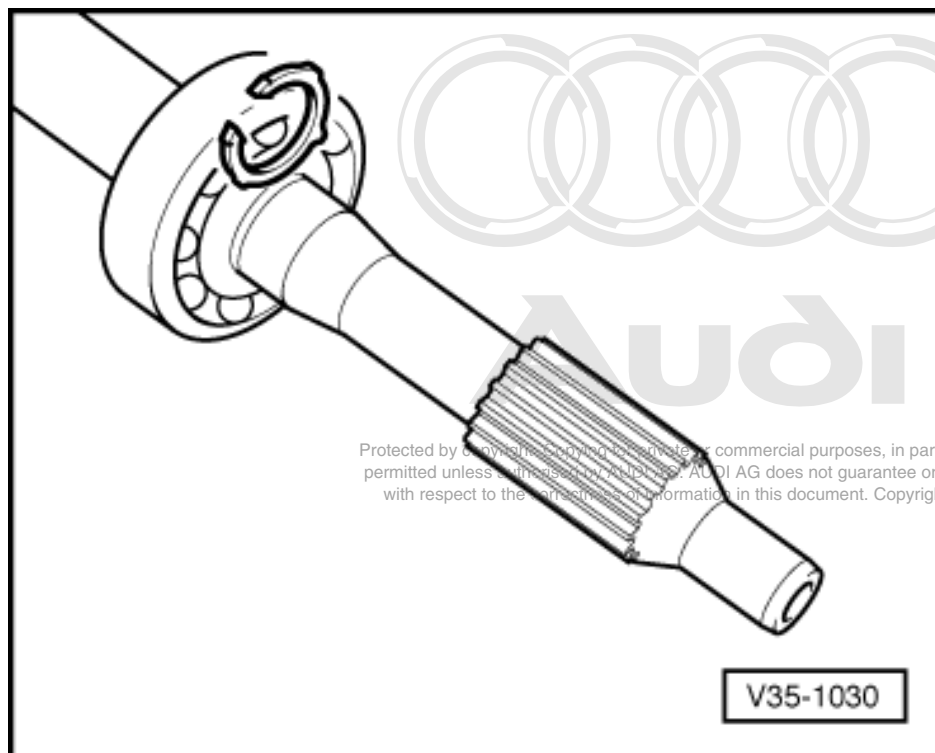
=> Parts List

Available circlips

Dimension "x"	Thickness (mm)
1.48 ... 1.56	1.54
1.57 ... 1.65	1.63
1.66 ... 1.74	1.72
1.75 ... 1.83	1.81
1.84 ... 1.92	1.90
1.93 ... 2.01	1.99
2.02 ... 2.10	2.08
2.11 ... 2.20	2.17

Determining the circlip in front of the input shaft ball bearing

- Knock rear circlip (as calculated) and ball bearing onto input shaft with fitting sleeve 30-100.



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V35-1030

- -> Determine the thickest circlip that will still just fit.
- Determine circlip as accurately as possible from table. Part numbers

=> Parts List

Available circlips

Circlip thickness (mm)		
1.45	1.72	1.99
1.54	1.81	2.08
1.63	1.90	2.17

3 - Dismantling and assembling drive pinion and hollow shaft

3.1 - Dismantling and assembling drive pinion and hollow shaft

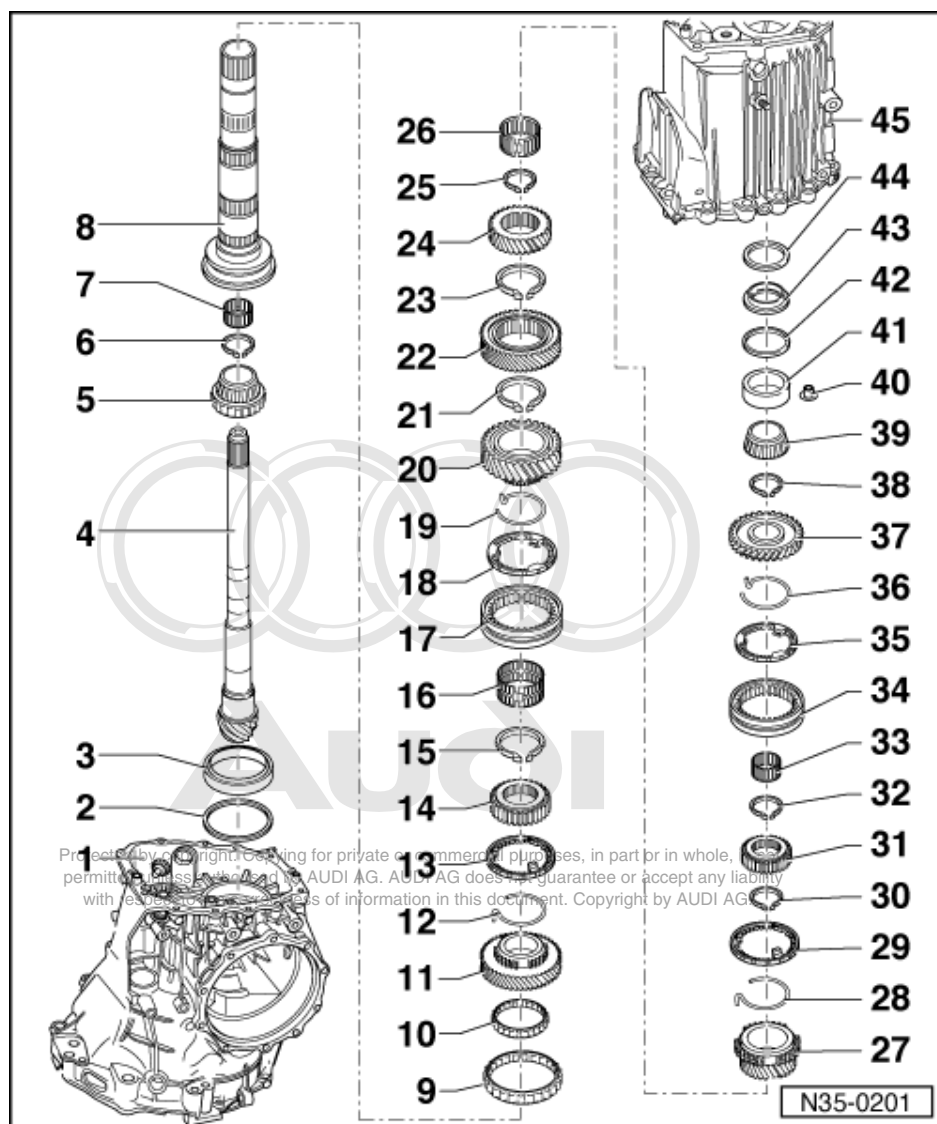
Special tools, testers and auxiliary equipment required

- ◆ Thrust plate VW 401
- ◆ Thrust plate VW 402
- ◆ Press tool VW 407
- ◆ Press tool VW 411
- ◆ Press tool VW 412
- ◆ Tube VW 415 A
- ◆ Tube VW 416 B
- ◆ Tube VW 418 A
- ◆ Thrust ring VW 429
- ◆ Thrust plate VW 447 i
- ◆ Thrust piece VW 454
- ◆ Tube VW 519
- ◆ Multi-purpose tool VW 771

- ◆ Support 40-103
- ◆ Tube 2010
- ◆ Thrust pad 3062
- ◆ Fitting tool 3128
- ◆ Separating tool Kukko 17/2
- ◆ Internal puller Kukko 21/1



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Notes:

- ♦ When installing new gears or the final drive set consult technical data =>Page 2 .
- ♦ Adjustments are required when replacing components marked 1) => adjustment overview, Page 198 .

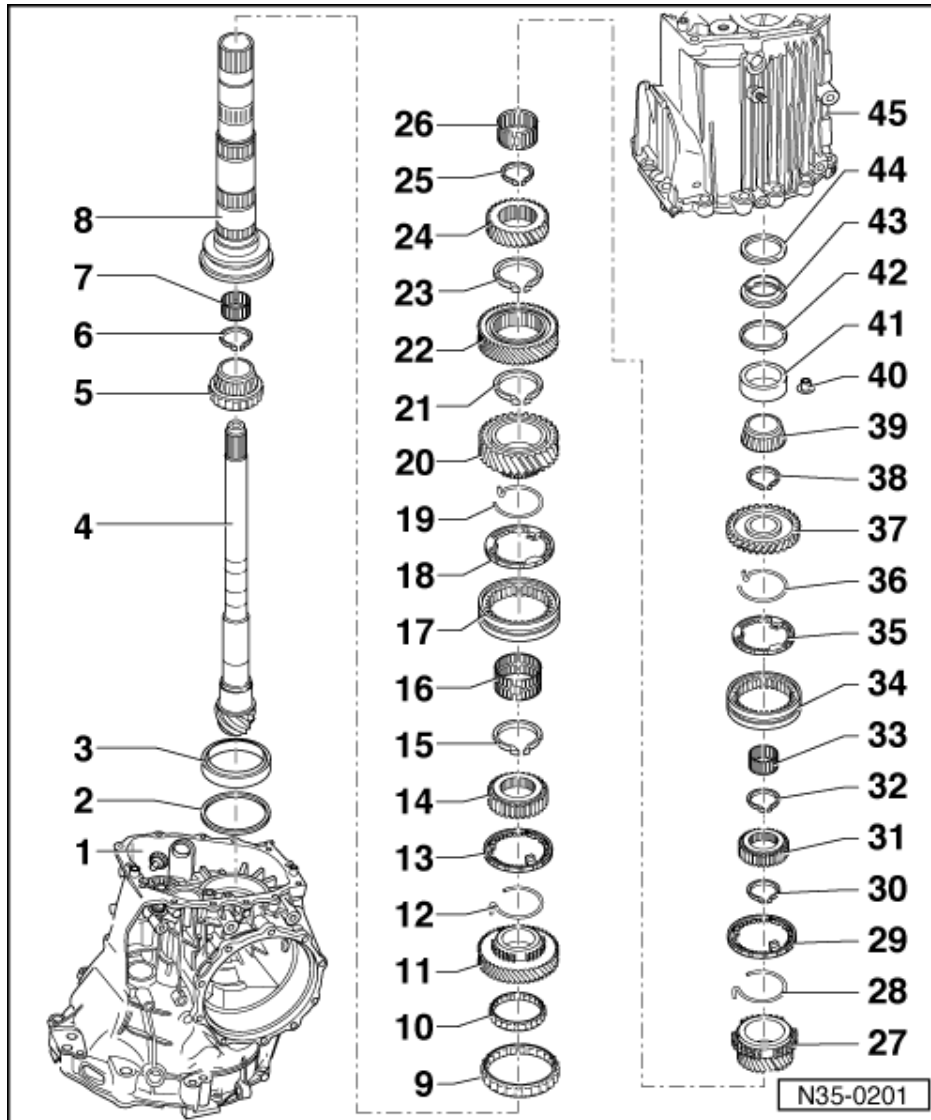
1 Gearbox housing

2 Shim "S3"

- ♦ Adjustment overview => Page 198

3 Outer race for double taper roller bearing 1)

- ♦ Replace together with -Item 5 -
- ♦ Pulling out =>Fig. 1
- ♦ Pressing in => Fig. 3



4 Pinion shaft 1)

- ♦ Is mated with crown wheel, renew together as a set
- ♦ Adjusting crown wheel and pinion shaft => Page 195

5 Inner race for double taper roller bearing 1)

- ♦ Replace
- ♦ Will be damaged during removal
- ♦ Pressing off => Fig. 2
- ♦ Pressing on => Fig. 4

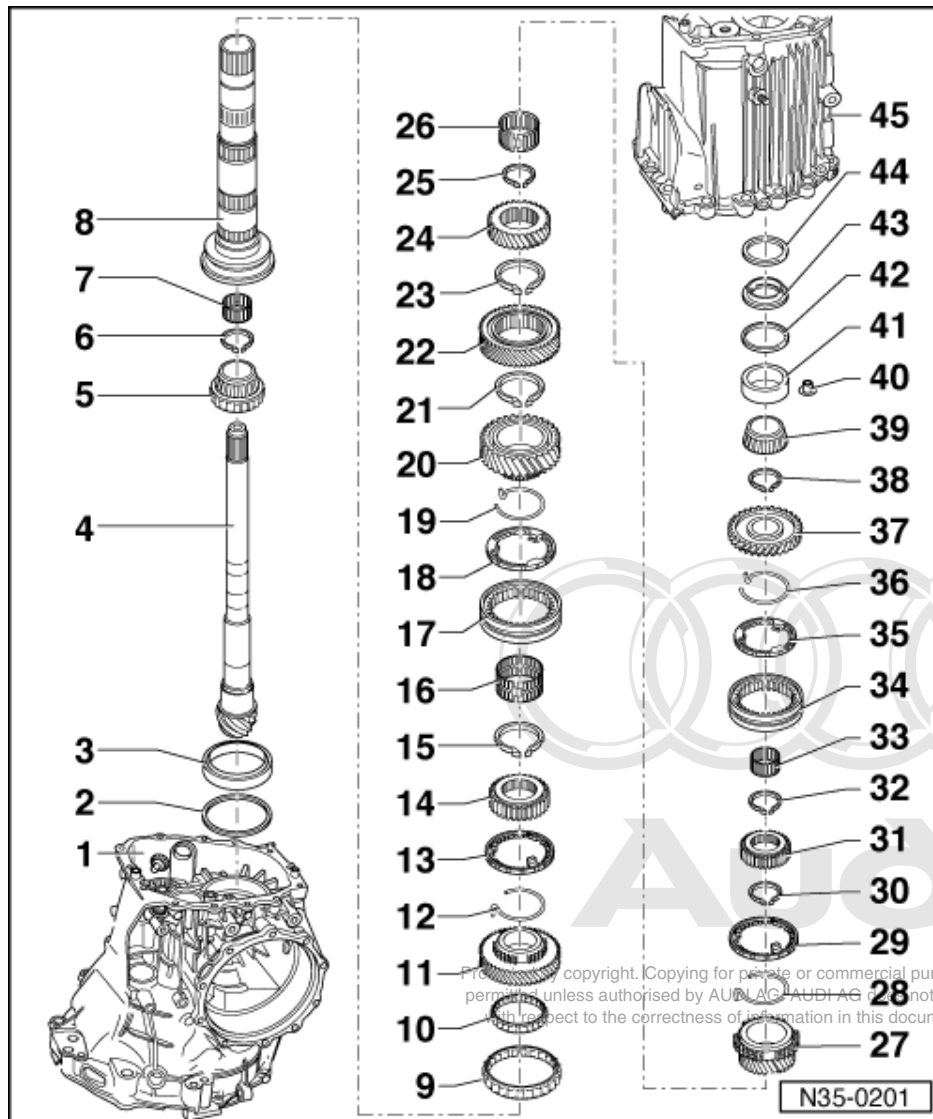
6 Circlip

- ♦ If the double taper roller bearing hub is replaced re-determine thickness => Fig. 5

7 Needle bearing

- ♦ For drive pinion in hollow shaft
- ♦ Lubricate with MoS2-grease

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**8 Hollow shaft1)**

- ♦ From 08.98 ä Reinforcements => from Page 167

9 Needle roller bearing for 1st gear**10 Needle roller bearing for 1st gear****11 1st speed sliding gear****12 Spring**

- ♦ Insert in 1st speed sliding gear => Fig. 16
- ♦ Allocation of spring to sliding gear

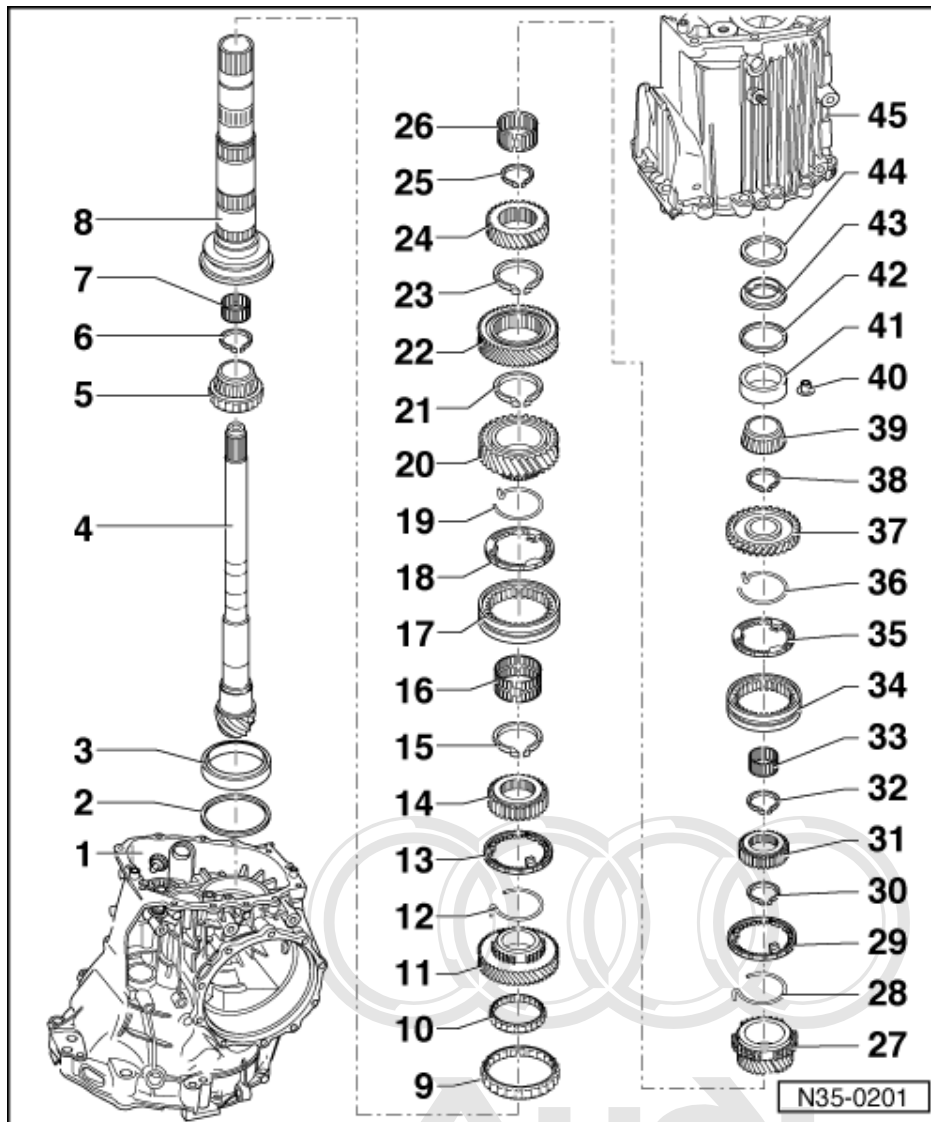
=> Parts List

13 Synchro-ring for 1st gear

- ♦ Checking for wear => Fig. 17

14 Synchro-hub for 1st and 2nd gear

- ♦ Pressing off => Fig. 14
- ♦ Pressing on => Fig. 18



15 Circlip

- ♦ Mark
- ♦ Installation position => Fig. 15 -Item 1-
- ♦ If the synchro-hub is replaced re-determine thickness => Fig. 15

16 Needle roller bearing for 2nd gear

17 Locking collar, 1st and 2nd gear

- ♦ Installation position => Fig. 19

18 Synchro-ring for 2nd gear

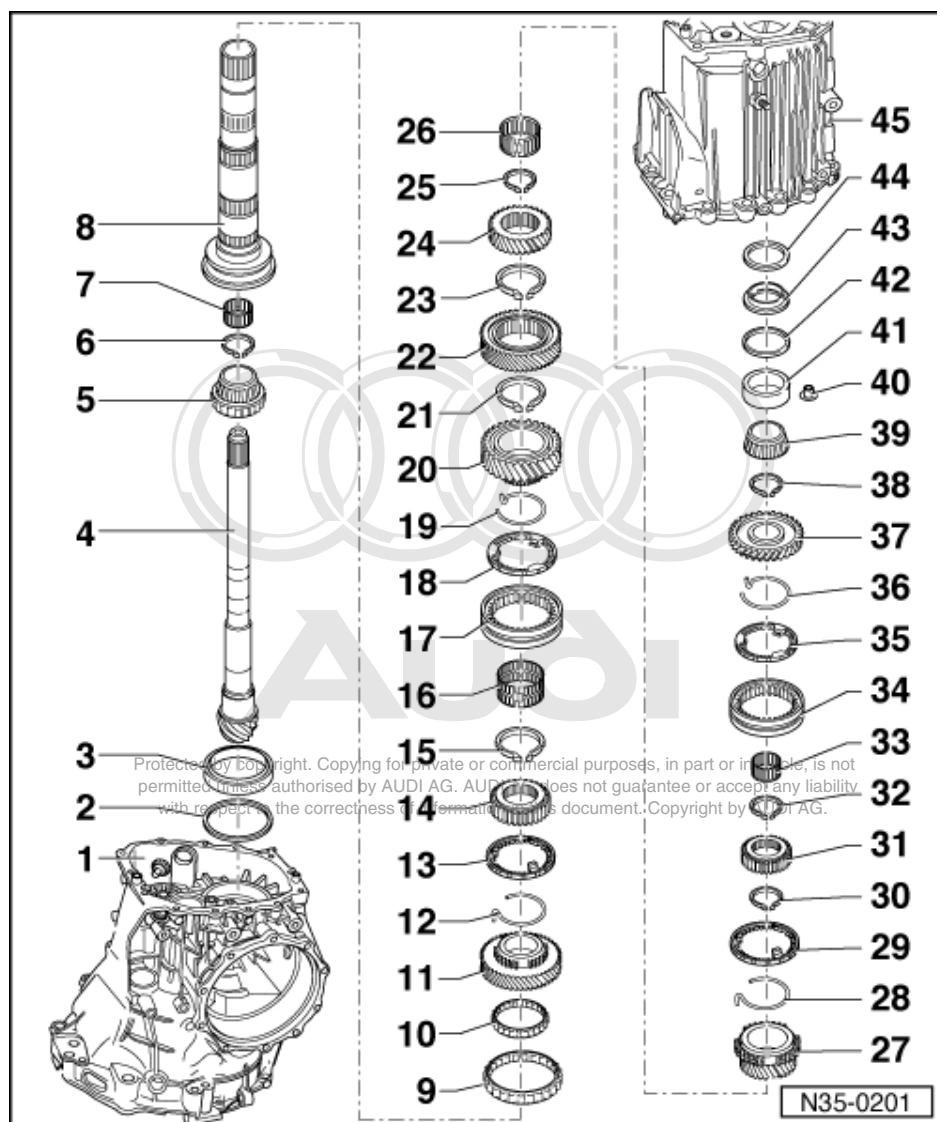
- ♦ Checking for wear => Fig. 17

19 Spring

- ♦ Insert in 2nd speed sliding gear => Fig. 16
- ♦ Allocation of spring to sliding gear

=> Parts List

20 2nd gear sliding gear



21 Circlip

- ♦ Mark
- ♦ Installation position => Fig. 15 - Item 2

22 3rd gear wheel

- ♦ Pressing off => Fig. 13
- ♦ Pressing on => Fig. 20

23 Circlip

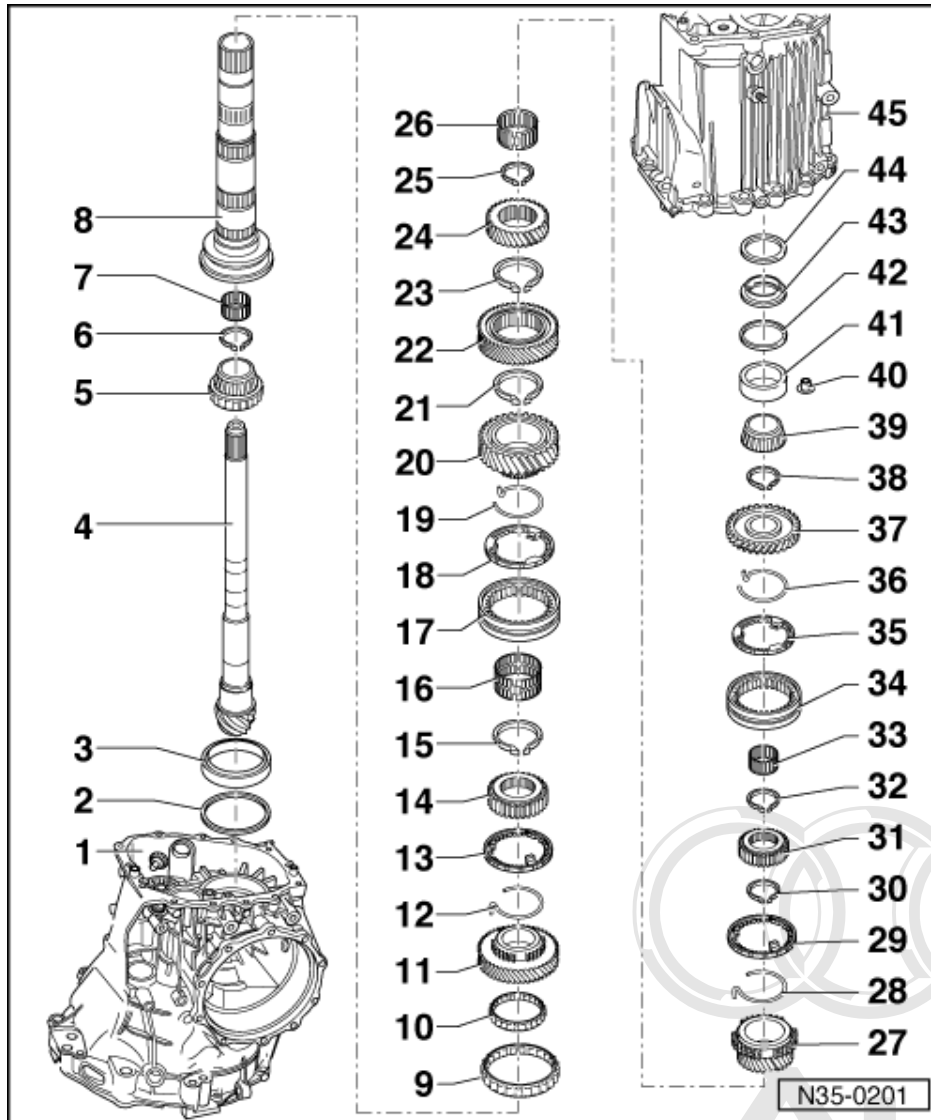
- ♦ Mark
- ♦ Installation position => Fig. 15 - Item 3
- ♦ If the 3rd gear wheel is replaced re-determine thickness => Fig. 5

24 4th gear wheel

- ♦ Pressing off => Fig. 12
- ♦ Pressing on => Fig. 21
- ♦ From 08.98 ä Reinforcements => from Page 167

25 Circlip

- ♦ Mark
- ♦ Installation position => Fig. 15 - Item 4-
- ♦ If the 4th gear wheel is replaced re-determine thickness => Fig. 5
- ♦ From 08.98 ä Reinforcements => from Page 167



26 Needle bearing

- ♦ From 08.98 ä Reinforcements => from Page 167

27 5th speed sliding gear

- ♦ From 08.98 ä Reinforcements => from Page 167

28 Spring

- ♦ Insert in 5th speed sliding gear => Fig. 16
- ♦ Allocation of spring to sliding gear

=> Parts List

29 Synchro-ring for 5th gear

- ♦ Checking for wear => Fig. 17

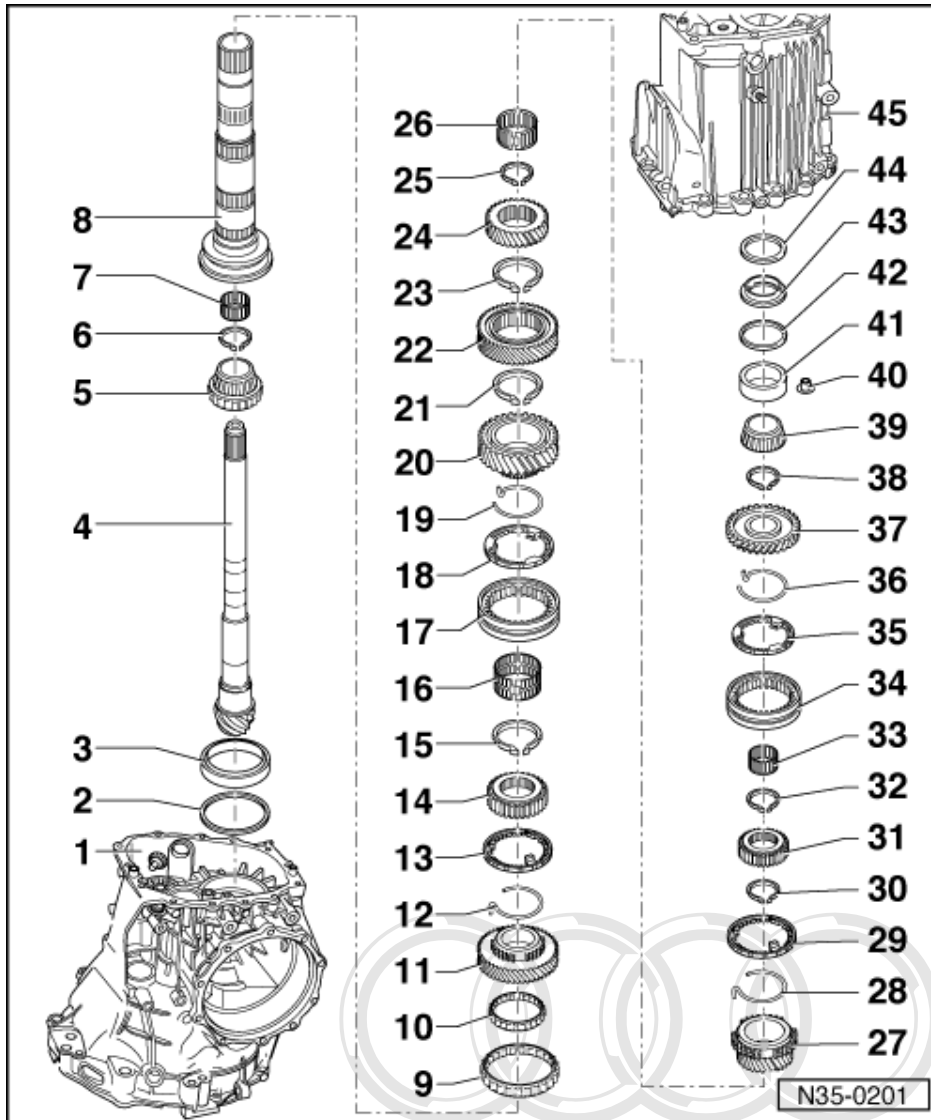
30 Circlip

- ♦ Mark
- ♦ Installation position => Fig. 15 - Item 5

31 5th gear and reverse gear synchro-hub

- ♦ Pressing off => Fig. 11
- ♦ Pressing on => Fig. 22

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32 Circlip

- ◆ Mark
- ◆ Installation position => Fig. 15 -Item 6-
- ◆ If the synchro-hub is replaced re-determine thickness =>Fig. 5

33 Needle bearing

- ◆ For reverse gear

34 Locking collar for 5th gear and reverse gear

- ◆ Installation position => Fig. 23

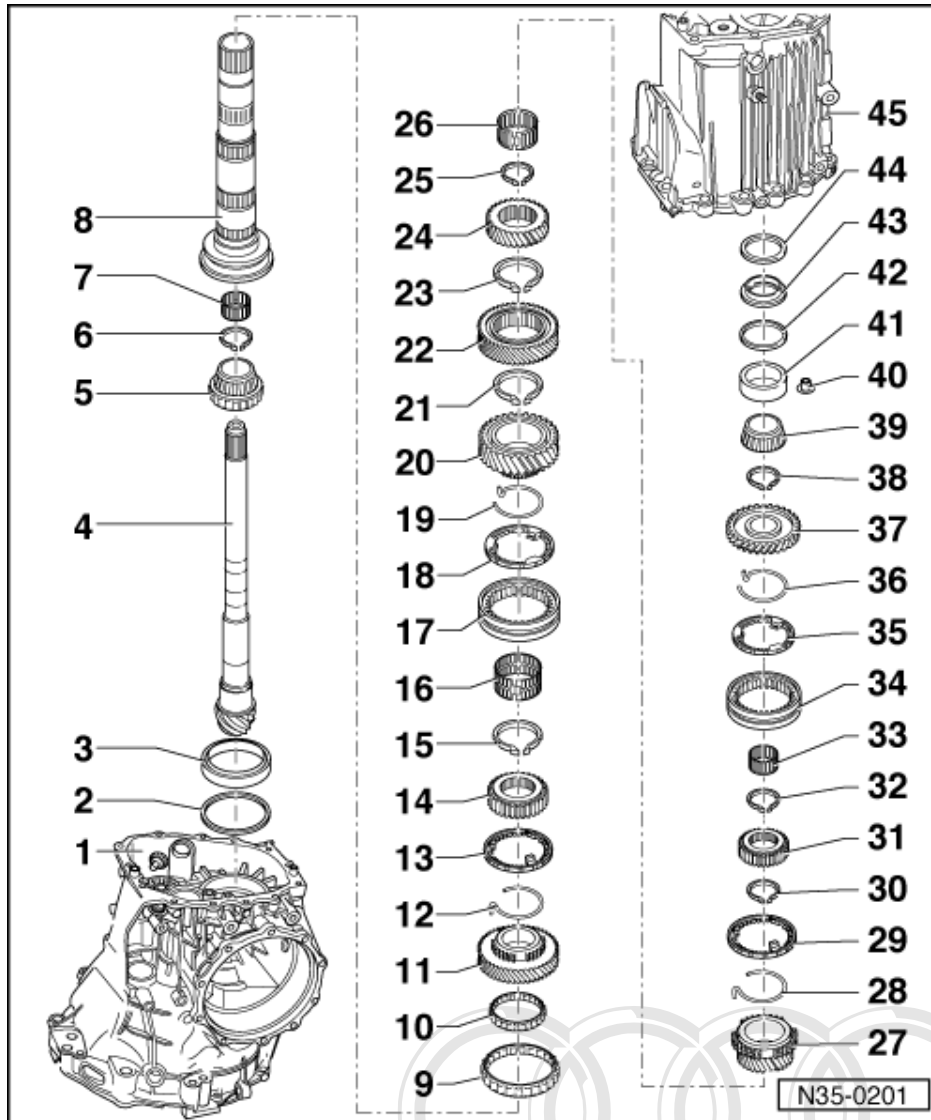
35 Reverse gear synchro-ring

- ◆ Checking for wear => Fig. 17

36 Spring

- ◆ Insert in reverse sliding gear => Fig. 16
- ◆ Allocation of spring to sliding gear

=> Parts List



37 Reverse sliding gear

38 Circlip

- ◆ Mark
- ◆ Installation position => Fig. 15 -Item 7-

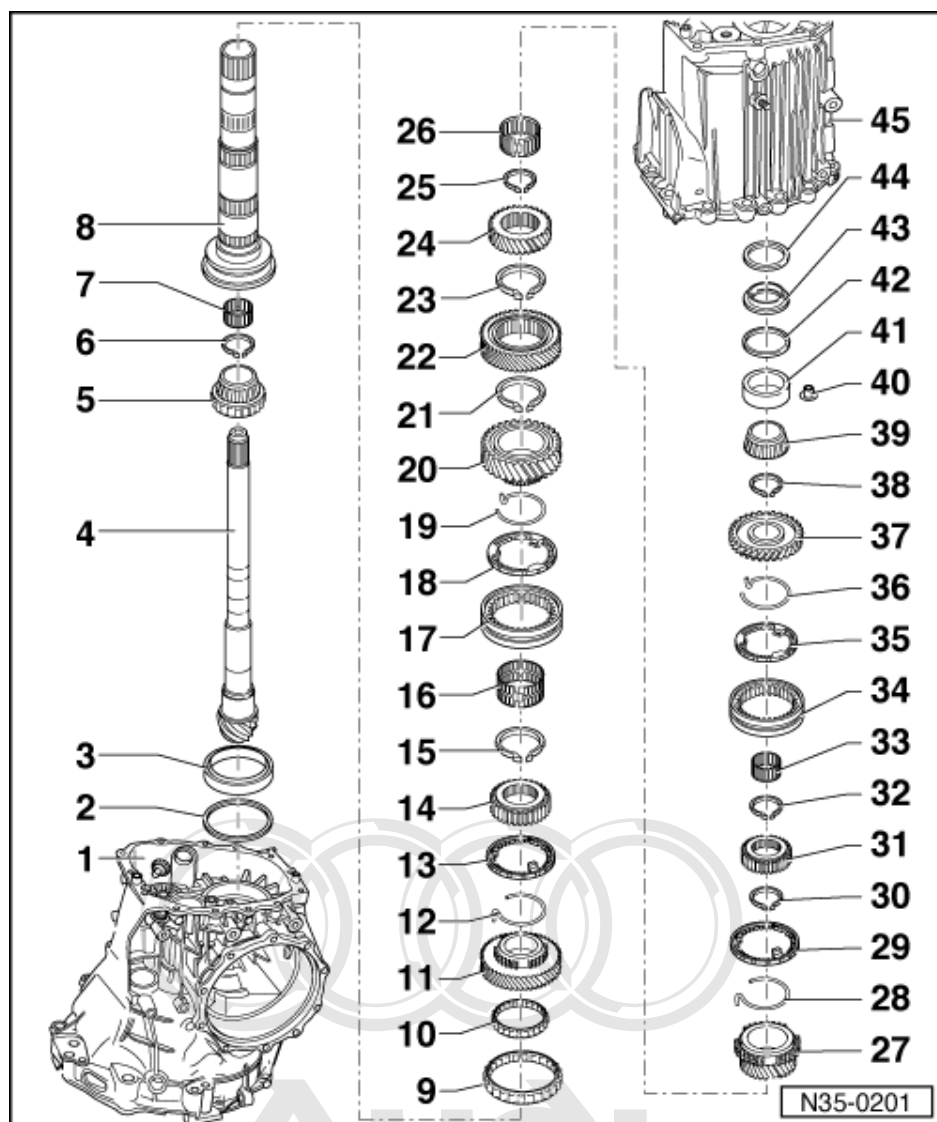
39 Inner race for small taper roller bearing 1)

- ◆ Pressing off => Fig. 9
- ◆ Pressing on => Fig. 10

40 Bushing

- ◆ To secure small taper roller bearing outer race
- ◆ Pulling out => Fig. 6
- ◆ Does not need to be fitted after the small taper roller bearing has been replaced

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41 Outer race for large taper roller bearing 1)

- ◆ Pressing out => Fig. 7
- ◆ Pressing in => Fig. 8

42 Shim "S4"

- ◆ Adjustment overview => Page 198

43 Ring

- ◆ Holds rubber washer
- ◆ Allocation

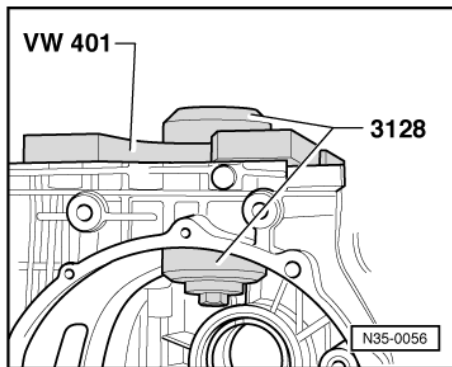
=> Parts List

44 Rubber washer

- ◆ Compensates variations in length
- ◆ Allocation

=> Parts List

45 Gearbox cover

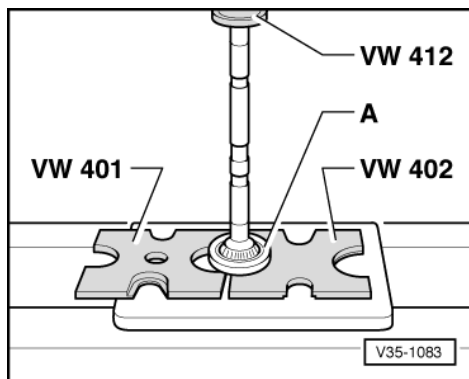


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-> Fig.1 Pulling out outer race for double taper roller bearing

- Remove differential => Page 181 .
- Place pressure piece of puller 3128 below the outer race.
- Fit threaded part of puller 3128 with pressure plate VW 401 onto gearbox housing.

When tightening the bolt the outer race will be pulled out of the housing.

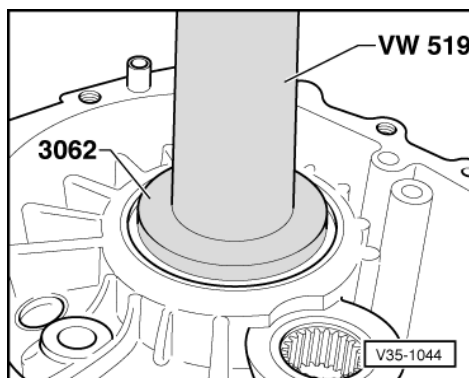


-> Fig.2 Pressing off inner race for double taper roller bearing

- Remove circlip before pressing off.
- The outer race -A- must be fitted to press off the inner race.

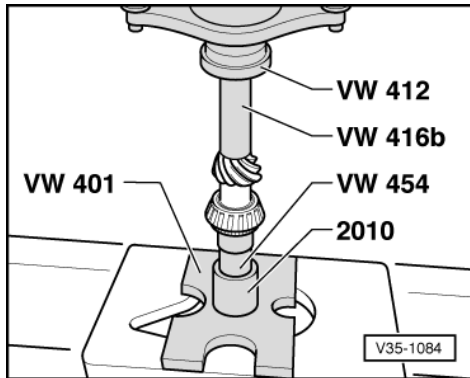
Note:

Inner race for double taper roller bearing will be destroyed when pressed off.

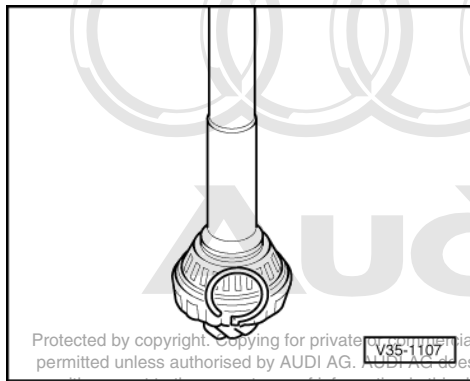


-> Fig.3 Pressing in outer race for double taper roller bearing

The smaller diameter of thrust pad VW 3062 faces outer race.



-> Fig.4 Pressing on inner race for double taper roller bearing



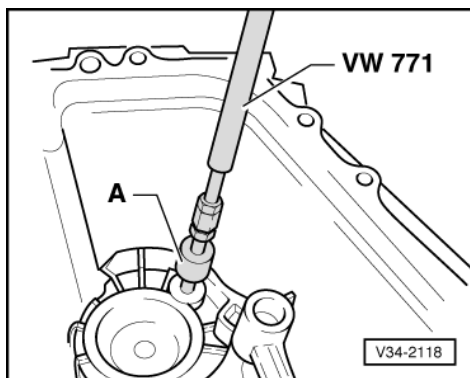
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-> Fig.5 Determining thickness of circlip

- Determine the thickest circlip that will just fit and install it.
- The circlips for synchro-hubs, needle bearings and individual gear wheels should also be determined as shown for double taper roller bearing.

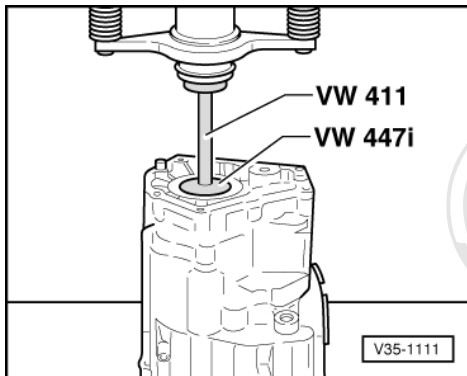
Available circlips and part numbers

=> Parts List



-> Fig.6 Pulling out securing bush for small taper roller bearing outer race

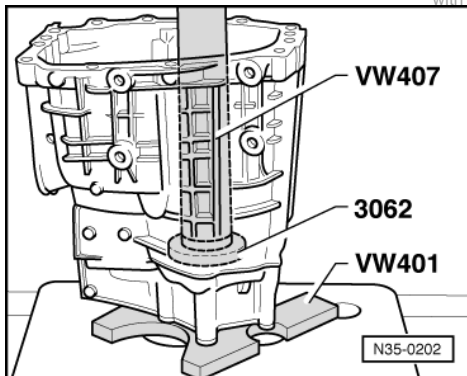
A - Internal puller 12 ... 14.5 mm, e.g. Kukko 21/1



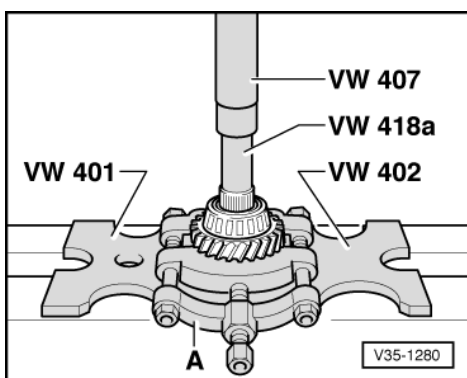
-> Fig.7 Pressing out outer race for taper roller bearing

- Outer race is pressed out together with ring -Item 156 .

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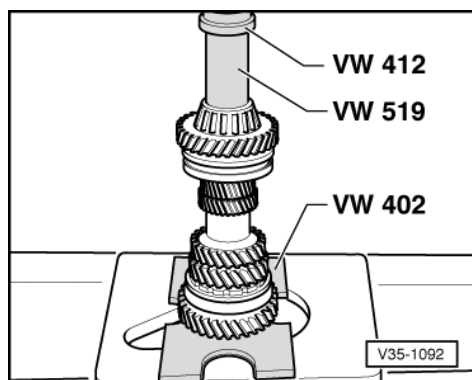
-> Fig.8 Pressing in outer race for taper roller bearing



-> Fig.9 Pressing off inner race for taper roller bearing

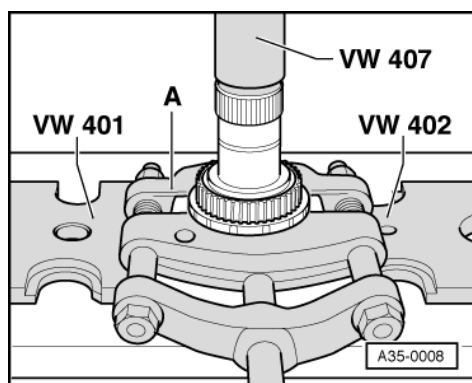
- Press off inner race with reverse gear sliding gear.

A - Separating device 22 ... 115 mm, e.g. Kukko 17/2



-> Fig.10 Pressing on inner race for taper roller bearing

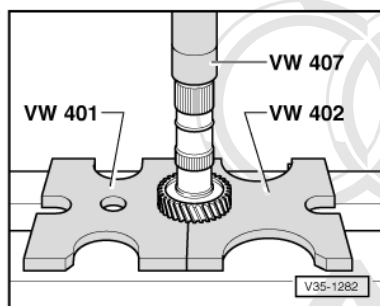
- Fit circlip before pressing on inner race.



-> Fig.11 Pressing off 5th gear and reverse gear synchro hub

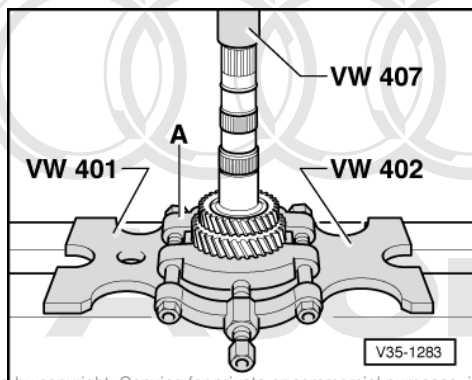
- Remove circlip before pressing off.
- Press off synchro hub with 5th speed sliding gear.

A - Separating device 22 ... 115 mm, e.g. Kukko 17/2



-> Fig.12 Pressing off 4th gear wheel

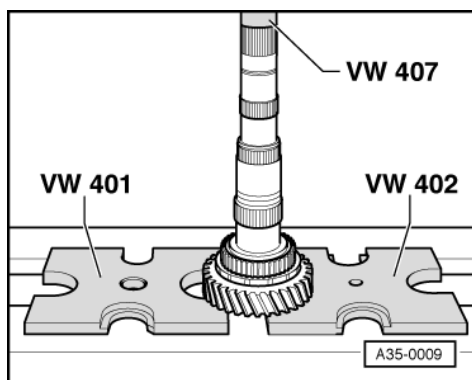
- Remove circlip before pressing off.



-> Fig.13 Pressing off 3rd gear wheel

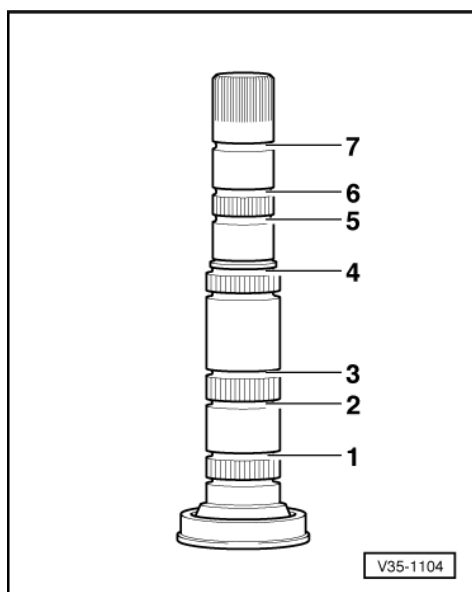
- Remove circlip before pressing off.
- Press 3rd gear wheel off with 2nd speed sliding gear.

A - Separating device 22 ... 115 mm, e.g. Kukko 17/2



-> Fig.14 Pressing off synchro hub for 1st and 2nd gear

- Remove circlip before pressing off.
- Press off synchro hub with 1st speed sliding gear.



-> Fig.15 Installation position of circlips

- The circlips for the synchro-hubs, needle roller bearings and individual gear wheels should also be determined as shown in Fig. 5 .

- ♦ Circlip -1- secures the 1st and 2nd gear synchro hub.

Identification: blue colour.

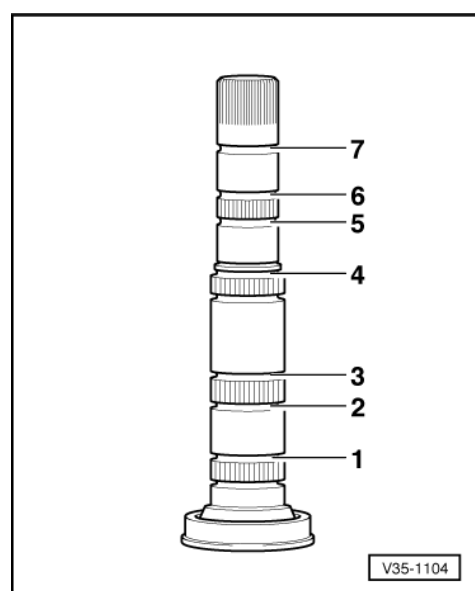
Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	

- ♦ Circlip -2- secures the needle roller bearing for 2nd speed sliding gear.

Thickness: 2.50 mm. Identification: blue colour.

- ♦ Circlip -3- secures the 3rd gear wheel.

Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	



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- ♦ -> Circlip -4- secures the 4th gear wheel.

Circlip thickness (mm)		
1.86	1.94	
1.90	1.98	

- ♦ Circlip -5- secures the needle roller bearing for 5th speed sliding gear.

Thickness: 2.00 mm. Identification: brown colour.

- ♦ Circlip -6- secures the synchro-hub for 5th gear and reverse gear.

Identification: blue colour.

Circlip thickness (mm)		
1.90	1.96	2.02

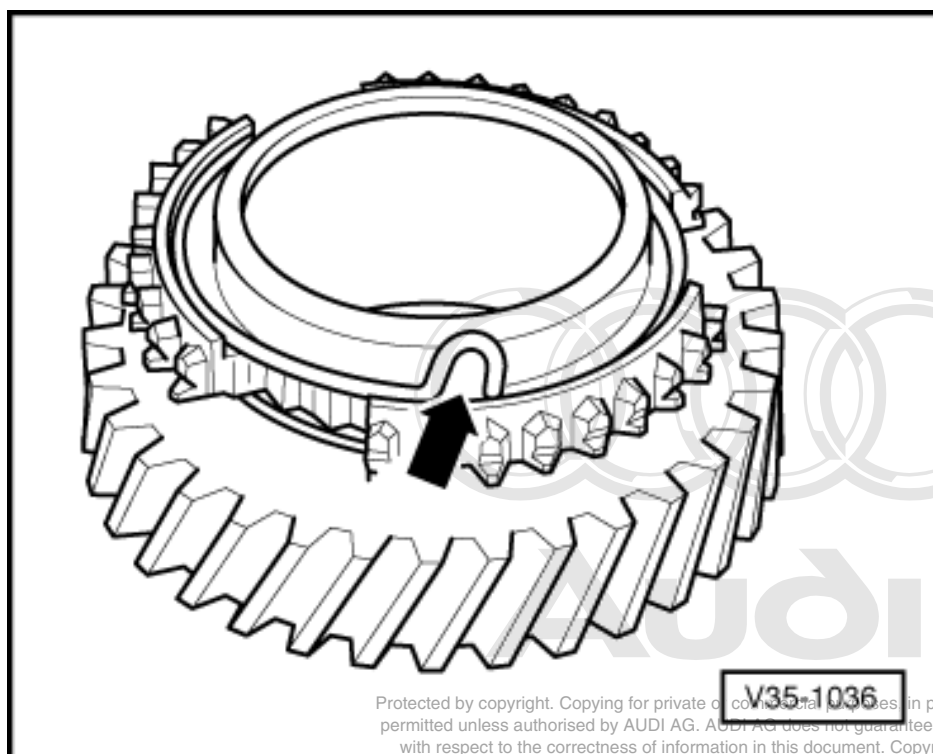
Circlip thickness (mm)		
1.93	1.99	2.05

- ♦ Circlip -7- secures the needle roller bearing for sliding gear for reverse gear.

Thickness: 2.50 mm.

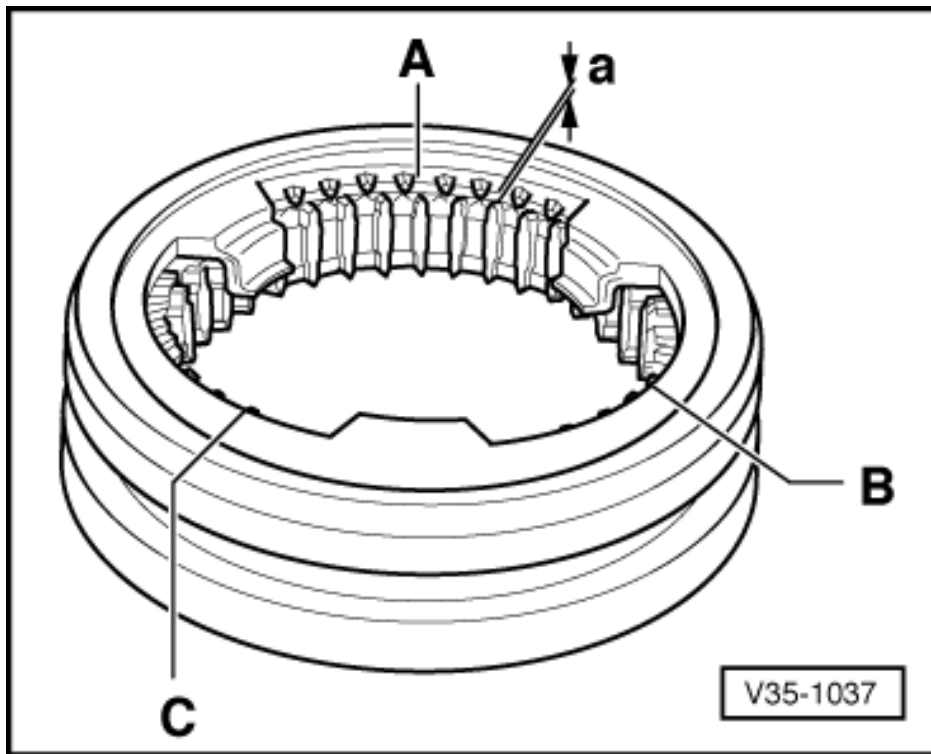
- Determine circlips according to table: Part numbers

=> Parts List



-> Fig.16 Inserting spring in sliding gear

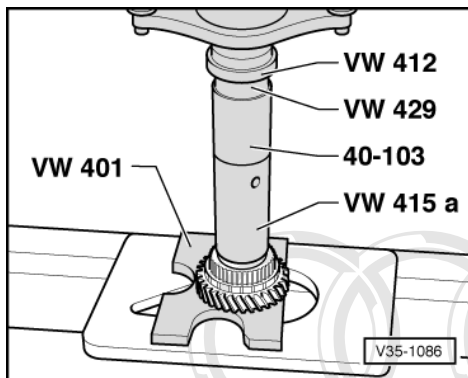
The bent end of the spring (arrow) must be hooked in the hole in the sliding gear.



-> Fig.17 Checking synchro-ring for wear

- Press synchro-ring into locking collar and measure gap -a- with a feeler gauge at positions -A-, -B- and -C-.
- Add the measured values and divide by 3.

The calculated value must not be less than 0.5 mm.

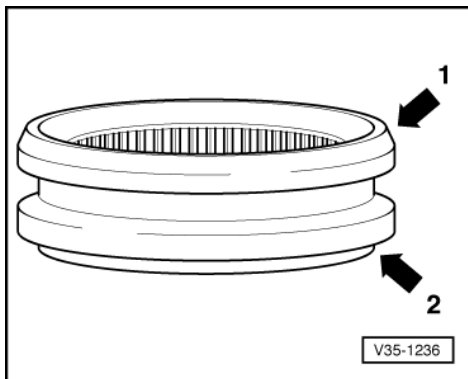


-> Fig.18 Pressing on synchro-hub for 1st and 2nd gear

- ♦ Installation position:

High inside collar faces 2nd gear

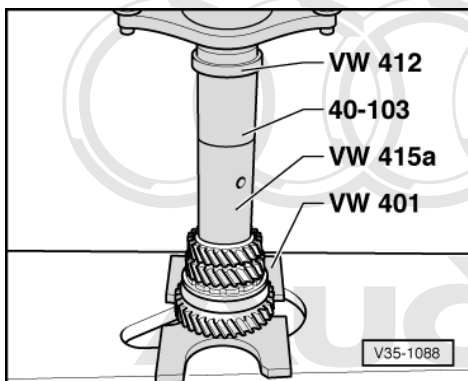
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-> Fig.19 Installation position of locking collar for 1st and 2nd gear

- ◆ Installation position:

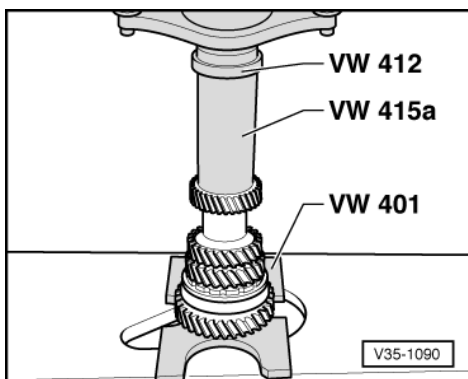
Bevelled edges -arrow 1- faces 2nd gear
Shoulder -arrow 2- faces 1st gear



-> Fig.20 Pressing on 3rd gear wheel

- ◆ Installation position:

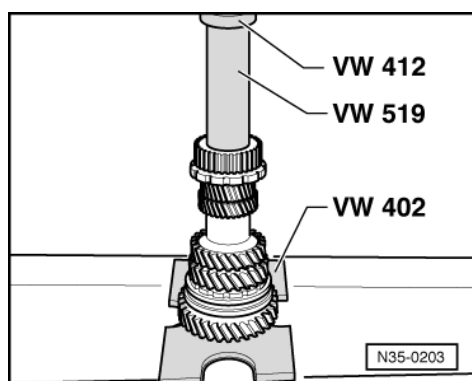
Groove on gear wheel faces 4th gear



-> Fig.21 Pressing on 4th gear wheel

- ◆ Installation position:

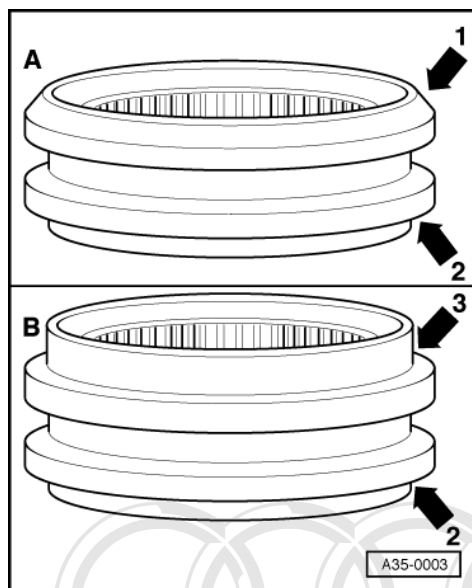
High inside collar faces 3rd gear



-> Fig.22 Pressing on 5th gear and reverse gear synchro hub

- ♦ Installation position:

High inside collar faces 5th gear



-> Fig.23 Installation position of locking collar for 5th and reverse gear

Only locking collars with chamfered edges -A- as well as with large shoulders -B- are fitted.

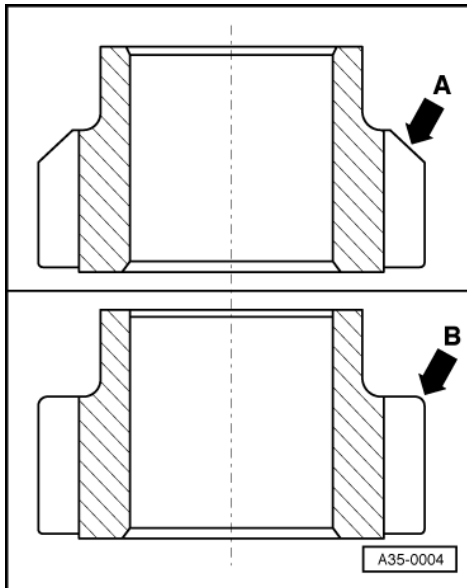
- ♦ Make sure locking collar is correct version for reverse gear wheel => Fig. 24
- ♦ Installation position:

Bevelled edges -arrow 1- faces reverse gear

Small shoulder -arrow 2- faces 5th gear

Large shoulder -arrow 3- faces reverse gear

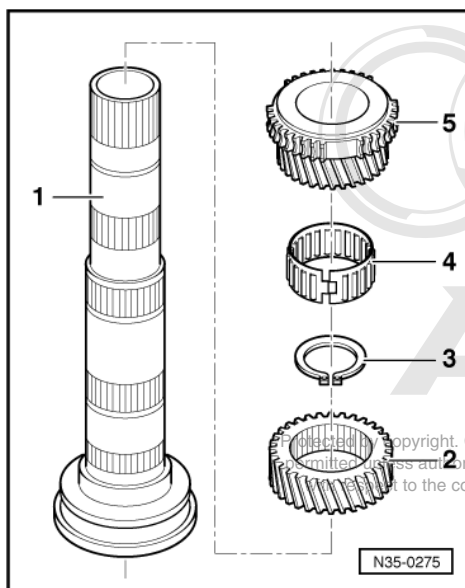
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-> Fig.24 Selecting correct locking collar for reverse gear wheel

A Reverse gear wheel with chamfered edge	Both types of locking collar can be fitted (with chamfered edge or large shoulder).
B Reverse gear wheel without chamfered edge.	Install only locking collar with large shoulder, do not use locking collar with chamfered edge.

3.2 - Reinforcements from 08.98 > (as of gearbox build date 17 08 8) in the area of the 4th gear wheel



-> The following components are affected by this modification:

1 - Hollow shaft

- Distinguishing features => Fig. 1

2 - 4th gear wheel

- Distinguishing features => Fig. 2

3 - Circlip

- Distinguishing features => Fig. 2

4 - Needle roller bearing

- Distinguishing features => Fig. 3

5 - 5th speed sliding gear

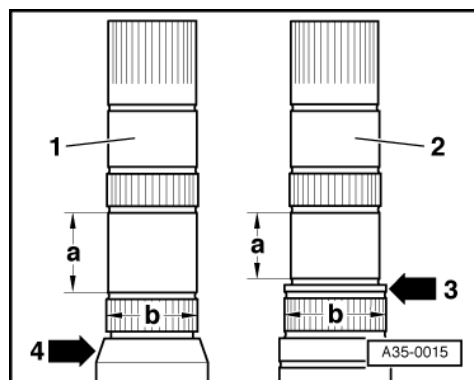
- Distinguishing features => Fig. 3

Notes:

- ♦ Never mix up components from gearboxes with reinforced 4th gear with components from gearboxes without reinforced 4th gear. Part allocation:

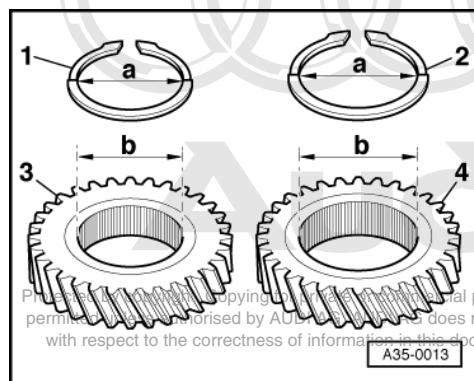
=> Parts List

- ♦ Dismantling and assembly of the new parts is carried out as described in the Workshop Manual.



-> Fig.1 Hollow shaft identification

	Hollow shaft 1 new version 08.98 ä	Hollow shaft 2 old version ä 08.98
	For reinforced 4th gear wheel	For non-reinforced 4th gear wheel
Dimension a	approx. 27.5 mm	approx. 23.8 mm
Dimension b	approx. 40.0 mm	approx. 43.5 mm
	with chamfered edges under the in- put shaft splines -Arrow 4-	with tongue over the input shaft splines -Arrow 3-

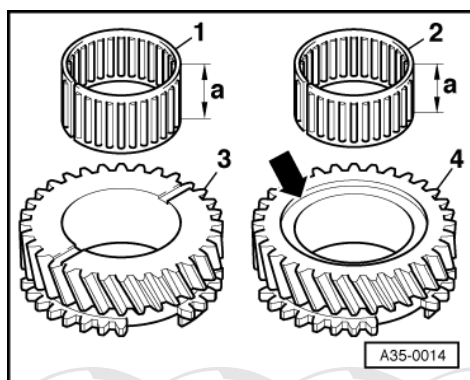


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-> Fig.2 Distinguishing features of circlips and gear wheels

Circlip	-1- New version 08.98 ä	-2- Old version ä 08.98
Dimension a	approx. 34.5 mm	approx. 38.0 mm

4th gear wheel	-3- New version 08.98 ä	-4- Old version ä 08.98
Dimension b	approx. 40.0 mm	43.5 mm



-> Fig.3 Distinguishing features of needle roller bearings and 5th speed sliding gears

Needle bearing	-1- New version 08.98 ä	-2- Old version ä 08.98
Dimension a	approx. 26,8 mm	approx. 24,8 mm

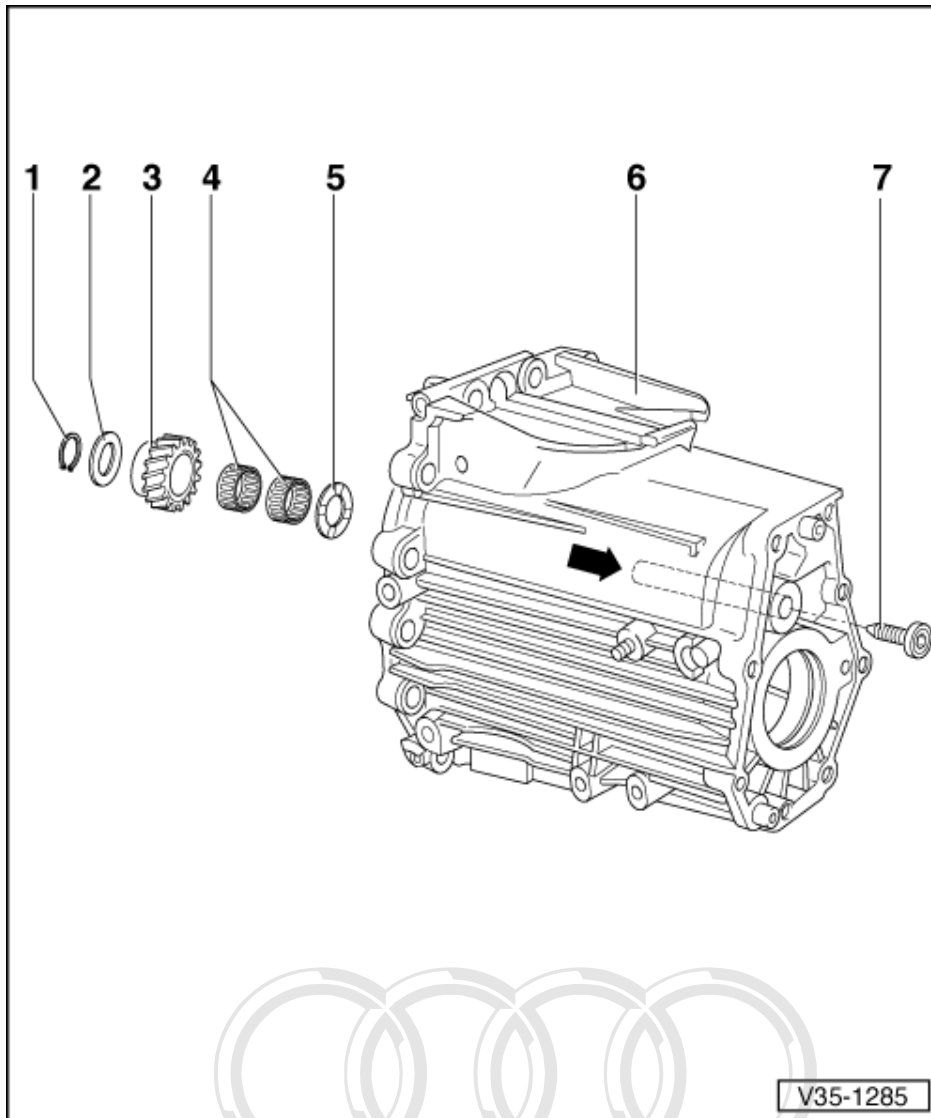
Sliding gear for 5th speed	-1- New version 08.98 ä	-2- Old version ä 08.98
	Without shoulder	with shoulder -arrow-

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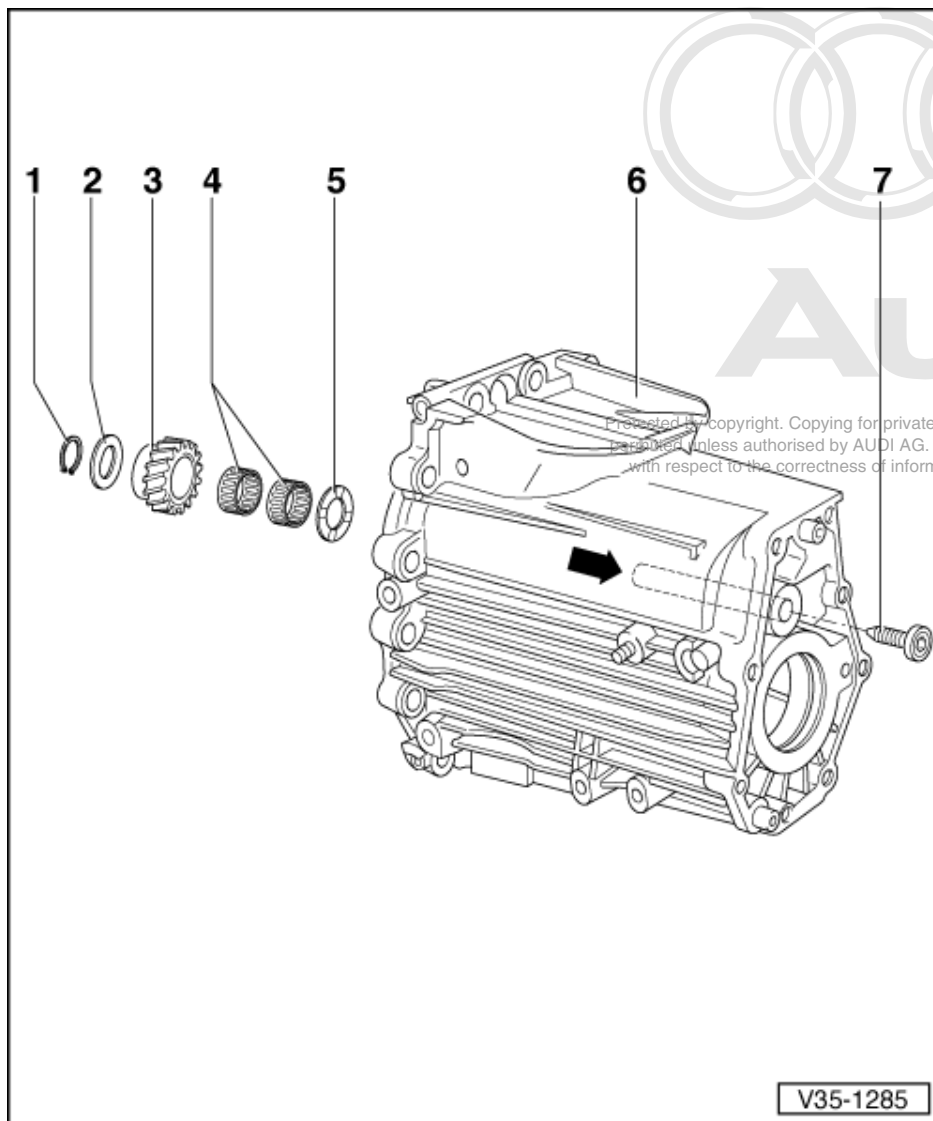
4 - Removing and installing reverse gear wheel

4.1 - Removing and installing reverse gear wheel



- 1 Circlip
- 2 Support plate
- 3 Reverse idler gear
 - ♦ Different versions, allocation => Fig. 167
- 4 Needle bearing
- 5 Thrust washer

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6 Gearbox cover

- ♦ With reverse gear shaft (arrow)
- ♦ The gear shafts for the reverse gear wheel do not need to be removed when removing the reverse gear wheel
- ♦ The reverse gear shaft is not available as a replacement part

7 TORX-screw - 35 Nm

- ♦ Serves as an additional method of securing the reverse gear shaft

39 - Final drive, Differential rear

1 - Renewing seal for flange shaft

1.1 - Renewing seal for flange shaft

- Gearbox installed
- Observe general repair instructions=> Page 10 .

Special tools, testers and auxiliary equipment required

- ♦ Drift VW 195
- ♦ Drift VW 295
- ♦ Extractor lever VW 681
- ♦ Drip tray V.A.G 1306
- ♦ Puller T10037

Notes:

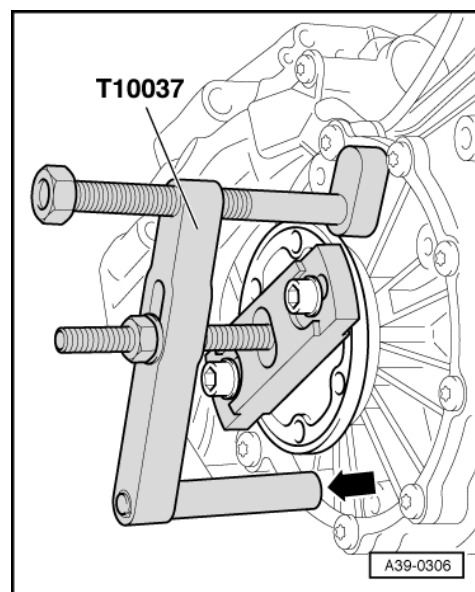
- ♦ Removing and installing oil seal on left-hand side is shown below.
- ♦ The procedure is identical for left and right-hand seals.
- ♦ Exhaust system does not have to be removed.
- ♦ Flange shafts without polygon bearings are installed on gearboxes with the letters CPU, CXF and CXZ.
- ♦ A spacer ring is fitted between the polygon bearing and the differential large bevel gear on flange shafts with 30 mm spline diameter => Page 174 .

Removing

- Remove heat shield for drive shaft.
- Unbolt drive shaft from flange on gearbox.

=> Running Gear, Front and Four-wheel Drive; Repair Group 40; Removing and installing driveshaft Removing and installing driveshaft

- Turn steering to left onto full lock stop.
- Tie up drive shaft as high as possible. Do not damage paint on drive shaft.



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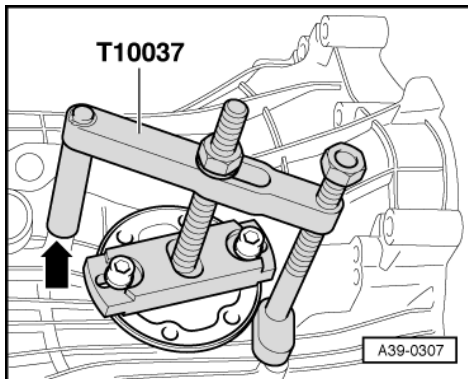
- Place drip tray V.A.G 1306 underneath the gearbox.

Note:

In order to prevent damaging the needle roller bearing (polygon bearing) or the differential during removal, the flange shaft must be removed evenly, parallel and without applying one-sided force.

Remove flange shaft (left).

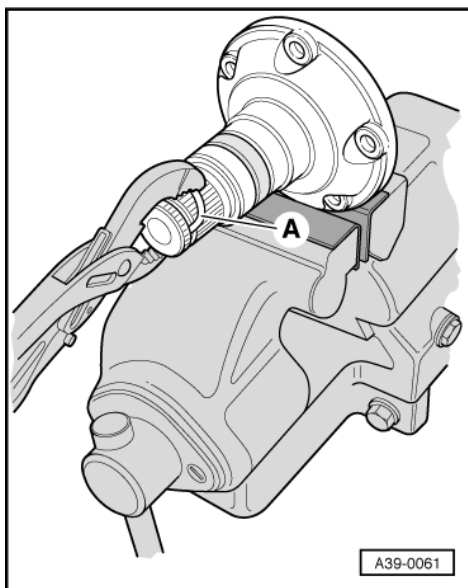
- -> Remove the flange shaft, to do this screw the lower support of puller T10037 into the housing (arrow).



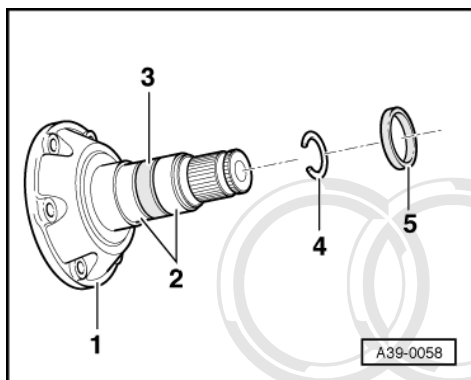
Remove the right flange shaft

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- -> Remove the flange shaft, to do this screw the lower support of puller T10037 into the housing (arrow).



- -> Always renew flange shaft circlip.
- Clamp flange shaft in vice using soft jaws. Use new circlip -A- to press out old circlip from groove in flange shaft.
- Pull out flange shaft oil seal with VW 681.



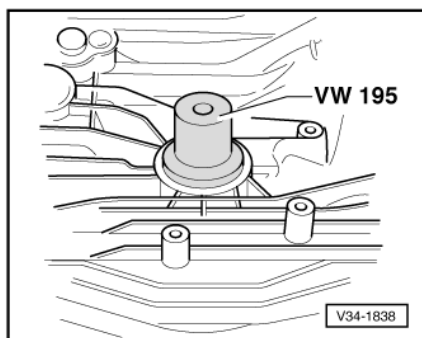
-> Assembling flange shaft with polygon bearing

- 1 - Flange shaft
- 2 - Needle roller bearing (polygon bearing)
- 3 - Spacer ring
- 4 - Circlip
- 5 - Spacer ring - fitted additionally on shafts with 30 mm spline diameter

Notes:

- ♦ If the polygon bearings do not run smoothly with the flange shaft removed, this does not indicate that the bearings are defective. A test for noisy bearings can only be performed with the bearings installed.
- ♦ Inspect for signs of damage to polygon bearings (such as cracking in outer race).
- ♦ The polygon bearings can only be replaced together with the flange shaft.
- ♦ A spacer ring -5- is fitted between the polygon bearing and the differential large bevel gear on flange shafts with 30 mm spline diameter.

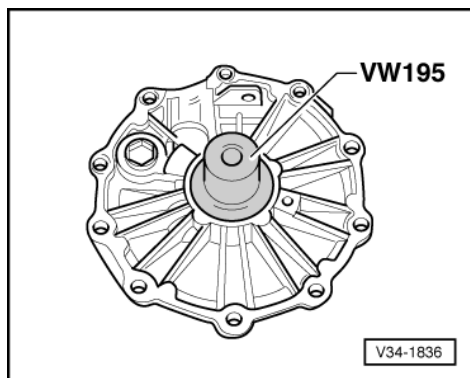
Installing



- Fill space between sealing and dust lips with a thin layer of multi-purpose grease.
- Lightly oil outer circumference of seal.
- -> Knock in new oil seal for right-hand flange shaft to a depth of 5.5 mm below outer surface of housing; keep seal straight when installing

Note:

If the old flange shaft is reinstalled after the repair, the oil seal must be knocked in to a depth of approx. 6.5 mm so that the new seal does not run on the same contact surface as the old one.



- -> Knock in new oil seal for left-hand flange shaft to a depth of 5.5 mm below surface of cover; keep seal straight when installing.

Note:

If the old flange shaft is reinstalled after the repair, the oil seal must be knocked in to a depth of approx. 6.5 mm so that the new seal does not run on the same contact surface as the old one.

- Drive in flange shaft using drift VW 295.
- Bolt drive shaft to flange shaft.
- Fit drive shaft heat shields.
- Check oil level in gearbox => Page 93 .

Tightening torques

Component		Nm
Drive shaft to flange shaft	M8	40
	M10	70
Drive shaft heat shields		23

2 - Replacing oil seal for Flange shaft/propshaft

2.1 - Replacing oil seal for Flange shaft/propshaft

- Gearbox installed
- Observe general repair instructions=> Page 10 .

Special tools, testers and auxiliary equipment required

- ♦ Extractor lever VW 681
- ♦ Mandrel 30-505
- ♦ Press tool 30-506 B
- ♦ Set of ring spanners for lambda probe 3337
- ♦ Drip tray V.A.G 1306

Removing

Vehicles with 4-cylinder engine:

- Remove rear section of exhaust system from clamp(s):

=> 4-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

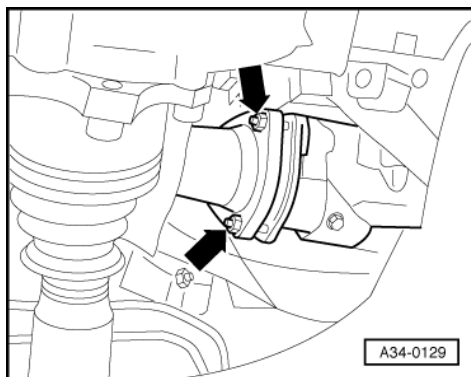


=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing parts of exhaust system Removing and installing parts of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

Vehicles with 6-cylinder engine:

- Unscrew lambda probes on right exhaust pipes with special tool 3337 and move clear to the side.

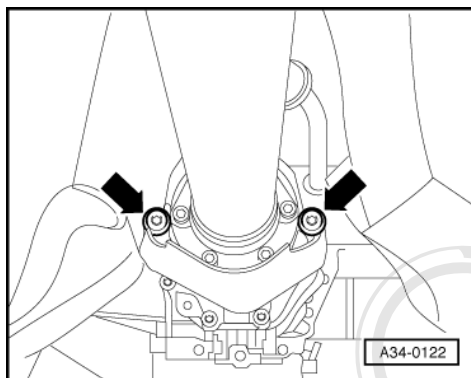


- Detach heat shield above right drive shafts.
- -> Unbolt front exhaust pipes with catalytic converters from left and right exhaust manifolds (3 nuts on each side) -arrows-:

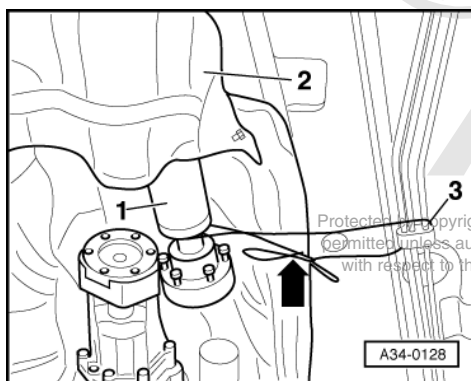
=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

All models:

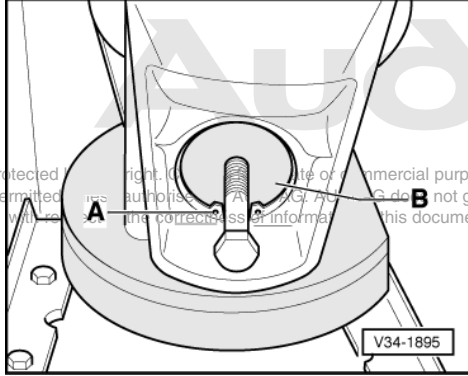


- -> Remove heat shield for propshaft from cover for Torsen differential -arrows-.



- -> Unscrew propshaft -1- from gearbox and place onto heat shield -2-.
- Secure propshaft with wire -arrow- at bracket -3- of fuel lines.
- Place drip tray V.A.G 1306 underneath and drain gearbox oil.

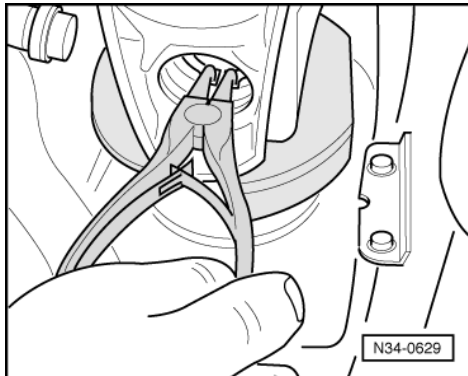
- Place drip tray V.A.G 1306 below cap.



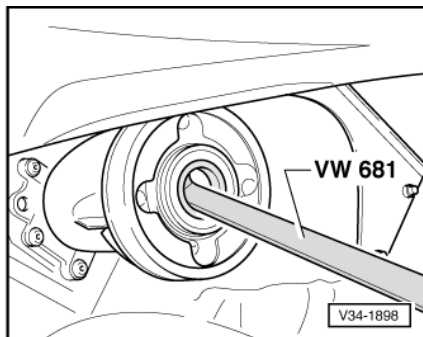
Note:

-> Oil flows out when sealing cap -B- is removed.

- Remove circlip -A-.
- Screw M8 bolt into thread of sealing cap.
- Pull out sealing cap using bolt.

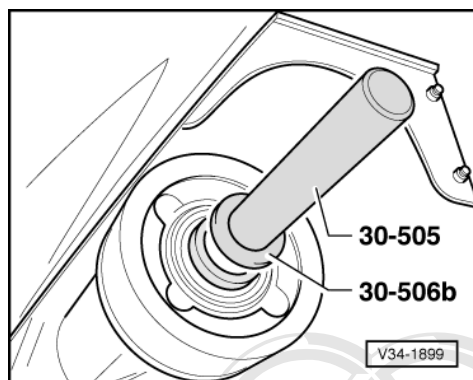


- -> Open out circlip and pull out flange shaft.

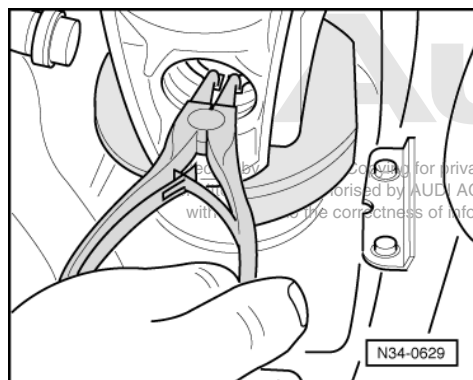


- -> Pull out flange shaft oil seal with VW 681.

Installing



- Fill space between sealing and dust lips with multipurpose grease.
- Lightly oil outer circumference of seal.
- -> Knock in new oil seal for flange shaft to a depth of 2 mm below outer surface of housing; keep seal straight when installing
- Insert flange shaft.



- -> When inserting flange shaft, fit circlip at the same time.
- Circlip must be properly seated in the base of the groove
- Fit new O-ring for sealing cap.
- Fit plug and secure in position.
- Bolt on propshaft => Page 223 .
- Top up oil in gearbox and check oil level => Page 93 .
- Stress free alignment of exhaust system

=> 4-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

Tightening torques

Component	Nm
Propshaft on gearbox	55
Heat shield for propshaft on Torsen differential cover	25

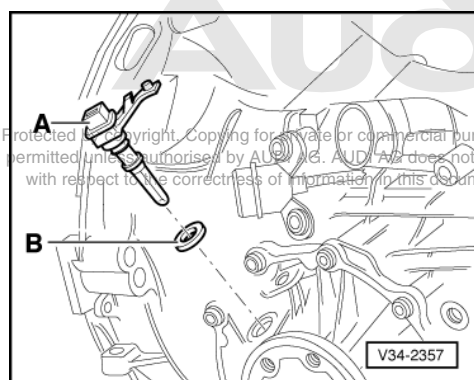
3 - Removing and installing speedometer sender and drive wheel

3.1 - Removing and installing speedometer sender and drive wheel

- Gearbox installed
- Observe general repair instructions=> Page **10** .

3.2 - Removing and installing speedometer sender -G22

Removing



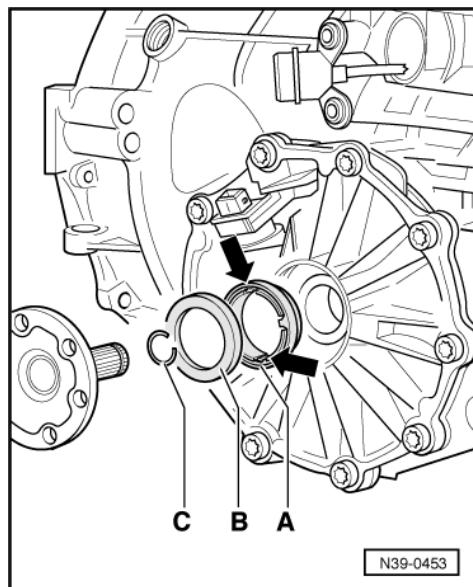
- -> Pull connector off speedometer sender -A-.
- Press retaining clip down, turn sender sideways and pull out upwards.

Installing

- Renew O-ring -B- during installation.
- Insert sender and click into place.
- Handle sender carefully. If it is damaged it is possible that the speedometer will not indicate exactly.



3.3 - Removing and installing speedometer drive wheel

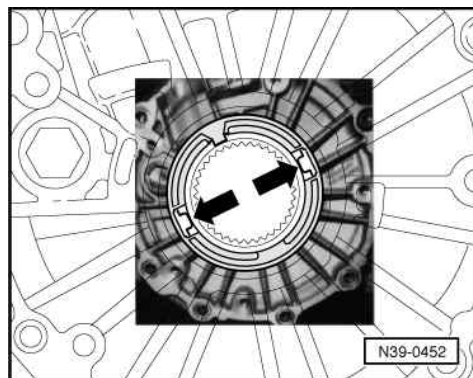


Special tools, testers and auxiliary equipment required

- ♦ Drift VW 195
- ♦ Drift VW 295
- ♦ Extractor lever VW 681
- ♦ Drip tray V.A.G 1306

Removing

- -> Remove flange shaft on left side and oil seal -B- => Renewing flange shaft seal, Page 172 .



- Remove speedometer sender => Page 179 .
- -> Press retaining clips in direction of arrows with a screwdriver.
- Remove drive wheel by levering out, alternating between sides.

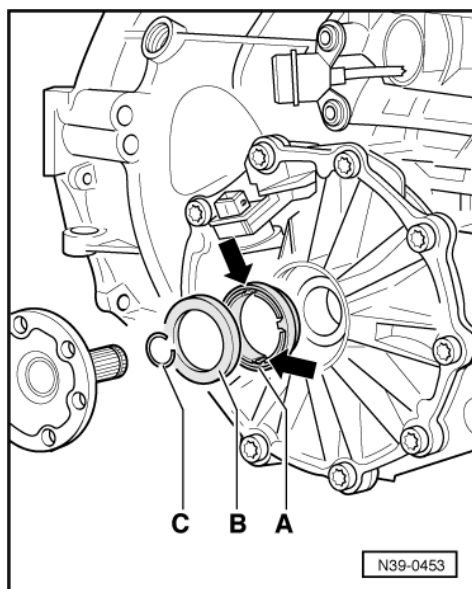
Installing

Installation is carried out in the reverse order, when doing this note the following:

Note:

Fit the drive wheel carefully onto the differential, making sure that it is kept straight. Do not use excessive force - the drive wheel can break easily.

Installation position:



-> The drive peg of the drive wheel -A- faces seal -B- and locates in the groove of the differential.

The retaining clips (arrows) locate in the annular groove in the differential.

- Always renew seal -B- and circlip -C- =>Page 173 .
- Drive in flange shaft using drift VW 295.
- Top up oil in gearbox and check oil level => Page 93 .

Tightening torques

Component		Nm
Drive shaft to flange shaft	M8	40
	M10	70
Heat shields over drive shafts to gearbox		23

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4 - Removing and installing differential

4.1 - Removing and installing differential

Special tools, testers and auxiliary equipment required

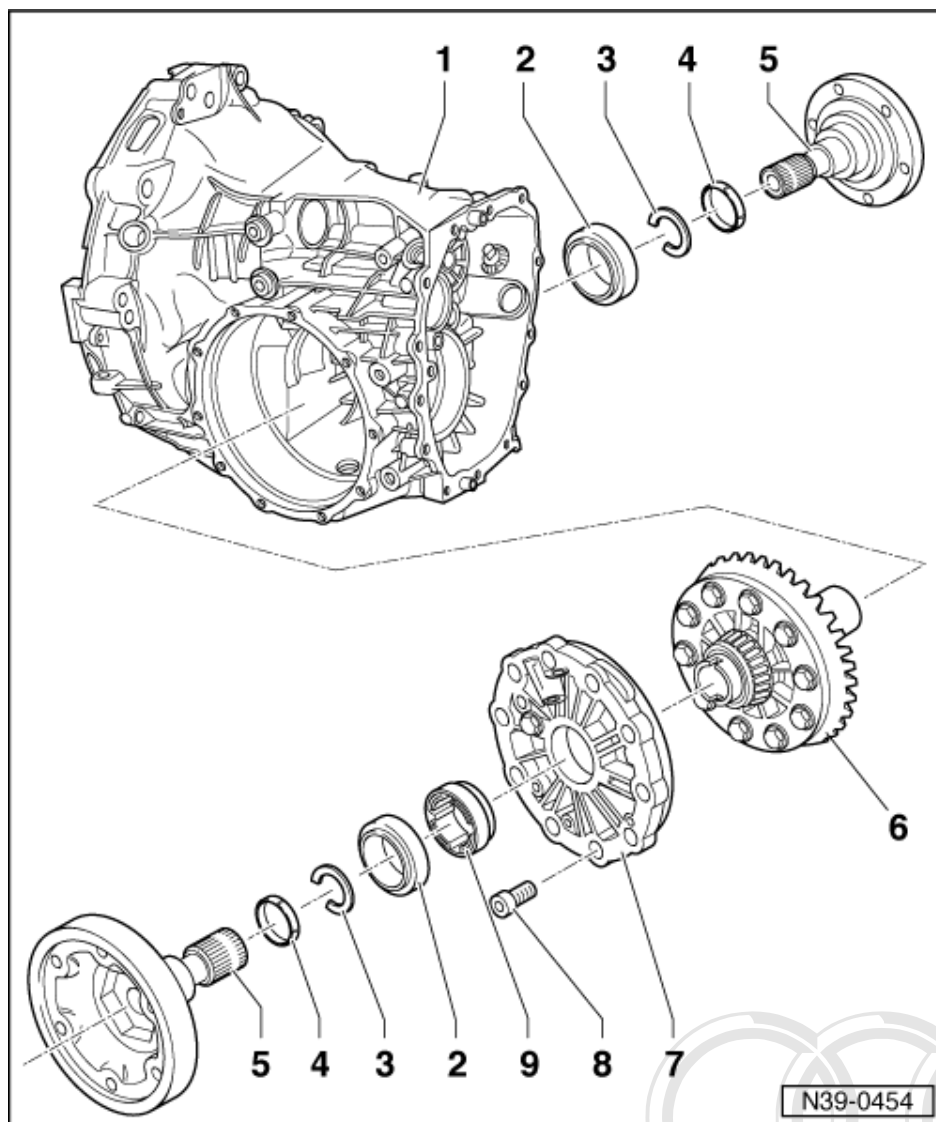
- ◆ Multi-purpose tool VW 771
- ◆ Socket 3257
- ◆ Internal puller Kukko 21/3

Notes:

- ◆ Removing and installing is possible with the gearbox installed.
- ◆ The differential can be removed and installed without removing shift mechanism, input shaft, drive pinion and gear box cover. These components must be removed if the differential needs to be adjusted.
- ◆ Flange shafts without polygon bearings are installed on gearboxes with the letters CPU, CXF and CXZ.
- ◆ The polygon bearings can only be replaced together with the flange shaft.



- ♦ Inspect polygon bearings for visible damage.
- ♦ If the polygon bearings do not run smoothly with the flange shaft removed, this does not indicate that the bearings are defective. A test for noisy bearings can only be performed with the bearings installed.
- ♦ A spacer ring is fitted between the polygon bearing and the differential large bevel gear on flange shafts with 30 mm spline diameter => Fig. 4, -Item 5-.
- ♦ Adjustments are required when replacing components marked 1) => adjustment overview, Page 198.

**1 Gearbox housing 1)****2 Sealing ring**

- ♦ Replacing => Page 172.

3 Circlip

- ♦ Replace
- ♦ Removing and installing => Fig. 1

4 Spacer ring

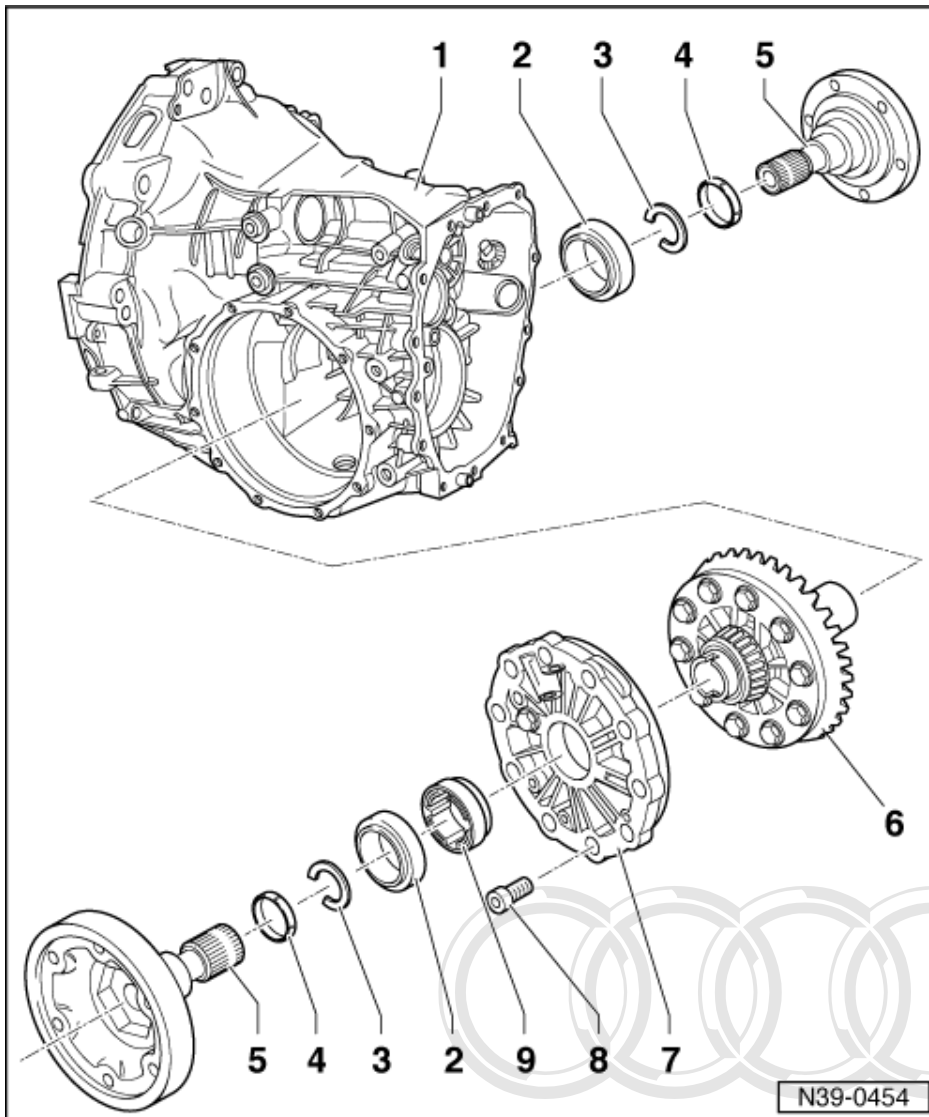
- ♦ Is only fitted on flange shafts with polygon bearing which have a spline diameter of 30 mm
- ♦ Removing => Fig. 2
- ♦ Installing => Fig. 3

5 Flange shaft

- ♦ Removing and installing => Page 172

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- ♦ Assembling flange shaft with polygon bearing => Fig. 4



6 Differential with crown wheel 1)

- ♦ Can be removed without removing gear cluster
- ♦ Dismantling and assembling => Page 186
- ♦ From 08.98 à Reinforcements (phased introduction) => Fig. 5

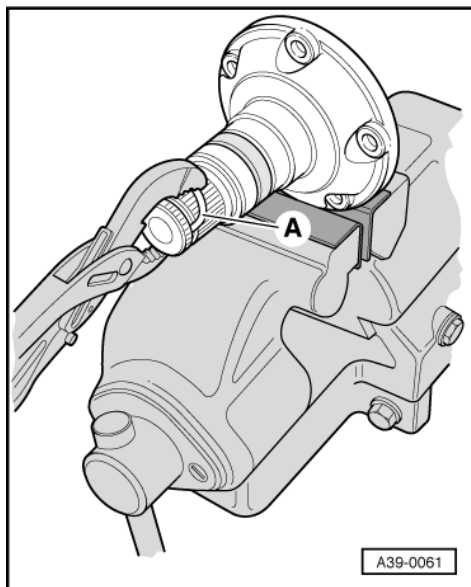
7 Cover for final drive 1)

- ♦ With AMV 188 000 02 or AMV 188 001 02 to seal
- ♦ From 08.98 à Reinforcements (phased introduction) => Fig. 5

8 TORX-screw - 25 Nm

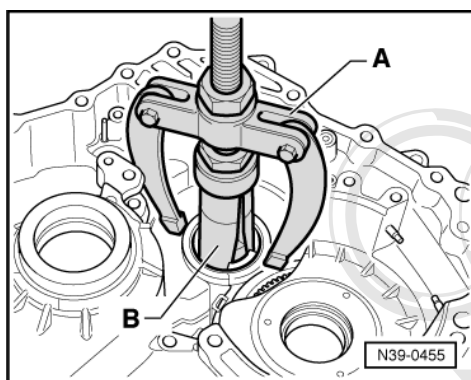
9 Speedometer drive wheel

- ♦ Removing and installing => Page 180
- ♦ Fit the drive wheel carefully onto the differential, making sure that it is kept straight. Do not use excessive force - the drive wheel can break easily



-> Fig.1 Removing and installing circlip

- Clamp flange shaft in vice using soft jaws. Use new circlip -A- to press out old circlip from groove in flange shaft.

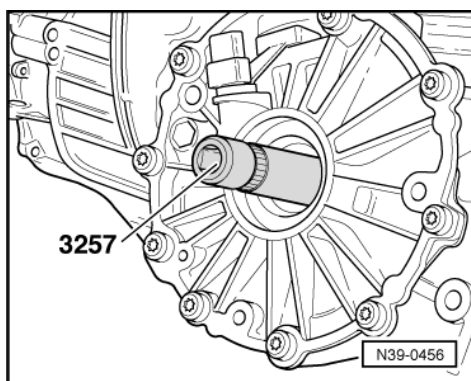


-> Fig.2 Removing spacer ring

A - Internal puller 18.5 ... 23.5 mm, e.g. Kukko 21/3

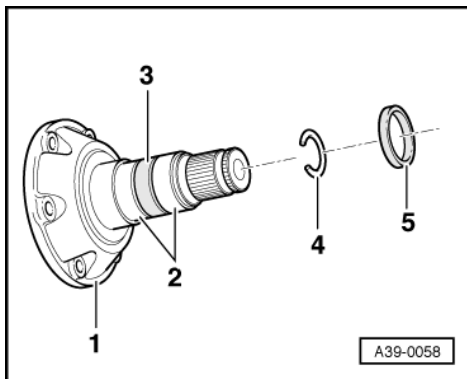
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- If the spacer ring is tight pull out using the multi-purpose tool VW 771.



-> Fig.3 Installing spacer ring

- Drive new spacer ring home, when doing this take care not to cant ring.

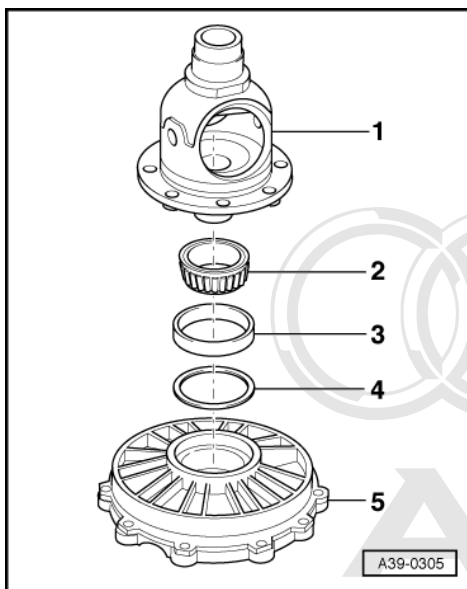


-> Fig.4 Assembling flange shaft with polygon bearing

- 1 - Flange shaft
- 2 - Needle roller bearing (polygon bearing)
- 3 - Spacer ring
- 4 - Circlip
- 5 - Spacer ring - fitted additionally on shafts with 30 mm spline diameter

Note:

The needle roller bearings (polygon bearings) do not turn easily when the flange shaft is removed. This does not indicate a faulty bearing.



-> Fig.5 Reinforcements introduced from 08.98 à (taper roller bearings with larger inner and outer diameters) on the left-hand side of the differential (crown wheel side). The introduction is phased from gearbox build date 17 08 8, but covers all gearboxes from build date 11 01 9.

The following components are affected by this modification:

- 1 - Differential housing

- 2 - Taper roller bearing inner race
- 3 - Taper roller bearing outer race
- 4 - Shim "S1"
- 5 - Final drive cover

Part allocation:

=> Parts List

5 - Dismantling and assembling differential

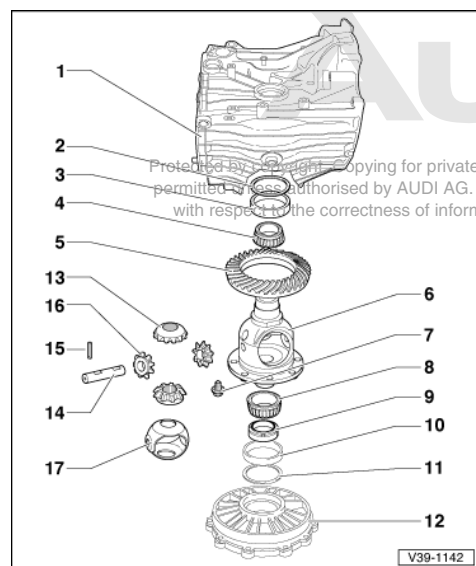
5.1 - Dismantling and assembling differential

Special tools, testers and auxiliary equipment required

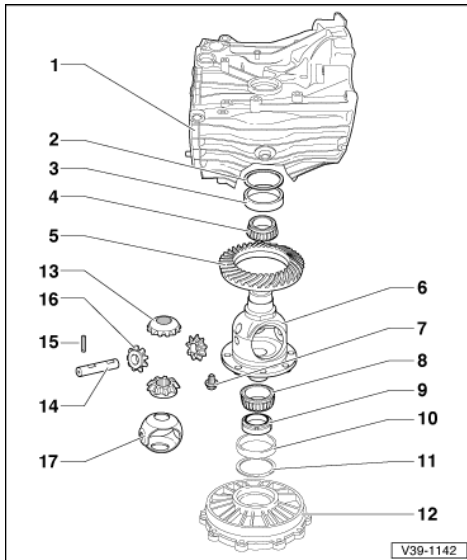
- ◆ Drift VW 295
- ◆ Thrust plate VW 401
- ◆ Thrust plate VW 402
- ◆ Press tool VW 407
- ◆ Press tool VW 408 A
- ◆ Thrust pad VW 447 H
- ◆ Thrust pad VW 447 i
- ◆ Thrust piece VW 472/1
- ◆ Thrust pad VW 511 i
- ◆ Thrust plate 30-11
- ◆ Thrust plate 30-205
- ◆ Sleeve 40-21
- ◆ Thrust plate 40-105
- ◆ Drift 3138
- ◆ Sleeve 3144
- ◆ Tube 3296
- ◆ Sealant AMV 188 000 02 or AMV 188 001 02
- ◆ Two-arm puller Kukko 20/10 or Kukko 44/2
- ◆ Two-arm puller Kukko 204/2

Notes:

- ◆ Removing and installing differential => Page 181 .
- ◆ Replace both taper roller bearings together.
- ◆ Adjustments are required when replacing components marked 1) => adjustment overview, Page 198 .

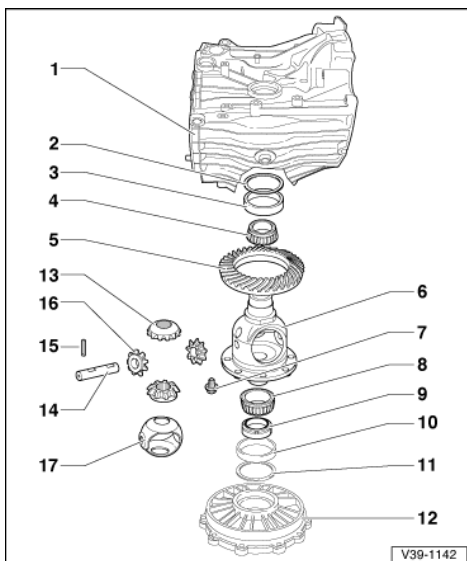


- 1 Gearbox housing 1)
- 2 Shim "S2"
 - ♦ Note thickness
 - ♦ Adjustment overview => Page 198
- 3 Outer race for taper roller bearing (right) 1)
 - ♦ Tapping out => Fig. 1
 - ♦ Driving in with VW 472/1 and VW 408 A => Fig. 2
 - ♦ With letters CPU, CXF and CXZ with VW 295 and 30-205



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- 4 Inner race for taper roller bearing (right) 1)
 - ♦ Pull off with 3296 => Fig. 3
 - ♦ Pressing on => Fig. 4
 - ♦ With letters CPU, CXF and CXZ with thrust sleeve 40-21
- 5 Crown wheel 1)
 - ♦ Paired with pinion shaft (final drive set)
 - ♦ Allocate according to the gearbox code letters via the Parts Catalogue => Page 2 .
 - ♦ Drive off housing with a drift => Fig. 10
 - ♦ Fit to differential housing => Fig. 11



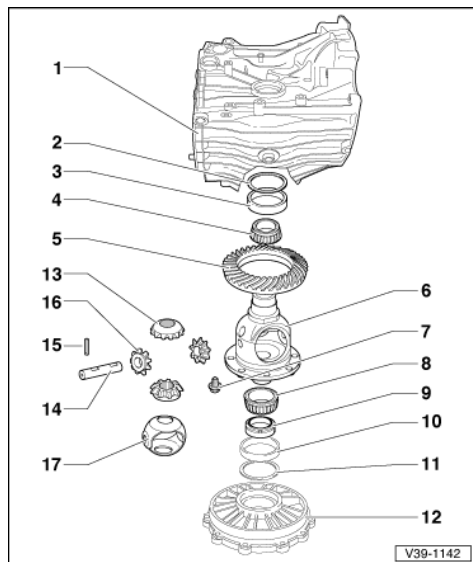
- 6 Differential housing 1)
 - ♦ Allocate according to the gearbox code letters via the Parts Catalogue => Page 2 .
 - ♦ From 08.98 ä Reinforcements (phased introduction) => Page 185 Fig. 5
- 7 Bolt - 60 Nm + turn 45ofurther
 - ♦ Replace



- ♦ Lightly tighten bolts then tighten diagonally to specified torque.

8 Inner race for taper roller bearing (left) 1)

- ♦ Pulling off => Fig. 5
- ♦ Press on with 3296 => Fig. 4
- ♦ With letters CPU, CXF and CXZ with thrust sleeve 40-21
- ♦ From 08.98 ä Reinforcements (phased introduction) => Page 185 Fig. 5



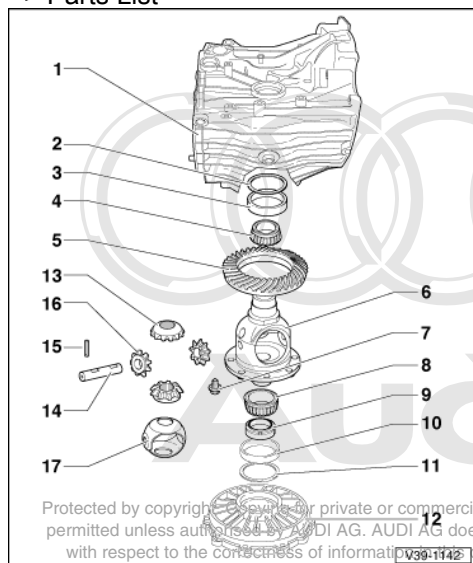
9 Speedometer drive wheel

- ♦ Removing and installing => Page 180
- ♦ Fit the drive wheel carefully onto the differential, making sure that it is kept straight. Do not use excessive force - the drive wheel can break easily

10 Outer race for taper roller bearing (left) 1)

- ♦ Tapping out => Fig. 7
- ♦ Driving in with VW 472/1 and VW 408 A => Fig. 8
- ♦ With letters CPU, CXF and CXZ with VW 511 and VW 295
- ♦ From 08.98 ä Reinforcements (phased introduction) => Page 185 Fig. 5
- ♦ Driving in with 2050 and VW 408 A => Fig. 9
- ♦ Allocation

=> Parts List



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11 Shim "S1"

- ♦ Note thickness
- ♦ Adjustment overview => Page 198

- ♦ Allocation

=> Parts List

12 Cover for final drive 1)

- ♦ From 08.98 ä Reinforcements (phased introduction) => Page 185 Fig. 5
- ♦ Allocation

=> Parts List

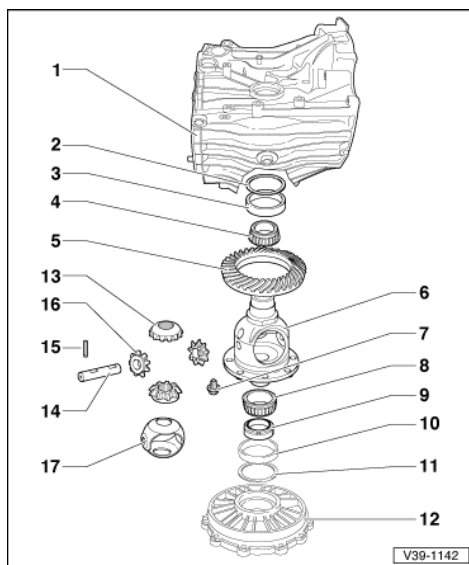
- ♦ Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces

13 Large bevel gear

- ♦ Installing => Fig. 12

14 Shaft for planet wheels

- ♦ Knock out with drift after removing spring pin



15 Spring pin

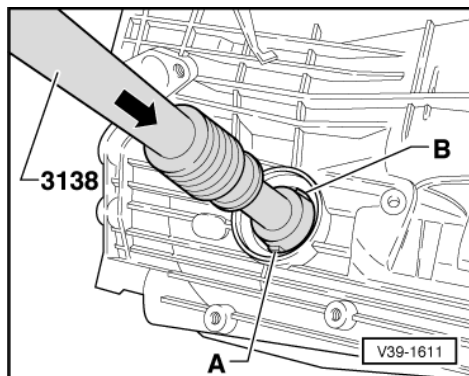
- ♦ For securing shaft for bevel gears
- ♦ Version with annular groove: Removing and installing => Fig. 13
- ♦ Version without annular groove: Drive out with drift

16 Small bevel gear

- ♦ Installing => Fig. 12

17 One-piece thrust washer

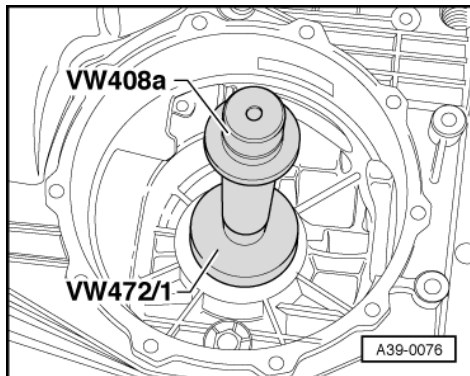
- ♦ Coat with gearbox oil when installing



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-> Fig.1 Driving right taper roller bearing outer race out of gearbox housing

- Turn webs -A- and -B- out until they sit on the outer race within the recess in the gearbox.
- After removing check shims for damage.

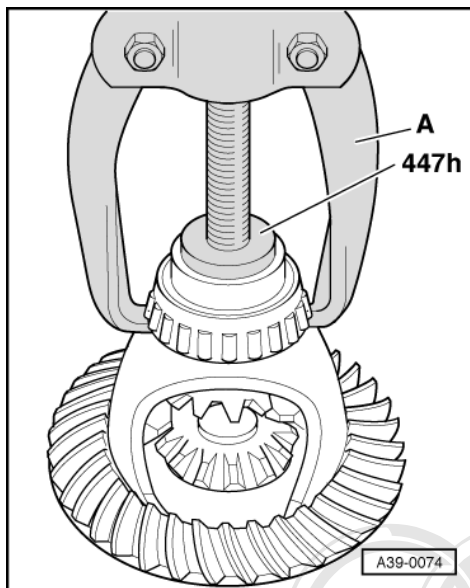


-> Fig.2 Driving right taper roller bearing outer race into gearbox housing

- Thrust piece VW 472/1 is fitted with the taper in the outer race.

Note:

With letters CPU, CXF and CXZ, thrust plate 30-205 and drift VW 295 must be used.



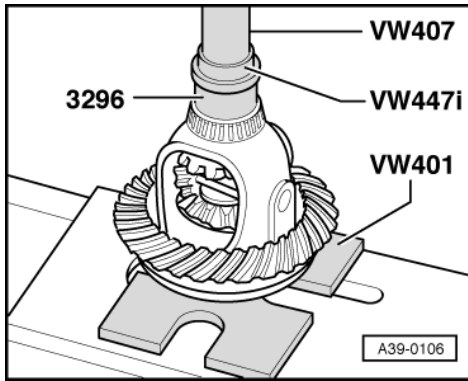
-> Fig.3 Pulling off right taper roller bearing inner race

- A - Two arm puller, e.g. Kukko 20/10 or Kukko 44/2

Notes:

- ♦ If using a puller with small diameter spindle, also fit thrust plate 30-11 between thrust pad 447 H and puller.
- ♦ With letters CPU, CXF and CXZ, thrust plate 40-105 must be used.
- ♦ There is a slot in the bearing seat in the differential housing for applying puller -A-.

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-> Fig.4 Pressing on right taper roller bearing inner race

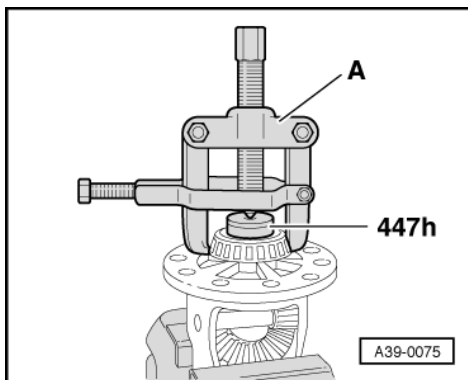
Important:
Wear protective gloves!

- Heat the inner race to approx. 100 °C, position and push to final position.

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Note:

With gearbox code letters CPU, CXF and CXZ, thrust sleeve 40-21 must be used.

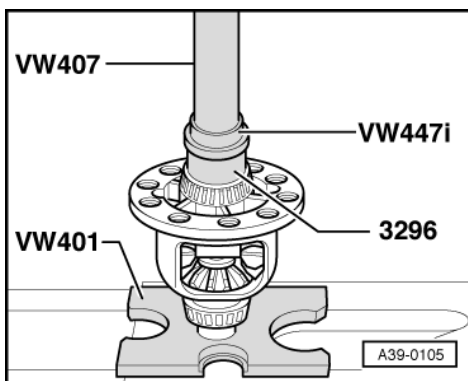


-> Fig.5 Pulling off left taper roller bearing inner race

A - Two arm puller, e.g. Kukko 204/2

Notes:

- ♦ If using a puller with small diameter spindle, also fit thrust plate 30-11 between thrust pad 447 H and puller.
- ♦ With letters CPU, CXF and CXZ, thrust plate 40-105 must be used.
- ♦ There is a slot in the bearing seat in the differential housing for applying puller -A-.



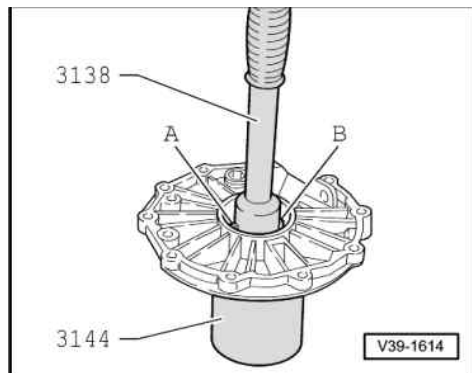
-> Fig.6 Pressing on left taper roller bearing inner race

Important:
Wear protective gloves!

- Heat the inner race to approx. 100 °C, position and push to final position.

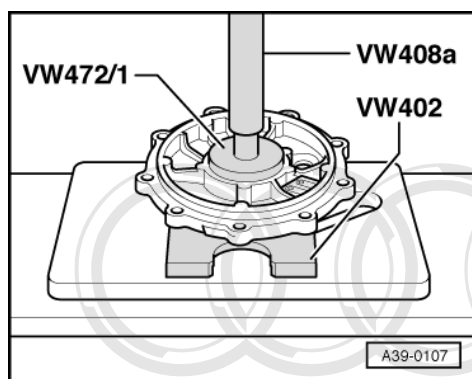
Note:

With gearbox code letters CPU, CXF and CXZ, thrust sleeve 40-21 must be used.



-> Fig.7 Knocking left taper roller bearing outer race out of cover

- Turn webs -A- and -B- out until they sit on the outer race within the recess in the gearbox.
- After removing check shims for damage.

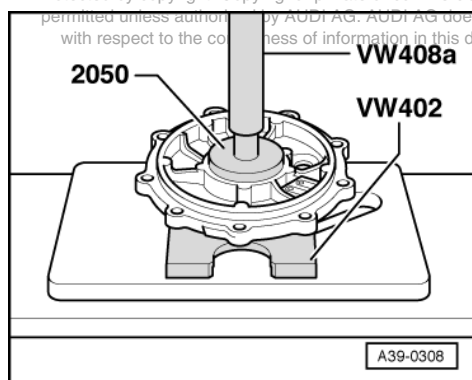


-> Fig.8 Driving left taper roller bearing outer race into cover (gearbox without reinforcements).

- Thrust piece VW 472/1 is fitted with the taper in the outer race.

Note:

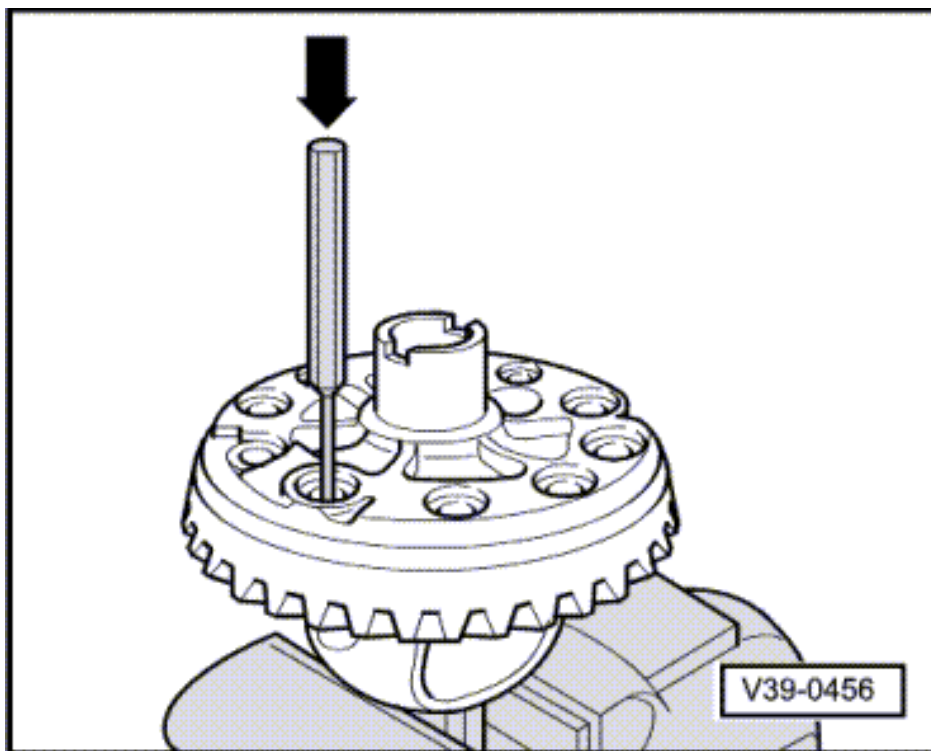
With gearbox code letters CPU, CXF and CXZ, thrust plate VW 511-205 and drift VW 295 must be used.



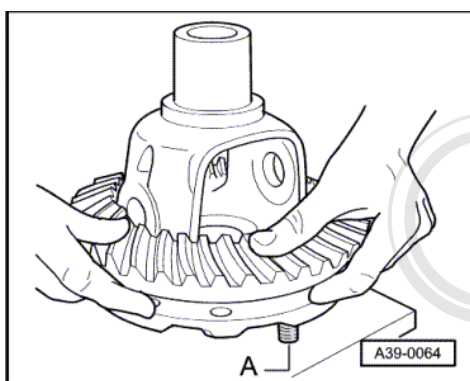
-> Fig.9 Driving left taper roller bearing outer race into cover (gearbox with reinforcements from 08.98 ä)

=>Page 185 Fig. 5

- Press the outer race for the left taper roller bearing into the cover using thrust piece 2050.
- Thrust piece 2050 is fitted with the taper in the outer race.



-> Fig.10 Driving crown wheel off housing



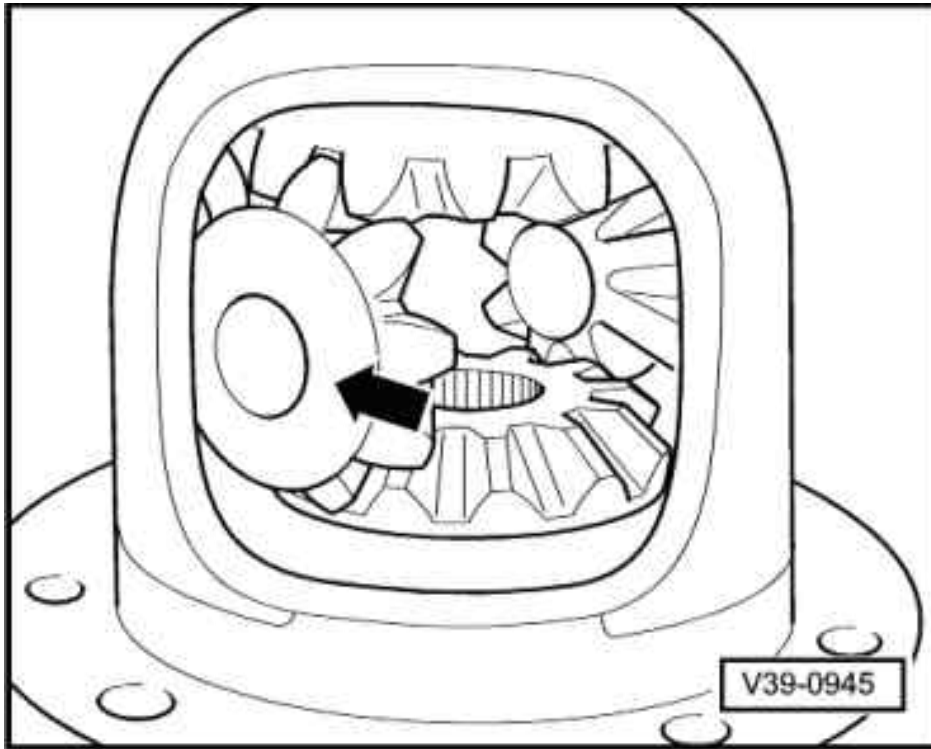
-> Fig.11 Fitting crown wheel

Important:
Wear protective gloves!

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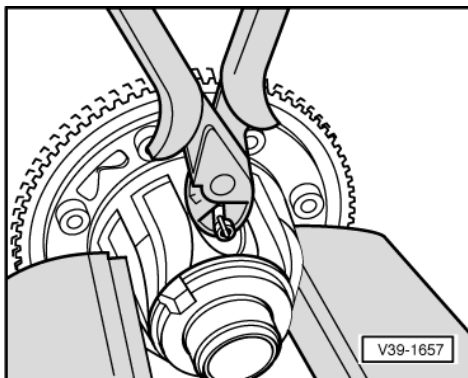


- When fitting crown wheel guide it on centring pins -A- (locally made).
- Heat the crown wheel to approx. 100 °C and position.
- Allow the crown wheel to cool off slightly before inserting the bolts. Then tighten to the specified torque.



-> Fig.12 Installing small bevel gears

- Lubricate one-piece thrust washer with gearbox oil and install.
- Insert large bevel gears.
- Insert small bevel gears spaced 180° apart, and then rotate into place -arrow-.
- Drive small bevel gear shaft into final position and secure.



-> Fig.13 Removing and installing spring pin

Removing

- Spring pin with annular groove: pull out using side-cutting pliers
- Spring pin without annular groove: knock out from behind using a drift.



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Installing

- Drive in spring pin as far as the stop.

6 - Adjusting drive pinion and crown wheel

6.1 - Adjusting drive pinion and crown wheel

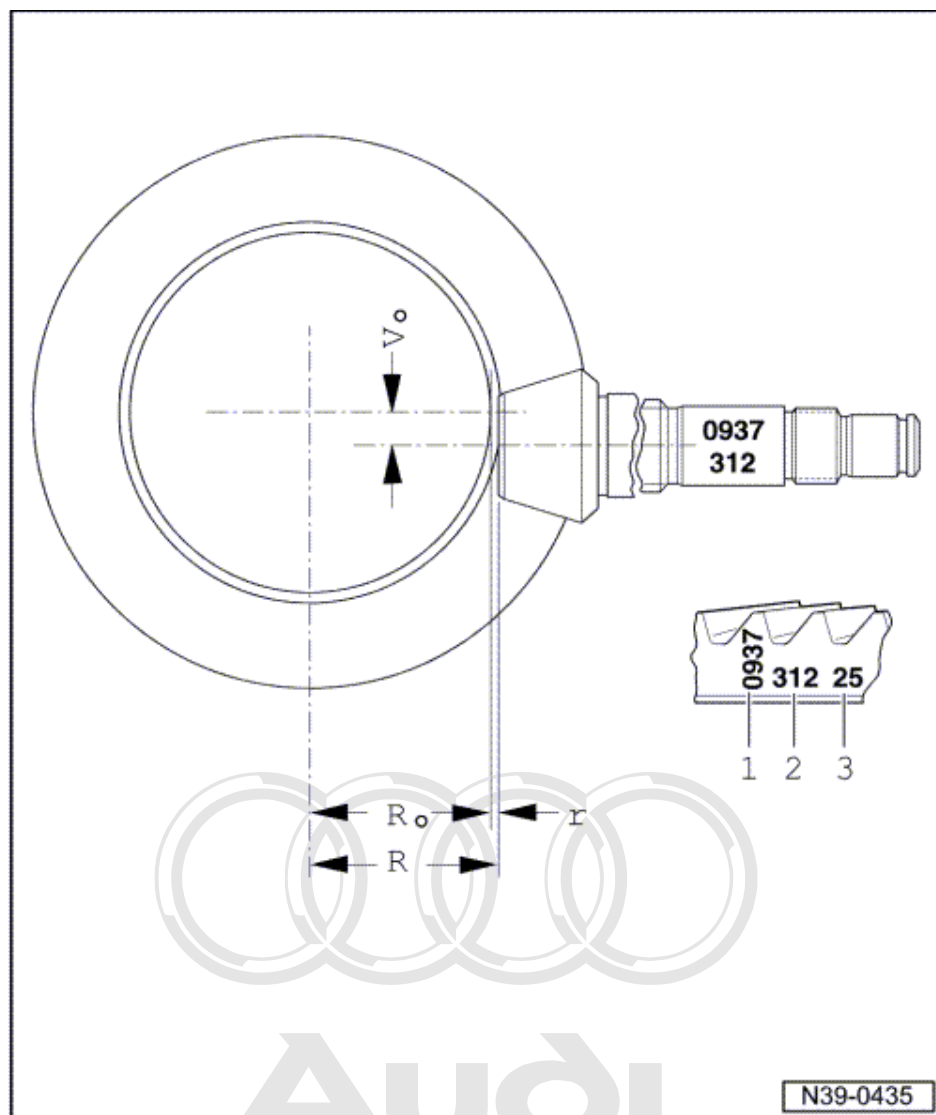
General notes:

- ♦ Careful adjustment of the drive pinion and crown wheel is important for the service life and smooth running of the final drive. For this reason, the drive pinion and crown wheel are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions of rotation. The position of quietest running is found by moving the drive pinion in an axial direction and at the same time lifting the crown wheel out of the zero-play mesh position by the amount necessary to maintain the backlash within the specified tolerance.
- ♦ The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.
- ♦ The deviation "r", which is related to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the crown wheel. The final drive set (drive pinion and crown wheel) must only be replaced together as a matched pair.
- ♦ Observe the general repair instructions for taper roller bearings and shims.
- ♦ The friction torque measurement is only used as a final check to make sure that the adjustment is correct.



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6.2 - Adjusting and marking of gear sets



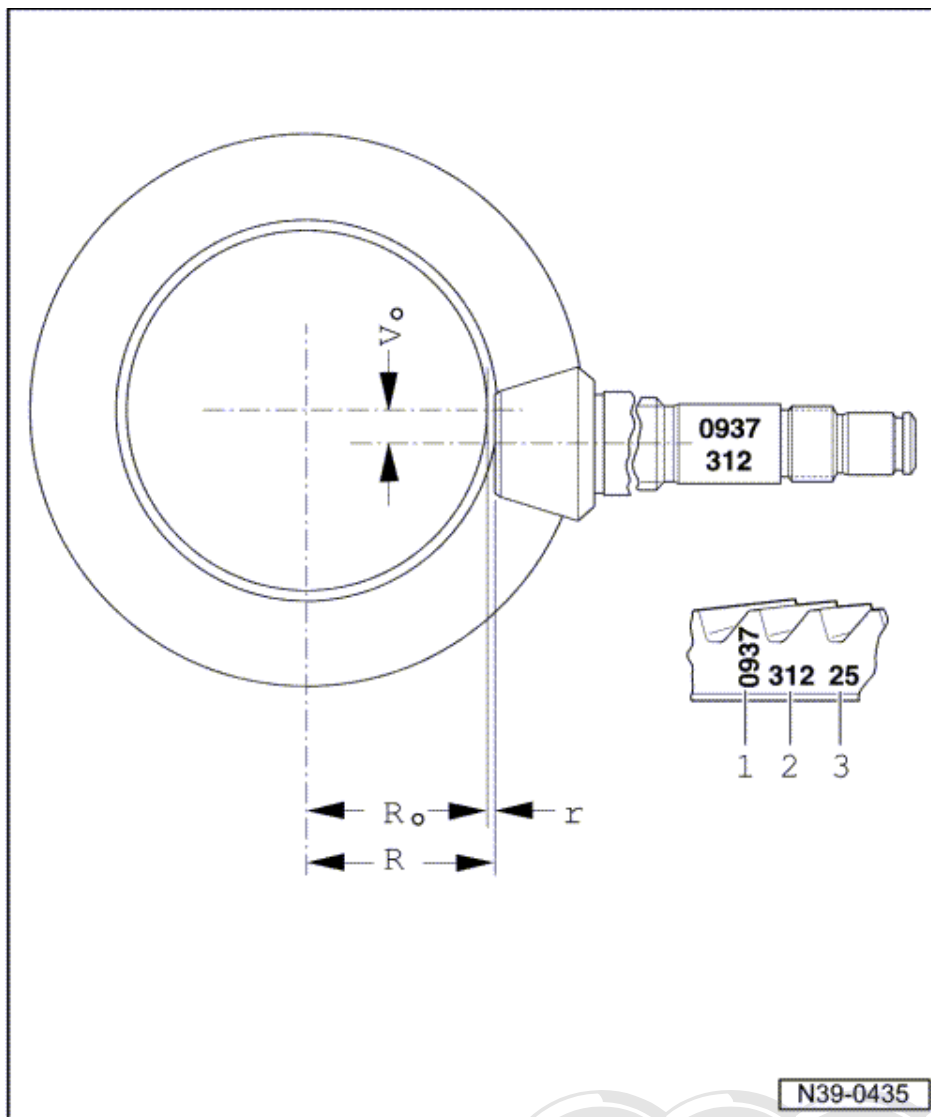
1 Marking "0937" indicates Oerlikon final drive set with transmission ratio 37 : 9.

2 Pairing number (312) of final drive set

3 Deviation (tolerance) "r" is based on the test machine master gauge used in production. The deviation "r" is always given in 1/100 mm. Example: "25" means $r = 0.25 \text{ mm}$

Ro - Length of test machine master gauge used.

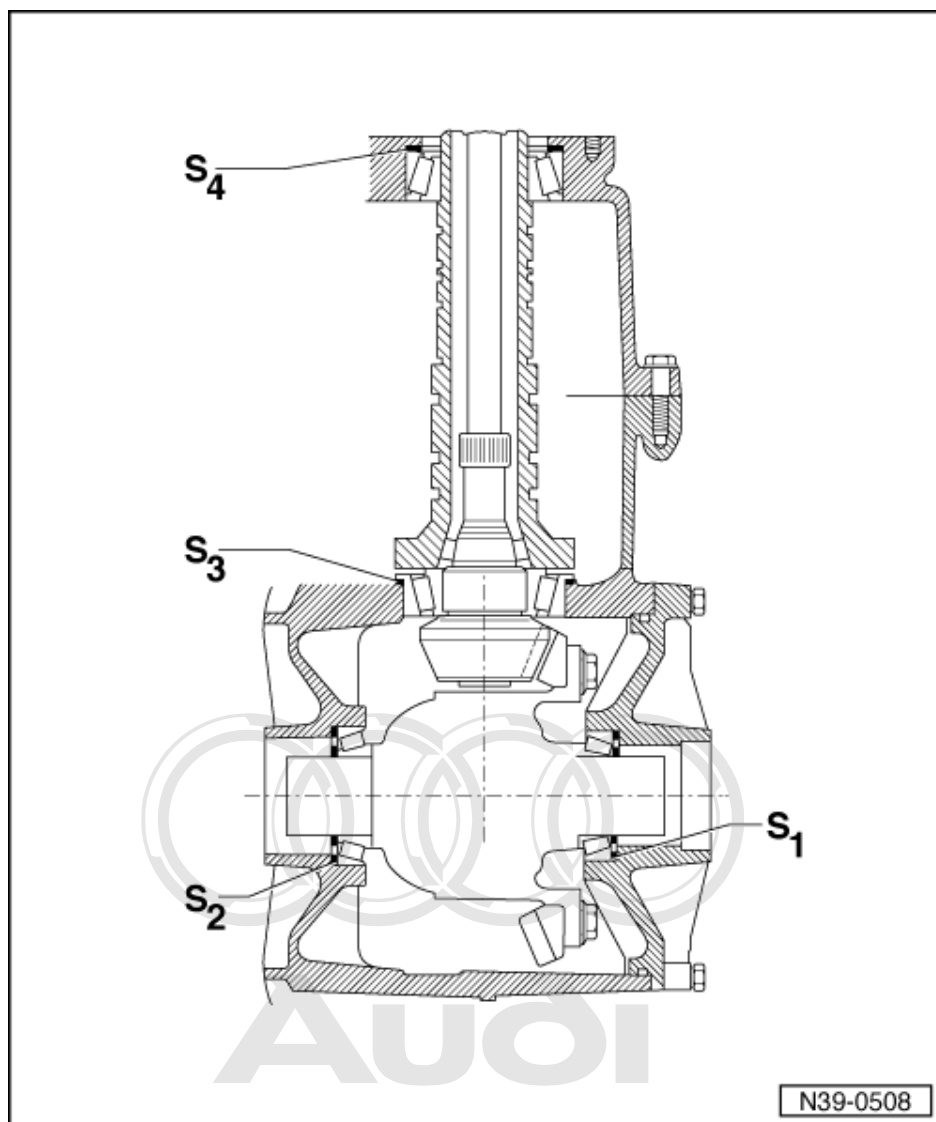
Ro - Crown wheel $\varnothing 170 \text{ mm} = 54.95 \text{ mm}$



R - Actual dimension between crown wheel and face of pinion shaft at point with quietest running for this gear set.
Vo - Hypoid offset

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6.3 - Position of shims



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Note:

Adjustment overview when Replacing individual components of gearbox =>Page 198 .

- S1 - Adjustment shim for crown wheel in cover for final drive
- S2 - Adjustment shim for crown wheel in gearbox housing
- S3 - Adjustment shim for pinion shaft in gearbox housing
- S4 - Adjustment shim for pinion shaft in gearbox cover

6.4 - Adjustment overview

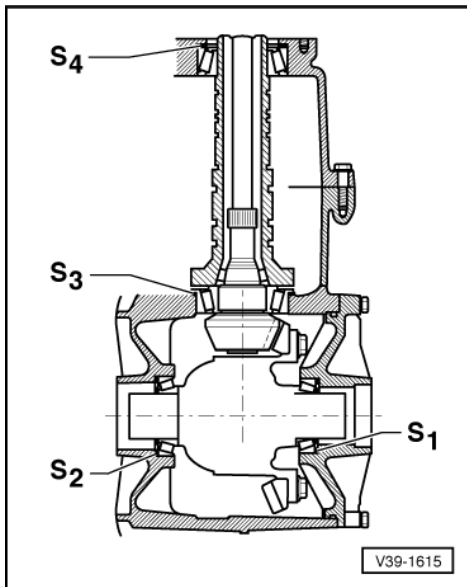
Note:

If repairs have been carried out on the gearbox it is only necessary to adjust the pinion shaft, crown wheel or final drive set if components have been renewed which have a direct effect on the adjustments of the final drive. To eliminate unnecessary adjustments observe following table:

Parts renewed: ▼	To adjust:			
	Crown wheel "S1"+"S2" 1) => Page 211	Pinion shaft "S3"+"S4" 1) using deviation "r" => Page 200	Pinion shaft "S4" 1) => Page 210	Backlash Testing => Page 215
Gearbox housing 3)	X	X		X
Gearbox cover			X	
Differential housing	X			X
Double taper roller bearing for drive pinion in hollow shaft		X		X
Taper roller bearing for differential	X			X
Final drive set 2)	X	X		X
Final drive cover	X			X

- 1) Shims; installation position => Page 198
- 2) Drive pinion and crown wheel; only replace together.
- 3) If the gearbox housing is renewed then the input shaft also needs to be adjusted => Page 145, adjusting input shaft.

6.5 - Sequence of readjustment of final drive



-> If the pinion shaft and crown wheel have to be adjusted, the following sequence is recommended as the most efficient:

- 1.) Determine total shim thickness "Stotal" for "S1" + "S2" (sets preload for taper roller bearings for differential) => from Page 211.
- 2.) Determine total shim thickness "Stotal" for "S3" + "S4" (sets preload for taper roller bearings for pinion shaft) => from Page 200.



3.) Distribute total shim thickness "Stotal" for "S3" + "S4" so that the distance from centre of crown wheel to face of pinion shaft is the same as distance "R" which was determined during production => from Page 207 .

4.) Distribute total shim thickness "Stotal" for "S1" + "S2" so that the specified backlash exists between crown wheel and drive pinion => from Page 216 .

Note:

Overview of components and shims =>Page 198 .

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6.6 - Adjusting drive pinion

(Adjusting drive pinion and hollow wheel)

Repairs after which the pinion shaft must be adjusted => table on Page 198 .

Special tools, testers and auxiliary equipment required

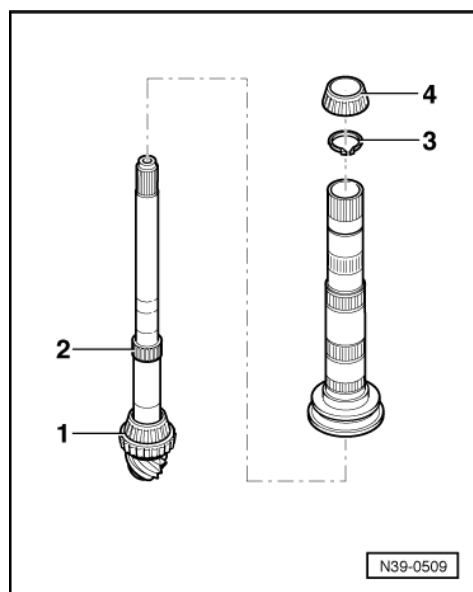
- ♦ Extractor lever for gear set VW 296
- ♦ Universal mandrel VW 385/1
- ♦ 2 x centring disc VW 385/3
- ♦ Measuring plunger VW 385/14
- ♦ Measuring plate VW 385/17
- ♦ Master gauge VW 385/30
- ♦ End measuring plate VW 385/33
- ♦ Universal dial gauge bracket VW 387
- ♦ Thrust plate VW 401
- ♦ Press tool VW 407
- ♦ Tube VW 519

- ♦ Fitting tool VW 792
- ♦ Thrust pad 3062
- ♦ Sleeve 3182
- ♦ Torque gauge 0 ... 600 Ncm
- ♦ Dial gauge
- ♦ Dial gauge extension 6.5 mm
- ♦ Dial gauge extension 30 mm

Determining total shim thickness "Stotal" for shims "S3" + "S4"

(Adjusting preload of taper roller bearings for drive pinion with hollow shaft)

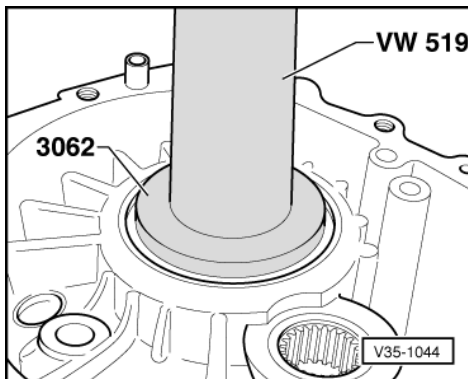
- Differential removed.



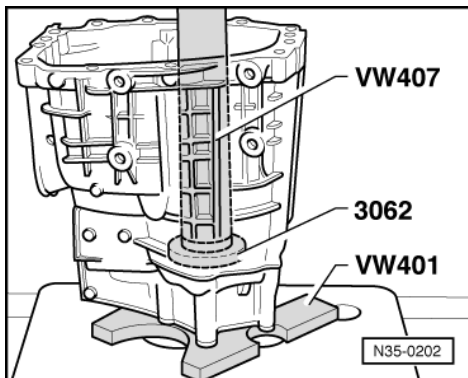
- -> Press inner race -1- for double taper roller bearing onto drive pinion and secure in place => Page 147 onwards.
- Fit needle roller bearing -2-.
- Fit circlip -3- onto hollow shaft and press on inner race for taper roller bearing -4- => Page 147 onwards.
- Fit drive pinion in hollow shaft.

Note:

Illustration shows hollow shaft without gear wheels. Adjustment of drive pinion can be performed either with or without gears fitted.



- -> Fit double taper roller bearing outer race for pinion shaft in gearbox housing without shims => Fig. 158.

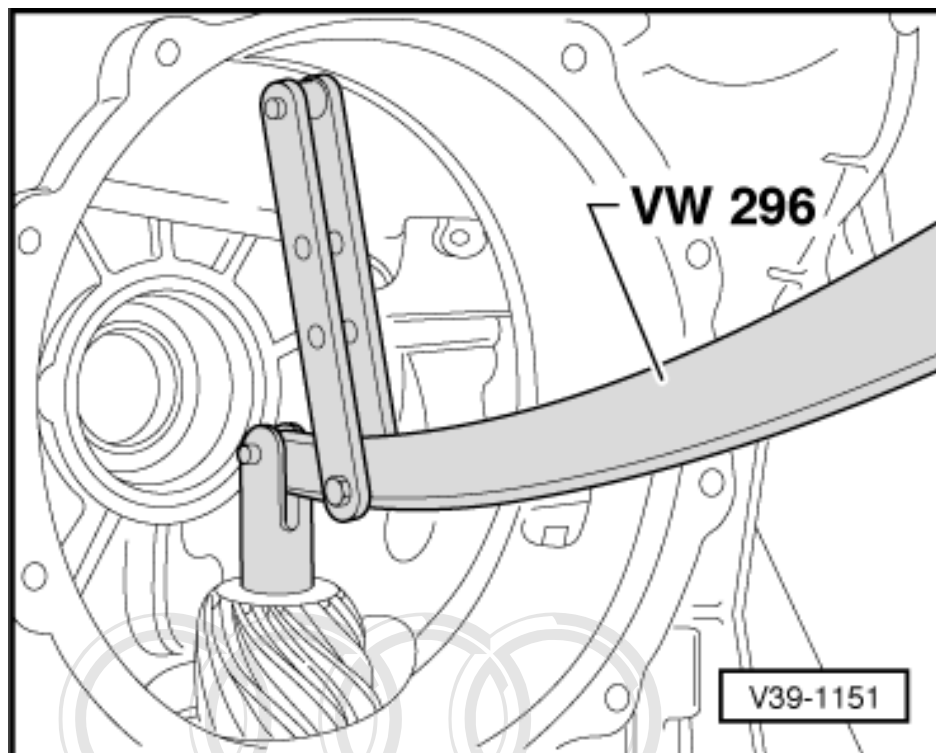


- -> Fit taper roller bearing outer race for pinion shaft in gearbox cover with shim "S4*" (1.0 mm thick) => Fig. 159.

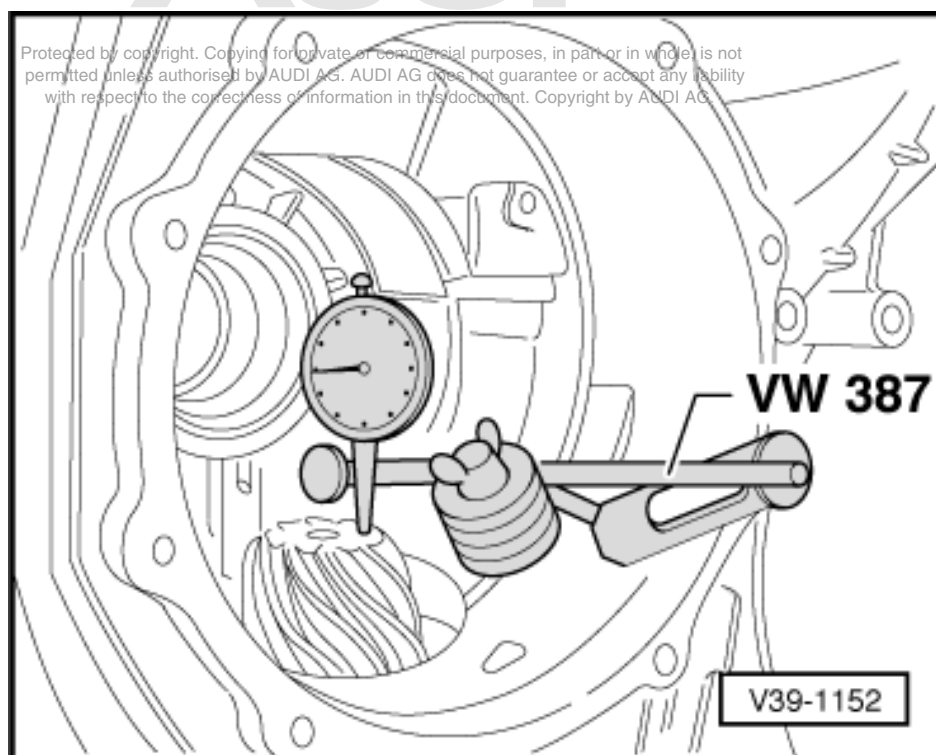
Notes:

- ♦ For measurement purposes a shim "S4" with a thickness of 1.0 mm is initially inserted. It is referred to as "S4*" in the following. After determining measurement "e", "S4*" will be replaced by the correct shim "S4".
- ♦ When taking measurements, always fit rubber washer together with ring for rubber washer => Page 156.
- Insert completely assembled drive pinion with hollow in gearbox housing.

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- Fit gearbox cover and tighten bolts to 22 Nm.
- Turn gearbox so that the gearbox cover is downwards.
- -> Press down on face of pinion shaft with lever VW 296 until the taper roller bearing outer race contacts the gearbox cover.
- While maintaining pressure, rotate drive pinion 5 turns in both directions in relation to hollow shaft to settle double taper roller bearing.
- Then rotate drive pinion and hollow shaft 5 turns in both directions to settle taper roller bearing.



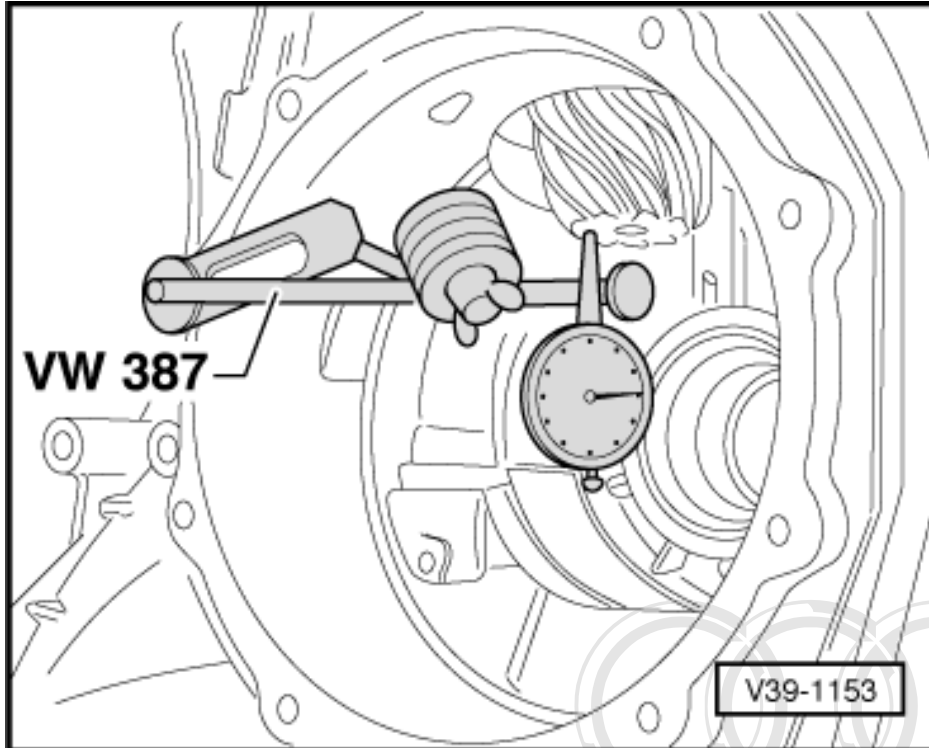
- -> Assemble measuring equipment, use a 30 mm dial gauge extension.

- Set dial gauge (3 mm measuring range) to "0" with 1 mm preload.

Note:

The dial gauge extension must contact the machined surface on the face of the pinion.

- Turn gearbox 180° so that the gearbox cover is upwards.



- Rotate drive pinion and hollow shaft 5 turns in both directions to settle taper roller bearing. Otherwise a false reading will be obtained.
- → Read off play on dial gauge and note reading.
 - Measurement in example: 0.45 mm

Note:

If the measurement has to be repeated, drive pinion must first be rotated another 5 turns in each direction to settle the taper roller bearing. Reset dial gauge to "0" with 1 mm preload.

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Formula:

"Stotal" = "S4*" + measurement + bearing preload

Example:

Inserted shim "S4*"	1.00 mm
+ Measurement (example)	0.45 mm
+ Bearing preload (constant)	0.15 mm
= Total shim thickness "Stotal" for "S3" + "S4"	1.60 mm

Determining thickness of shim "S3*"

Formula:

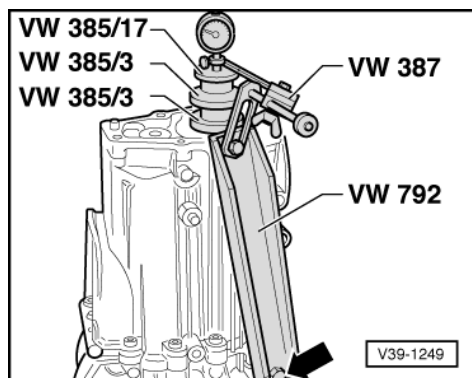
"S3*" = "Stotal" - "S4*"

Example:



Total shim thickness "Stotal" for "S3" + "S4"	1,60 mm
- Inserted shim "S4**"	1,00 mm
= Thickness of shim "S3**"	0,60 mm

- Remove double taper roller bearing outer race, fit shim "S3**" in gearbox housing and install outer race again
=> Fig. 158.
- Insert completely assembled pinion shaft in gearbox housing again.
- Fit gearbox cover and tighten bolts to 22 Nm.
- Rotate drive pinion together with hollow shaft and drive pinion separately in relation to hollow shaft 5 turns each in both directions to settle taper roller bearing.

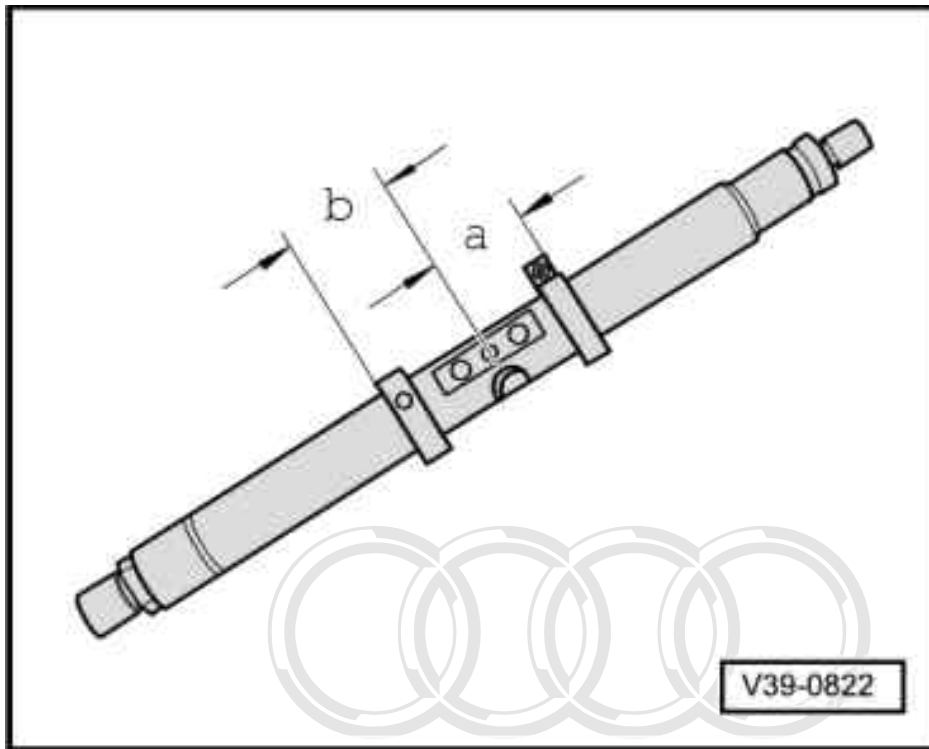


- -> Fit measuring tools and secure with bolt (arrow) to gearbox housing.
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.
- Loosen gearbox cover bolts and turn pinion shaft several times.
- If the correct shims have been selected the dial gauge will now indicate the following value:
 - 0.05 ... 0.15 mm
- Retighten gearbox cover bolts to 22 Nm.
- Remove measuring tools.
- Rotate drive pinion together with hollow shaft and drive pinion separately in relation to hollow shaft 5 turns each in both directions to settle taper roller bearing.



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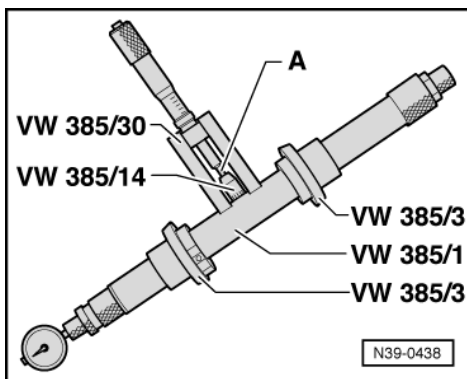
Determining measurement "e"



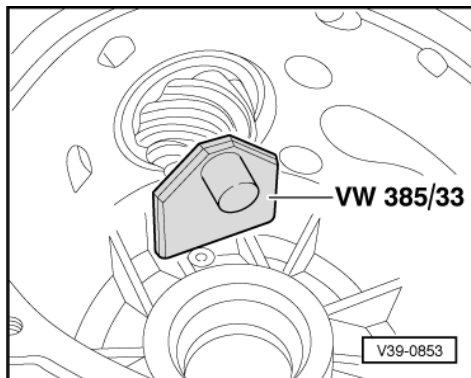
Note:

Measurement "e" is required to determine the final shim thickness of "S3" and "S4".

- -> Set adjustment rings of universal mandrel VW 385/1 to the following measurements:
- Distance a = 35 mm
- Distance b = 75 mm



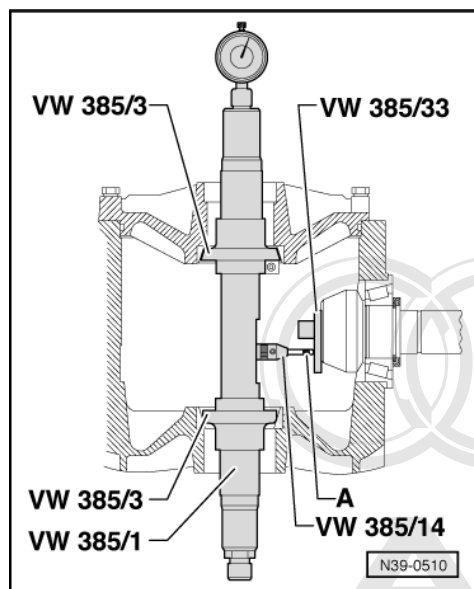
- -> Assemble universal mandrel VW 385/1 as shown in the illustration:
- Dial gauge extension -A-, 6.5 mm long
- Master gauge VW 385/30
- Set master gauge VW 385/30 to Ro = 54.95 mm (for 170 mm dia. crown wheel) and fit onto mandrel.
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.



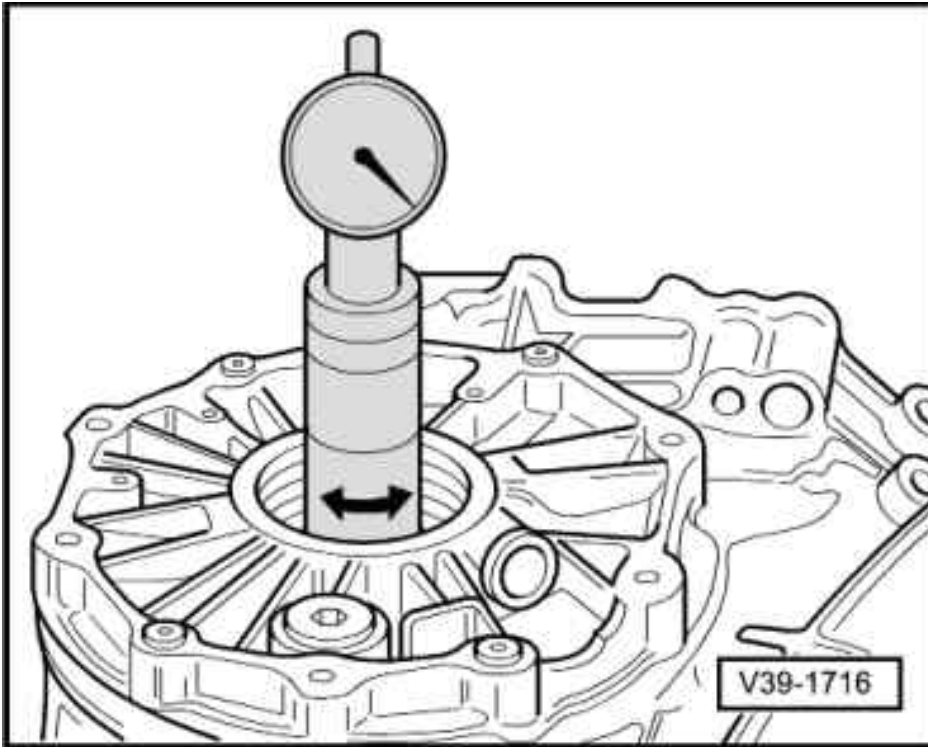
- -> Place end measuring plate on face of pinion shaft.

Note:

Ensure plate contact surface fits exactly and is free of oil.



- -> Remove master gauge and insert measuring mandrel in the housing.
- Dial gauge extension -A- = 6.5 mm long must be fitted
- The dial gauge faces towards the final drive cover
- Fit final drive cover and tighten 4 bolts to 22 Nm.
- Using the adjustable ring, move 2nd centring disc VW 385/3 out as far as possible so that the mandrel can still just be turned by hand.



- -> Turn mandrel until the dial gauge point touches the end measuring plate on pinion shaft head, then measure maximum deflection (return point).
- Measurement in following example: "e" = 0.26 mm (in red scale on dial)

Note:

Then, (after removing universal mandrel) check again that the dial gauge, with master gauge VW 385/30 in place, indicates "0" with 2 mm preload. Otherwise correct adjustments.

Determining thickness of shim "S3"

Formula:	
"S3"	= "S3*" + "r" + "e"
("e" in black scale)	
Or	
"S3"	= "S3*" + "r" - "e"
("e" in red scale)	

Notes:

- ◆ The deviation "r", which is related to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the crown wheel.
- ◆ If dial gauge reading is in red scale, subtract dimension "e".
- ◆ If dial gauge reading is in black scale, add dimension "e".

Example:	
Inserted shim "S3"	0.60 mm
+ Deviation "r"	0.38 mm
- Value determined for "e" (red scale)	0.26 mm
= Thickness of shim "S3"	0.72 mm

- Determine shim(s) as accurately as possible from table. Part numbers



=> Parts List

The following shims are available for "S3"

Shim thickness (mm) 1)		
0.40	0.55	0.70
0.45	0.60	0.75
0.50	0.65	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

Determining thickness of shim "S4"

Formula:	
"S4"	= "Stotal" - "S3"

Example:	
Total shim thickness "Stotal" for "S3" + "S4"	1.60 mm
- Thickness of shim "S3"	0.72 mm
= Thickness of shim "S4"	0.88 mm

- Determine shim(s) as accurately as possible from table. Part numbers

=> Parts List

The following shims are available for "S4"

Shim thickness (mm) 1)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

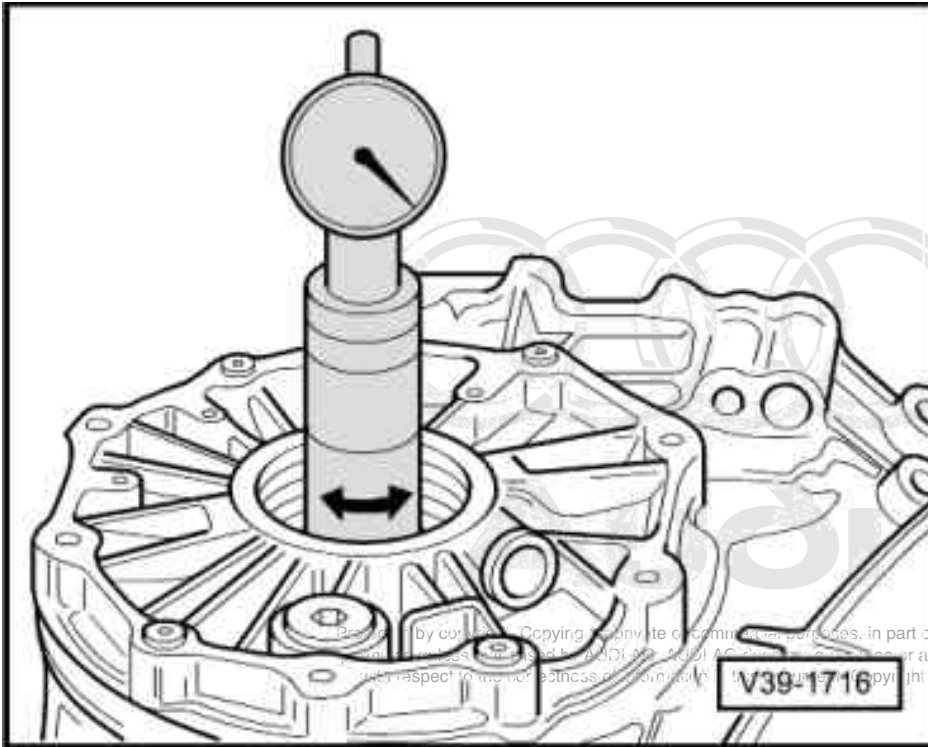
1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

Performing check measurement

Checking dimension "r"

- Install drive pinion and hollow shaft with shims "S3" and "S4" which have been measured.
- Rotate hollow shaft against drive pinion 5 turns in both directions to settle taper roller bearing.
- Rotate drive pinion and hollow shaft 5 turns in both directions to settle taper roller bearing.

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- -> Insert universal mandrel => "Determining measurement 'e'" on Page 205 , and perform check measurement.
- Read off dial gauge anti-clockwise (red scale).
 - If the shims have been correctly selected, the deviation "r" (marked on outer circumference of crown wheel) must be shown within a tolerance of ± 0.04 mm.

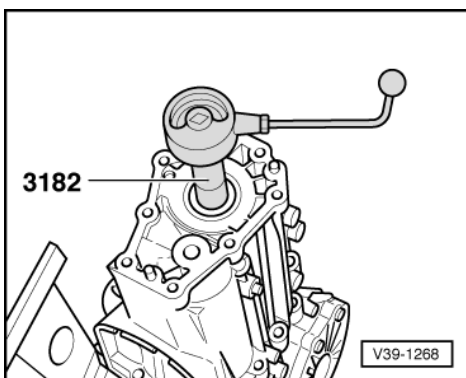
Note:

Then, (after removing universal mandrel) check again that the dial gauge, with master gauge VW 385/30 in place, indicates "0" with 2 mm preload. Otherwise correct adjustments.

Measuring frictional torque (check)

Notes:

- ♦ Taper roller bearings for drive pinion/hollow shaft are low friction bearings. Therefore the frictional torque only has a limited use as a check. Correct adjustment is only possible by determining the total shim thickness "Stotal".
- ♦ Do not additionally oil new taper roller bearings for frictional torque measurement. The bearings have already been treated with a special oil by the manufacturer.



- -> Fit torque gauge 0 ... 600 Ncm on drive pinion.
- Read off friction torque.

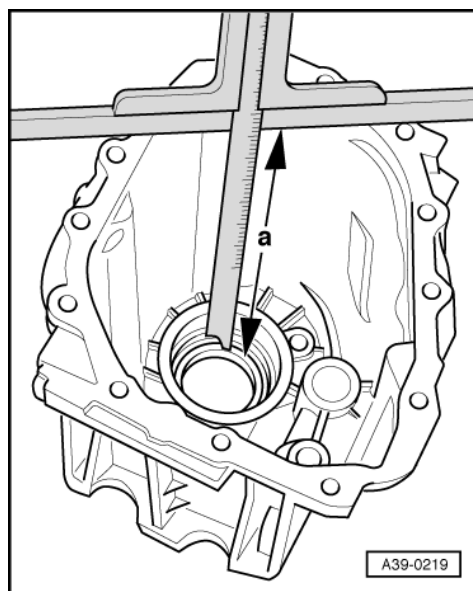
Frictional torque specified values:

New bearings	Used bearings
150 ... 250 Ncm	30 ... 60 Ncm

6.7 - Re-determining "S4" shim when fitting new gearbox cover

Special tools, testers and auxiliary equipment required

- ♦ 2 x centring disc VW 385/3
- ♦ Measuring plate VW 385/17
- ♦ Universal dial gauge bracket VW 387
- ♦ Fitting tool VW 792
- ♦ Dial gauge
- ♦ Dial gauge extension
- ♦ Depth gauge (accurate to within at least 5/100 mm)



- Clean housing flange.
- -> Measure difference in depth "a" on old and new gearbox cover.

Example:

Depth "a" on old gearbox cover	257.40 mm
Depth "a" on new gearbox cover	257.55 mm
= Difference	0.15 mm

- Install thicker shim "S4" if the new gearbox cover is deeper.
- Install thinner shim "S4" if the old gearbox cover is deeper.

Example:

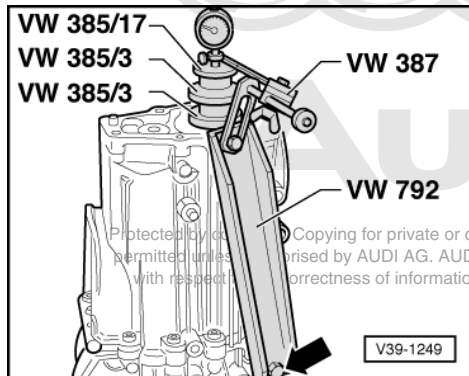
Previous shim "S4"	0.95 mm
+ Difference	0.15 mm
= New "S4" shim	1.10 mm

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Available shims => table on Page 208 .

- Install taper roller bearing outer race with shim "S4" in gearbox cover => Fig. 159 .
- Insert completely assembled pinion shaft in gearbox housing again.

- Fit gearbox cover and tighten bolts to 22 Nm.
- Rotate drive pinion together with hollow shaft and drive pinion separately in relation to hollow shaft 5 turns each in both directions to settle taper roller bearing.



- -> Fit measuring tools and secure with bolt (arrow) to gearbox housing.
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.
- Loosen gearbox cover bolts and turn pinion shaft several times.
- If the correct shims have been selected the dial gauge will now indicate the following value:
 - 0.05 ... 0.15 mm

If this reading is not obtained, adjustment must be corrected.

6.8 - Adjusting crown wheel

(Adjusting differential)

Repairs after which the crown wheel must be adjusted => adjustment overview on Page **198**.

Special tools, testers and auxiliary equipment required

- ◆ Dial gauge extension VW 382/10
- ◆ Measuring plate VW 385/17
- ◆ Drive pinion clamp VW 386 A
- ◆ Universal dial gauge bracket VW 387
- ◆ Measuring lever VW 388
- ◆ Thrust plate VW 402
- ◆ Press tool VW 408 A
- ◆ Thrust piece VW 472/1
- ◆ Adjustment tool for crown wheel VW 521
- ◆ Torque gauge 0 ... 600 Ncm
- ◆ Dial gauge
- ◆ Dial gauge extension

Determining total shim thickness "Stotal" for shims "S1" + "S2"

(Setting preload of taper roller bearing for differential)

- Pinion shaft removed

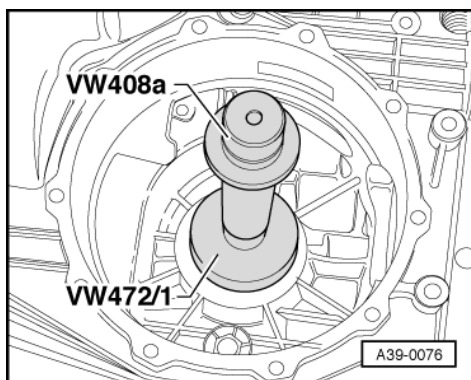
Note:

If only the taper roller bearings for the differential are being renewed, the crown wheel can be removed from the differential housing. The pinion shaft does not then need to be removed.

- Remove seal and outer races of both taper roller bearings for the differential.



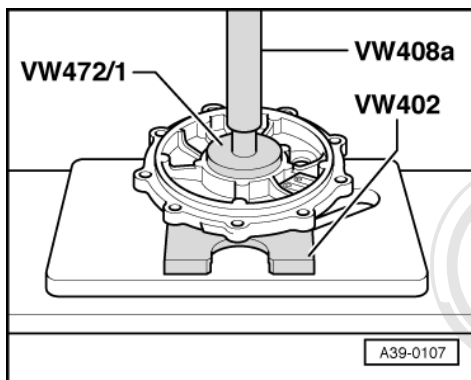
- Remove shims => Page 186 .



- -> Knock taper roller bearing outer race (small) with shim "S2" into gearbox housing => Fig. 190 . For measurement purposes use a 1.20 mm thick "S2*" shim (2 shims of 0.60 mm).

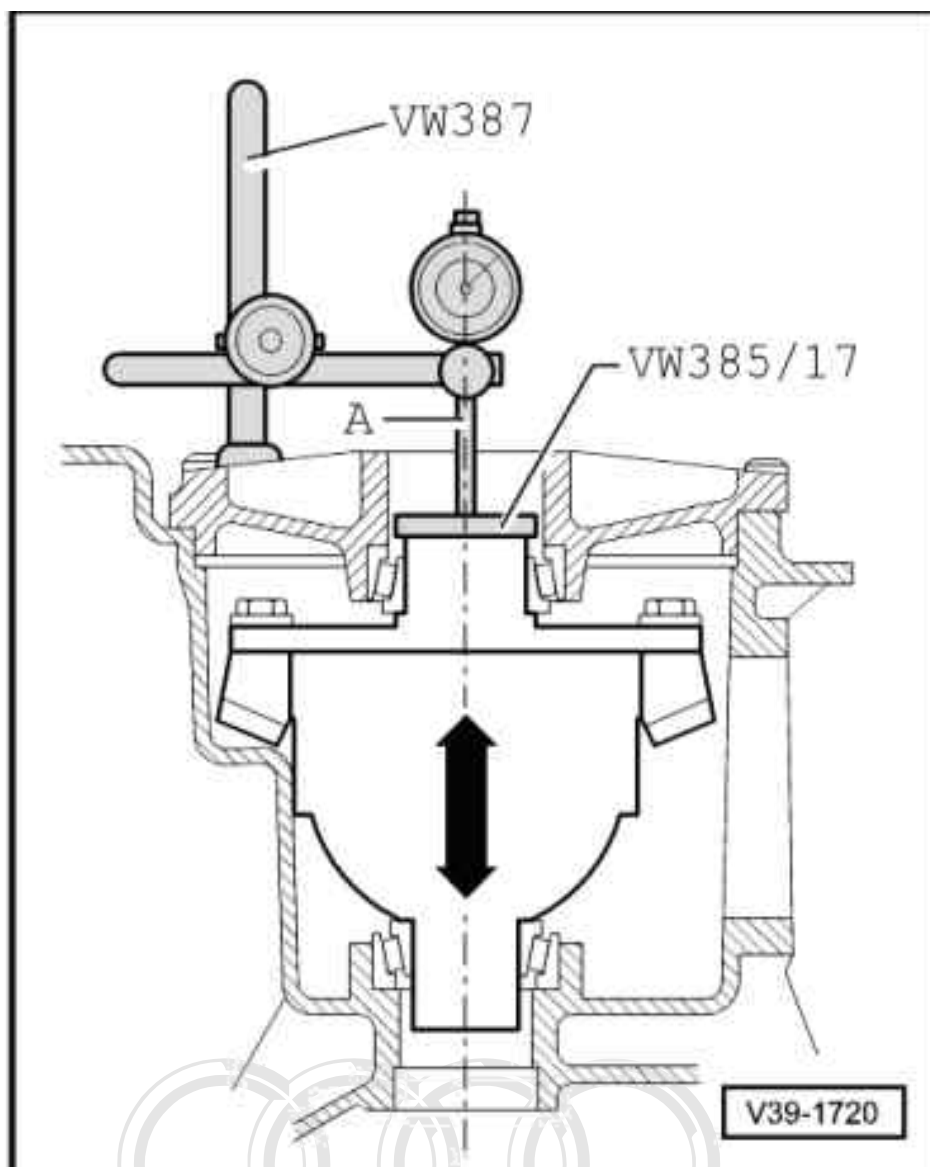
Note:

For measurement purposes a shim "S2" with a thickness of 1.20 mm is initially inserted. It is referred to as "S2" in the following. After determining the backlash "S2*" will be replaced by the correct "S2".*



- -> Press outer race for taper roller bearing without shim "S1" into cover for differential => Fig. 192 .
- Insert differential without drive wheel for speedometer sender -G22 into gearbox housing. The crown wheel is positioned on the left-hand side in front of the final drive cover .
- Install cover for differential with 4 bolts (25 Nm).
- Position gearbox so that cover for differential faces up.

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- Turn differential 5 turns in both directions to settle the taper roller bearing.
- -> Assemble measuring equipment, use a 30 mm dial gauge extension.
- Set dial gauge (3 mm measuring range) -A- to "0" with 2 mm preload.

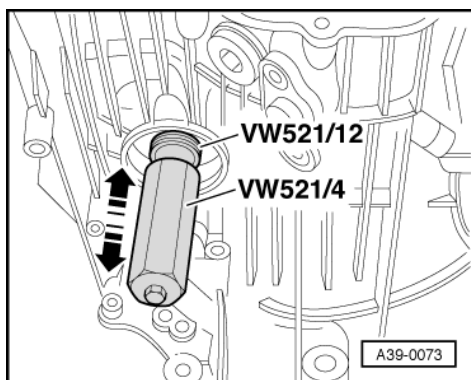
Note:

The tip of the dial gauge must be positioned on centre of differential.

- Lift differential without turning; read off play on dial gauge and note.
- Measurement in following example: 0.62 mm

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Notes:



- -> Secure special tools VW 521/4 and VW 521/12 on right of differential (gearbox side) to lift differential.
- If the measurement has to be repeated, drive pinion must first be rotated another 5 turns in each direction to settle the taper roller bearing.

Formula:

$$\text{"Stotal"} = \text{"S2*"} + \text{measurement} + \text{bearing preload}$$

Example:

Inserted shim(s) "S2*"	1.20 mm
+ Measurement	0.62 mm
+ Bearing preload (constant)	0.30 mm
= Total shim thickness "Stotal" for "S1" + "S2"	2.12 mm

Determining thickness of shim "S1"

Notes:

- The preliminary adjustment shim "S1*" will be replaced with the final shim "S1" after determining the backlash.
- The total shim thickness "Stotal" remains the same.

Formula:

$$\text{"S1*"} = \text{"Stotal"} - \text{"S2*"} =$$

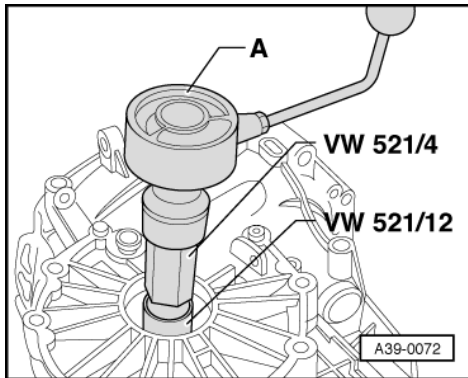
Example:

Total shim thickness "Stotal" for "S1" + "S2"	2.12 mm
- Inserted shim(s) "S2*"	1.20 mm
= Thickness of shim "S1"	0.92 mm

Measuring frictional torque (check)

Notes:

- Differential taper roller bearings are low friction bearings. Therefore the frictional torque only has a limited use as a check. Correct adjustment is only possible by determining the total shim thickness "Stotal".
- Do not additionally oil new taper roller bearings for frictional torque measurement. The bearings have already been treated with a special oil by the manufacturer.
- Pinion shaft removed



- -> Fit torque gauge 0 ... 600 Ncm -A- onto differential.

B - Socket

- Read off friction torque.

Frictional torque specified values:

New bearings	Used bearings
150 ... 350 Ncm	30 ... 60 Ncm

Note:

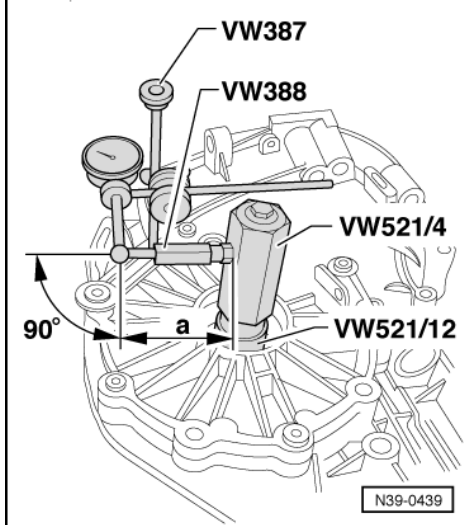
If the final drive set is being re-adjusted, the adjustment of the pinion shaft should be performed now, and the adjustment should be checked =>Page 200.

Measuring backlash

(Position of crown wheel in gearbox housing)

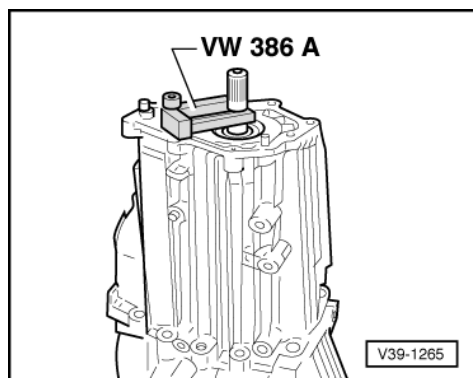
- Pinion shaft with shims "S3" and "S4" installed
- Install differential.
- Turn differential 5 turns in both directions so that the taper roller bearings settle.

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- -> Secure dial gauge retainer VW 387 to the housing.
- Attach crown wheel adjusting device VW 521/4 and VW 521/12.
- Fit dial gauge with dial gauge extension VW 382/10 (6 mm flat).
- Adjust measuring lever VW 388 to dimension "a" = 67 mm (for 170 mm dia. crown wheel).

- Measure play between teeth flanks (backlash) as follows:
 - Turn crown wheel until it makes contact with a tooth flank (end of backlash travel).
 - Preload dial gauge to 2 mm and set to zero.
 - Turn crown wheel back until lying against an opposite tooth flank (backlash).
- Read off backlash and note value.
- Turn crown wheel through 90° and repeat measurements a further 3 times.



Notes:

- ♦ -> If drive pinion rotates when the differential is turned, fit clamp VW 386 A so that backlash can be measured accurately.
- ♦ Loosen the clamp in order to turn the crown wheel.

Determining average backlash

- Add the four measured values together and divide by four.

Example:	
1st Measurement	0.28 mm
+ 2nd Measurement	0.30 mm
+ 3rd Measurement	0.30 mm
+ 4th Measurement	0.28 mm
= Sum of measured values	1.16 mm

- Result: The average backlash is 1.16 divided by 4 = 0.29 mm

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Note:

If the individual measurements differ by more than 0.06 mm this means that the installation of the crown wheel is not correct or that the final drive set itself is defective. Check installation, replace final drive set, if necessary.

Determining thickness of shim "S2"

Formula:	
"S2"	= "S2*" - backlash + lift

Example:	
Inserted shim "S2"	1.20 mm
- Average backlash	0.29 mm
+ Lift (constant)	0.15 mm
= Thickness of shim "S2"	1.06 mm

- Determine shim(s) as accurately as possible from table. Part numbers

=> Parts List

The following shims are available for "S2"

Shim thickness (mm) 1)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

Determining thickness of shim "S1"

Formula:		
"S1"	=	"Stotal" - "S2"

Example:		
Total shim thickness "Stotal" for "S1" + "S2"		2.12 mm
- Thickness of shim "S2"		1.06 mm
= Thickness of shim "S1"		1.06 mm

- Determine shim(s) as accurately as possible from table. Part numbers

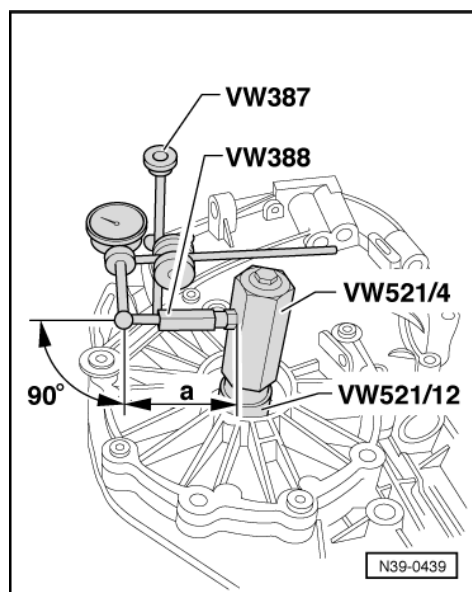
=> Parts List

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The following shims are available for "S1"

Shim thickness (mm) 1)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.





-> Check measurement

- After installing shims "S1" and "S2", turn the differential 5 turns in both directions so that the taper roller bearings settle.
- Measure backlash four times on circumference.
 - Specified value: 0.12 ... 0.22 mm

Notes:

- ♦ If the backlash is beyond the tolerance, the adjustments must be repeated. The total shim thickness "Stotal" must not be changed.
- ♦ The individual measurements must not differ by more than 0.06 mm from each other.

7 - Servicing prop shaft

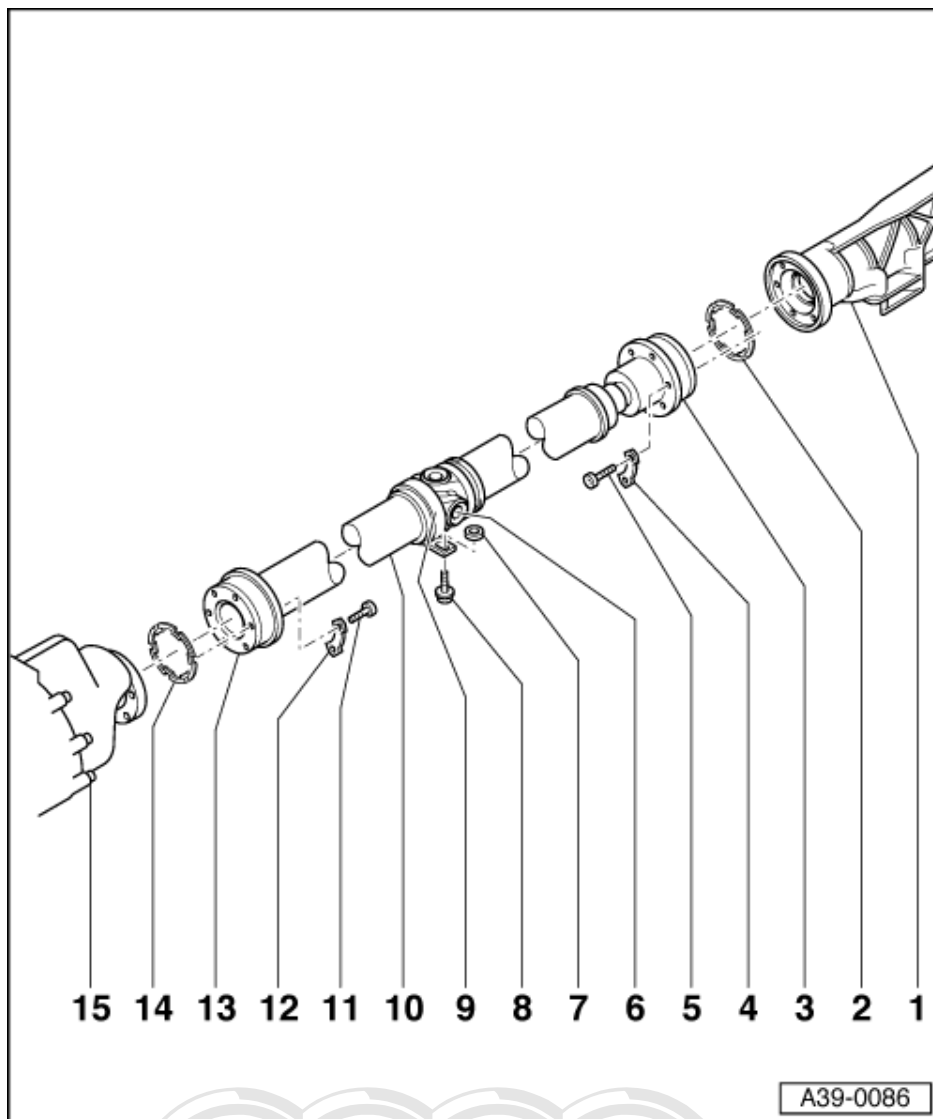
7.1 - Servicing prop shaft

Notes:

- ♦ General repair instructions => Page 10 .
- ♦ Do not bend the propshaft more than 25° at the central joint, otherwise the universal joint will be damaged.
- ♦ Only store and transport propshaft extended.
- ♦ No repair work can be carried out on the propshaft with the exception of removing, installing and adjusting.
- ♦ If the propshaft is only detached at the gearbox or from rear final drive then the propshaft is to be tied-up or supported at the constant velocity joint.
- ♦ Before removing, mark position of propshaft joint in relation to rear flange. Reinstall in the same positions otherwise the imbalance will be excessive; the bearings could be damaged and humming noises may occur.
- ♦ If complaints are received (noises, vibrations), it is essential to check whether correct adjustment of the propshaft rectifies the fault before replacing the propshaft.
- ♦ After removing the propshaft from the rear final drive, the additional balance disc (thicker washer) that may be located between the lock plate and the bolt head must not be reinstalled.



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1 Rear final drive

2 Gasket

- ◆ Replace
- ◆ Detach protective foil and stick self-adhesive side of the gasket onto flange shaft
- ◆ Degrease flange shaft

3 Constant velocity joint

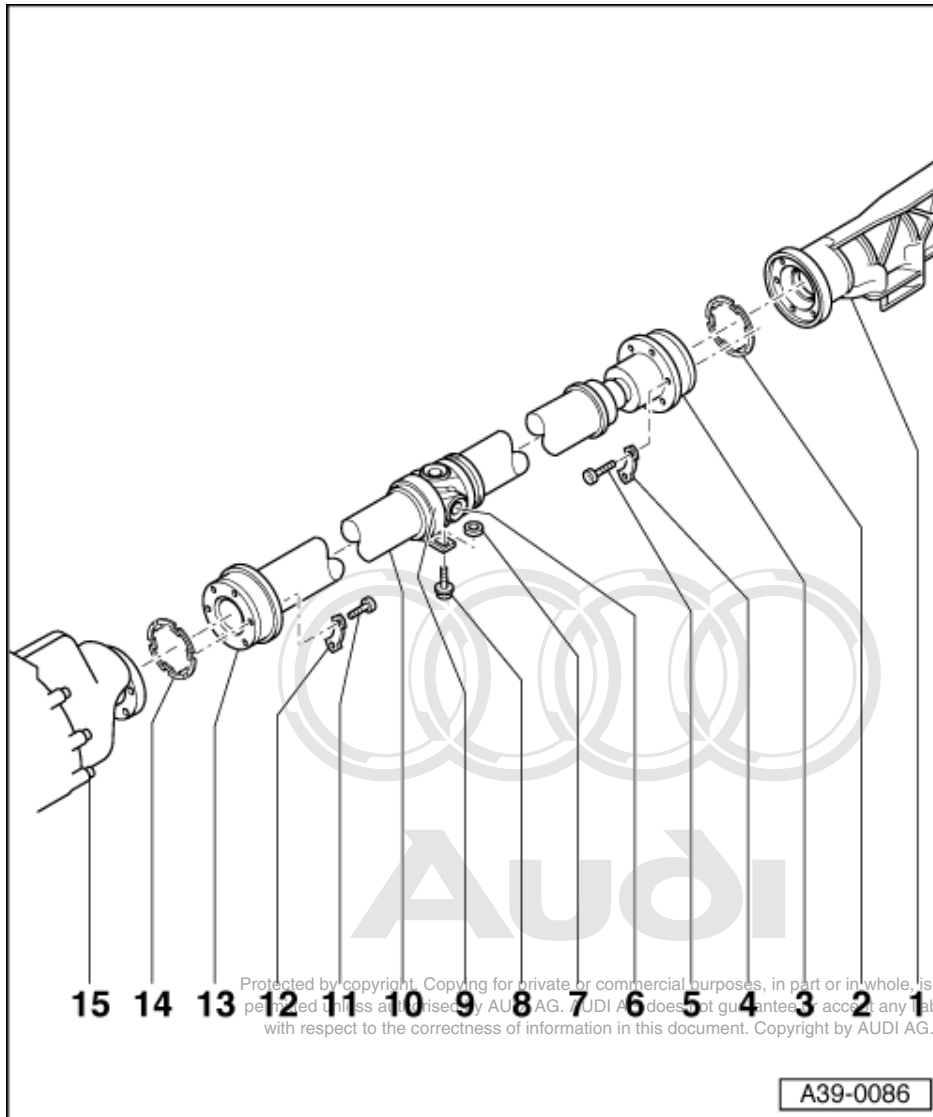
- ◆ Max. permissible angle of deflection 8°

4 Shim

**5 Hexagon socket-head bolt
- 55Nm**

- ◆ Self-locking
- ◆ Replace
- ◆ Threads for bolts in flange shafts must always be cleaned (e.g. with a thread tap).

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6 Universal joint

- ♦ Max. permissible angle of deflection 25°

7 Adjustment shim

- ♦ Determining thickness => Page 227

8 Hexagon bolt - 23 Nm

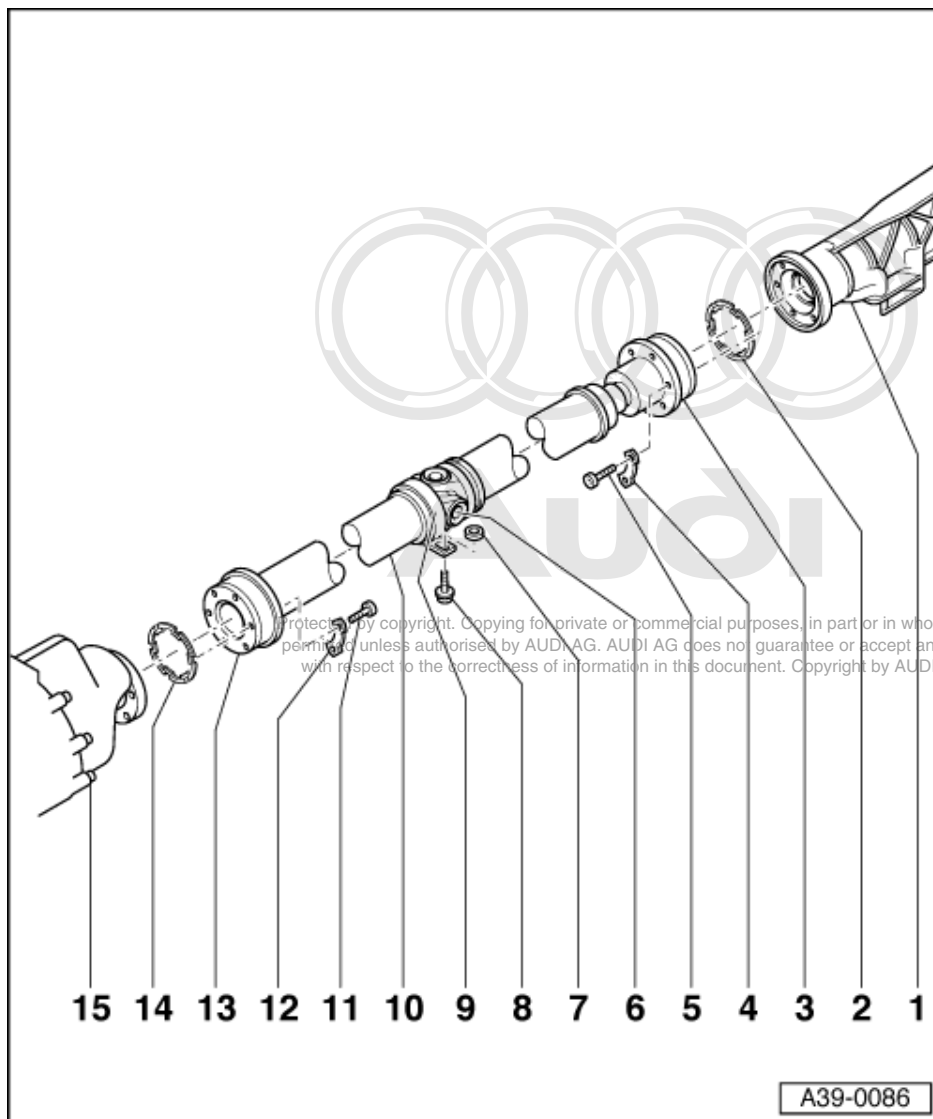
9 Propshaft centre mounting

10 Prop shaft

- ♦ Adjusting => Page 225

11 Hexagon socket-head bolt - 55Nm

- ♦ Self-locking
- ♦ Replace
- ♦ Threads for bolts in flange shafts must always be cleaned (e.g. with a thread tap).



12 Shim

13 Constant velocity joint

- ♦ Max. permissible angle of deflection 8°

14 Gasket

- ♦ Replace
- ♦ Detach protective foil and stick self-adhesive side of the gasket onto flange shaft
- ♦ Degrease flange shaft

15 Manual gearbox

7.2 - Removing and installing prop shaft

Special tools, testers and auxiliary equipment required

- ♦ Assembly tool 3298
- Observe notes=> Page 218 .

Removing

- Remove cross member, if fitted, underneath exhaust system.



- Remove rear section of exhaust system as from clamp(s):

=> 4-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing parts of exhaust system Removing and installing parts of exhaust system

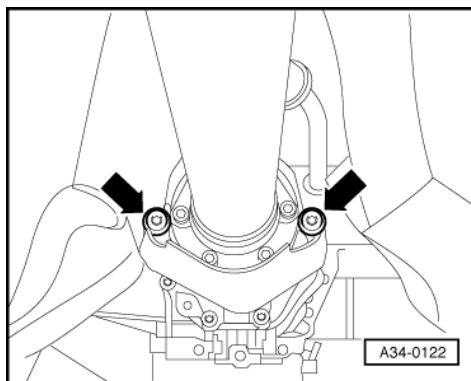
=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

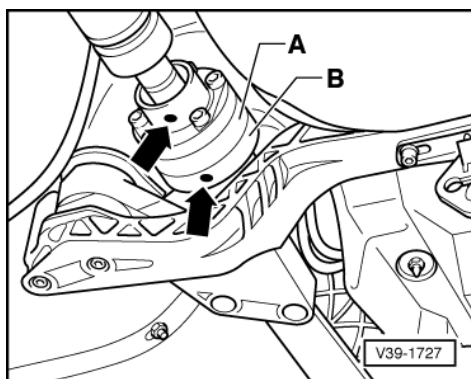
Removing

- Remove heat shield above propshaft.



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- -> Remove heat shield for propshaft from cover for Torsen differential -arrows-.

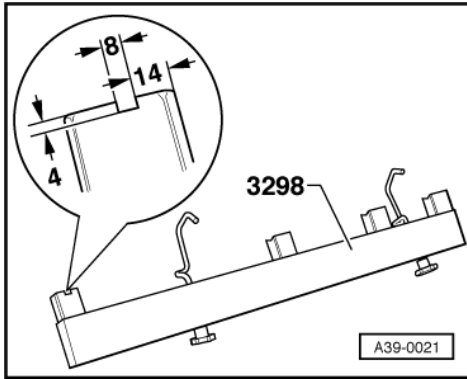


- -> Check for presence of a factory mark (coloured dot -arrows-) at the prop shaft and at the rear axle drive flange/prop shaft. If there is no mark, make a coloured mark on rear axle drive -B- to indicate the position of prop shaft flange -A-.

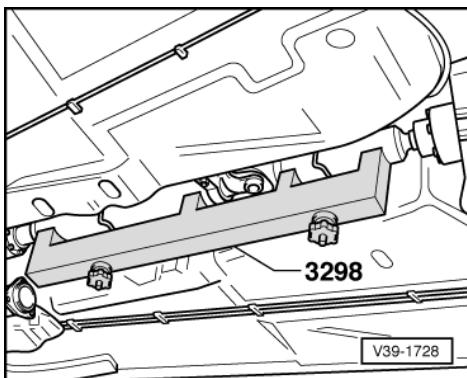
Note:

This marking is only required if same propshaft is to be re-installed later.

- Release fastening bolts for prop shaft flange.



- -> Cut out the assembly device 3298, as illustrated in Fig.
- Remove the three upper securing bolts from each constant velocity joint on the propshaft.
- Loosen securing bolts of centre propshaft mounting slightly.



- -> Engage assembly device 3298 and tighten plastic nuts.

Note:

Never fit assembly appliance onto balance plates.

- Remove securing bolts of flange to gearbox and to rear final drive as well as securing bolts of centre propshaft mounting.
- Slide propshaft together towards rear final drive. The constant velocity joints move along their axes.
- Guide out propshaft with assembly appliance past gearbox flange.

Note:

Only transport and store propshaft when extended.

Installing

Installation is carried out in the reverse order, when doing this note the following:

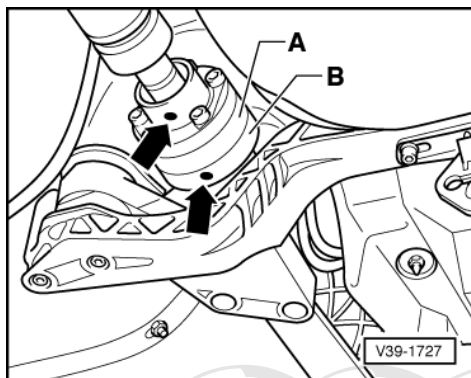
Notes:

- ◆ It is essential that the locking fluid remaining in the threads in the flange shafts on the gearbox and rear final drive is cleaned out after removing the propshaft. Otherwise there is a danger that the new bolts will seize when they are screwed in and then shear if they have to be removed later.
- ◆ The threaded holes can be cleaned with a thread tap.

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- ♦ Renew gaskets on flange shafts (detach protective foil and stick gasket onto flange shaft). The adhesive surface must be free of grease.



- ♦ -> To prevent imbalance, install flanges of prop shaft -A- and rear final drive -B- in such a way that the factory markings (or coloured markings made on removal) are in a line -arrows-.
 - ♦ If a new propshaft is installed and if the factory colour marking on the flange of the rear final drive is no longer visible the radial run-out on the propshaft flange must be measured => Page 225 and the colour marking on the propshaft placed in line with the new marking on the flange.
 - ♦ After removing the propshaft from the rear final drive, the additional balance disc (thicker washer) that may be located between the lock plate and the bolt head must not be reinstalled.
 - ♦ Replace prop shaft bolts (self-locking).
- Adjust propshaft after installing => Page 225 .
 - Stress free alignment of exhaust system

=> 4-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

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=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, alignment of exhaust system Removing and installing exhaust system parts, alignment of exhaust system

Tightening torques

Component	Nm
Propshaft to gearbox (Drive flange)	55
Prop shaft to final drive (input flange)	55
Propshaft centre mounting to body	23
Heat shield for propshaft to gearbox	23
Cross member to body	25
Nuts for clamp	40

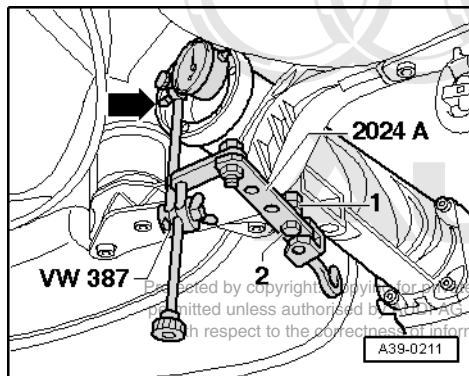
7.3 - Measuring and marking radial run-out at propshaft flange

Special tools, testers and auxiliary equipment required

- ◆ Universal dial gauge bracket VW 387
- ◆ Lifting tackle 2024 A
- ◆ Dial gauge
- ◆ Bolt M10 x 85

Notes:

- ◆ It is always necessary to measure radial run-out when thrust tube has been removed. Affix a new coloured dot and remove the old colour marking.
- ◆ If a new propshaft is installed and if the marking on the flange shaft of the rear final drive is no longer visible the position of maximum radial run-out must be determined and marked by a coloured dot.
- ◆ The coloured dot on the propshaft is positioned opposite the above coloured dot => Page 223 .
- ◆ The radial run-out can be measured when rear final drive is installed but the propshaft must be disconnected at rear final drive. Observe notes=> Page 218 .
- Remove bolt on front left of rear gearbox support.



- -> Remove lug from lifting appliance 2024 A and secure it at free hole with an M10 x 85 mm bolt -2-. Use approx. 5 M12 nuts -1- as spacers.
- Secure dial gauge bracket VW 387 to lug when it is secured in position.
- Position dial gauge on ground diameter in propshaft flange -arrow- and set to "0" with 1 mm preload.
- Rotate the differential by turning the two rear wheels (left and right-hand flange shafts) simultaneously in one direction until the propshaft flange has undergone one complete revolution.
- Mark the position of greatest radial run-out on flange exterior by a coloured dot (equates to greatest distance from rotational axis).
- Remove old marking from propshaft flange.
- Install propshaft => Page 223 .

7.4 - Adjusting propshaft

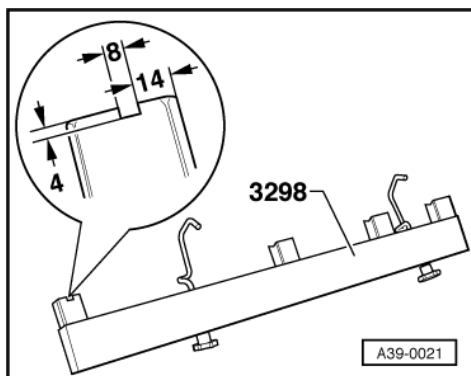
Special tools, testers and auxiliary equipment required

- ◆ Assembly tool 3298
- Observe notes=> Page 218 .

Adjustments must be carried out with the greatest care and attention since a poorly adjusted propshaft is often the cause of vibration and humming.

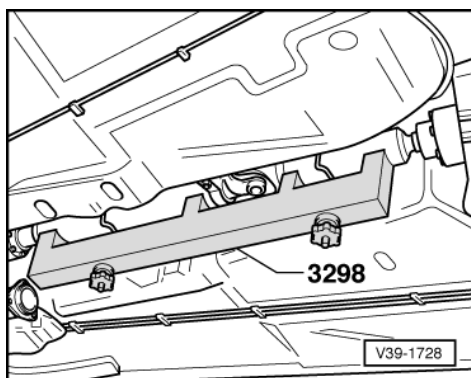
- Remove cross member, if fitted, underneath exhaust system.
- Remove rear section of exhaust system as from clamp(s):

- => 4-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts
- => 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing parts of exhaust system Removing and installing parts of exhaust system
- => 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system
- => 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system
- => 6-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts
- Remove heat shield above propshaft.



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- -> Cut out the assembly device 3298, as illustrated in Fig.
- Loosen securing bolts of centre propshaft mounting slightly.

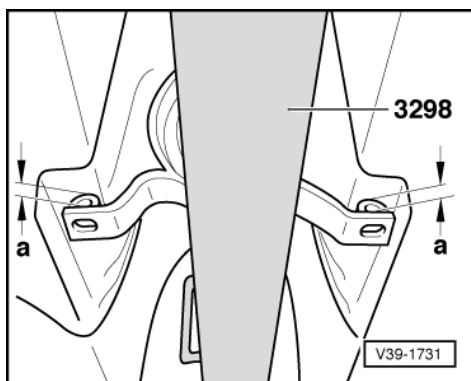


- -> Engage assembly device 3298 and tighten plastic nuts.

Note:

Never fit assembly appliance onto balance plates.

- Remove securing bolts and shims from centre mounting.



- -> Align centre propshaft mounting so that the dimension -a- on left-hand side is the same as dimension -a- on right-hand side.
- Measure the distances -a-.
- Select required shims from table. Part numbers

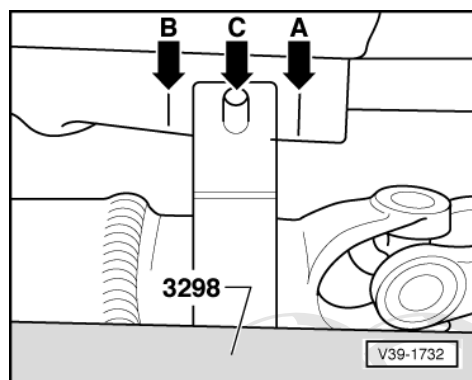
=> Parts List

The following shims are available

Distance -a- (mm)	Shim thickness (mm)
0 ... 3.0	-
3.1 ... 5.0	2
5.1 ... 7.0	4
7.1 ... 9.0	6
9.1 ... 11.0	8
11.1 ... 13.0	10

- Install correct shims on left and right.

Aligning propshaft longitudinally



- -> Slide propshaft with assembly device to rear onto stop.
- Mark position of centre mounting on body -arrow A-.
- Push the propshaft with the assembly device forward as far as it will go.
- Mark position of centre mounting on body -arrow B-.
- Align propshaft -arrow C-.
- The centre mounting must be positioned centrally between the markings -A- and -B-.
- Install securing bolts of propshaft centre mounting and previously determined shims and tighten.
- Remove assembly device.
- Install heat shield above propshaft.

The remaining installation steps are carried out in the reverse sequence - note the following points:

- **Stress free alignment of exhaust system**

=> 4-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system



=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

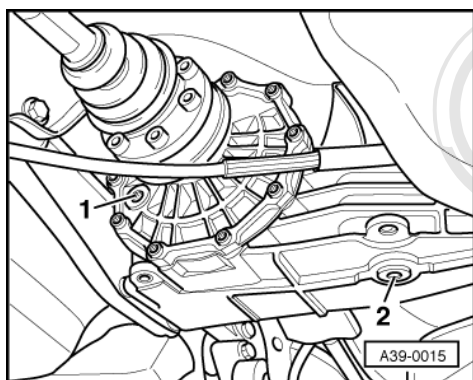
=> 6-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

Tightening torques

Component	Nm
Propshaft centre mounting to body	23
Cross member to body	25
Nuts for clamp	40

8 - Checking gear oil level in rear final drive

8.1 - Checking gear oil level in rear final drive



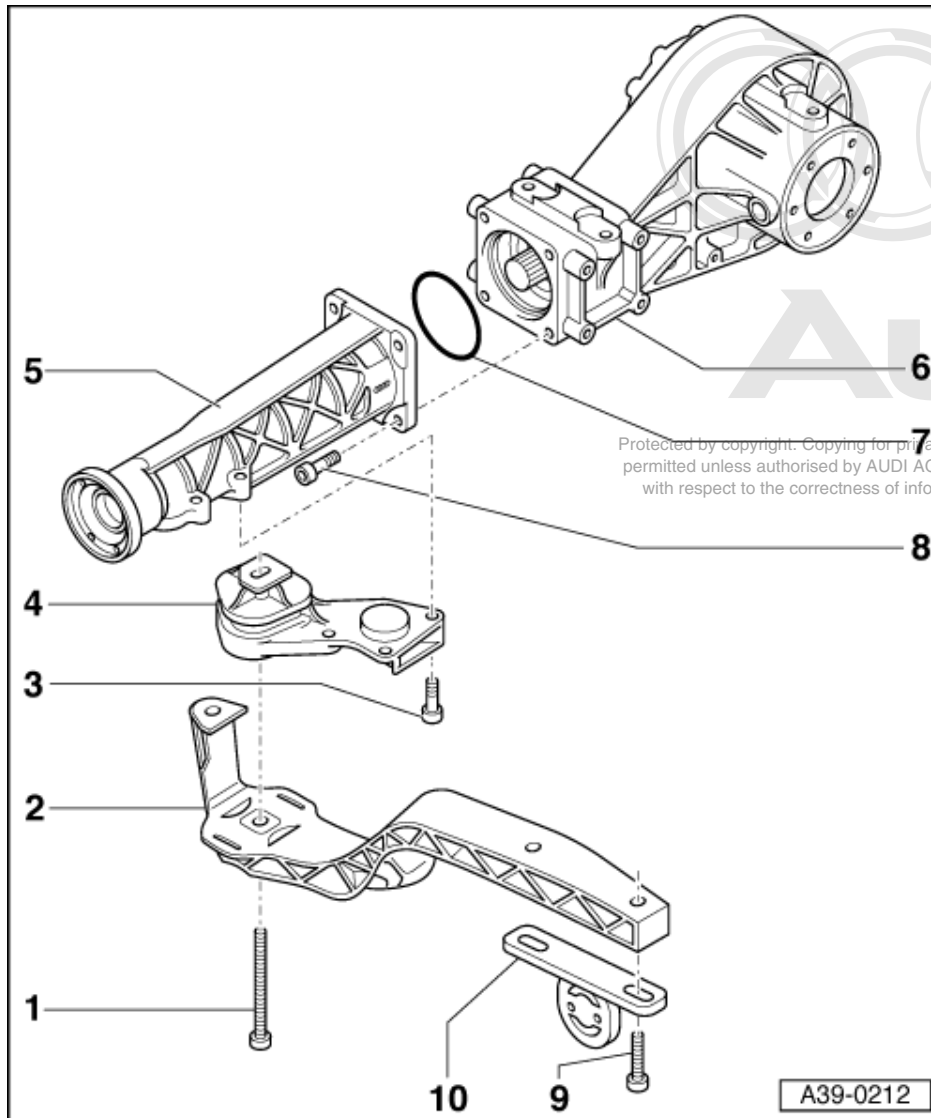
- -> Remove oil filler plug -1- to check final drive oil level.
- Specified value: oil level up to lower edge of filler hole
- Top up with gear oil, if necessary: Specification => Page 6
- Fit oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	35

9 - Removing and installing thrust tube

9.1 - Removing and installing thrust tube



9.2 - Assembly overview

- 1 Release and tighten bolt - 40 Nm
- 2 Front cross member
- 3 Release and tighten bolt - 40 Nm
- 4 Final drive support
- 5 Thrust tube
- 6 Housing of rear final drive
- 7 O-ring
- 8 Release and tighten bolt - 35 Nm
- 9 Release and tighten bolt - 23 Nm
- 10 Bracket
 - ♦ For exhaust system



9.3 - Removing

- Rear final drive installed

Special tools, testers and auxiliary equipment required

- ♦ Multi-purpose tool VW 771 with 771/15
- ♦ Drip tray V.A.G 1306
- ♦ Universal mount V.A.G 1359/2
- ♦ Engine/gearbox lifter V.A.G 1383 A

- Place drip tray V.A.G 1306 underneath and drain gearbox oil.
- Remove rear section of exhaust system as from clamp(s):

=> 4-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

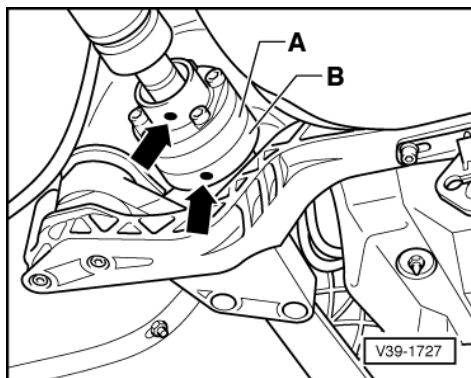
=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing parts of exhaust system Removing and installing parts of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

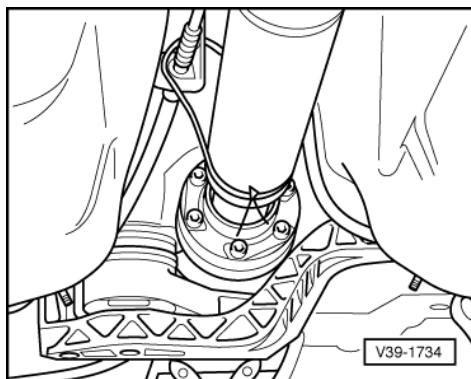
=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

- Remove heat shield above propshaft.



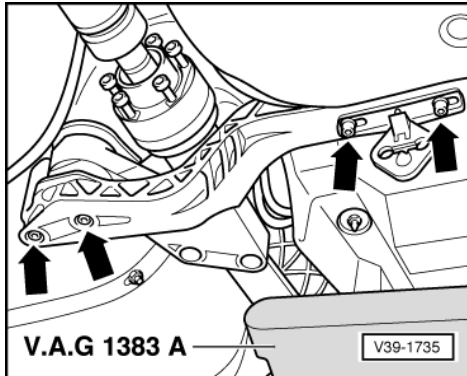
- Remove heat shield next to rear final drive.
- -> Check whether there is a factory marking (paint spot) on propshaft. If there is no mark, make a coloured mark on rear axle drive -B- to indicate the position of prop shaft flange -A-.
- Unscrew fastening bolts for propshaft flange.



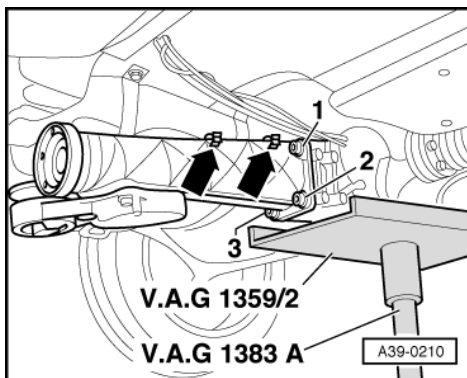
- -> Secure propshaft to handbrake cable bracket with wire.

Note:

*If it is not possible to push propshaft up and off flange, lower final drive before tying up propshaft. When lowering final drive, prevent propshaft from dropping down, and do not bend centre joint further than maximum angle permitted => notes on Page **218**.*



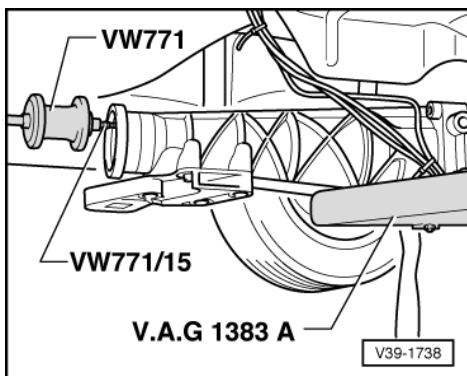
- Support final drive with gearbox lifter V.A.G 1383 A.
- -> Unscrew bolts -arrows- from front of cross member for rear axle drive.
- Detach front cross member.



- Lower final drive about 10 cm.
- -> Unscrew 4 bolts for thrust tube -1 ... 3-

Note:

Fourth bolt is not visible in illustration.



- -> Pull off flange shaft with thrust tube.

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9.4 - Installing

Installation is carried out in the reverse order, when doing this note the following:

Notes:

- ♦ It is essential that the locking fluid remaining in the threads in the flange shafts on the gearbox and rear final drive is cleaned out after removing the propshaft. Otherwise there is a danger that the new bolts will seize when they are screwed in and then shear if they have to be removed later.
 - ♦ The threaded holes can be cleaned with a thread tap.
 - ♦ Replace gasket between prop shaft and drive flange (remove protective sheet and bond gasket to flanged shaft). The adhesive surface must be free of grease.
 - ♦ Replace prop shaft bolts (self-locking).
- If there is a factory marking on the propshaft adjust the radial run-out on the propshaft flange=>Page 225 and place the colour marking on the propshaft in line with the new marking on the flange.
- Stress free alignment of exhaust system

=> 4-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing parts of exhaust system Removing and installing parts of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

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=> 6-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

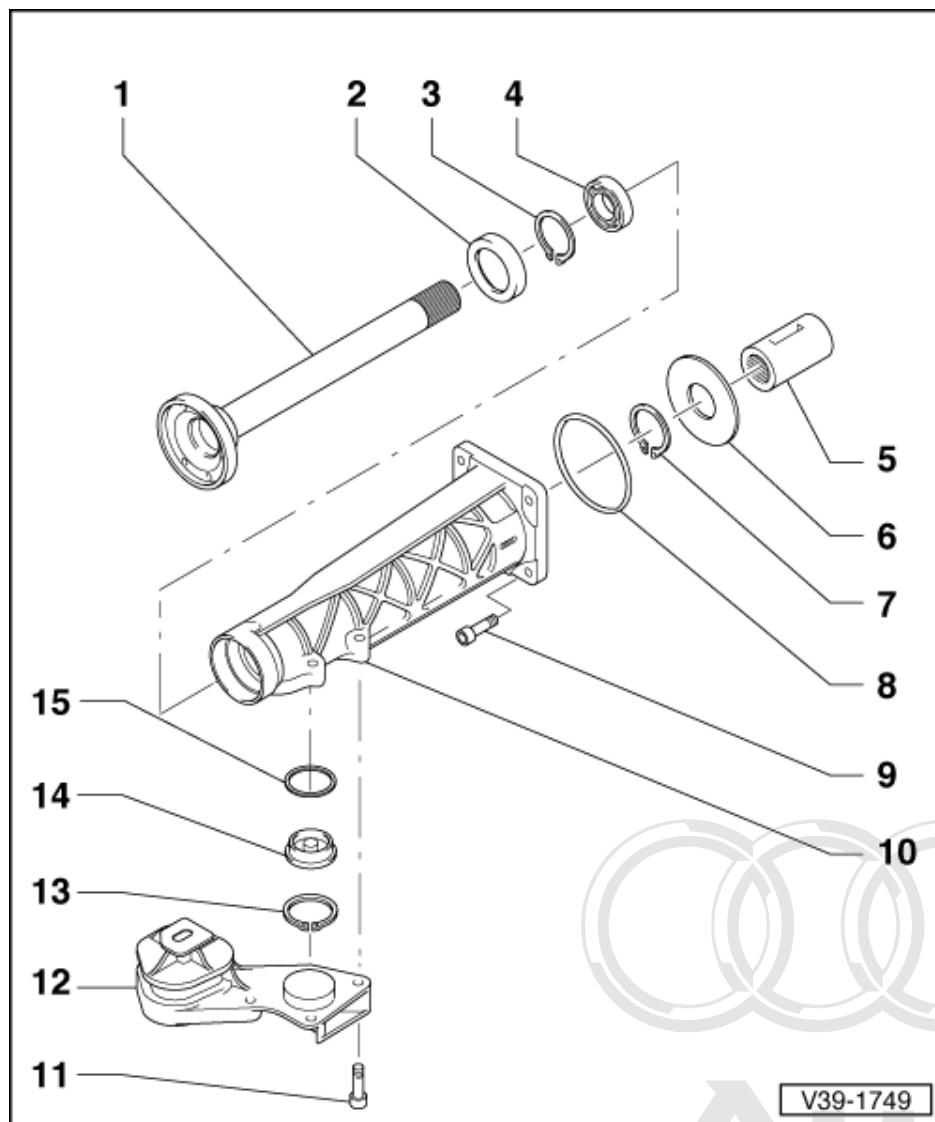
- Top-up gear oil in rear final drive and check oil level => Page 228 .

Tightening torques

Component	Nm
Thrust tube to rear final drive	35
Prop shaft to final drive (input flange)	55
Front cross member for rear final drive to body	40
Front cross member for rear final drive with exhaust system bracket to body	23
Oil filler plug	35
Nuts for clamp	40

10 - Dismantling and assembling thrust tube - assembly overview

10.1 - Dismantling and assembling thrust tube - assembly overview



Note:

Removing and installing thrust tube => Page 229
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1 Flange shaft

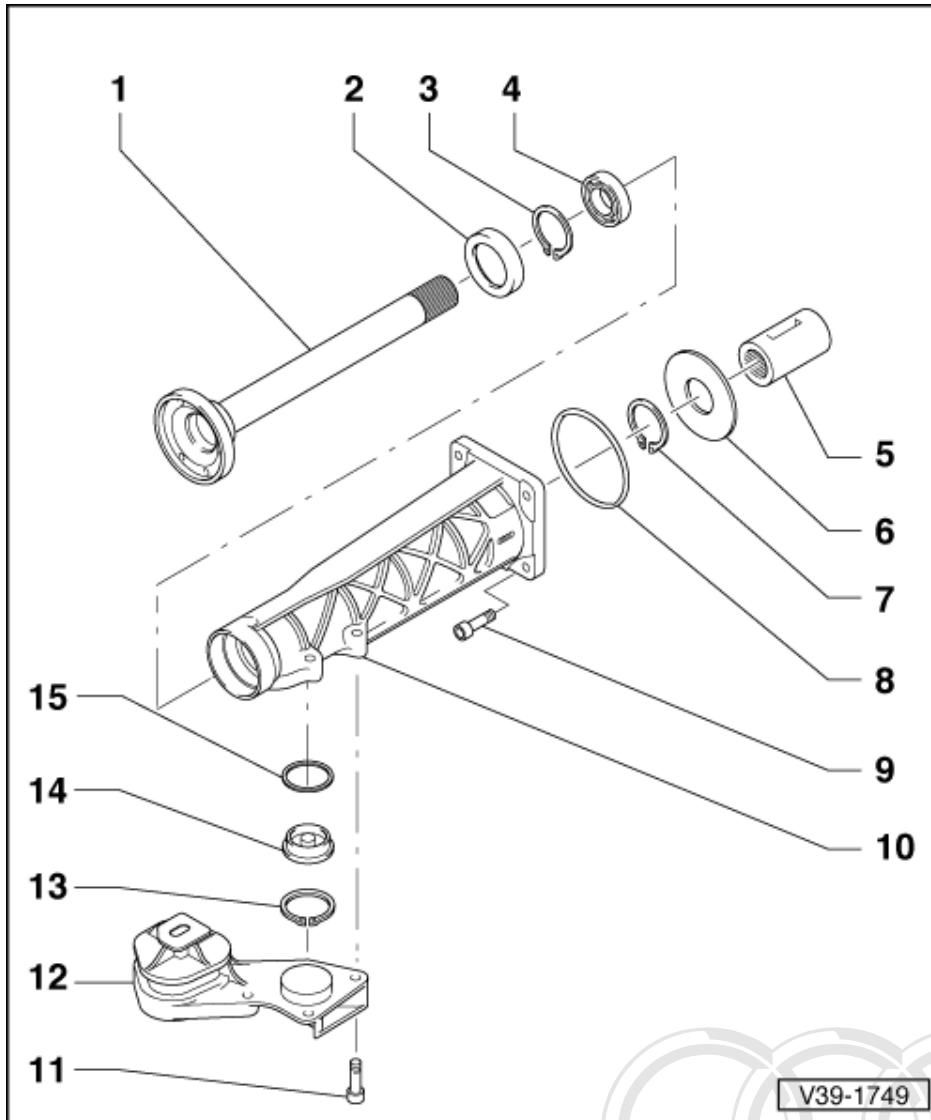
- ♦ Removing => Page 237
- ♦ When installing flange shaft, circlip -Item 239

2 Sealing ring

- ♦ Levering out => Page 237
- ♦ Driving in => Page 239

3 Circlip

- ♦ Removing => Page 237



4 Grooved ball bearing for flange shaft

- ♦ Pulling out => Page 238
- ♦ Pressing in =>Page 238

5 Socket weld

- ♦ Pulling off => Page 236
- ♦ Pressing on =>Page 239

6 Baffle plate

- ♦ Press out only if damaged
- ♦ Installing => Page 238

7 Circlip

- ♦ To remove flange shaft, open out circlip => Page 237

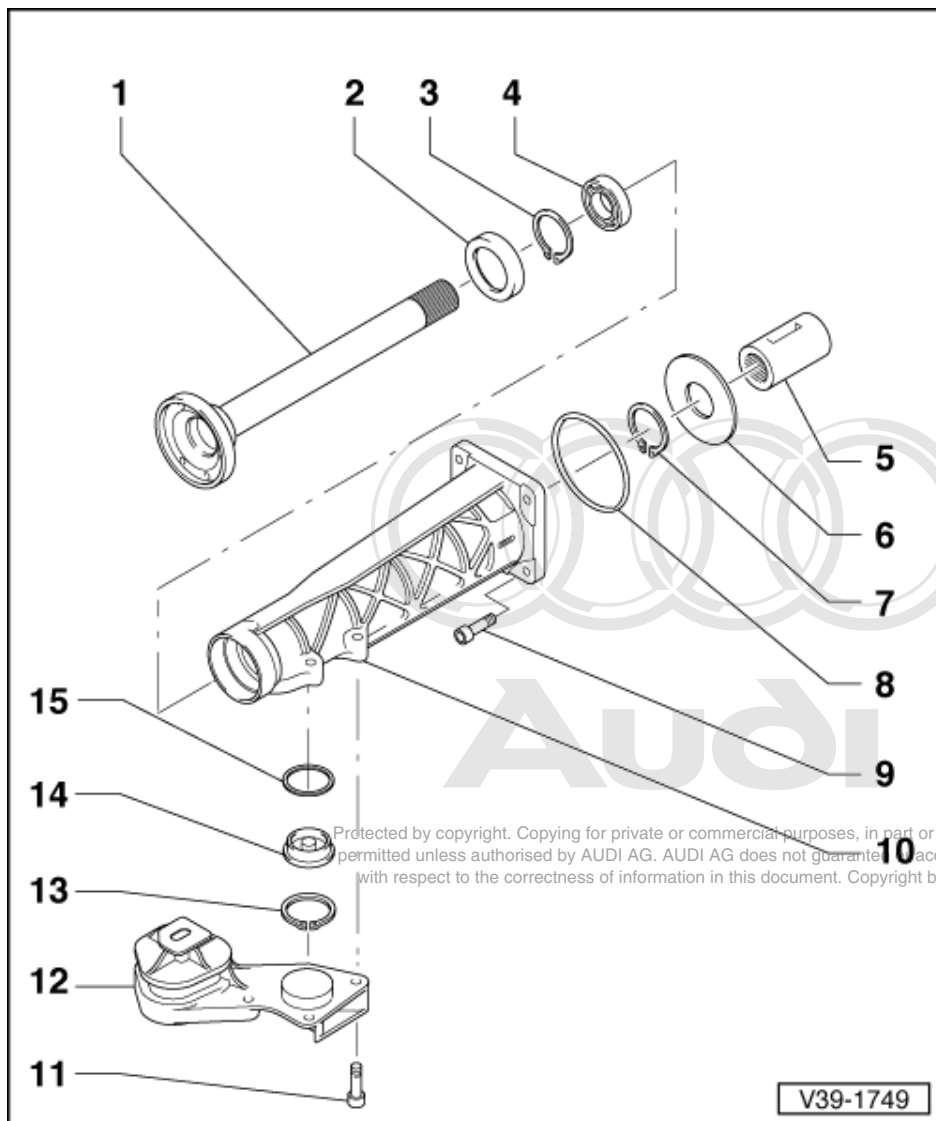
8 O-ring

- ♦ Replace

9 Release and tighten bolt - 35 Nm

- ♦ Secures thrust tube to rear final drive housing

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10 Thrust tube

11 Release and tighten bolt - 40 Nm

- ♦ Secures gearbox support to thrust tube

12 Final drive support

13 Circlip

- ♦ Removing => Page 236

14 Trim cap

- ♦ Removing => Page 236

15 O-ring

- ♦ Replace

10.2 - Dismantling and assembling thrust tube

Special tools, testers and auxiliary equipment required

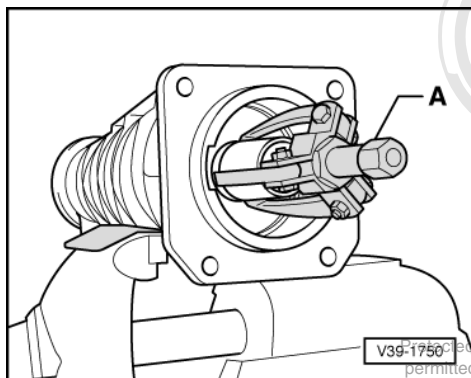
- ♦ Thrust plate VW 402
- ♦ Press tool VW 409
- ♦ Press tool VW 412
- ♦ Thrust piece VW 433
- ♦ Multi-purpose tool VW 771 with 771/15
- ♦ Fitting drift 2051



- ♦ Fitting drift 2062
- ♦ Bucket tappet compressor 2078
- ♦ Internal puller Kukko 21/5

Note:

Removing and installing thrust tube => Page **229**



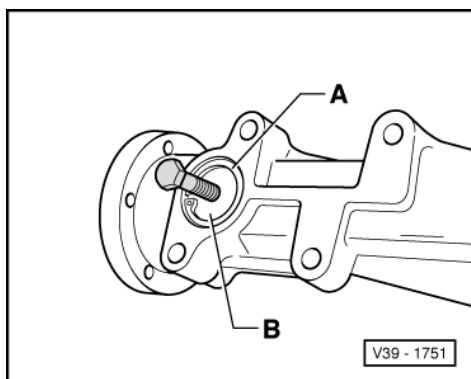
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Dismantling

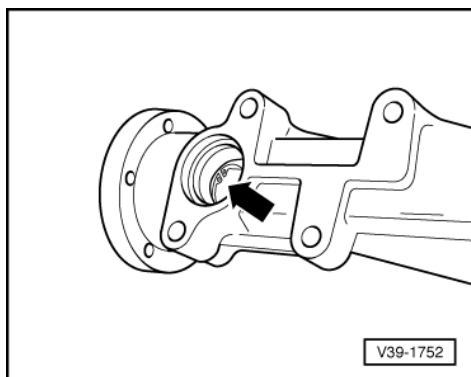
- Clamp thrust tube in vice using soft jaws.
- -> Pull off sleeve.

A - Internal puller 30 ... 37 mm, e.g. Kukko 21/5

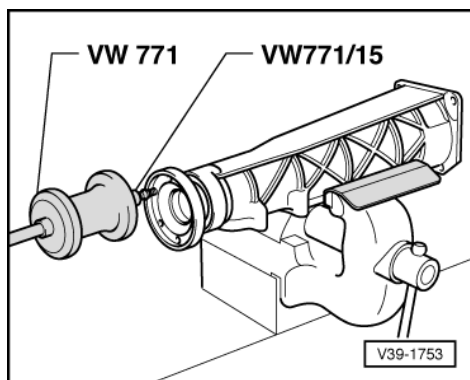
- Detach gearbox support



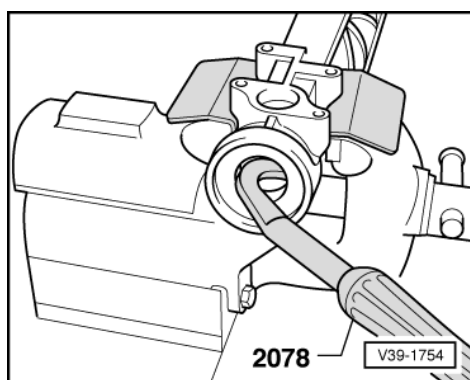
- -> Remove circlip -A-.
- Screw M8 bolt into thread in cover cap -B- and pull out cover cap.



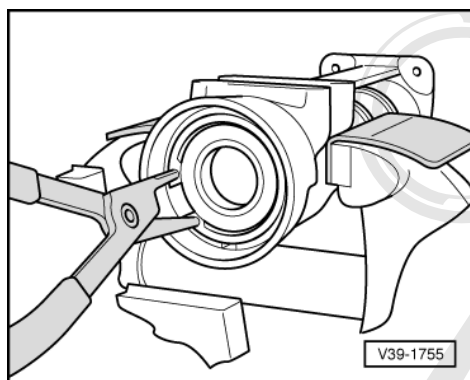
- -> Open out circlip -arrow- on flange shaft and push circlip towards splines.



- -> Remove flange shaft.
- Take circlip out of thrust tube.

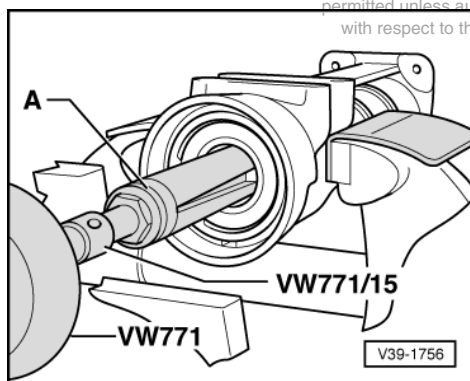


- -> Lever out seal.



- -> Remove circlip.

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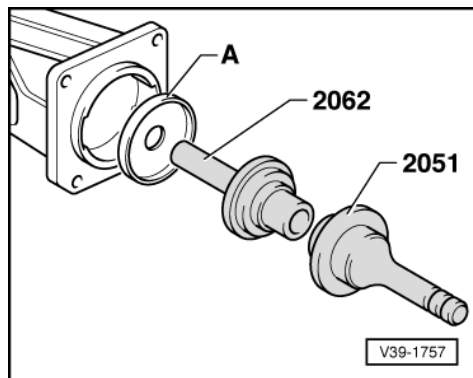
- -> Pull out grooved ball bearing for flange shaft.

A - Internal puller 30 ... 37 mm, e.g. Kukko 21/5

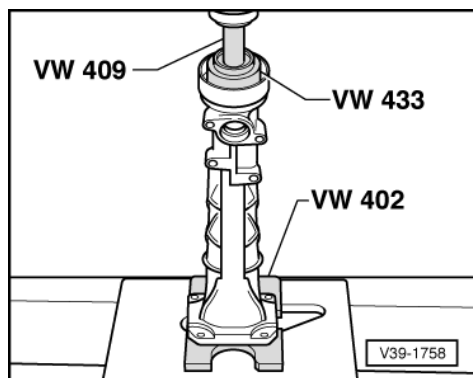
Note:

Removal causes damage to bearing.

Only if baffle plate is damaged:

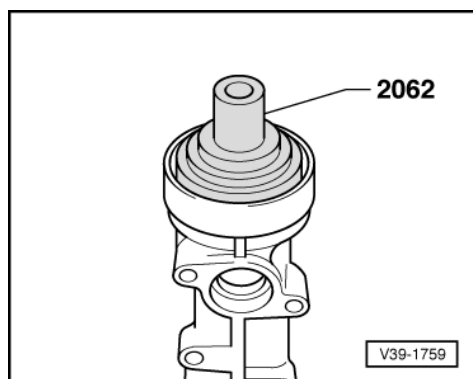


- If baffle plate is damaged, press it out with flange shaft.
- -> To install, drive in baffle plate -A- onto stop.



Assembling

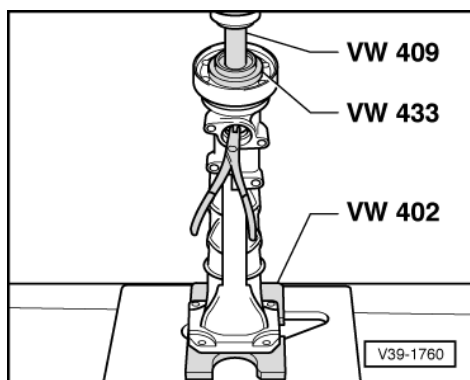
- -> Press grooved ball bearing into thrust tube.
- Fit outer circlip.



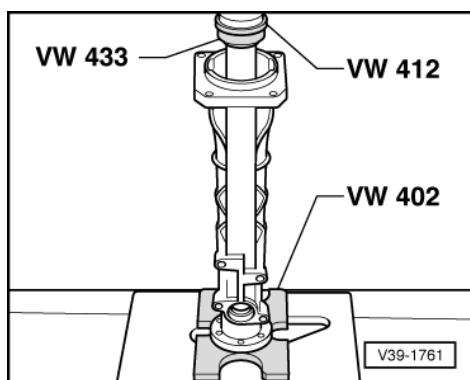
- Pack space between sealing lip and dust lip of seal with multi-purpose grease.
- -> Drive in seal as far as stop.



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- -> Insert inner circlip in thrust tube and hold in position with pliers; press in flange shaft.
- Insert circlip in groove.



- -> Press sleeve onto flange shaft as far as stop.
- Install cover cap with seal.
- Fit circlip.
- Install gearbox support.
- Fit O-ring on thrust tube.

11 - Replacing flange shaft oil seals

11.1 - Replacing flange shaft oil seals

- Rear final drive installed
- Observe general repair instructions=> Page 10 .

Note:

The exhaust system must only be removed when the left sealing ring is replaced.

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Special tools, testers and auxiliary equipment required

- ♦ Fitting drift 2062
- ♦ Drip tray V.A.G 1306
- ♦ Universal mount V.A.G 1359/2
- ♦ Engine/gearbox lifter V.A.G 1383 A

Removing

- Remove rear section of exhaust system as from clamp(s):



=> 4-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing parts of exhaust system Removing and installing parts of exhaust system

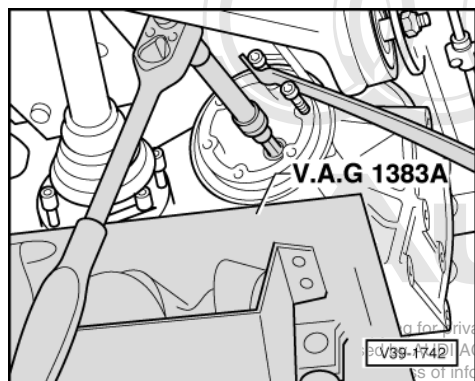
=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

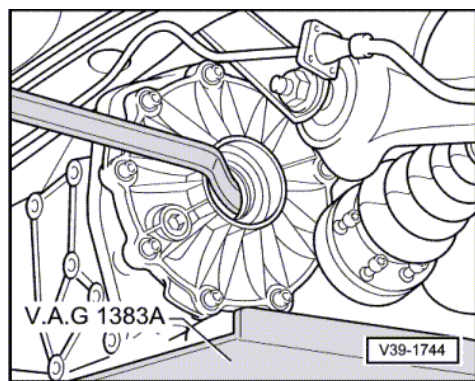
=> 6-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

- Release drive shafts on left or right of final drive and put aside:

=> Running Gear, Front and Four-wheel Drive; Repair Group 42; Arrangement of Rear Axle Components (vehicles with 4WD); Removing and installing subframe Arrangement of Rear Axle Components (vehicles with 4WD) Removing and installing subframe



- -> Remove flange shaft. To loosen the securing bolt, screw two bolts into the flange shaft and counter-hold with a lever.
- Place drip tray V.A.G 1306 underneath and drain gearbox oil.
- Pull out flange shaft using the bolts already screwed in.

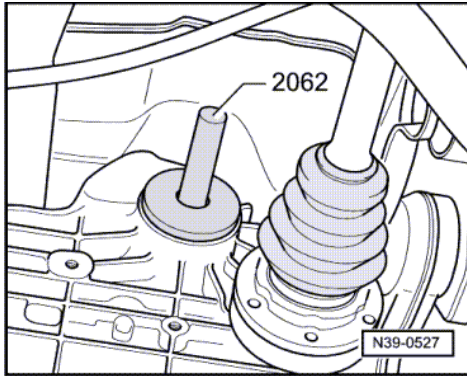


- -> Lever out flange shaft oil seals using a suitable lever.

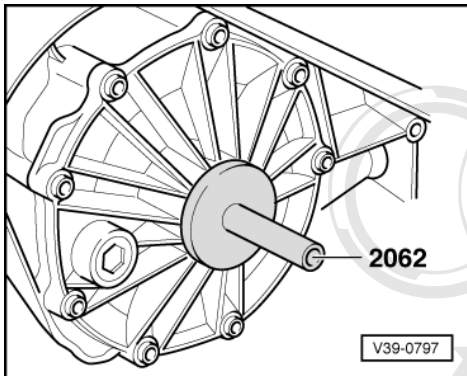
Installing

Installation is carried out in the reverse order, when doing this note the following:

- Clean seat for oil seal.
- Coat outer circumference of seal with gear oil.



- Fill space between sealing and dust lips with multipurpose grease.
- -> Drive in oil seal for right flange shaft onto stop with drift 2062; do not cant seal.



- -> Drive in oil seal for right flange shaft onto stop with drift 2062; do not cant seal.
- Bolt on drive shaft

=> Running Gear, Front and Four-wheel Drive; Repair Group 42; Arrangement of Rear Axle Components (vehicles with 4WD); Removing and installing subframe Arrangement of Rear Axle Components (vehicles with 4WD) Removing and installing subframe

- Stress free alignment of exhaust system

=> 4-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

- Top-up gear oil in rear final drive and check oil level => Page 228 .

Tightening torque

Component	Nm
-----------	----



12 - Removing and installing rear final drive

12.1 - Removing and installing rear final drive

Special tools, testers and auxiliary equipment required

- ♦ Universal mount V.A.G 1359/2
- ♦ Engine/gearbox lifter V.A.G 1383 A

Removal

- Remove rear section of exhaust system as from clamp(s):

=> 4-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

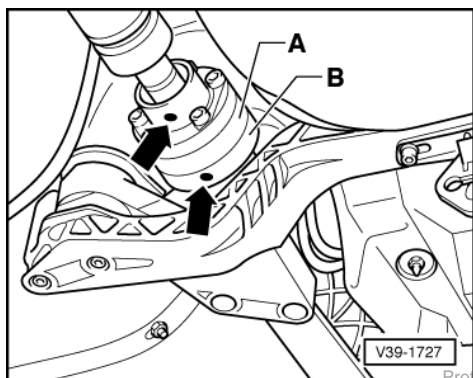
=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing parts of exhaust system Removing and installing parts of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

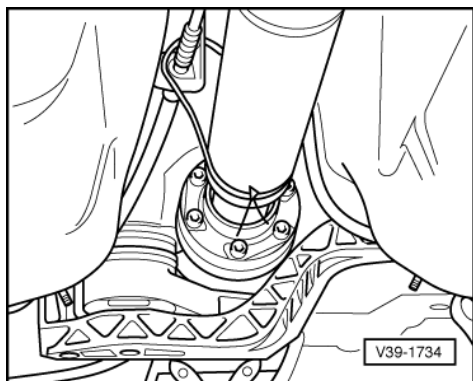
=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (5-valve), Mechanical Components; Repair Group 26; Removing and installing exhaust system parts Removing and installing exhaust system parts

- Remove heat shield above propshaft.



- -> Check whether there is a factory marking (paint spot) on propshaft. If there is no mark, make a coloured mark on rear axle drive -B- to indicate the position of prop shaft flange -A-.
- Unscrew fastening bolts for propshaft flange.



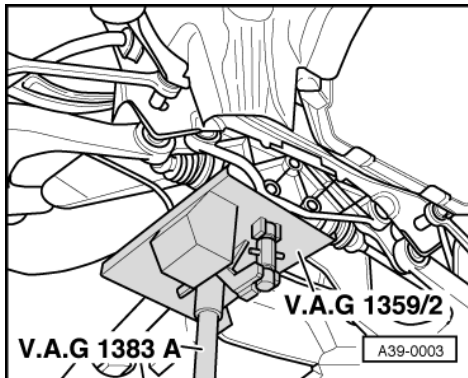
- -> Secure propshaft to handbrake cable bracket with wire.

Note:

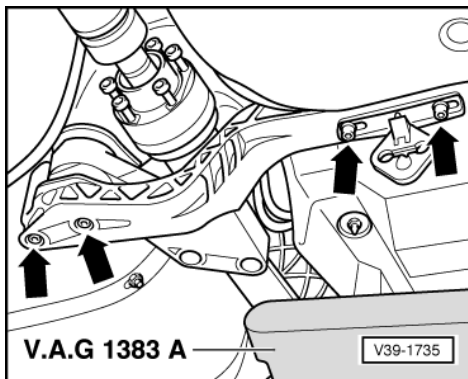
*If it is not possible to push propshaft up and off flange, lower final drive before tying up propshaft. When lowering final drive, prevent propshaft from dropping down, and do not bend centre joint further than maximum angle permitted => notes on Page **218**.*

- Detach left and right-hand driveshafts from rear final drive

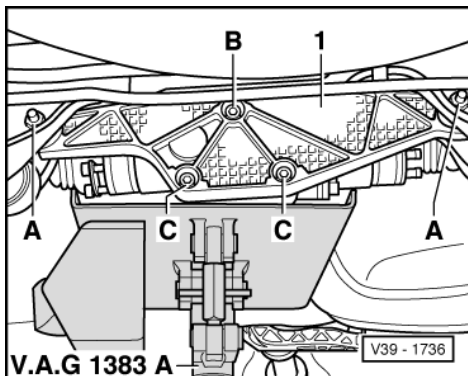
=> Running Gear, Front and Four-wheel Drive; Repair Group 42; Arrangement of Rear Axle Components (vehicles with 4WD); Removing and installing subframe Arrangement of Rear Axle Components (vehicles with 4WD) Removing and installing subframe



- -> Support axle drive with gearbox lifter V.A.G 1383 A and universal mount V.A.G 1359/2.
- Secure final drive with strap.



- -> Unscrew bolts -arrows- from front of cross member for rear axle drive.
- Detach front cross member.



- -> Unscrew securing bolts -B- and -C- of rear cross member on rear final drive.



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- Lower final drive with gearbox jack.

Note:

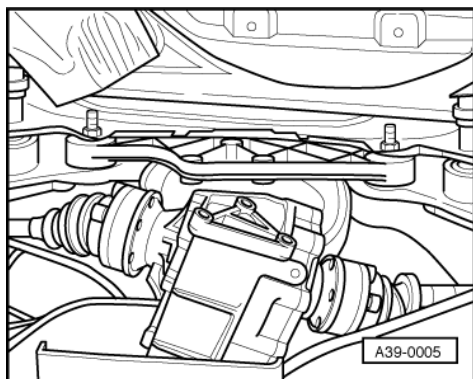
The cross member -1- need not be removed.

Installing

Installation is carried out in the reverse order, when doing this note the following:

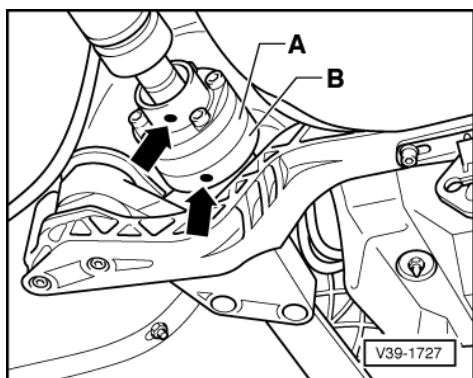
Notes:

- ♦ Always renew self-locking nuts.
- ♦ It is essential that the residues of locking fluid are cleaned out from the threaded holes in flange shaft on the rear final drive after removing the propshaft. Otherwise there is a danger that new bolts will seize and then shear when removing them again.
- ♦ The threaded holes can be cleaned with a thread tap.
- ♦ Replace gasket between prop shaft and drive flange (remove protective sheet and bond gasket to flanged shaft). The adhesive surface must be free of grease.
- ♦ Replace prop shaft bolts (self-locking).



- -> Raise final drive with gearbox jack until both driveshafts can be connected.
- Lightly tighten securing bolts for driveshafts.
- Lift final drive and bolt to cross member and final drive support.
- Bolt on propshaft => Page 223

Notes:



- ♦ -> To prevent imbalance, install flanges of prop shaft -A- and rear axle drive -B- in such a way that the coloured markings are in a line -arrows-.
- ♦ After removing the propshaft from the rear final drive, the additional balance disc (thicker washer) that may be located between the lock plate and the bolt head must not be reinstalled.

- ◆ Replace prop shaft bolts (self-locking).
- Check gear oil in rear final drive => Page **228**.
- Stress free alignment of exhaust system

=> 4-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Engine (5-valve turbo), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

=> 4-cylinder Diesel Direct Injection Engine (TDI), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (2-valve), Mechanics; Repair Group 26; Removing and installing exhaust system Removing and installing exhaust system

=> 6-cylinder Engine (5-valve), Mechanics; Repair Group 26; Removing and installing exhaust system parts, Stress-free alignment of exhaust system Removing and installing exhaust system parts, Stress-free alignment of exhaust system

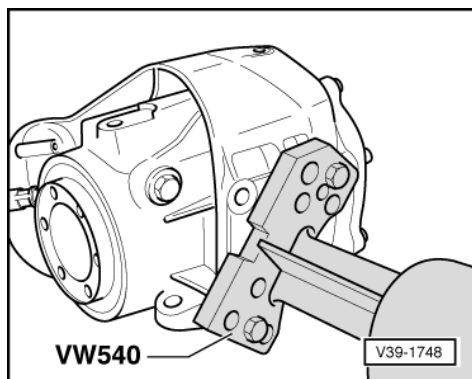
Tightening torques

Component	Nm
Prop shaft to final drive (input flange)	55
Front cross member for rear final drive to body	40
Front cross member for rear final drive with exhaust system bracket to body	23
Rear cross member for rear final drive to subframe	50
Rear final drive on rear cross member	55
Drive shaft to flange shaft M8	40
M10	77

12.2 - Attaching rear final drive to engine stand

Special tools, testers and auxiliary equipment required

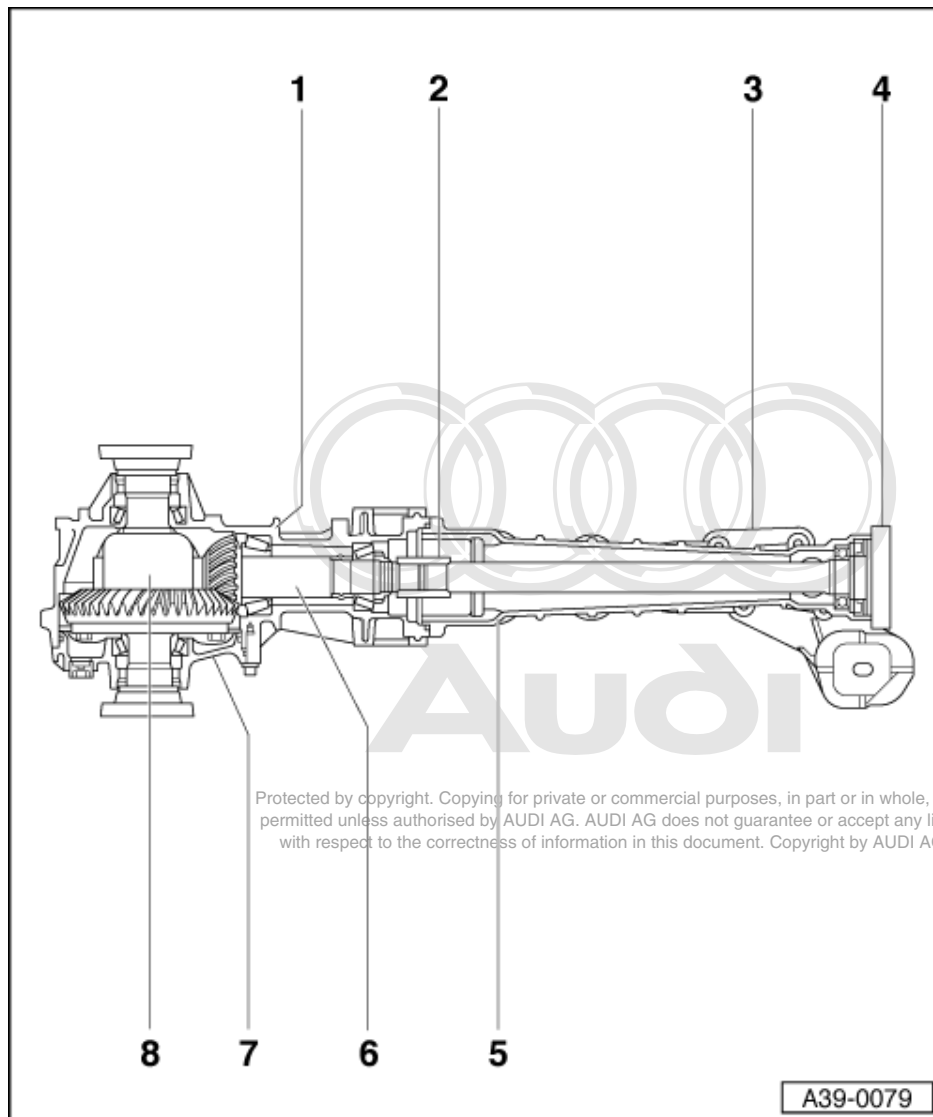
- ◆ Engine and gearbox support VW 540



- -> Secure complete rear final drive to a repair stand with engine and gearbox support VW 540.

13 - Dismantling and assembling rear final drive

13.1 - Dismantling and assembling rear final drive

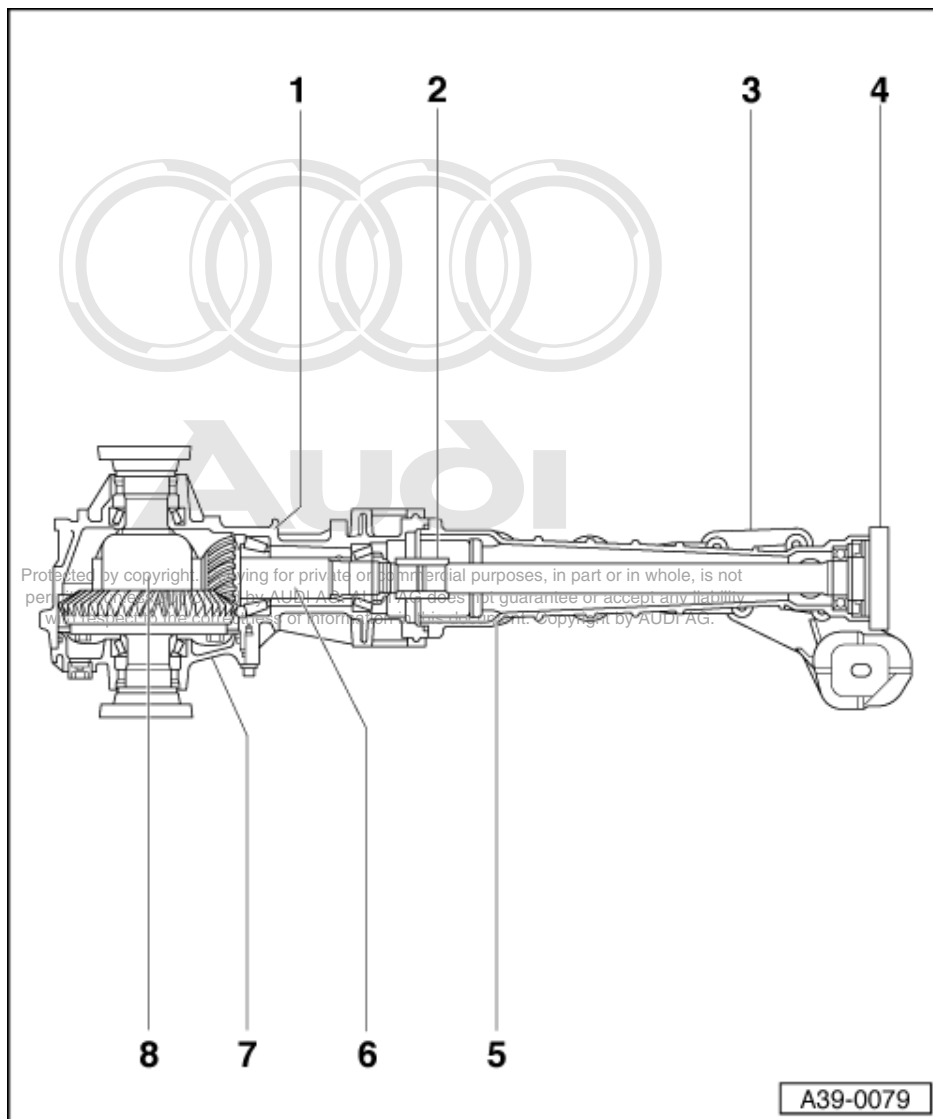


13.2 - Gearbox overview

Notes:

- ♦ Removing thrust tube from rear final drive with final drive installed => Page 229 .
- ♦ Removing thrust tube from rear final drive with final drive removed => Page 247 .

- 1 Final drive housing
- 2 Socket weld
- 3 Final drive support
- 4 Flange for propshaft
 - ♦ Removing => Page 237



5 Thrust tube

- ♦ Removing and installing => Page 229

6 Pinion shaft

- ♦ Paired with crown wheel
- ♦ Removing and installing drive pinion => Page 265

7 Final drive cover

8 Differential

- ♦ Must be removed before dismantling drive pinion
- ♦ Removing- and installing => Page 249
- ♦ Dismantling and assembling => Page 255

Removing thrust tube from rear final drive

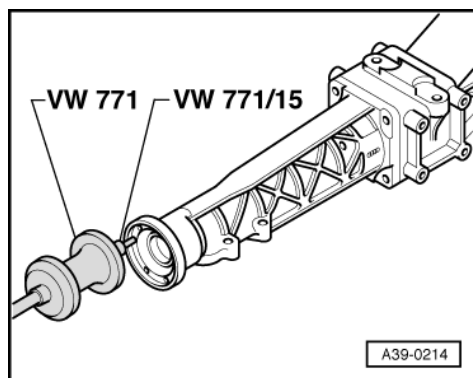
- Rear final drive removed

Special tools, testers and auxiliary equipment required

- ♦ Multi-purpose tool VW 771 with 771/15
- ♦ Drip tray V.A.G 1306
- Secure rear final drive to repair stand => Page 245 .
- Place drip tray V.A.G 1306 underneath and drain gearbox oil.



- Remove bolts securing thrust tube to rear final drive housing.



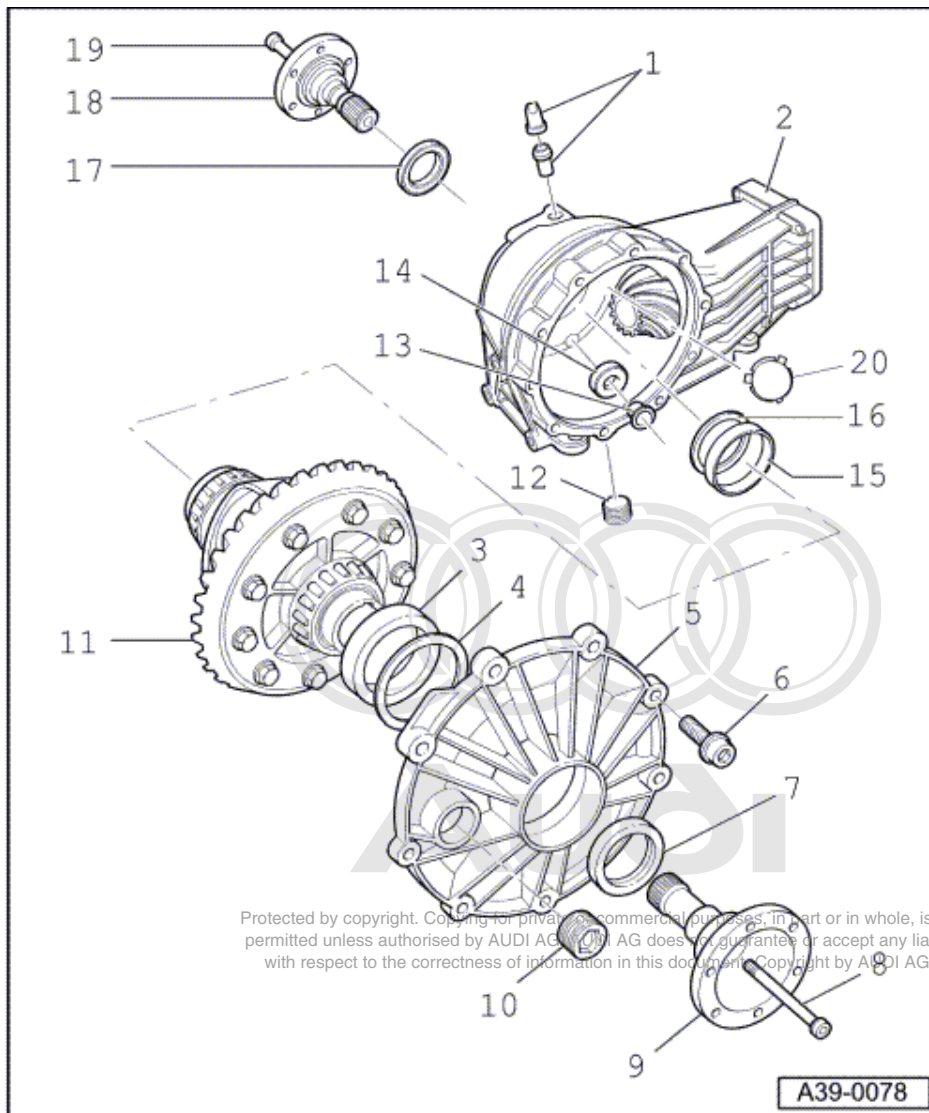
- -> Pull off thrust tube with flange shaft; support thrust tube.



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14 - Removing and installing differential

14.1 - Removing and installing differential



Notes:

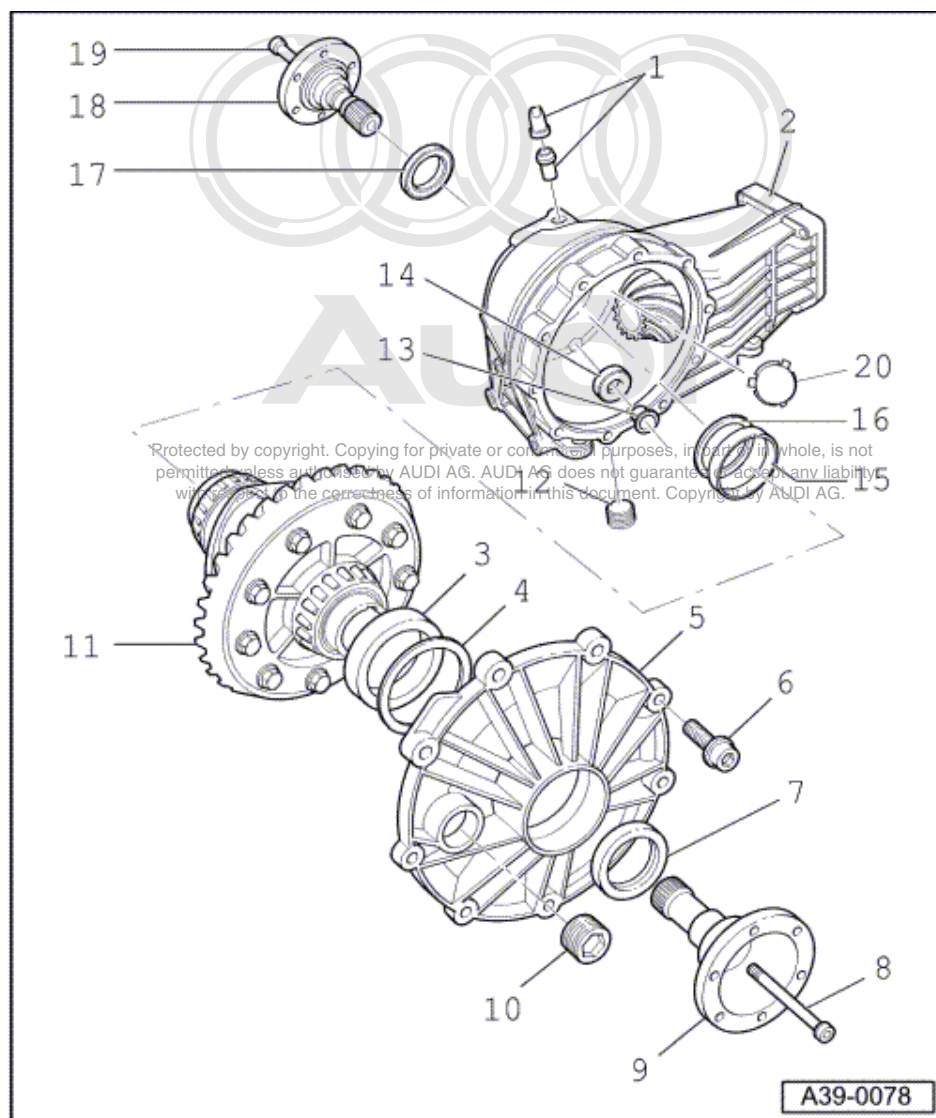
- ◆ General repair instructions => Page **10**.
- ◆ Securing rear final drive to repair stand => Page 39-122.
- ◆ Adjustments are required when replacing components marked 1) => adjustment overview, Page **275**.

1 Vent sleeve

- ◆ With rubber valve
- ◆ Installation position => Fig. **3**.

2 Final drive housing 1)

- ◆ With drive pinion
- ◆ Removing and installing drive pinion => Page **265**



3 Outer race for large taper roller bearing 1)

- ◆ Driving out => Fig. 262
- ◆ Pressing in => Fig. 263

4 Shim "S1"

- ◆ Note thickness
- ◆ Adjustment overview => Page 275

5 Cover for final drive 1)

- ◆ With O-ring
- ◆ Replace O-ring
- ◆ Insert O-ring with oil

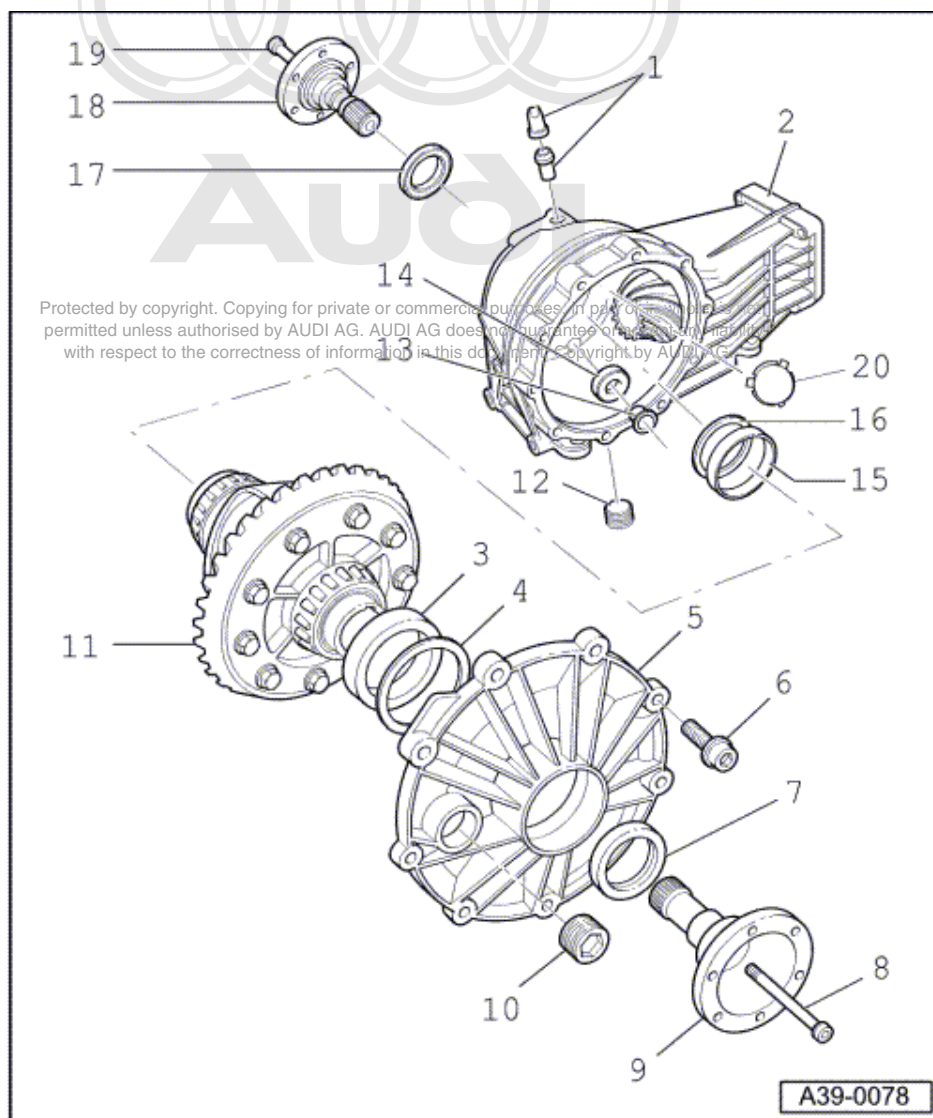
6 TORX-screw - 25 Nm

7 Seal, right

- ◆ Replacing => Page 239 .

8 Hexagon socket-head bolt

- 25 Nm



9 Flange shaft, right

- ♦ Removing and installing => Fig. 1

10 Oil filler plug - 35 Nm

11 Differential with crown wheel 1)

- ♦ Dismantling and assembling => Page 255

12 Oil drain plug, 35 Nm

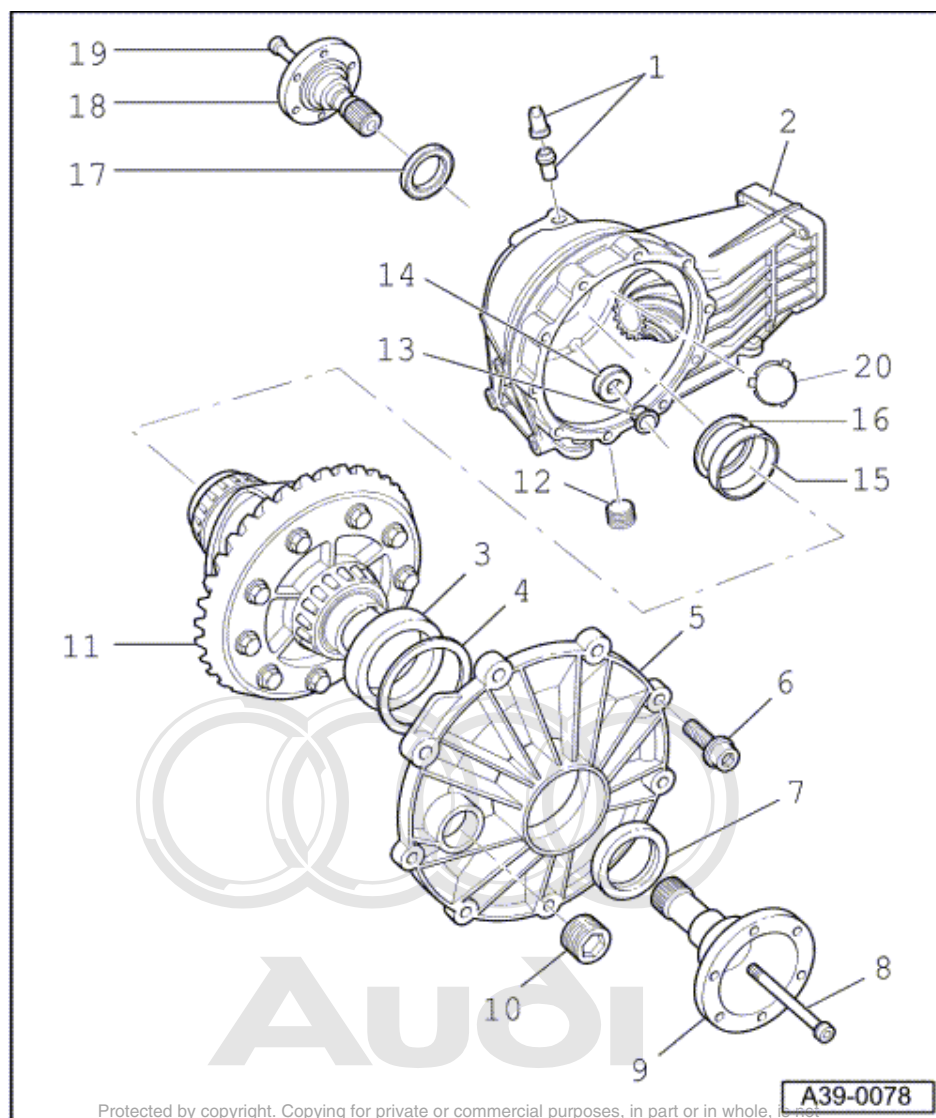
13 Bushing

- ♦ Holds solenoid in position
- ♦ Drive in onto stop

14 Solenoid

15 Outer race for small taper roller bearing 1)

- ♦ Driving out
=>Fig. 260
- ♦ Pressing in
=>Fig. 260



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16 Shim "S2"

- ♦ Note thickness
- ♦ Adjustment overview => Page **275**

17 Seal, left

- ♦ Replacing => Page **239** .

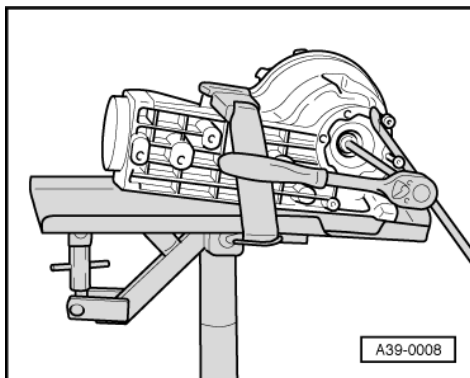
18 Flange shaft, left

- ♦ Removing and installing => Fig. **1**

19 Hexagon socket-head bolt
- 25 Nm

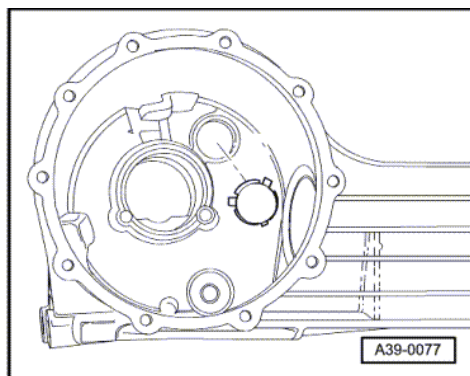
20 Cap

- ♦ Installing => Fig. **2**

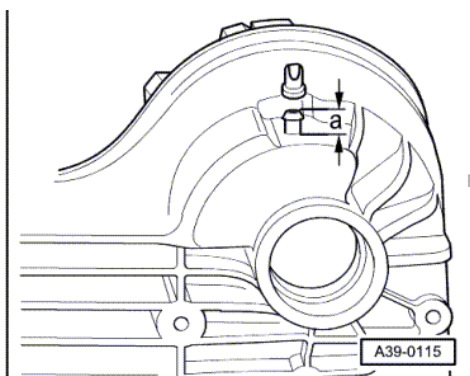


-> Fig.1 Removing and installing flange shaft

- To loosen the securing bolt, screw two bolts into the flange shaft and counter-hold with a lever.
- Pull out flange shaft using the bolts already screwed in.



-> Fig2 Press in cover until stop



-> Fig.3 Installation position vent sleeve

The vent sleeve must protrude from the housing by 13 mm (dimension -a-) after being pressed in.

The slot in the rubber valve is located longitudinally in the direction of travel.

Removing and installing differential

- Rear final drive removed



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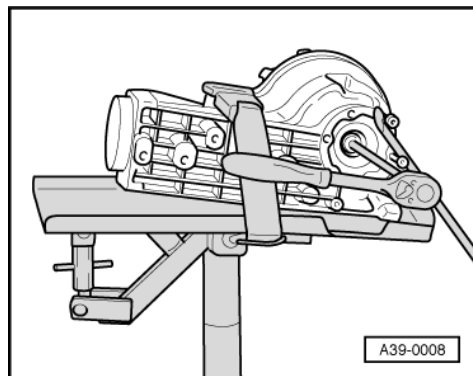


Special tools, testers and auxiliary equipment required

- ♦ Drip tray V.A.G 1306

Removing

- Secure complete rear final drive to repair stand => Page 245 .
- Place drip tray V.A.G 1306 underneath and drain gearbox oil.

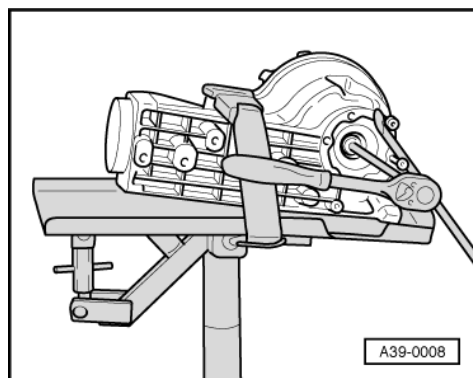


- -> Remove left and right-hand flange shafts.
- To loosen the securing bolt, screw two bolts into the flange shaft and counter-hold with a lever.
- Mark flange shafts (left and right).
- Pull out flange shaft using the bolts already screwed in.
- Unscrew securing bolts from cover for final drive.
- Take cover for final drive off axle housing and remove differential.

Installing

Installation is carried out in the reverse order, when doing this note the following:

- Insert differential.
- Renew O-ring for cover for final drive and oil when installing.
- Fit cover for final drive onto final drive housing and using diagonal sequence tighten to 25 Nm.
- Replace the oil seal for flange shaft => Page 239 .
- Fill space between sealing and dust lips with multipurpose grease.



- -> Insert flange shafts and tighten to 25 Nm.
- Top-up gear oil in rear final drive and check oil level => Page 228 .



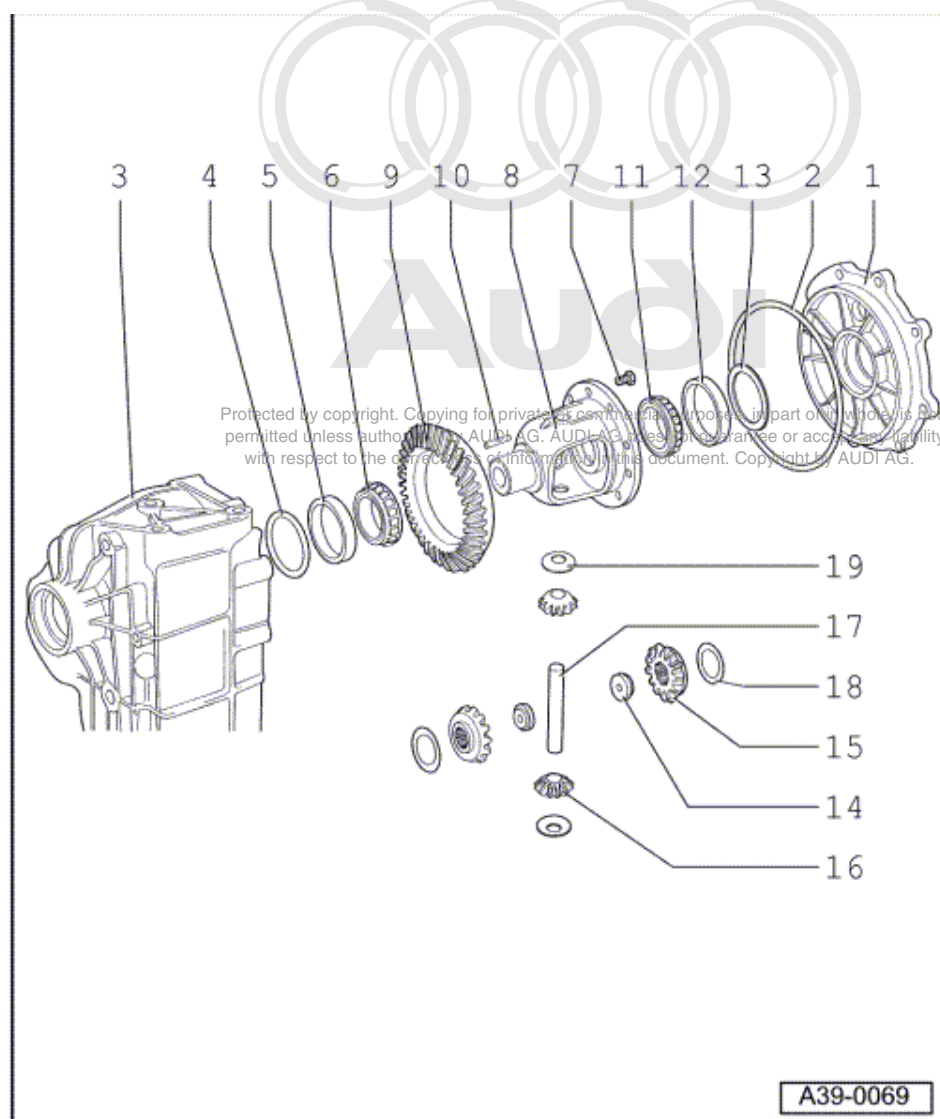
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15 - Dismantling and assembling differential

15.1 - Dismantling and assembling differential

Special tools, testers and auxiliary equipment required

- ◆ Drift VW 295
- ◆ Thrust plate VW 401
- ◆ Thrust plate VW 402
- ◆ Press tool VW 407
- ◆ Press tool VW 408 A
- ◆ Press tool VW 412
- ◆ Thrust piece VW 442
- ◆ Sleeve 40-21
- ◆ Thrust plate 40-105
- ◆ Thrust piece 2050
- ◆ Drift 3138
- ◆ Taper roller bearing puller V.A.G 1582 and V.A.G 1582/6
- ◆ Two-arm puller Kukko 44/2



Notes:

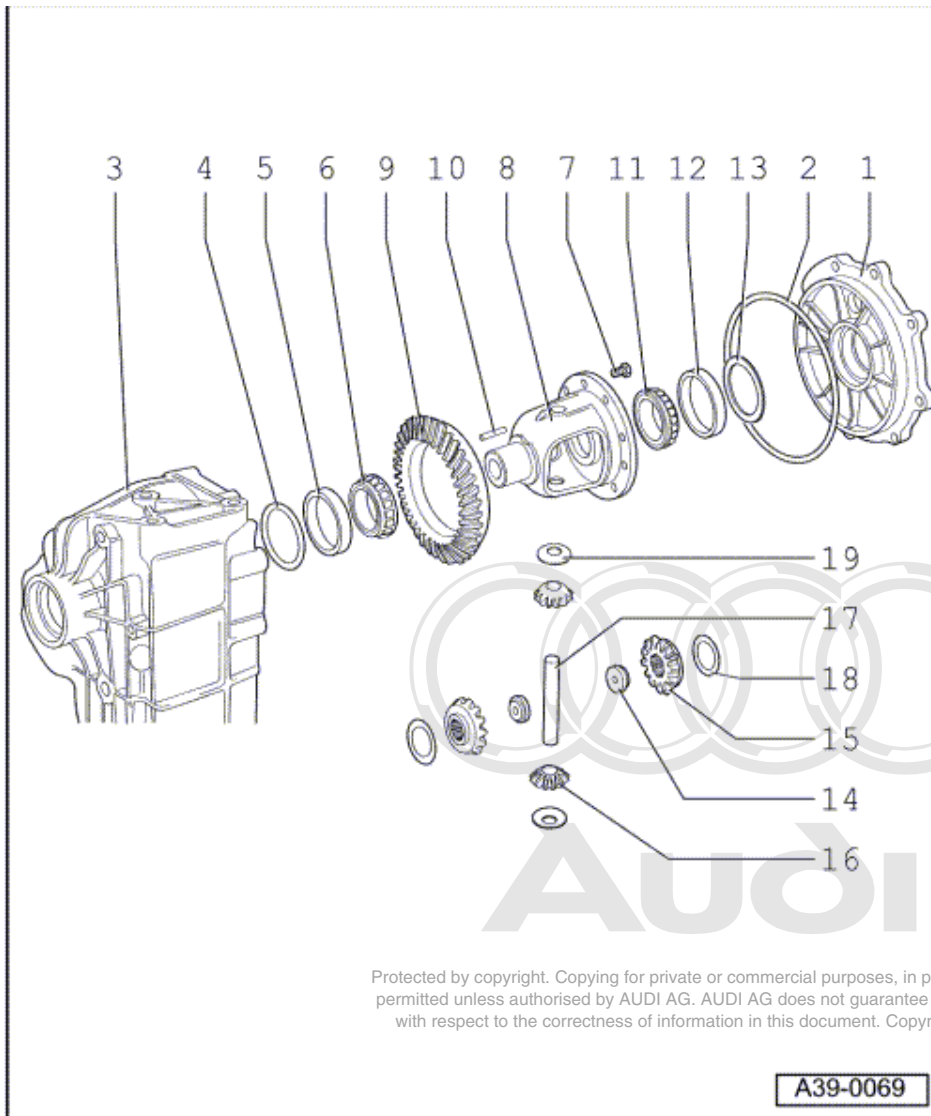
- ♦ General repair instructions =>Page **10** .
- ♦ Replace both taper roller bearings of the differential together. Use same make if possible.
- ♦ Adjustments are required when replacing components marked 1) => adjustment overview, Page **275** .

1 Cover for final drive 1)

2 O-ring

- ♦ Replace
- ♦ Insert with oil

3 Final drive housing 1)



4 Shim "S2"

- ♦ Note thickness
- ♦ Adjustment overview => Page **275**

5 Outer race for small taper roller bearing 1)

- ♦ Tapping out => Fig. **1**
- ♦ Pressing in => Fig. **2**

6 Inner race for small taper roller bearing 1)

- ♦ Pulling off =>Fig. **3**
- ♦ Pressing on =>Fig. **4**

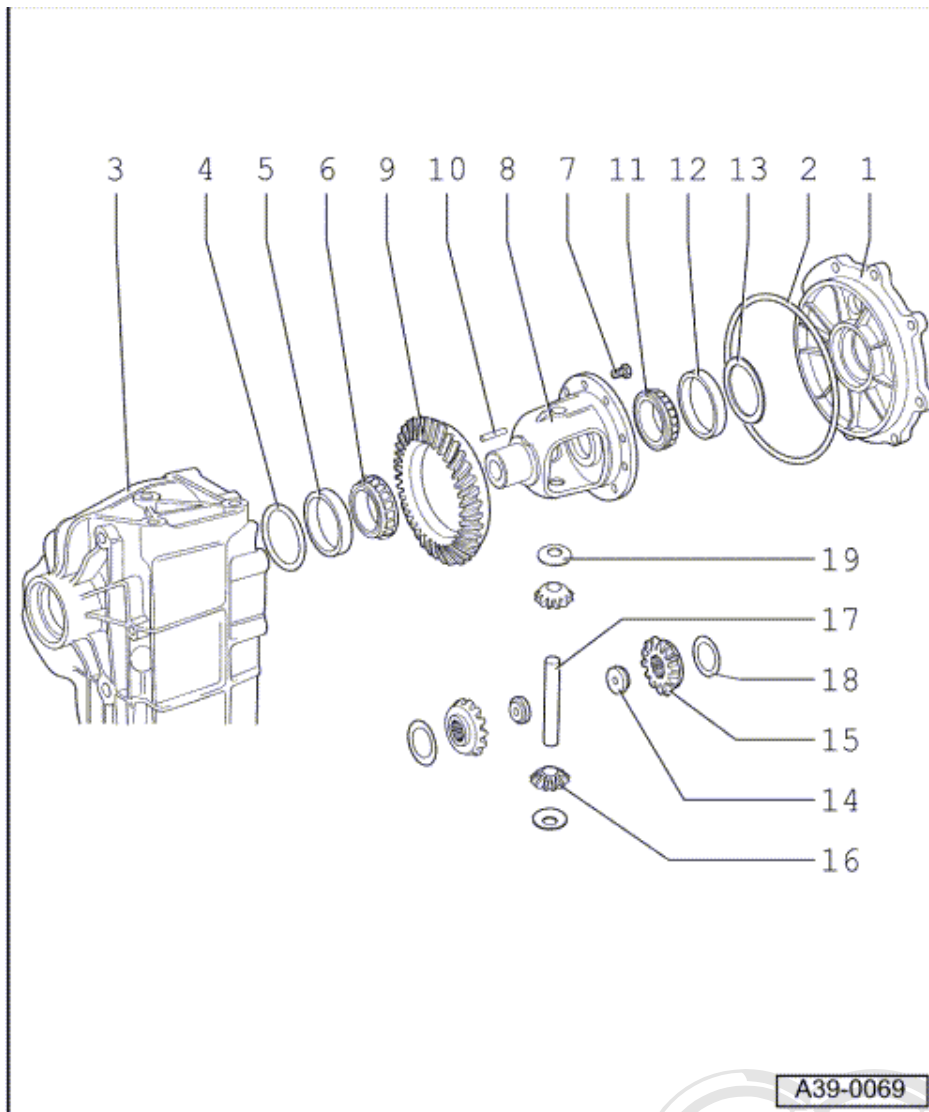
7 Bolt - 60 Nm + turn 45ofurther

- ♦ Replace

- ◆ Allocation

=> Parts List

- ◆ Lightly tighten bolts then tighten diagonally to specified torque.



8 Differential housing 1)

9 Crown wheel 1)

- ◆ Paired with pinion shaft (final drive set)
- ◆ Allocation based on gearbox code letters

=> Parts List

- ◆ Drive off housing with a drift => Fig. 9
- ◆ Fit to differential housing => Fig. 10

10 Spring pin

- ◆ For securing shaft for bevel gears
- ◆ Drive in flush

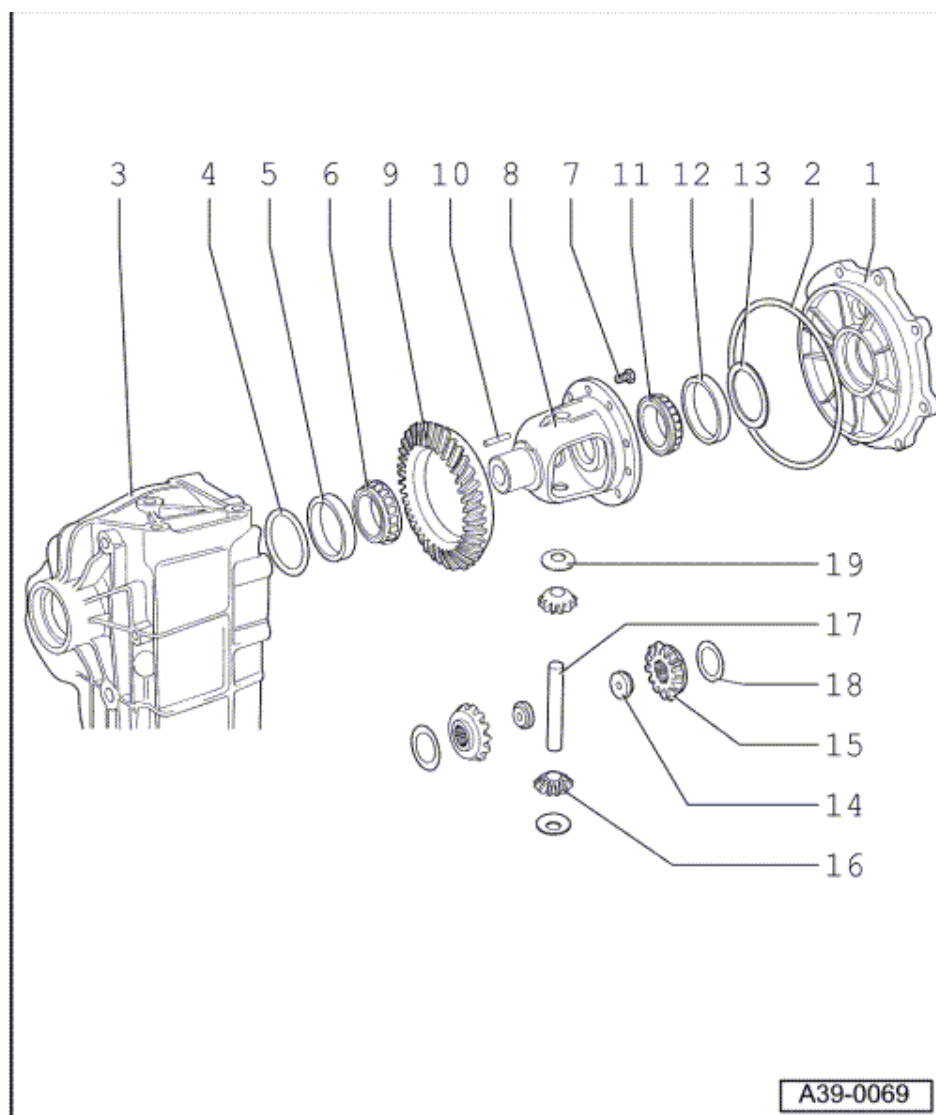
11 Inner race for large taper roller bearing 1)

- ◆ Pulling off => Fig. 5

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- ◆ Pressing on =>Fig. 6



12 Outer race for large taper roller bearing 1)

- ◆ Tapping out => Fig. 7
- ◆ Pressing in => Fig. 8

13 Shim "S1"

- ◆ Note thickness
- ◆ Adjustment overview => Page 275

14 Threaded piece

15 Large bevel gear

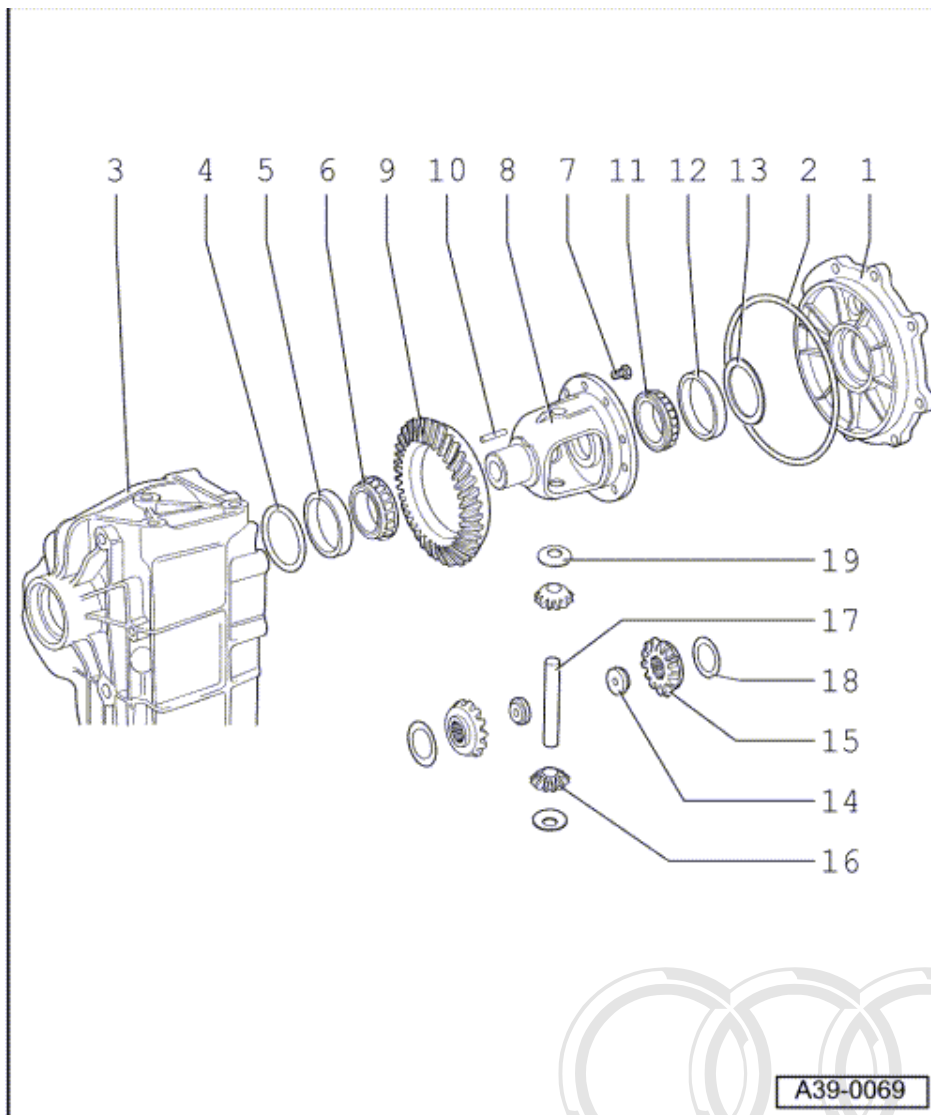
- ◆ Installing => Fig. 11
- ◆ Adjusting => Fig. 12

16 Small bevel gear^

- ◆ Installing => Fig. 11



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17 Shaft for planet wheels

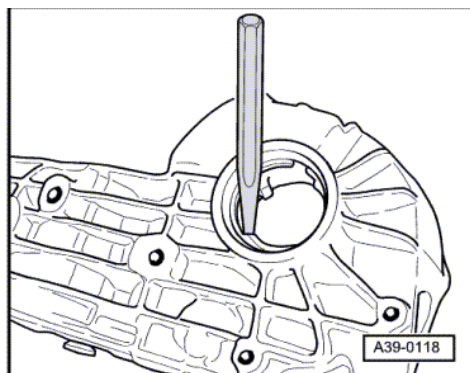
- ◆ Drive out with drift
- ◆ Drive in carefully so that the thrust washers are not damaged
- ◆ Secure with spring pin - Item **10** -

18 Adjustment shim

- ◆ Redefine thickness => Fig. **12**

19 Thrust washer

- ◆ Check for cracks

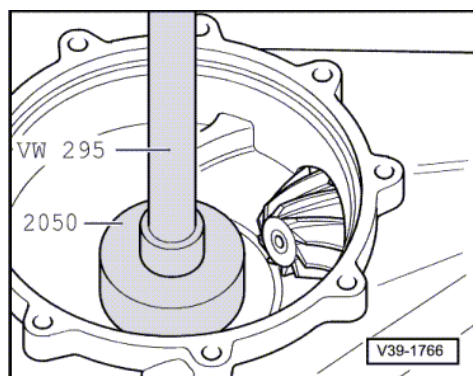


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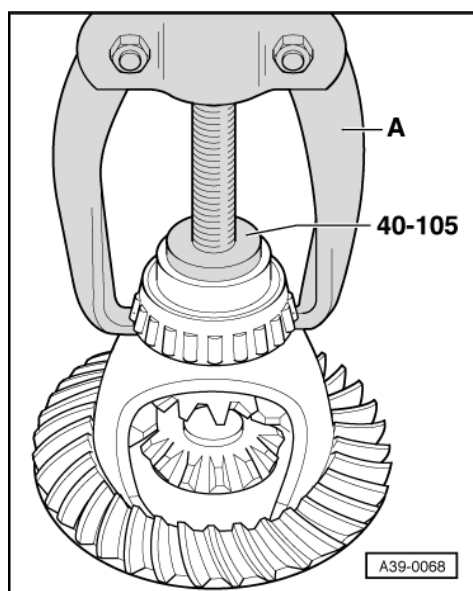
-> Fig.1 Driving out small taper roller bearing outer race of cover

- After removing check shims for damage.



-> Fig2 Pressing in taper roller bearing outer race small until stop into housing

- Position outer race using VW 295 and light even blows with a hammer.
- Then drive in onto stop as shown in illustration.

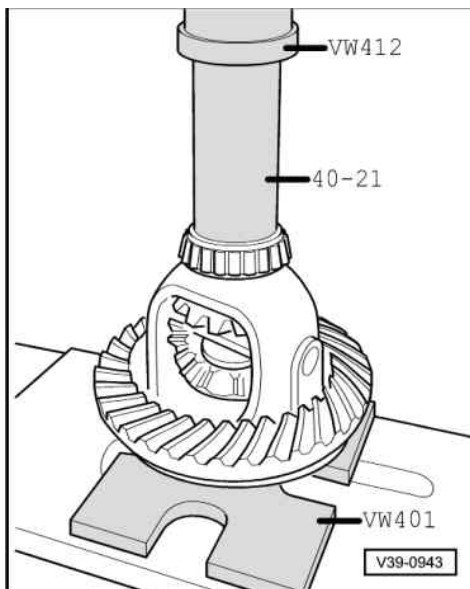


-> Fig.3 Pulling off inner race for small taper roller bearing

- A - Two arm puller, e.g. Kukko 44/2



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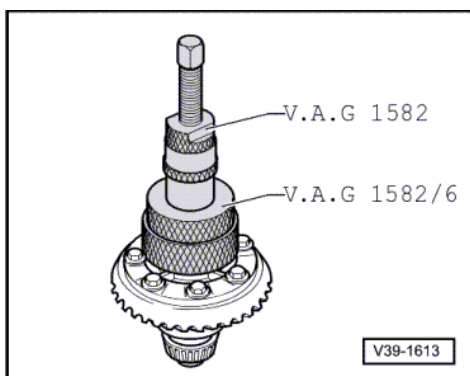


-> Fig.4 Pressing on small taper roller bearing inner race

Important:
Wear protective gloves!

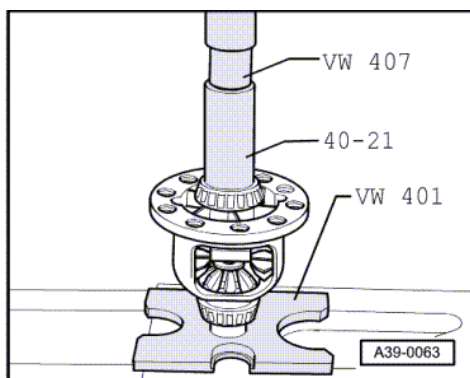
- Heat the inner race to approx. 100 °C, position and push to final position.

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-> Fig.5 Pulling off inner race for large taper roller bearing

- Fit thrust plate 40-105 onto differential housing before fitting puller.

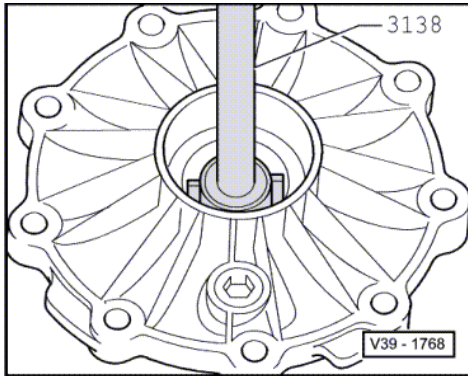




-> Fig.6 Pressing on large taper roller bearing inner race

Important:
Wear protective gloves!

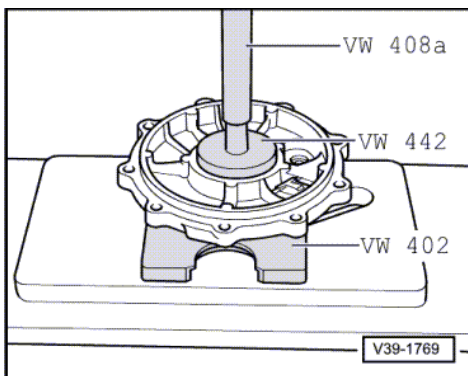
- Heat the inner race to approx. 100 °C, position and push to final position.



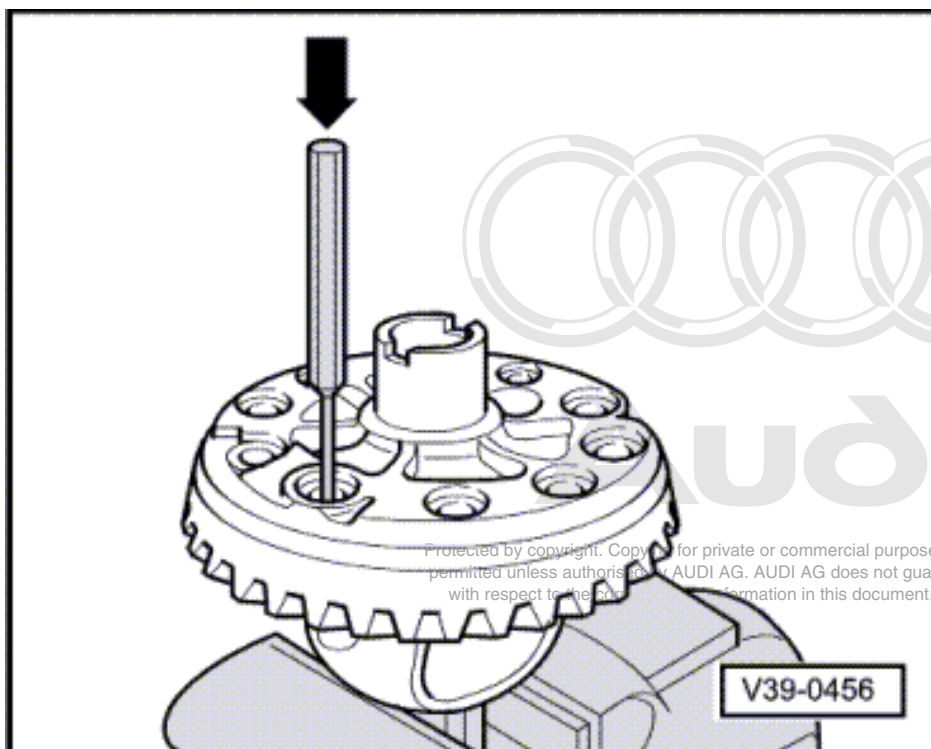
-> Fig.7 Driving out outer race for large taper roller bearing out of cover

- After removing check shims for damage.

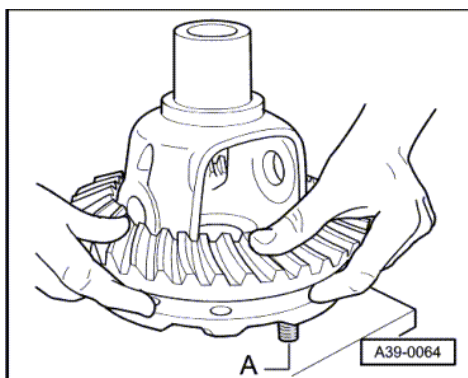
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-> Fig.8 Pressing in outer race for large taper roller bearing into cover



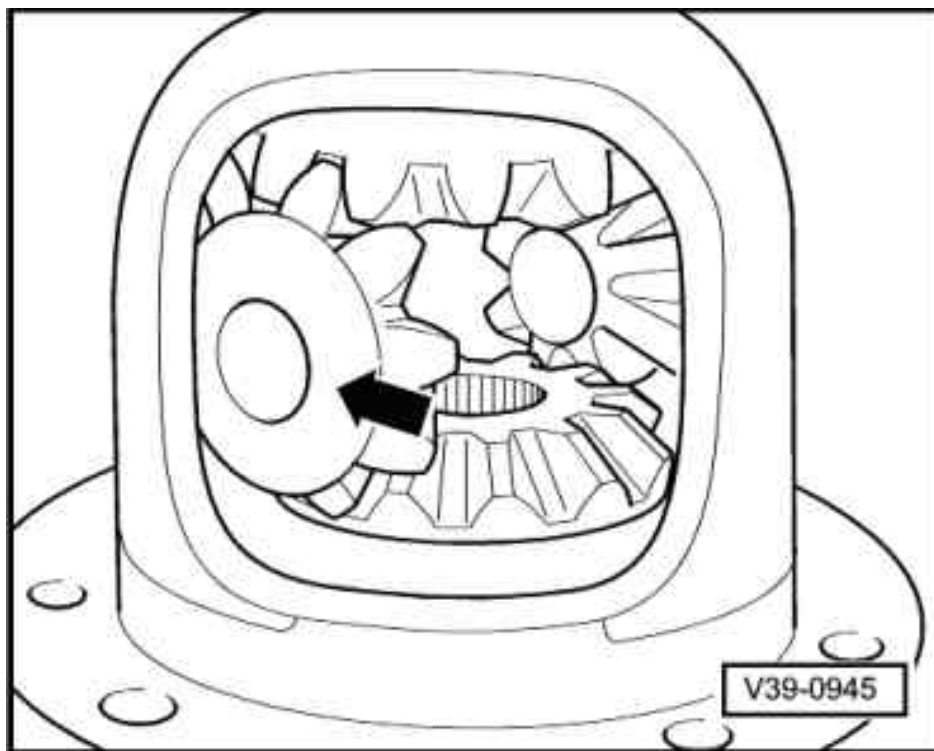
-> Fig.9 Driving crown wheel off housing



-> Fig.10 Fitting crown wheel

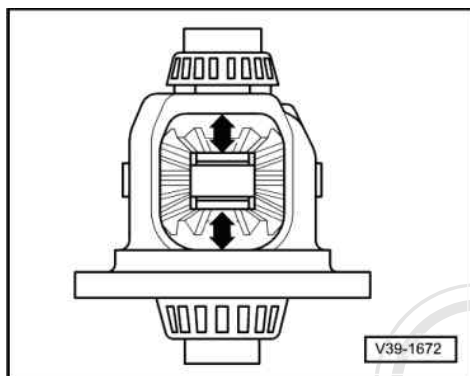
Important:
Wear protective gloves!

- When fitting crown wheel guide it on centring pins -A- (locally made).
- Heat the crown wheel to approx. 100 °C and position.



-> Fig.11 Installing small bevel gears

- If large bevel gears have been replaced, measure and select new shims => Fig. 12 .
- Insert large bevel gears with recalibrated shims.
- Insert small bevel gears spaced 180° apart, and then rotate into place -arrow-.
- Insert washers and align.
- Insert threaded pieces.
- Drive small bevel gear shaft into final position and secure.



-> Fig.12 Adjusting differential bevel gears

- Insert large bevel gears with thinnest shims (0.5 mm).
- Insert planet wheels at a 180° offset with thrust washers.

Note:

Do not now interchange bevel gears and thrust washers.

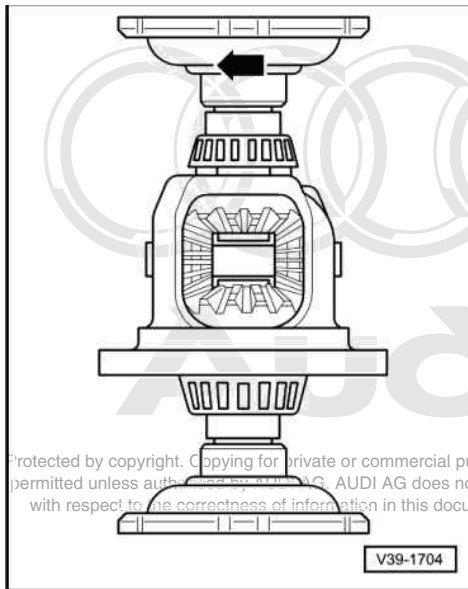
- Press planet wheels outwards.
- Press planet wheels outwards.
- Press large bevel gears in direction of arrow and check play.
- Ascertain the thickest - just fitting - shim for the large bevel gears on each side.

- The same thickness of shim should be used on both sides.
- Select required shims from table. Part numbers

=> Parts List

The following shims are available:

Shim thickness (mm)		
0.50	0.70	0.90
0.60	0.80	1.00



Note:

-> The adjustment is also correct if no further play is perceptible, although it is still possible to rotate the differential bevel gears -arrow-.

16 - Removing and installing and dismantling and assembling drive pinion

16.1 - Removing and installing and dismantling and assembling drive pinion

Special tools, testers and auxiliary equipment required

- ◆ Thrust plate VW 401
- ◆ Thrust plate VW 402
- ◆ Press tool VW 407
- ◆ Press tool VW 408 A
- ◆ Press tool VW 412
- ◆ Mounting rails VW 457
- ◆ Drift VW 460/2
- ◆ Tube VW 519
- ◆ Engine and gearbox support VW 540
- ◆ Thrust plate 30-205
- ◆ Inserter ring 2003/3
- ◆ Pinion assembly device 2052/2
- ◆ Thrust plate 3005

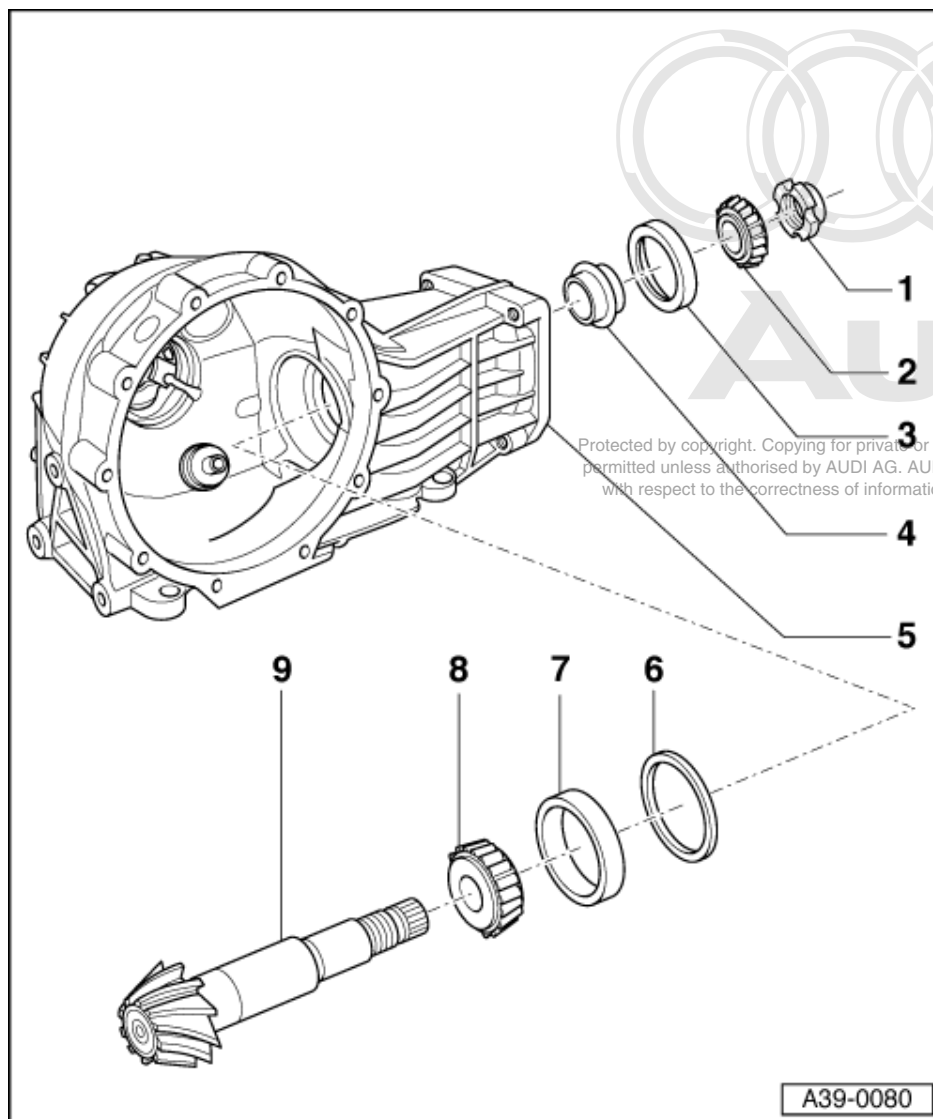
- ◆ Thrust pad 3062
- ◆ Drift 3138
- ◆ Assembly device 3253 with 3253/3 and 3253/4
- ◆ Holding tool 3304



- ♦ Engine/gearbox lifter V.A.G 1383 A
- ♦ Universal mount V.A.G 1359/2
- ♦ Separating tool Kukko 17/2
- ♦ Internal puller Kukko 21/7
- ♦ Counter support Kukko 22/2
- ♦ Torque gauge 0 ... 600 Ncm
- ♦ Socket, long, 32 A/F

Notes:

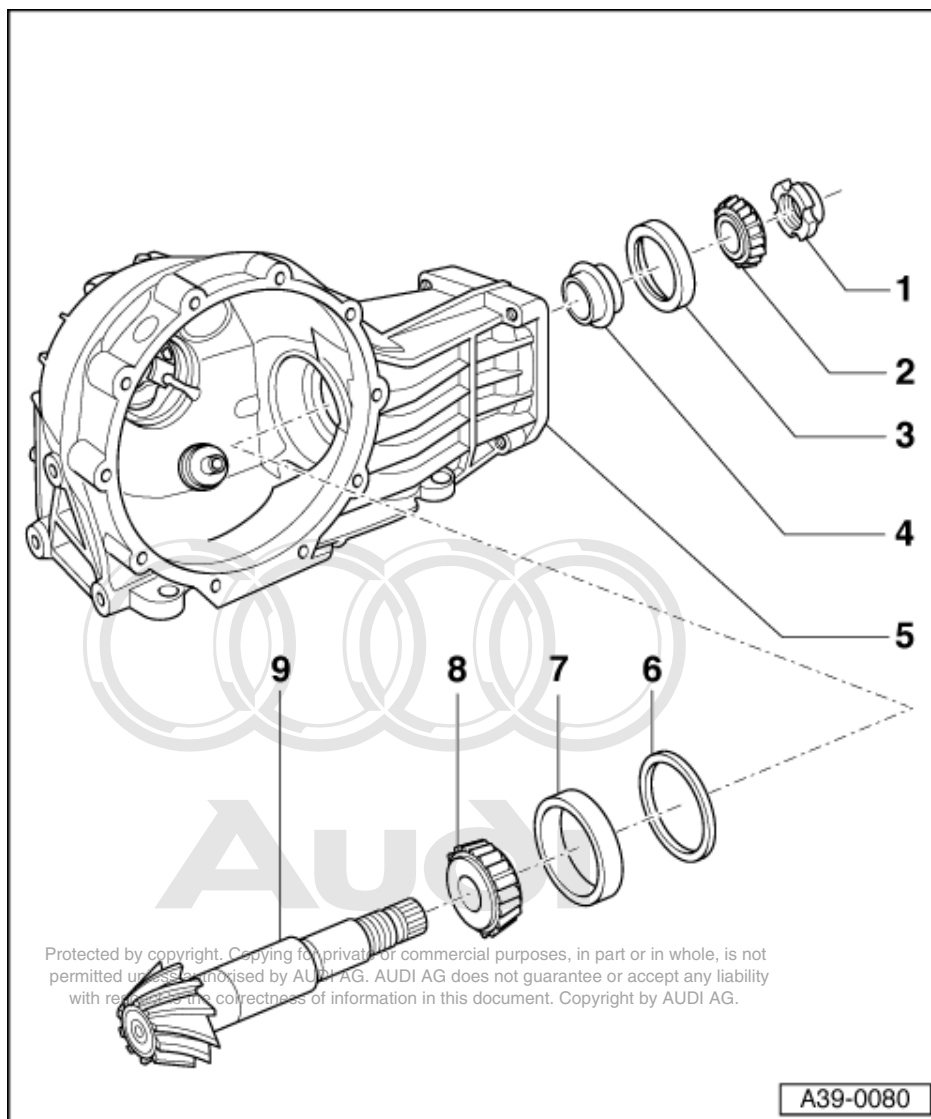
- ♦ General repair instructions => Page 10 .
- ♦ Removing thrust tube from rear final drive with final drive installed => Page 230 .
- ♦ Removing thrust tube from rear final drive with final drive removed => Page 247 .
- ♦ Replace both taper roller bearings together. Use same make if possible.
- ♦ Do not additionally oil new taper roller bearings for frictional torque measurement. The bearings have already been treated with a special oil by the manufacturer.
- ♦ Remove differential => Page 249 .
- ♦ Adjustments are required when replacing components marked 1) => adjustment overview, Page 275 .



1 Nut

- ♦ Replace
- ♦ Unscrewing => Fig. 1 and Fig. 2
- ♦ Screwing in => Fig. 11
- ♦ Measuring friction torque
=> Fig. 12
- ♦ Locking => Fig. 13

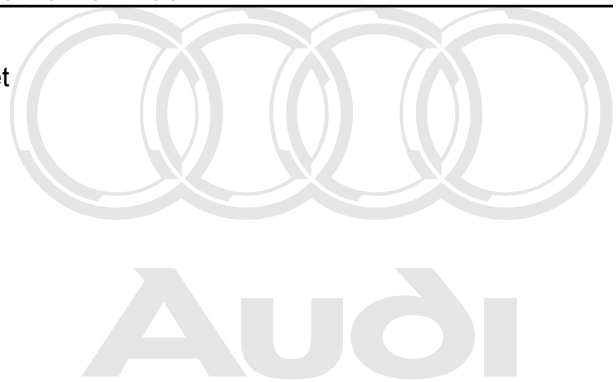
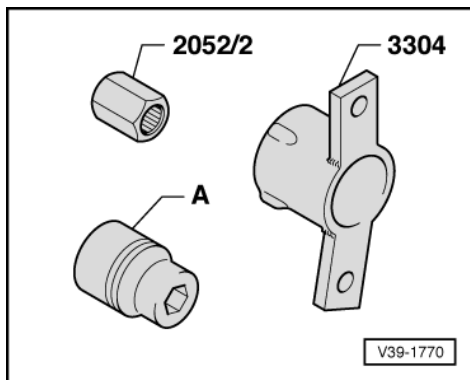
- 2 Inner race for small taper roller bearing 1)
 - ♦ Pressing out drive pinion => Fig. 3
 - ♦ Pressing on => Fig. 10
- 3 Outer race for small taper roller bearing 1)
 - ♦ Pulling out => Fig. 4
 - ♦ Pressing in => Fig. 9
- 4 Spacer sleeve 1)
 - ♦ Replace
- 5 Final drive housing 1)



- 6 Shim "S3"
 - ♦ Note thickness
 - ♦ Adjustment overview => Page 275
- 7 Outer race for large taper roller bearing 1)
 - ♦ Tapping out => Fig. 5
 - ♦ Inserting => Fig. 8
- 8 Inner race for large taper roller bearing 1)
 - ♦ Pressing off => Fig. 6
 - ♦ Pressing on => Fig. 7
- 9 Drive pinion 1)



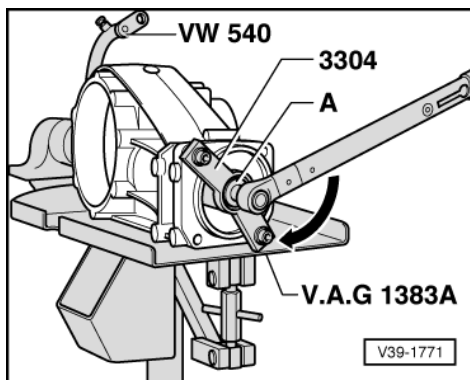
- ♦ Is mated with crown wheel, renew together as a set



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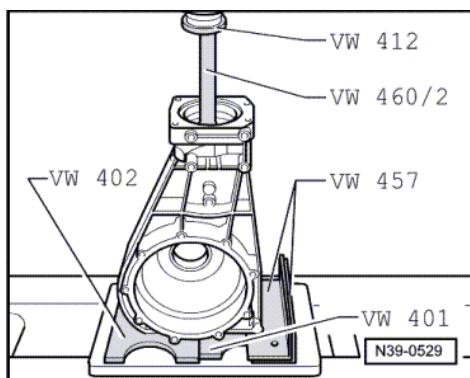
-> Fig.1 Tool for slackening and tightening drive pinion nut

A - 32 mm socket insert

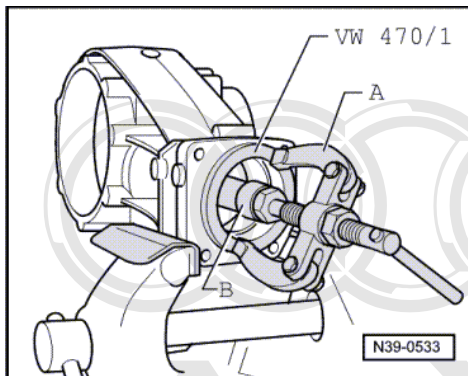


-> Fig.2 Removing nut for drive pinion

- Fit counterhold 3304 with two hexagon bolts M8 x 30.
- Final drive must be supported when loosening nut (e.g. using universal support V.A.G 1359/2 in combination with gearbox jack V.A.G 1383 A).



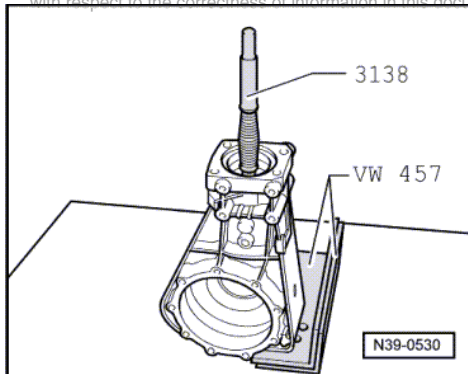
-> Fig.3 Pressing drive pinion out of inner race for small taper roller bearing



-> Fig.4 Pulling out small taper roller bearing outer race

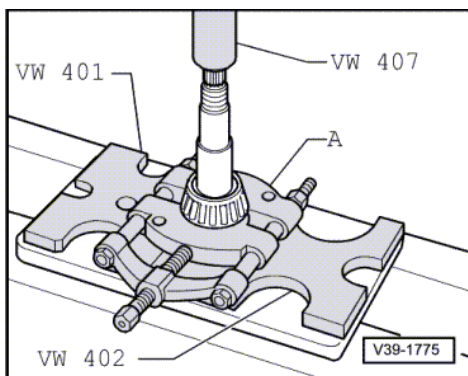
B - Support, e.g. Kukko 22/2
B - Internal puller 46 ... 58 mm, e.g. Kukko 21/7

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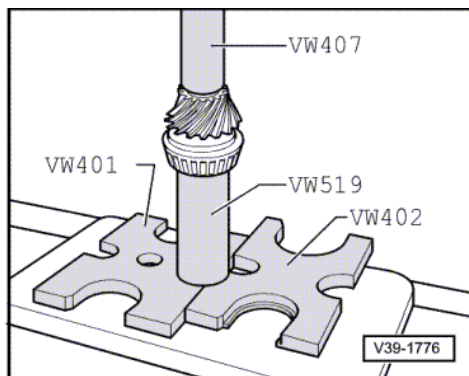
-> Fig.5 Driving out outer race for large taper roller bearing

- After removing check shims for damage.



-> Fig.6 Pressing inner race for large taper roller bearing off drive pinion

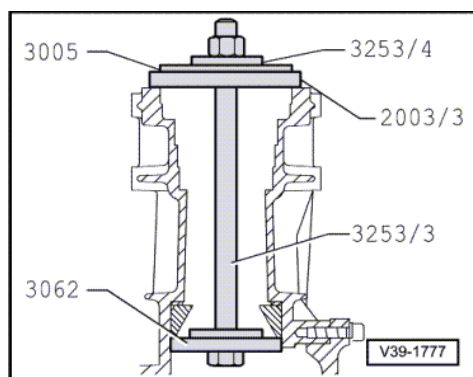
A - Separating device 22 ... 115 mm, e.g. Kukko 17/2



-> Fig.7 Pressing inner race for large taper roller bearing onto drive pinion

Important:
Wear protective gloves!

- Heat the inner race to approx. 100 °C, position and push to final position.



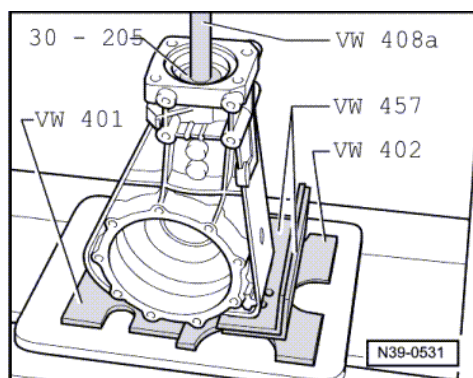
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-> Fig.8 Inserting outer race for large taper roller bearing

- Insert predetermined shim "S3" for drive pinion => Page 277 .

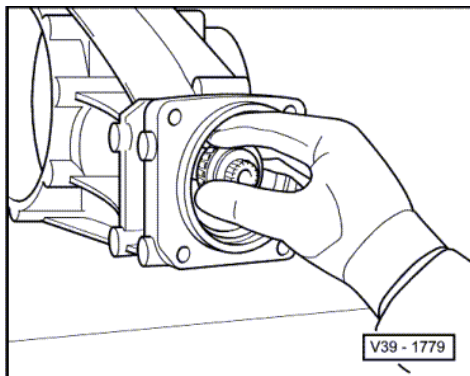
Note:

Inscription "Oben" ("top") with thrust pad 3253/4 faces the nut of the puller.



-> Fig.9 Pressing in small taper roller bearing outer race

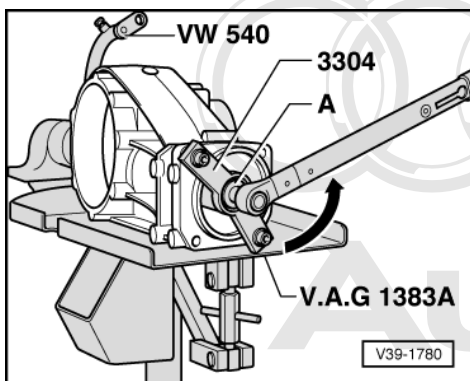
- Oil the outer race and mount it using press tool VW 408 A and thrust plate 30-205.



-> Fig.10 Pressing on small taper roller bearing inner race

Important:
Wear protective gloves!

- Insert the new drive pinion with a new spacer sleeve.
- Heat inner race for small taper roller bearing to approx. 100 oC and fit onto drive pinion.
- Press up drive pinion and insert bearing with thrust plate 40-21 onto stop.

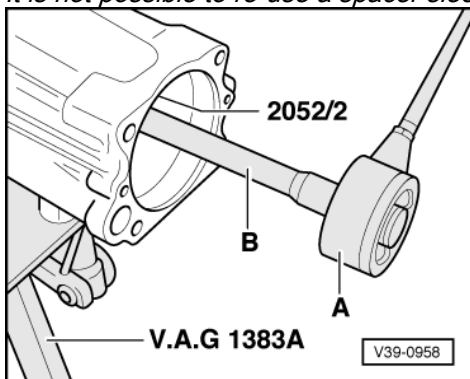


-> Fig11 Tighten nut for drive pinion and adjusting friction torque

- Fit counterhold 3304 with two hexagon bolts M8 x 30.
- Final drive must be supported when tightening nut (e.g. using universal support V.A.G 1359/2 in combination with gearbox jack V.A.G 1383 A).
- Fit new drive pinion nut.
- Tighten drive pinion nut just far enough so that no play can be felt at drive pinion.
- Gradually increase tightening torque, checking friction torque at regular intervals, until specified friction torque is obtained => Fig. 12 .

Note:

If the specified frictional torque is exceeded, the spacer sleeve must be replaced and the adjustment repeated. It is not possible to re-use a spacer sleeve that has been excessively compressed.





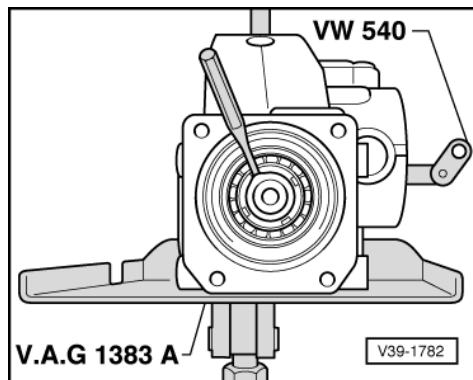
-> Fig.12 Measuring frictional torque

- A - Torque gauge, commercially available, 0 ... 600 Ncm
- B - Extension with 32 mm socket insert

- The following frictional torques should be set:

New bearings	Run bearings 1)
200 ... 250 Ncm	30 ... 60 Ncm

- 1) with at least 50 km service



-> Fig.13 Removing nut for drive pinion

- Peen drive pinion nut with a punch.

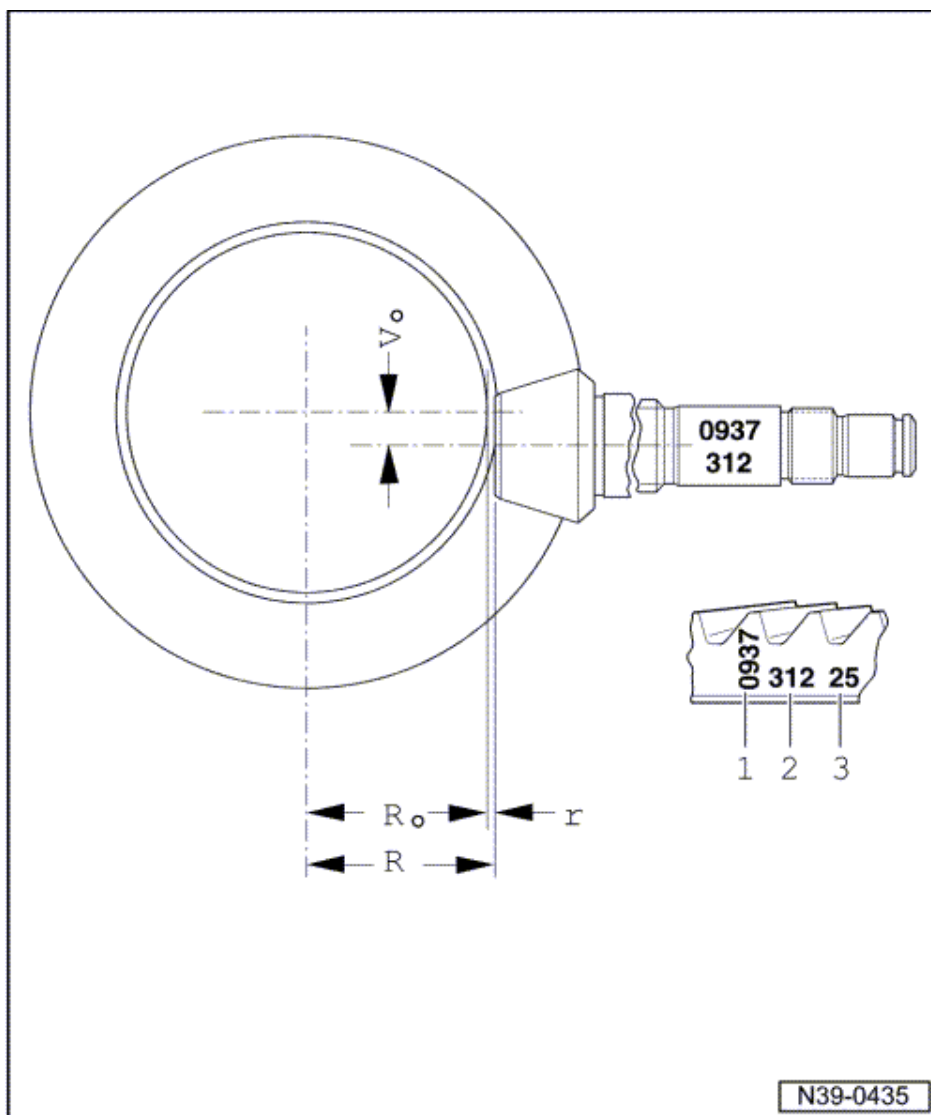
17 - Adjusting drive pinion and crown wheel

17.1 - Adjusting drive pinion and crown wheel

General notes:

- ♦ Careful adjustment of the drive pinion and crown wheel is important for the service life and smooth running of the final drive. For this reason, the drive pinion and crown wheel are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions of rotation. The position of quietest running is found by moving the drive pinion in an axial direction and at the same time lifting the crown wheel out of the zero-play mesh position by the amount necessary to maintain the backlash within the specified tolerance.
- ♦ The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.
- ♦ The deviation "r", which is related to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the crown wheel. The final drive set (drive pinion and crown wheel) must only be replaced together as a matched pair.
- ♦ Observe the general repair instructions for taper roller bearings and shims.
- ♦ Maximum care and cleanliness are essential for achieving good results when performing repairs and taking measurements.

17.2 - Adjusting and marking of gear sets

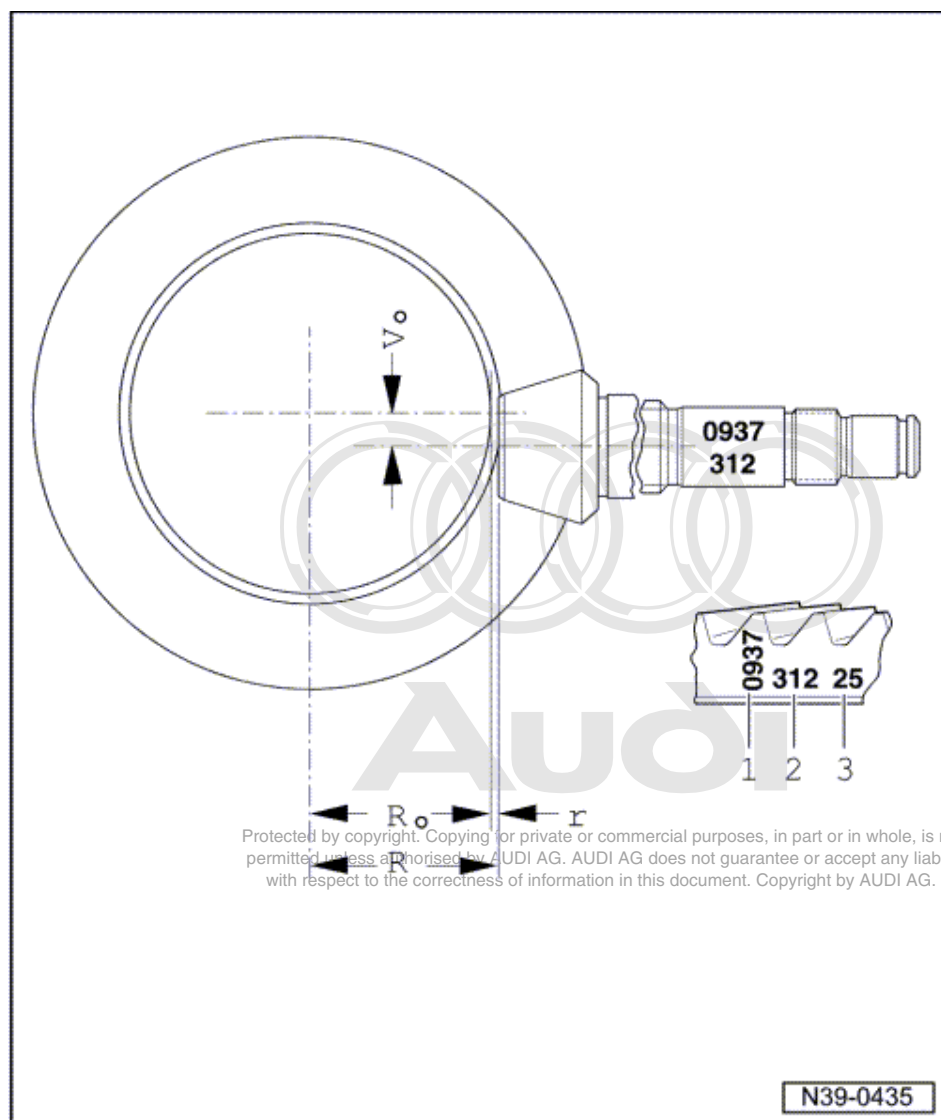


- 1 Marking "0937" indicates Oerlikon final drive set with transmission ratio 37 : 9.
- 2 Gear set pairing number (312).
- 3 Deviation (tolerance) "r" is based on the test machine master gauge used in production. The deviation "r" is always given in 1/100 mm. Example: "25" means $r = 0.25 \text{ mm}$

Ro - Length of adjustment master "Ro" of tester used.
Ro -Crown wheel = 57.50 mm



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R - Actual dimension between crown wheel and face of pinion shaft at point with quietest running for this gear set.

$$R = R_o + r$$

Vo - Hypoid offset

17.3 - Sequence of readjustment of final drive

The following procedure is recommended to save time when the drive pinion and crown wheel have to be adjusted:

- 1.) Determine total shim thickness "Stotal" for "S1" + "S2" for the specified preload for taper roller bearings for differential.
- 2.) Determine total shim thickness "S3" to reproduce the installation position for the drive pinion determined on the test machine in production.
- 3.) Distribute total shim thickness "Stotal" for "S1" + "S2" so that the specified backlash exists between crown wheel and drive pinion.

Note:

Overview of components and shims =>Page **276** .

17.4 - Adjustment overview

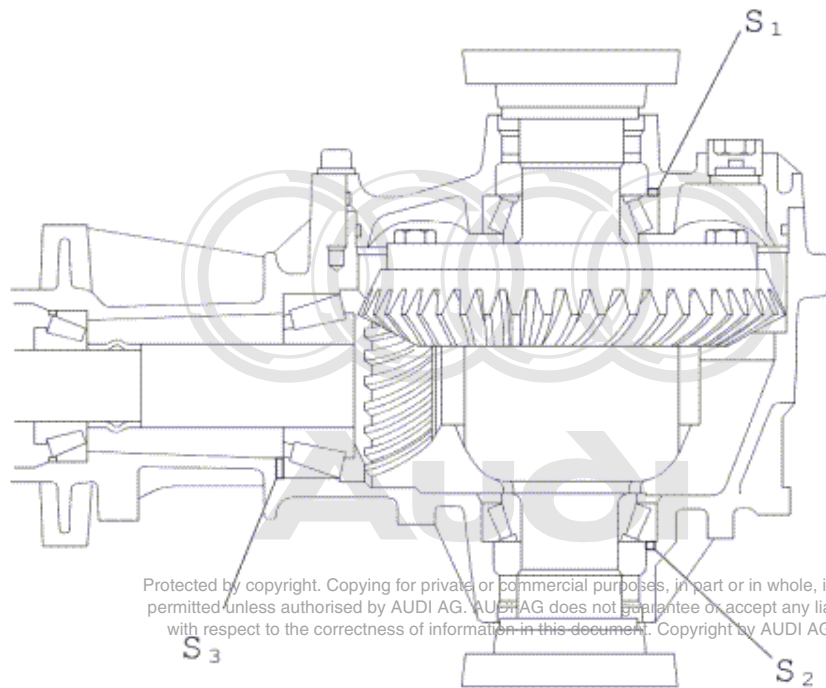
Note:

If performing assembly work on the final drive it is only necessary to adjust the drive pinion or final drive set if components have been renewed which have a direct effect on the adjustments of the final drive. To eliminate unnecessary adjustments observe following table:

Parts renewed: ▼	To adjust:		
	Crown wheel "S1"+"S2" 1) => Page 283	Pinion shaft "S3" 1) using deviation "r" => Page 277	Backlash Testing => Page 285
Final drive housing	X	X	X
Differential housing	X		X
Taper roller bearings for pinion shaft		X	X
Taper roller bearing for differential	X		X
Final drive set 2)	X	X	X
Final drive cover	X		X

- 1) Shims; installation position => Page **276** .
- 2) Drive pinion and crown wheel; only replace together.

17.5 - Position of shims



A39-0062

Note:

Adjustment overview when Replacing individual components of gearbox =>Page 275.

- S1 - Adjustment shim for crown wheel in cover for final drive
- S2 - Shim for crown wheel in final drive housing
- S3 - Shim for drive pinion in final drive housing

Special tools, testers and auxiliary equipment required

- ♦ Dial gauge extension VW 382/10
- ♦ Universal mandrel VW 385/1
- ♦ Centring disc VW 385/2
- ♦ Centring disc VW 385/3
- ♦ Measuring plunger VW 385/14
- ♦ Dial gauge extension VW 385/15
- ♦ Measuring plate VW 385/17
- ♦ Master gauge VW 385/30
- ♦ End measuring plate VW 385/33
- ♦ Universal dial gauge bracket VW 387
- ♦ Measuring lever VW 388
- ♦ Thrust plate VW 401

- ◆ Thrust plate VW 402
- ◆ Press tool VW 408 A
- ◆ Mounting rails VW 457

- ◆ Adjustment tool for crown wheel VW 521/4
- ◆ Adjustment tool for crown wheel VW 521/8
- ◆ Engine and gearbox support VW 540
- ◆ Thrust plate 30-205
- ◆ Inserter ring 2003/3
- ◆ Pinion assembly device 2052/2
- ◆ Thrust plate 3005
- ◆ Holding tool 3028
- ◆ Thrust pad 3062
- ◆ Assembly device 3253 with 3253/3 and 3253/4
- ◆ Holding tool 3304
- ◆ Engine/gearbox lifter V.A.G 1383 A
- ◆ Universal mount V.A.G 1359/2
- ◆ Dial gauge extension 30 mm
- ◆ Dial gauge
- ◆ Torque gauge 0 ... 600 Ncm

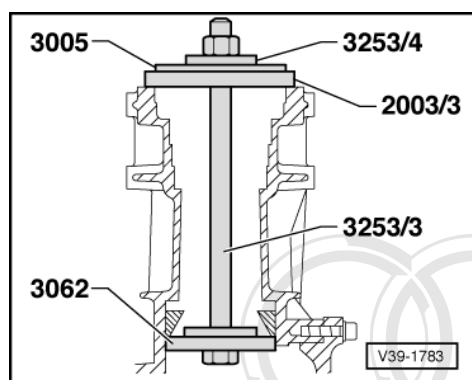
17.6 - Adjusting drive pinion

Notes:

- ◆ Before adjusting the drive pinion adjust the crown wheel (ascertain total shim thickness "S" for shims "S1" + "S2") => Page **283**.
- ◆ Re-adjustment of the drive pinion is only necessary if the final drive set, taper roller bearing for drive pinion or housing for final drive is replaced. Adjustments => Page **275**.
- ◆ Do not additionally oil new taper roller bearings for frictional torque measurement. The bearings have already been treated with a special oil by the manufacturer.

Ascertaining shim "S3" thickness

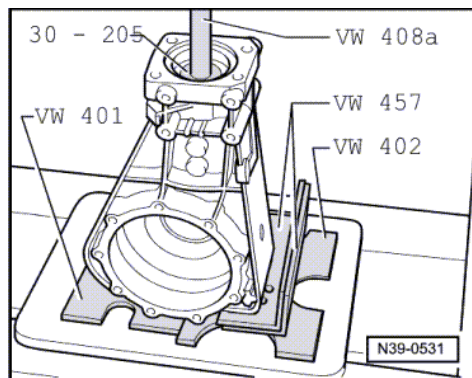
(Setting preload of taper roller bearing for drive pinion)



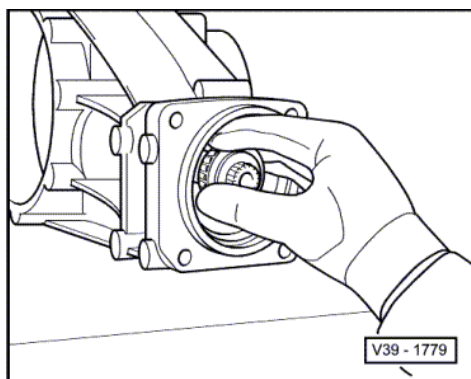
- Tensioning final drive in engine and gearbox bracket => Page **245**.
- -> Pull outer race for large taper roller bearing into housing without shim.

Note:

Inscription "Oben" ("top") with thrust washer 3253/4 faces the nut of the puller.



- -> Pull outer race for small taper roller bearing into housing.
- Oil the outer race and mount it using press tool VW 408 A and thrust plate 30-205.



- -> Insert drive pinion without spacer sleeve.

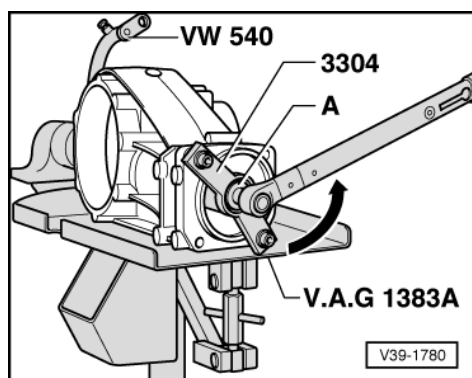
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Important:
Wear protective gloves!

- Heat inner race for taper roller bearing to approx. 100 °C and fit onto drive pinion.

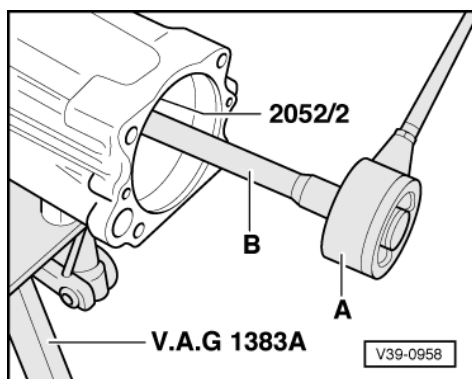
Notes:

- ♦ Do not additionally oil new taper roller bearings for frictional torque measurement. The bearings have already been treated with a special oil by the manufacturer.
- ♦ Only install spacer sleeve for final frictional torque measurement (after determining shim "S3").



- -> Fit support tool 3304 with two hexagon bolts M8 x 30.
- Final drive must be supported when tightening nut (e.g. using universal support V.A.G 1359/2 in combination with gearbox jack V.A.G 1383 A).
- Fit new drive pinion nut.
- Tighten drive pinion nut just far enough so that no play can be felt at drive pinion.

- Gradually increase tightening torque, checking friction torque at regular intervals, until specified friction torque is obtained.



- A - -> Torque gauge, commercially available, 0 ... 600 Ncm
 B - Extension with 32 mm socket insert

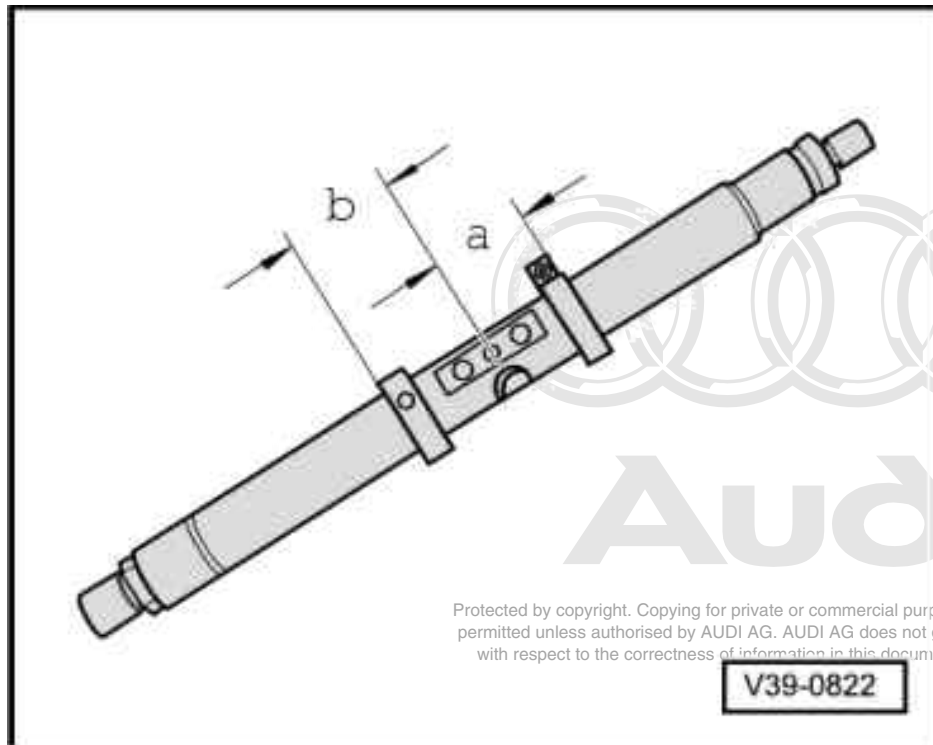
- The following frictional torques should be set:

New bearings	run bearings 1)
200 ... 250 Ncm	30 ... 60 Ncm

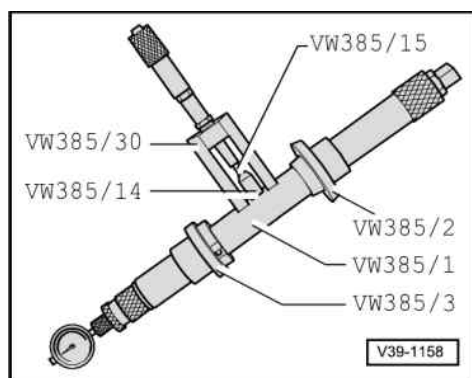
- 1) with at least 50 km service

Note:

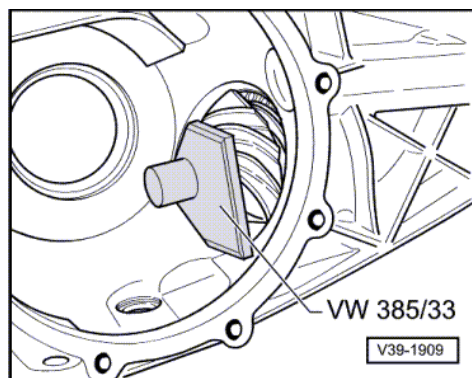
If the specified frictional torque is exceeded, the spacer sleeve must be replaced and the adjustment repeated. It is not possible to re-use a spacer sleeve that has been excessively compressed.



- -> Set adjustment ring of universal mandrel VW 385/1.
- Distance a = 60 mm
- Set sliding adjustment ring.
- Distance b = 55 mm



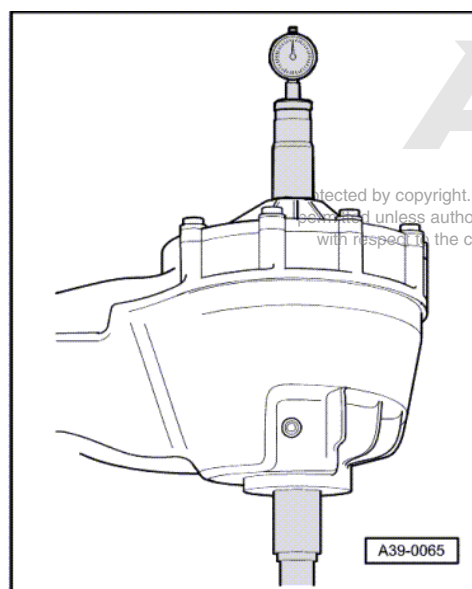
- -> Assemble universal mandrel as illustrated.
- Dial gauge extension VW 385/15 = 9 mm long
- Set universal master gauge VW 385/30.
- Ro = 57.50 mm
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.



Note:

Before performing following measurements turn drive pinion at least five turns in both directions, so that the taper roller bearings settle. Otherwise a false reading will be obtained.

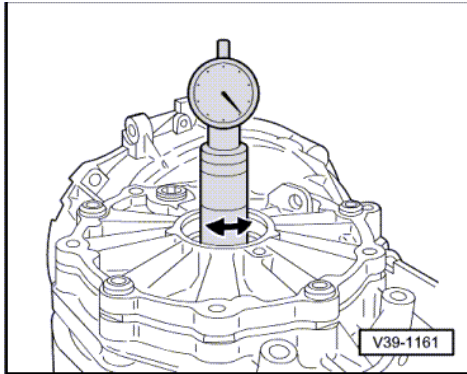
- -> Place end measuring plate VW 385/33 onto drive pinion head.



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- -> Remove master gauge and insert measuring mandrel in the housing.
- The centring disc for VW 385/3 faces towards cover for final drive
- Fit cover for final drive and tighten 4 bolts.
- Using the adjustable ring, move 2nd centring disc out as far as possible so that the mandrel can still just be turned by hand.

Determining measurement "e"



- -> Turn mandrel until the dial gauge point touches the end measuring plate on pinion shaft head, then measure maximum deflection (return point). The measured value is dimension "e" (in red scale).
- Measurement in following example: "e" = 1.60 mm

Note:

Dimension "e" is required to determine thickness of shim "S3".

- Then, (after removing universal mandrel) check again that the dial gauge, with master gauge VW 385/30 fitted, indicates "0" with 2 mm preload, otherwise repeat the measurement.

Determining shim thickness "S3"

Formula:	
"S3" = "e" - "r"	
e	= determined value
r	= deviation (marked on crown wheel in 1 /100 mm)

Example:	
Determined value "e"	1.60 mm
- Deviation "r"	0.42 mm
= Thickness of shim "S3"	1.18 mm

- Determine shim(s) as accurately as possible from table. **Part numbers**

=> Parts List

The following shims are available for "S3"

Shim thickness (mm) 1)		
0.95	1.20	1.45
1.00	1.25	1.50
1.05	1.30	1.55
1.10	1.35	
1.15	1.40	



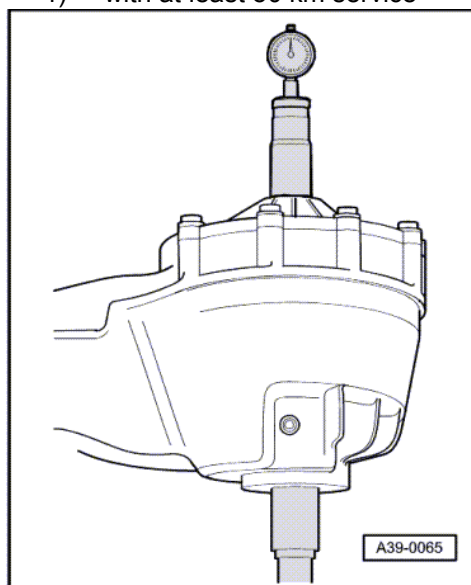
- 1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.
- Remove universal mandrel.
 - Remove drive pinion and outer race for large taper roller bearing and reinstall with calibrated shims "S3" and spacer sleeves => from Page 268 .
 - Insert inner race for small taper roller bearing and tighten drive pinion nut until specified frictional torque is achieved => Fig. 271

Notes:

- ♦ Do not additionally oil new taper roller bearings for frictional torque measurement. The bearings have already been treated with a special oil by the manufacturer.
 - ♦ Only increase tightening torque slowly and read-off frictional torque frequently. If the specified frictional torque is exceeded, the spacer sleeve must be replaced and the adjustment repeated. It is not possible to re-use a spacer sleeve that has been excessively compressed.
- Set to following frictional torques:

New bearings	run bearings 1)
200 ... 250 Ncm	30 ... 60 Ncm

1) with at least 50 km service

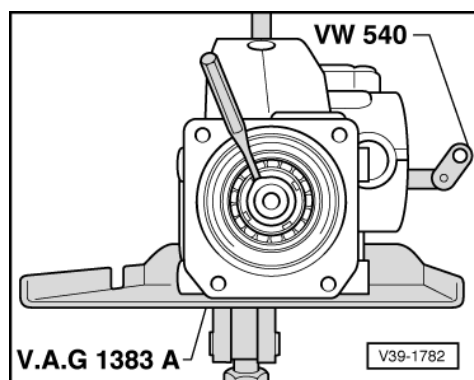


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Performing check measurement

Checking dimension "r"

- Turn drive pinion at least 5 turns in both directions.
- -> Insert universal mandrel and perform check measurement.
- If the shims have been correctly selected, the dial gauge, reading anti-clockwise (in red scale), will show the deviation "r" within a tolerance of ± 0.04 mm



- -> Peen drive pinion nut with a drift.

17.7 - Adjusting crown wheel

(Adjusting differential)

Repairs after which the crown wheel must be adjusted => adjustment overview on Page **275**.

Notes:

- ♦ Differential taper roller bearings are low friction bearings. Therefore the frictional torque only has a limited use as a check. Correct adjustment is only possible by determining the total shim thickness "Stotal".
- ♦ Do not additionally oil new taper roller bearings for frictional torque measurement. The bearings have already been treated with a special oil by the manufacturer.

Determining total shim thickness "Stotal" for shims "S1" + "S2"

(Setting preload of taper roller bearing for differential)

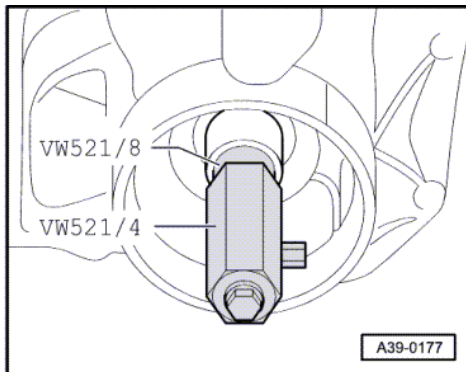
- Drive pinion removed or crown wheel dismantled from differential housing
- Lever out seals for flange shaft using a suitable lever.
- Remove outer races of differential taper roller bearings and remove shims => Page **255**.
- Drive in left taper roller bearing outer race for differential (housing side) with shim "S2" into final drive housing => Fig. **260**. For measurement purposes use a 1.00 mm thick "S2*" shim (2 shims, 1 of 0.80 mm and 1 of 0.20 mm).

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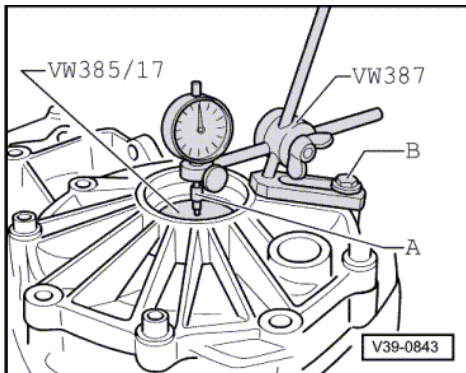
Note:

For measurement purposes a shim "S2" with a thickness of 1.00 mm is initially inserted. It is referred to as "S2" in the following. After determining the backlash "S2*" will be replaced by the correct "S2".*

- Press in outer race for right-hand taper roller bearing for differential (cover side) without shim in onto stop => Fig. **255**.
- Insert differential into housing. The crown wheel is positioned on the right side (cover side).



- Fit cover and tighten bolts to 25 Nm.
- -> Install special tools VW 521/4 and 521/8 onto housing side in differential housing.
- Turn cover side of differential housing upwards.

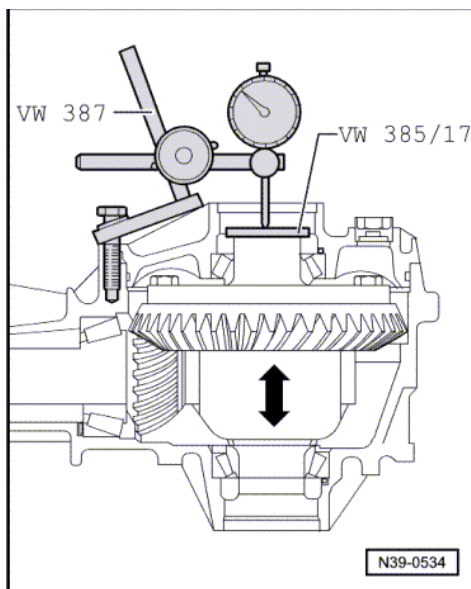




- Turn differential 5 turns in both directions to settle the taper roller bearing.
- Place measuring plate VW 385/17 onto differential.
- -> Fit measuring tools.

- A - Dial gauge extension approx. 30 mm long
- B - Hexagon bolt M8 x 45

- Position dial gauge extension in middle of measuring plate VW 385/17.



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- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.
- -> Lift differential without turning; read off play on dial gauge and note.
- Measurement in following example: 0,50 mm

Note:

If the measurement has to be repeated, the differential must again first be turned 5 turns in each direction to settle the taper roller bearing.

Formula:
"Stotal" = "S2*" + measurement + bearing preload

Example:	
Inserted shim(s) "S2*"	1.00 mm
+ Measurement	0.50 mm
+ Bearing preload (constant)	0.30 mm
= Total shim thickness "Stotal" for shims "S1" + "S2"	1.80 mm

Determining thickness of shim "S1*"

Notes:

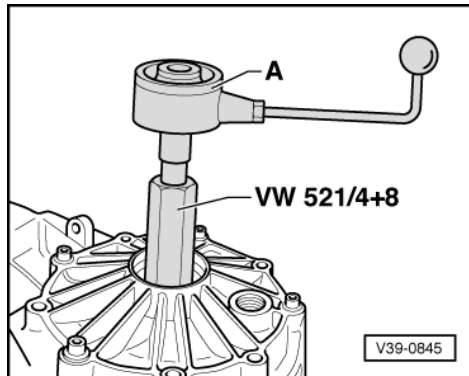
- ♦ The preliminary adjustment shim "S1*" will be replaced with the final shim "S1" after determining the backlash.
- ♦ The total shim thickness "Stotal" remains the same.

Formula:
"S1*" = "Stotal" - "S2*"

Example:

Total shim thickness "Stotal" for shims "S1" + "S2"	1.80 mm
- Inserted shim(s) "S2"	1.00 mm
= Thickness of shim "S1"	0.80 mm

- Define shim(s) as precisely as possible based on the table => Page 287 .



Measuring frictional torque (check)

- Pinion shaft removed
- Differential fitted with shims "S1*" and "S2"

- -> Fit torque gauge 0 ... 600 Ncm -A- onto differential.
- Read off friction torque.

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Frictional torque specified values:

New bearings	run bearings 1)
150 ... 300 Ncm	30 ... 60 Ncm

1) with at least 50 km service

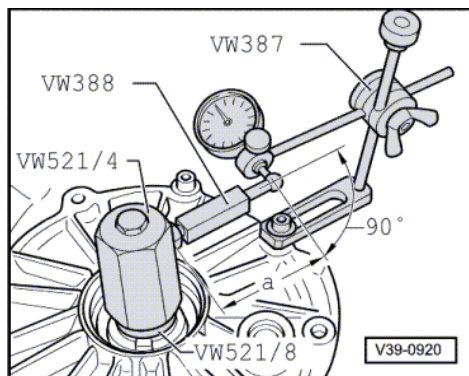
Notes:

- ♦ Differential taper roller bearings are low friction bearings. Therefore the frictional torque only has a limited use as a check. Correct adjustment is only possible by determining the total shim thickness "Stotal".
- ♦ Do not additionally oil new taper roller bearings for frictional torque measurement. The bearings have already been treated with a special oil by the manufacturer.
- ♦ If the final drive set is being re-adjusted, the adjustment of the pinion shaft should be performed now, and the adjustment should be checked =>Page 277 .

Adjusting backlash

(Position of crown wheel in gearbox housing)

- Drive pinion with shim "S3" installed
- Differential with shims "S1*" + "S2*" installed
- Insert differential into final housing mount cover and tighten all bolts to 25 Nm.
- Turn differential 5 turns in both directions so that the taper roller bearings settle.





- -> Fit measuring tools.
- Use dial gauge extension VW 382/10 (6 mm flat).
- Set measuring lever VW 388 to dimension "a" = 60 mm.
- Measure play between teeth flanks (backlash) as follows:
 - Turn crown wheel until it makes contact with a tooth flank (end of backlash travel).
 - Preload dial gauge to 1 mm and set to zero.
 - Turn crown wheel back until lying against an opposite tooth flank (backlash).
 - Read off backlash and note value.
 - Turn crown wheel through 90° and repeat measurements a further 3 times.

Note:

If the individual measurements differ by more than 0.06 mm from each other, the installation of the crown wheel or the final drive set itself is not correct. Check installation, replace final drive set, if necessary.

Determining average backlash

Example:	
1st Measurement	0.28 mm
+ 2nd Measurement	0.30 mm
+ 3rd Measurement	0.30 mm
+ 4th Measurement	0.28 mm
= Sum of measured values	1.16 mm

- Result: The average backlash is 1.16 divided by 4 = 0.29 mm

Determining thickness of shim "S2"

Formula:	
"S2"	= "S2*" - backlash + lift

Example:	
Inserted shim "S2*"	1.00 mm
- Average backlash	0.29 mm
+ Lift (constant)	0.15 mm
= Thickness of shim "S2"	0.86 mm

- Determine shim(s) as accurately as possible from table. Part numbers

=> Parts List

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The following shims are available for "S2"

Shim thickness (mm) 1)		
0.15	0.50	1.50
0.20	0.80	
0.25	1.00	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

Determining thickness of shim "S1"

Formula:	
"S1"	= "Stotal" - "S2"

Example:

Total shim thickness "Stotal" for "S1" + "S2"	1.80 mm
- Thickness of shim "S2"	0.86 mm
= Thickness of shim "S1"	0.94 mm

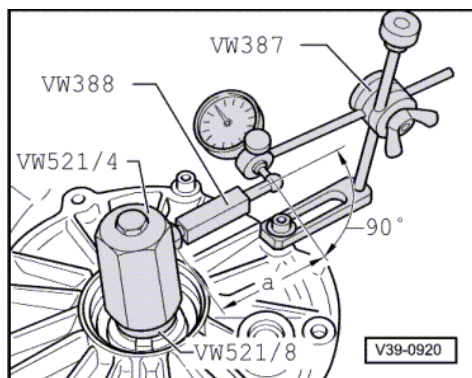
- Determine shim(s) as accurately as possible from table. Part numbers

=> Parts List

The following shims are available for "S1"

Shim thickness (mm) 1)		
0.15	0.50	0.90
0.20	0.60	1.00
0.30	0.70	1.20
0.40	0.80	

- 1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.



-> Check measurement

- Drive pinion with shim "S3" installed
- Differential with shims "S1" + "S2" installed
- Turn differential 5 turns in both directions so that the taper roller bearings settle.
- Measure backlash four times on circumference.
 - Specified value: 0.12 ... 0.22 mm

Notes:

- ◆ If the backlash is beyond the tolerance, the adjustments must be repeated. The total shim thickness "Stotal" must not be changed.
- ◆ The individual measurements must not differ by more than 0.06 mm from each other.

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