

Audi 80 1992 ➤

5-speed manual gearbox 01A four-wheel drive									
Gearbox ID	AXM	AXN	CBR	CCH	CDV	CPN	CPR	CPS	CPU
	CVR	CVX	CVV	CVY					

Edition 02.1998



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

Audi 80 1992 ➤

5-speed manual gearbox 01A four-wheel drive

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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Audi 5-speed manual gearbox 01A four-wheel drive - Edition 02.1998



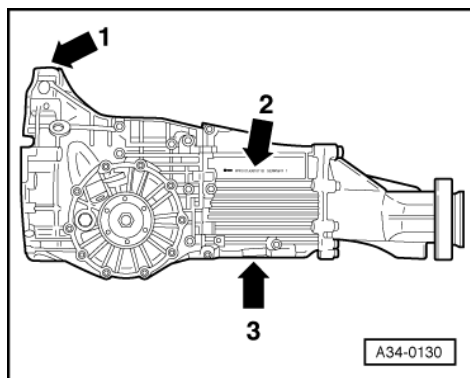
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00 - Technical data

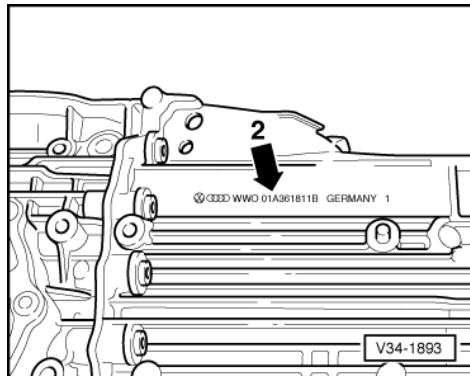
1 - Identification of gearbox

1.1 - Identification of gearbox

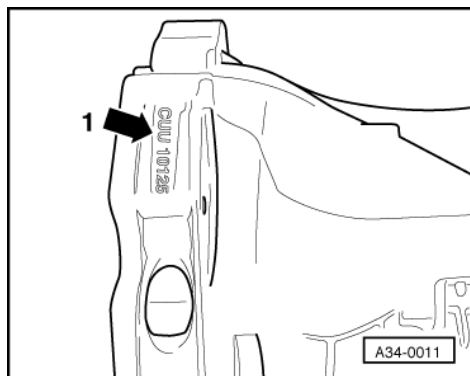


-> Location on gearbox

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 production

Additional data are 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		CCH	AXM	AXN	CVV
Production	from	09.91	09.91	09.91	07.94
	to	07.94	08.94	01.95	01.95
Allocation	Model Engine	Audi 80 1992 ä 2.0 l - 85 kW 2.0 l - 103 kW	Audi 80 1992 ä 2.0 l - 101 kW 2.3 l - 98 kW 2.6 l - 102 kW 1) 2.6 l - 110 kW	Audi 80 1992 ä 2.0 l - 79 kW 1) 2.0 l - 85 kW 2.0 l - 103 kW	Audi 80 1992 ä 2.0 l - 103 kW
Ratio	Final drive	41 : 9 = 4.556	37 : 9 = 4.111	41 : 9 = 4.556	41 : 9 = 4.556
Z2 : Z1=i	1st gear	39 : 11 = 3.545	39 : 11 = 3.545	39 : 11 = 3.545	35 : 10 = 3.500
	2nd gear	40 : 19 = 2.105	40 : 19 = 2.105	40 : 19 = 2.105	36 : 17 = 2.118
	3rd gear	39 : 30 = 1.300	40 : 28 = 1.429	39 : 30 = 1.300	39 : 30 = 1.300
	4th gear	33 : 35 = 0.943	35 : 34 = 1.029	33 : 35 = 0.943	33 : 35 = 0.943
	5th gear	30 : 39 = 0.769	31 : 37 = 0.838	30 : 38 = 0.789	30 : 38 = 0.789
	Reverse gear	35 : 10 = 3.500	35 : 10 = 3.500	35 : 10 = 3.500	31 : 9 = 3.444

1) China, CIS

Code letters	CCH	AXM	AXN	CVV
Speedometer	Electronic			
Capacity	2.75 litres			
Specification	Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)			
Clutch mechanism	Hydraulic	Hydraulic	Hydraulic	Hydraulic
Clutch plate dia.	228 mm	228 mm	228 mm	228 mm
Drive shaft flange dia.	100 mm	100 mm	100 mm	100 mm
Polygon bearings	No	No	2)	No 3)
Weight in top gear	3.504	3.444	3.595	3.959

Assignment of rear final drive Code letters	AZF CMB	AZC AZD	AZF CMB	CMB
---	------------	------------	------------	-----

- 2) With or without polygon bearings, depending on production date
- 3) Large diameter differential bearings as for gearboxes with polygon bearings

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		CPU	CPS	CVR	CDV
Production	from	07.94	08.94	08.94	07.92
	to	07.95	07.95	07.95	07.95
Allocation	Model Engine	Audi 80 1992 ä 2.0 l - 79 kW1) 2.0 l - 85 kW 2.0 l - 103 kW	Audi 80 1992 ä 2.3 l - 98 kW 2.6 l - 102 kW1)	Audi 80 1992 ä 2.3 l - 98 kW 2.6 l - 102 kW1)	Audi 80 1992 ä 2.6 l - 102 kW1) 2.6 l - 110 kW
Ratio Z2 : Z1=i	Final drive	41 : 9 = 4.556	37 : 9 = 4.111	37 : 9 = 4.111	37 : 9 = 4.111
	1st gear	35 : 10 = 3.500	35 : 10 = 3.500	35 : 10 = 3.500	39 : 11 = 3.545
	2nd gear	36 : 17 = 2.118	36 : 17 = 2.118	36 : 17 = 2.118	39 : 21 = 1.857
	3rd gear	39 : 30 = 1.300	40 : 28 = 1.429	40 : 28 = 1.429	39 : 30 = 1.300
	4th gear	33 : 35 = 0.943	35 : 34 = 1.029	35 : 34 = 1.029	35 : 34 = 1.029
	5th gear	30 : 38 = 0.789	31 : 37 = 0.838	31 : 37 = 0.838	31 : 37 = 0.838
	Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444	35 : 10 = 3.500

- 1) China, CIS

Code letters	CPU	CPS	CVR	CDV
Speedometer	Electronic			
Capacity	2.75 litres			
Specification	Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)			
Clutch mechanism	Hydraulic	Hydraulic	Hydraulic	Hydraulic
Clutch plate dia.	228 mm	228 mm	228 mm	228 mm
Drive shaft flange dia.	100 mm	100 mm	100 mm	100 mm
Polygon bearings	2)	2)	2)	2)
Final drive ratio	3.595	3.444	3.444	3.444
Assignment of rear final drive Code letters	CMB	AZC	AZC	AZC

- 2) With or without polygon bearings, depending on production date

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		CPR	CVY	CBR	CPN
Production	from	07.94	08.94	09.91	07.94
	to	07.95	07.95	07.95	07.95
Allocation	Model Engine	Audi 80 1992 ä 2.6 l - 110 kW	Audi 80 1992 ä 2.6 l - 110 kW	Audi 80 1992 ä 2.8 l - 128 kW	Audi 80 1992 ä 2.8 l - 128 kW
Ratio Z2 : Z1=i	Final drive	37 : 9 = 4.111	37 : 9 = 4.111	35 : 9 = 3.889	35 : 9 = 3.889
	1st gear	35 : 10 = 3.500	35 : 10 = 3.500	35 : 10 = 3.500	35 : 10 = 3.500
	2nd gear	35 : 19 = 1.842	35 : 19 = 1.842	35 : 19 = 1.842	35 : 19 = 1.842
	3rd gear	39 : 30 = 1.300	39 : 30 = 1.300	38 : 31 = 1.226	38 : 31 = 1.226
	4th gear	35 : 34 = 1.029	35 : 34 = 1.029	33 : 35 = 0.943	33 : 35 = 0.943
	5th gear	31 : 37 = 0.838	31 : 37 = 0.838	31 : 38 = 0.816	31 : 38 = 0.816



Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444	31 : 9 = 3.444
--------------	----------------	----------------	----------------	----------------

Code letters	CPR	CVY	CBR	CPN
Speedometer	Electronic			
Capacity	2.75 litres			
Specification	Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)			
Clutch mechanism	Hydraulic	Hydraulic	Hydraulic	Hydraulic
Clutch plate dia.	228 mm	228 mm	240 mm	240 mm
Drive shaft flange dia.	100 mm	100 mm	100 mm	100 mm
Polygon bearings	2)	2)	2)	2)
itotal in top gear	3.444	3.444	3.173	3.173
Assignment of rear final drive Code letters	AZC	AZC	CAV	CAV

2) With or without polygon bearings, depending on production date

Manual gearbox		5-speed 01A four-wheel drive			
Code letters		CVX			
Production	from to	08.94 01.95			
Allocation	Model Engine	Audi 80 1992 ä 2.8 I - 128 kW			
Ratio	Final drive	35 : 9 = 3.889			
Z2 : Z1=i	1st gear	35 : 10 = 3.500			
	2nd gear	35 : 19 = 1.842			
	3rd gear	38 : 31 = 1.226			
	4th gear	33 : 35 = 0.943			
	5th gear	31 : 38 = 0.816			
	Reverse gear	31 : 9 = 3.444			

Code letters	CVX			
Speedometer	Electronic			
Capacity	2.75 litres			
Specification	Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)			
Clutch mechanism	Hydraulic			
Clutch plate dia.	240 mm			
Drive shaft flange dia.	100 mm			
Polygon bearings	No 3)			
itotal in top gear	3.173			
Assignment of rear final drive Code letters	CAV			

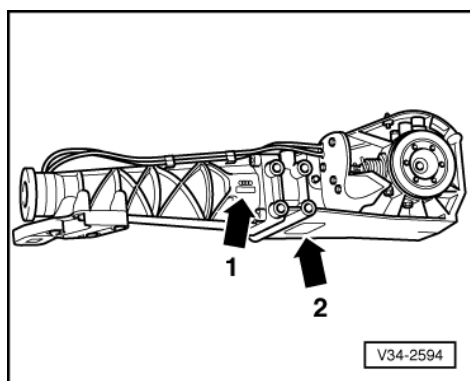
3) Large diameter differential bearings as for gearboxes with polygon bearings

2 - Rear final drive identification

2.1 - Rear final drive identification

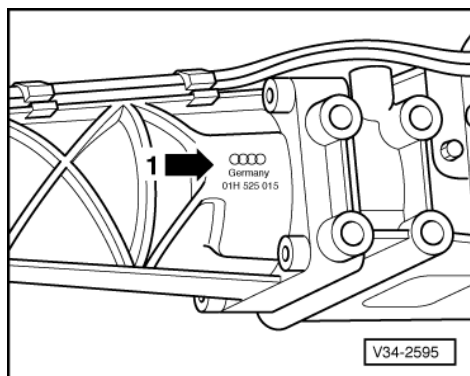
Final drive 01H is assigned to the manual gearbox 01A, four-wheel drive.

Assignment => Page **6**

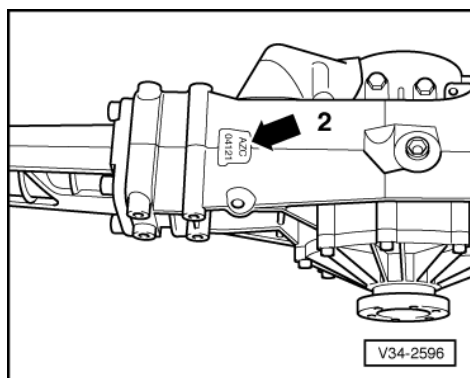


-> Location on final drive

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



-> Final drive 01H -arrow 1-



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

Example:	AZC	04	12	1
	Code letters	Day	Month	Year (1991) of production

Note:

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

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

Rear final drive		01H			
Code letters		AZC	AZD	AZF	CMB
Production	from	07.91	07.91	07.91	01.93
	to	07.95	07.93	07.93	07.95
Allocation	Model	Audi 80 1992 ä	Audi 80 1992 ä	Audi 80 1992 ä	Audi 80 1992 ä
	Engine	2.3 l - 98 kW 2.6 l - 102 kW ¹⁾ 2.6 l - 110 kW	2.0 l - 101 kW 2.3 l - 98 kW	2.0 l - 85 kW 2.0 l - 103 kW	2.0 l - 79 kW ¹⁾ 2.0 l - 85 kW 2.0 l - 103 kW
Ratio	Final drive	37 : 9 = 4.111	37 : 9 = 4.111	41 : 9 = 4.556	41 : 9 = 4.556
Capacity		1.3 litres			
Specification		Gear oil GL 5 SAE 90 (MIL-L 2105 B)			
Drive shaft flange dia.		100 mm	90 mm	90 mm	100 mm
Assignment of manual gearbox Code letters		AXM CDV CPS CPR CVR CVY	AXM	AXN CCH	AXN CCH CPU CVV

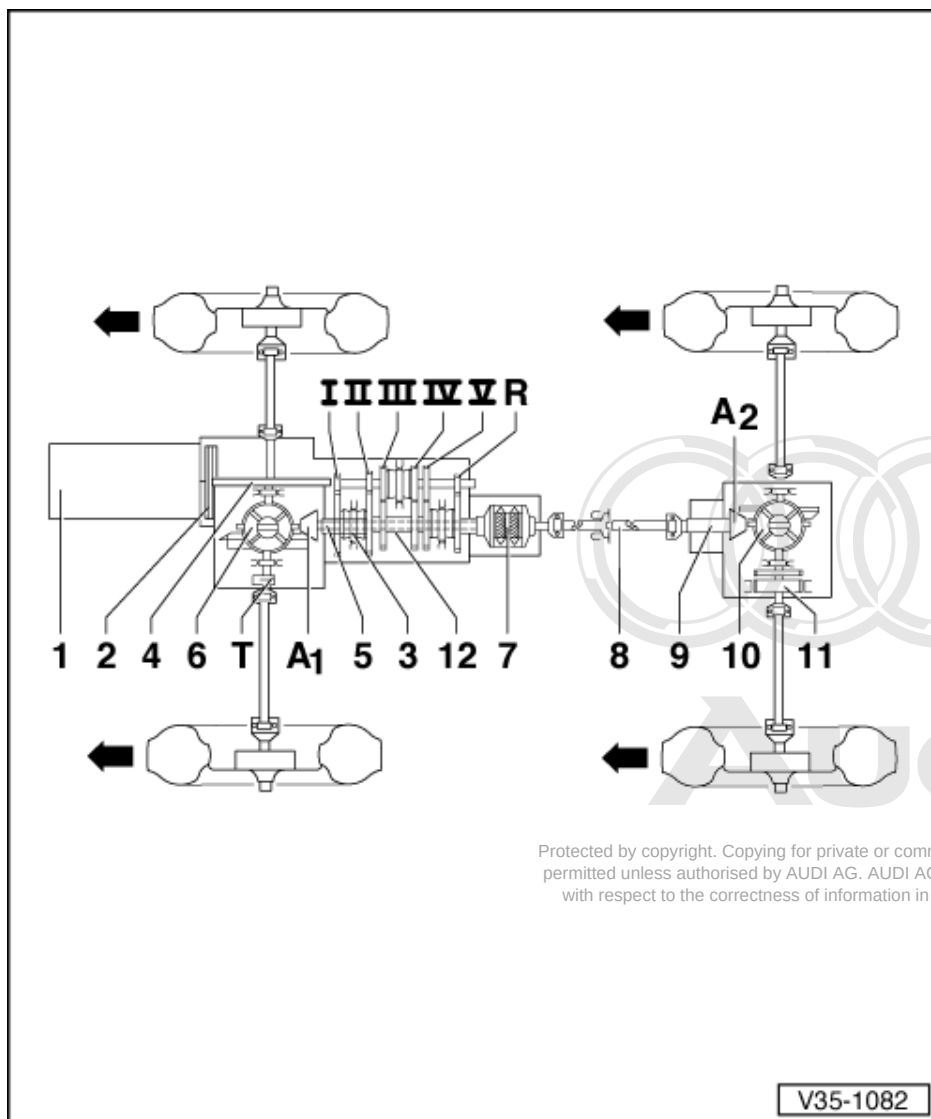
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1) China, CIS

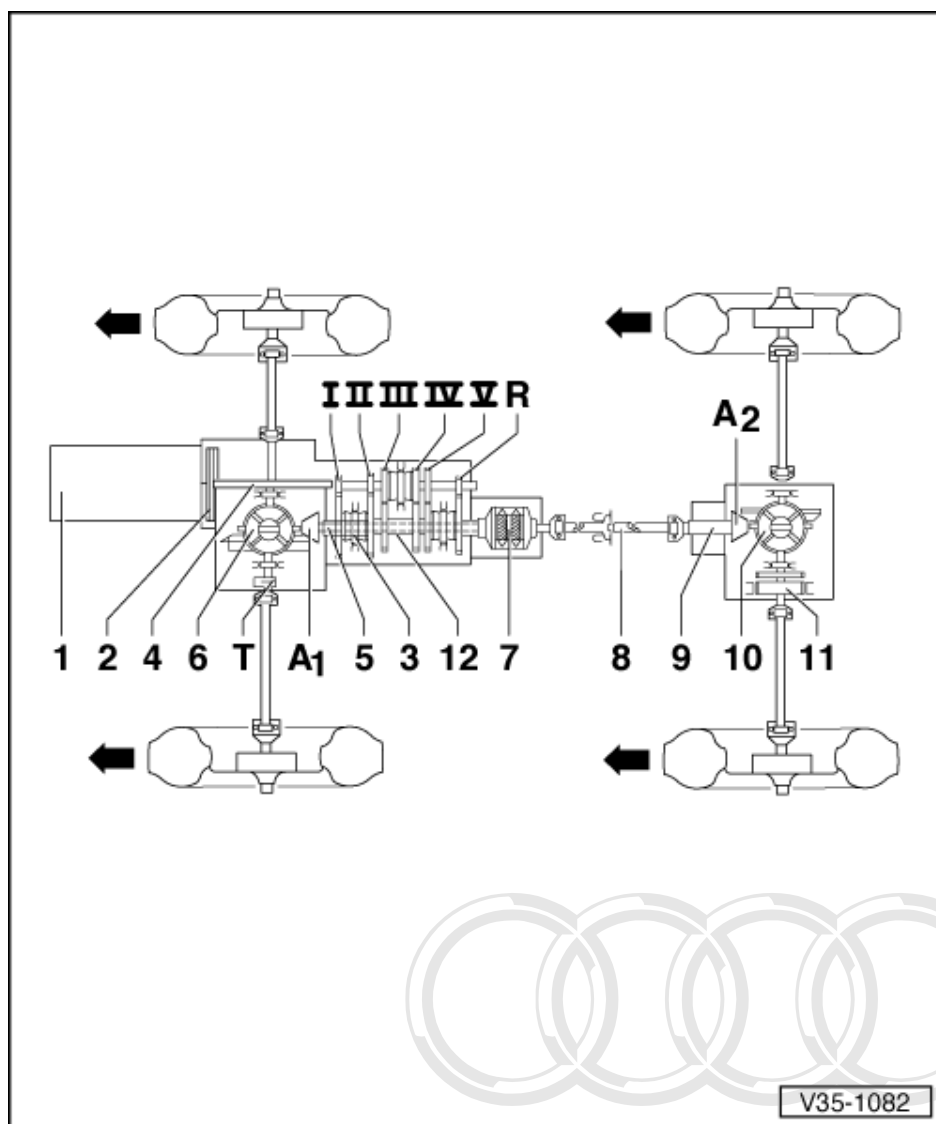
Rear final drive		01H			
Code letters		CAV			
Production	from	08.94			
	to	07.95			
Allocation	Model	Audi 80 1992 ä			
	Engine	2.8 l - 128 kW			
Ratio	Final drive	35 : 9 = 3.889			
Capacity		1.3 litres			
Specification		Gear oil GL 5 SAE 90 (MIL-L 2105 B)			
Drive shaft flange dia.		100 mm			
Assignment of manual gearbox Code letters		CBR CPN CVX			

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 Front differential
- 7 Torsen differential
- 8 Propshaft
- 9 Rear drive pinion
- 10 Rear differential
- 11 Differential lock
- 12 Hollow shaft



- 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 - Notes on performance, brake testing and towing/tow starting

- ♦ Performance and brake test

=> 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
itotal = Overall ratio	iG x iA

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Example:

	5th gear	Final drive
Drive gear	ZG1 = 38	ZA1 = 9
Driven gear	ZG2 = 30	ZA2 = 41

Calculations:	
iG	= 30 : 38 = 0.789
iA	= 41 : 9 = 4.556
itotal	= (30 : 38) x (41 : 9) = 0.789 x 4.556 = 3.596

5 - General repair instructions

5.1 - General repair instructions

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

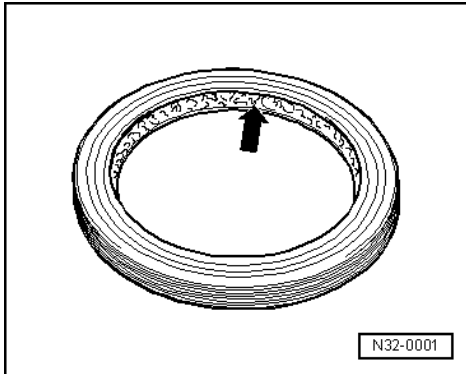
- ♦ Select the correct bolts and other components according to the gearbox code letters via the Parts Catalogue => Page 2 onwards.



- ♦ When fitting a new gearbox or rear final drive, the oil level must be checked and oil added if necessary => Page 193 .
- ♦ Capacities and specifications =>Page 6 .
- ♦ Thoroughly clean all connections and the surrounding areas before disconnecting.
- ♦ When installing gearbox, ensure that the dowel sleeves are fitted correctly.

O-rings, seals, gaskets

- ♦ Always renew O-rings, seals 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.



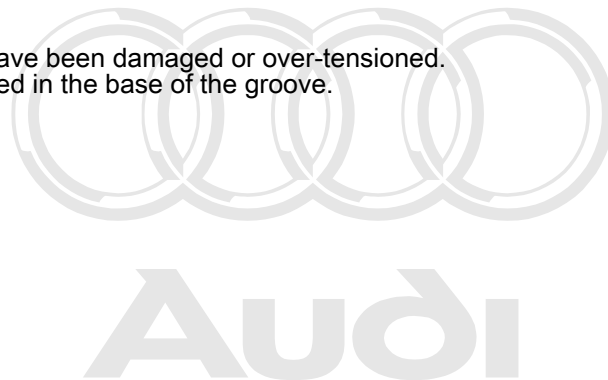
- ♦ -> Before installing radial shaft oil seals, lightly oil outer circumference and pack space between sealing lips -arrow- with grease.
- ♦ The open side of the seals must face the fluid against which the seal is to serve.
- ♦ When replacing oil seals, always vary the point at which the sealing lips 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 in gearbox =>Page 60 .

Sealants

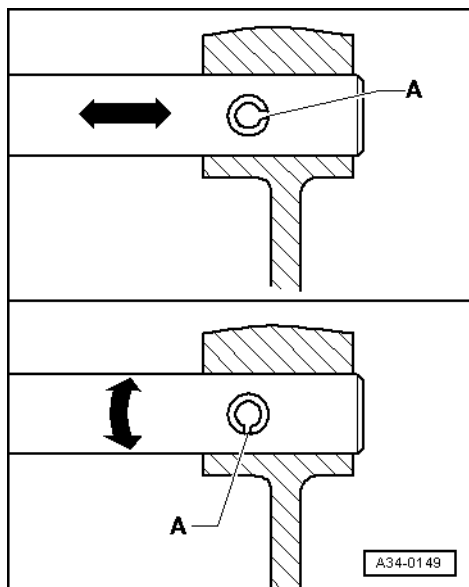
- ♦ Thoroughly clean housing joint surfaces before applying sealing paste.
- ♦ Apply sealing paste AMV 188 001 02 or AMV 188 000 02 evenly and not too thick.
- ♦ Breather holes must remain free of sealing paste.

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.



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- ♦ -> Replace spring sleeves. 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 crosswise in stages if no tightening sequence is specified.
- ♦ The tightening torques stated apply to non-oiled nuts and bolts.
- ♦ Always replace self-locking nuts and bolts.
- ♦ Use a wire brush to clean the threads of bolts screwed in with a locking compound. 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.

Bearings

- ♦ Install needle roller bearings with the lettering on the bearing (the side with thicker metal) facing towards the drift or other tool used for installing.
- ♦ Grease needle roller bearing for gearbox 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 the outer or inner 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.

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. Install only shims which are in perfect condition.

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



Gears, synchro-hubs, inner races for sliding gears

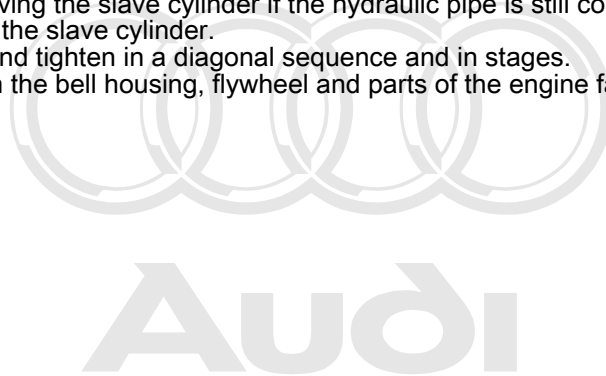
- ♦ Heat gears and synchro-hubs to approx. 100 °C before installing. Press in onto stop when installing so there is no axial clearance.
- ♦ Heat inner races for sliding gears to approx. 100 °C when installing.
- ♦ Temperature can be checked with temperature tester V.A.G 1558.
- ♦ Note installation position.

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.

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 cant clutch pressure plate, loosen and tighten in a diagonal sequence and in stages.
- ♦ 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 foot pedal cluster, remove cover below dash panel:

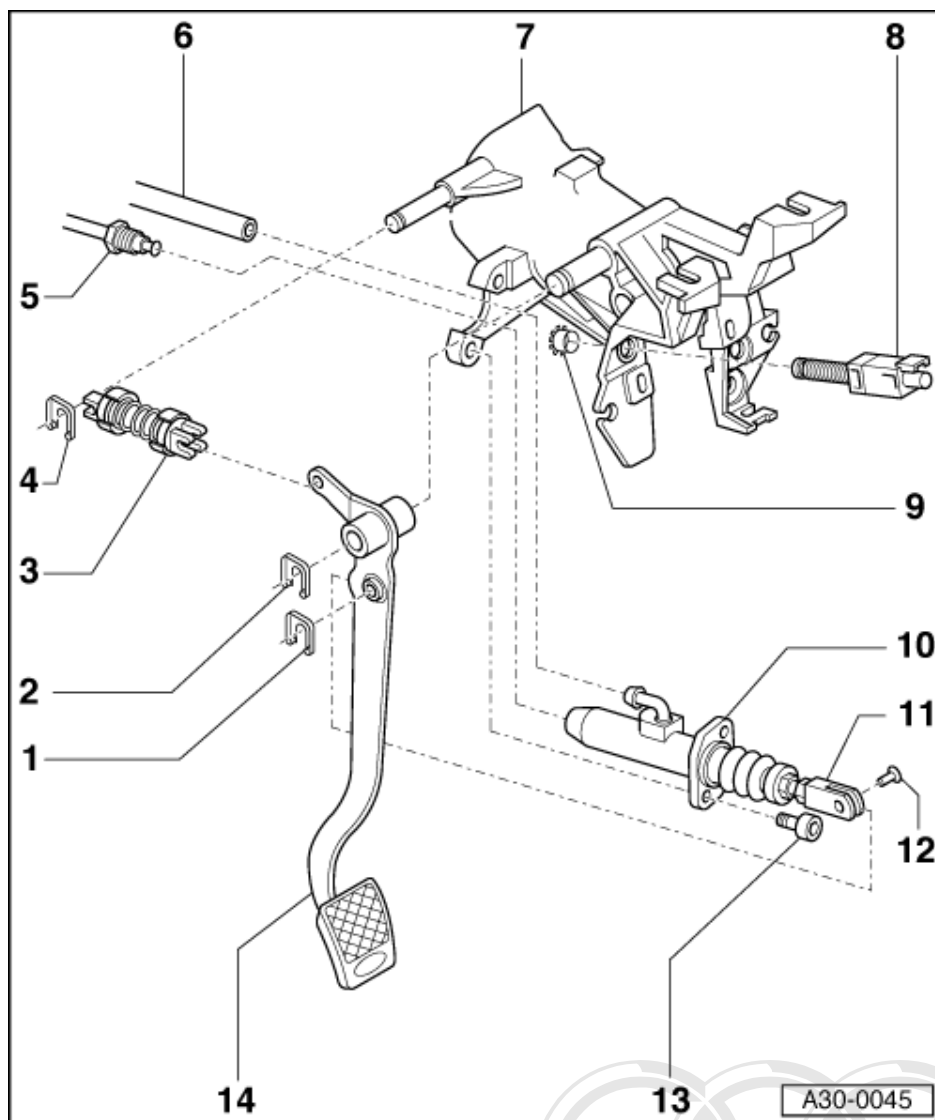
=> General body repairs; Repair group 70; Dash panel, Removing driver's storage compartment Dash panel, Removing driver's storage compartment

- ◆ 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, foot pedal cluster



1 Locking clip

- ◆ Replace
- ◆ Fit onto pin

2 Locking clip

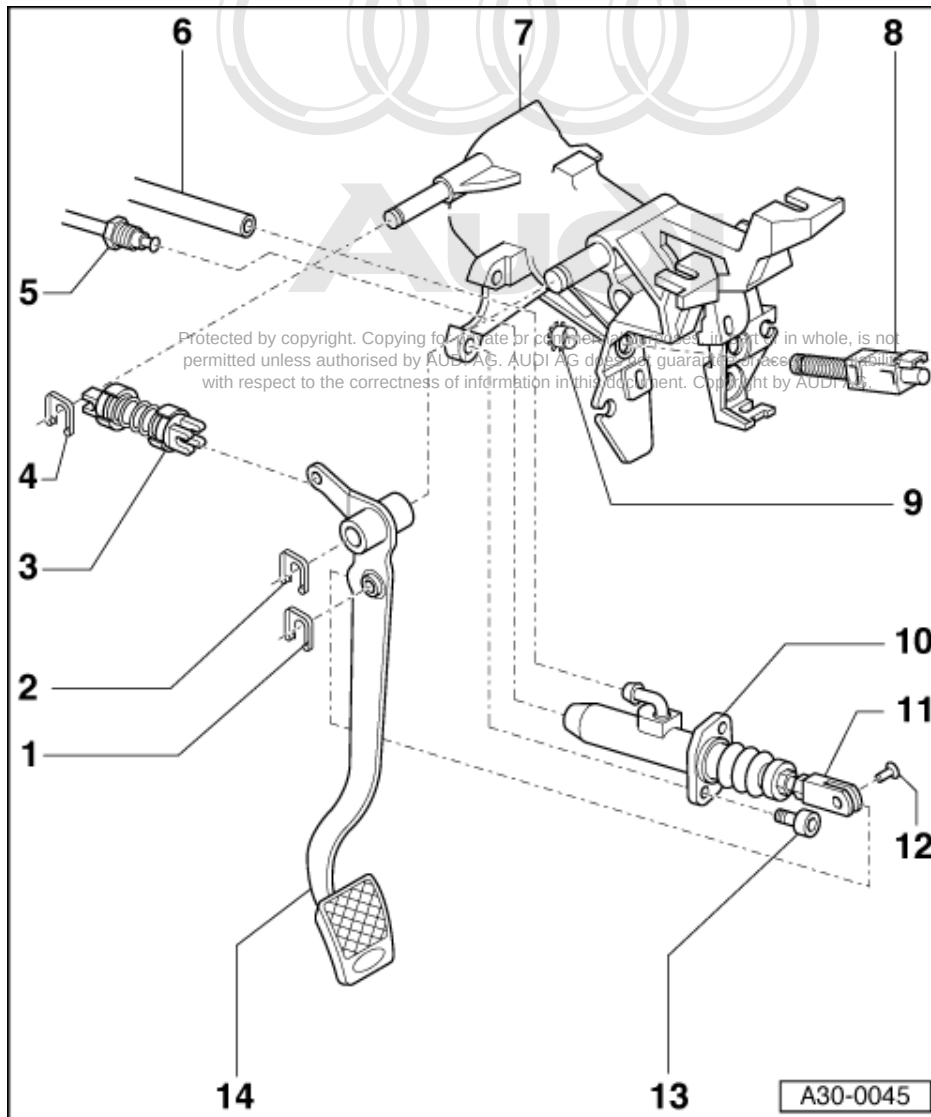
- ◆ Replace
- ◆ Fit onto shaft on pedal bracket

3 Over-centre spring

- ◆ Installation position: Goes towards outside of vehicle
- ◆ Do not grease spring
- ◆ Only grease moving surfaces on pedal and pedal bracket
- ◆ Removing and installing
=> Fig. 18
- ◆ Allocation

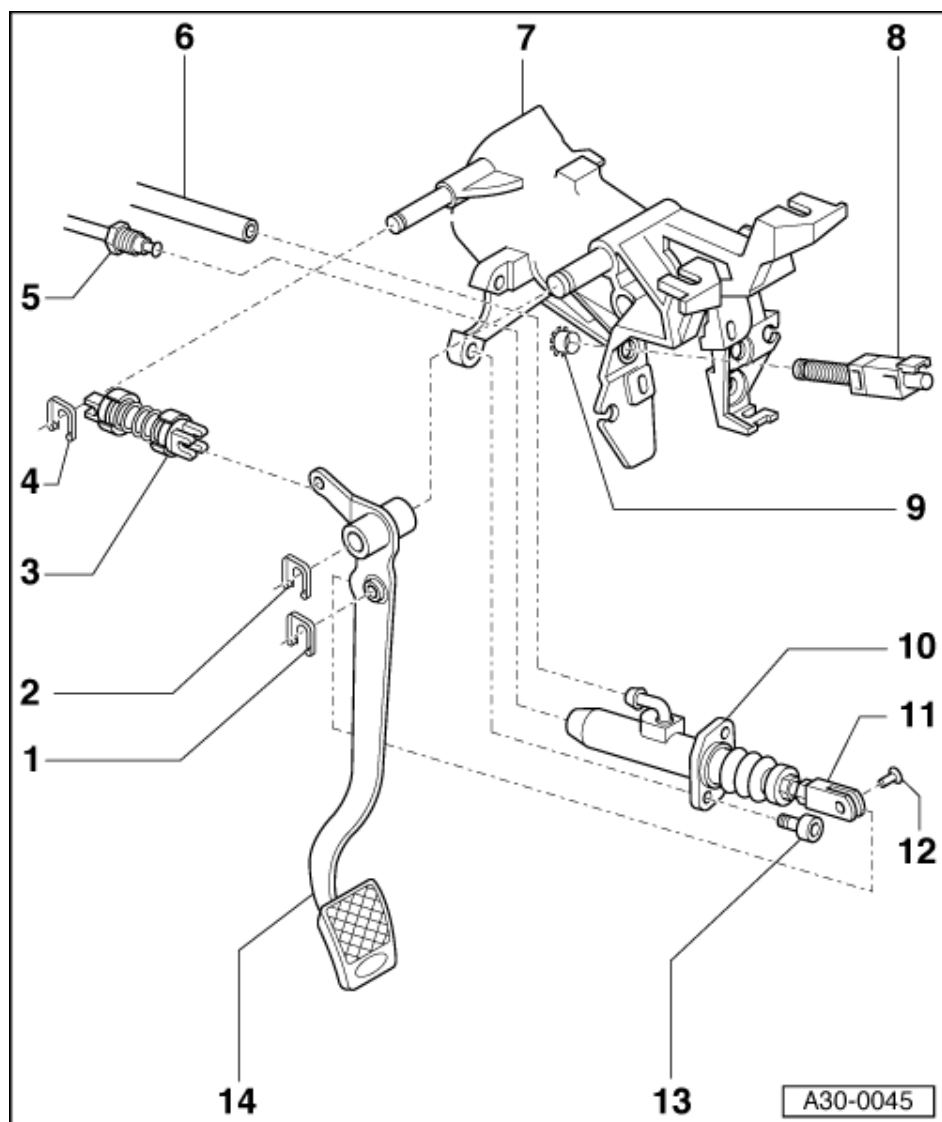
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=> Parts Catalogue



- 4 Locking clip**
 - ◆ Replace
- 5 Pipe**
 - ◆ For clutch master cylinder
 - ◆ Tighten nut on pipe connection to 15 Nm
- 6 Supply hose**
 - ◆ For master cylinder
 - ◆ Must not touch over-centre spring
 - ◆ Locate accordingly on pedal bracket and secure with cable clip
- 7 Pedal bracket**
 - ◆ Removing and installing

=> Running gear, Four-wheel drive; Repair group 46; Removing and installing foot pedal cluster; Servicing foot pedal cluster Removing and installing foot pedal cluster Servicing foot pedal cluster



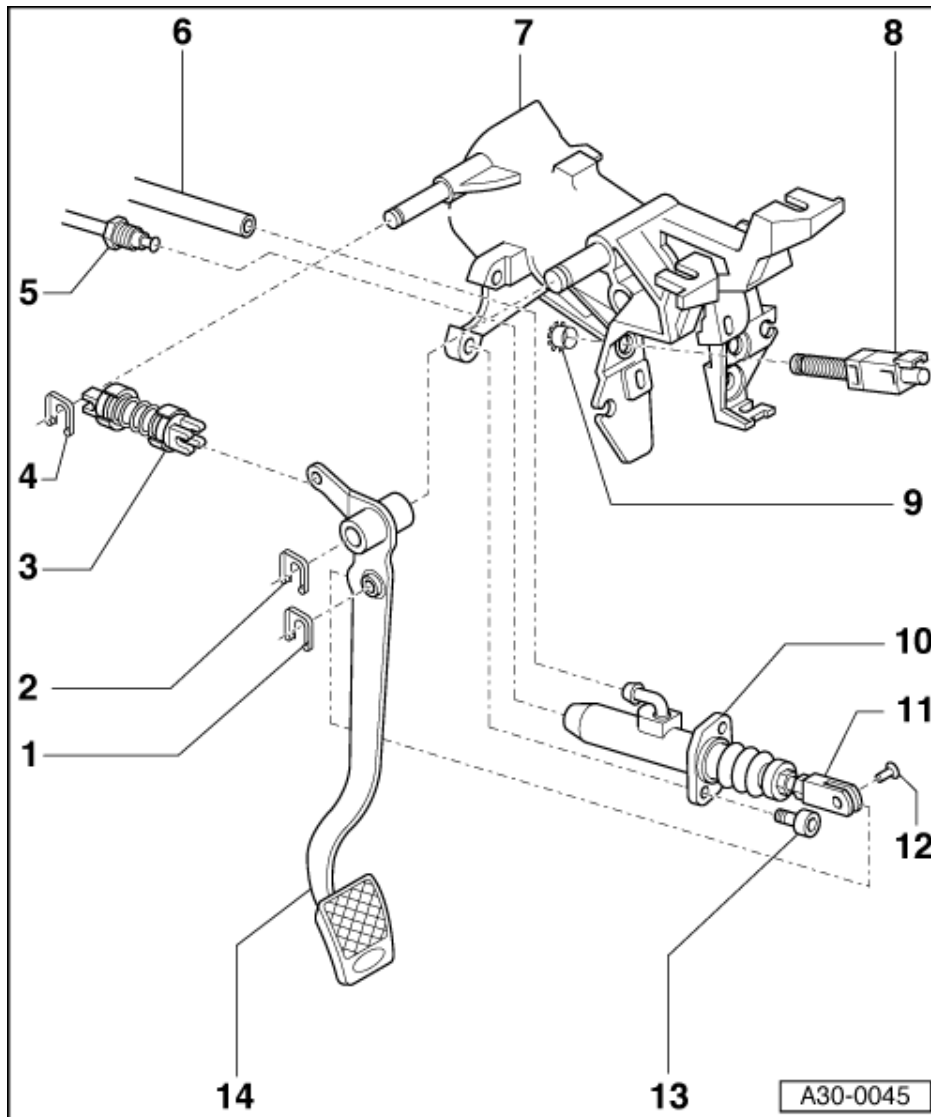
8 Vent valve

- ♦ For cruise control system
- ♦ Replace
- ♦ Press in valve after fitting clip
- ♦ Adjust with clevis connected:
 - Operate clutch pedal.
 - Press in vent valve onto stop
 - Pull clutch pedal all the way back by hand.

9 Clip

- ♦ Secures vent valve for cruise control
- ♦ Using pliers, press clip into appropriate holes in pedal bracket until fully home

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10 Master cylinder

- ◆ Replace if leaking

11 Clevis

- ◆ Adjusting
=> Fig. 18

12 Pin

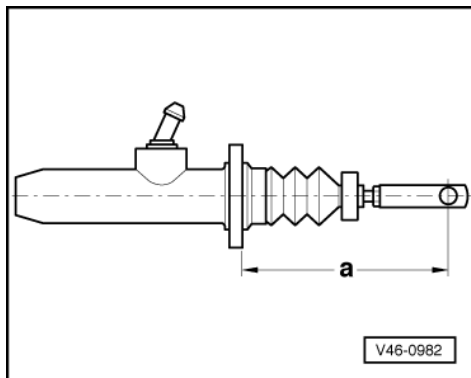
- ◆ Secure clevis to clutch pedal

13 Bolt - 20 Nm

14 Clutch pedal

- ◆ Is located in correct position by clevis adjustment
- ◆ Can be replaced with pedal bracket installed
- ◆ Fit onto shaft on pedal bracket
- ◆ Bearing bush cannot be replaced separately; pedal is supplied as replacement part with integral bush.

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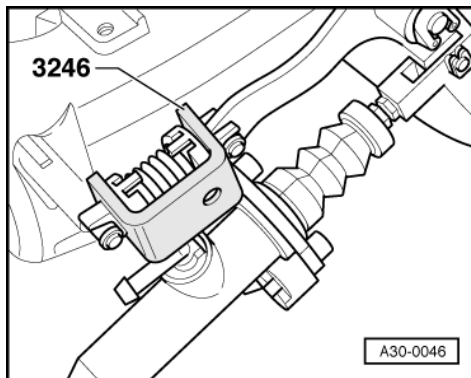
-> Fig.1 Adjusting clevis

- Check distance -a- when replacing master cylinder. Adjust if necessary.
- When measuring, clevis must be at right angles to mounting surface of clutch master cylinder.
- Dimension $a = 109.5 \pm 0.5$ mm
- To adjust, turn clevis.

Notes:

If the clevis is correctly adjusted and the clutch pedal does not return properly by itself, this can be caused by the following:

- ♦ Air in hydraulic system.
- ♦ Pedal bearing or over-centre spring not moving freely.



-> Fig.2 Removing and installing over-centre spring

Special tools, testers and auxiliary equipment required

- ♦ Installation clamp 3246
- Remove left-hand storage compartment

=> General body repairs; Repair group 70; Dash panel, Removing driver's storage compartment Dash panel, Removing driver's storage compartment

- Take locking element off pivot pin.
- Push clamp 3246 on over-centre spring sideways.
- Depress clutch pedal and remove over-centre spring together with installation clamp.

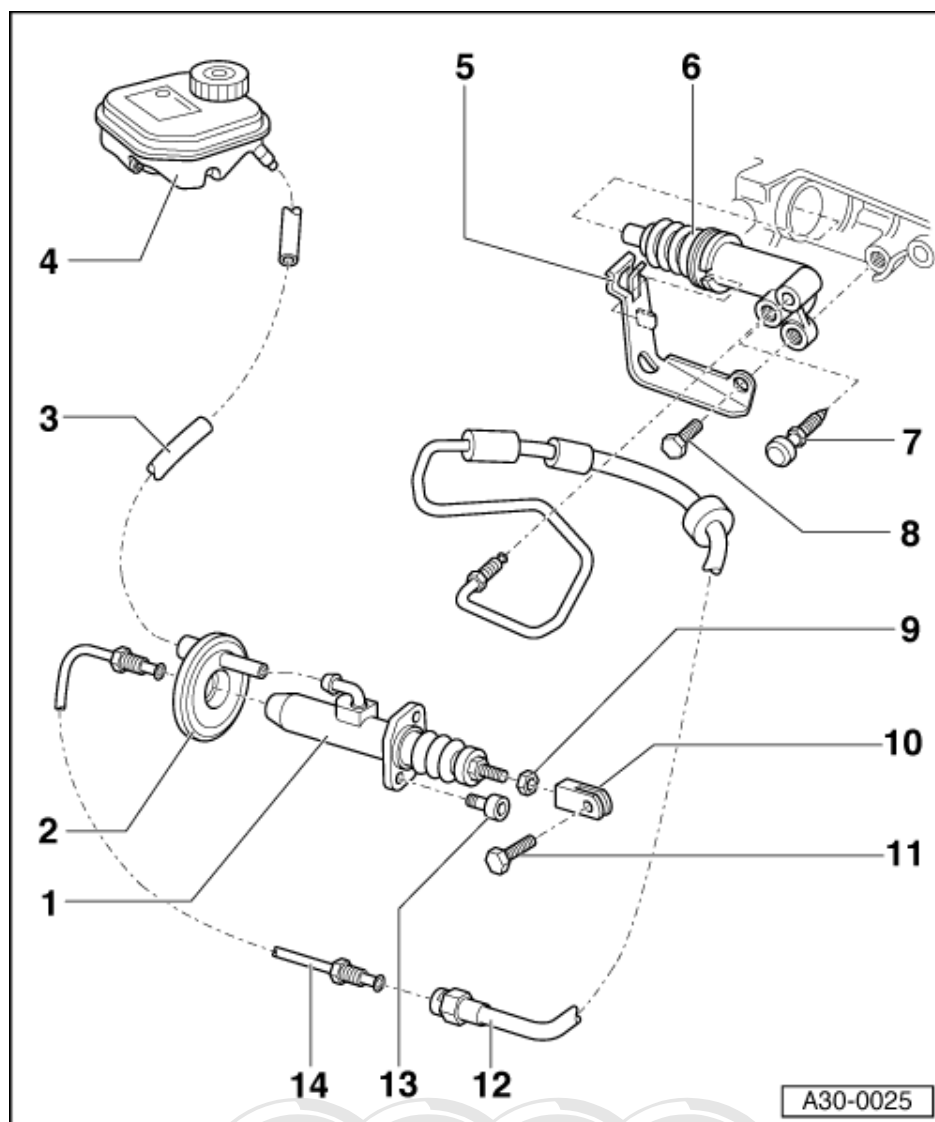
Notes:

- ♦ Installation clamp 3246 is shown in diagram with pedal bracket removed.

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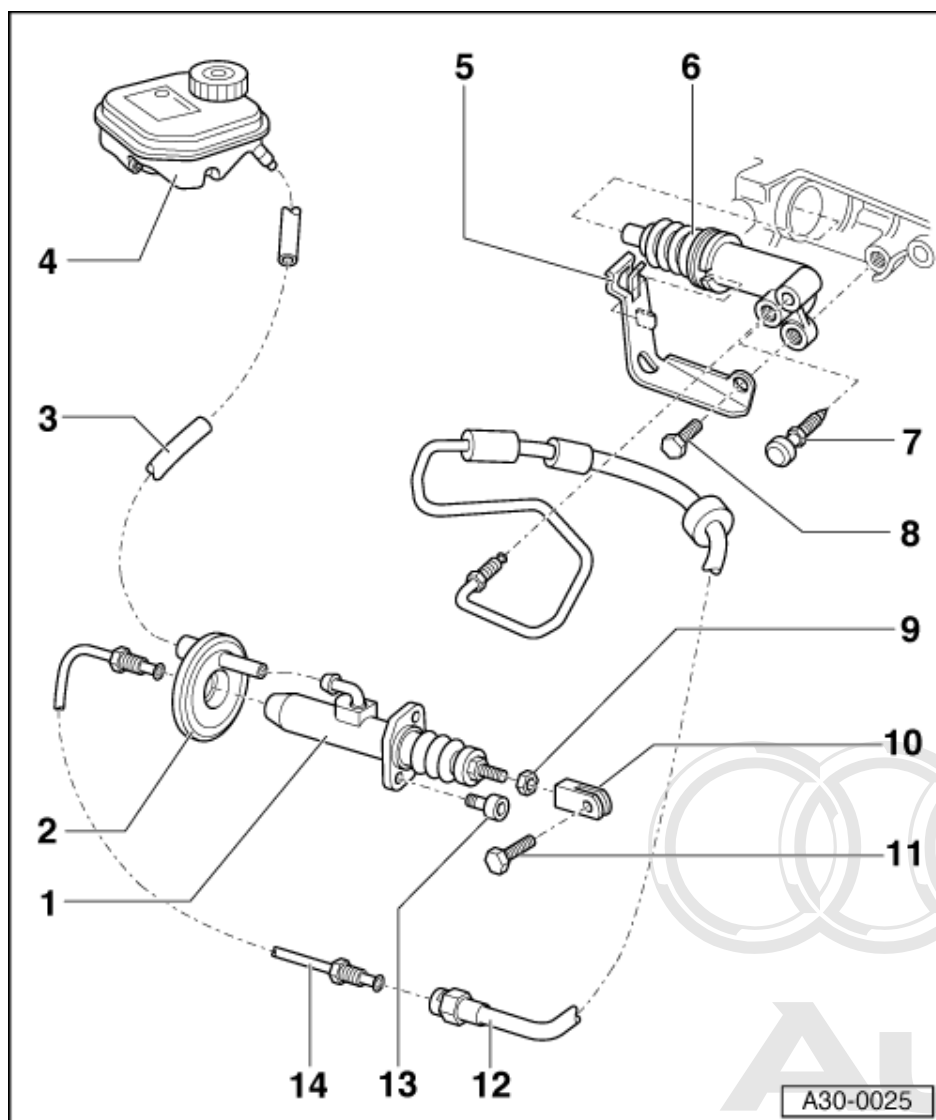
- ◆ Grease all bearing points with polycarbamide grease G 052 142 A2 before assembling

1.3 - Assembly overview - Hydraulic system



- 1 Master cylinder
 - ◆ Replace if leaking
- 2 Grommet
- 3 Supply hose
 - ◆ For master cylinder
- 4 Brake fluid reservoir
- 5 Bracket for hose/pipe assembly
 - ◆ Engage on clutch slave cylinder
 - ◆ Not fitted on all versions

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6 Slave cylinder

- ◆ Do not operate clutch pedal after slave cylinder has been removed.
- ◆ Installing
=> Fig. 28
- ◆ After working on hydraulic clutch mechanism, bleed slave cylinder
=> Page 23

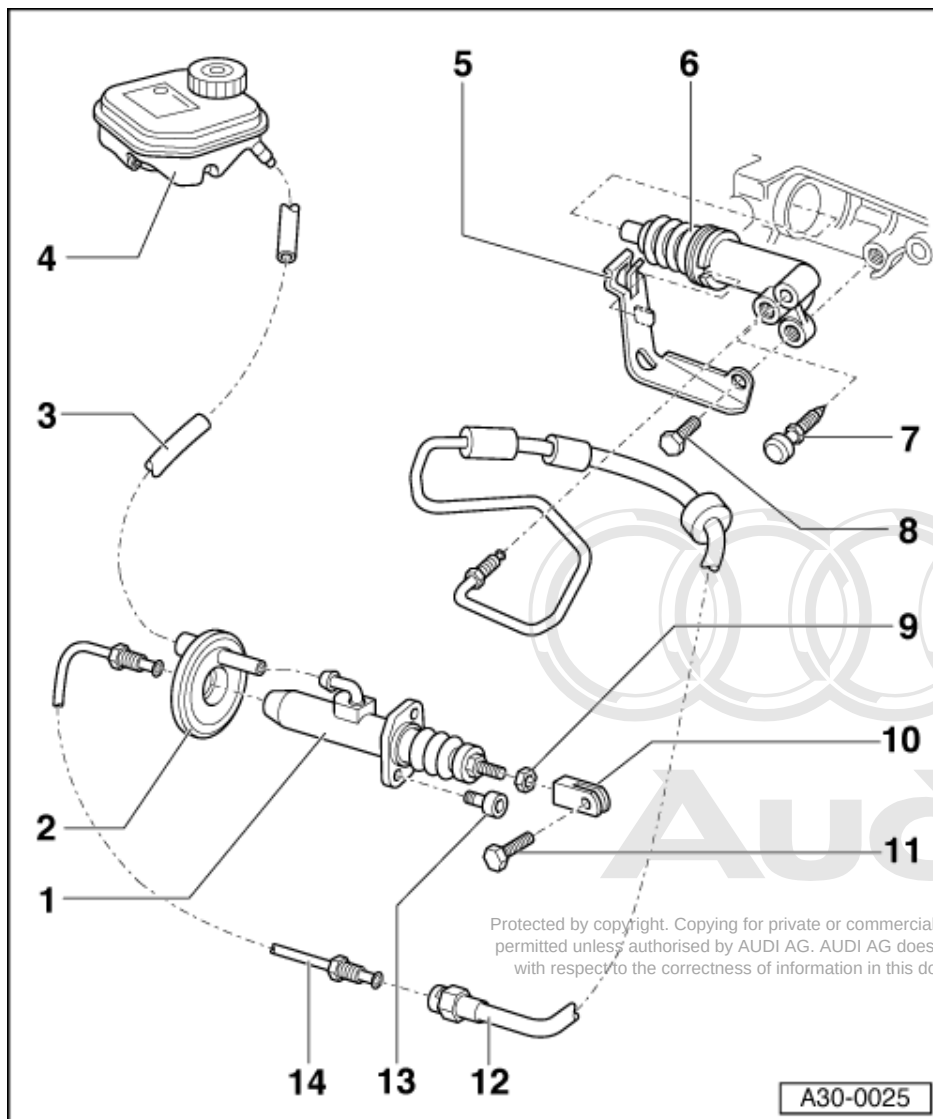
7 Bleeder valve

- ◆ Tighten to 4.5 Nm
- ◆ Follow correct work sequence when bleeding => Page 23

8 Bolt

- ◆ Hexagon bolt: apply locking compound D 185 400 A2 and tighten to 25 Nm.
- ◆ Self-locking hexagon socket head bolt: replace bolt and tighten to 20 Nm

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9 Lock nut - 10 Nm

10 Clevis

- ♦ Adjusting
=> Fig. 18

11 Bolt - 25 Nm

- ♦ Self-locking
- ♦ Replace

12 Pressure hose

- ♦ Tighten nut on pipe connection to 15 Nm

13 Bolt - 20 Nm

14 Pipe

- ♦ For clutch master cylinder
- ♦ Tighten nut on pipe connection to 15 Nm

1.4 - Removing and installing master cylinder

Special tools, testers and auxiliary equipment required

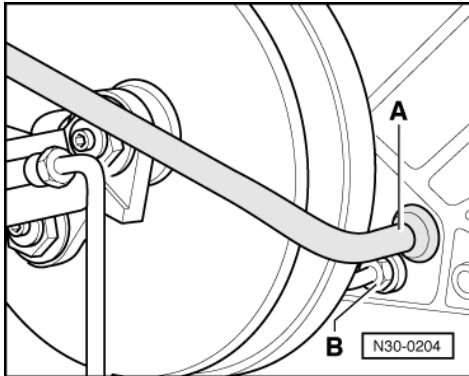
- ♦ Hose clamp 3094



Removing

Notes:

- ♦ 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.



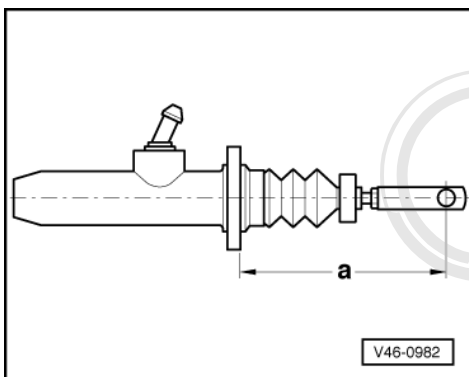
- -> Clamp supply hose -A- leading to brake fluid reservoir using special tool 3094. Pull hose off at master cylinder and plug it.
- Unscrew pipe -B- from master cylinder and seal.
- Remove driver's side storage compartment.

=> General body repairs; Repair group 70; Dash panel, Removing driver's storage compartment Dash panel, Removing driver's storage compartment

- If fitted, pull out switch above clutch pedal.
- Detach clutch pedal from master cylinder. To do this, unclip using a screwdriver and pull out pin.
- Unscrew master cylinder from inside vehicle.

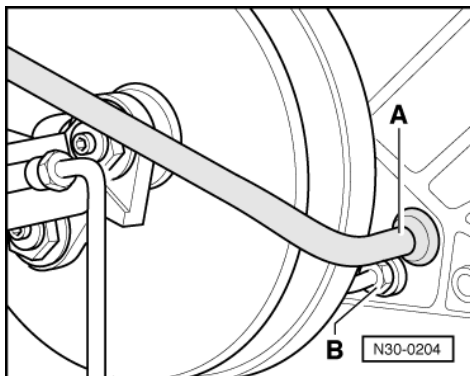
Installing

Install in reverse order, paying attention to the following:



- -> When replacing the master cylinder, measure distance -a- on push rod joint and adjust if necessary
- Dimension $a = 109.5 \pm 0.5$ mm
- Connect clutch pedal to master cylinder. Clip pin onto clutch pedal.

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- -> Tighten union nut -B- to 15 Nm on the master cylinder.
- Slide supply hose -A- for the brake fluid reservoir on as far as its stop.
- Bleed clutch system after installing master cylinder => Page 23.

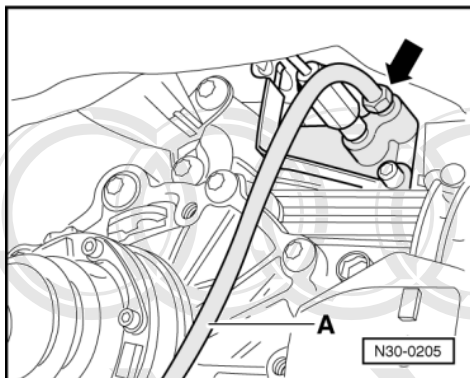
1.5 - Bleeding clutch system

Special tools, testers and auxiliary equipment required

- ◆ Brake filler and bleeding appliance V.A.G 1238 B or V.A.G 1869

Notes:

- ◆ 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 appliance and allow about 100 cm³ of brake fluid to drain out.
- Working pressure 2.5 bar

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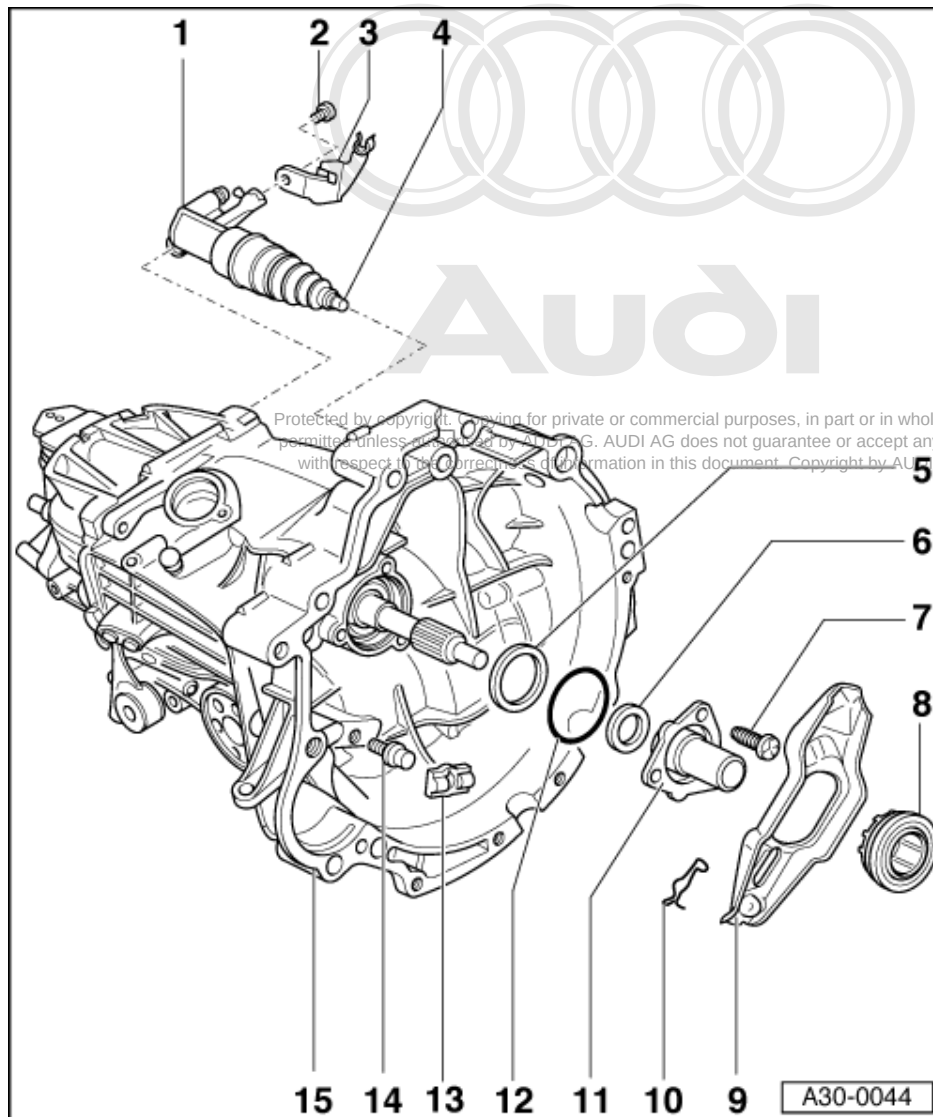
Ensure bleeder hose is correctly fitted during bleeding operation.

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



2 - Servicing clutch release mechanism

2.1 - Servicing clutch release mechanism

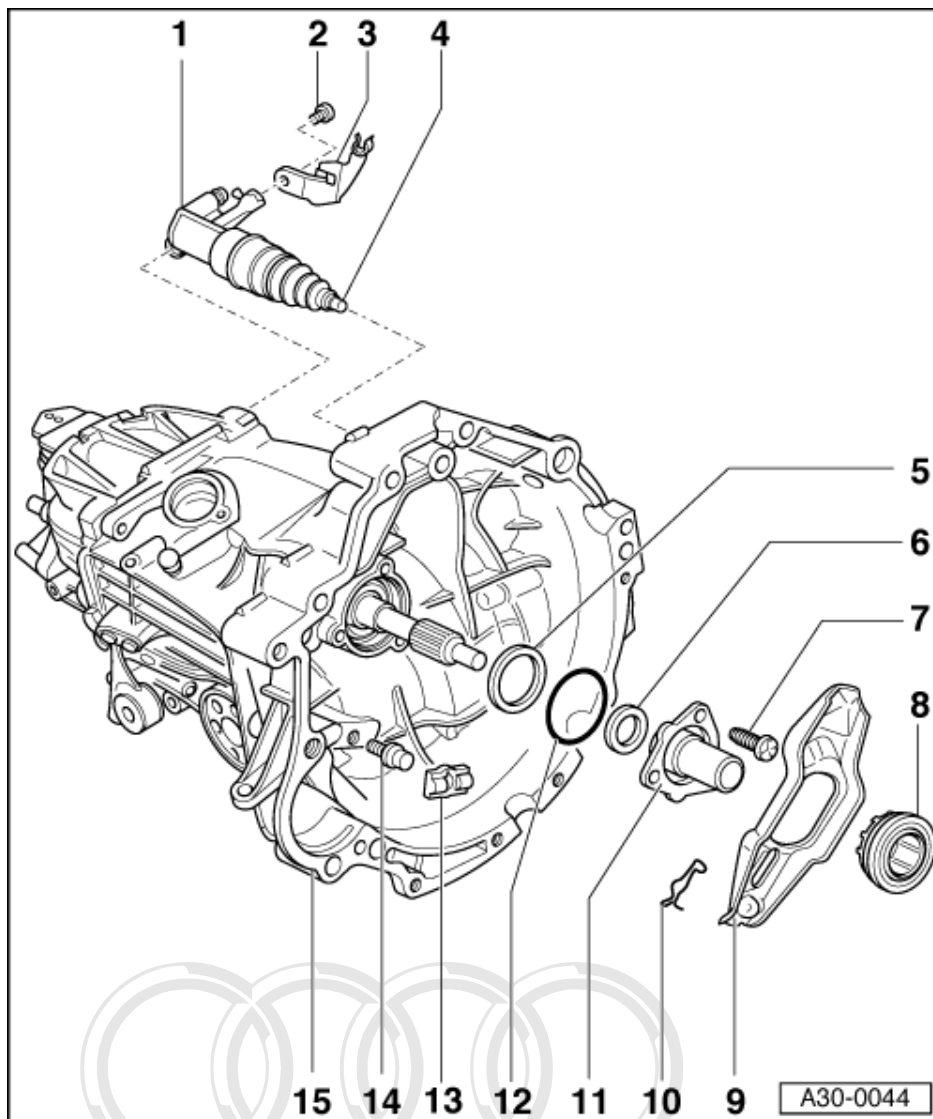


1 Slave cylinder

- ◆ Do not operate clutch pedal after slave cylinder has been removed.
- ◆ Installing
=> Fig. 28
- ◆ When installing, press in slave cylinder far enough so that securing bolt can be fitted easily.

2 Bolt

- ◆ Hexagon bolt: apply locking compound D 185 400 A2 and tighten to 25 Nm.
- ◆ Self-locking hexagon socket head bolt: replace bolt and tighten to 20 Nm



3 Bracket for hose/pipe assembly

- ◆ Engage on clutch slave cylinder
- ◆ Not fitted on all versions

4 Push rod

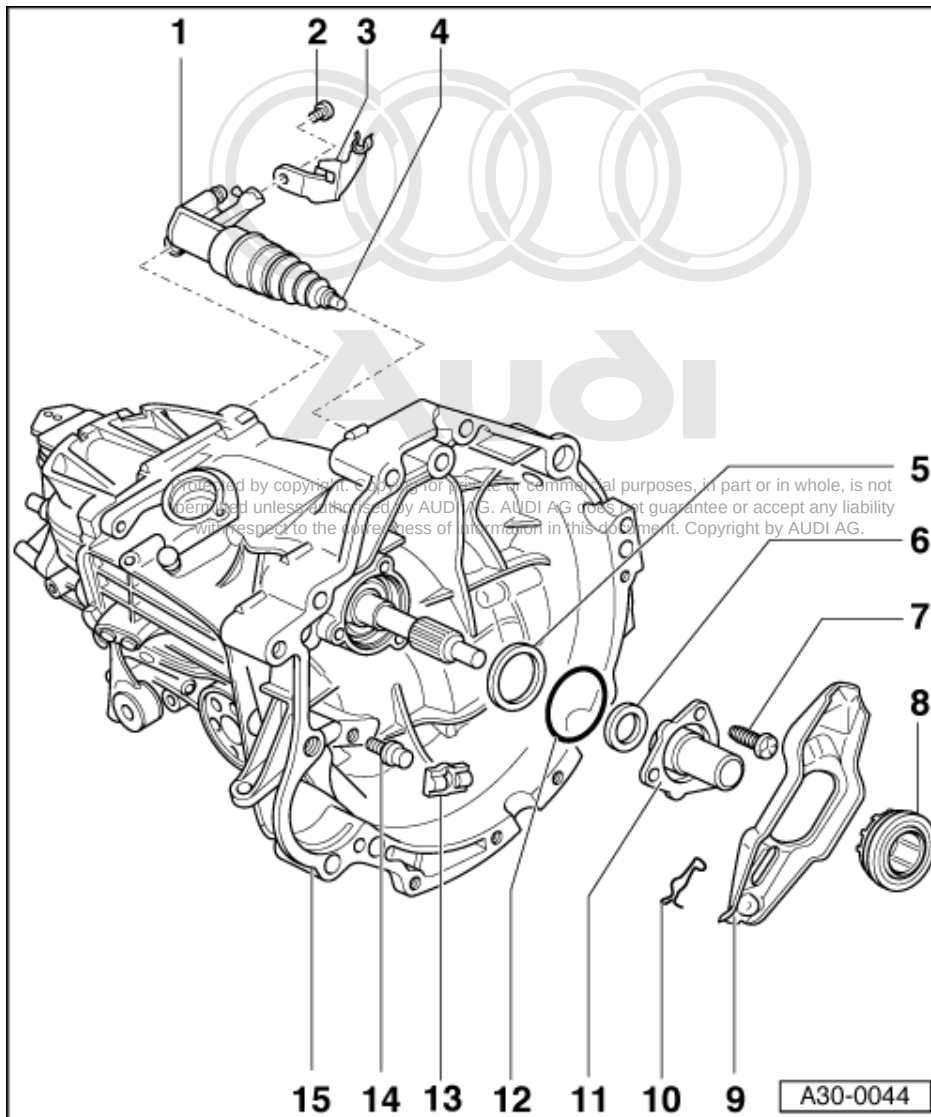
- ◆ Lubricate end of push rod with copper grease, e.g. Z 381 351 TE

5 Dished washer

- ◆ Smaller diameter (convex side) to guide sleeve

6 Input shaft oil seal

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



7 Torx socket head bolt
- 35 Nm

- ◆ Self-locking
- ◆ Replace

8 Release bearing

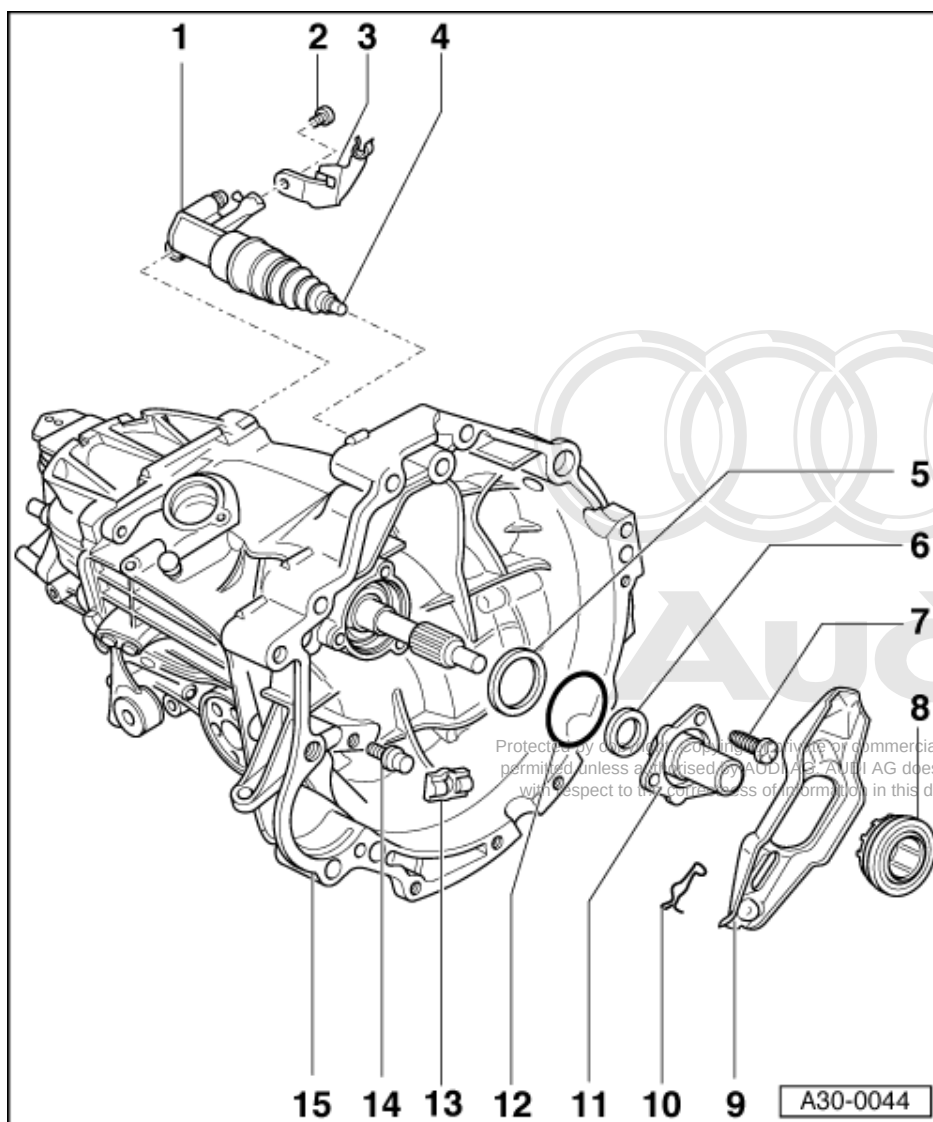
- ◆ Do not wash out bearing, only wipe
- ◆ Replace noisy bearings

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 Retention spring

- ◆ Secure to clutch release lever



11 Guide sleeve

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

12 O-ring

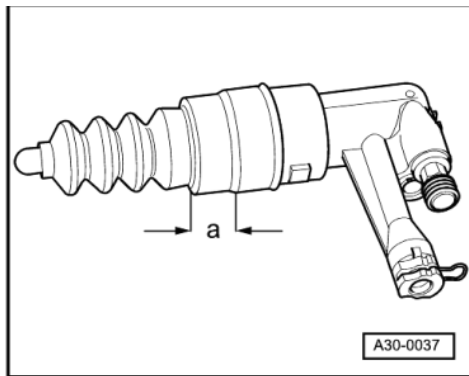
- ◆ Replace

13 Intermediate piece

14 Ball stud

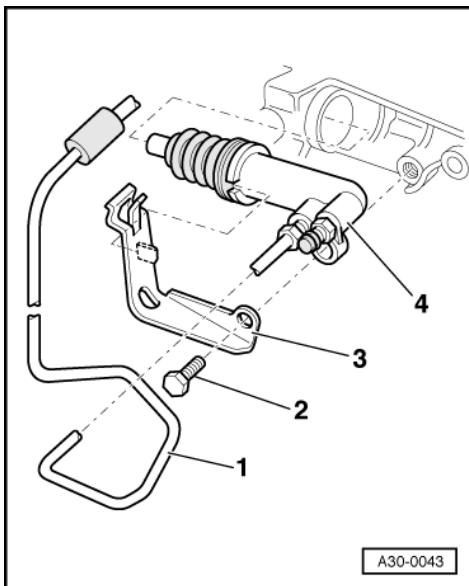
- ◆ Tighten to 25 Nm
- ◆ Lubricate with MoS2-grease

15 Gearbox



-> 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.
- 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.



- -> Secure bracket -3- (if fitted) for pressure pipe -1- on slave cylinder and secure with bolt.

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.
- ♦ Installing securing bolt -2-:
Hexagon bolt: apply locking compound D 185 400 A2 when installing and tighten to 25 Nm.
Self-locking hexagon socket head bolt: replace bolt and tighten to 20 Nm

3 - Servicing clutch

3.1 - Servicing clutch

Notes:

- ♦ Observe the general repair instructions =>Page 9 .

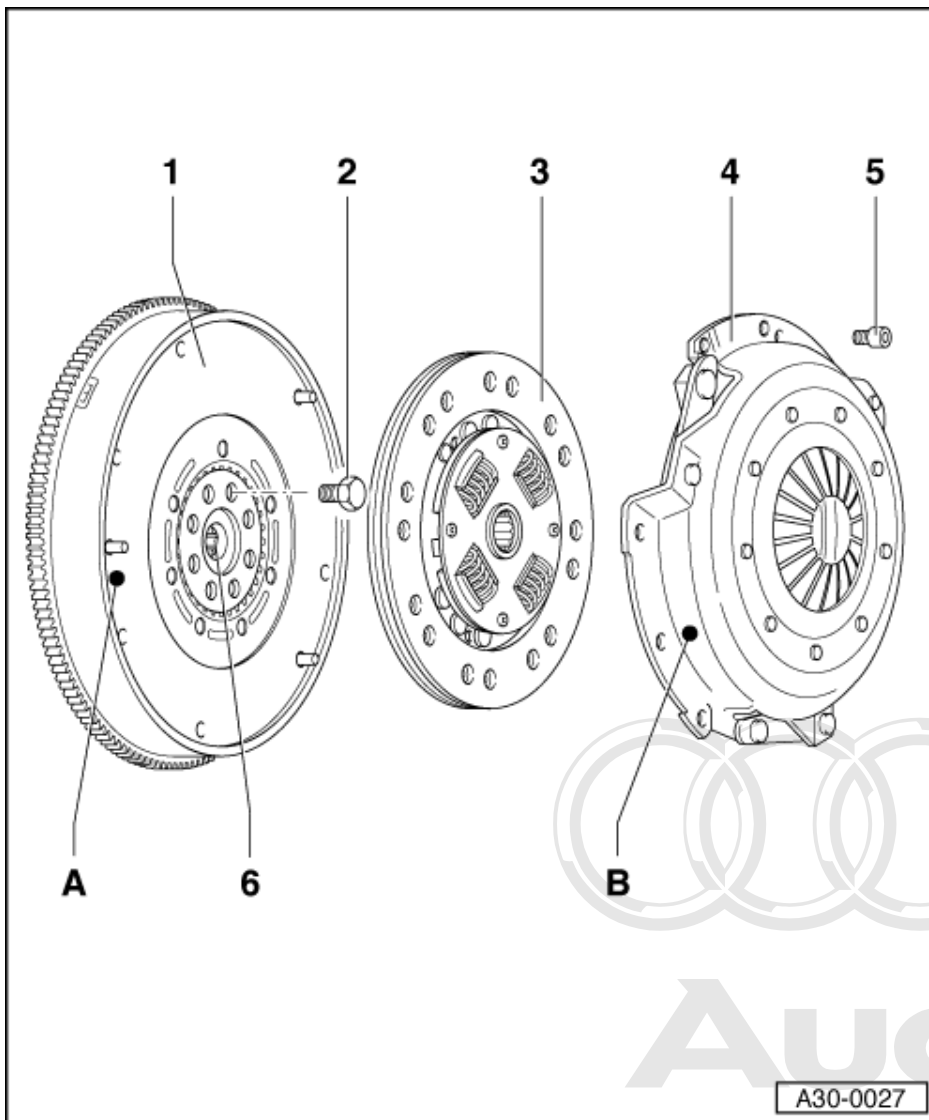
- ◆ Before replacing clutch plate and pressure plate

=> 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 Catalogue

- ◆ 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 45**
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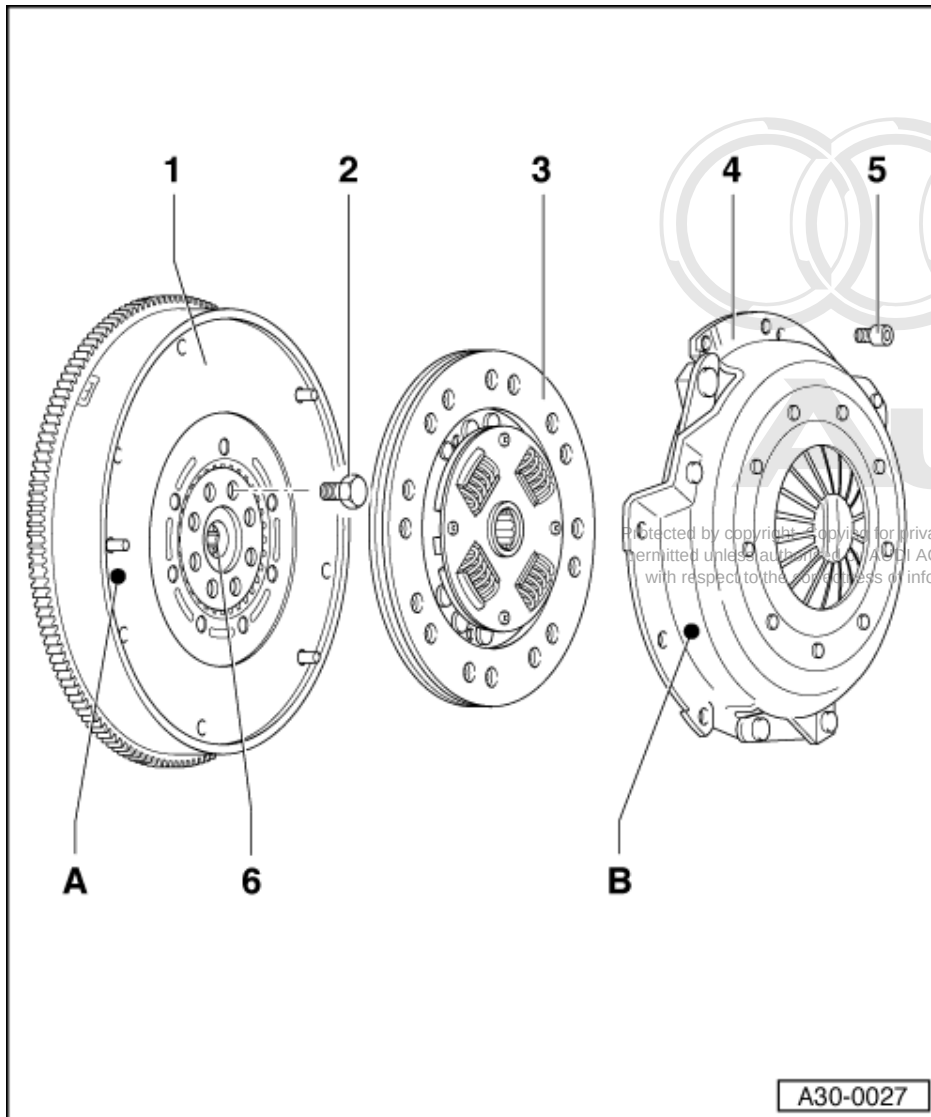
A - Coloured marking on dual mass flywheel

- ◆ 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:

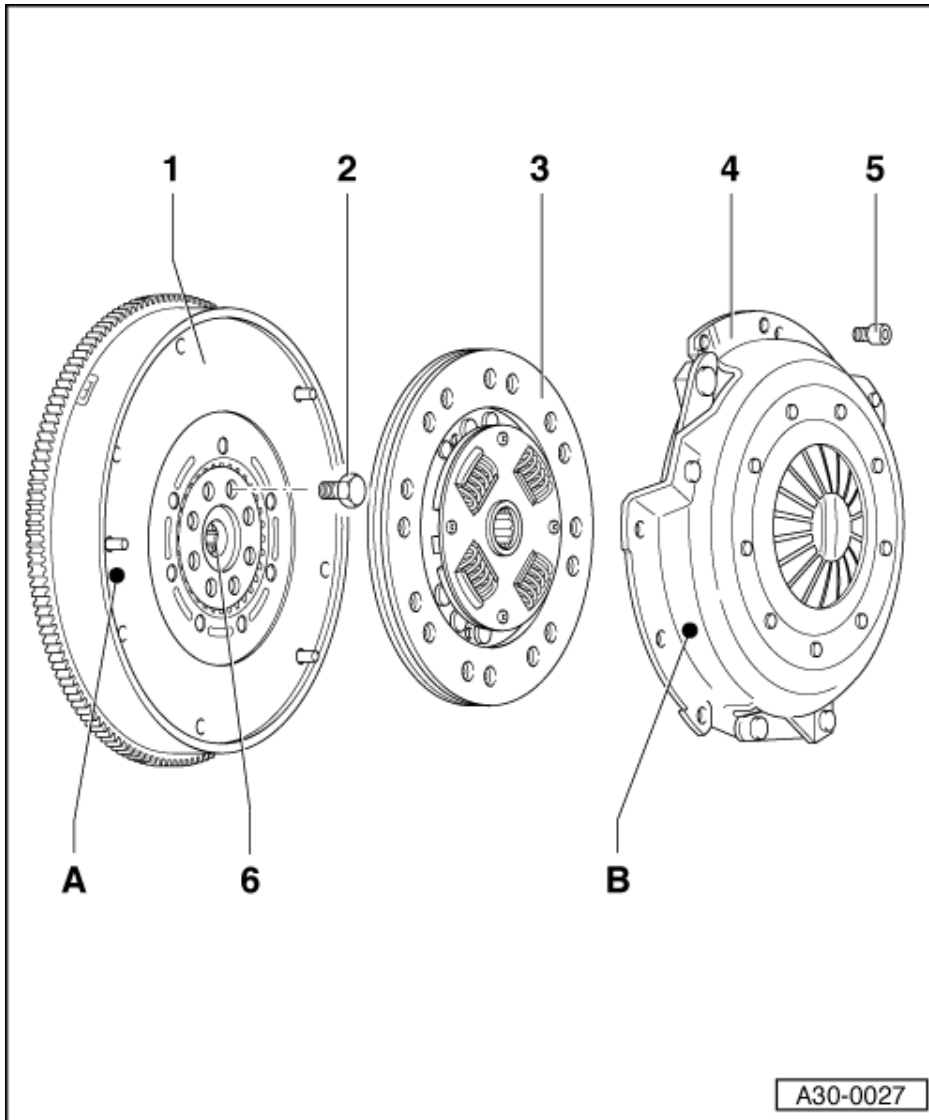
=> 4-cyl. fuel injection engine, Mechanics; Repair group 13

=> 5-cyl. injection engine (2-valve), Mechanics; Repair group 13

=> 6-cyl. fuel injection engine, Mechanics; Repair group 13

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

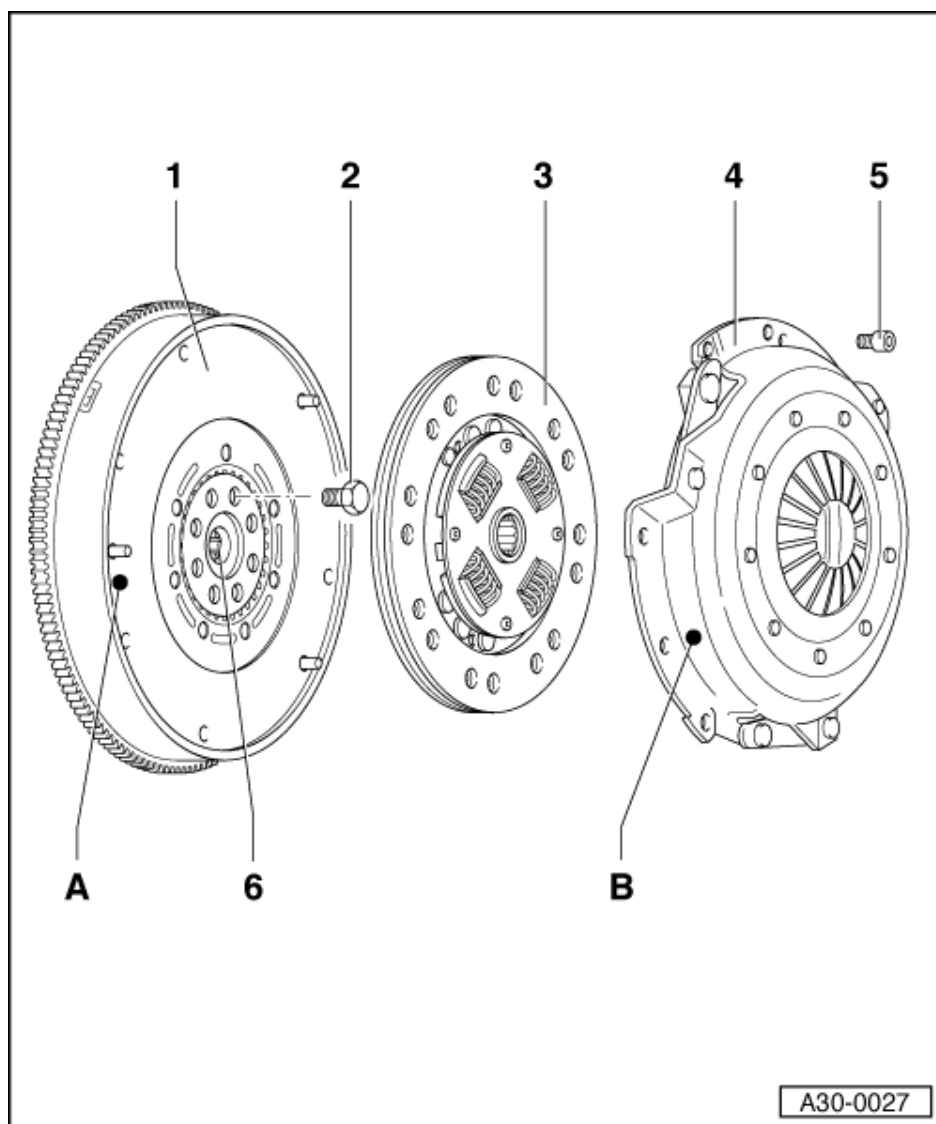


3 Clutch plate

- ◆ 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 => Page 2 onwards
- ◆ Centring => Fig. 1
- ◆ Lightly grease splines



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4 Pressure plate

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

5 Bolt - 22 Nm

- ◆ Loosen and tighten gradually in several stages working diagonally

6 Needle roller bearing

- ◆ Driving out and in

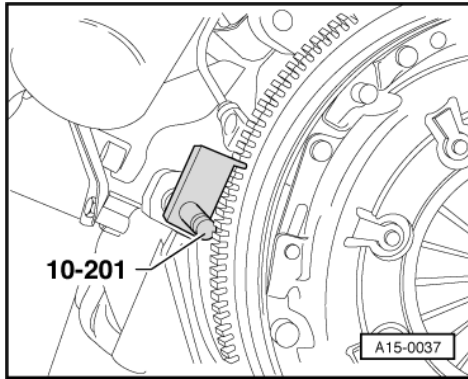
=> 4-cyl. fuel injection engine, Mechanics; Repair group 13

=> 5-cyl. injection engine (2-valve), Mechanics; Repair group 13

=> 6-cyl. fuel injection engine, Mechanics; Repair group 13



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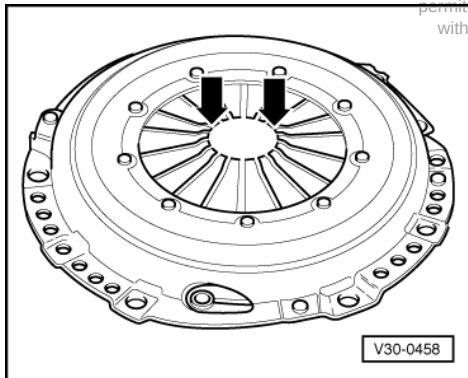


-> Fig.1 Centring clutch plate and removing and installing pressure plate

Special tools, testers and auxiliary equipment required

- ◆ Counter-hold tool 10-201 or 3067
- ◆ Mandrel 3176
- Installation position of clutch plate: Spring pack (coil springs) or marking "Getriebeseite" towards pressure plate and gearbox.
- When assembling, ensure that white marking (if provided) on dual-mass flywheel coincides with white marking on pressure plate.
- Clutch lining and contact surface of pressure plate must make full contact with flywheel before securing bolts are inserted.
- Loosen and tighten bolts gradually in several stages working diagonally. Tightening torque: 22 Nm.
- Reverse position of counter-hold tool 10-201 or 3067 when removing.
- Use mandrel 3176 to centre clutch plate.

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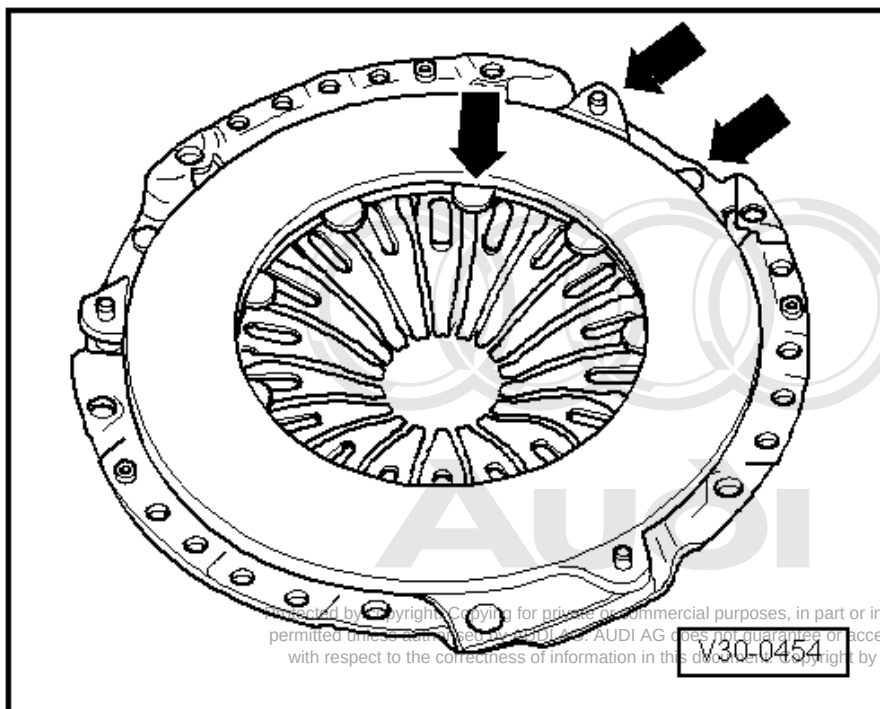


-> Fig.2 Checking ends of diaphragm spring

- ◆ 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).



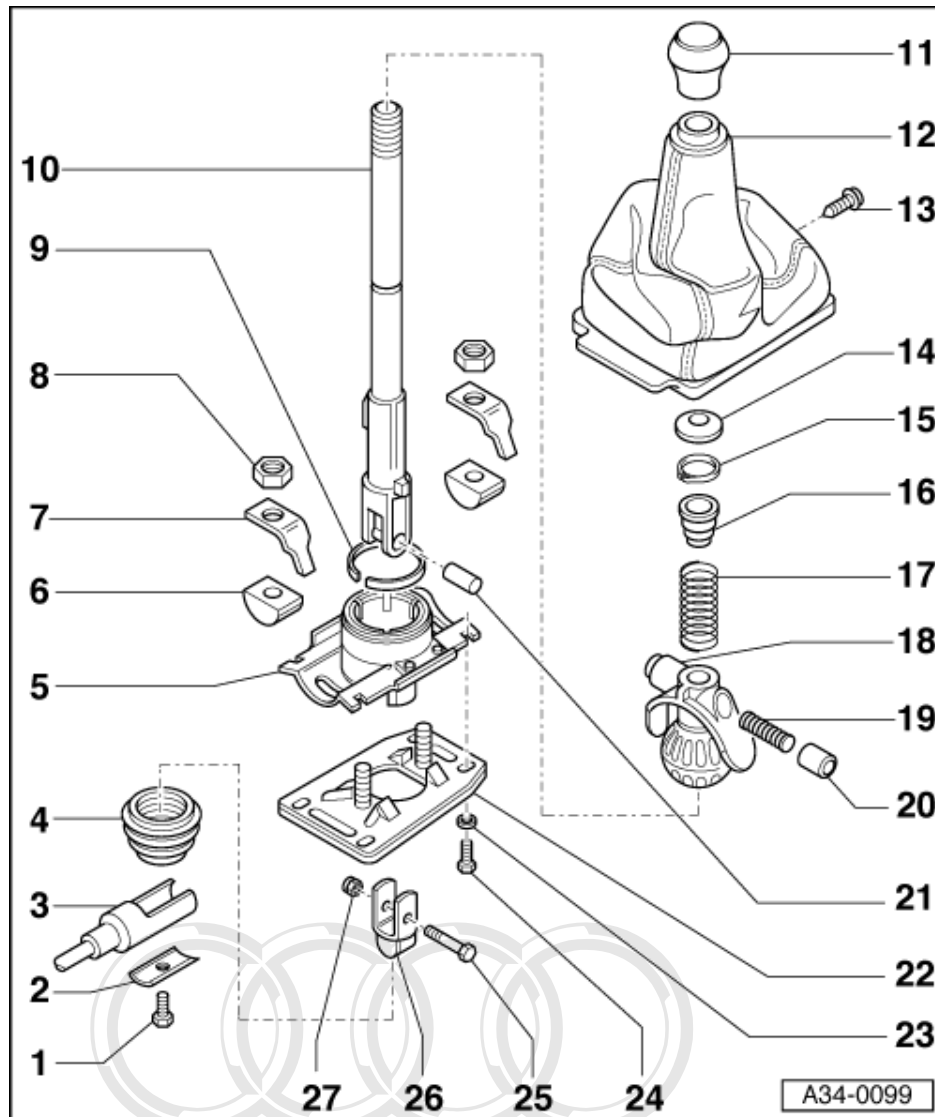
-> Fig.3 Checking spring connection and riveted fastenings

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

34 - Controls, Housing

1 - Servicing shift mechanism

1.1 - Servicing shift mechanism



Notes:

- ◆ Lubricate bearings and moving surfaces with polycarbamide grease, part no. G 052 142 A2.
- ◆ Adjust shift mechanism
=> Page 42

1 Bolt - 23 Nm

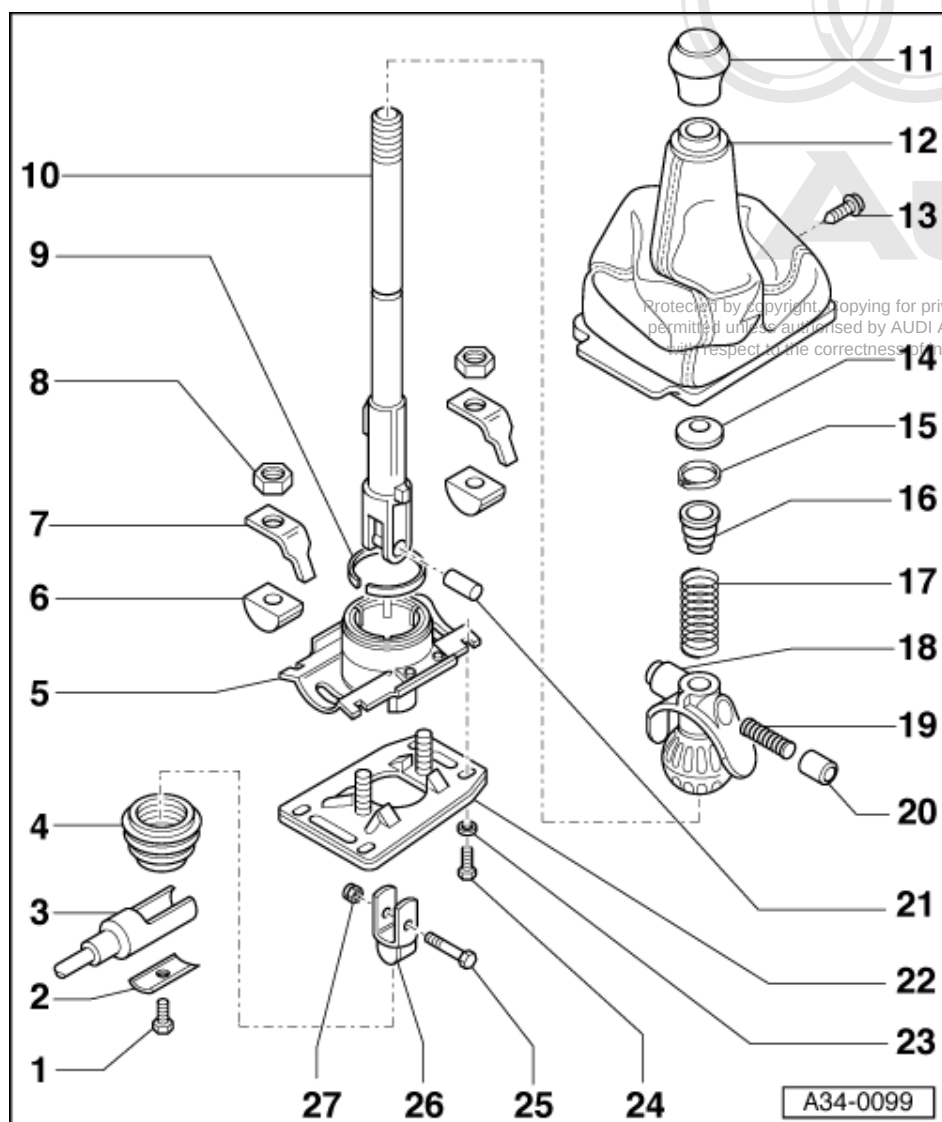
- ◆ Self-locking
- ◆ Replace
- ◆ Clean threads in selector fork with tap

2 Clamp

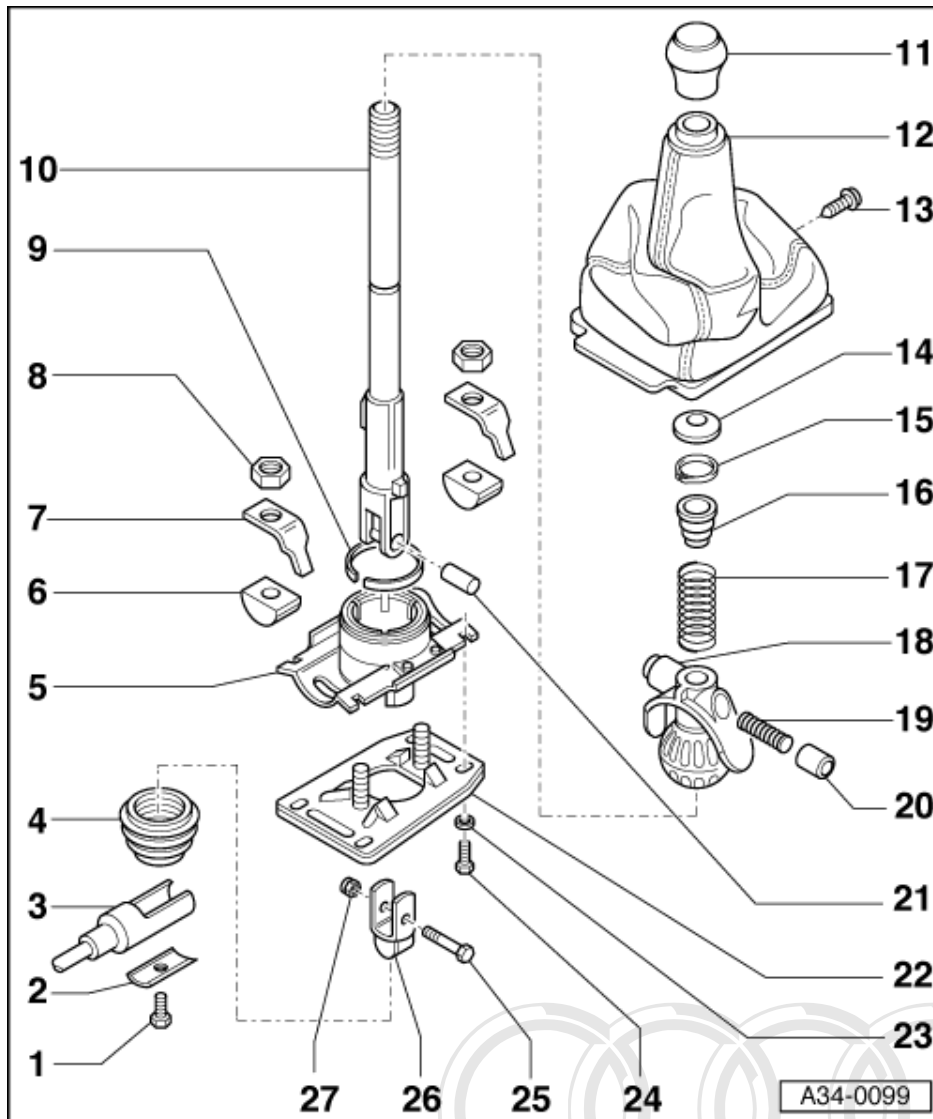
3 Selector rod



- ♦ With selector joint



- 4 Boot
 - ♦ Engage in gear stick mounting and selector fork
- 5 Ball housing
 - ♦ Limit pieces for ball stop on left and right must be engaged.
 - ♦ Installation position: Reverse detent faces left
- 6 Connector
- 7 Leaf spring
 - ♦ Not fitted on all versions
- 8 Nut - 25 Nm
 - ♦ Secures ball housing to gear stick mounting



9 Circlip

- ♦ Replace
- ♦ Remove before removing the ball stop
- ♦ Installation position: Rounded side faces ball housing (item 5)

10 Gear stick

- ♦ Can only be fitted into ball housing in one position
- ♦ Lubricate area around bottom drilling with G 052 142 A2

11 Gear stick knob

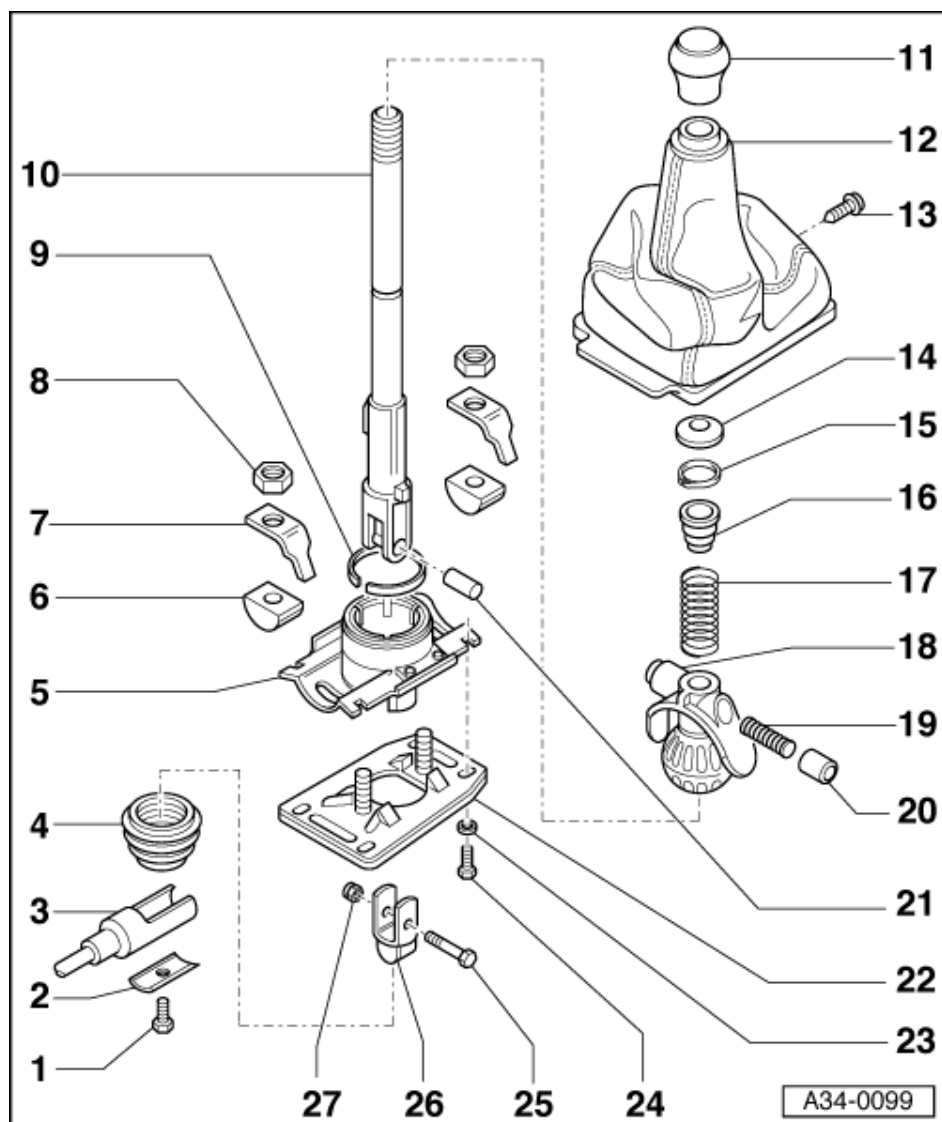
12 Gear stick cover

- ♦ Removing and installing
=> Page 41

13 Bolt

- ♦ For cover

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14 Rubber cap

15 Circlip

- ♦ Do not open out too far when fitting

16 Spacer bush

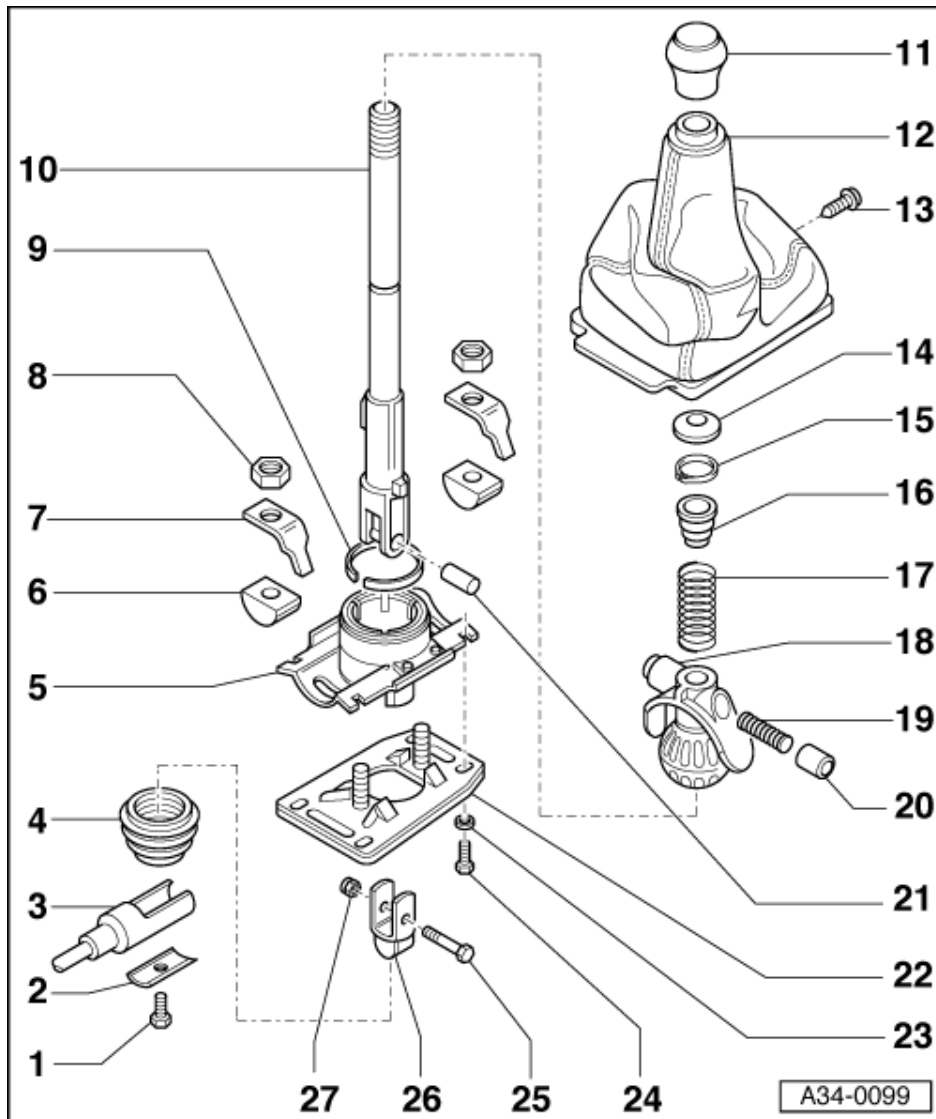
17 Spring

18 Ball stop

- ♦ Insert spring and spacer bush in ball stop and assemble on gear stick so that spring and bush are on the right.
- ♦ Install ball stop before fitting circlip -Item **9** -
- ♦ Lubricate ball with G 052 142 A2 polycarbamide grease

Audi

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19 Spring

20 Bush

- ♦ Installation position: Rounded end faces the gear stick
- ♦ Lubricate with G 052 142 A2 polycarbamide grease

21 Spacer tube

- ♦ Lubricate with G 052 142 A2 polycarbamide grease

22 Gear stick mounting

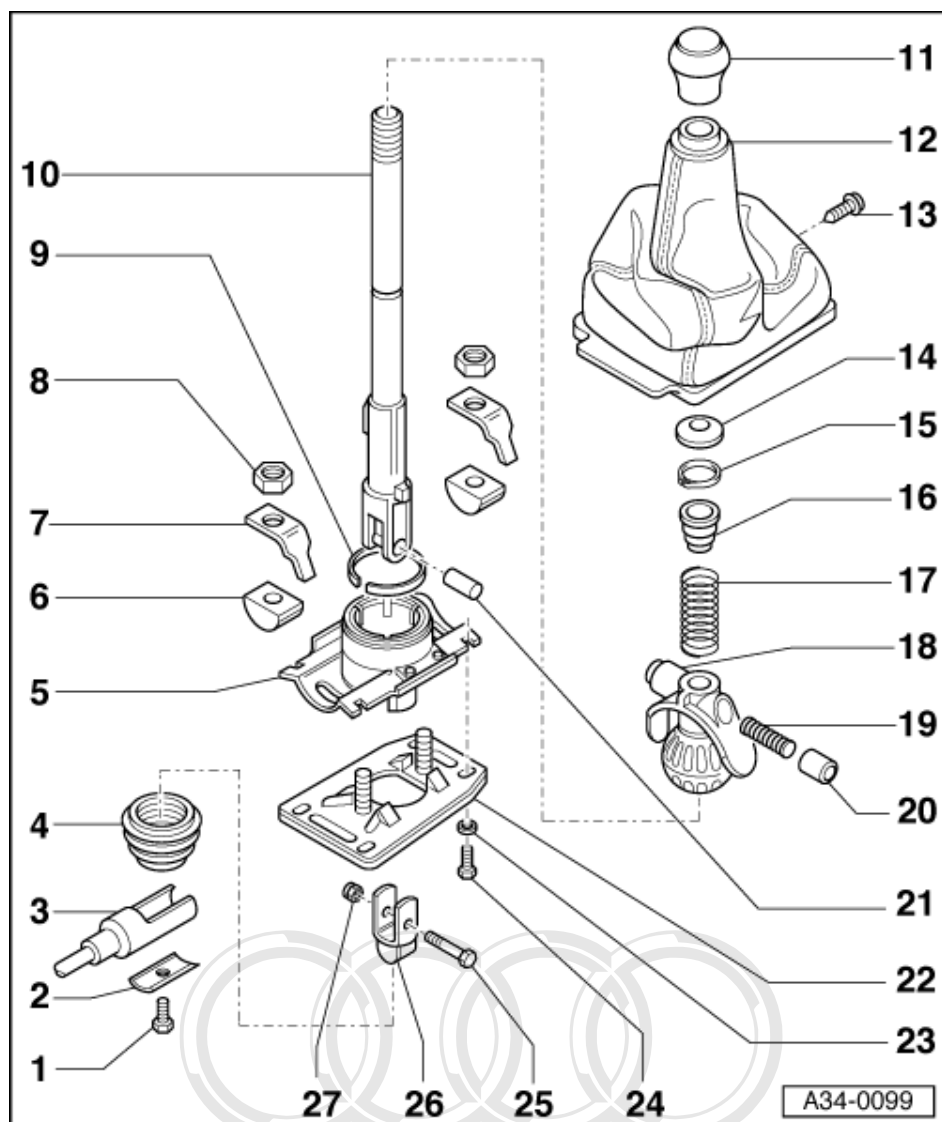
- ♦ Apply AKD 512 000 05 sealant between gear stick mounting and floor panel

23 Washer

24 Bolt - 10 Nm

- ♦ Secures gear stick mounting

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25 Bolt

- ◆ Secures selector fork

26 Selector fork

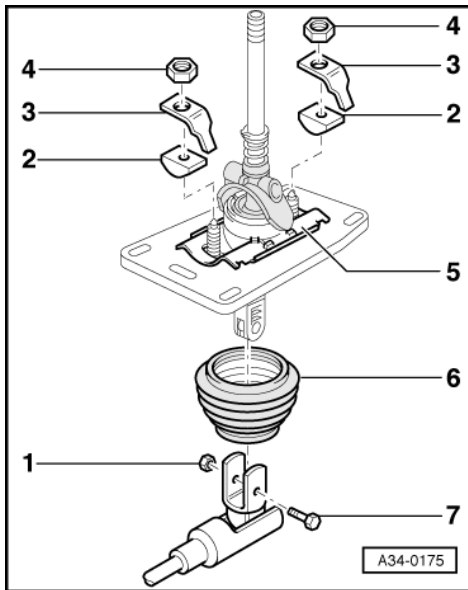
- ◆ Lubricate with G 052 142 A2 polycarbamide grease

27 Nut - 10 Nm

- ◆ Secures selector fork

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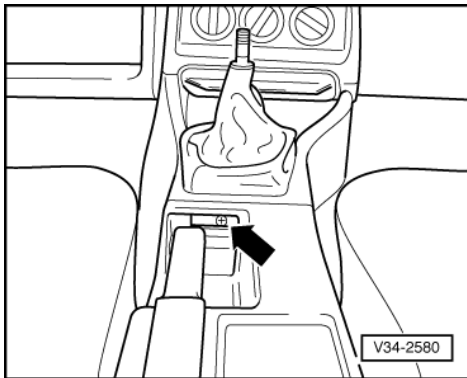
1.2 - Removing and installing shift mechanism



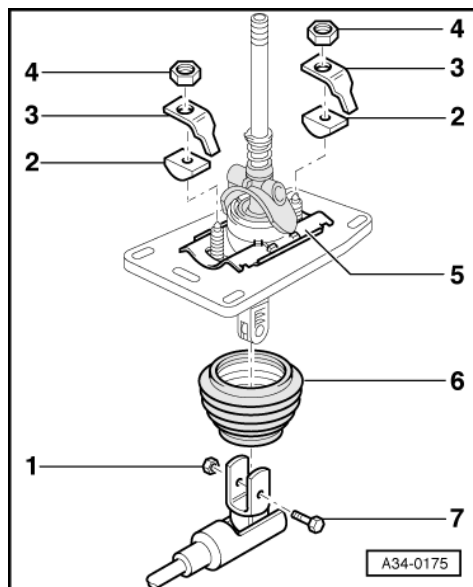
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Removing

- Removing propshaft => Page **185** .
- -> Pull bellows -6- off underside of shift mechanism.
- Slacken nut -1- securing selector fork to gear stick.
- Take bolt -7- out of selector fork.



- Unscrew gear stick knob.
- Detach cap on centre console.
- -> Unscrew bolt -arrow- for cover.
- Lift off cover.
- Remove noise insulation.



- -> Unscrew nuts -4- securing ball housing and remove two connecting pieces -2- and leaf springs -3-.
- Lift ball housing -5- out of centre console together with gear stick.

Installing

Install in reverse order, paying attention to the following:

- Push selector rod on so that the securing bolt fits in the recess in the selector shaft.
- Check shift mechanism adjustment, adjust if necessary => Page 42 .
- Before installation it is important to use a tap to clean out locking fluid left in threads in propshaft drive flanges on gearbox and rear final drive and in thread of clutch slave cylinder mounting.
- Install propshaft => Page 189 .
- Align exhaust system free of stress

=> 4-cyl. fuel injection engine, Mechanics; Repair group 26

=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26

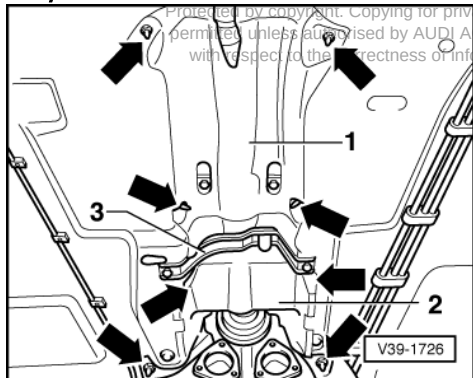
=> 6-cyl. fuel injection engine, Mechanics; Repair group 26

Tightening torques

Component	Nm
Ball housing to housing for shift mechanism	25
Selector fork to gear stick	10
Selector rod to selector fork	23

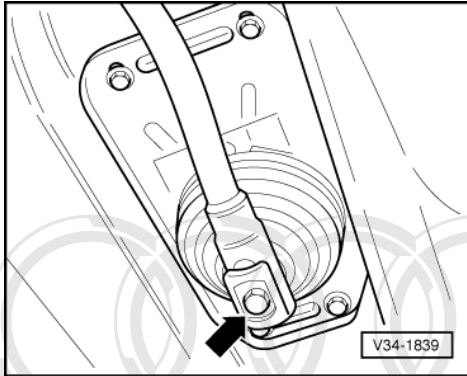
1.3 - Adjust shift mechanism

Requirements:

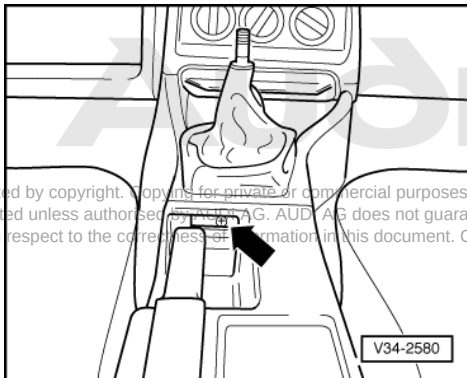


- ◆ Correct operation of shift mechanism actuation and transfer elements.
- ◆ Shift mechanism moves smoothly.
- ◆ Gearbox, clutch and clutch mechanism must be in proper condition.
- ◆ Gearbox in neutral.

- -> Remove heat shield -2- -arrows-.

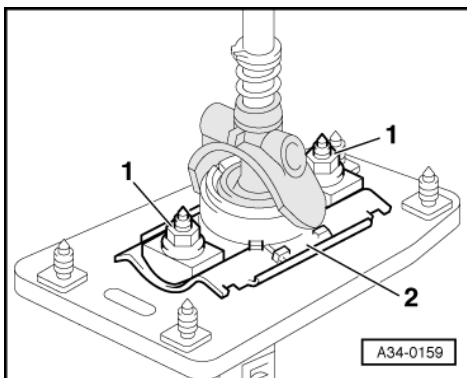


- -> Slacken bolt -arrow- for selector rod.



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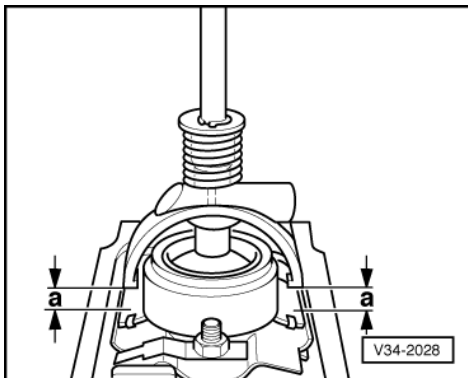
- Unscrew gear stick knob.
- Detach cap on centre console.
- -> Unscrew bolt -arrow- for cover.
- Lift off cover.



- Remove noise insulation.
- -> Loosen ball housing nuts -1-.
- Align ball housing -2- so that it is horizontal.
- Tighten ball housing nuts to 25 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:

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

- 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 heat shield.

1.4 - 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.
 - 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 95 .

2 - Removing and installing gearbox

2.1 - Removing and installing gearbox

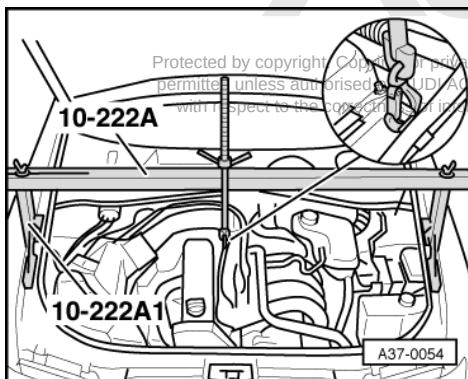
Special tools, testers and auxiliary equipment required

- ◆ Engine support bracket 10-222A with supports 10-222A/1
- ◆ Lifting tackle 2024 A
- ◆ Mandrel 3204
- ◆ Gearbox support 3282
- ◆ Adjustment plate 3282/10
- ◆ Engine/gearbox jack V.A.G 1383 A
- ◆ Torque wrench V.A.G 1331 (5...50 Nm)
- ◆ Torque wrench V.A.G 1332 (40...200 Nm)
- ◆ Universal mount V.A.G 1359/2

2.2 - Removing

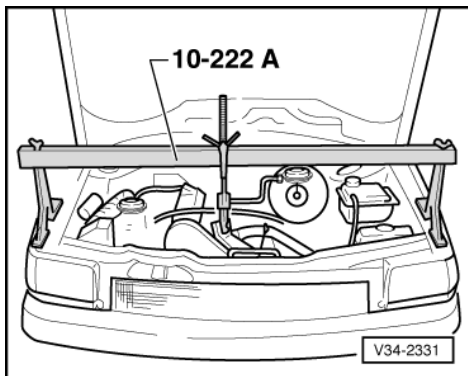
- Observe or obtain radio code on vehicles with coded radio.
- With ignition switched off disconnect battery earth strap.

Vehicles with 4-cylinder engine:



- -> Set up engine support bracket 10-222 A with supports 10-222 A1 on wing panel flanges.
- Take up weight on spindle of support bar 10-222 A.

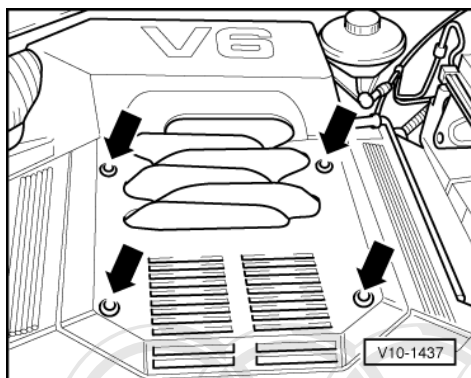
Vehicles with 5-cylinder engine:



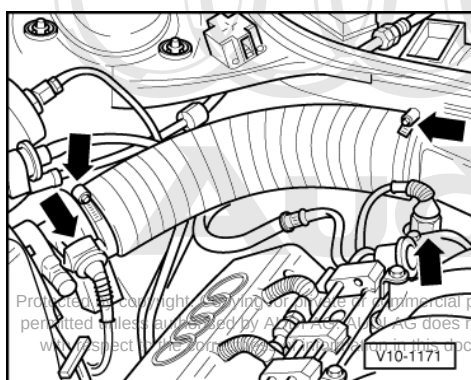
- -> Mount engine support bracket 10-222 A on wing panel flanges and take up weight of engine via spindle.



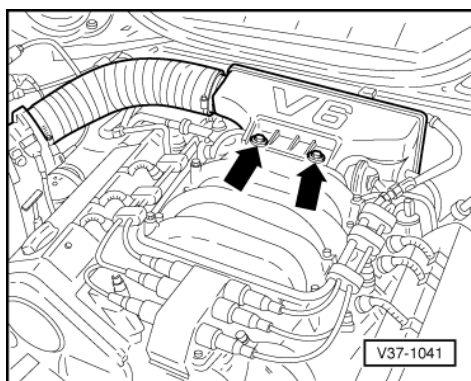
Vehicles with 6-cylinder engine:



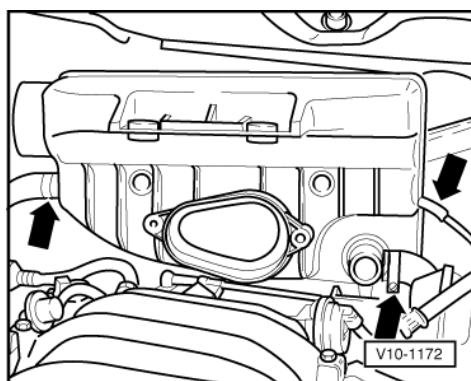
- -> Remove engine cover -arrows-.



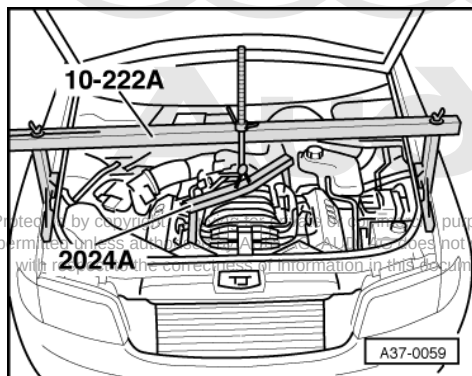
- -> Remove air duct between air mass meter and intake manifold -top arrows-.



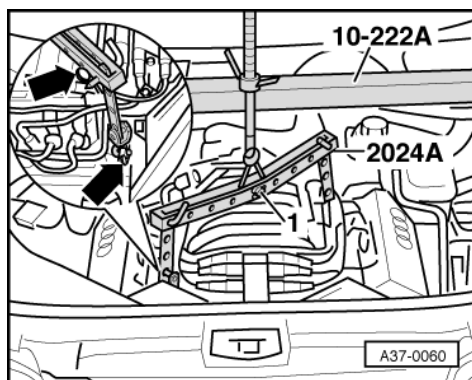
- -> Unscrew securing bolts -arrows- on intake silencer.



- -> Pull off two crankcase breathers and vacuum hose -arrows-.
- Push intake silencer to rear and lift out upwards.



- -> Set up support bar 10-222 A on wing panel flanges. Spindle is at front.



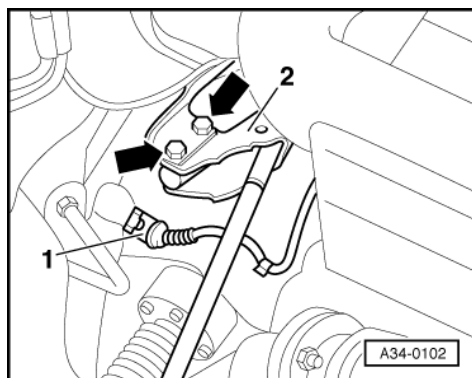
- -> Remove lifting eye from lifting tackle 2024 A. Re-insert pin -1- in centre hole on lifting tackle and secure with locking pin.
- Engage pin on lifting tackle 2024 A on spindle of support bar 10-222 A.
- Attach lifting tackle 2024 A to engine at front right and rear left. To do this, disconnect spark plug connectors from cylinders 1 and 6.

Warning

The hooks and locating pins of the lifting tackle must be secured with locking pins -arrows in illustration-.

- Take up weight of engine on spindle.

All vehicles:

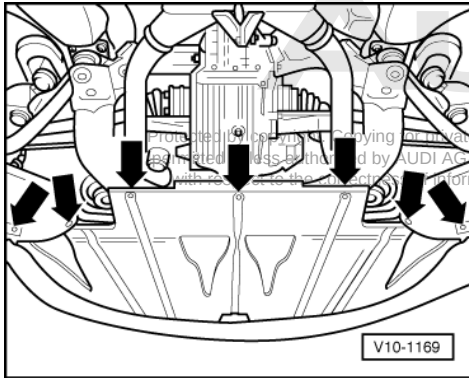


- -> Unscrew bottom nuts on follower for track rod -2-.



Notes:

- ♦ -Item 1- is not fitted.
- ♦ On some engine version the nuts on follower have to be unscrewed from underneath.
- Unscrew bolts -arrows-.
- Turn steering to left onto full lock stop.
- Press follower with track rods upwards.
- Unscrew engine/gearbox securing bolts accessible from above

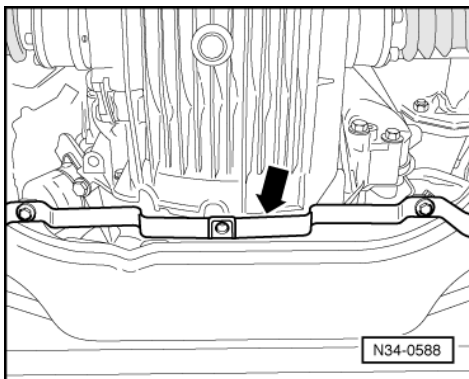


- Press bracket for coolant pipe upwards.

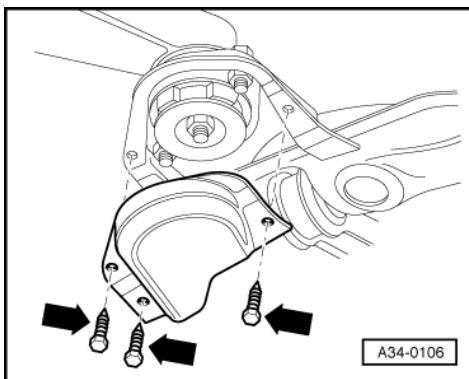
Note:

On removal, note the bolt lengths and assignment for re-installation.

- Remove front wheels.
- -> Remove noise insulation -arrows-.



- -> Unbolt bracket for noise insulation -arrow-.
- Unbolts exhaust mounting bracket(s) on gearbox.



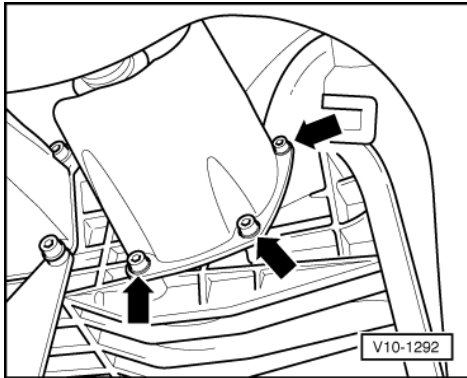
- -> Remove heat shield for bonded rubber mountings (left and right) -arrows-.

Vehicles with 4-cylinder or 5-cylinder engine :

- Remove front exhaust pipe with catalytic converter:

=> 4-cyl. fuel injection engine, Mechanics; Repair group 26

=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26

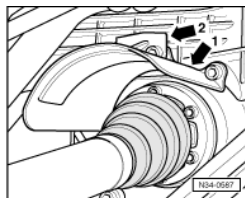


Note:

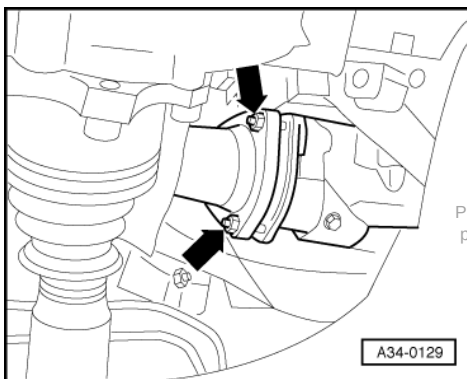
Avoid excessive bending of the flexible pipe connection (decoupling element) on the front exhaust pipe. The angle between the catalytic converter and the front exhaust pipe must not exceed 10°, otherwise the flexible connection will be damaged.

- -> Remove heat shields for drive shafts (left and right) -arrows-.

Vehicles with 6-cylinder engine:



- -> Detach heat shield above left and right drive shafts.



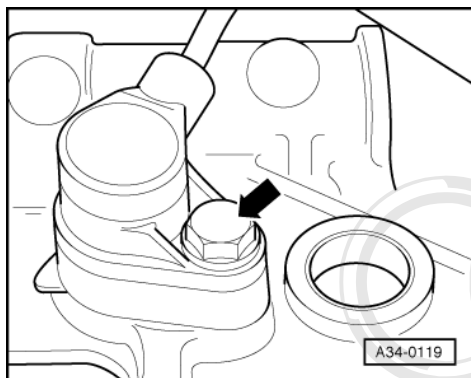
- -> Unbolt front exhaust pipes from exhaust manifolds (3 nuts on each side) -arrows-.
- Slacken clamps on exhaust pipes.



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- Remove front exhaust pipes with catalytic converters.



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

All vehicles:

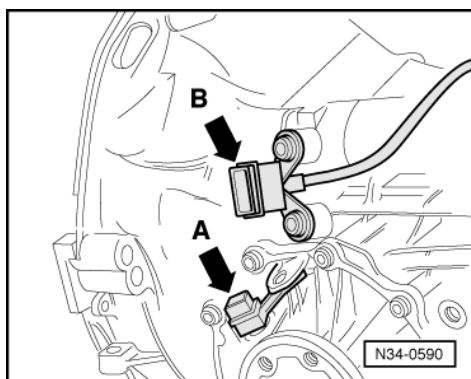
- Unbolt drive shaft from flange on gearbox.

=> Running gear, Four-wheel drive: Repair group 40: Removing and installing suspension struts and drive shaft
Removing and installing suspension struts and drive shaft

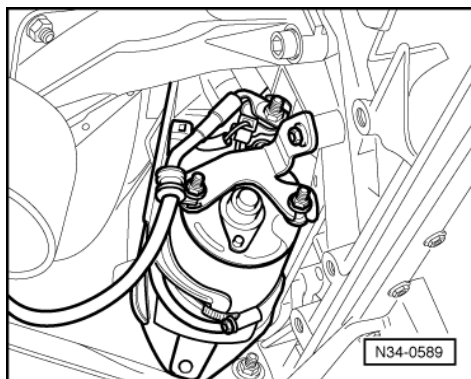
- Secure drive shafts as high as possible by tying to body.

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.

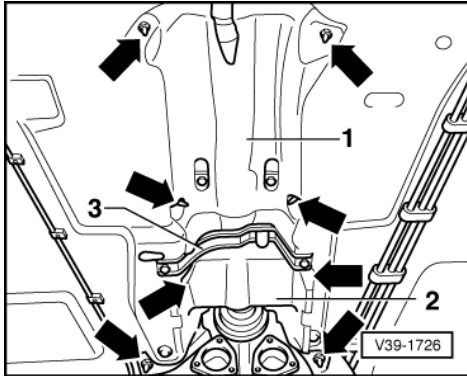


- -> Unbolt starter from engine/gearbox and secure as necessary.

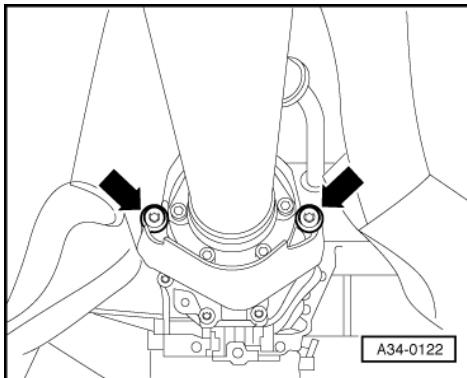
=> Electrical system; Repair group 27; Removing and installing starter Removing and installing starter

Note:

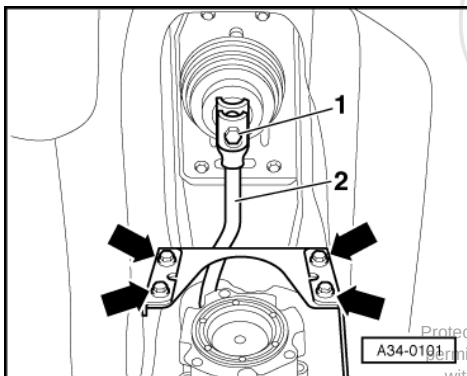
Starter cables do not need to be disconnected.



- -> Remove heat shields -1- and -2- -arrows-.
- Unbolt cross member -3- below propshaft.

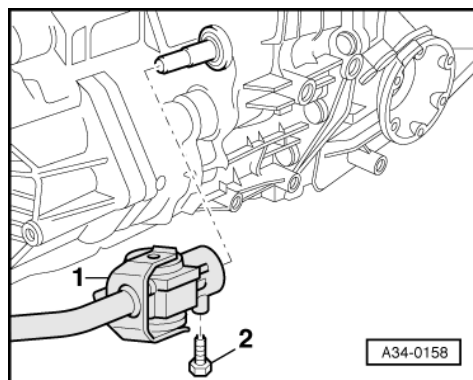


- -> Remove heat shield for propshaft (if fitted) from cover for Torsen differential -arrows-.
- Removing propshaft => Page 185 .

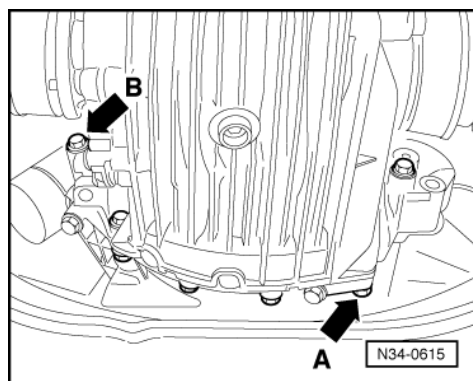


- -> Unscrew tunnel support -arrows-.

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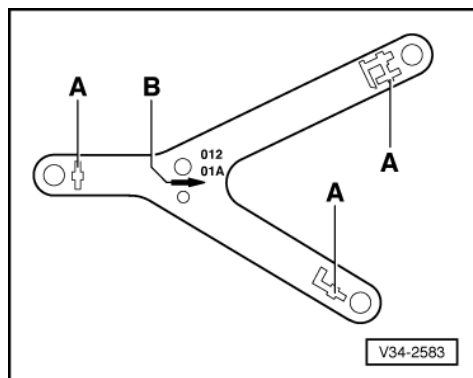
- -> Unscrew bolt -2- at selector joint -1- on selector rod.



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

Note:

On removal, note the bolt lengths and assignment for re-installation.

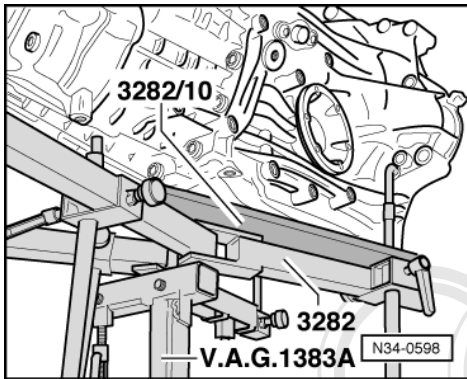


- -> Set up the gearbox support 3282 for removing the manual gearbox 01A (four-wheel drive) with adjustment plate 3282/10 and attach to gearbox lifter V.A.G 1383 A.

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.

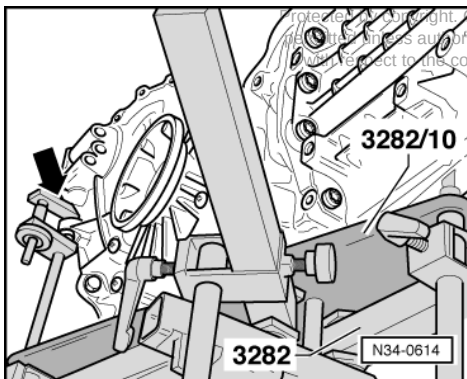


- -> Run gearbox jack V.A.G 1383 A with gearbox support 3282 in under the gearbox and take up the weight of the gearbox.

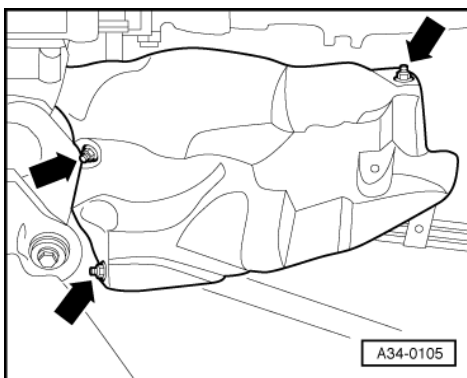
Note:

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.

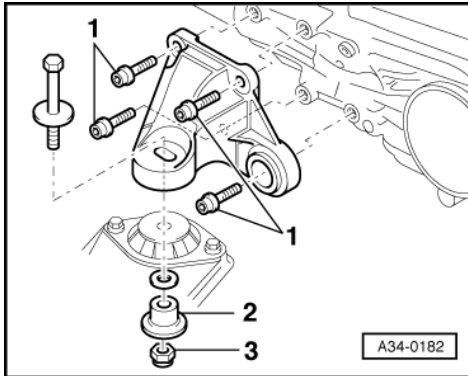
- Support gearbox with gearbox lifter V.A.G 1383 A.



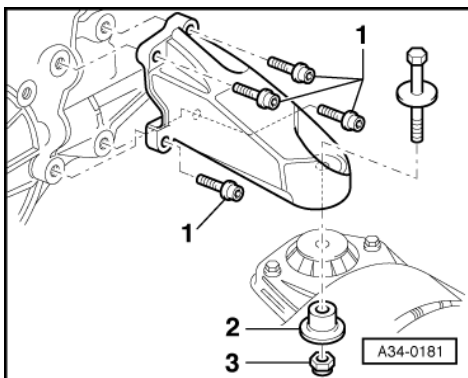
- -> Align adjustment plate parallel to gearbox and lock safety support -arrow- on gearbox.



- -> Remove heat shield on right-hand side of tunnel (if fitted) -arrows-.



- -> Loosen bottom nut -3- on bonded rubber mounting.
- Unscrew bolts -1- on right gearbox support.

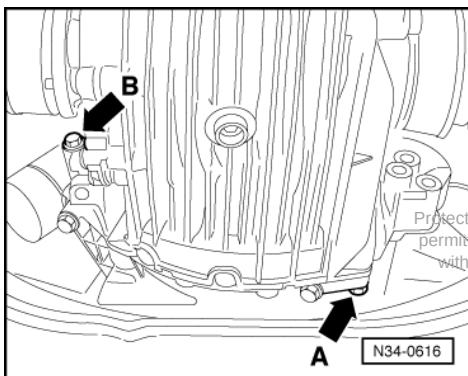


- -> Loosen bottom nut -3- on bonded rubber mounting.
- Unscrew bolts -1- on left gearbox support.
- If fitted, remove cable holder and cables for procon-ten system from gearbox

=> General body repairs; Repair group 68; Servicing procon-ten system, left-hand drive ä 06.94 Servicing procon-ten system, left-hand drive ä 06.94

Note:

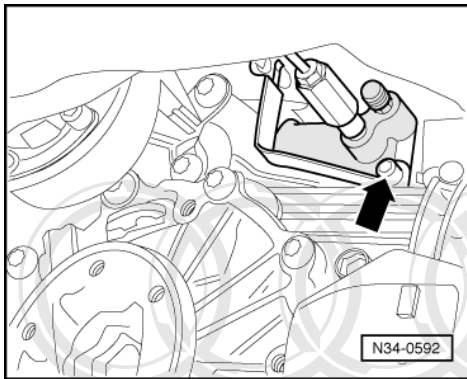
Lower gearbox slightly in order to release procon-ten cables from cable guides on gearbox.



- -> 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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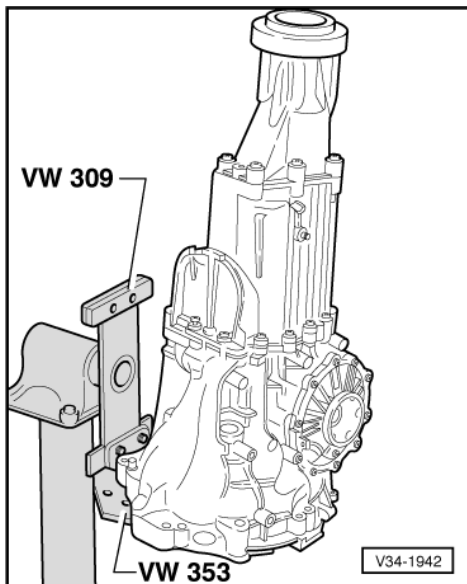
Note:

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

2.3 - Securing gearbox to repair stand

Special tools, testers and auxiliary equipment required

- ◆ Retaining plate VW 309
- ◆ Gearbox support VW 353

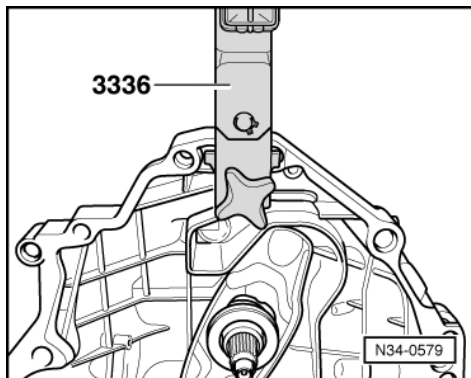


- -> Secure gearbox to repair stand with gearbox support VW 353 and retaining plate VW 309 to carry out repairs.



2.4 - Transporting the gearbox

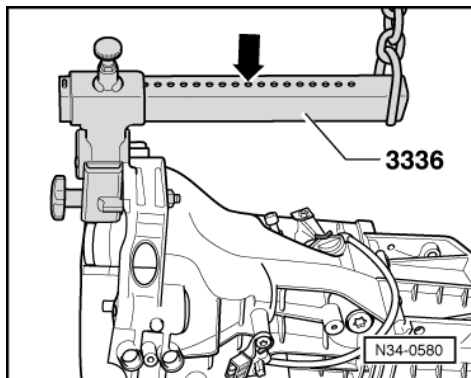
Special tools, testers and auxiliary equipment required



- ♦ Gearbox support 3282
- ♦ Gearbox lifting beam 3336

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

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



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

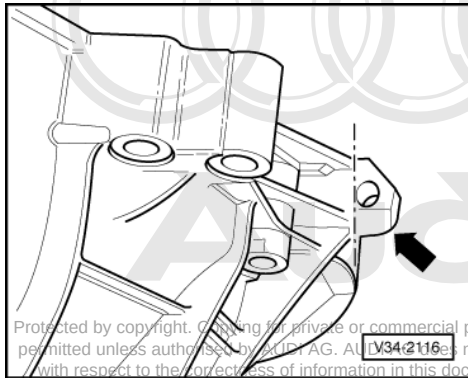
2.5 - Installing

Install in reverse order, paying attention to the following:

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- 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, replace 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 threads of clutch slave cylinder mounting on gearbox and selector lever/selector rod connection.
- Check whether dowel sleeves for centralising engine/gearbox are in cylinder block, install if necessary.
- Renew all self locking nuts.

Vehicles with 4-cylinder 4 valve engine:

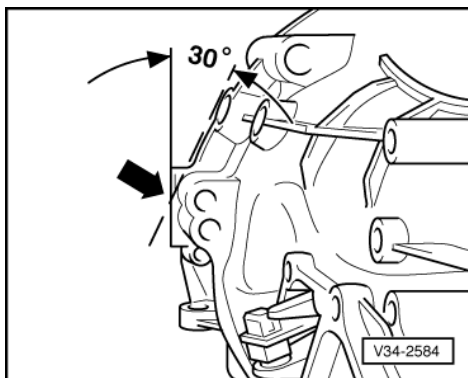


- -> If gearbox housing has to be replaced when performing repairs, saw off right gearbox mounting lug along line indicated -arrow- before installing.

Note:

Otherwise lug will contact exhaust system.

Vehicles with 6-cylinder engine:

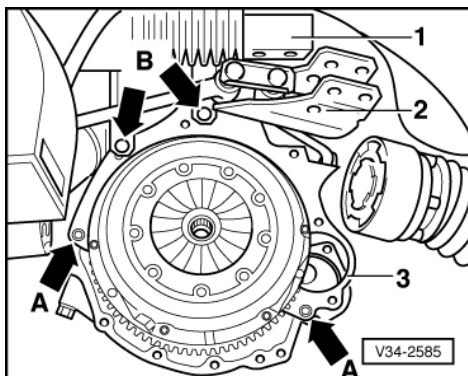


- -> If gearbox housing has to be replaced when performing repairs, saw off a 30° chamfer on outer left engine/ gearbox mounting lug along line indicated -arrow- before installing.

Note:

Otherwise it will come into contact with exhaust system.

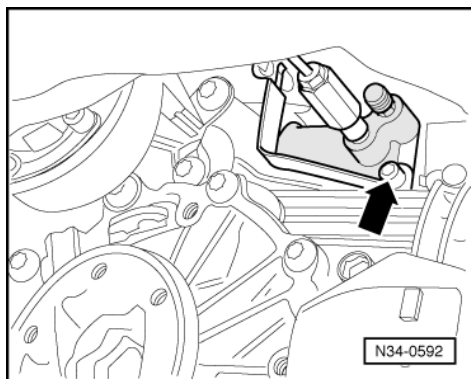
All vehicles:



- -> Track rod -1- on steering box must be retracted to enable follower -2- to be moved upwards.
- If gearbox has intermediate plate -3-, fit between gearbox and engine onto engine dowel sleeves -arrows A-.



- Brackets -arrows B- for coolant pipes must be pressed upwards.



- -> Lift gearbox until clutch slave cylinder with bracket for hose/pipe can be installed (arrow).
- 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

- Before installation it is important to use a tap to clean out locking fluid left in threads in propshaft drive flanges on gearbox and rear final drive and in thread of clutch slave cylinder mounting.
- Install propshaft => Page 189 .
- Check shift mechanism adjustment, adjust if necessary => Page 42 .
- Align exhaust system free of stress

=> 4-cyl. fuel injection engine, Mechanics; Repair group 26

=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26

=> 6-cyl. fuel injection engine, Mechanics; Repair group 26

- Checking oil level in manual gearbox => Page 60 .
- After connecting battery, enter anti theft code for radio.

=> Operating instructions for radio

- Set clock to correct time.

Tightening torques

Component		Nm
Bolts/nuts	M6	10
	M8	20
	M10	45
	M12	65
Except for the following:		
Cable holder for procon-ten system		40
Drive shaft to flange shaft	M8	40
	M10	77
Engine speed sender -G28		10
Clutch slave cylinder to gearbox		
Hexagon socket head bolt 1)		20
Hexagon bolt 2)		25
Heat shields over drive shafts to gearbox		23

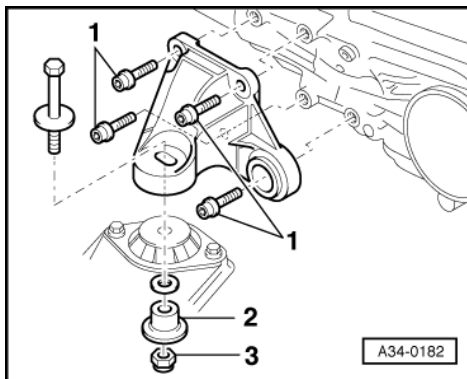
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Component	Nm
Selector rod to gearbox	23

- 1) Replace bolt
- 2) Apply locking compound D 185 400 A2 before installing.

Component	Nm
Front cross member below exhaust system to body	25
Heat shield for propshaft to Torsen differential cover	25
Tunnel support to body	23
Catalytic converter to mounting lugs	25
Front exhaust pipe to exhaust manifold	30
Clamp for exhaust pipe	40
Bracket for noise insulation to subframe	10
Track rod follower to steering boxBolts	50
Nuts	45 3)

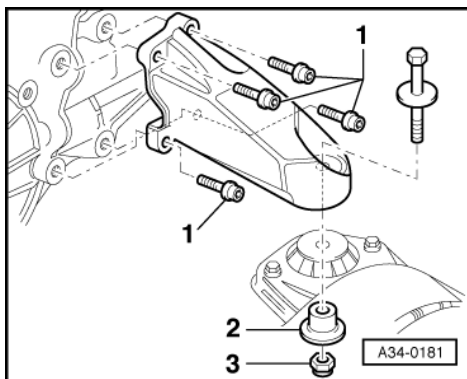
- 3) Replace self-locking nuts



-> Gearbox/engine mounting (right)

Item	Bolt	Qty.	Nm
1	M10 x 30	4	40
3	M10	1	40

- When installing gearbox support, fit stop -2- under bonded rubber mounting.





-> Gearbox/engine mounting (left)

Item	Bolt	Qty.	Nm
1	M10 x 35	4	40
3	M10	1	40

- When installing gearbox support, fit stop -2- under bonded rubber mounting.

3 - Checking oil level in manual gearbox

3.1 - Checking oil level in manual gearbox

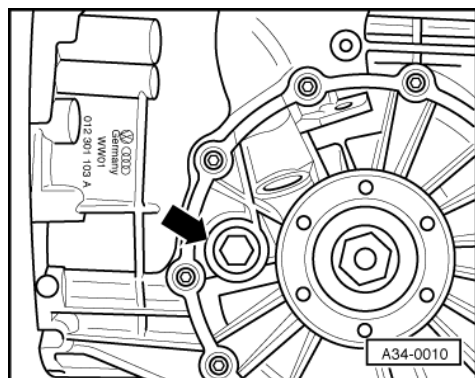
Special tools, testers and auxiliary equipment required

- ♦ 17 mm hexagon socket attachment

Notes:

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- ♦ The vehicle must be absolutely horizontal when checking gearbox oil level. This work is best performed over an inspection pit or using a 4-column lifting platform.
- ♦ 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.



- -> To check oil level, unscrew oil filler plug (arrow).
- Specification: Oil level up to lower edge of filler hole
- Top up with gear oil if necessary: Specification => Page 2 onwards.
- Fit oil filler plug.

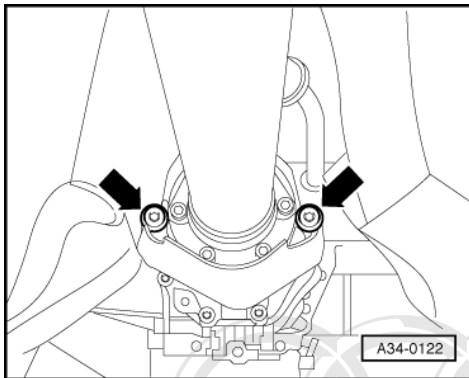
Tightening torque

Component	Nm
Oil filler plug	25

4 - Removing and installing cover with Torsen differential

4.1 - Removing and installing cover with Torsen differential

- Gearbox installed

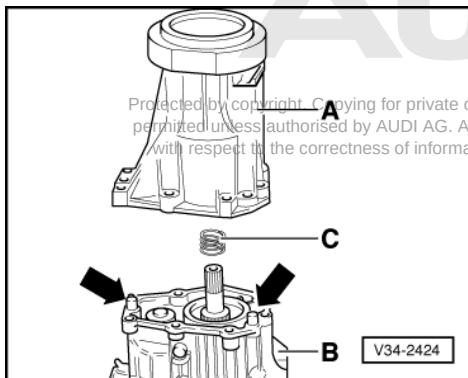


Special tools, testers and auxiliary equipment required

- ♦ Drip tray V.A.G 1306

Removing

- Removing propshaft => Page 185 .
- -> Remove heat shield for propshaft (if fitted) from cover for Torsen differential -arrows-.
- 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.

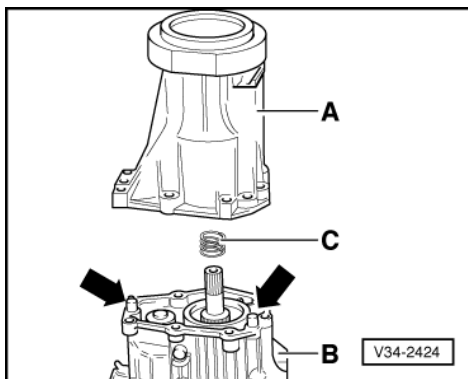
Removing and installing Torsen differential from cover => Page 82

Servicing cover => Page 82

Installing

Install in reverse order, paying attention to the following:

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





- -> Check that dowel sleeves for cover -A- are fitted in gearbox cover -B- (arrows).
- Fit spring -C- onto hollow shaft over drive pinion.
- Before installation it is important to use a tap to clean out locking fluid left in threads in propshaft drive flanges on gearbox and rear final drive and in thread of clutch slave cylinder mounting.
- Install propshaft => Page 189 .
- Top up oil in gearbox and check oil level in gearbox => Page 60 .
- Align exhaust system free of stress

=> 4-cyl. fuel injection engine, Mechanics; Repair group 26

=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26

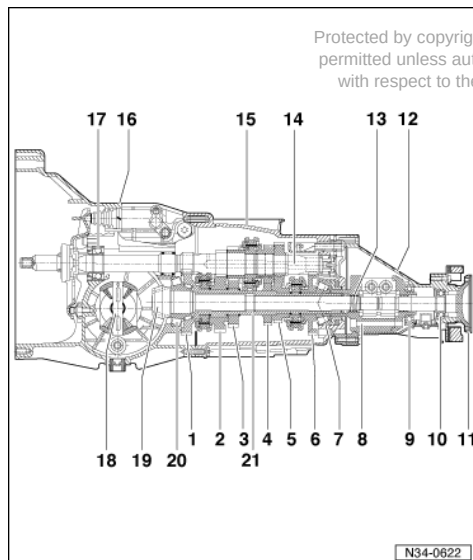
=> 6-cyl. fuel injection engine, Mechanics; Repair group 26

Tightening torques

Component	Nm
Cover with Torsen differential to gearbox	25
Prop shaft to gearbox	55
Heat shield for propshaft to Torsen differential cover	25

5 - Dismantling and assembling gearbox

5.1 - Dismantling and assembling gearbox



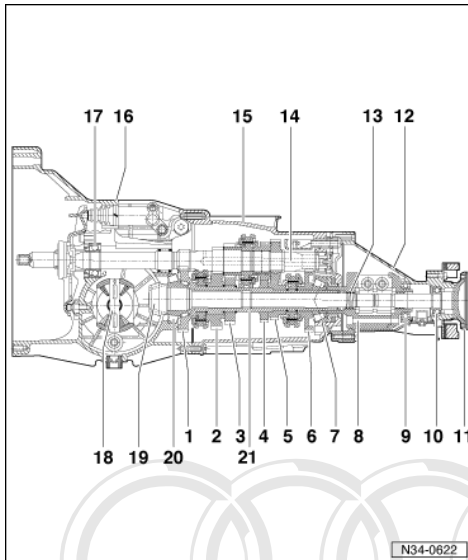
Assembly sequence =>Page 73

5.2 - 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 137

7 Taper roller bearing

- ♦ Adjusting => Page 165 onwards



8 Torsen differential

- ♦ Servicing only possible at manufacturer
- ♦ Removing and installing with cover => Page 60

9 Ball bearing

10 Ball bearing

11 Flange shaft

12 Cover for Torsen differential

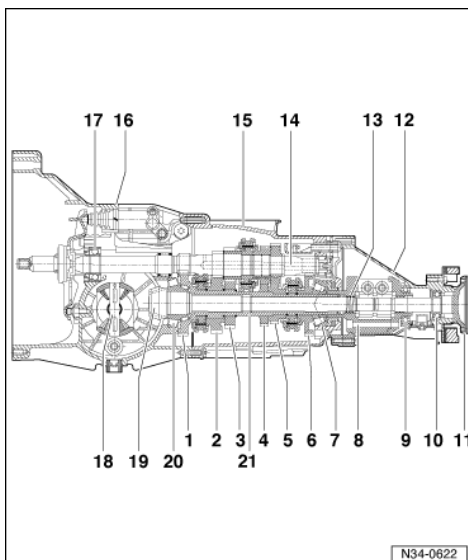
13 Spring

- ♦ Between Torsen differential and hollow shaft

14 Input shaft

- ♦ Dismantling and assembling => Page 98

15 Gearbox cover



16 Gearbox housing

17 Ball bearing

- ♦ Adjusting => adjusting input shaft, Page 113

18 Differential

- ♦ Removing and installing
=> Page 146



- ♦ Dismantling and assembling =>Page **151**

19 Drive pinion

- ♦ Dismantling and assembling hollow shaft and drive pinion
=> Page **115**

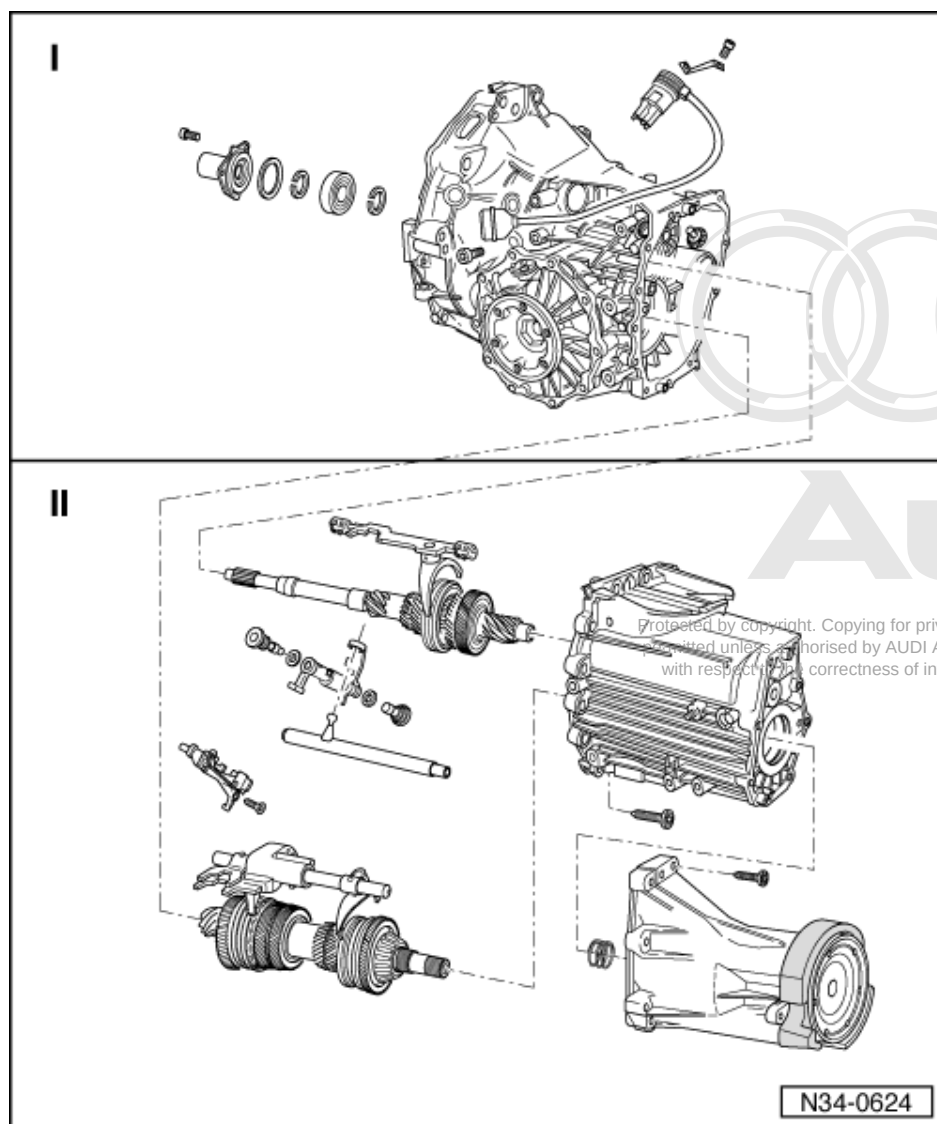
20 Radial taper roller bearing

- ♦ Adjusting => Page **165** onwards

21 Hollow shaft

- ♦ Dismantling and assembling hollow shaft and drive pinion
=> Page **115**

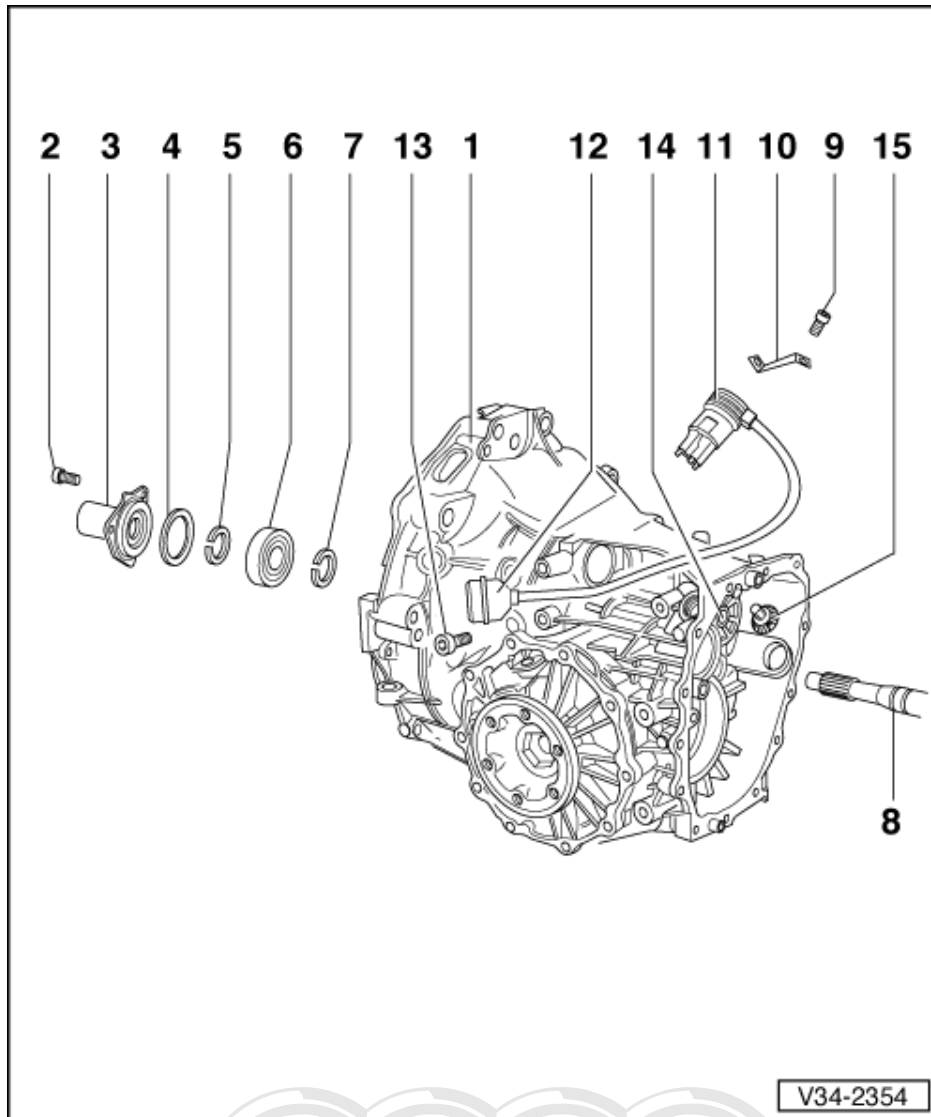
5.3 - Assembly overview



I - Removing and installing input shaft ball bearing and multi-function sender => Page **65**

II - Removing and installing input shaft, drive pinion, hollow shaft, selector rods, gearbox cover and cover with Torsen differential => Page **69**

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



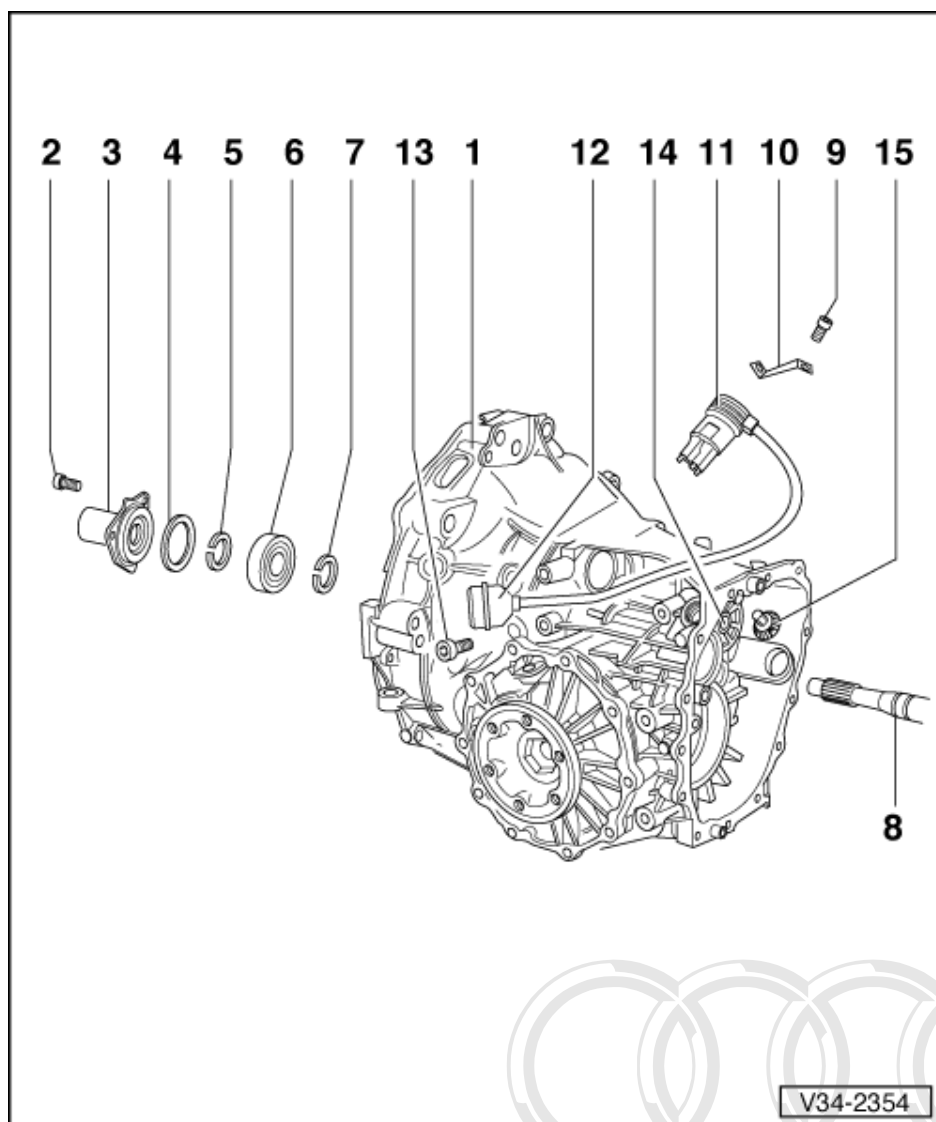
1 Gearbox housing

- ◆ With differential and flange shafts
- ◆ Removing and installing flange shafts => Page 139
- ◆ Removing and installing differential => Page 146
- ◆ Removing and installing speedometer sender and drive wheel => Page 144
- ◆ Breather installation position
=> Fig. 69

2 Torx socket head bolt - 35 Nm

- ◆ Self-locking
- ◆ Replace

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3 Guide sleeve

- ♦ With O-ring and seal for input shaft => Page **24**

4 Dished washer

- ♦ Smaller diameter (convex side) to guide sleeve

5 Circlip

- ♦ Determining thickness => adjusting input shaft, Page **113**

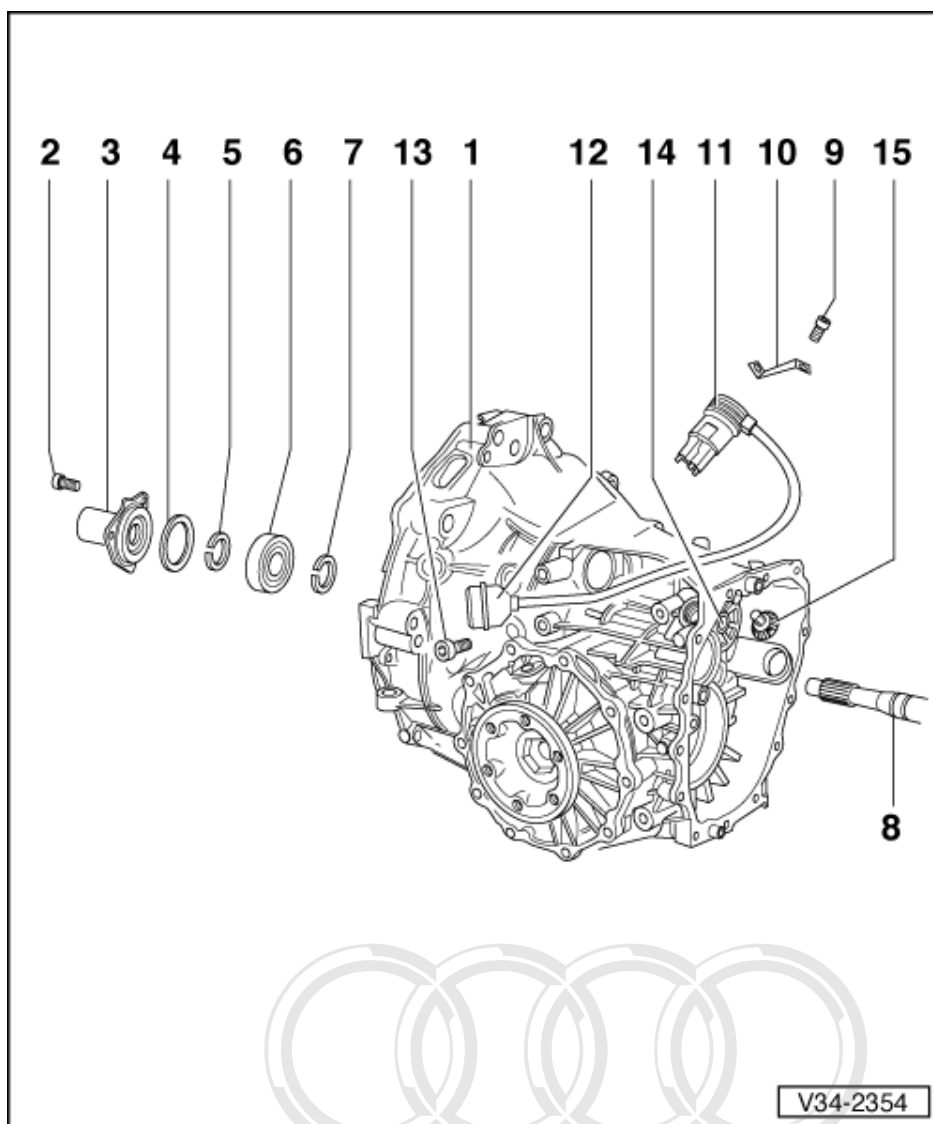
6 Ball bearing

- ♦ Removing and installing
=> Page **73**

7 Circlip

- ♦ Determining thickness => adjusting input shaft, Page **113**

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8 Input shaft

- ♦ Removing and installing
=> Page 69
- ♦ Dismantling and assembling =>Page 98
- ♦ Adjusting =>Page 113
- ♦ Servicing input shaft bearings => Page 98

9 Bolt - 25 Nm

10 Tab washer

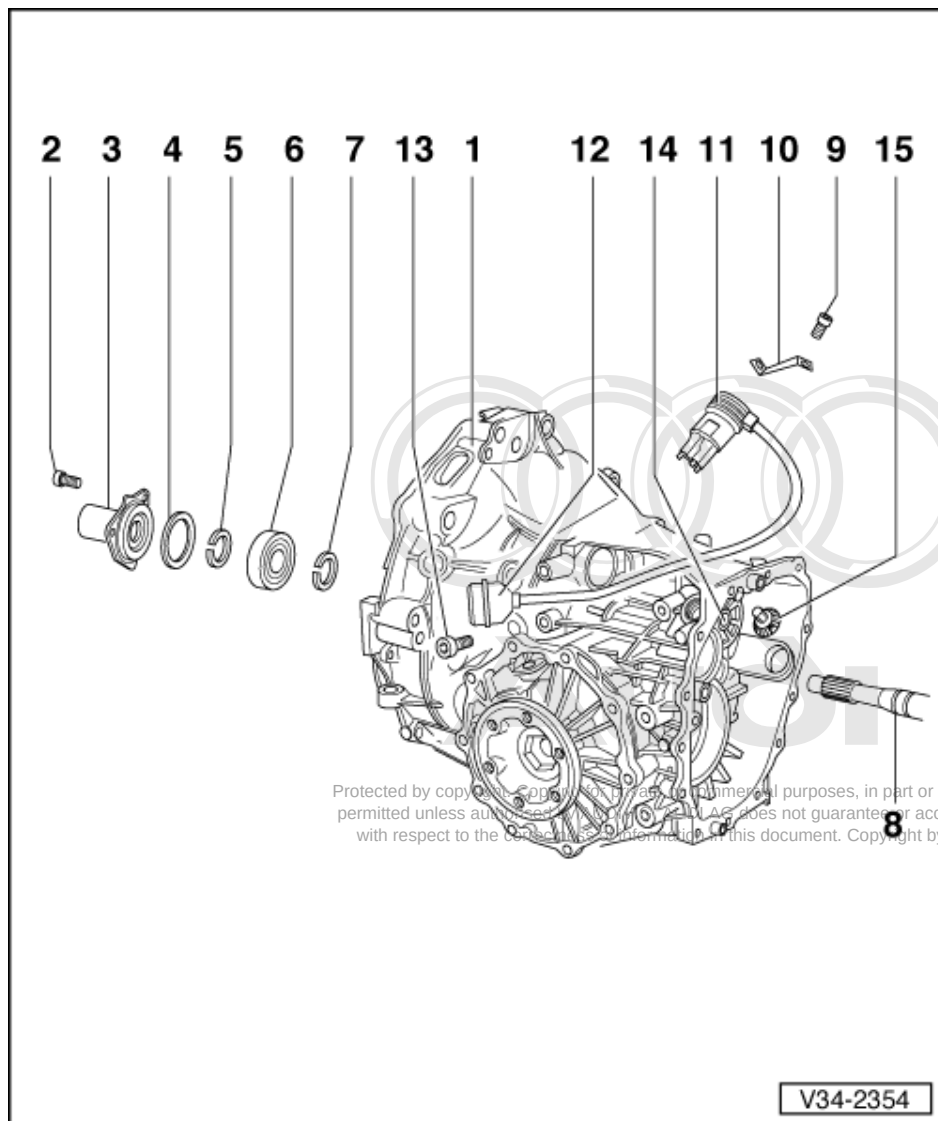
- ♦ For multi-function sender

11 Multi-function sender

12 Connector

- ♦ For multi-function sender

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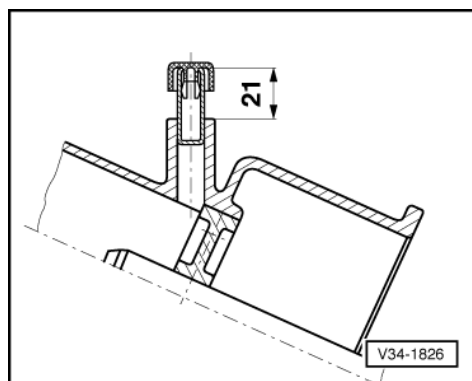
13 Bolt - 10 Nm

14 Cover for selector shaft

- ♦ Removing and installing
=> Page 90

15 Locking unit for 5th gear and reverse gear

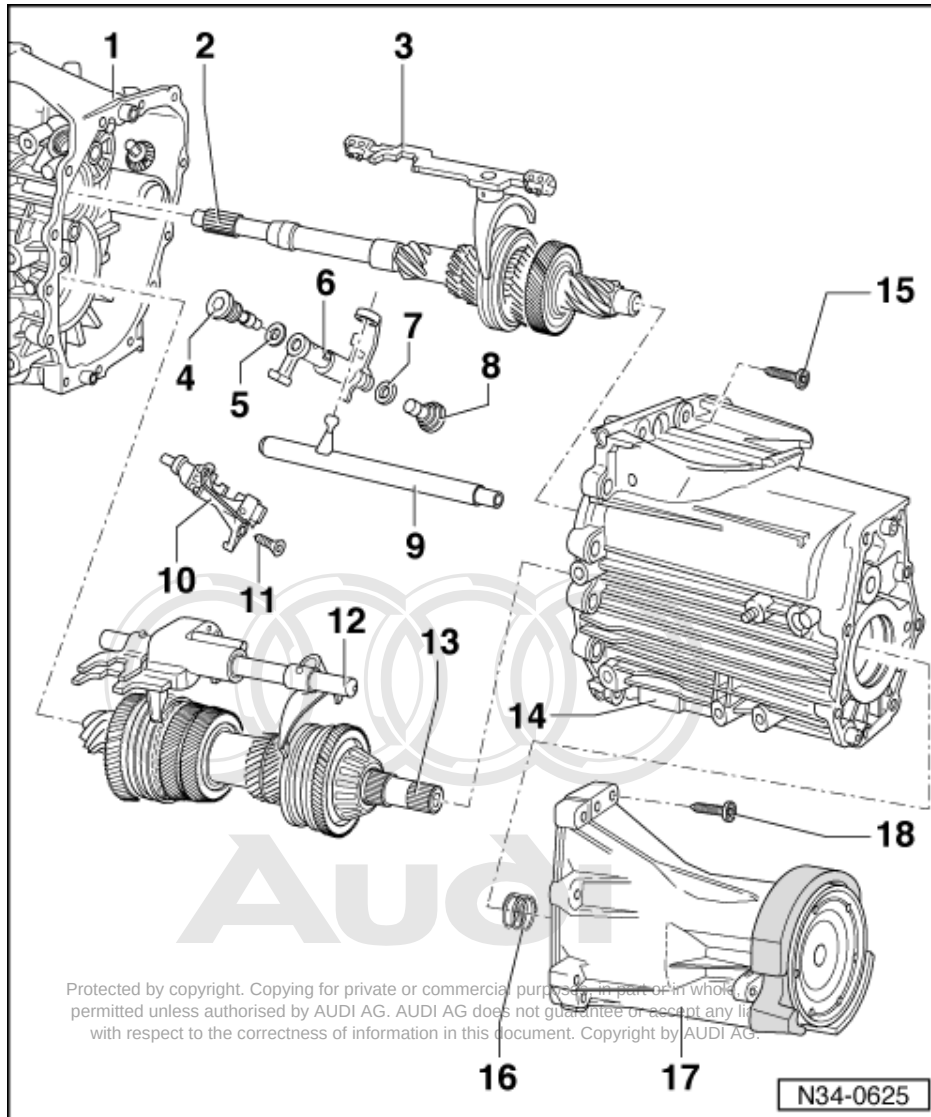
- ♦ Removing and installing
=> Page 95



-> Fig.1 Installation position of breather

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

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

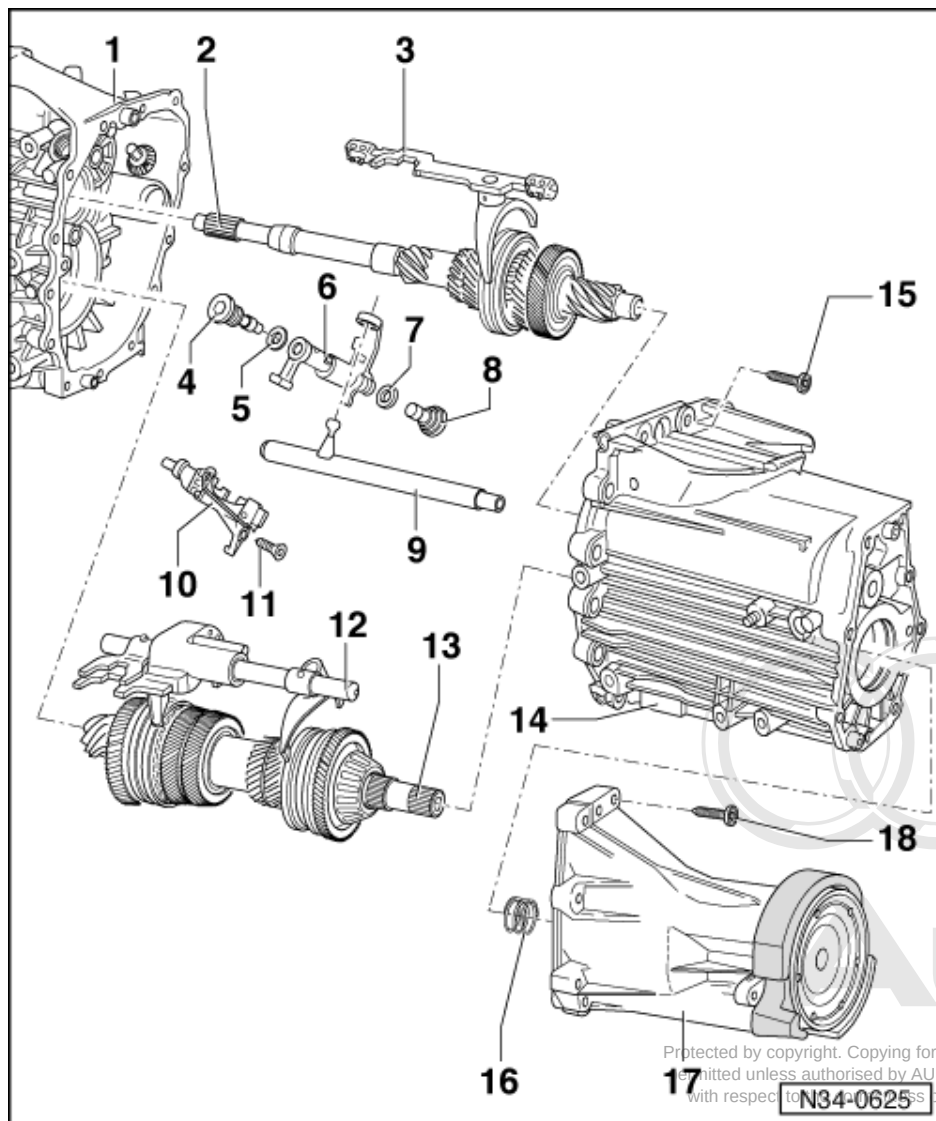


1 Gearbox housing

- ◆ Allocate components according to gearbox code letters using Parts Catalogue
=> Page 2 onwards

2 Input shaft

- ◆ Dismantling and assembling =>Page 98
- ◆ Adjusting =>Page 113
- ◆ Servicing input shaft bearings => Page 98



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N34-0625

3 Selector rod with selector fork for 3rd and 4th gear

- ◆ Dismantling and assembling =>Page 90
- ◆ Replacing mounting bushes
=> Page 90

4 Left stop bolt
- 40 Nm

5 Washer

6 Relay shaft

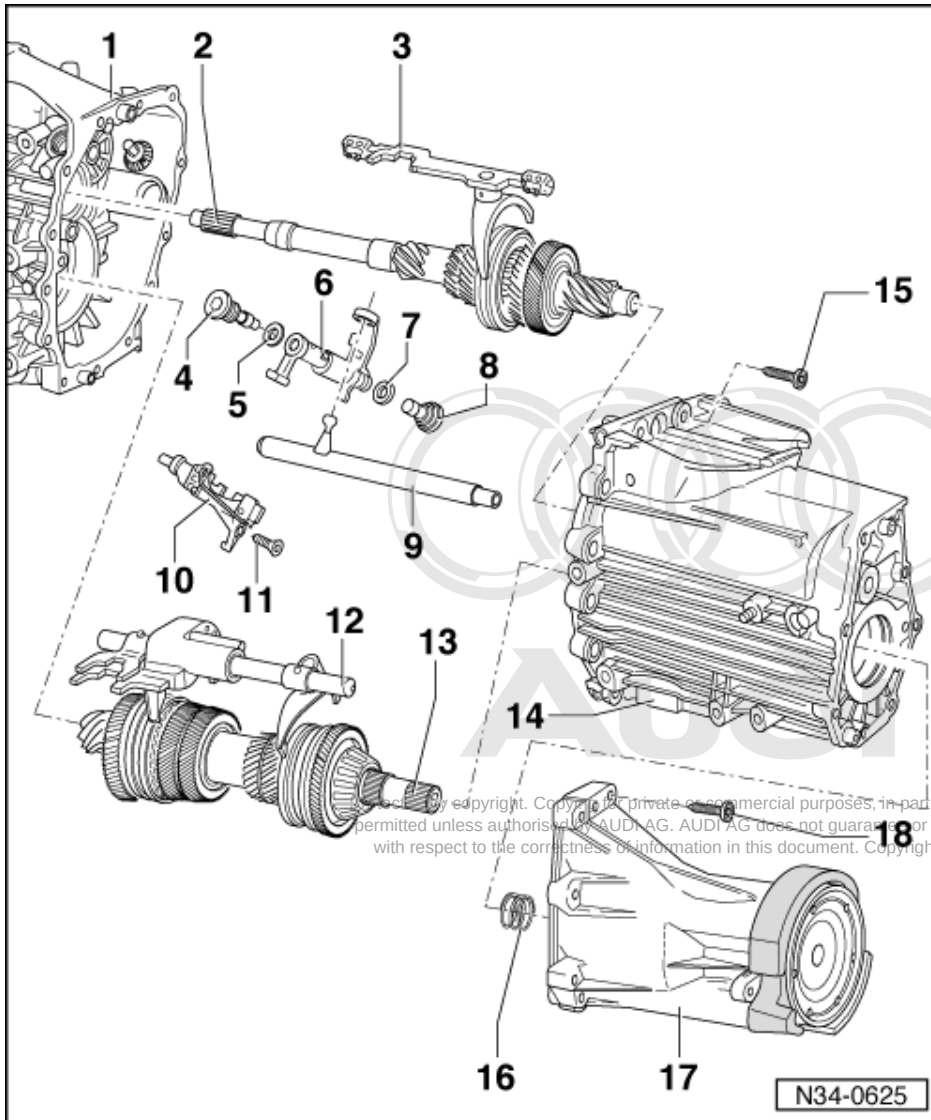
- ◆ Installation position => Page 91

7 Washer

8 Right stop bolt
- 40 Nm

9 Selector shaft

- ◆ Installation position => Page 90
- ◆ Replacing selector shaft sealing ring => Page 90



10 Detent segment

- ♦ Installation position => Page 91

11 Torx bolt - 25 Nm

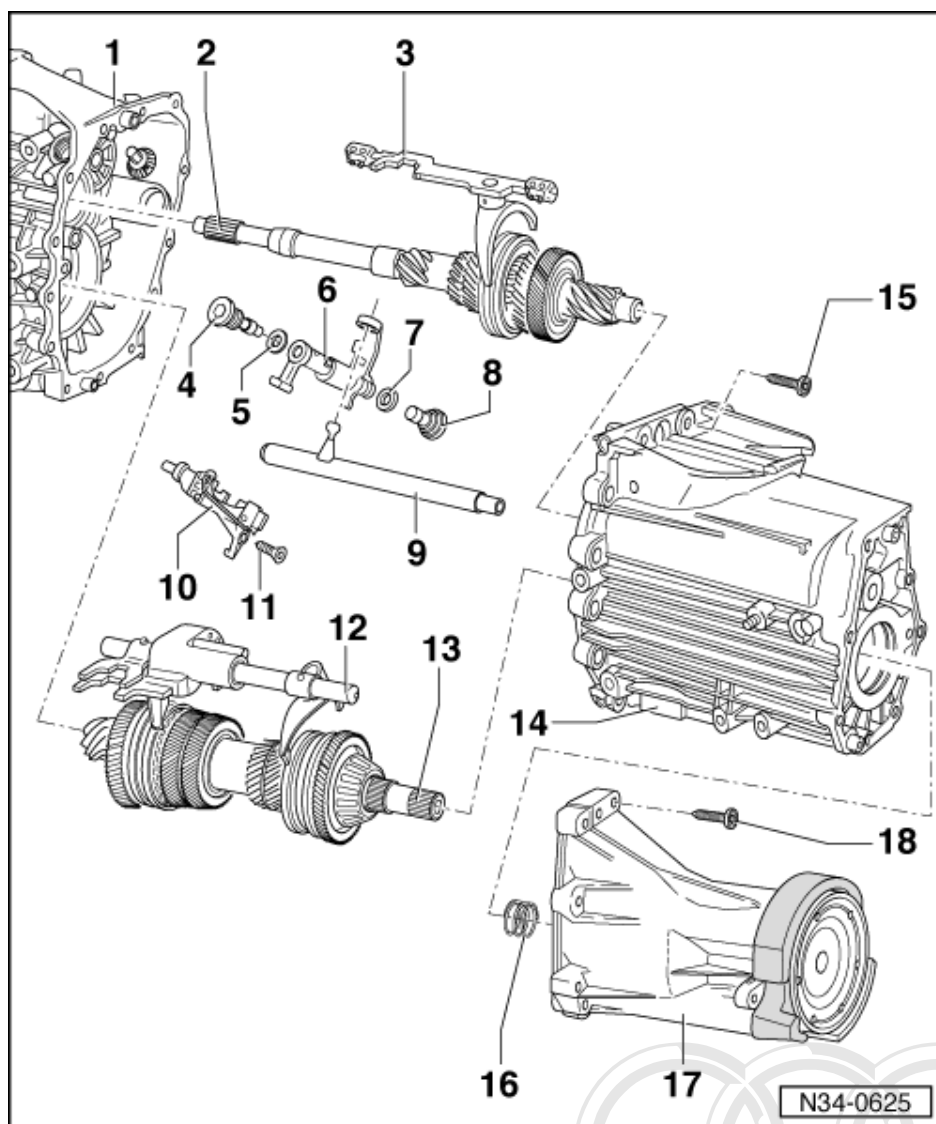
- ♦ With shoulder to secure the detent segment spring

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

- ♦ Dismantling and assembling =>Page 90
- ♦ Removing and installing ball sleeves => Fig. 94

13 Drive pinion with hollow shaft

- ♦ Dismantling and assembling =>Page 115
- ♦ Adjusting =>Page 161
- ♦ Servicing drive pinion and hollow shaft bearings
=> Page 115

**14 Gearbox cover**

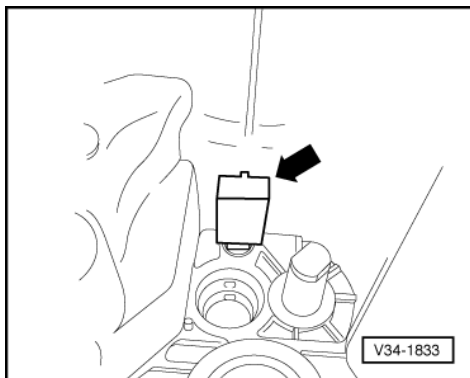
- ◆ Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces
- ◆ Removing and installing oil collector => Fig. 73

15 Torx bolt - 22 Nm**16 Spring****17 Cover with Torsen differential**

- ◆ Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces
- ◆ Removing and installing with gearbox installed
=> Page 60
- ◆ Removing and installing Torsen differential from cover
=> Page 82
- ◆ Servicing cover
=> Page 82

18 Torx bolt - 22 Nm

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-> 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

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

Notes:

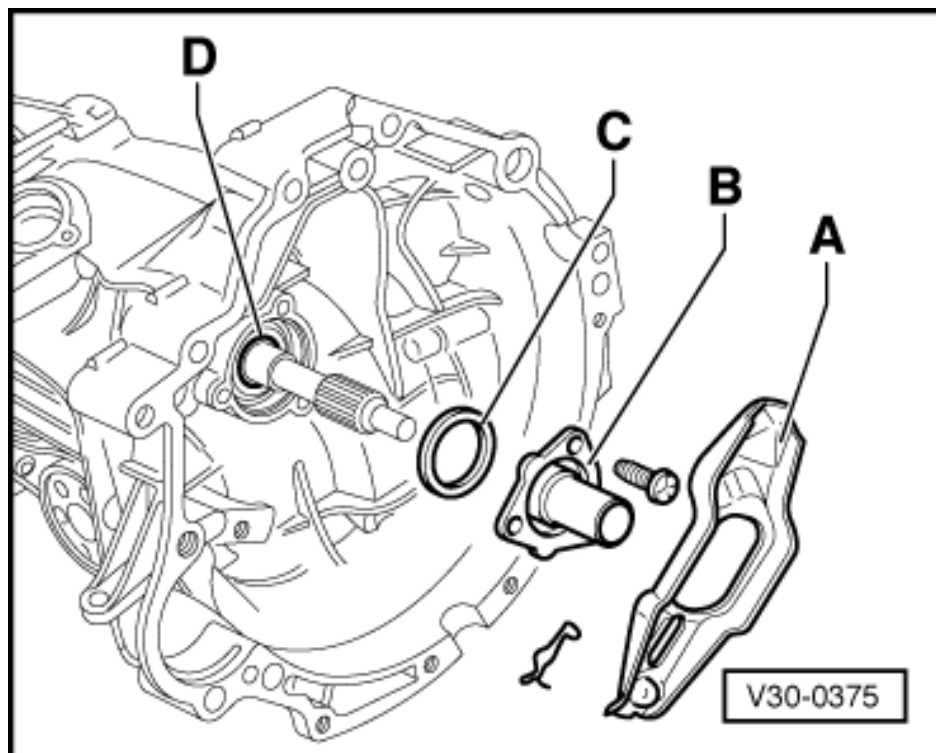
- ♦ It is not necessary to remove the differential to remove the above-mentioned components.
- ♦ Removal is only necessary when adjustments have to be carried out => adjustment overview, Page 163 .

Special tools, testers and auxiliary equipment required

- ♦ Retaining 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

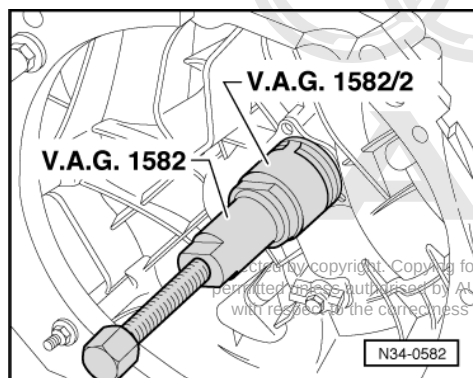
- Place drip tray V.A.G 1306 underneath the gearbox.
- Drain gear oil.
- Remove gearbox => Page 45 .
- Secure gearbox to repair stand => Page 55 .



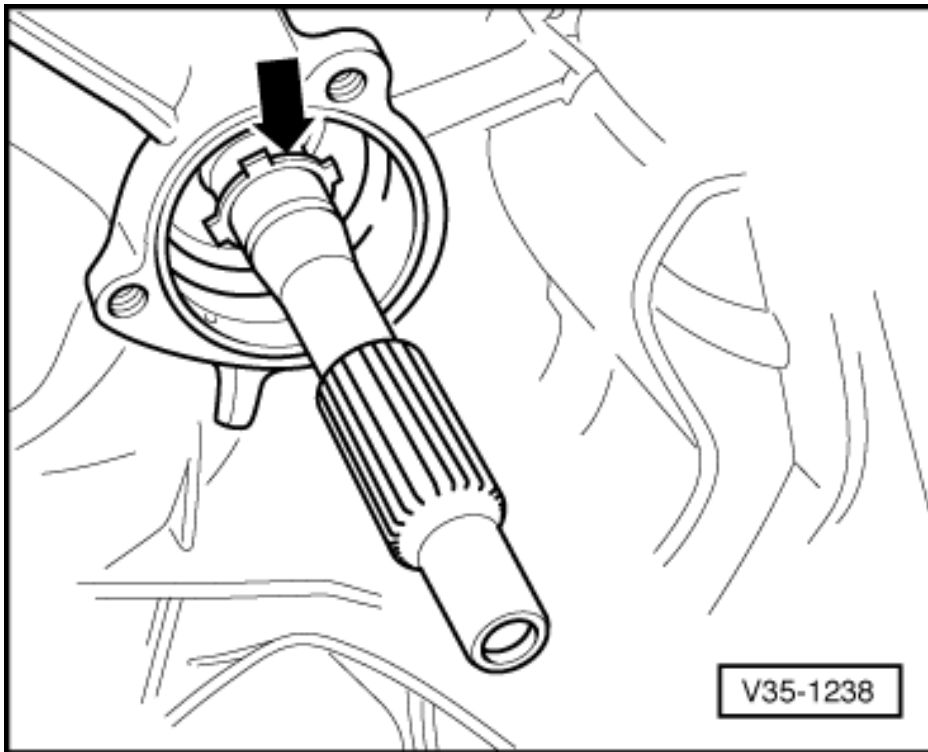
- -> Detach clutch release lever -A- with release bearing.

Notes:

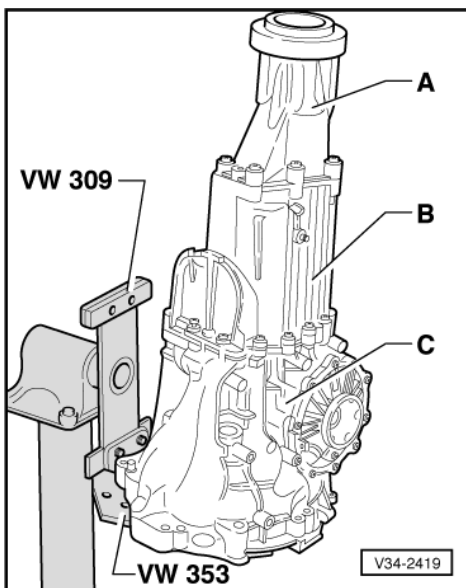
- ♦ Before pulling off guide sleeve, cover input shaft splines with a shrink-fit hose to protect oil seal.
- ♦ Removing oil seal from guide sleeve => Page 25 .
- Unscrew guide sleeve -B-.
- Remove dished washer -C-.
- Remove circlip -D- in front of input shaft ball bearing.
- If the ball bearing, input 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.



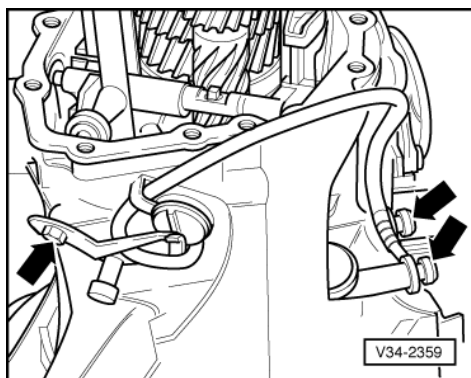
- -> Remove the circlip (arrow) behind the input shaft ball bearing.
- If the ball bearing, input shaft or gearbox housing is not to be replaced, note the thickness of the circlip.



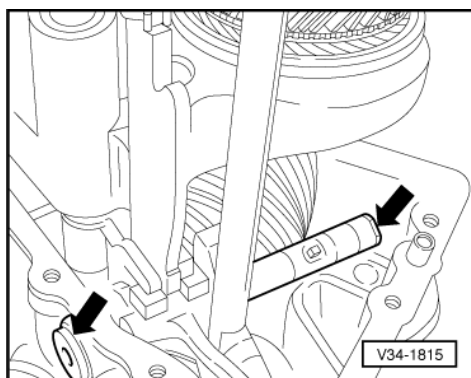
- -> Unbolt cover -A- with Torsen differential from gearbox cover -B-.
- Detach spring from drive pinion.
- Then unbolt gearbox cover -B- from gearbox housing -C-.



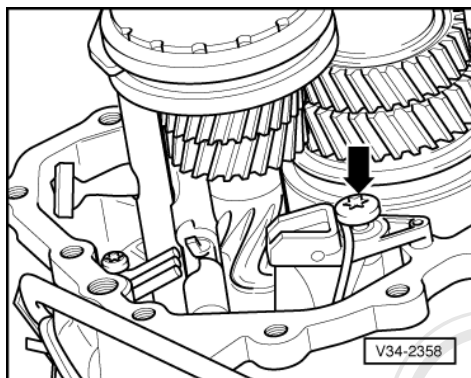
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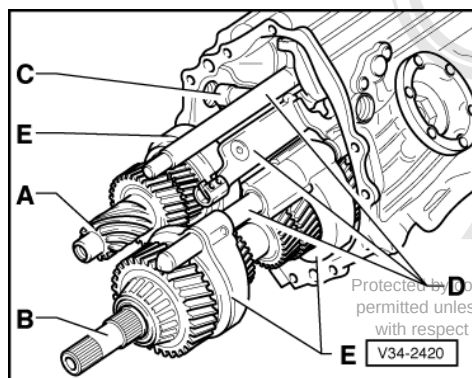
- -> Remove bolts (arrows) and pull out the multi-function sender.



- -> Remove relay shaft bolts (arrows).

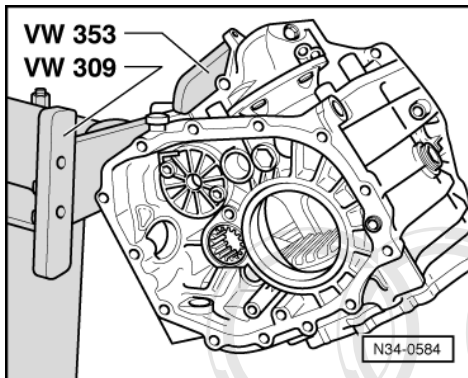


- -> Unscrew detent segment (arrow) and swivel it out.



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

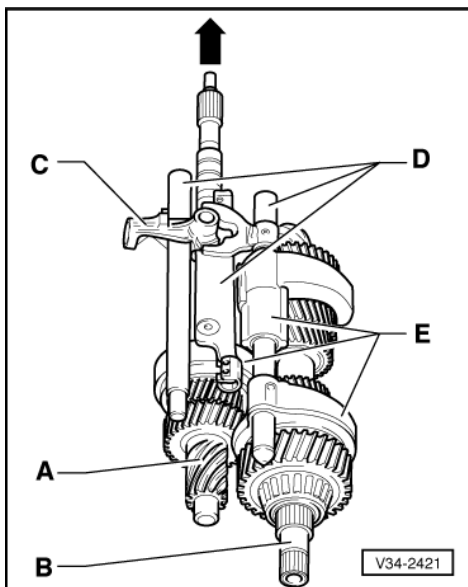


Installing

Note:

*If input shaft ball bearing, input shaft or the gearbox housing are replaced, it is necessary to re-determine the thickness of circlips for input shaft =>Page **113**, adjusting input shaft.*

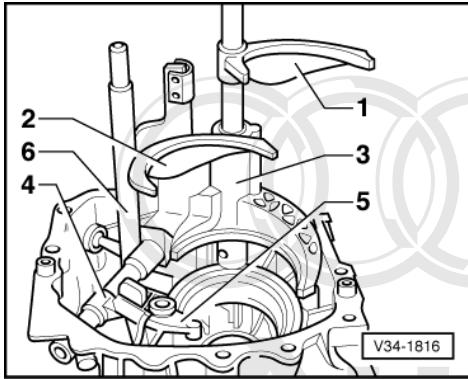
- -> Swing gearbox housing into the position shown. The components listed below can then be fitted more easily.



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

Note:

*Relay shaft -C- and selector shaft can also be fitted later =>Fig. V34-1816, Page **78**.*

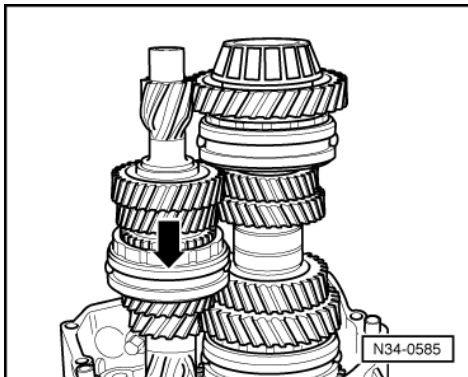


-> Location of shift mechanism in gearbox

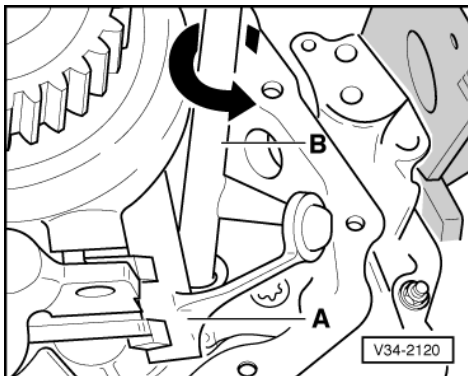
- 1 - Selector fork for 5th gear and reverse gear
2 - Selector fork for 3rd gear and 4th gear
3 - Selector fork for 1st gear and 2nd gear
4 - Relay shaft
5 - Detent mechanism
6 - Selector shaft

Note:

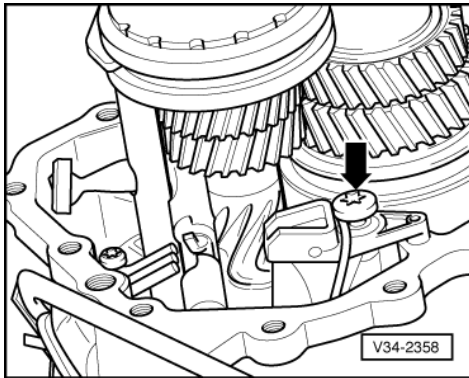
Shown in illustration with input shaft and drive pinion removed.



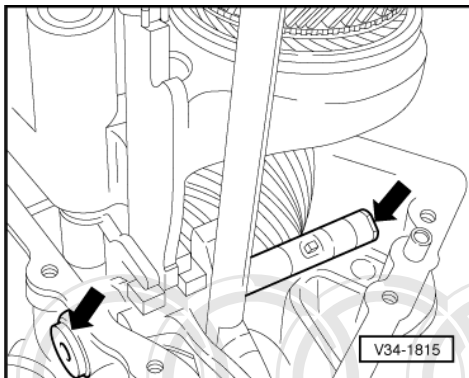
- -> Turn gearbox housing and engage 3rd gear (direction of arrow).



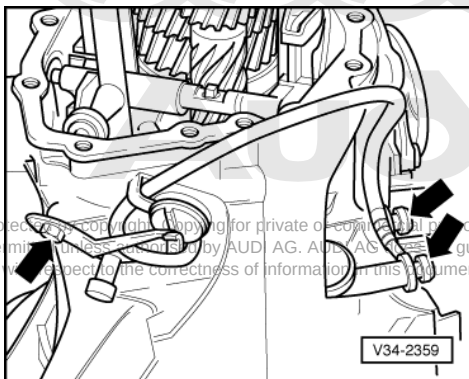
- -> Now install relay shaft -A-.
- Insert selector shaft -B- sideways onto drilling in gearbox housing and assemble into mounting eye.
- Then turn the selector shaft carefully in direction of arrow.



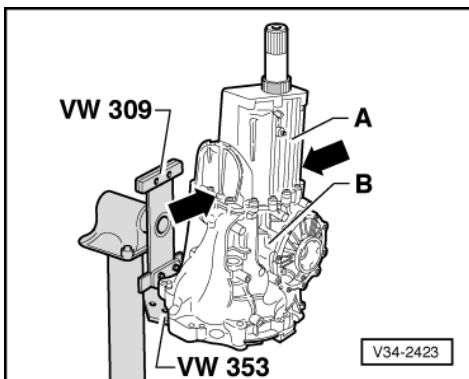
- -> Then insert the detent segment and bolt it tight (arrow).



- -> Screw in relay shaft bolts (arrow)

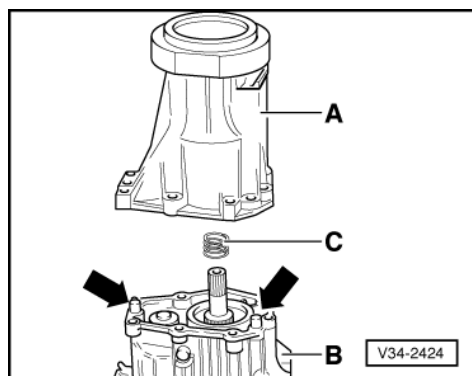


- Replace O-ring for multi-function sender.
- -> Carefully insert multi-function sender and tighten (arrow).

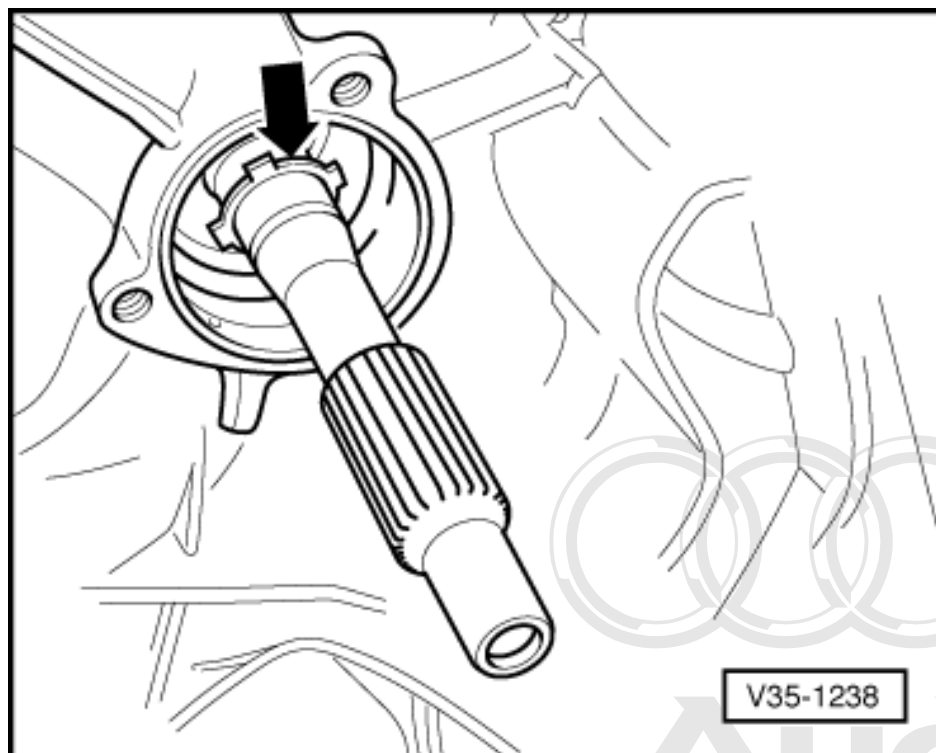




- -> Check that dowel sleeves for gearbox cover -A- are fitted in gearbox housing -B- (arrows).
- Fit gearbox cover onto gearbox housing.

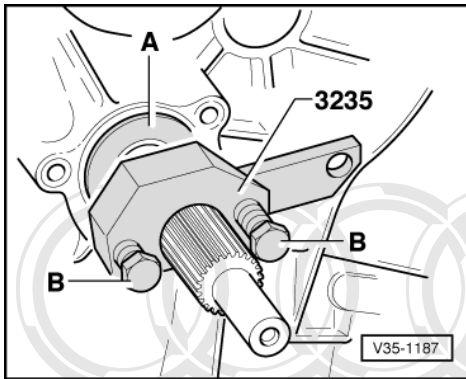


- -> Check that dowel sleeves for cover -A- are fitted in gearbox cover -B- (arrows).
- Fit spring -C-.
- Apply thin coat of sealant AMV 188 001 02 to sealing surfaces.
- Fit cover with Torsen differential -A- on gearbox cover -B-.



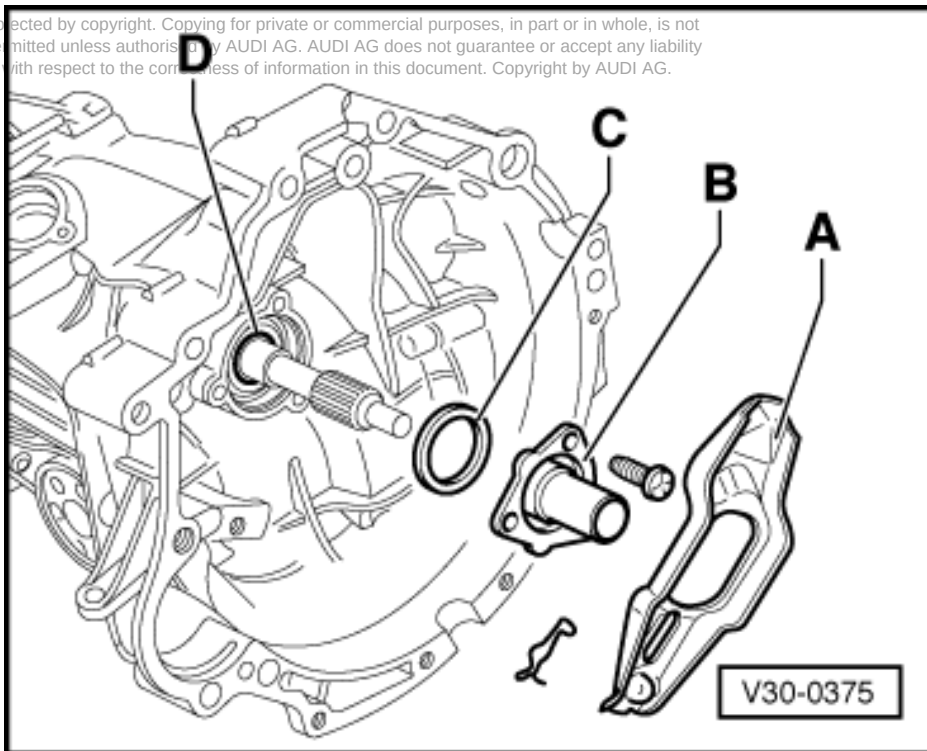
- -> Fit rear input shaft ball bearing circlip (arrow).
- Slide the ball bearing onto input shaft.
- Installation position: Closed side of ball cage faces towards gearbox housing

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- -> 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).

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- -> 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 25 .
- Fit guide sleeve -B- for release bearing.
- Fit clutch release lever -A- and release bearing.

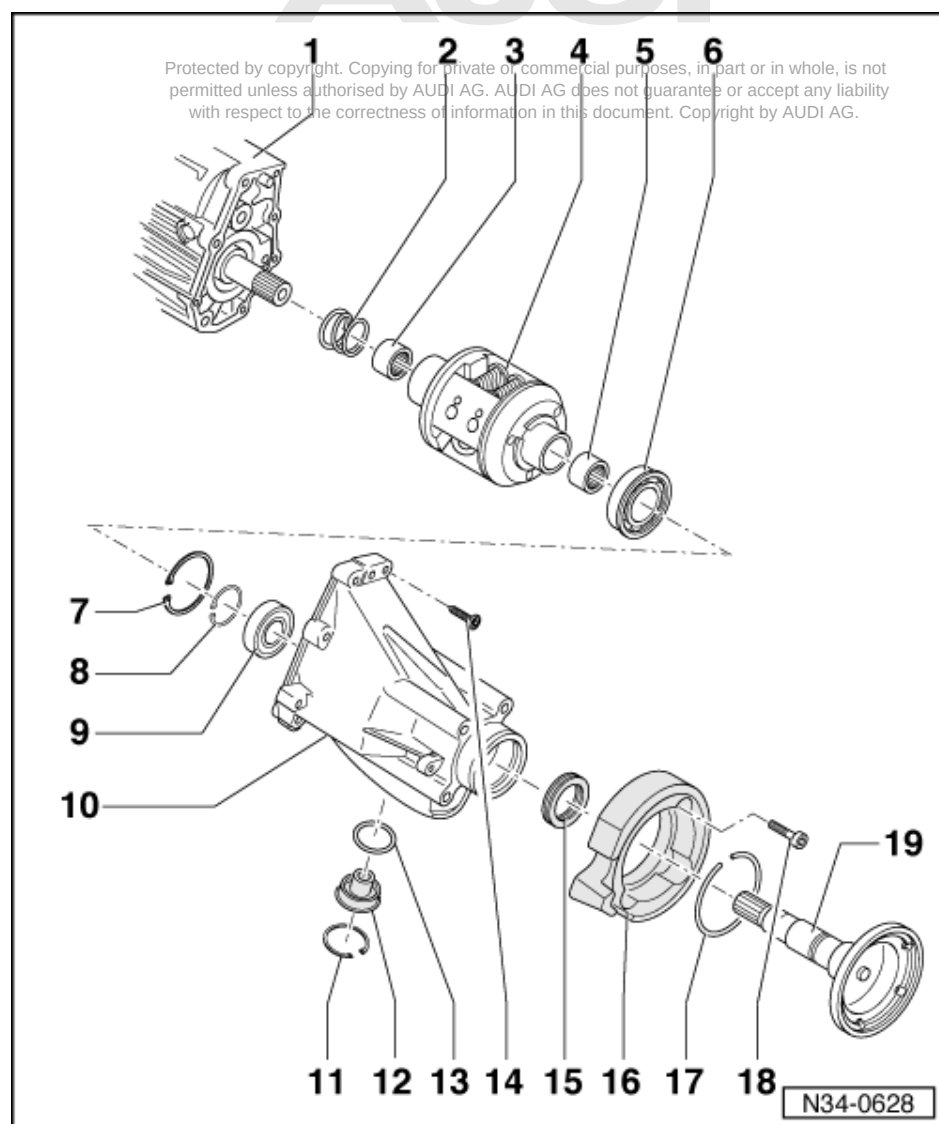


6 - Servicing cover for Torsen differential, removing and installing Torsen differential

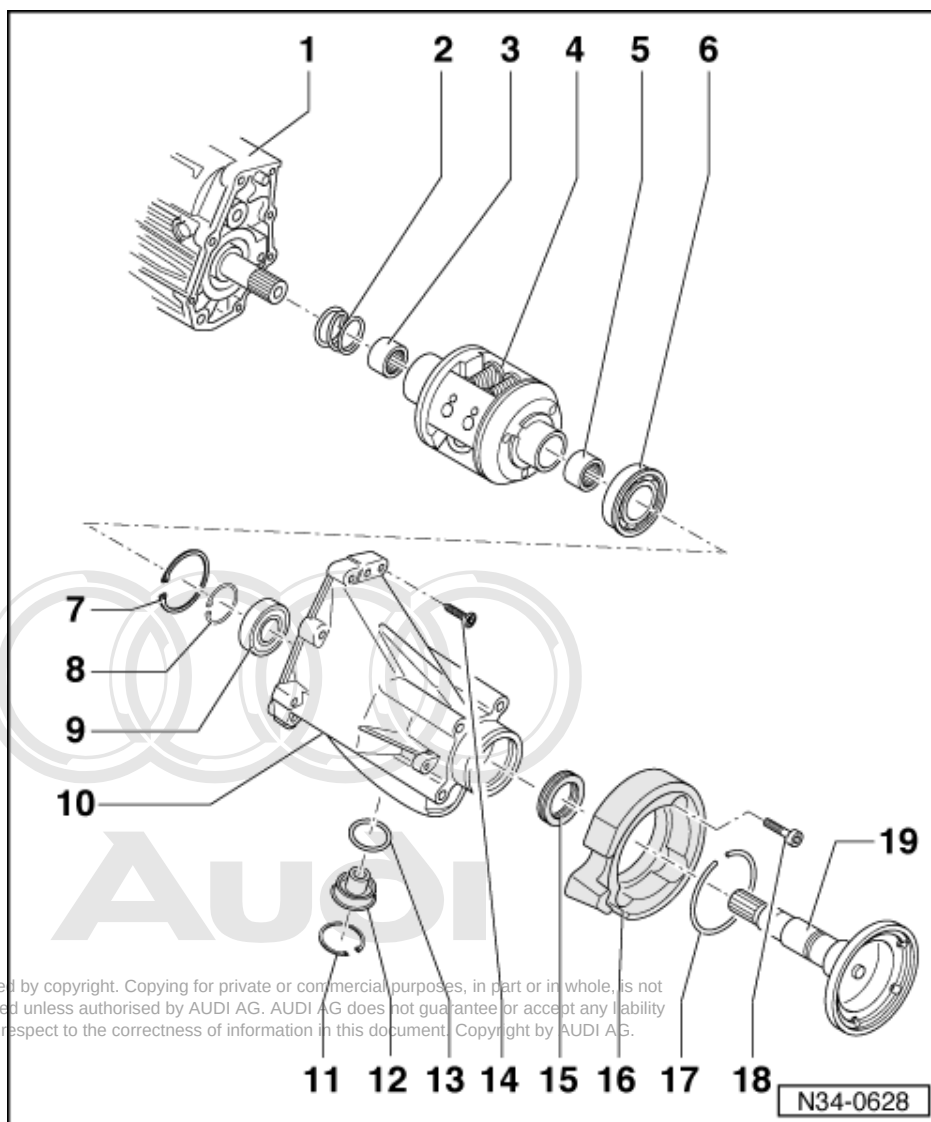
6.1 - Servicing cover for Torsen differential, removing and installing Torsen differential

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
- ♦ Extractor lever VW 681
- ♦ Tube VW 519
- ♦ VW 771/15 from multi-purpose tool set VW 771
- ♦ Drift sleeve 40-21
- ♦ Tube 2040
- ♦ Thrust pad 3002
- ♦ Separating tool Kukko 17/2
- ♦ Internal puller Kukko 21/4



- 1 Gearbox cover
- 2 Spring
- 3 Front needle roller bearing
 - ♦ Pulling out
=> Fig. 88
 - ♦ Installation position
=> Fig. 88
 - ♦ Pressing in
=> Fig. 89
- 4 Torsen differential
 - ♦ Do not dismantle
 - ♦ Press out after removing flange shaft
=> Fig. 86
 - ♦ Replace if damaged
 - ♦ Pressing in
=> Fig. 89



- 5 Rear needle roller bearing
 - ♦ Pulling out
=> Fig. 88
 - ♦ Installation position
=> Fig. 89
 - ♦ Pressing in
=> Fig. 89
- 6 Ball bearing

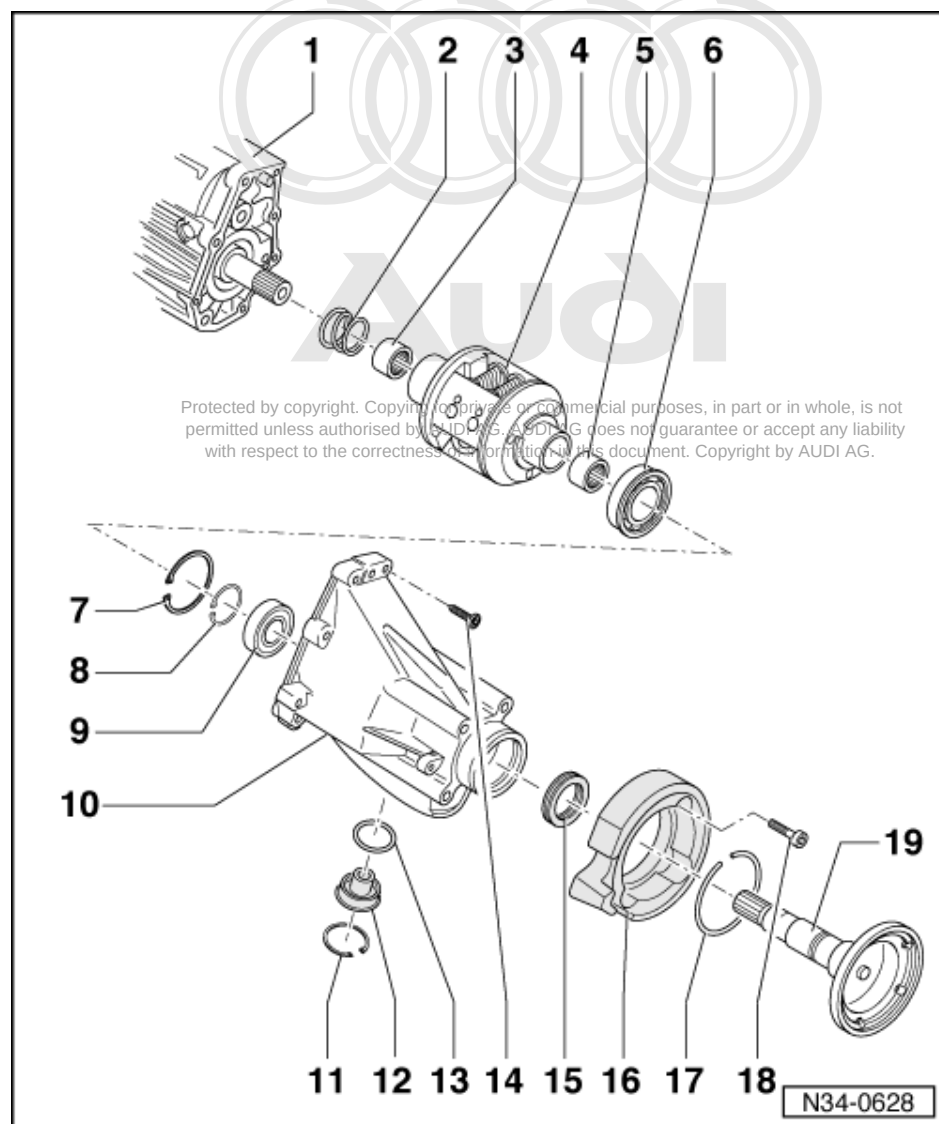


- ◆ For Torsen differential
- ◆ Pressing off
=> Fig. 87
- ◆ Pressing on
=> Fig. 87

7 Circlip

8 Circlip

- ◆ Remove and install together with flange shaft
=> Fig. 86



9 Ball bearing

- ◆ For flange shaft
- ◆ Pressing out
=> Fig. 87
- ◆ Pressing in
=> Fig. 88

10 Cover

- ◆ For Torsen differential

11 Circlip

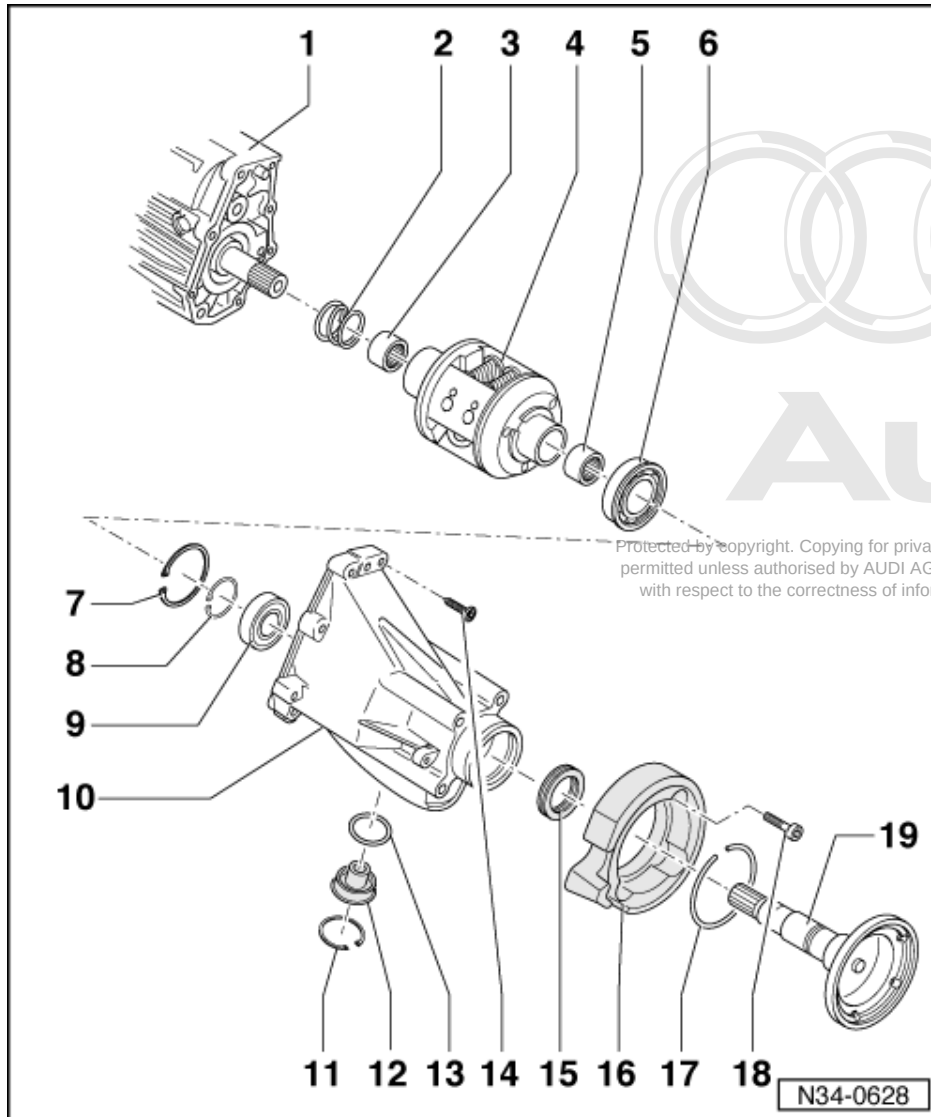
12 Cap

- ◆ Removing
=> Fig. 86

13 O-ring

- ◆ Replace

- ♦ Grease when installing
- 14 Torx bolt - 22 Nm



15 Oil seal

- ♦ Pull out with lever VW 681
- ♦ Driving in
=> Fig. 90

16 Vibration damper

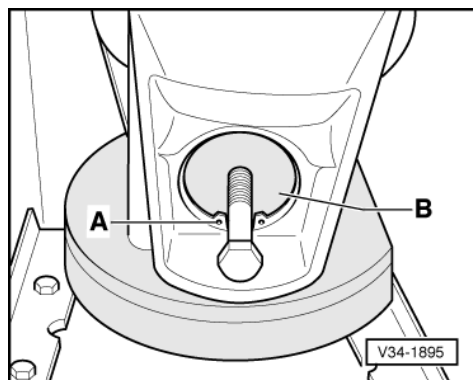
17 Circlip

18 Torx bolt - 35 Nm

- ♦ Self-locking
- ♦ Replace

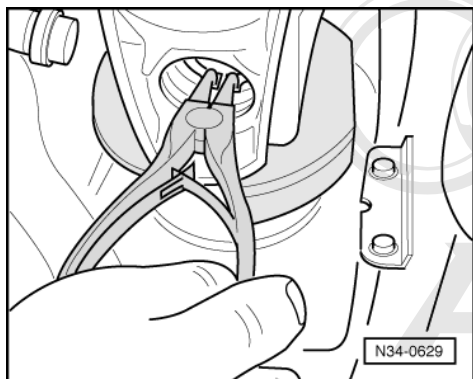
19 Flange shaft

- ♦ Removing and installing
=> Fig. 86



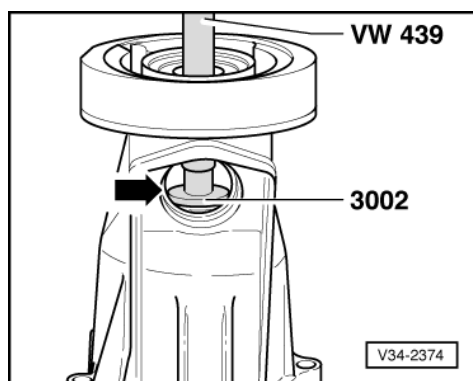
-> Fig.1 Removing sealing cap

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



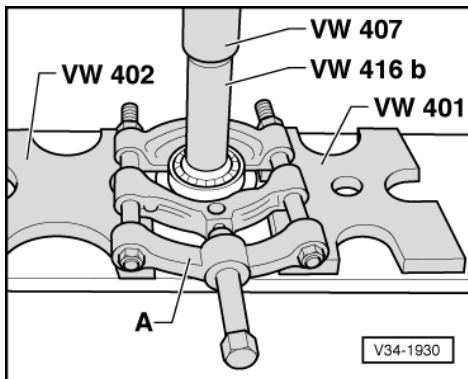
-> Fig.2 Removing and installing flange shaft

- 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



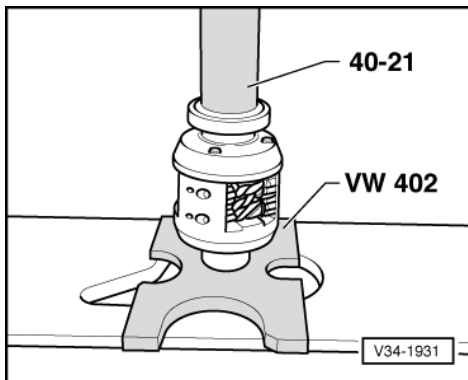
-> Fig.3 Pressing out Torsen differential

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



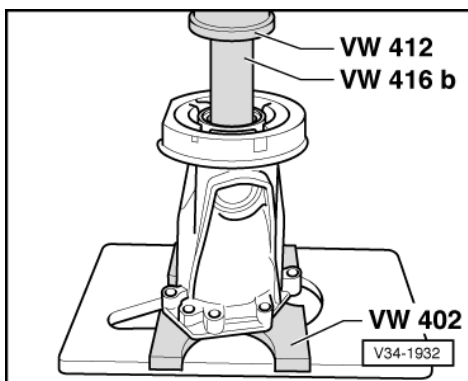
-> Fig.4 Pressing off ball bearing from Torsen differential

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



-> Fig.5 Pressing ball bearing onto Torsen differential

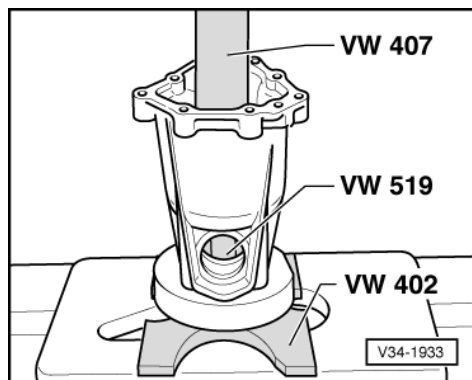
- Press the ball bearing on as far as stop.



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

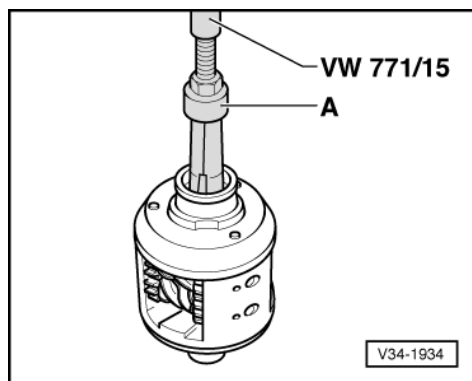
- Remove circlip before pressing off.

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

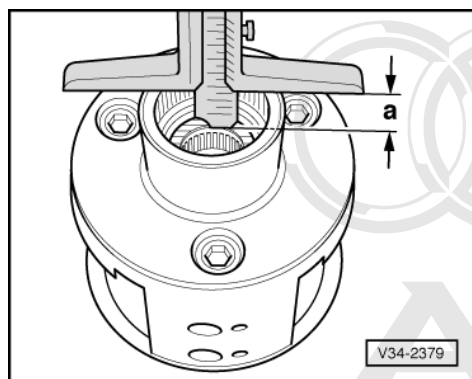
- Fit circlip after pressing in bearing.



-> Fig.8 Pulling out needle roller bearing

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

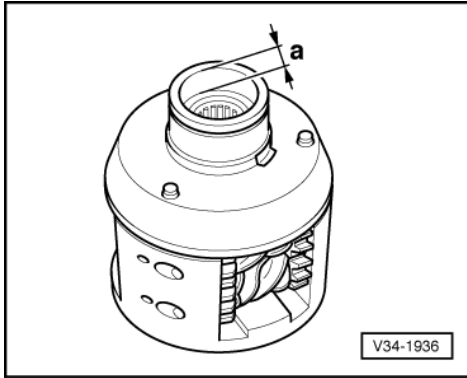
- Both needle roller bearings in Torsen differential are removed with same puller.



-> Fig.9 Installation position of front needle roller bearing

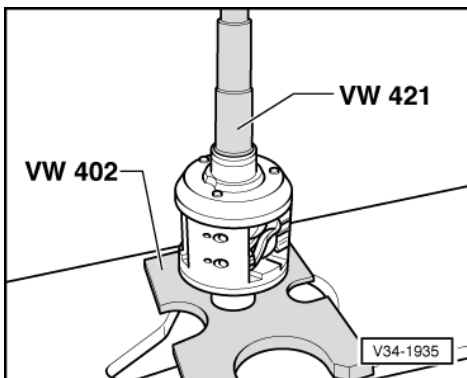
- ♦ Dimension a = 32.5 mm

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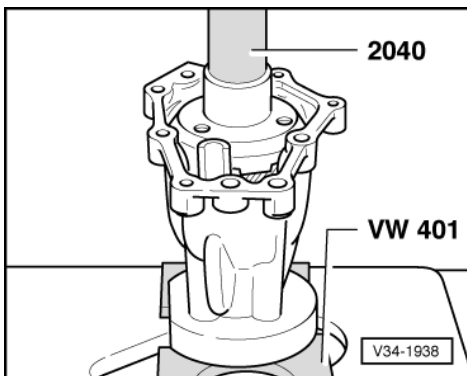
➔ Fig.10 Installation position of rear needle roller bearing

- ◆ Dimension a = 14 mm

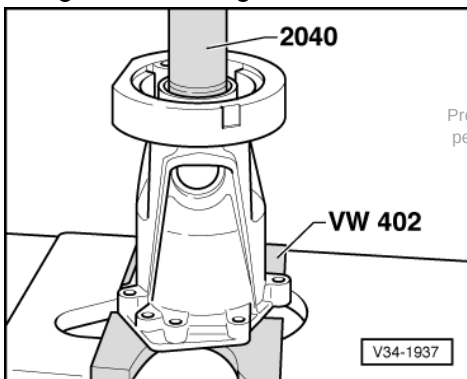


➔ Fig.11 Pressing in needle roller bearing

- 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

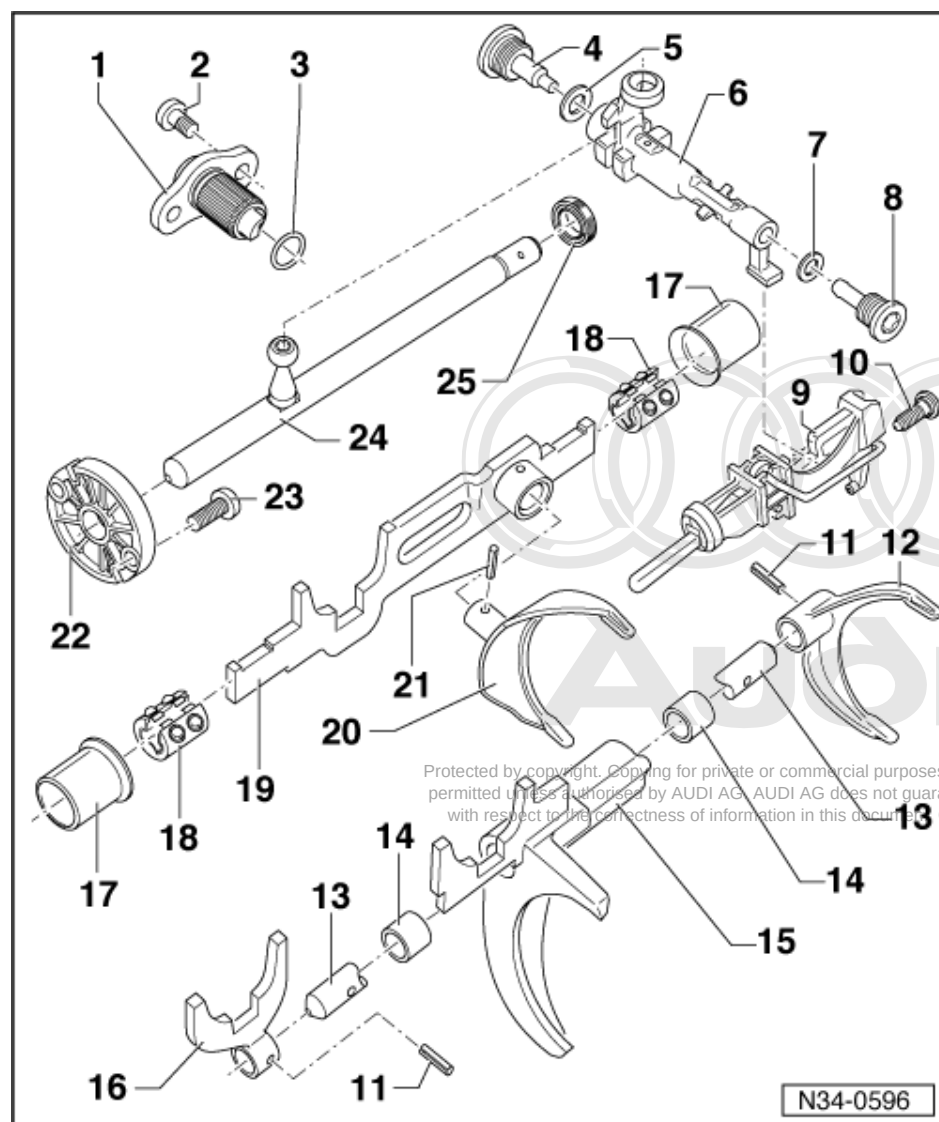
- Pack space between sealing and dust lips with multi-purpose grease.
- Lightly oil outer circumference of seal.
 - Installation position: 2 mm below surface of cover

7 - Dismantling and assembling shift mechanism in gearbox

7.1 - 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 complete shift mechanism in gearbox

=> Fig. 95

1 Locking unit for 5th gear and reverse gear

- ♦ Removing and installing
=> Page 95

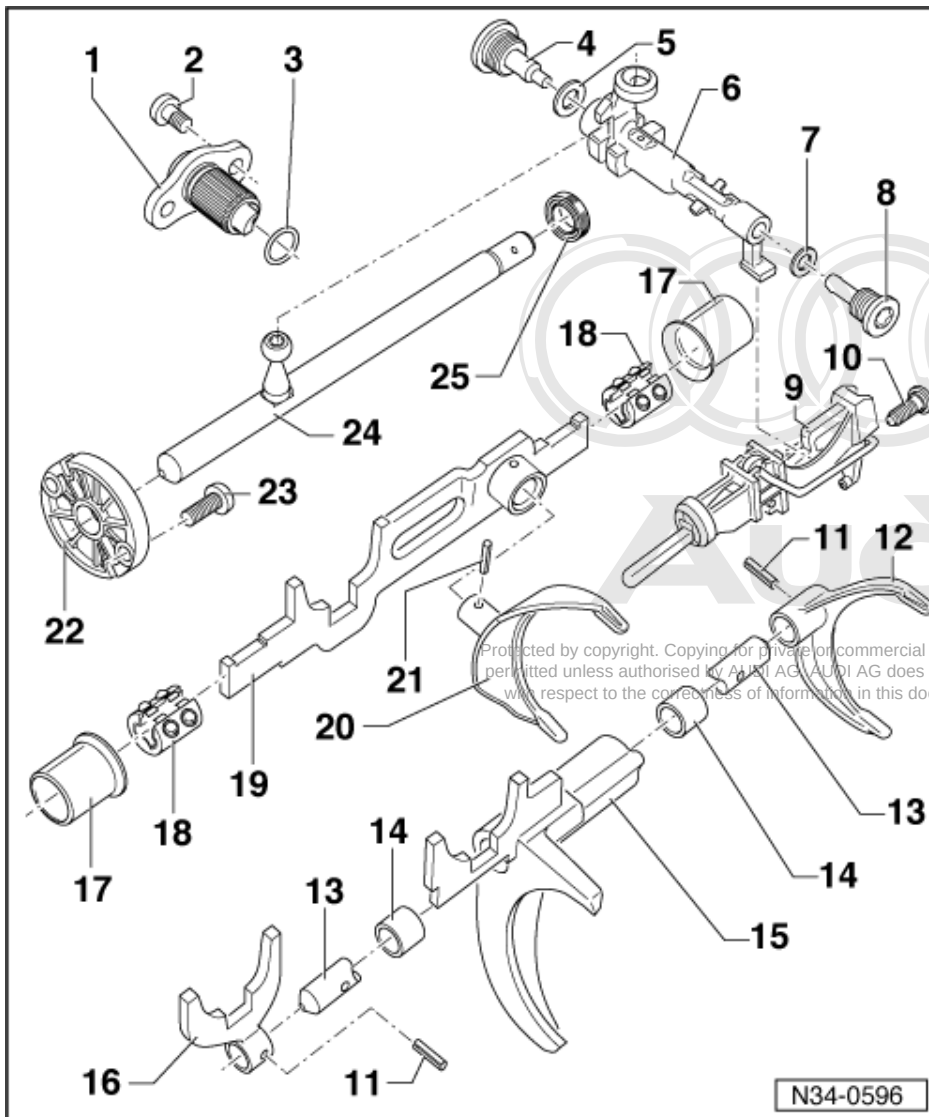
2 Torx bolt - 10 Nm

3 O-ring

- ♦ Replace

**4 Right stop bolt
- 40 Nm**

5 Washer



6 Relay shaft

7 Washer

**8 Left stop bolt
- 40 Nm**

9 Detent segment

10 Torx bolt - 25 Nm

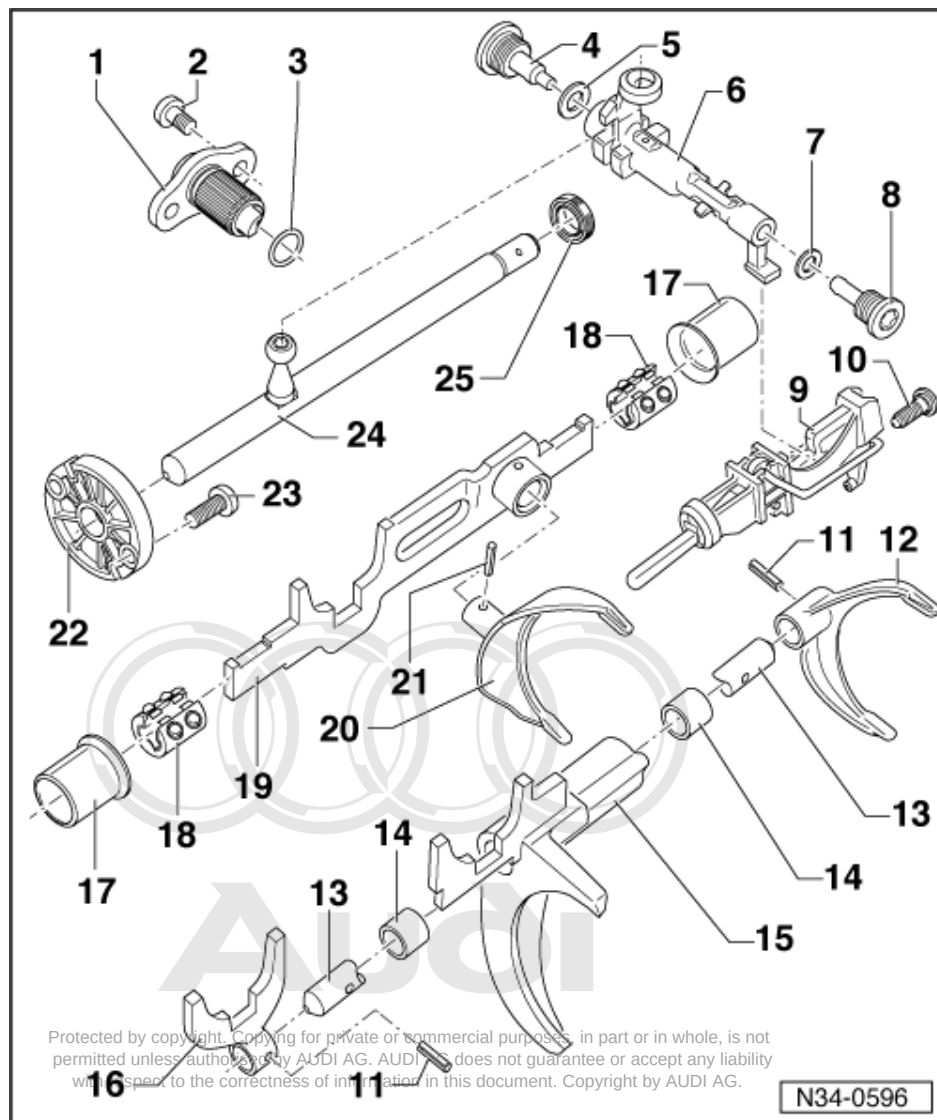


11 Spring pin

12 5th and reverse gear selector fork

- ♦ Installation position
=> Fig. 94

13 Selector rods for 1st/2nd and 5th/reverse gear



14 Ball sleeve

- ♦ Removing and installing
=> Fig. 94

15 Selector fork, 1st and 2nd gear

16 Follower

- ♦ Installation position
=> Fig. 94

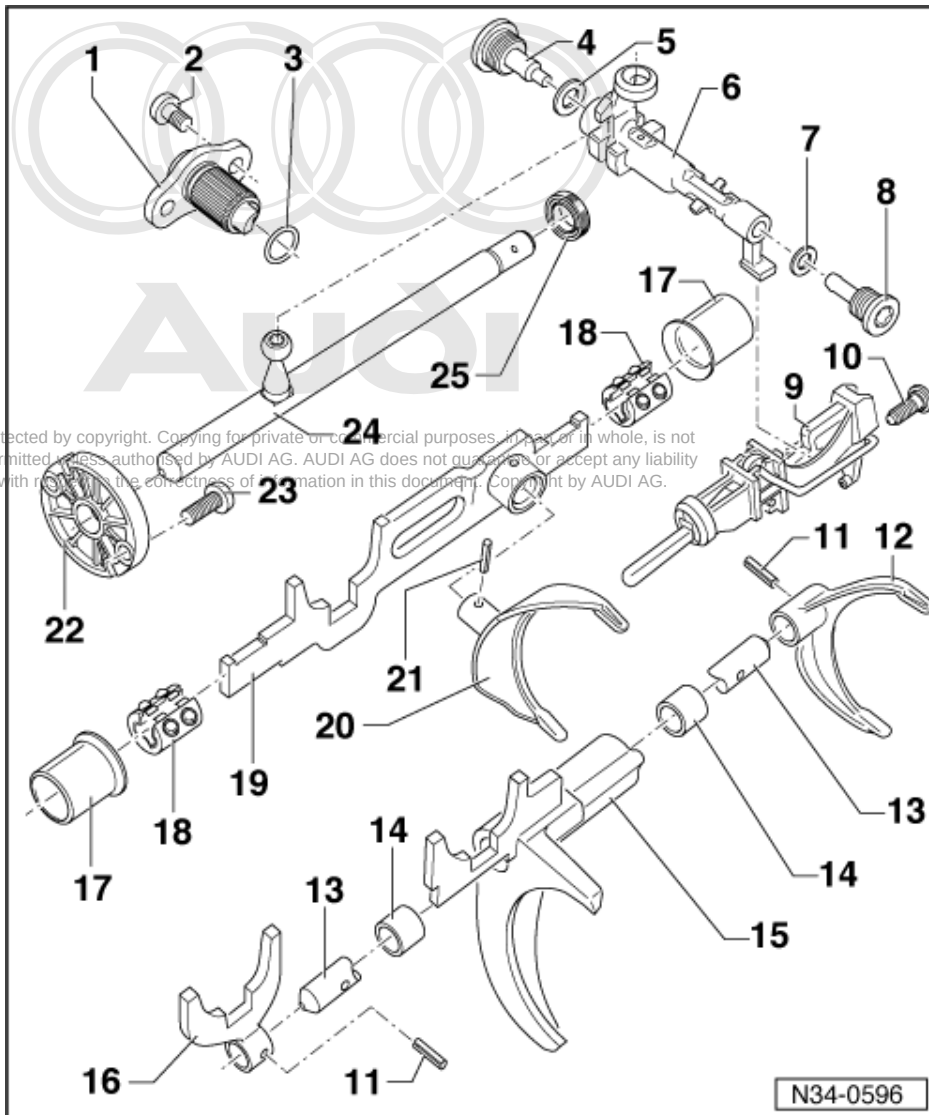
17 Mounting bush for 3rd and 4th gear

- ♦ Removing
=> Fig. 94
- ♦ Installing
=> Fig. 95

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 Cover

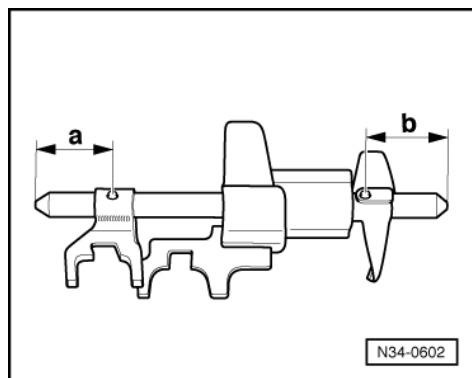
- ◆ For selector shaft

23 Torx bolt - 20 Nm

24 Selector shaft

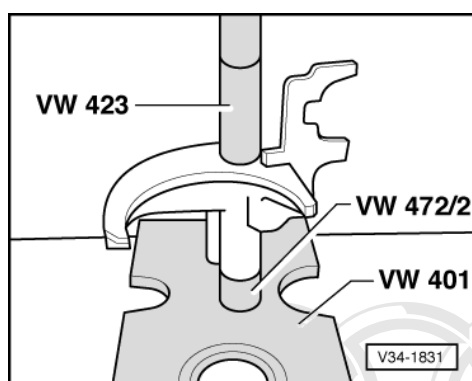
25 Oil seal

- ◆ Lever out with screwdriver
- ◆ Installation position
=> Fig. 95

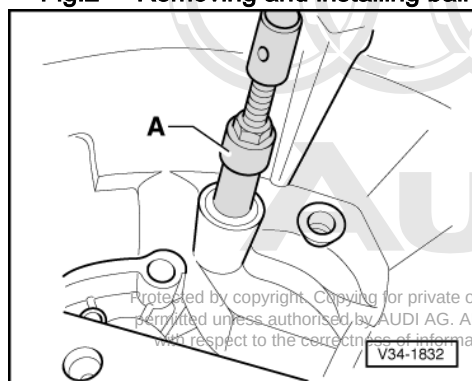


-> Fig.1 Installation position of 5th and reverse gear selector fork and follower for selector rod

- Dimension a = 55 mm
- Dimension b = 60 mm

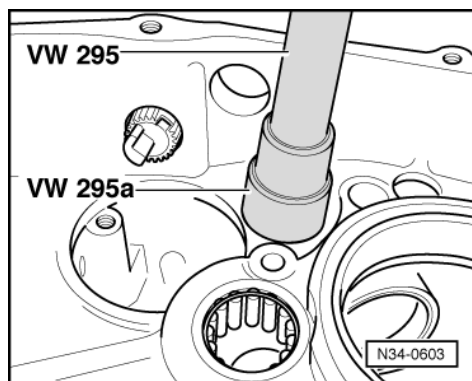


-> Fig.2 Removing and installing ball sleeve

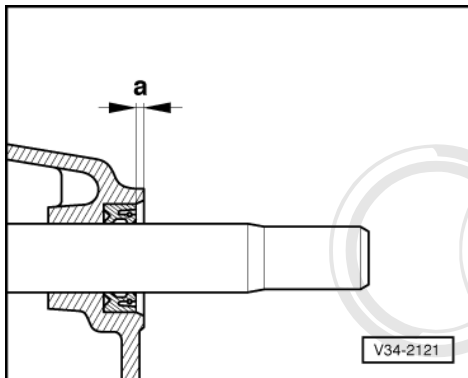


-> Fig.3 Pulling out mounting bush for 3rd and 4th gear selector rod

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



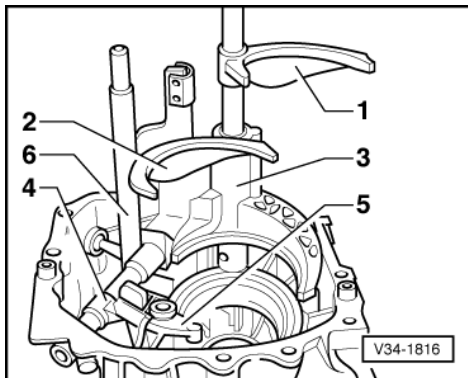
-> Fig.4 Driving mounting bush for 3rd and 4th gear selector rod home



-> Fig.5 Installation position of oil seal

- Pack space between sealing and dust lips with multi-purpose grease.
- Lightly oil outer circumference of seal.
- Dimension a = 1 mm

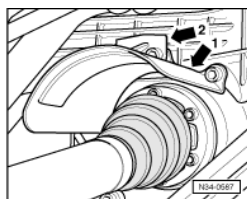
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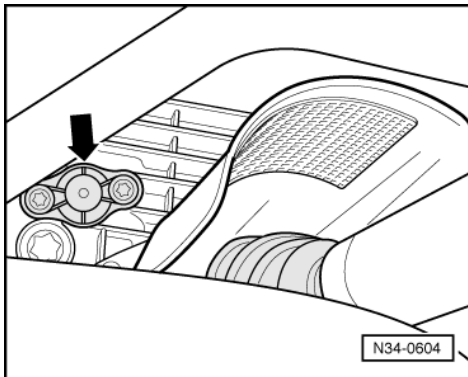
-> Fig.6 Installation position of complete shift mechanism in gearbox

- 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

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

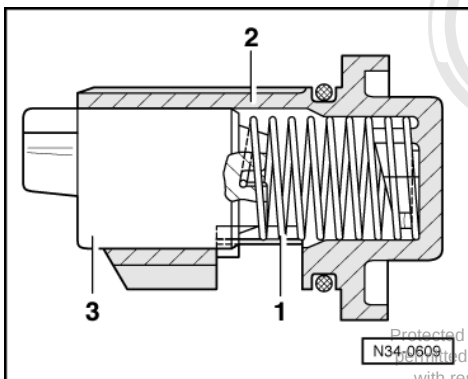


- -> Remove heat shield -arrow 2- above right-hand drive shaft.
- Detach heat shield -arrow 1- above right-hand drive shaft and pivot downwards.

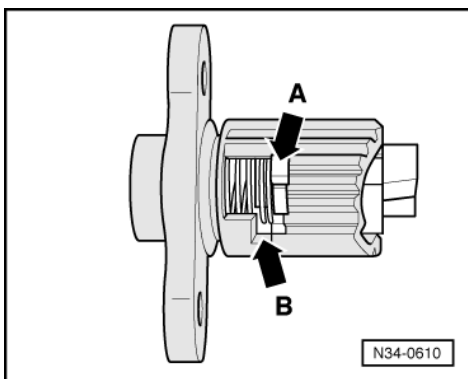


- -> Remove locking unit -arrow-.

Assembling locking unit:



- -> 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



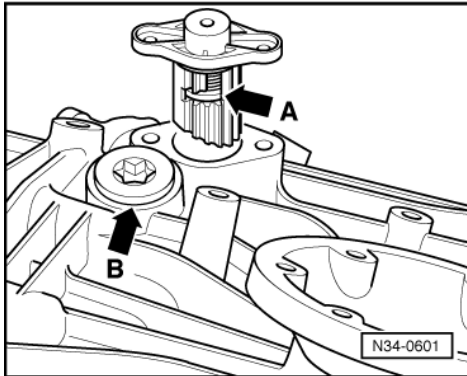
-> Installation position of bush:

- 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-).



-> Installation position of complete locking unit in gearbox:

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



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35 - Gears, Shafts

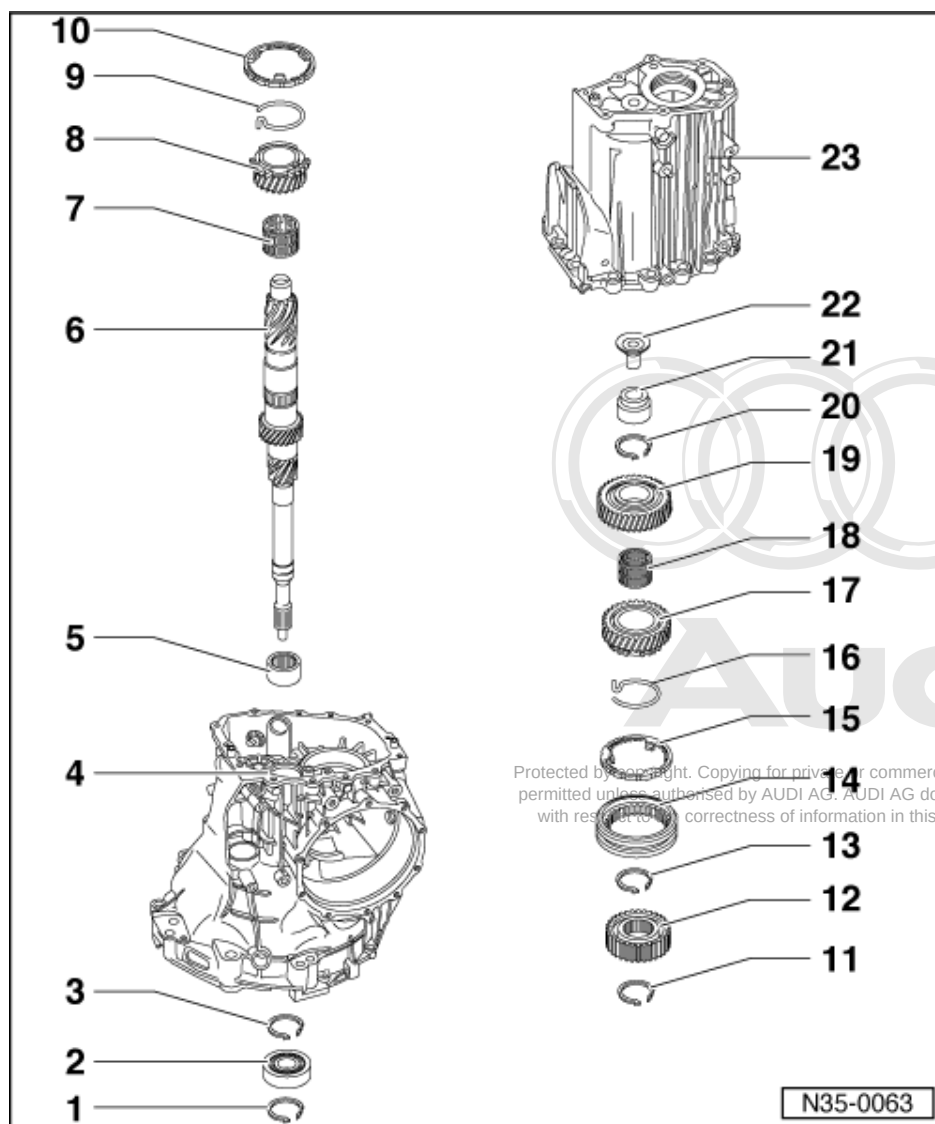
1 - Dismantling and assembling input shaft

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 plate VW 447 i
- ◆ Multi-purpose tool VW 771
- ◆ Drift 30-24
- ◆ Drift 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:

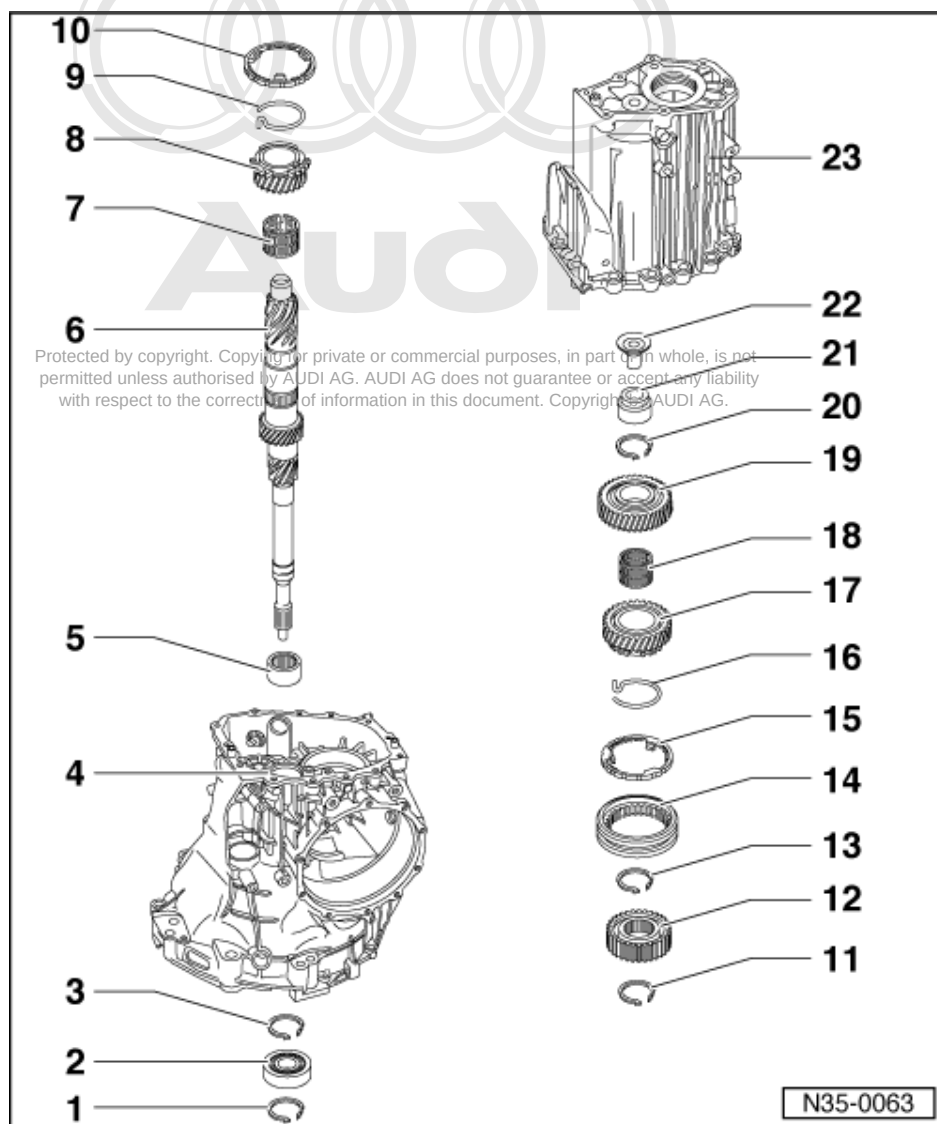
- ◆ When installing new gears or the input shaft consult technical data =>Page 2 onwards
- ◆ The position of the ball bearing will be affected if -Items 113 .

1 Circlip

- ◆ Mark
- ◆ Installation position => Fig. 15 -Item 1-
- ◆ Determining thickness => adjusting input shaft, Page 113

2 Ball bearing

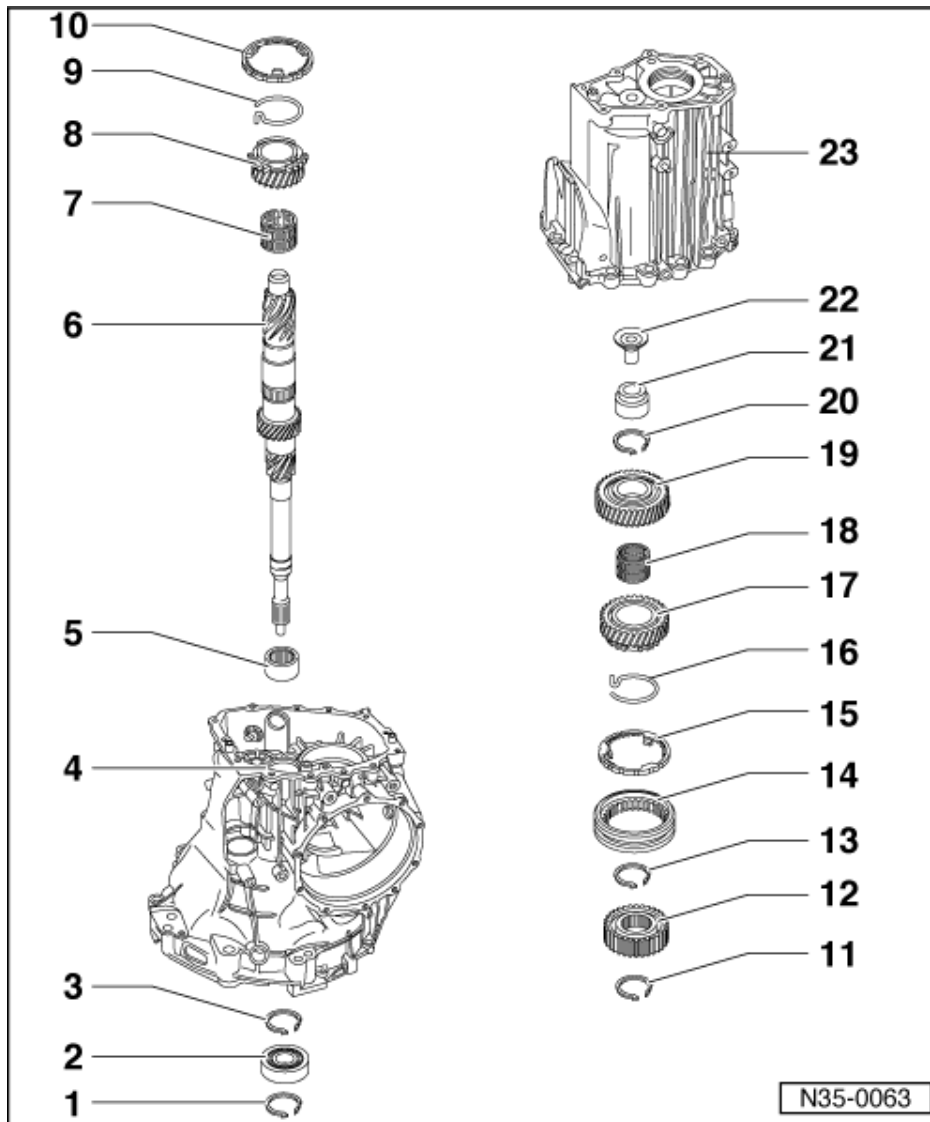
- ◆ Removing and installing
=> Page 73

**3 Circlip**

- ◆ Mark
- ◆ Installation position => Fig. 15 -Item 2
- ◆ Determining thickness => adjusting input shaft, Page 113

4 Gearbox housing**5 Needle roller bearing**

- ◆ Secured with bolt
=> Fig. 105
- ◆ Driving out
=> Fig. 105
- ◆ Selecting correct needle roller bearing for input shaft
=> Fig. 105
- ◆ Installation position
=> Fig. 106
- ◆ Pressing in
=> Fig. 106
- ◆ Securing => Fig. 107



6 Input shaft

- ♦ With oil feed sleeve
- ♦ Knocking in oil feed sleeve
=> Fig. 107
- ♦ Adjusting => Page 113
- ♦ Selecting correct needle roller bearing for input shaft
=> Fig. 105

7 Needle roller bearing for 3rd gear

- ♦ Mark

8 3rd speed sliding gear

9 Spring

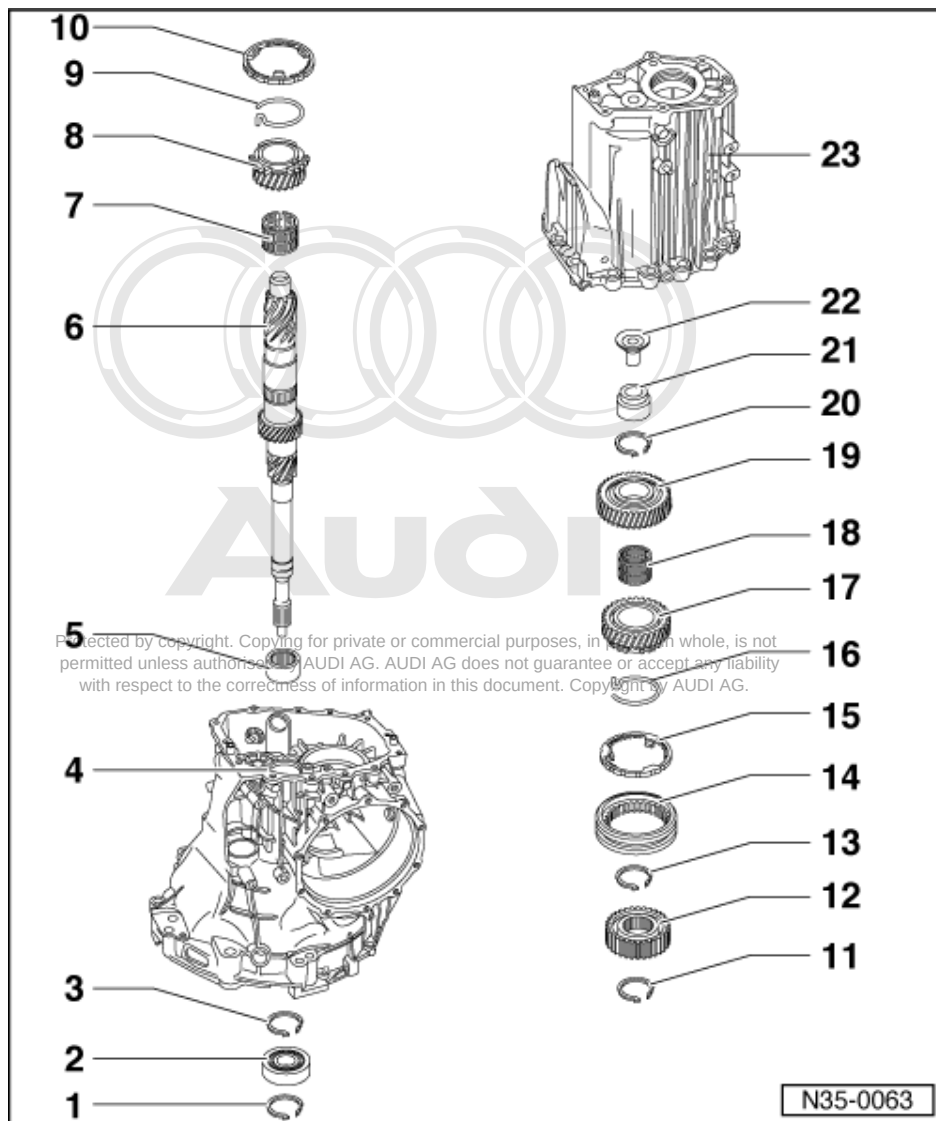
- ♦ Insert in 3rd speed sliding gear => Fig. 109
- ♦ Allocation of spring to sliding gear

=> Parts Catalogue

10 Synchro-ring for 3rd gear

- ♦ Checking for wear
=> Fig. 110

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**11 Circlip**

- ♦ Mark
- ♦ Installation position => Fig. 15 -Item 3-

12 Synchro-hub for 3rd and 4th gear

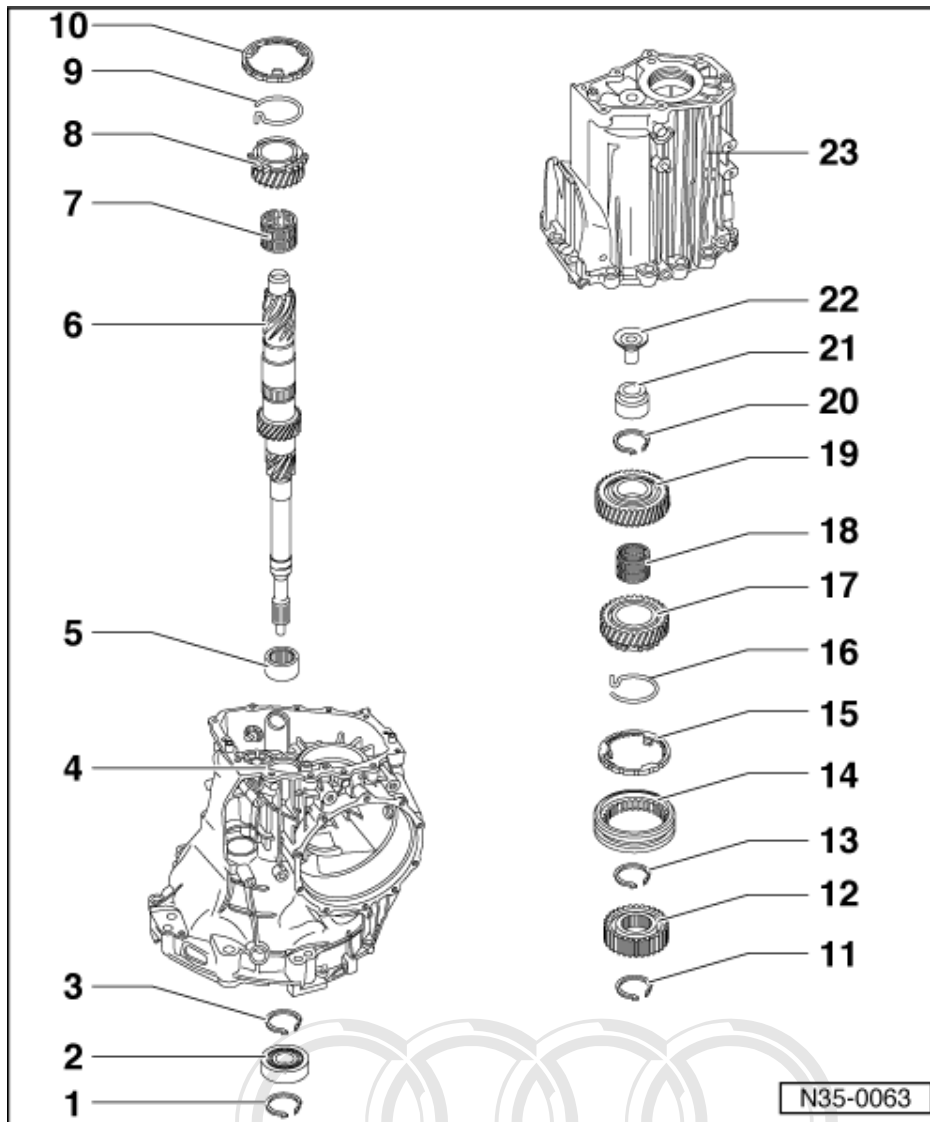
- ♦ High collar faces 3rd gear
- ♦ Pressing off
=> Fig. 109
- ♦ Pressing on
=> Fig. 112

13 Circlip

- ♦ Mark
- ♦ Installation position => Fig. 15 -Item 4-
- ♦ If synchro-hub is replaced re-determine thickness
=> Fig. 111

14 Locking collar for 3rd and 4th gear

- ♦ Installation position
=> Fig. 112



15 Synchro-ring for 4th gear

- ♦ Checking for wear
=> Fig. 110

16 Spring

- ♦ Insert in 4th speed sliding gear => Fig. 109
- ♦ Allocation of spring to sliding gear

=> Parts Catalogue

17 4th speed sliding gear

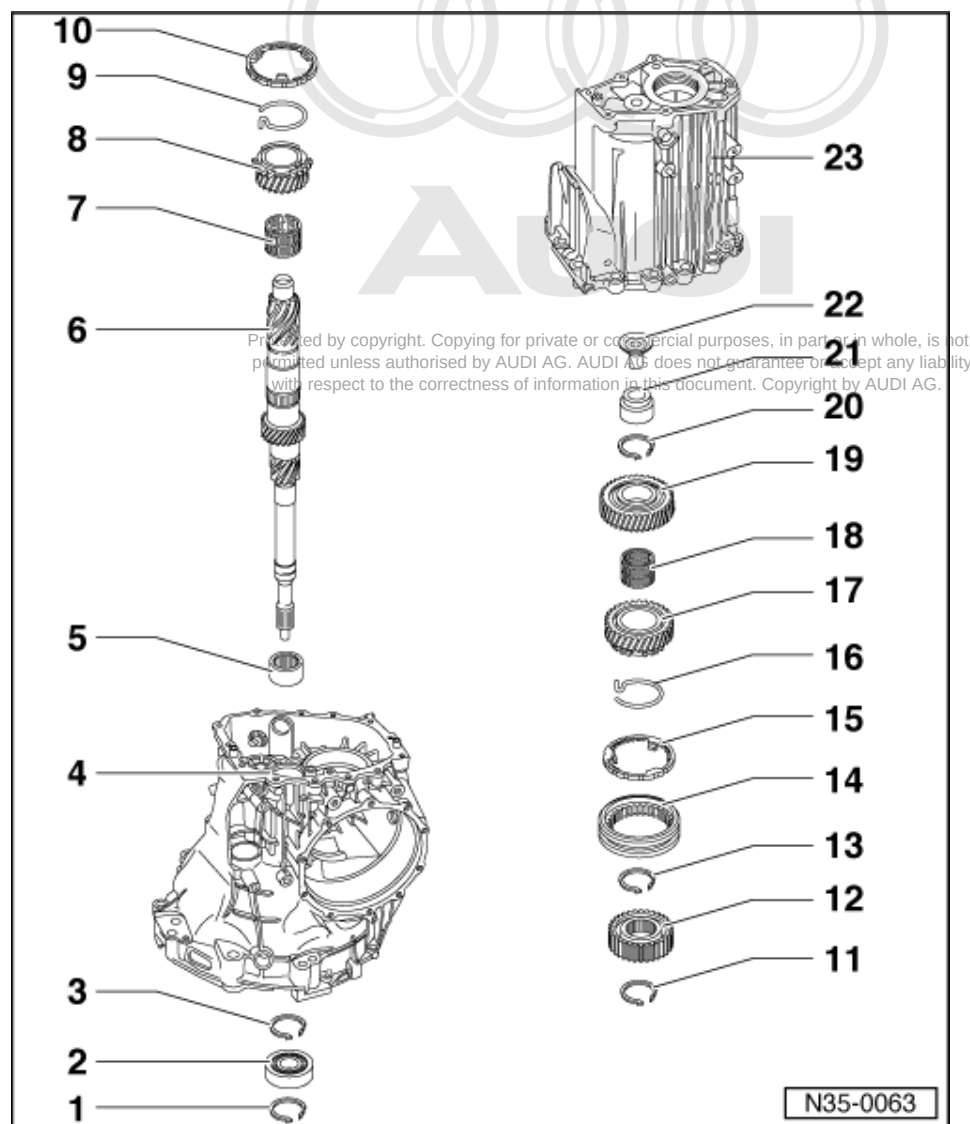
18 Needle roller bearing for 4th gear

- ♦ Mark

19 5th gear wheel

- ♦ Pressing off
=> Fig. 108
- ♦ Pressing on
=> Fig. 112

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**20 Circlip**

- ◆ Mark
- ◆ Installation position => Fig. 15 -Item 5-
- ◆ If the 5th gear wheel is replaced re-determine thickness
=> Fig. 111

21 Roller sleeve

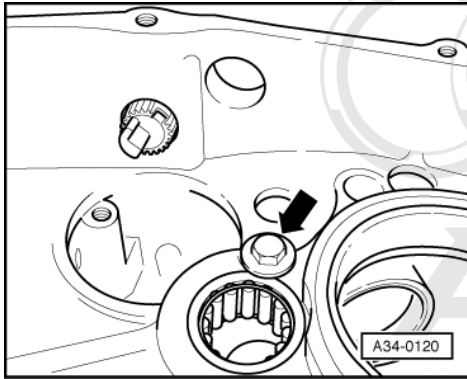
- ◆ Replace
- ◆ Will be damaged during removal
- ◆ Pulling out
=> Fig. 107
- ◆ Installation position
=> Fig. 108
- ◆ Driving in
=> Fig. 108

22 Sleeve

- ◆ Made of plastic

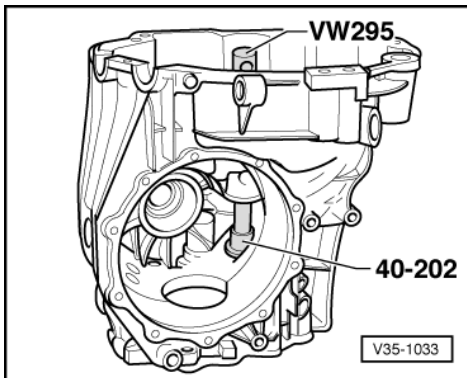
23 Gearbox cover

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

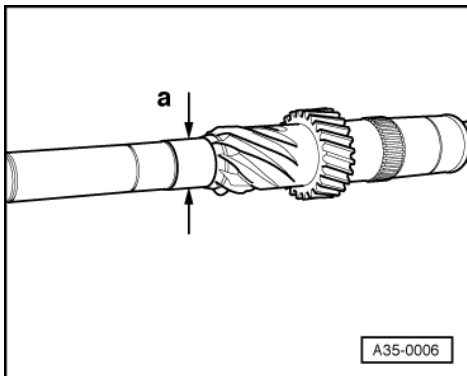


-> Fig.1 Unscrewing securing bolt -arrow- for needle roller bearing

- Unscrew securing bolt -arrow-.



-> Fig.2 Driving out needle roller bearing



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

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

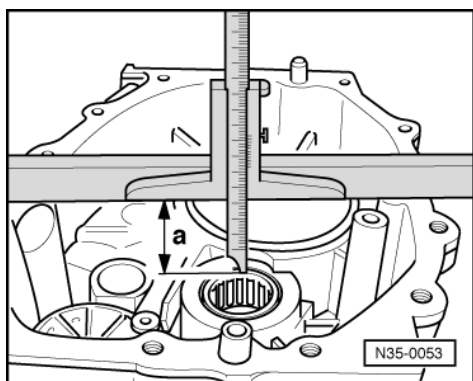
Note:

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.

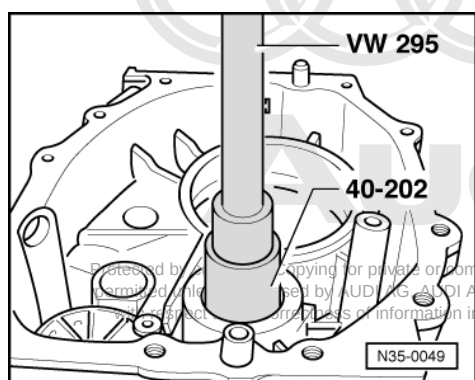


-> Fig.4 Installation position of needle roller bearing

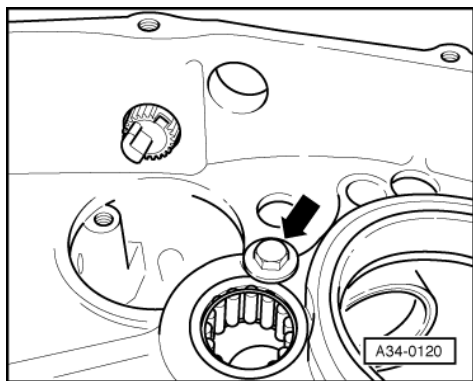
Distance -a- from lower edge of straight-edge to upper edge of needle roller bearing = 39.5 mm

Note:

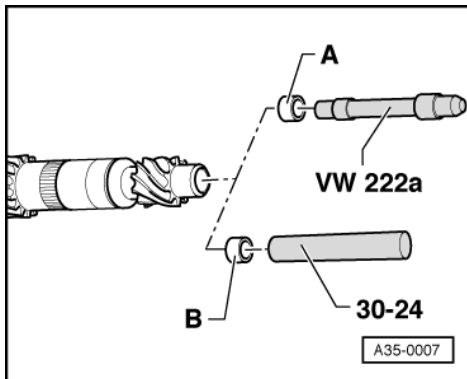
Measure distance from top edge of straight-edge and subtract the width of the straight-edge from the measured distance.



-> Fig.5 Pressing in needle roller bearing



- ➔ Fig.6 Screwing in securing bolt -arrow-
 ♦ Tightening torque: 25 Nm



➔ Fig.7 Knocking oil feed sleeve into input shaft

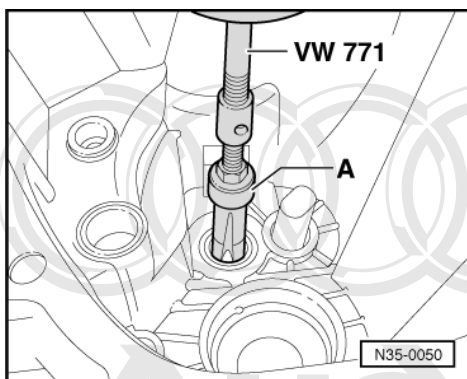
Item	Oil feed sleeve dia.	Fitting tool
A	14 mm	VW 222 A
B	16 mm	30-24

- ♦ Installation position:

Flanged edge on oil feed sleeve faces towards fitting tool

- ♦ Insertion depth:

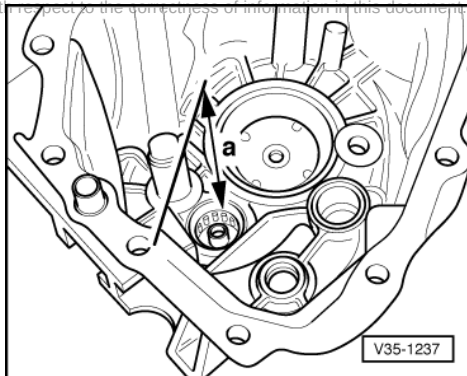
3.5 mm below top edge



➔ Fig.8 Pulling out roller sleeve

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

Before fitting internal extractor destroy the plastic sleeve inside the roller sleeve.
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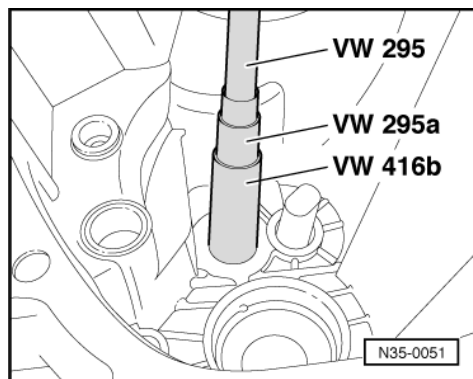


-> Fig.9 Installation position of roller sleeve

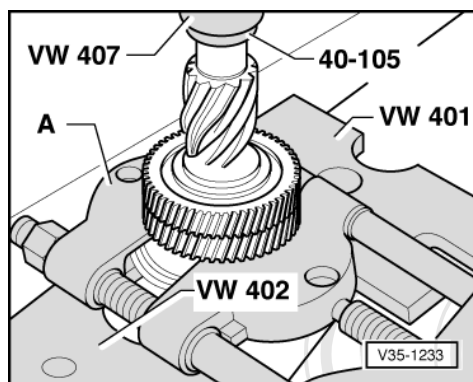
- ♦ Dimension a = 216 mm

Note:

Distance is measured from top surface of gearbox cover down to top of bearing.



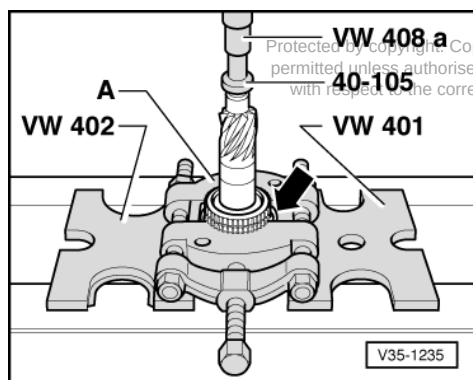
-> Fig.10 Driving in roller sleeve



-> Fig.11 Pressing off 5th gear wheel

- Remove circlip before pressing off.

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

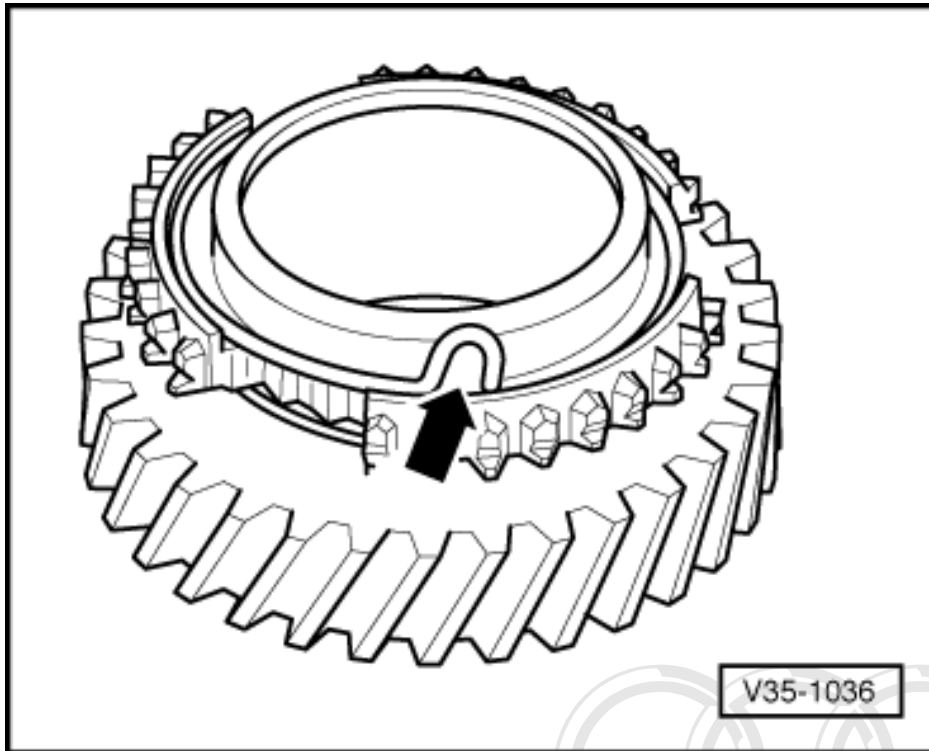


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-> **Fig.12 Pressing off synchro-hub for 3rd and 4th gear**

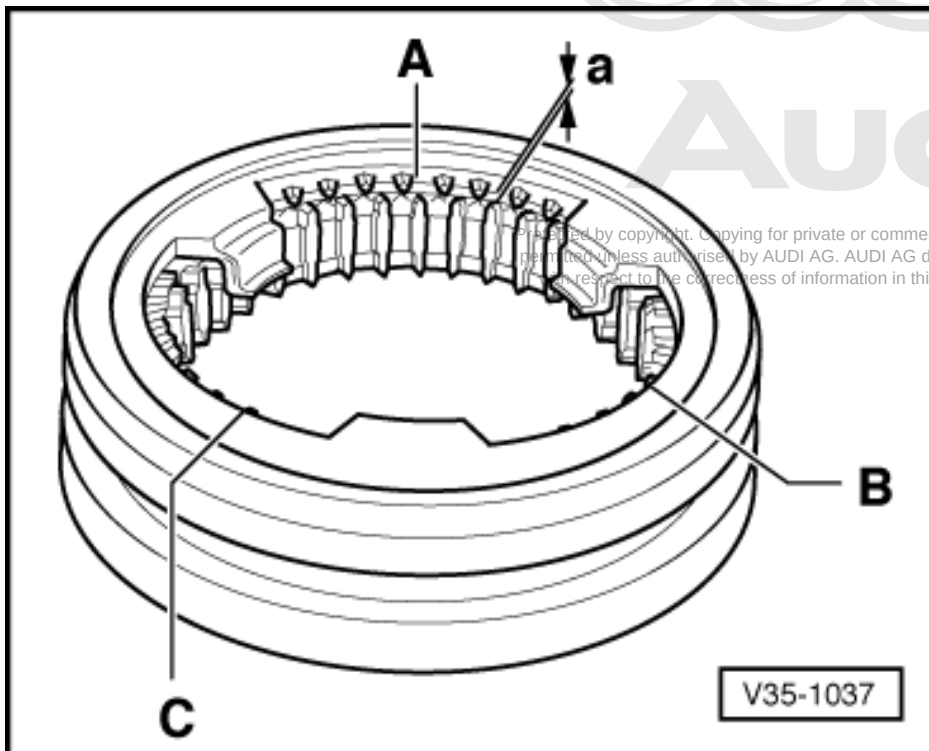
- Remove circlip before pressing off.
- Press 3rd gear synchro ring (arrow) towards 3rd gear wheel, then fit separating device -A-.

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



-> **Fig.13 Inserting spring in sliding gear**

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

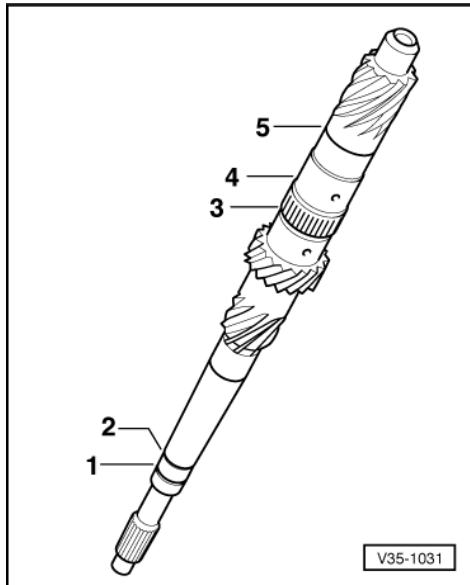




-> Fig.14 Checking synchro-ring for wear

- 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.

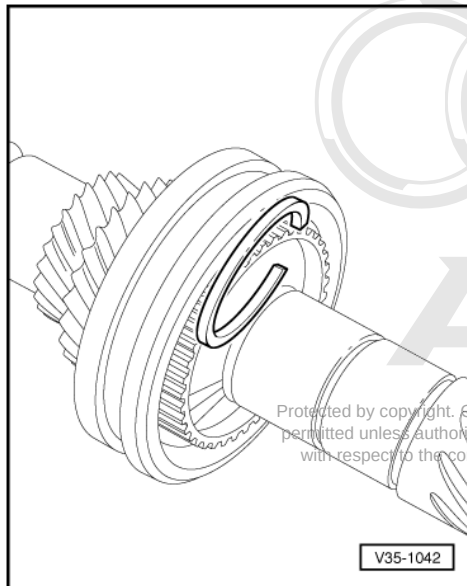
The calculated value must not be less than 0.5 mm.



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-> Fig.15 Installation position of circlips

- ♦ Circlips -1- and -2- secure the input shaft ball bearing.
Determining thickness => Adjusting input shaft, Page 113 .
- ♦ 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 111 . Identification: Blue colour.
- ♦ Circlip -5- secures the 5th gear wheel.
Determining thickness => table on Page 111 .



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-> Fig.16 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

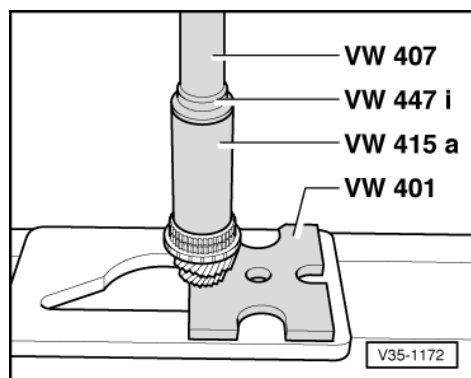
=> Parts Catalogue

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

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

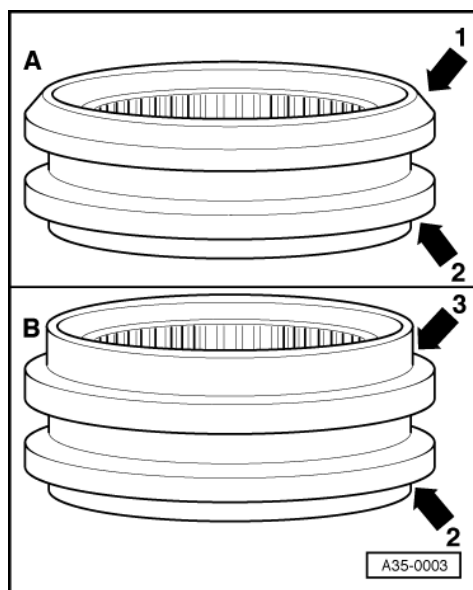
Available circlips for 5th gear wheel

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	





-> Fig.17 Pressing on synchro-hub for 3rd and 4th gear

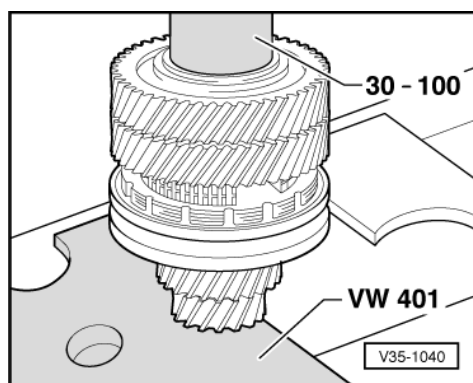


-> Fig.18 Installation position of locking collar

Different types of locking collar are installed: version -A- with chamfered edge, arrow 1, or version -B- with large shoulder, arrow 3.

♦ Installation position:

Chamfered edge -arrow 1- faces 4th gear
Small shoulder -arrow 2- faces 3rd gear
Large shoulder -arrow 3- faces 4th gear



-> Fig.19 Pressing on 5th gear wheel

Warning
Wear protective gloves.

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

♦ Installation position:

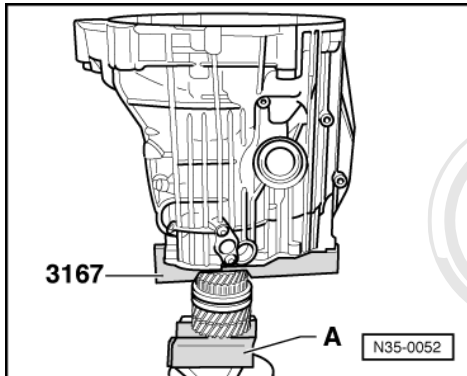
High collar faces reverse gear

2 - Adjusting input shaft

2.1 - Adjusting input shaft

Note:

Input shaft must be readjusted if gearbox housing, input shaft or ball bearing are replaced.

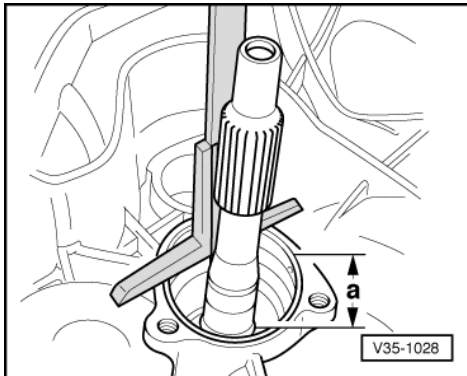


Special tools, testers and auxiliary equipment required

- ◆ Drift sleeve 30-100
- ◆ Distance gauge 3167
- ◆ Depth gauge

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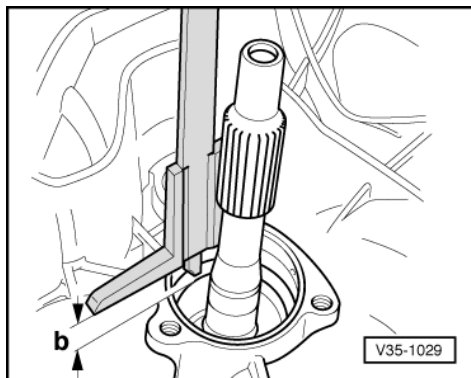
- -> Clamp input shaft in vice using soft jaws -A-.
- Place distance gauge 3167 onto 3rd speed sliding gear.



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

Calculating dimension "x"

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



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

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Determining circlip behind the input shaft ball bearing

Formula:

$$"x" = "a" - "b"$$

Example:

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

- Determine circlip from table. Part numbers

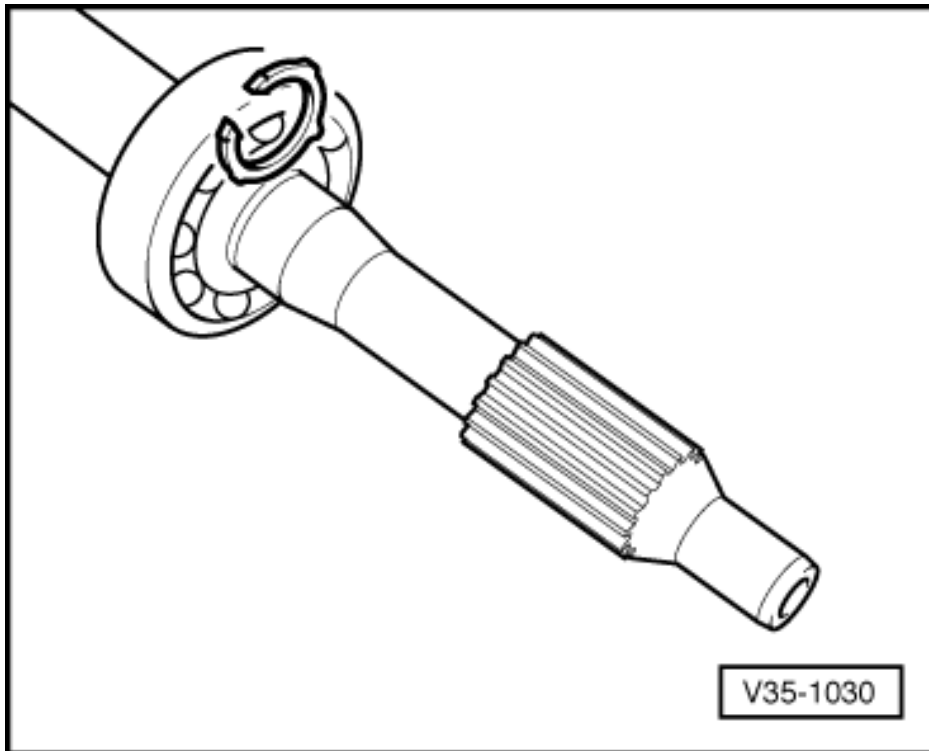
=> Parts Catalogue

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.



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

=> Parts Catalogue

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

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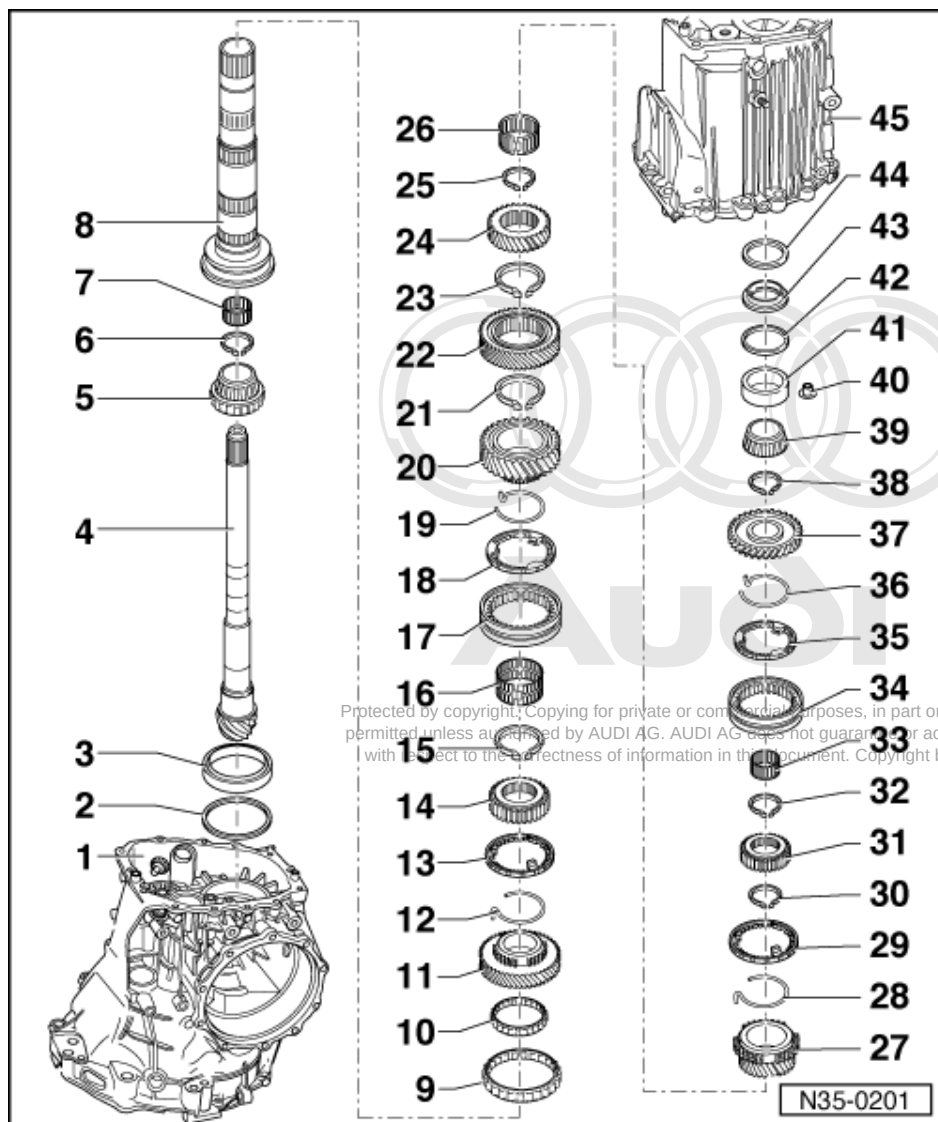
Special tools, testers and auxiliary equipment required

- ◆ 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 pad 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

**Notes:**

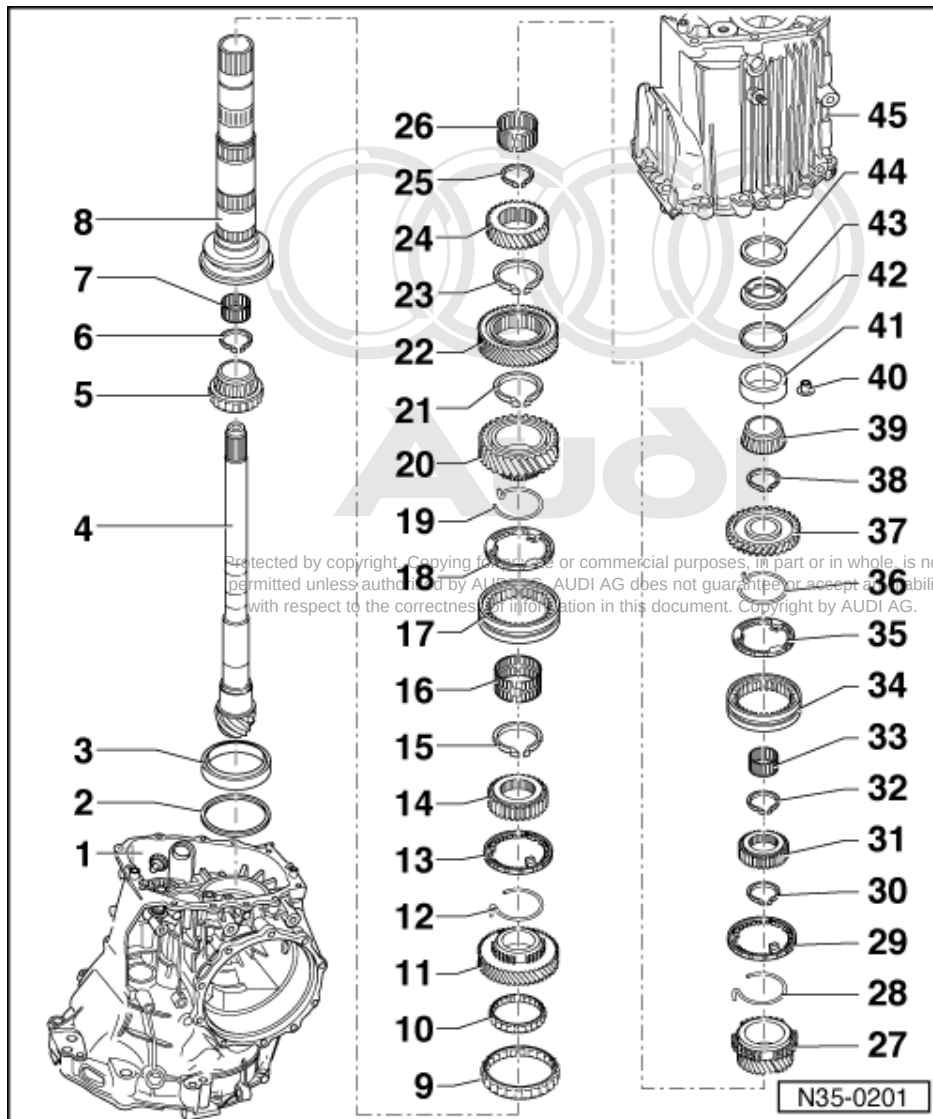
- ♦ When installing new gears or the final drive set consult technical data =>Page 2 onwards.
- ♦ Adjustments are required when replacing components marked 1) => Adjustment overview, Page 163 .

1 Gearbox housing 1)**2 Shim "S3"**

- ♦ Adjustment overview
=> Page 163

3 Outer race for double taper roller bearing 1)

- ♦ Replace together with -Item 5-
- ♦ Pulling out
=> Fig. 126
- ♦ Pressing in
=> Fig. 127

**4 Drive pinion 1)**

- ♦ Is mated with crown wheel, replace together as a set
- ♦ Adjusting crown wheel and drive pinion => Page 161

5 Inner race for double taper roller bearing 1)

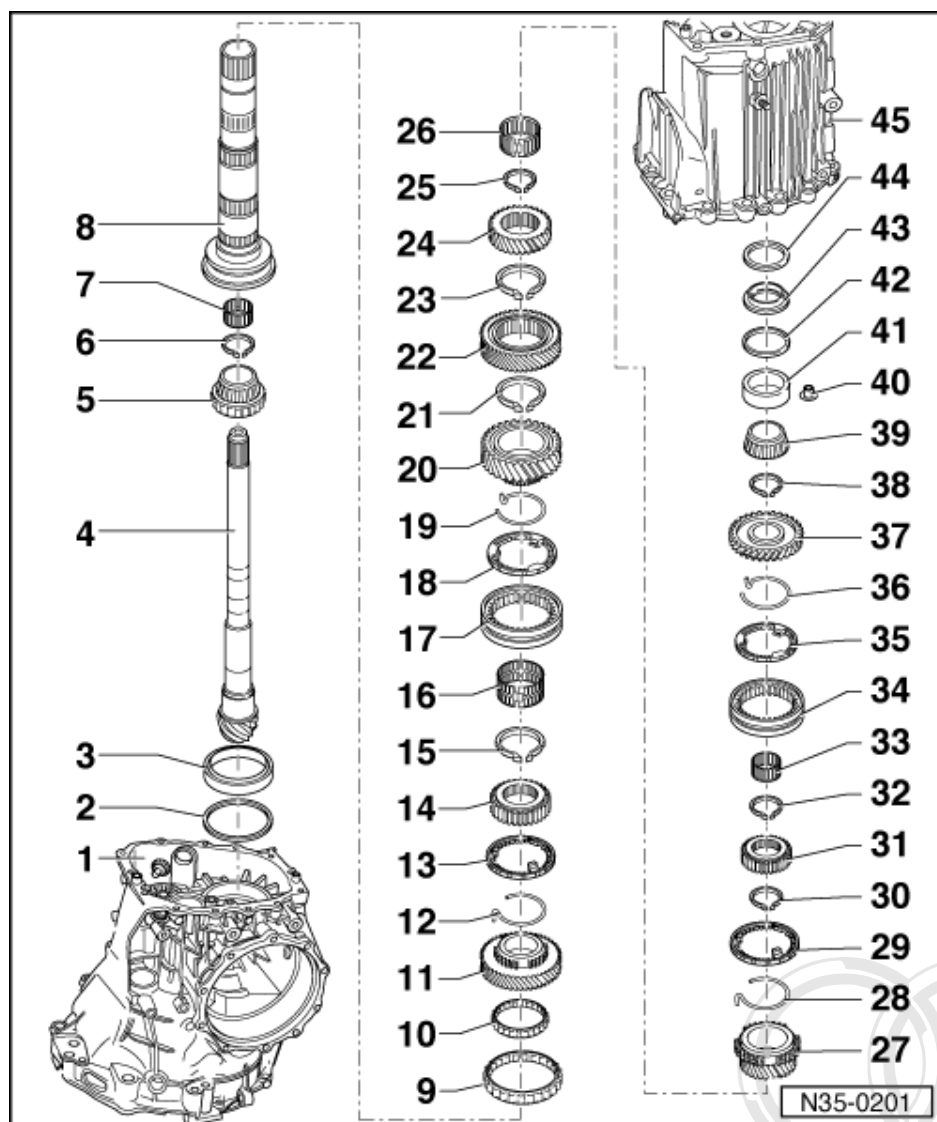
- ♦ Replace
- ♦ Will be damaged during removal
- ♦ Pressing off
=> Fig. 126
- ♦ Pressing on
=> Fig. 127

6 Circlip

- ♦ If double taper roller bearing is replaced re-determine thickness => Fig. 127

7 Needle roller bearing

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

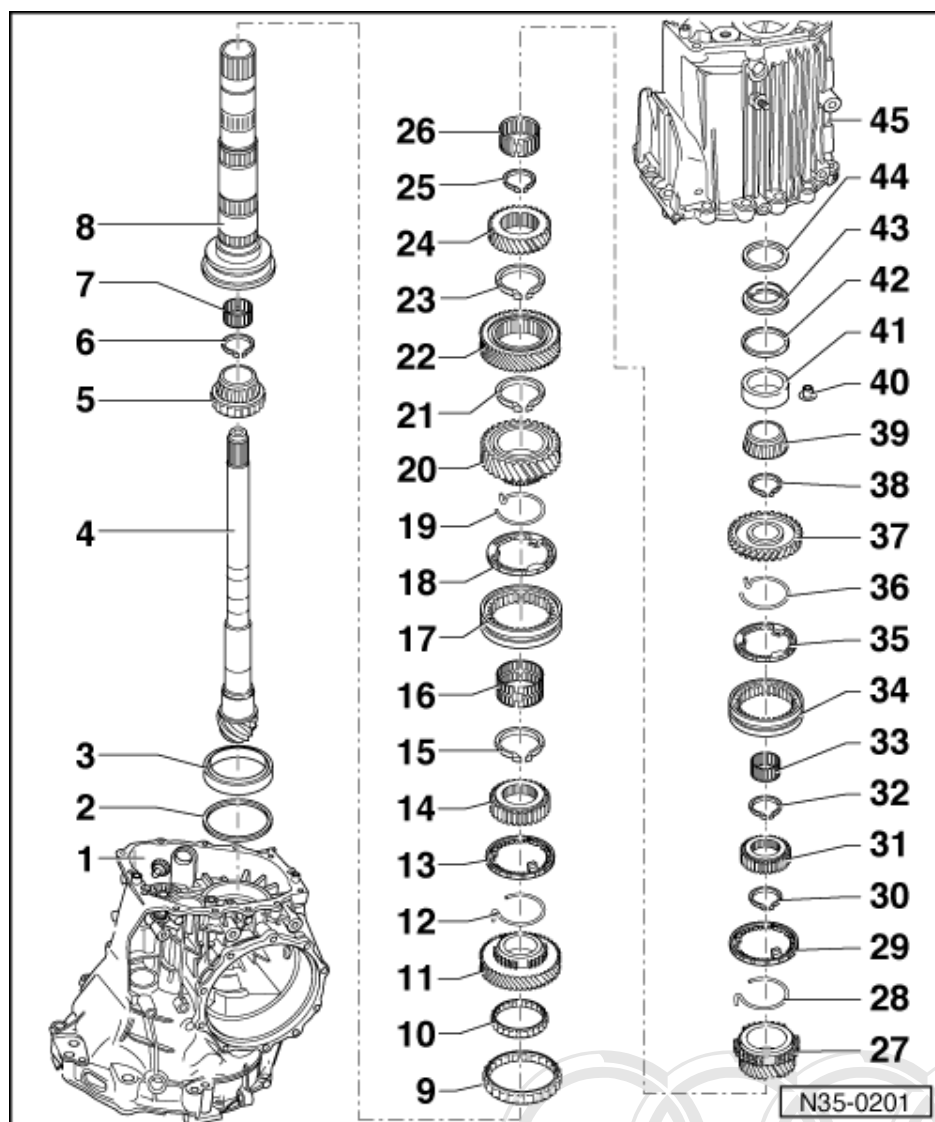


- 8 Hollow shaft1)
 9 Needle roller bearing for 1st gear
 10 Needle roller bearing for 1st gear
 11 1st speed sliding gear
 12 Spring
 ♦ Insert in 1st speed sliding gear => Fig. 132
 ♦ Allocation of spring to sliding gear

=> Parts Catalogue

- 13 Synchro-ring for 1st gear
 ♦ Checking for wear
 => Fig. 133
 14 Synchro-hub for 1st and 2nd gear
 ♦ Pressing off
 => Fig. 130
 ♦ Pressing on
 => Fig. 133

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15 Circlip

- ◆ Mark
- ◆ Installation position => Fig. 15 -Item 1-
- ◆ If synchro-hub is replaced re-determine thickness
=> Fig. 127

16 Needle roller bearing for 2nd gear

17 Locking collar, 1st and 2nd gear

- ◆ Installation position
=> Fig. 134

18 Synchro-ring for 2nd gear

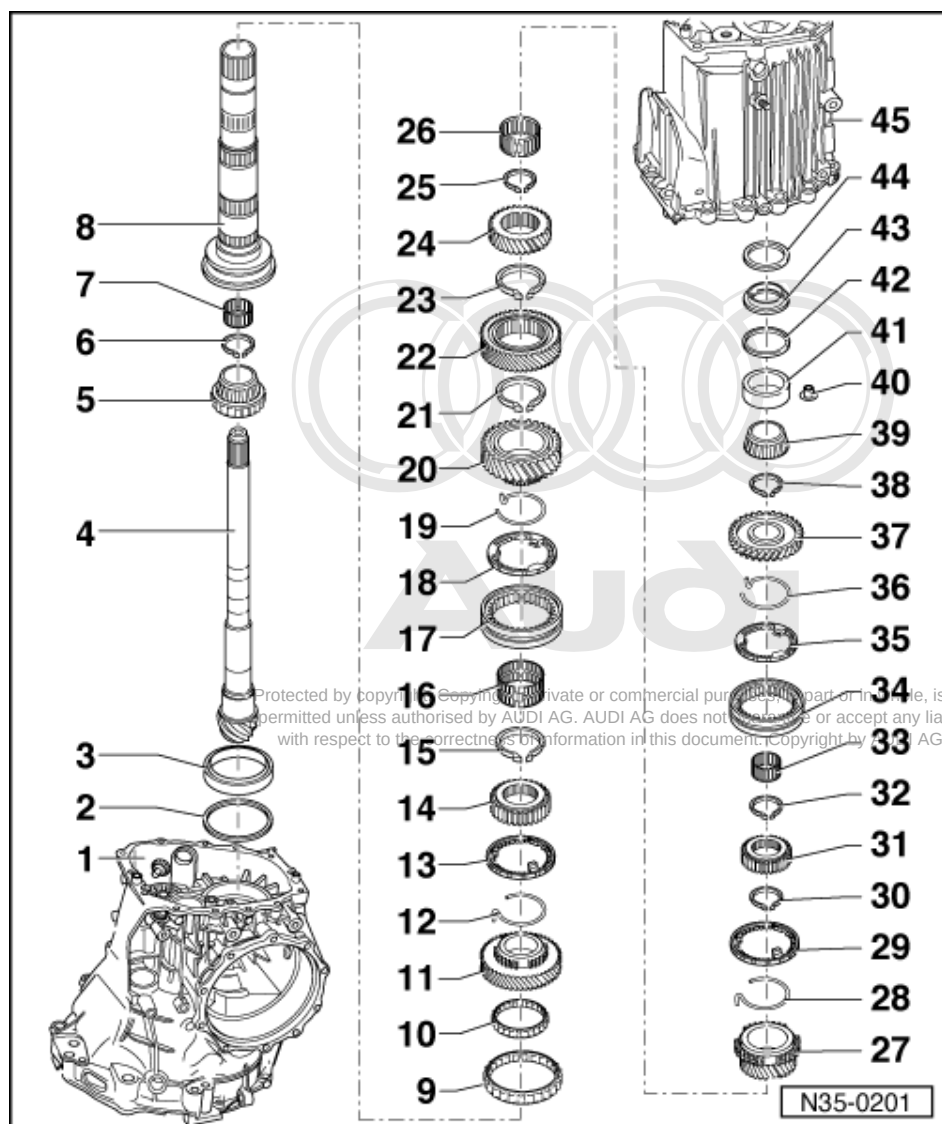
- ◆ Checking for wear
=> Fig. 133

19 Spring

- ◆ Insert in 2nd speed sliding gear => Fig. 132
- ◆ Allocation of spring to sliding gear

=> Parts Catalogue

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**20 2nd speed sliding gear****21 Circlip**

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

22 3rd gear wheel

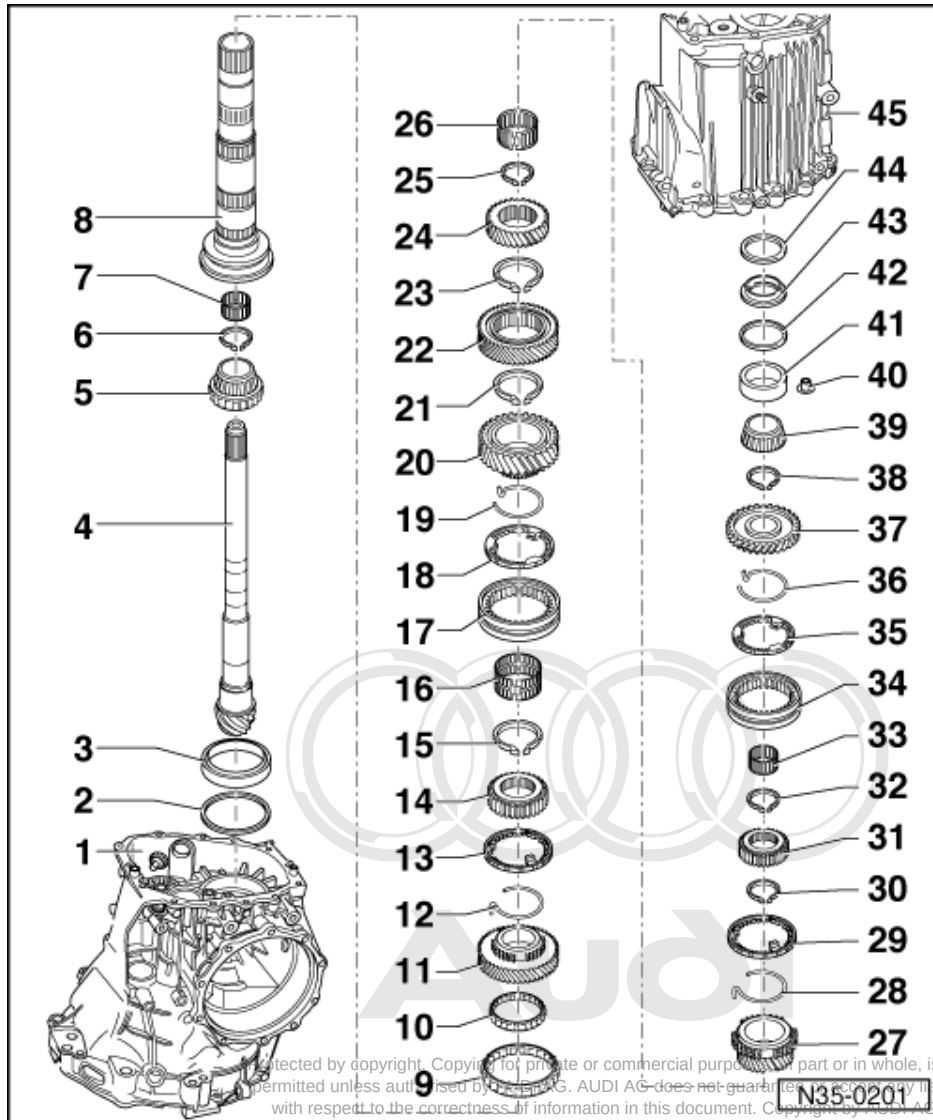
- ◆ Pressing off
=> Fig. 130
- ◆ Pressing on
=> Fig. 134

23 Circlip

- ◆ Mark
- ◆ Installation position => Fig. 15 -Item 3-
- ◆ If the 3rd gear wheel is replaced re-determine thickness
=> Fig. 127

24 4th gear wheel

- ◆ Pressing off
=> Fig. 129
- ◆ Pressing on
=> Fig. 134



25 Circlip

- ◆ Mark
- ◆ Installation position => Fig. 15 -Item 4-
- ◆ If the 4th gear wheel is replaced re-determine thickness
=> Fig. 127

26 Needle roller bearing

27 5th speed sliding gear

28 Spring

- ◆ Insert in 5th speed sliding gear => Fig. 132
- ◆ Allocation of spring to sliding gear

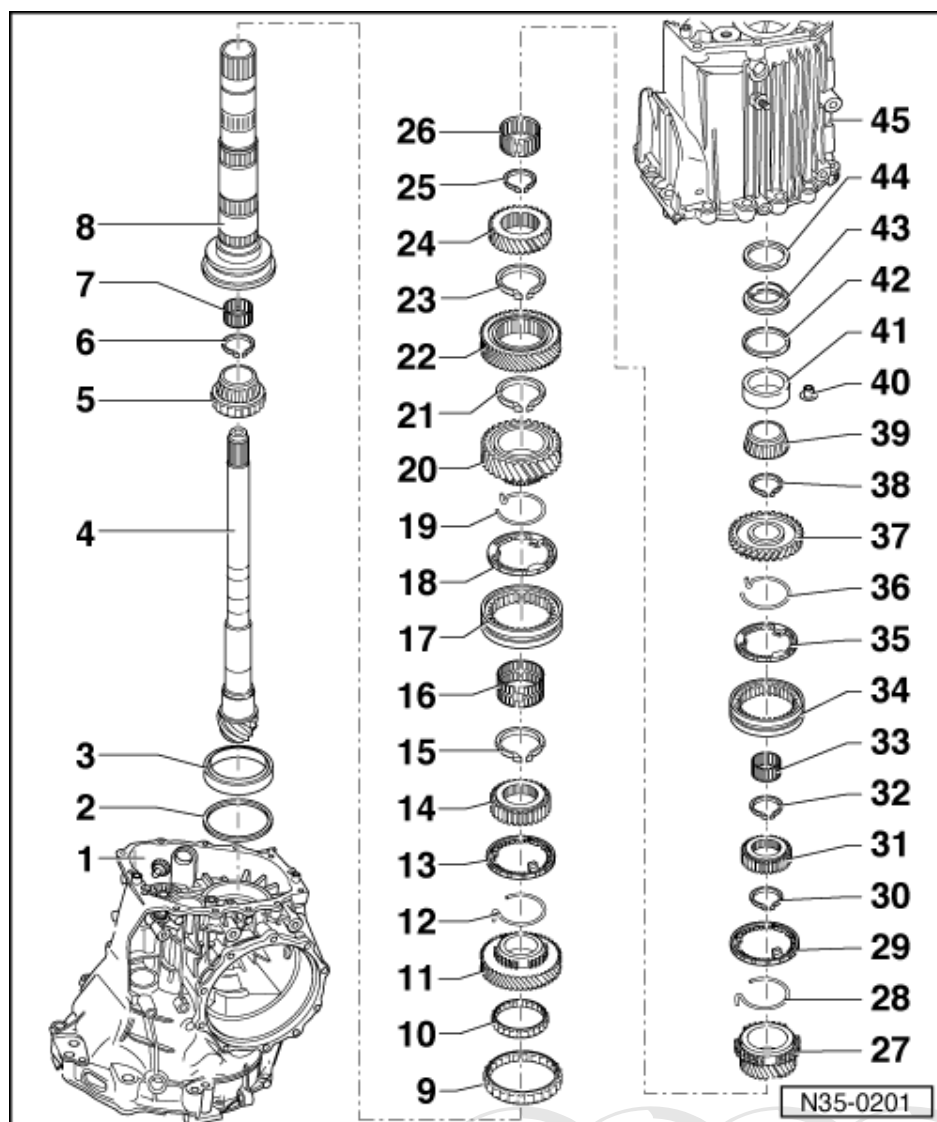
=> Parts Catalogue

29 Synchro-ring for 5th gear

- ◆ Checking for wear
=> Fig. 133

30 Circlip

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

**31 5th gear and reverse gear synchro-hub**

- ◆ Pressing off
=> Fig. 129
- ◆ Pressing on
=> Fig. 135

32 Circlip

- ◆ Mark
- ◆ Installation position => Fig. 15 -Item 6-
- ◆ If synchro-hub is replaced re-determine thickness
=> Fig. 127

33 Needle roller bearing

- ◆ For reverse gear

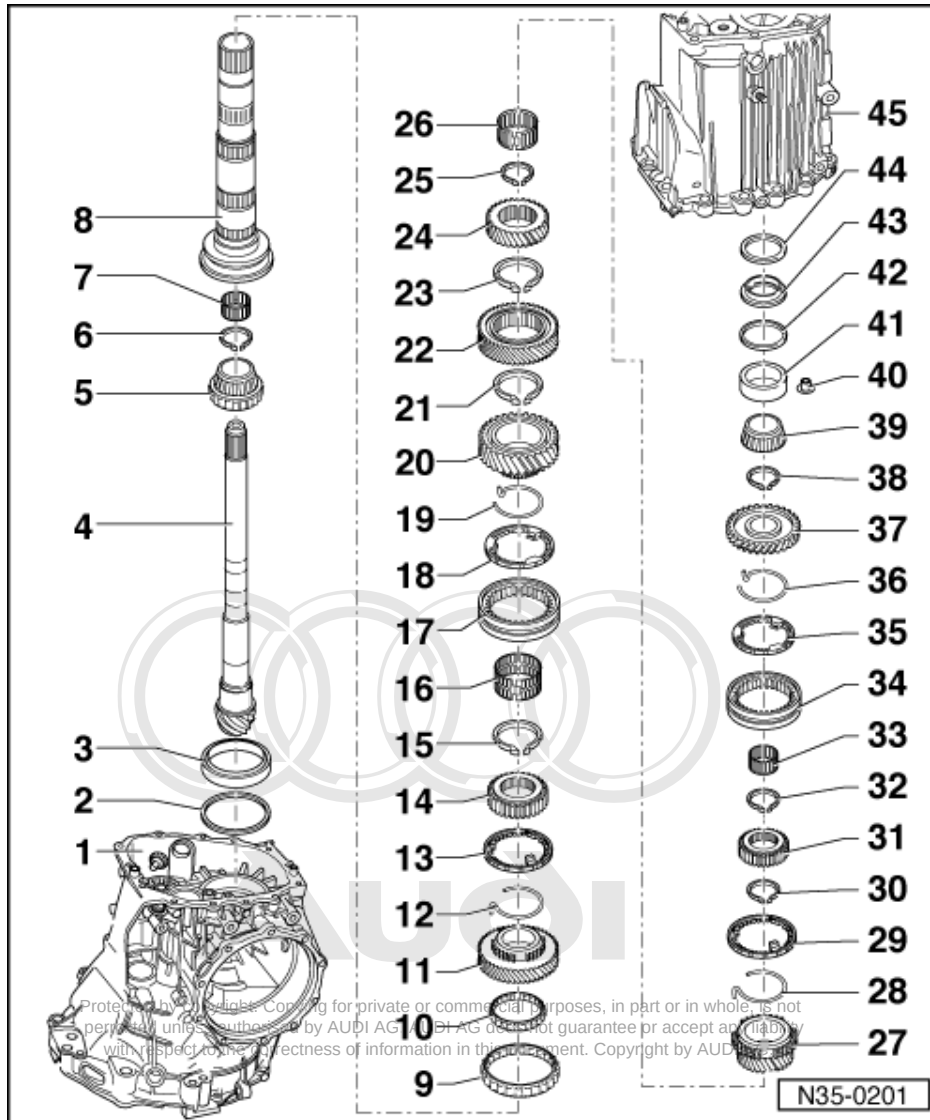
34 Locking collar for 5th gear and reverse gear

- ◆ Installation position
=> Fig. 135

35 Reverse gear synchro-ring

- ◆ Checking for wear
=> Fig. 133

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**36 Spring**

- ♦ Insert in sliding gear for reverse gear => Fig. 132
- ♦ Allocation of spring to sliding gear

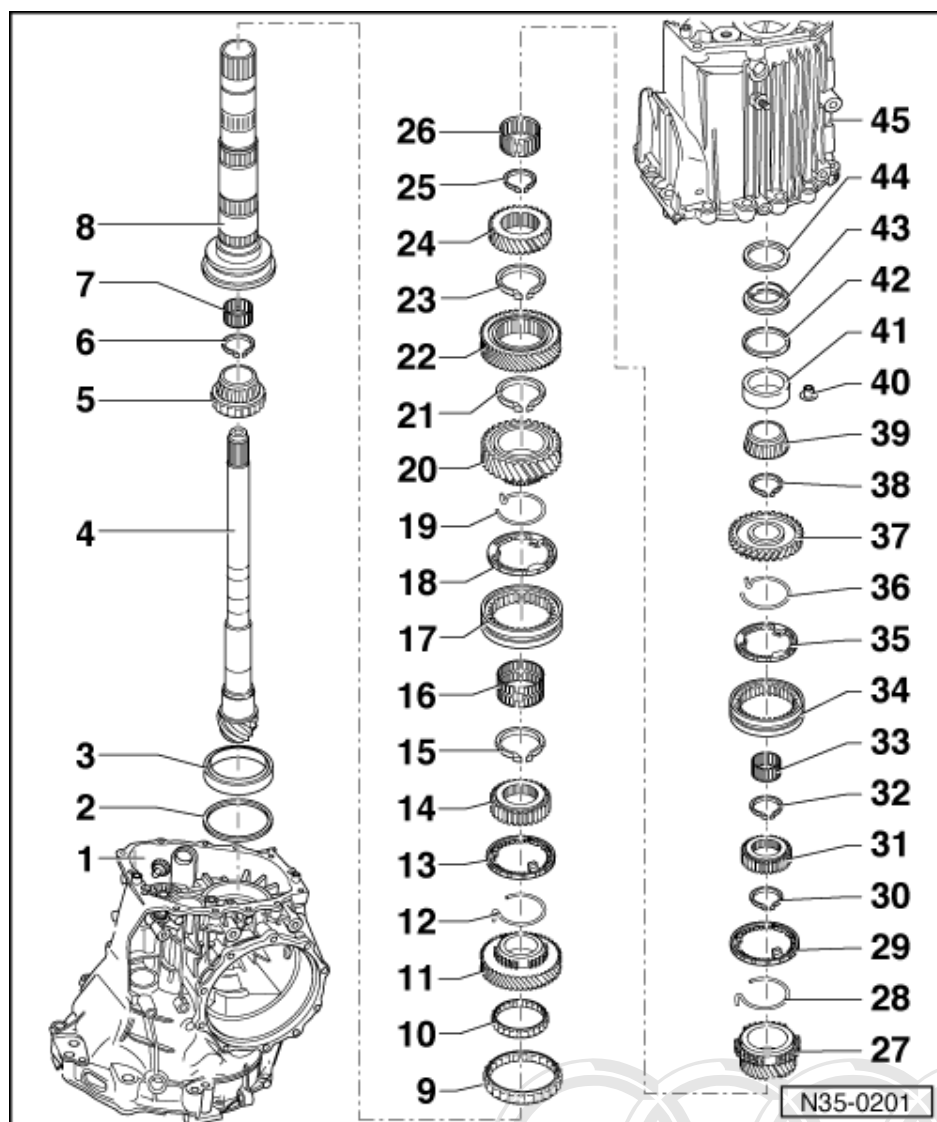
=> Parts Catalogue

37 Sliding gear for reverse gear**38 Circlip**

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

39 Inner race for taper roller bearing 1)

- ♦ Pressing off
=> Fig. 128
- ♦ Pressing on
=> Fig. 129

**40 Bush**

- ♦ To secure small taper roller bearing outer race
- ♦ Pulling out
=> Fig. 128
- ♦ Does not need to be fitted after the small taper roller bearing has been replaced.

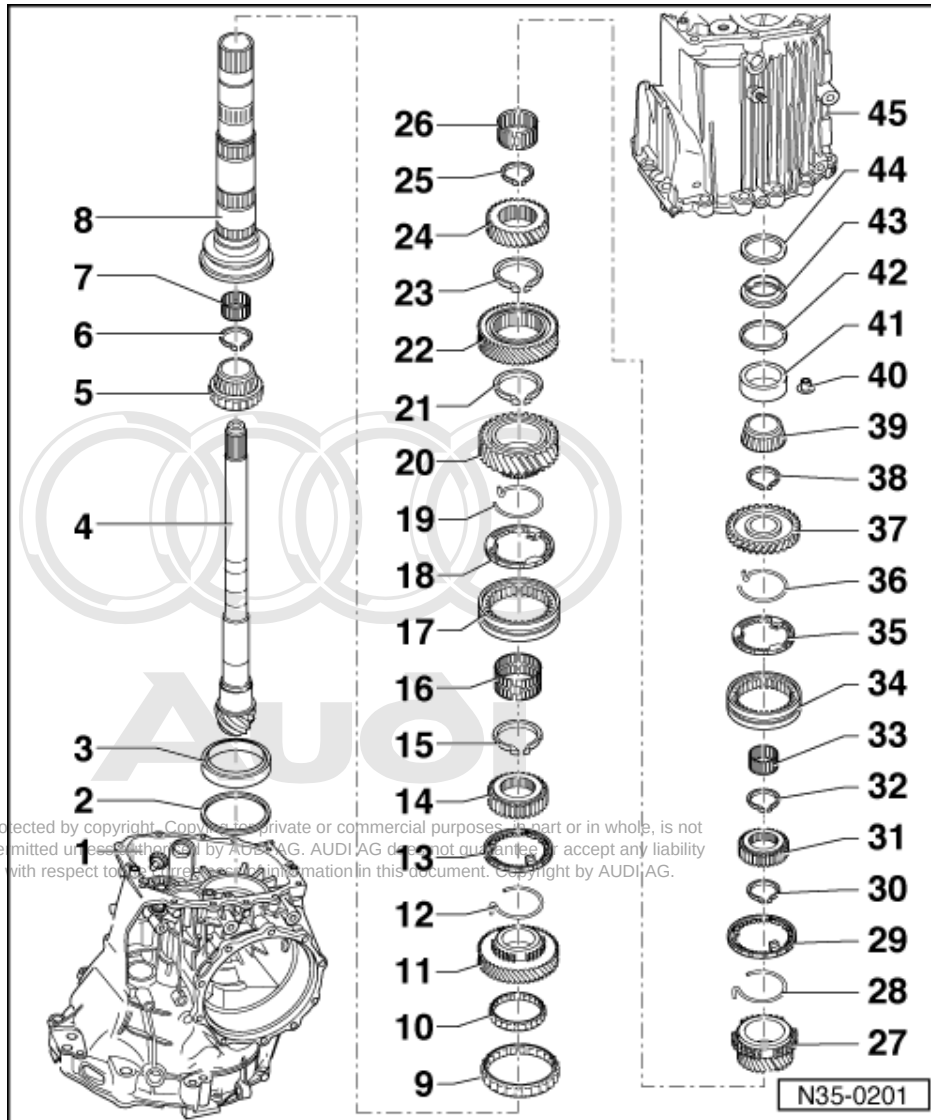
41 Pulling out outer race for taper roller bearing 1)

- ♦ Pulling out
=> Fig. 128
- ♦ Pressing in
=> Fig. 128

42 Shim "S4"

- ♦ Adjustment overview
=> Page 163

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43 Ring

- ♦ Holds rubber washer
- ♦ Allocation

=> Parts Catalogue

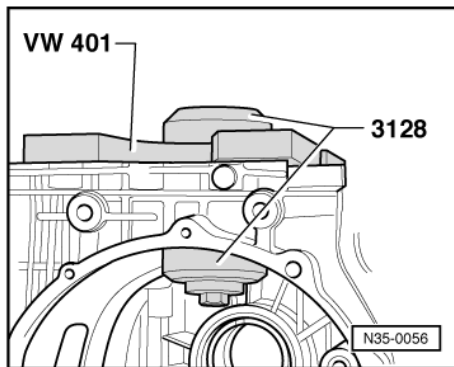
44 Rubber washer

- ♦ Compensates variations in length
- ♦ Allocation

=> Parts Catalogue

45 Gearbox cover1)

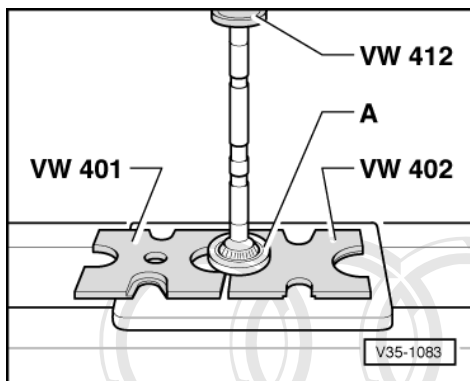
- ♦ Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces



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

- Removing differential => Page 146 .
- 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 bolt the outer race will be pulled out of housing.



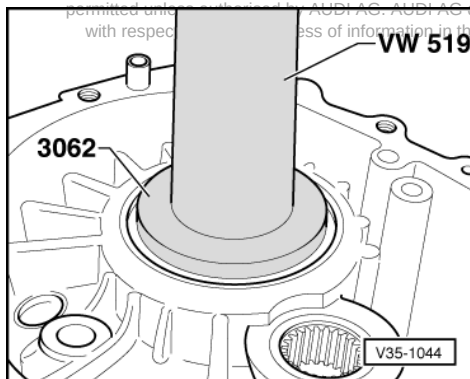
-> Fig.2 Pressing off inner race for double taper roller bearing

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

Note:

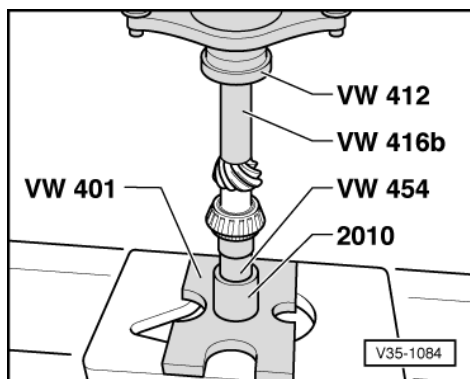
Inner race for double taper roller bearing will be destroyed when pressed off.

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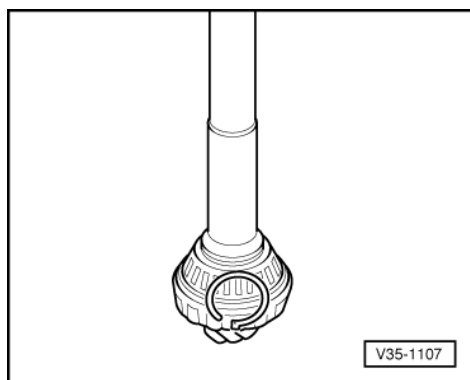


-> Fig.3 Pressing in outer race for double taper roller bearing

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



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

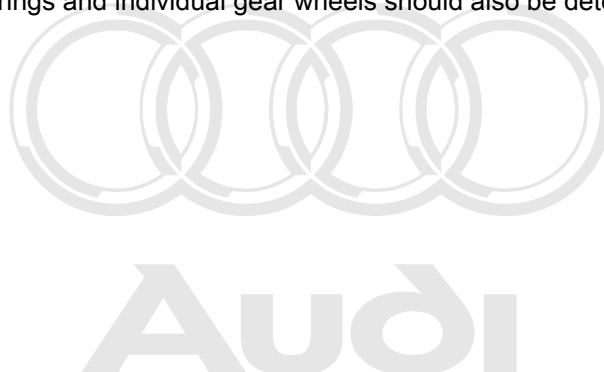
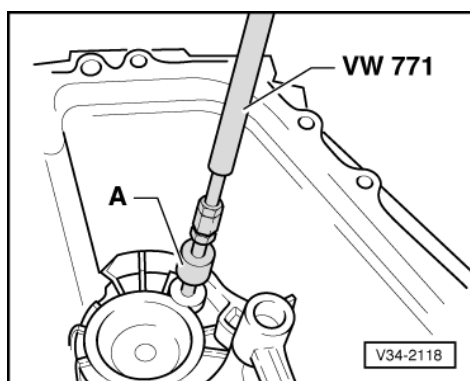


-> Fig.5 Determining thickness of circlip

- 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 Catalogue

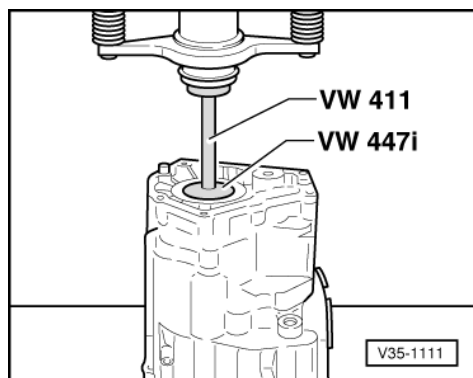


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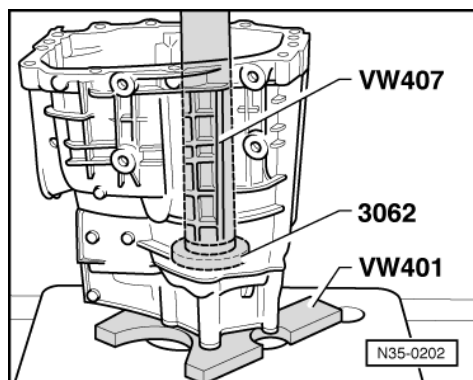
-> Fig.6 Pulling out securing bush for small taper roller bearing outer race

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

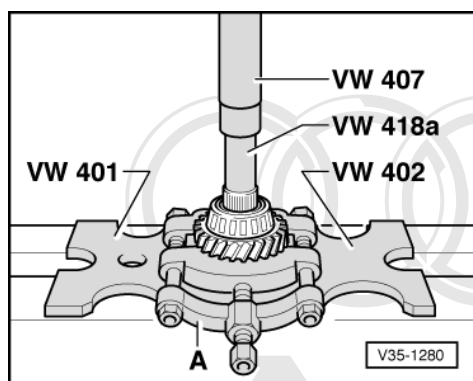


-> Fig.7 Pressing out outer race for taper roller bearing

- Outer race is pressed out together with ring -Item 125 .



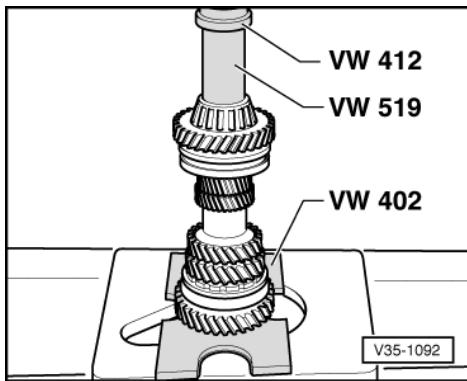
-> Fig.8 Pressing in outer race for taper roller bearing



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

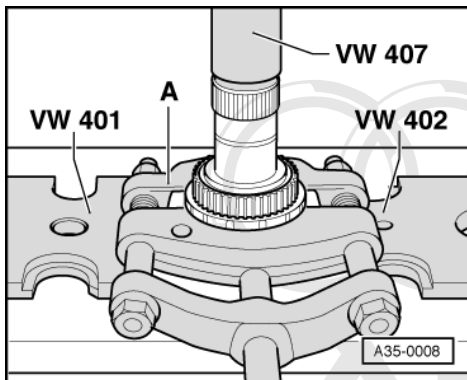
- Press off inner race with reverse gear sliding gear.

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



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

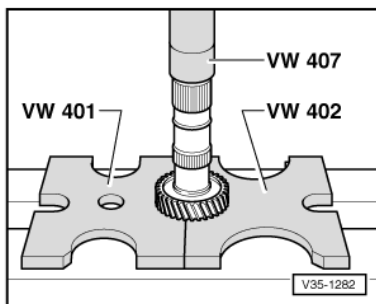
- Fit circlip before pressing on inner race.



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

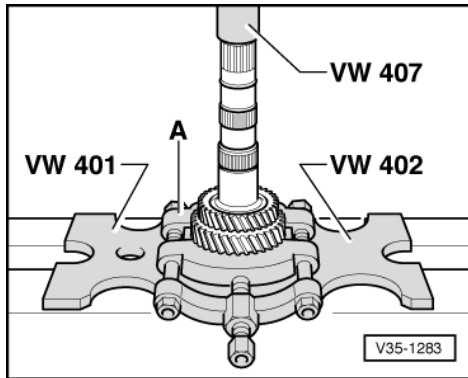
- Remove circlip before pressing off.
- Press off synchro-hub with 5th speed sliding gear.

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



-> Fig.12 Pressing off 4th gear wheel

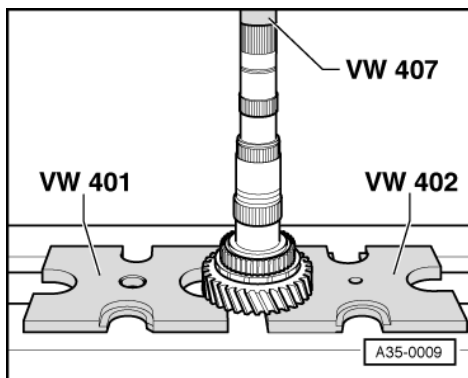
- Remove circlip before pressing off.



-> Fig.13 Pressing off 3rd gear wheel

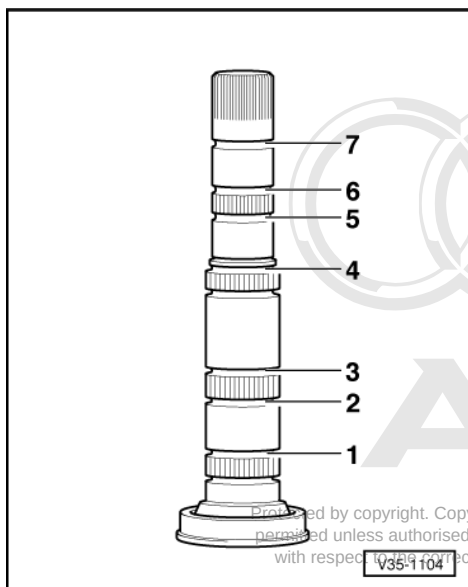
- Remove circlip before pressing off.
- Press 3rd gear wheel off with 2nd speed sliding gear.

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.



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➔ **Fig.15 Installation position of circlips**

- The circlips for 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.

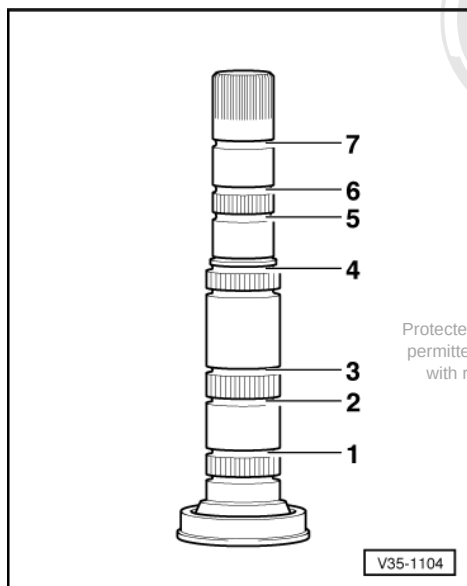
Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	

- ◆ 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	



- ◆ ➔ 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



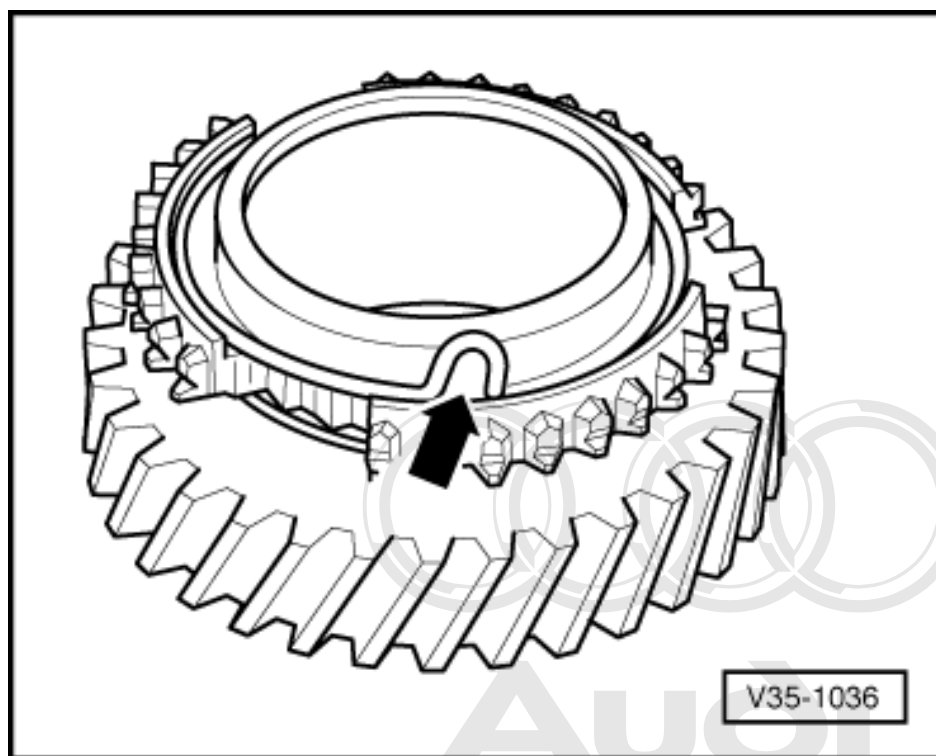
Circlip thickness (mm)		
1.93	1.99	2.05

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

Thickness: 2.50 mm.

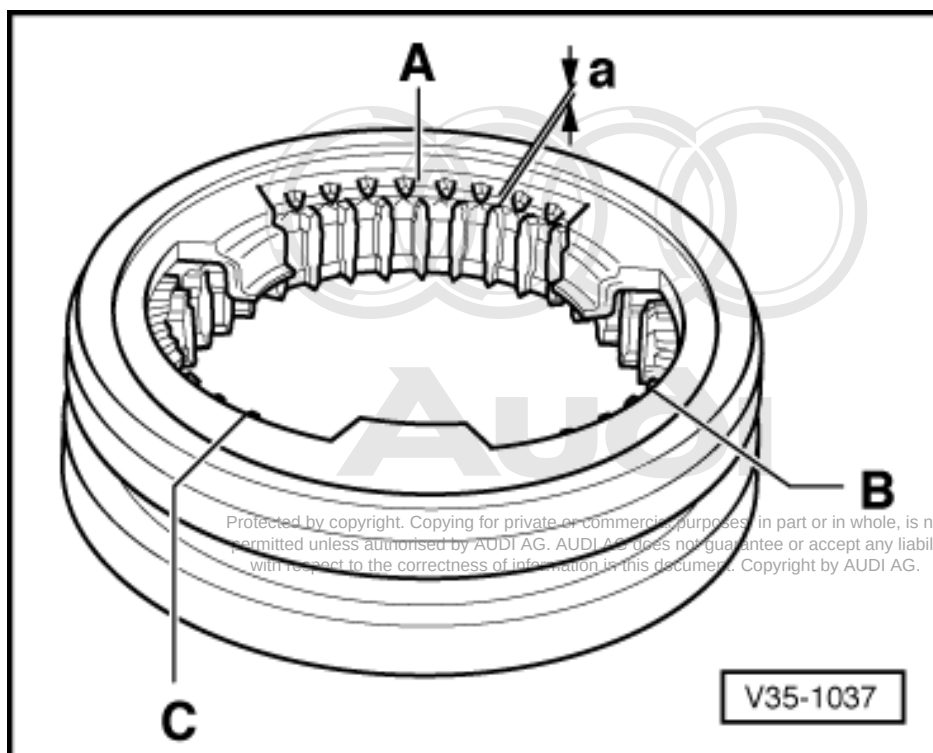
- Determine circlips according to table: Part numbers

=> Parts Catalogue



-> **Fig.16 Inserting spring in sliding gear** Copying for private or 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.

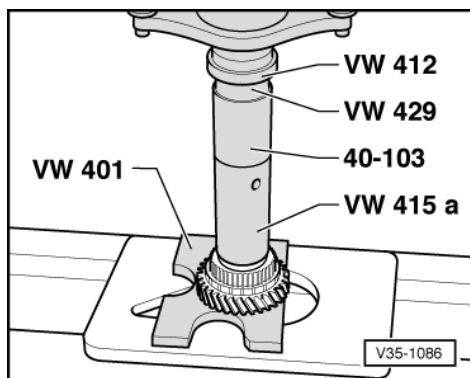
The bent end of the spring (arrow) must be hooked in the hole in the sliding gear.



→ 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.

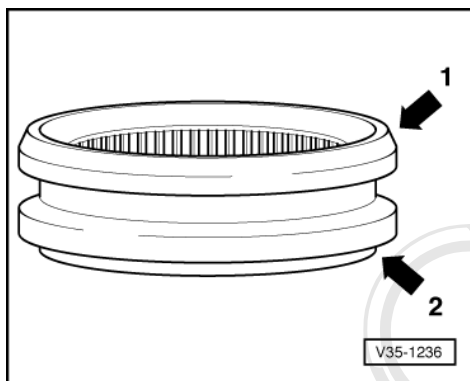
The calculated value must not be less than 0.5 mm.



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

- ◆ Installation position:

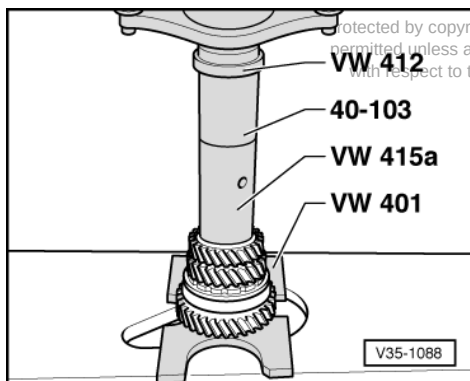
High inside collar faces 2nd gear



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

- ♦ Installation position:

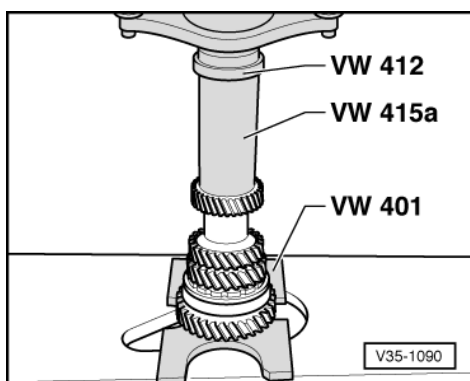
Chamfered edge -arrow 1- faces 2nd gear
Shoulder -arrow 2- faces 1st gear



-> Fig.20 Pressing on 3rd gear wheel

- ♦ Installation position:

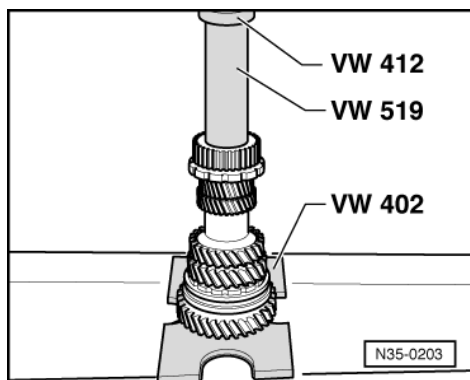
Groove on gear wheel faces 4th gear



-> Fig.21 Pressing on 4th gear wheel

- ♦ Installation position:

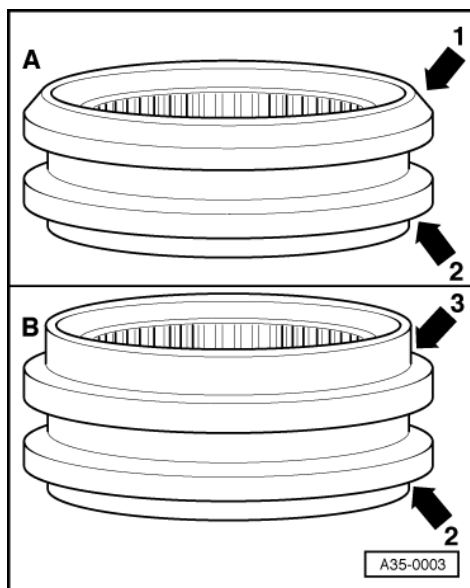
High inside collar or groove on gear wheel faces 3rd gear



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

- ◆ Installation position:

High inside collar faces 5th gear



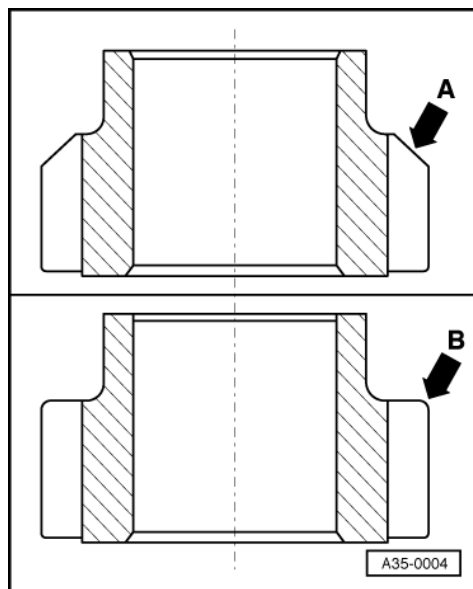
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-> Fig.23 Installation position of locking collar for 5th and reverse gear

Different types of locking collar are installed: version -A- with chamfered edge, arrow 1, or version -B- with large shoulder, arrow 3.

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

Chamfered edge -arrow 1- faces 4th gear
Small shoulder -arrow 2- faces 5th gear
Large shoulder -arrow 3- faces reverse gear



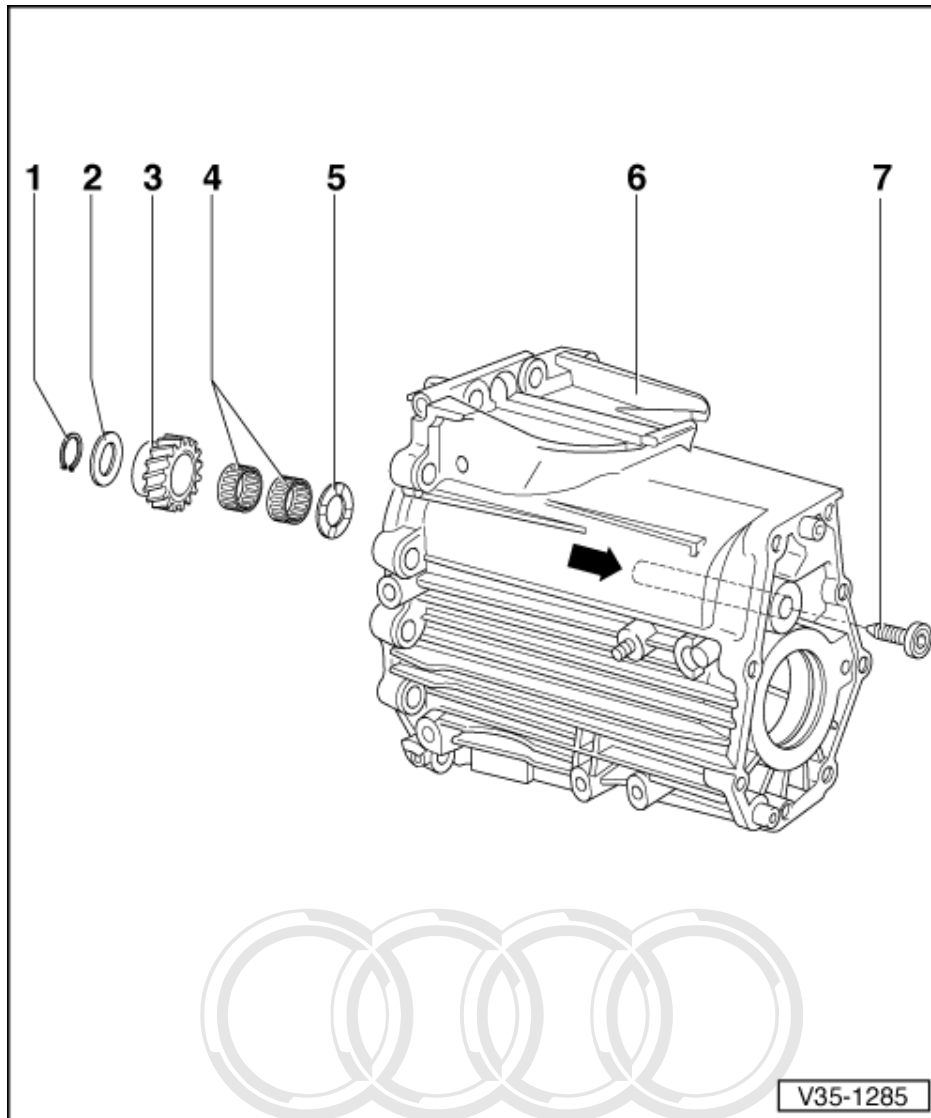
-> Fig.24 Selecting correct locking collar for reverse gear wheel

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.

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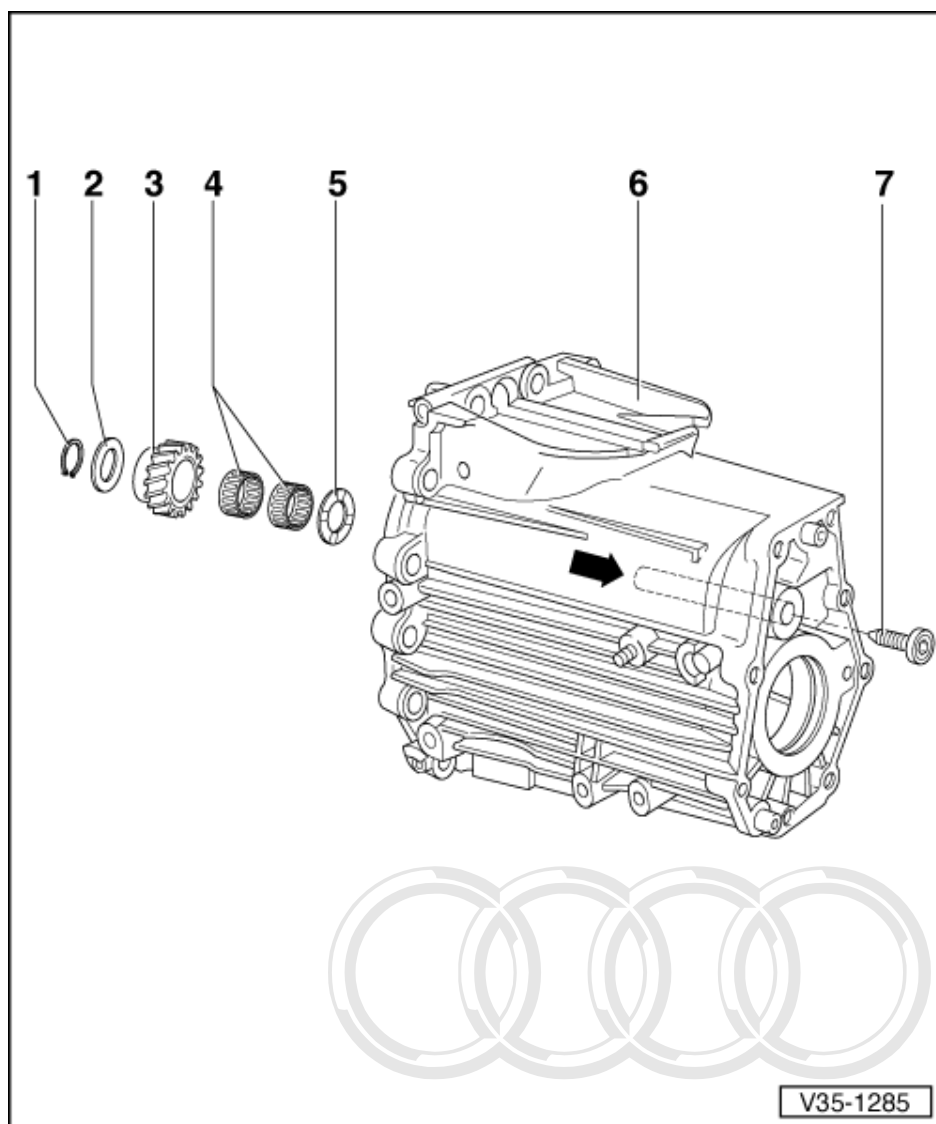
4 - Removing and installing reverse idler gear

4.1 - Removing and installing reverse idler gear



- 1 Circlip
- 2 Support plate
- 3 Reverse idler gear
 - ♦ Allocation of different types
=> Fig. 136
- 4 Needle roller bearing
- 5 Thrust washer

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6 Gearbox cover

- ◆ With reverse gear shaft (arrow)
- ◆ To remove the reverse gear it is not necessary to remove the reverse gear shaft
- ◆ The reverse gear shaft is not available as a replacement part
- ◆ Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces

7 Torx bolt - 35 Nm

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39 - Final drive, Differential rear

1 - Replacing flange shaft oil seal

1.1 - Replacing flange shaft oil seal

- Gearbox installed
- Observe general repair instructions=> Page 9.

Special tools, testers and auxiliary equipment required

- ◆ Drift VW 195
- ◆ Drift VW 295
- ◆ Extractor lever VW 681
- ◆ Drip tray V.A.G 1306
- ◆ Two levers

Notes:

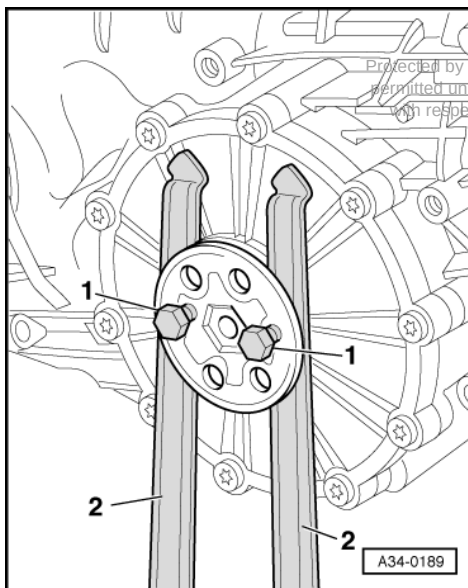
- ◆ Removing and installing oil seal on left-hand side is shown below.
- ◆ Procedure is identical for left and right-hand seals.
- ◆ Exhaust system does not have to be removed.
- ◆ Flange shaft may be with or without a polygon bearing. Assignment => Page 2

Removing

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

=> Running gear, Four-wheel drive; Repair group 40; Removing and installing suspension struts and drive shafts Removing and installing suspension struts and drive shafts

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



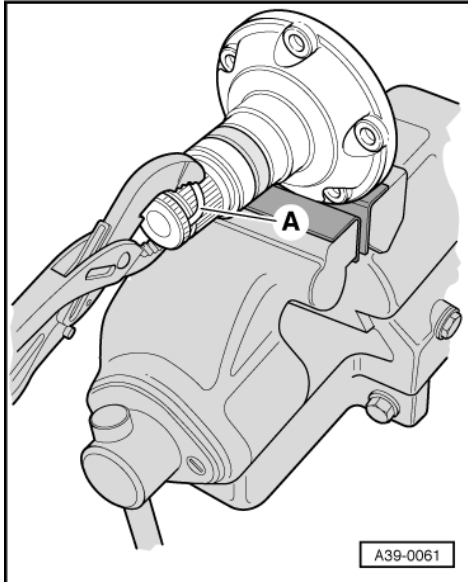
- Place drip tray V.A.G 1306 underneath the gearbox.
- -> Insert two levers -2- behind flange shaft (second mechanic required).



- To press off flange shaft, screw in two bolts -1- evenly in opposite threads in flange shaft.

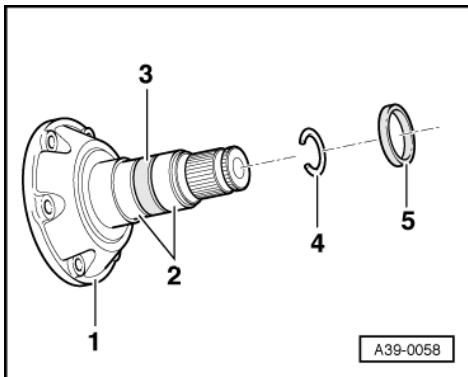
Note:

Flange shaft must be pressed off uniformly and kept in a straight line. Differential housing can break if too much force is applied on one side.



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- -> Always replace 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

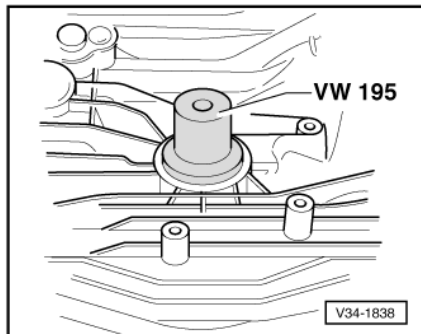
- 1 - Flange shaft
- 2 - Needle roller bearing (polygon bearing)
- 3 - Spacer ring
- 4 - Circlip
- 5 - Spacer ring - fitted additionally on shafts with 30 mm spline diameter

Notes:

- ♦ If polygon bearings do not run smoothly with flange shaft removed, this does not indicate that bearings are defective. An acoustic test can only be performed when installed.
- ♦ Inspect for signs of damage to polygon bearings (such as cracking in outer race).
- ♦ The polygon bearings can only be replaced together with flange shaft.

- ♦ A spacer ring -5- is fitted between the polygon bearing and differential sun wheel on flange shafts with 30 mm spline diameter.

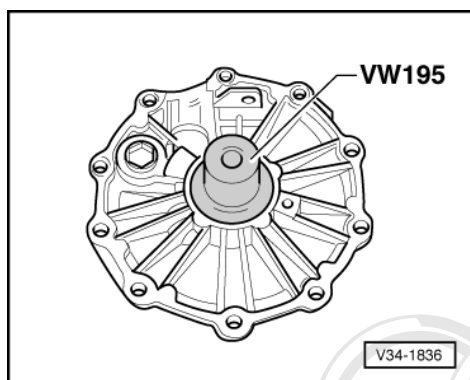
Installing



- Pack space between sealing and dust lips with 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 old flange shaft is reinstalled after the repair, oil seal must be knocked in to a depth of approx. 6.5 mm so that 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 using VW 195; keep seal straight when installing

Note:

If old flange shaft is reinstalled after the repair, oil seal must be knocked in to a depth of approx. 6.5 mm so that 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.
- Checking oil level in manual gearbox => Page 60

Tightening torques

Component		Nm
Drive shaft to flange shaft	M8	40
	M10	77
Drive shaft heat shields		23



2 - Replacing oil seal for Flange shaft/propshaft

2.1 - Replacing oil seal for Flange shaft/propshaft

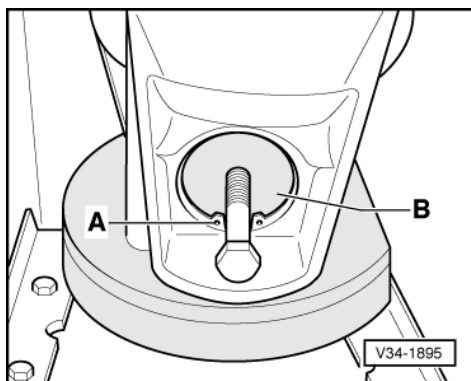
- Gearbox installed
- Observe general repair instructions=> Page 9 .

Special tools, testers and auxiliary equipment required

- ♦ Extractor lever VW 681
- ♦ Mandrel 30-505
- ♦ Press tool 30-506 B
- ♦ Drip tray V.A.G 1306

Removing

- Removing propshaft => Page 185 .

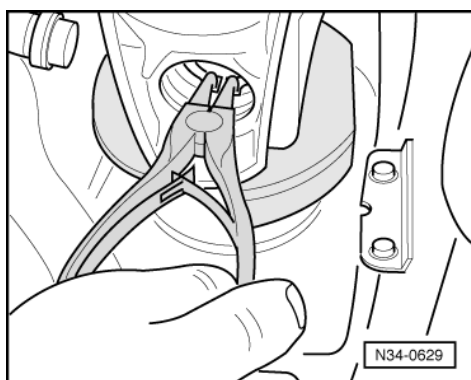


- Place drip tray V.A.G 1306 underneath and drain gearbox oil.

Note:

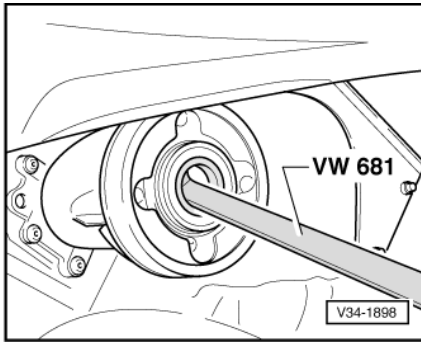
-> Oil flows out when sealing cap -B- is removed.

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



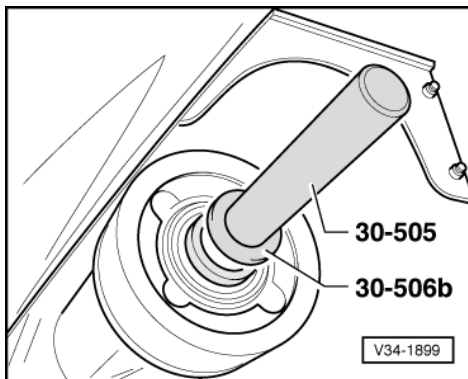
- -> Open out circlip and pull out flange shaft.

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

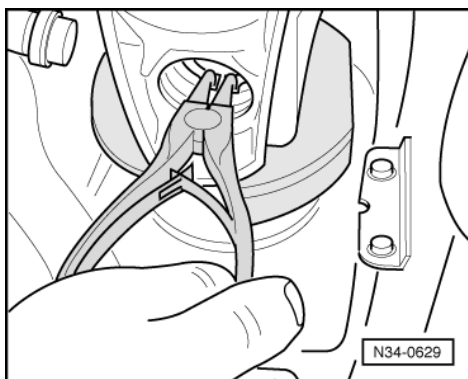
Installing



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Install in reverse order, paying attention to the following:

- Pack space between sealing and dust lips with multi-purpose 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.
- It is essential to remove any residue of locking compound with a thread tap from threaded holes in flanged shafts for propshaft of manual gearbox and rear final drive and also in threaded holed for attaching clutch slave cylinder before installing gearbox.
- Install propshaft => Page 189 .



- Align exhaust system free of stress
- => 4-cyl. fuel injection engine, Mechanics; Repair group 26
- => 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26
- => 6-cyl. fuel injection engine, Mechanics; Repair group 26
- Top up oil in gearbox and check oil level => Page **60** .

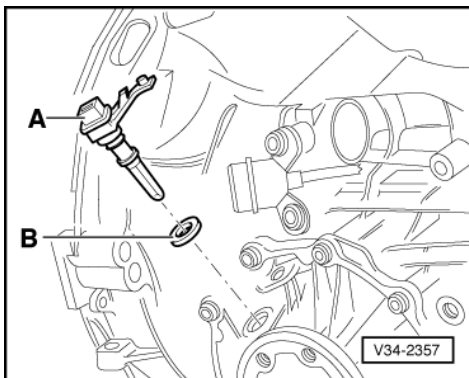
3 - Removing and installing speedometer sender and drive wheel

3.1 - Removing and installing speedometer sender and drive wheel

- Gearbox installed
- Observe general repair instructions=> Page **9** .

3.2 - Removing and installing speedometer sender -G22

Removing



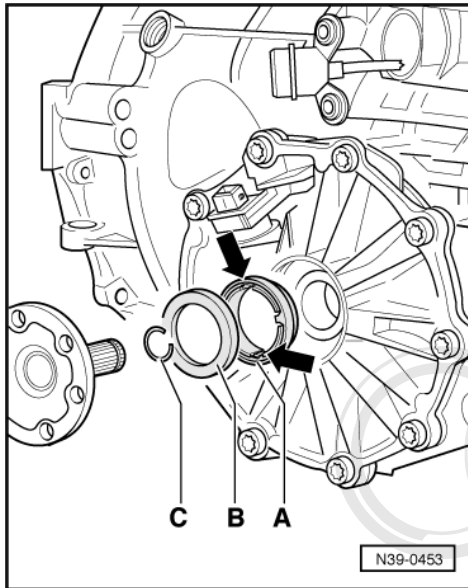
- -> Pull connector off speedometer sender -A-.
- Press retaining clip down, turn sender sideways and pull out upwards.

Installing

- Replace 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.

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3.3 - Removing and installing speedometer drive wheel

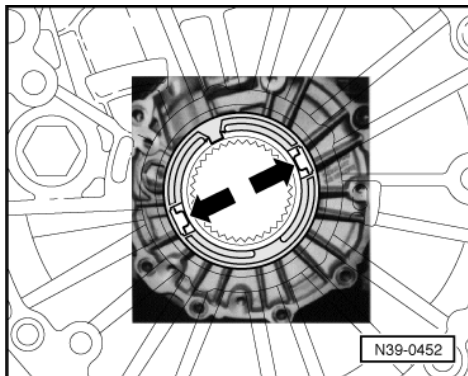


Special tools, testers and auxiliary equipment required

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

- -> Remove flange shaft on left side and oil seal -B- => Replacing flange shaft seal, Page 139 .



- Remove speedometer sender => Page 144 .
- -> Press retaining clips in direction of arrows with a screwdriver.
- Remove drive wheel by levering out, alternating between sides.

Installing

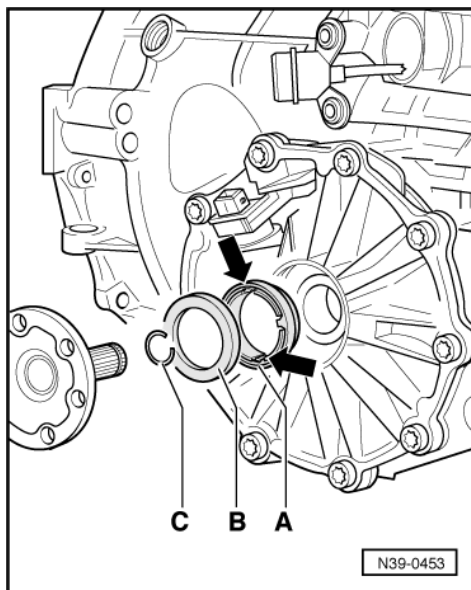
Install in reverse order, paying attention to the following:

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 replace seal -B- and circlip -C- =>Page **140** .
- Drive in flange shaft using drift VW 295.
- Top up oil in gearbox and check oil level => Page **60** .

Tightening torques

Component		Nm
Drive shaft to flange shaft	M8	40
	M10	77
Heat shields over drive shafts to gearbox		23

4 - Removing and installing differential

4.1 - Removing and installing differential

Special tools, testers and auxiliary equipment required

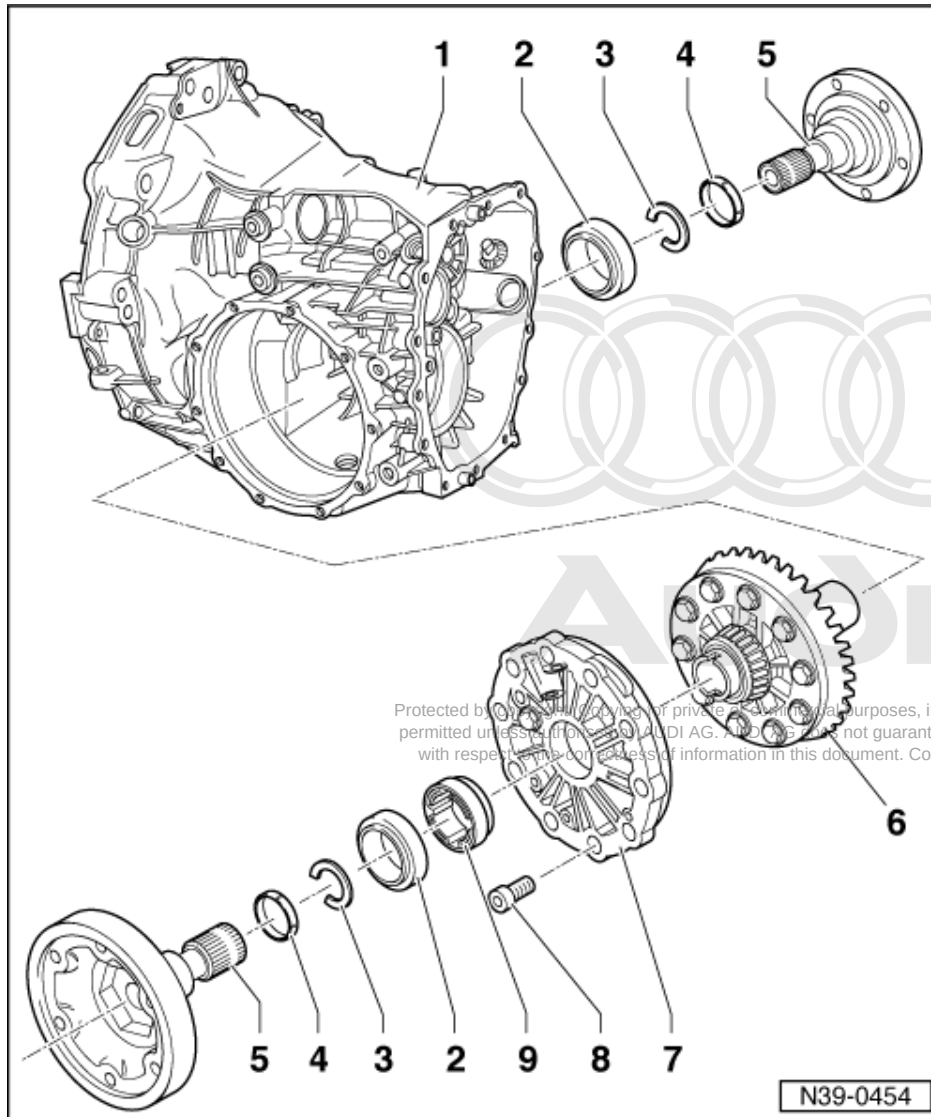
- ♦ Multi-purpose tool VW 771
- ♦ Socket 3257
- ♦ Internal puller Kukko 21/3

Notes:

- ♦ Removing and installing is possible with the gearbox installed.
- ♦ The differential can be removed and installed without removing selector mechanism, input shaft, drive pinion and cover. These components must be removed if the differential needs to be adjusted.
- ♦ Flange shaft may be with or without a polygon bearing. Assignment => Page **2**
- ♦ The polygon bearings can only be replaced together with flange shaft.

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- ◆ Inspect polygon bearings for visible damage.
- ◆ If polygon bearings do not run smoothly with flange shaft removed, this does not indicate that bearings are defective. An acoustic test can only be performed when installed.
- ◆ A spacer ring is fitted between the polygon bearing and the differential sun wheel on flange shafts with 30 mm spline diameter => Fig. 4, -Item 5-.
- ◆ Adjustments are required when replacing components marked 1) => Adjustment overview, Page 163.



1 Gearbox housing 1)

2 Oil seal

- ◆ Replacing => Page 139

3 Circlip

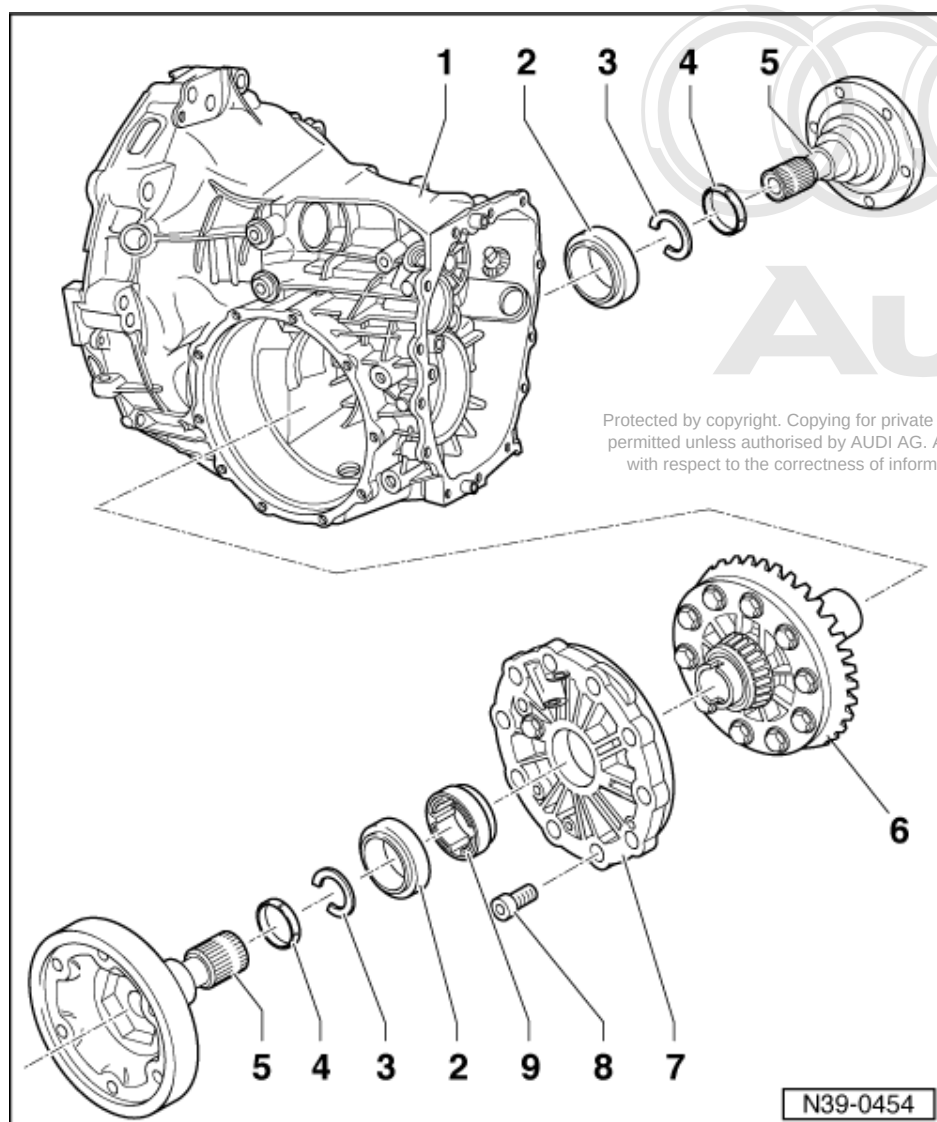
- ◆ Replace
- ◆ Removing and installing
=> Fig. 150

4 Spacer ring

- ◆ Is only fitted on flange shafts with polygon bearing which have a spline diameter of 30 mm => Page 2 onwards
- ◆ Removing
=> Fig. 150
- ◆ Installing



=> Fig. 151



5 Flange shaft

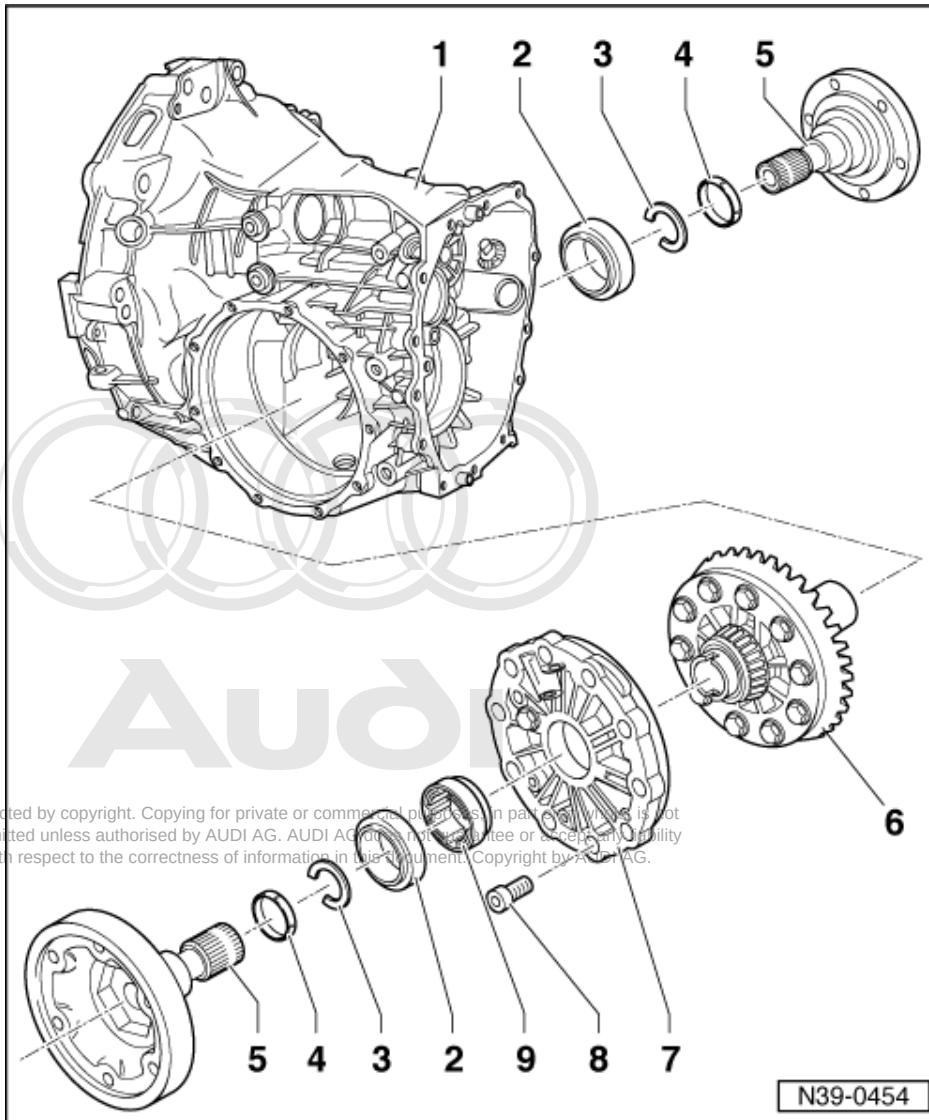
- ♦ Removing and installing
=> Page 139
- ♦ Assembling flange shaft with polygon bearing
=> Fig. 151

6 Differential with crown wheel 1)

- ♦ Can be removed without removing gear cluster
- ♦ Dismantling and assembling =>Page 151

7 Cover for final drive 1)

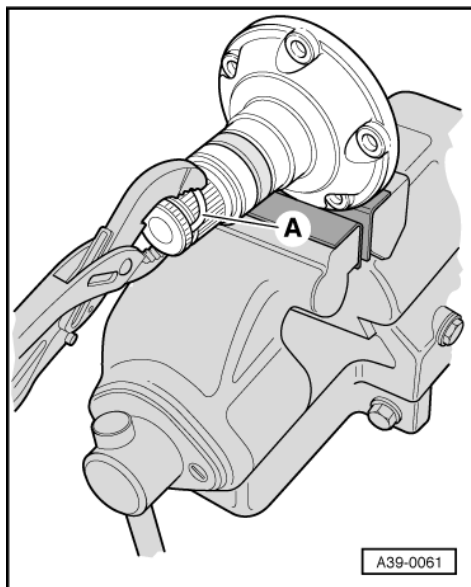
- ♦ Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces



8 Torx bolt - 25 Nm

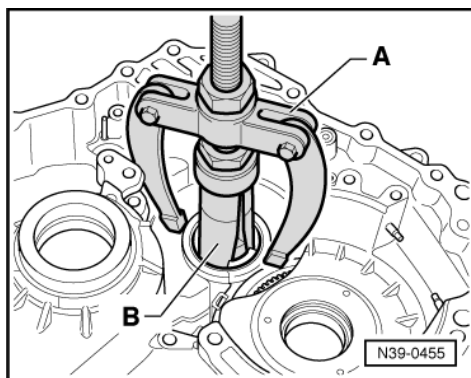
9 Speedometer drive wheel

- ◆ Removing and installing
=> Page **145**
- ◆ 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

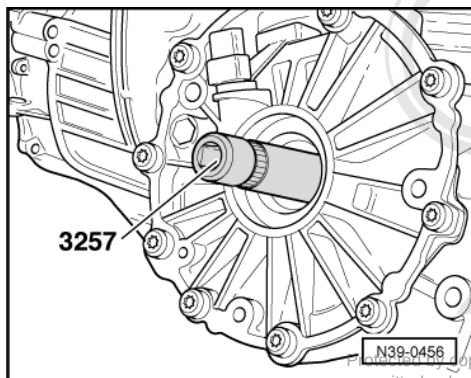
- Clamp flange shaft in vice using soft jaws. Use new circlip -A- to press out old circlip from groove in flange shaft.



-> Fig.2 Removing spacer ring

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

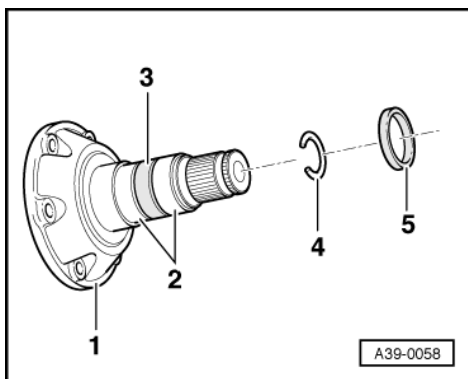
- If the spacer ring is tight pull out using the multi-purpose tool VW 771.



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➔ Fig.3 Installing spacer ring

- Drive new spacer ring home, taking 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.

5 - Dismantling and assembling differential

5.1 - Dismantling and assembling differential

Special tools, testers and auxiliary equipment required

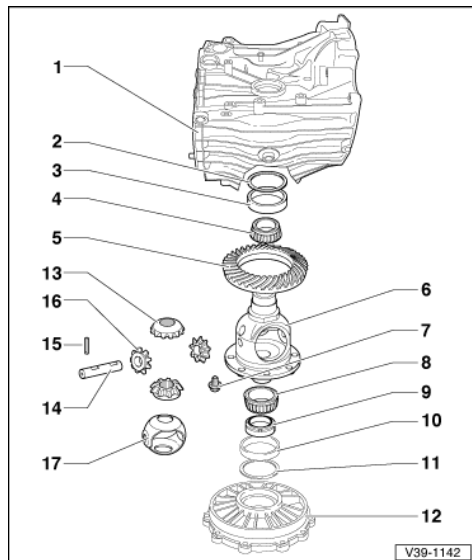
- ◆ Drift VW 295
- ◆ Thrust plate VW 401
- ◆ Thrust plate VW 402
- ◆ Press tool VW 407
- ◆ Press tool VW 408 A
- ◆ Thrust plate VW 447 H
- ◆ Thrust plate VW 447 i
- ◆ Thrust pad VW 472/1
- ◆ Thrust plate VW 511 i
- ◆ Thrust plate 30-11
- ◆ Thrust plate 30-205
- ◆ Drift sleeve 40-21
- ◆ Thrust plate 40-105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

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Notes:

- ♦ Removing and installing differential => Page 146 .
- ♦ Replace both taper roller bearings together.
- ♦ Adjustments are required when replacing marked components 1) => Adjustment overview, Page 163 .



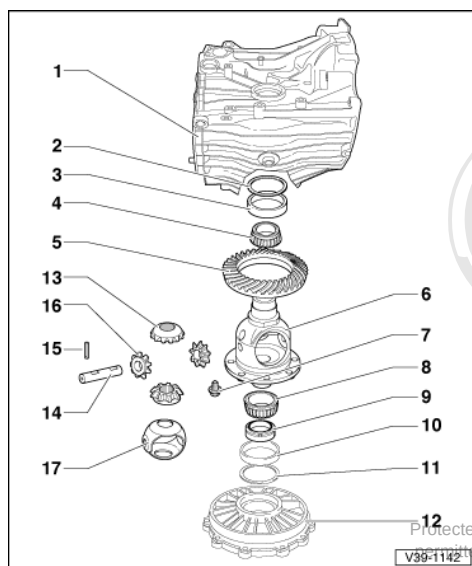
1 Gearbox housing 1)

2 Shim "S2"

- ♦ Note thickness
- ♦ Adjustment overview
=> Page 163

3 Outer race for taper roller bearing (right) 1)

- ♦ Taper roller bearings same on left and right (does not apply to gearboxes without polygon bearings
=> Page 2 onwards)
- ♦ Driving out, gearbox with polygon bearings
=> Fig. 155
- ♦ Driving out, gearbox without polygon bearings
=> Fig. 156
- ♦ Driving in, gearbox with polygon bearings
=> Fig. 156
- ♦ On gearboxes without polygon bearings, drive in using VW 295 and 30-205



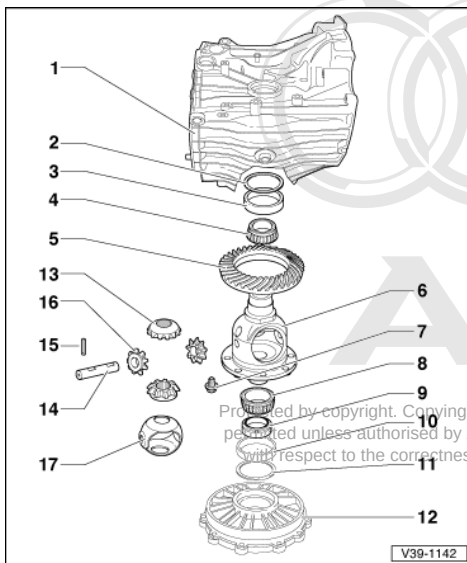
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4 Inner race for taper roller bearing (right) 1)

- ♦ Taper roller bearings same on left and right (does not apply to gearboxes without polygon bearings)
=> Page 2 onwards)
- ♦ Pulling out with 3296
=> Fig. 157
- ♦ Pressing on, gearbox with polygon bearings
=> Fig. 157
- ♦ On gearboxes without polygon bearings, drive on using press tool 40-21

5 Crown wheel 1)

- ♦ Paired with drive pinion (final drive set)
- ♦ Select according to gearbox code letters via Parts Catalogue => Page 2 onwards.
- ♦ Drive off housing with a drift => Fig. 159
- ♦ Fit to differential housing
=> Fig. 159



6 Differential housing 1)

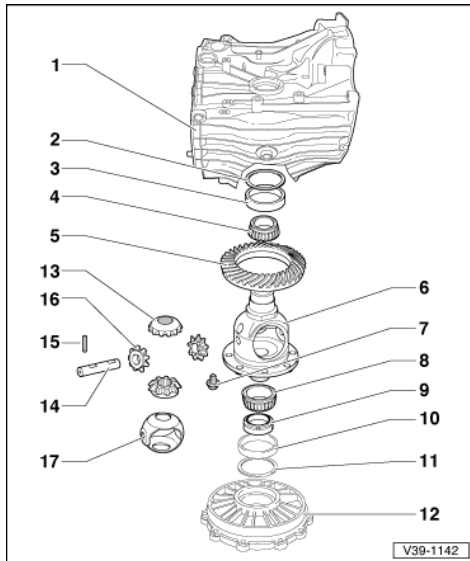
- ♦ Select according to gearbox code letters via Parts Catalogue => Page 2 onwards.

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)

- ♦ Taper roller bearings same on left and right (does not apply to gearboxes without polygon bearings)
=> Page 2 onwards)
- ♦ Pulling off
=> Fig. 157
- ♦ Pressing on, gearbox with polygon bearings
=> Fig. 158
- ♦ On gearboxes without polygon bearings, drive on using press tool 40-21

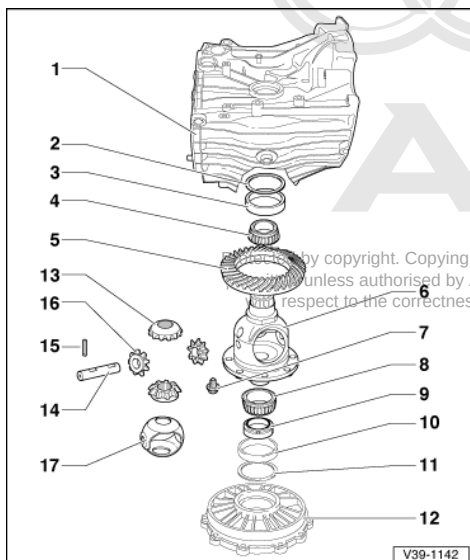


9 Speedometer drive wheel

- ◆ Removing and installing
=> Page 145
- ◆ 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)

- ◆ Taper roller bearings same on left and right (does not apply to gearboxes without polygon bearings
=> Page 2 onwards)
- ◆ Driving out
=> Fig. 158
- ◆ Driving in, gearbox with polygon bearings
=> Fig. 159
- ◆ On gearboxes without polygon bearings, drive in using VW 511 and VW 295



11 Shim "S1"

- ◆ Note thickness
- ◆ Adjustment overview
=> Page 163

12 Cover for final drive 1)

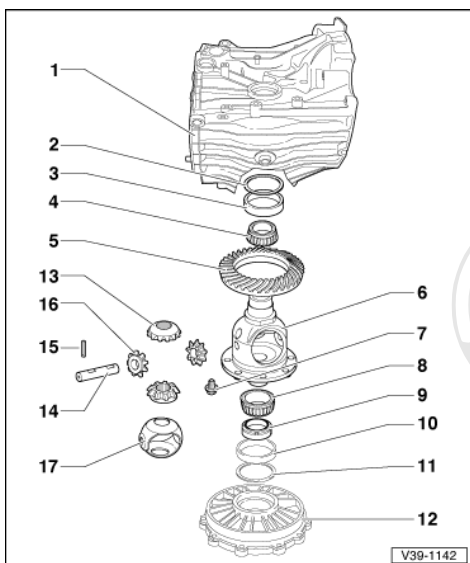
- ◆ Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces

13 Sun wheel

- ◆ Installing
=> Fig. 160

14 Shaft for bevel gears

- ◆ Knock out with drift after removing spring sleeve



15 Spring pin

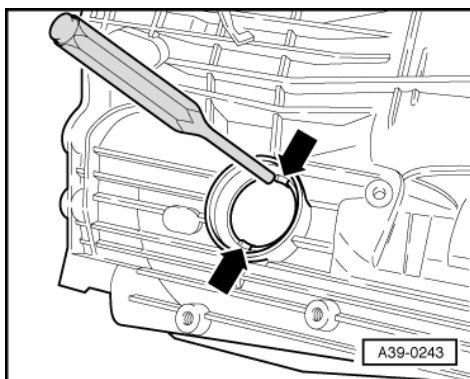
- ◆ For securing shaft for bevel gears
- ◆ Version with annular groove: Removing and installing
=> Fig. 160
- ◆ Version without annular groove: Drive out with drift

16 Planet pinion

- ◆ Installing
=> Fig. 160

17 One-piece thrust washer

- ◆ Coat with gearbox oil when installing

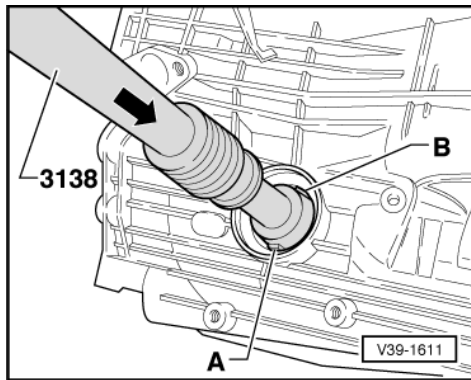


-> Fig.1 Driving out outer race for right taper roller bearing out of gearbox housing (gearbox with polygon bearings)

- To drive out bearing race, apply drift in the recesses in the bearing seat on alternate sides -arrows-.

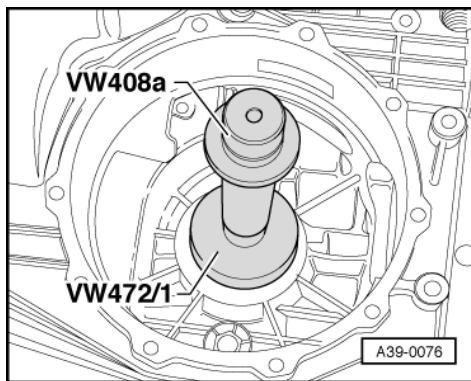
Note:

The shims are damaged on removal; fit new shims.



-> Fig.2 Driving out outer race for right taper roller bearing out of gearbox housing (gearbox without polygon bearings)

- 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.

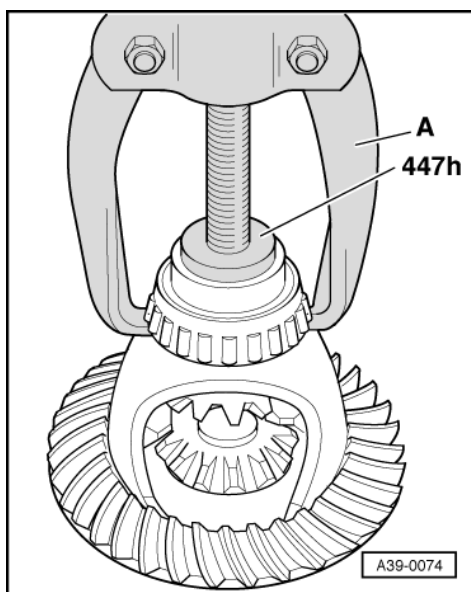


-> Fig.3 Driving right taper roller bearing outer race into gearbox housing

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

Note:

On gearboxes with flange shafts without polygon bearings (=> Page 2 onwards) use thrust plate 30-205 and drift VW 295.



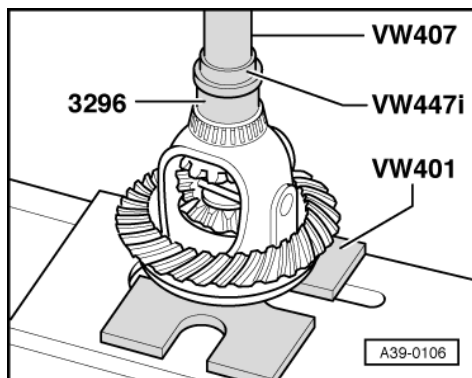
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-> Fig.4 Pulling off inner race for right taper roller bearing

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.
- ◆ On gearboxes with flange shafts without polygon bearings (=> Page 2 onwards) use thrust plate 40-105.
- ◆ There is a slot in the bearing seat in the differential housing for applying puller -A-.



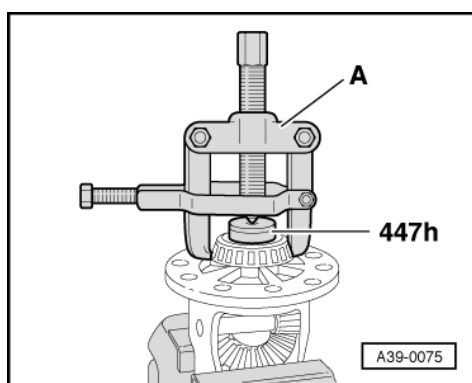
-> Fig.5 Pressing on inner race for right taper roller bearing

Warning
 Wear protective gloves.

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

Note:

On gearboxes with flange shafts without polygon bearings (=> Page 2 onwards) use fitting sleeve 40-21.



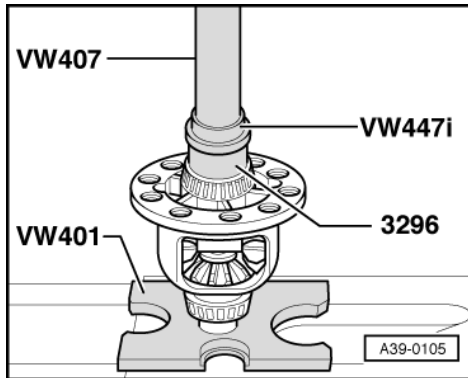
-> Fig.6 Pulling off inner race for left taper roller bearing

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

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Notes:

- ◆ If using a puller with small diameter spindle, also fit thrust plate 30-11 between thrust pad 447 H and puller.
- ◆ On gearboxes with flange shafts without polygon bearings (=> Page 2 onwards) use thrust plate 40-105.
- ◆ There is a slot in the bearing seat in the differential housing for applying puller -A-.



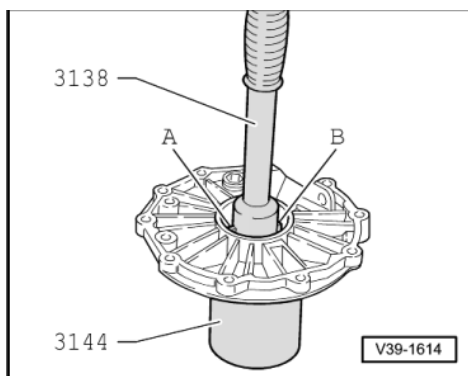
-> Fig.7 Pressing on inner race for left taper roller bearing

Warning
Wear protective gloves.

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

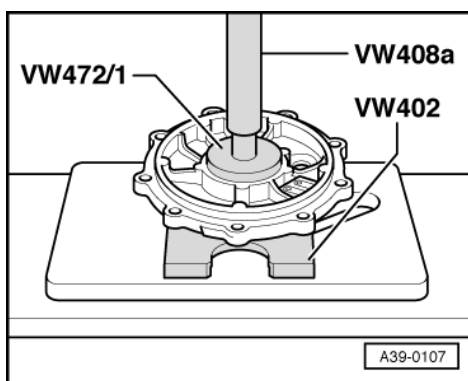
Note:

On gearboxes with flange shafts without polygon bearings (=> Page 2 onwards) use fitting sleeve 40-21.



-> Fig.8 Driving out outer race for left taper roller bearing 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.



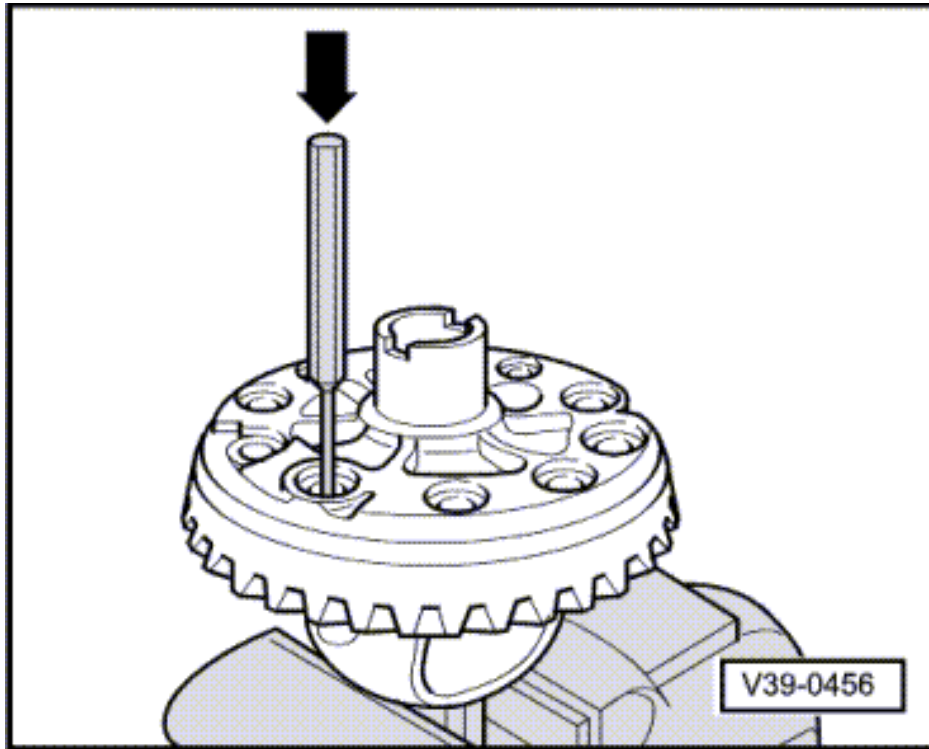
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-> Fig.9 Driving outer race for left taper roller bearing into cover

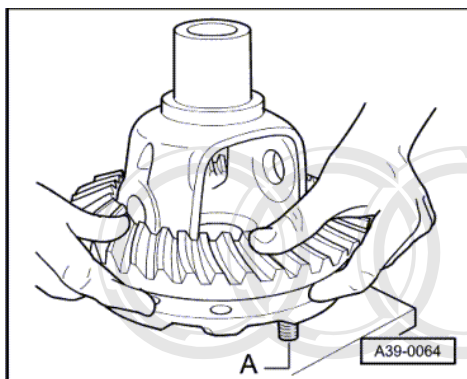
- Thrust pad VW 472/1 is fitted with the taper in the outer race.

Note:

On gearboxes with flange shafts without polygon bearings (=> Page 2 onwards) use thrust pad VW 511 and drift VW 295.



-> Fig.10 Driving crown wheel off housing



-> Fig.11 Installing crown wheel

Warning

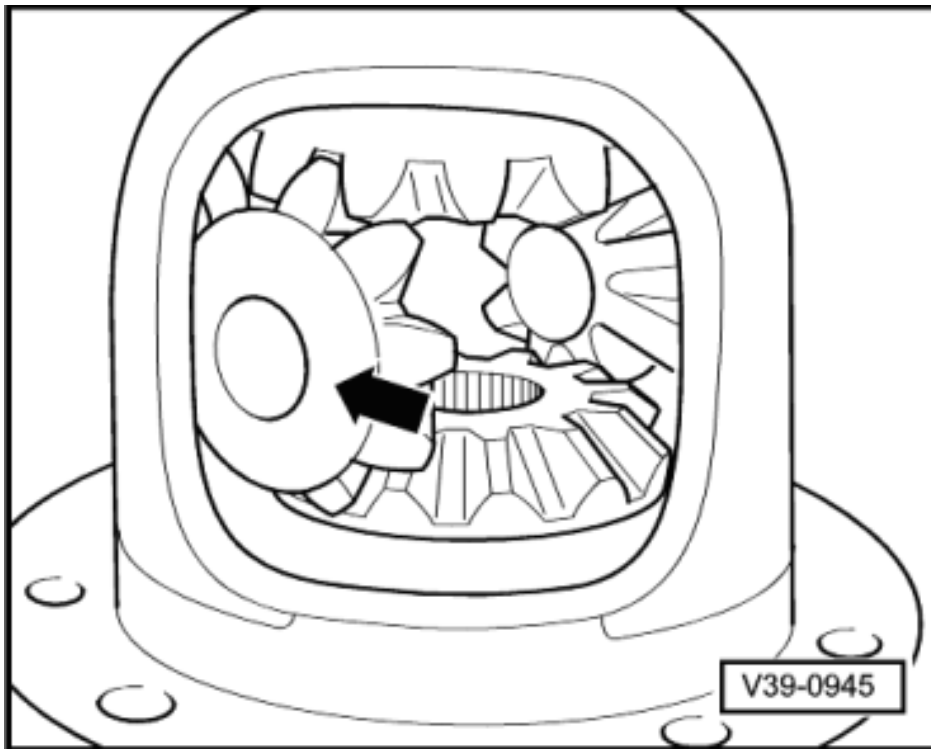
Wear protective gloves

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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.

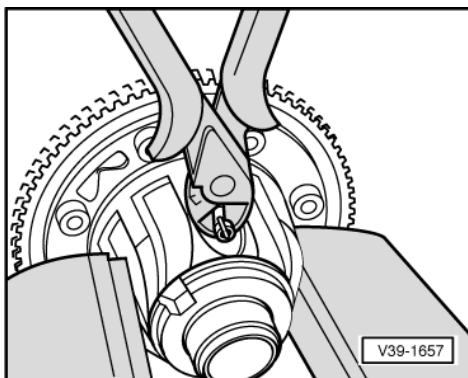


- Allow crown wheel to cool off slightly before inserting bolts. Then tighten to specified torque.



-> Fig.12 Installing bevel gears

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



-> Fig.13 Removing and installing spring sleeve

Removing

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

Installing

- Drive in spring sleeve as far as the stop.



6 - Adjusting drive pinion and crown wheel

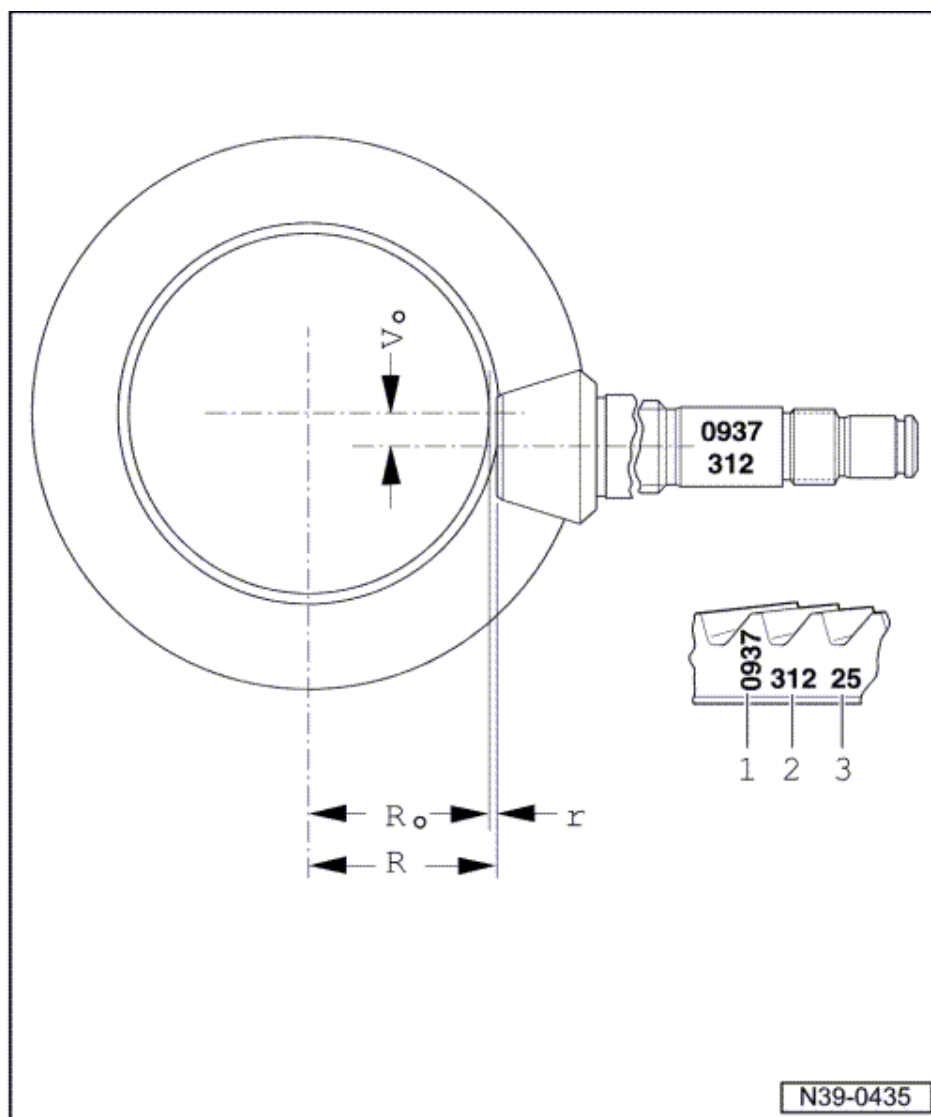
6.1 - Adjusting drive pinion and crown wheel

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 final drive sets; identification

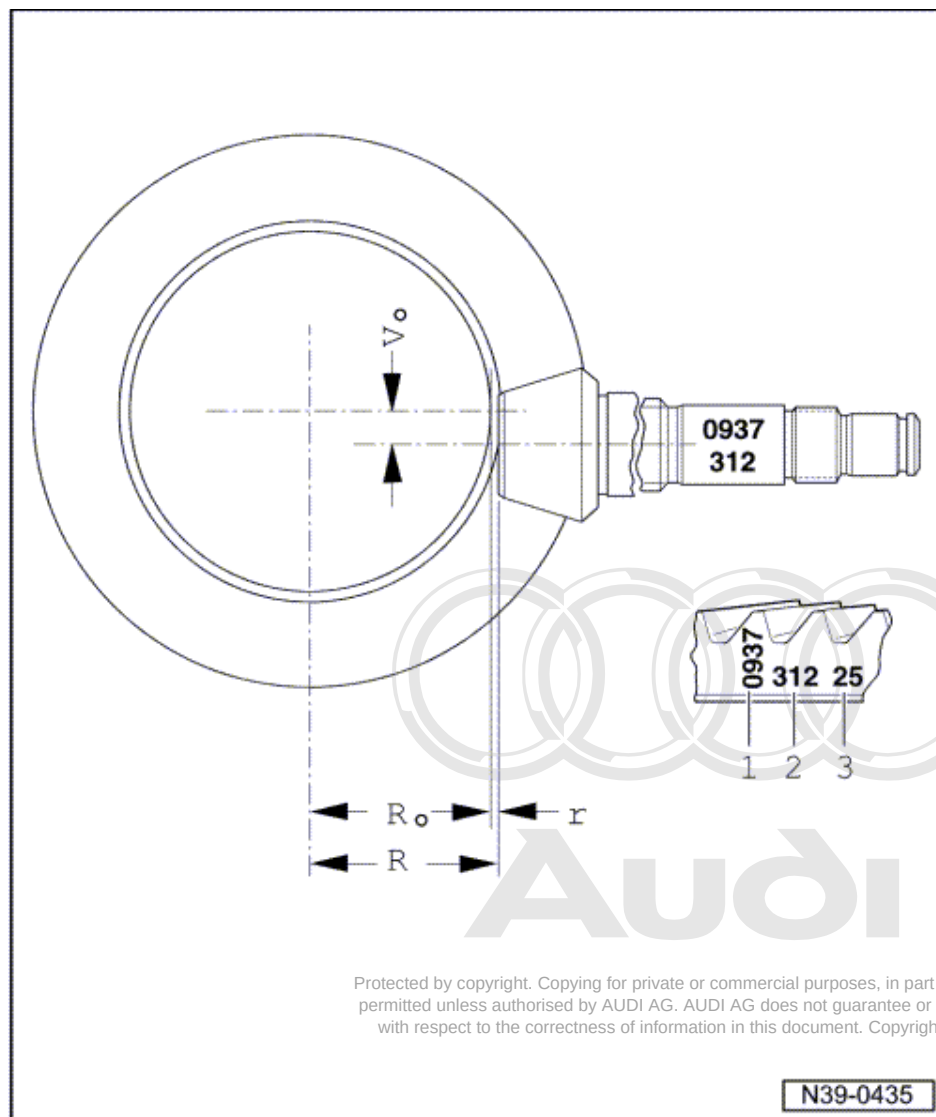




- 1 "0937" indicates Oerlikon final drive set with a ratio of 37 : 9.
- 2 Pairing number (312) of final drive set
- 3 Deviation (tolerance) "r" is based on the test machine master gauge used in production. The deviation "r" is always given in 1/100 mm. Example: "25" means
 $r = 0.25 \text{ mm}$

Ro - Length of test machine master gauge used.

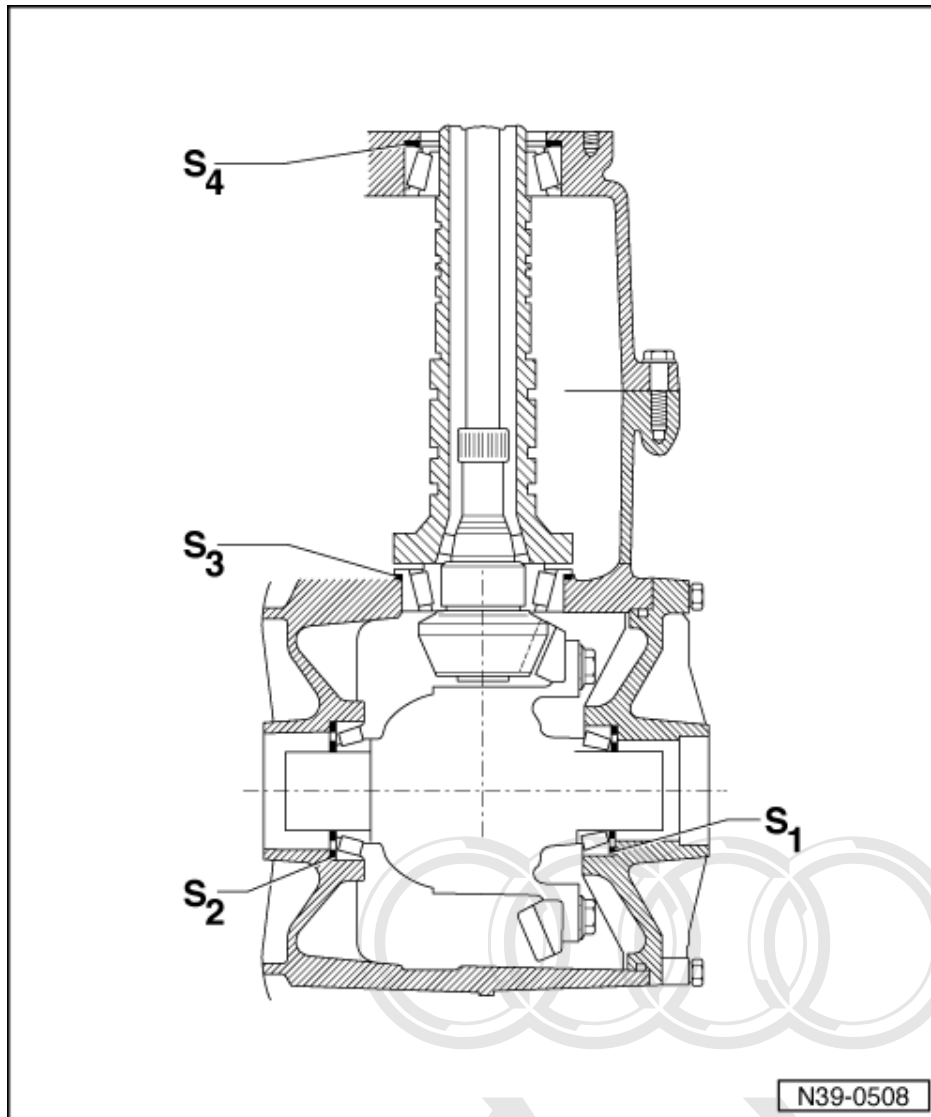
Ro - Crown wheel $\varnothing 170 \text{ mm} = 54.95 \text{ mm}$



R - Actual dimension between crown wheel and face of drive pinion at point with quietest running for this gear set

Vo - Hypoid offset

6.3 - Position of shims



Note:

Adjustment overview when replacing individual components of gearbox =>Page **163**.
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- S1 - Adjustment shim for crown wheel in cover for gearbox housing**
- S2 - Adjustment shim for crown wheel in gearbox housing**
- S3 - Adjustment shim for drive pinion in gearbox housing**
- S4 - Adjustment shim for drive pinion in gearbox cover**

6.4 - Adjustment overview

Note:

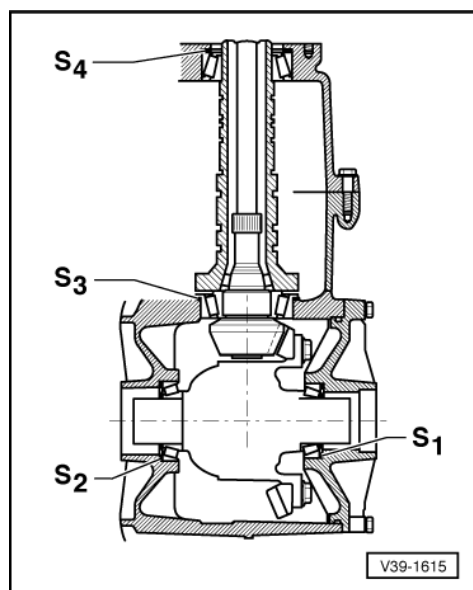
If repairs have been carried out on the gearbox it is only necessary to adjust drive pinion, crown wheel or final drive set if components have been replaced which have a direct effect on the adjustments of the final drive. Refer to following table to avoid unnecessary adjustments:



Parts replaced: ▼	To be adjusted:			
	Crown wheel "S1"+"S2" 1) => Page 176	Drive pinion "S3"+"S4" 1) using deviation "r" => Page 165	Drive pinion "S4" 1) => Page 175	Backlash => Page 180
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 163 .
- 2) Drive pinion and crown wheel; only replace together.
- 3) If the gearbox housing is replaced then the input shaft also needs to be adjusted => Page 113 , adjusting input shaft.

6.5 - Sequence for re-adjusting final drive set



-> When crown wheel and drive pinion have to be adjusted, in the interests of a rational sequence, keep to the following order:

- 1.) Determine total shim thickness "Stotal" for "S1" + "S2" (sets preload for taper roller bearings for differential) => Page 176 onwards.
- 2.) Determine total shim thickness "Stotal" for "S3" + "S4" (sets preload for taper roller bearings for drive pinion) => Page 165 onwards.

- 3.) Distribute total shim thickness "Stotal" for "S3" + "S4" so that the distance from centre of crown wheel to face of drive pinion is the same as distance "R" which was determined during production => Page 172 onwards.
- 4.) Distribute total shim thickness "Stotal" for "S1" + "S2" so that specified backlash exists between crown wheel and drive pinion => Page 181 onwards.

Note:

Overview of components and shims =>Page 163.

6.6 - Adjusting drive pinion

Repairs after which the drive pinion must be adjusted => table on Page 163.

Special tools, testers and auxiliary equipment required

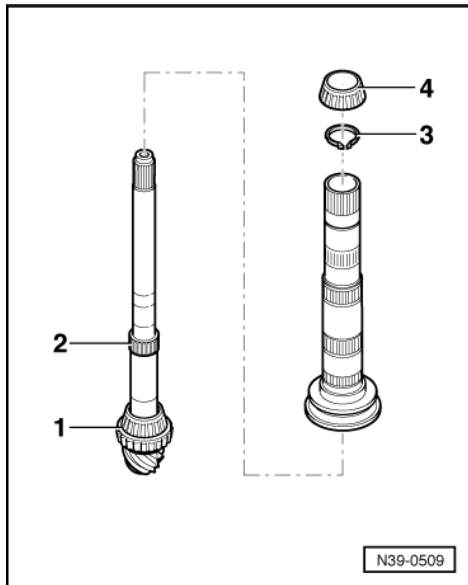
- ◆ Extractor lever for gear set VW 296
- ◆ Universal measuring tool VW 385
- ◆ Universal mandrel VW 385/1
- ◆ Centring disc VW 385/2 (for gearboxes without polygon bearings)
- ◆ 2 x centring disc VW 385/3
- ◆ Measuring plunger VW 385/14
- ◆ Dial gauge extension VW 385/15
- ◆ Measuring plate VW 385/17
- ◆ Master gauge VW 385/30
- ◆ End measuring plate VW 385/33
- ◆ Universal dial gauge bracket VW 387

- ◆ 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 bearing for drive pinion)

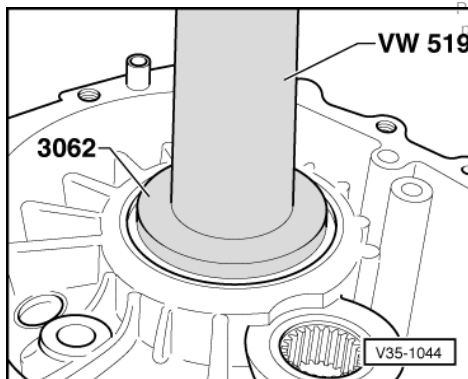
- Differential removed.



- -> Press inner race -1- for double taper roller bearing onto drive pinion and secure in place => Page 115 onwards.
- Fit -2- needle roller bearing.
- Fit circlip -3- onto hollow shaft and press on inner race for taper roller bearing -4- => Page 115 onwards.
- Fit drive pinion in hollow shaft.

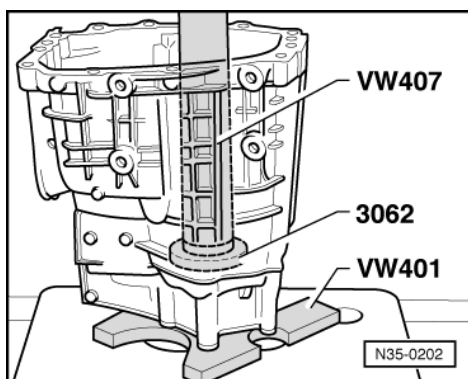
Note:

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



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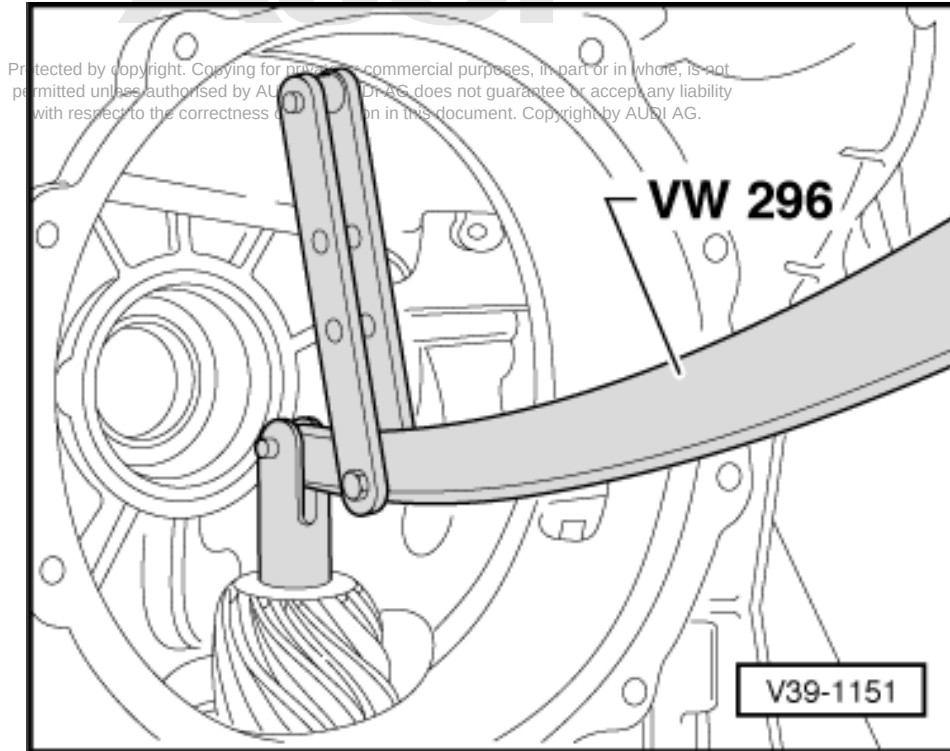
- -> Fit double taper roller bearing outer race for pinion shaft in gearbox housing without shims => Fig. 127 .



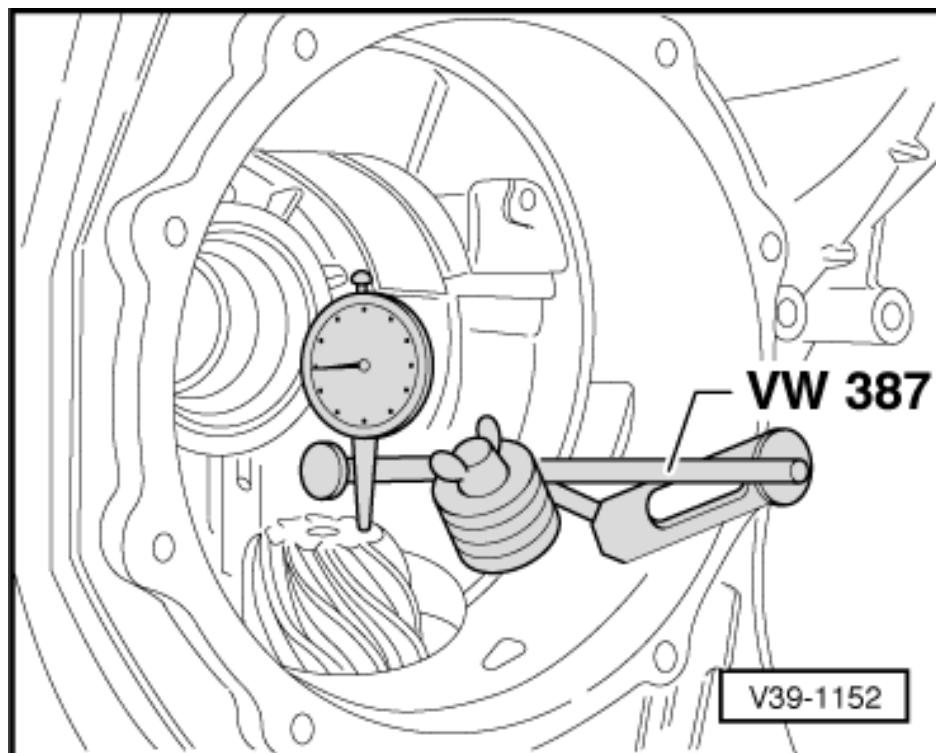
- -> Fit outer race for taper roller bearing for pinion shaft in gearbox cover with shim "S4*" (1.0 mm thick) => Fig. 128 .

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 125.
- Insert completely assembled drive pinion with hollow in gearbox housing.



- 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.

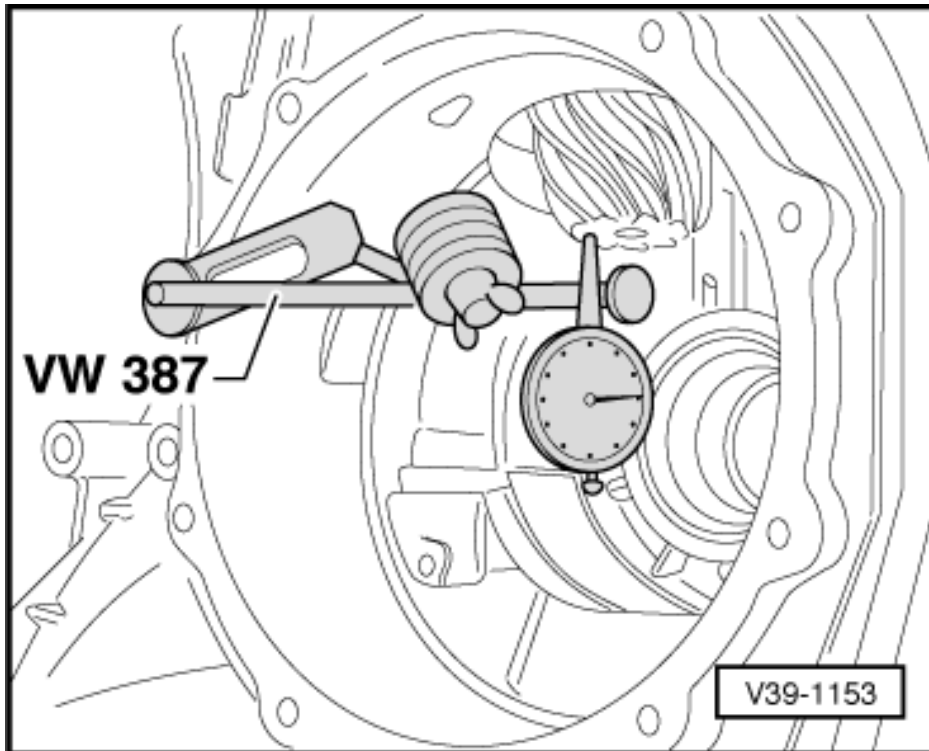
Note:

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



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- -> 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 2 mm preload.

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

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Determining thickness of shim "S3*"

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

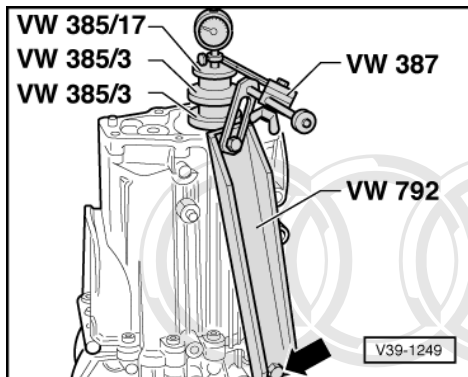
Example:	
Total shim thickness "Stotal" for "S3" + "S4"	1.60 mm
- Inserted shim "S4*"	1.00 mm
= Thickness of shim "S3*"	0.60 mm

- Remove double taper roller bearing outer race, fit shim "S3*" in gearbox housing and install outer race again => Fig. 127.
- Insert completely assembled drive pinion in gearbox housing again.
- Fit gearbox cover and tighten bolts to 22 Nm.



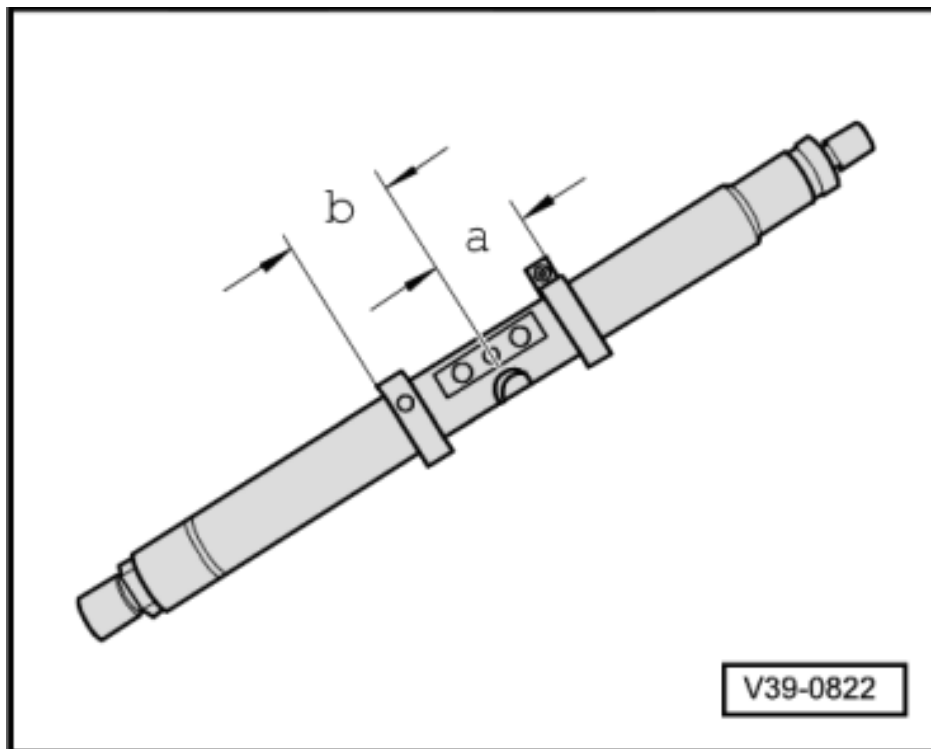
Checking preload of taper roller bearing for drive pinion

- 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.

Determining dimension "e"

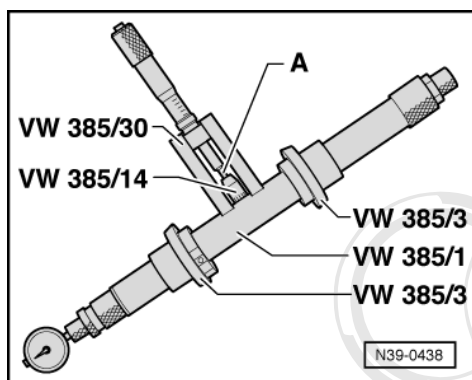


Note:

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:
 - Dimension a = 35 mm

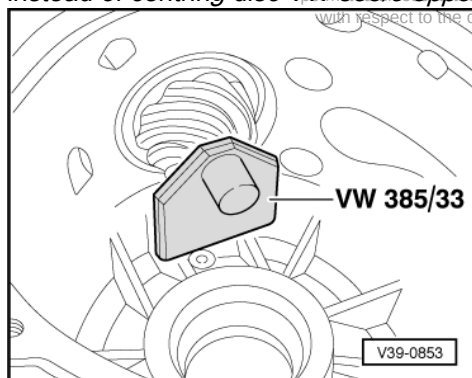
- Dimension b = 75 mm



- -> 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 $R_o = 54.95$ mm (for 170 mm dia. crown wheel) and fit onto mandrel.
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.

Note:

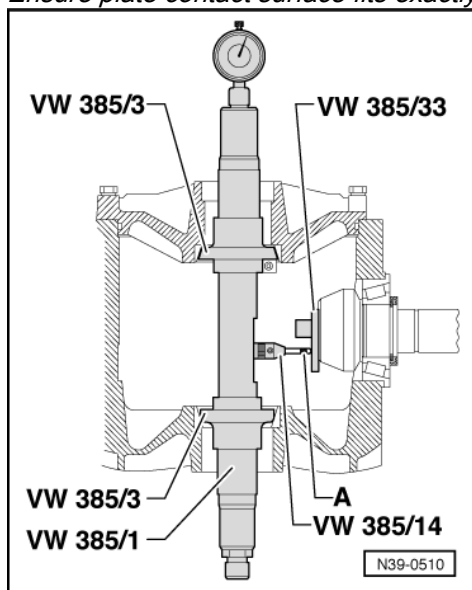
On gearboxes with flange shafts without polygon bearings (=> from Page 2), use centring disc VW 385/2 instead of centring disc VW 385/3 opposite the dial gauge.



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

Note:

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

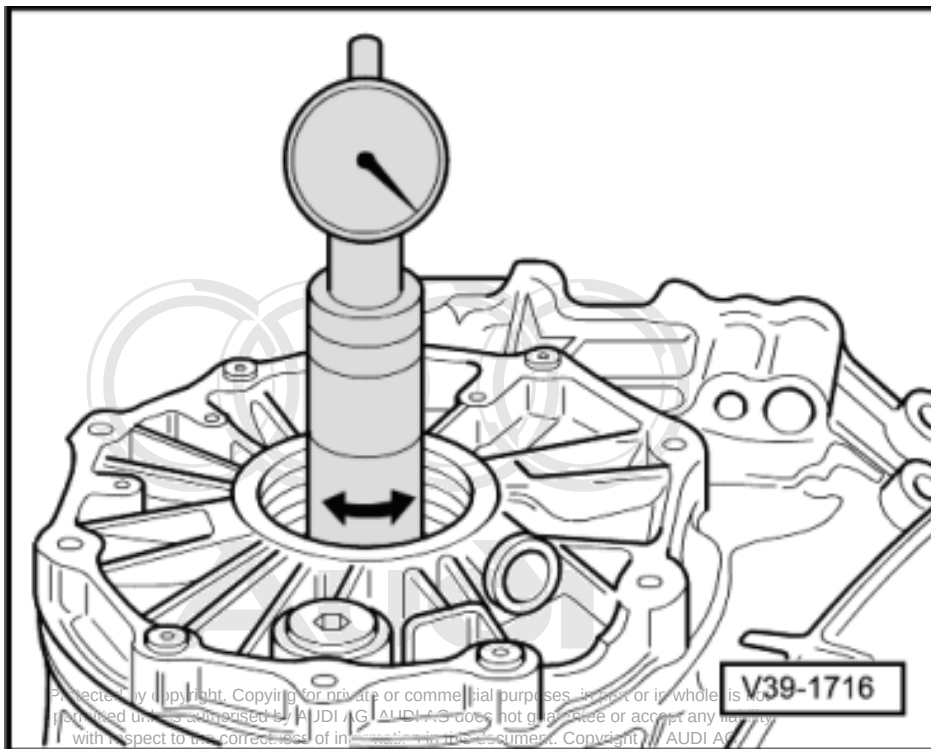




- -> Remove master gauge and insert measuring mandrel in the housing.
 - Dial gauge extension -A- = 6.5 mm long must be fitted
 - The centring disc 385/3 faces towards cover for final drive
- Using the adjustable ring, move 2nd centring disc VW 385/3 out as far as possible so that the mandrel can still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

Note:

On gearboxes with flange shafts without polygon bearings (=> from Page 2), use centring disc VW 385/2 instead of centring disc VW 385/3 opposite the dial gauge.



- -> Turn mandrel until the dial gauge point touches the end measuring plate on drive pinion 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:

$$\text{"S3"} = \text{"S3"} + \text{"r"} + \text{"e"}$$

("e" in black scale)

or

$$\text{"S3"} = \text{"S3"} + \text{"r"} - \text{"e"}$$

("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
- Determined value "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 Catalogue

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.

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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 Catalogue

The following shims are available for "S4"

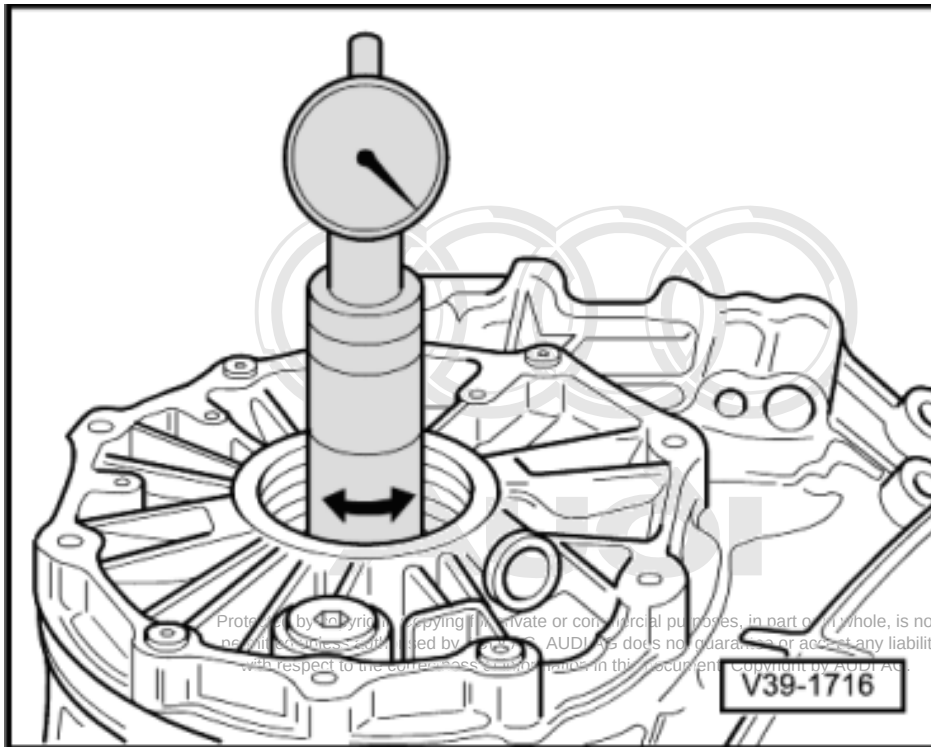
Shim thickness (mm) 1)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

- 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.



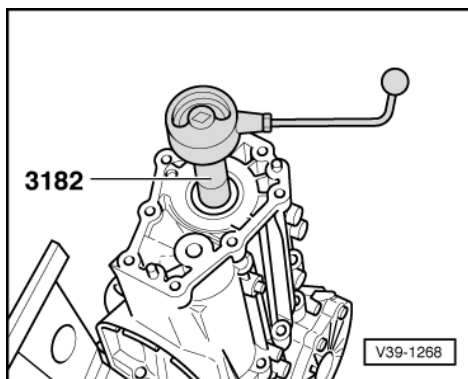
- -> Insert universal mandrel => "Determining measurement 'e'" on Page 170 , perform check measurement.
- Read off dial gauge anti-clockwise (red scale).
 - If the shims have been correctly selected, the deviation "r" (marked on outer circumference of crown wheel) must be shown within a tolerance of ± 0.04 mm.

Note:

Then, (after removing universal mandrel) check again that the dial gauge, with master gauge VW 385/30 or VW 385/15 in place, indicates "0" with 2 mm preload. Otherwise correct adjustments.

Measuring friction 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 specifications:

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

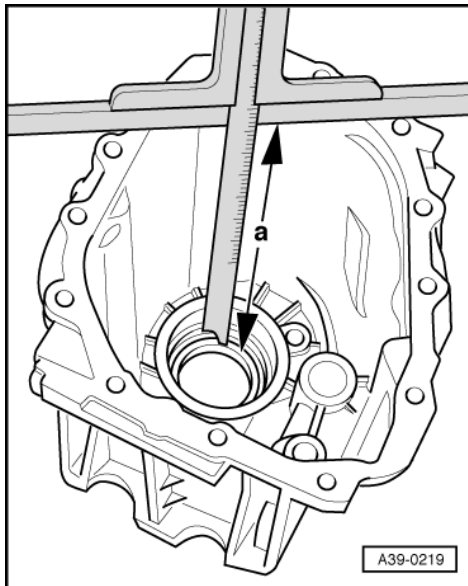
6.7 - Re-determining "S4" shim when fitting new gearbox cover

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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

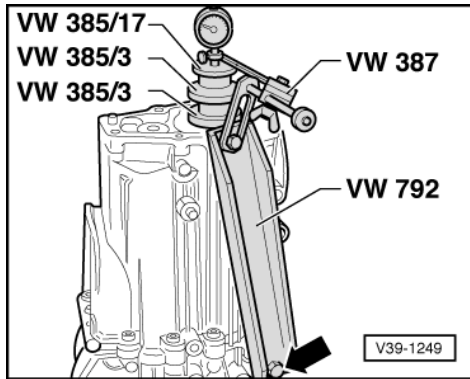
Available shims => table on Page 173 .



- Install outer race for taper roller bearing with shim "S4" in gearbox cover => Fig. 128 .
- Insert completely assembled drive pinion in gearbox housing again.
- Fit gearbox cover and tighten bolts to 22 Nm.

Checking preload of taper roller bearing for drive pinion

- 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

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

- Remove measuring tools.
- Apply thin coat of sealant AMV 188 001 02 to sealing surfaces.
- Retighten gearbox cover bolts to 22 Nm.

6.8 - Adjusting crown wheel

(Adjusting differential)

Repairs after which the crown wheel must be adjusted => adjustment overview on Page 163 .

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 pad VW 472/1
- ♦ Adjustment tool for crown wheel VW 521
- ♦ Torque gauge 0 ... 600 Ncm
- ♦ Dial gauge
- ♦ Dial gauge extension 30 mm

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

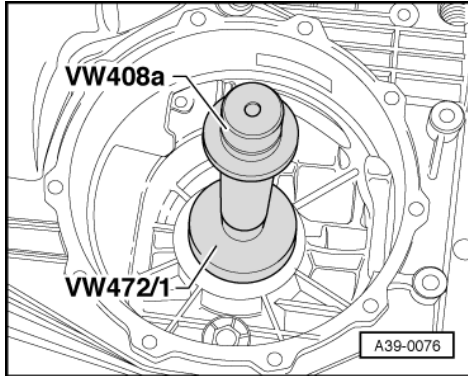
(Adjusting preload of taper roller bearing for differential)

- Drive pinion removed

Note:

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

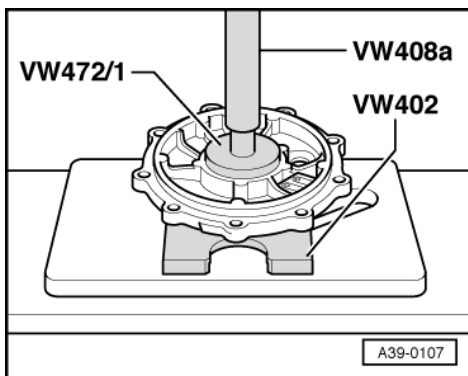
- Remove seal and outer races of both taper roller bearings for the differential.
- Remove shims => Page **151** .



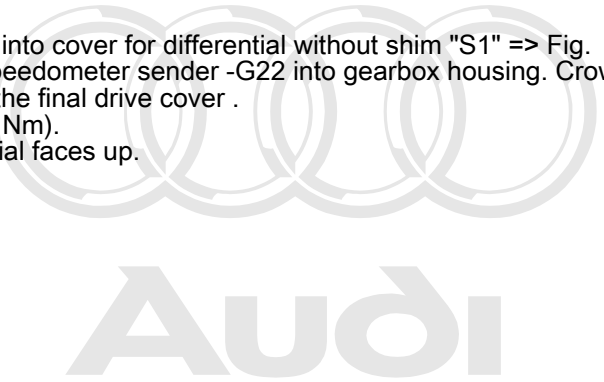
- -> Knock taper roller bearing outer race (small) with shim "S2" into gearbox housing => Fig. **156** . For measurement purposes use a 1.20 mm thick "S2*" shim (2 shims of 0.60 mm).

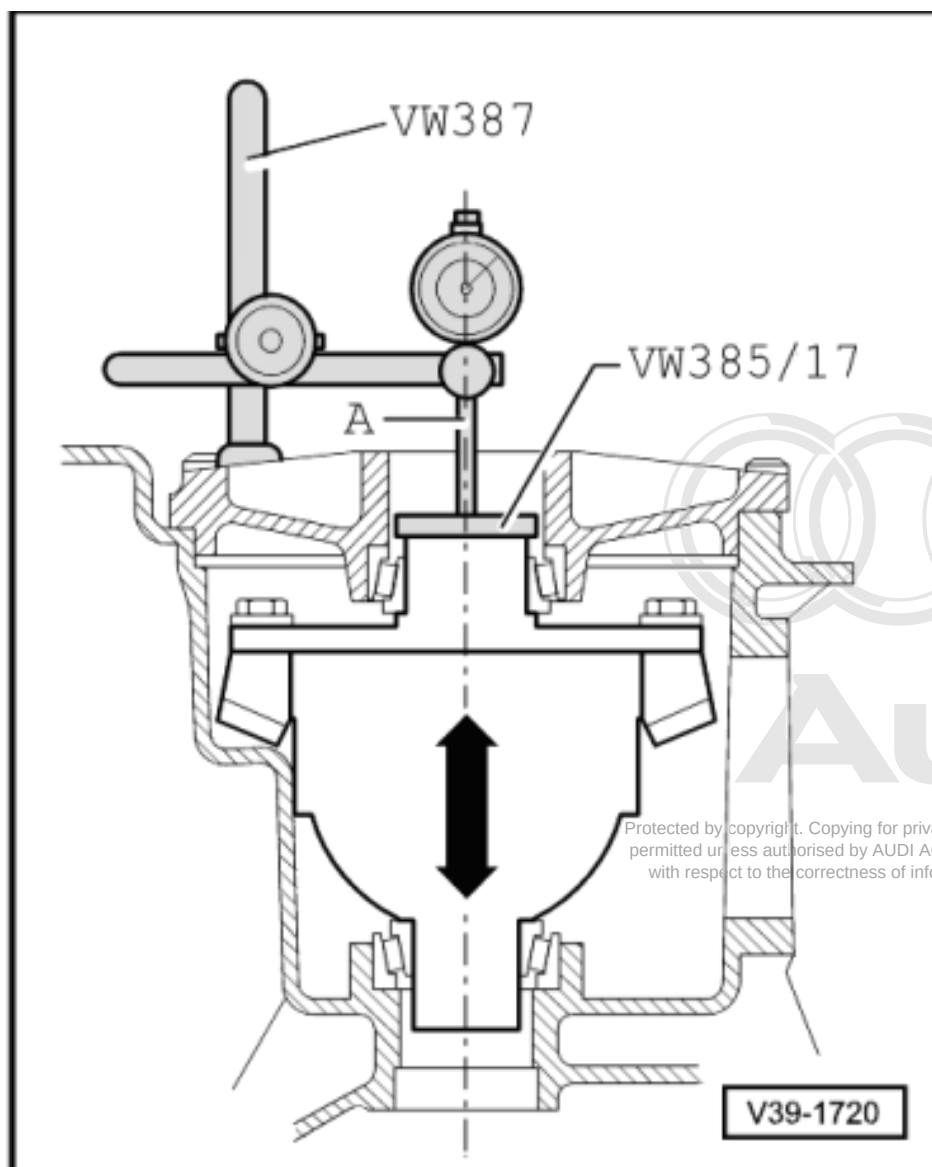
Note:

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 into cover for differential without shim "S1" => Fig. **159** .
- Insert differential without drive wheel for speedometer sender -G22 into gearbox housing. 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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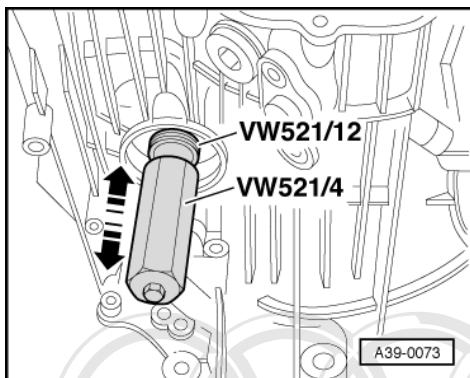
- Turn differential 5 turns in both directions to settle the taper roller bearing.
- -> Assemble measuring equipment, use a 30 mm dial gauge extension.
- Set dial gauge (3 mm measuring range) -A- to "0" with 2 mm preload.

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

Notes:



- ♦ -> To lift differential, attach special tools VW 521/4 and VW 521/8 (for gearboxes without polygon bearings) or VW 521/12 (for gearboxes with polygon bearings) on right of differential (housing side).
- ♦ If measurement has to be repeated, differential must again be turned 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:

$$\text{"S1*"} = \text{"Stotal"} - \text{"S2*"} - \text{bearing preload}$$

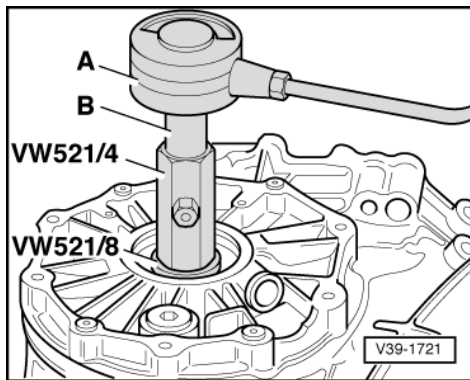
Example:

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 friction 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.
- Drive pinion removed



- -> Fit torque gauge 0 ... 600 Ncm onto differential. (Use VW 521/8 for gearboxes without polygon bearings, and VW 521/12 for gearboxes with polygon bearings).
- Read off friction torque.

Frictional torque specifications:

New bearings	Used bearings
200 ... 350 Ncm	30 ... 60 Ncm

Note:

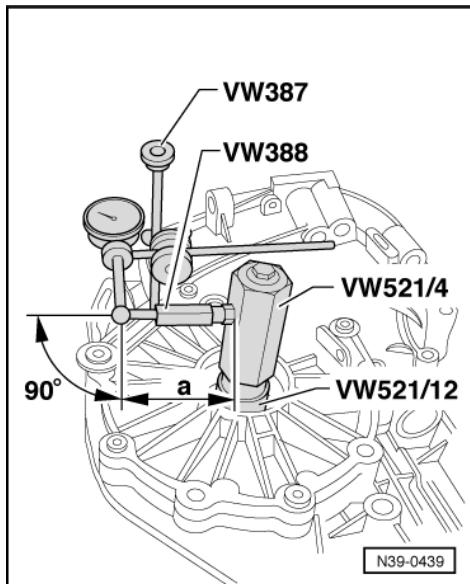
If final drive set is being re-adjusted, adjustment of drive pinion should be performed now, and adjustment should be checked =>Page 165.

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Measuring backlash

(Position of crown wheel in gearbox housing)

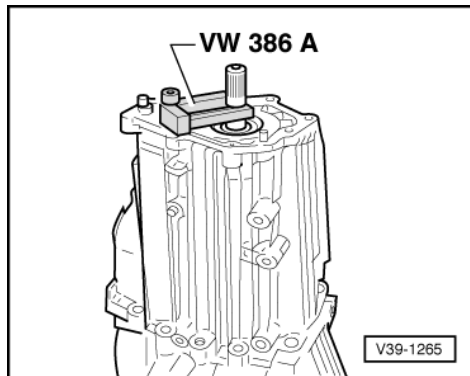
- Pinion shaft with shims "S3" and "S4" installed
- Install differential.
- Turn differential 5 turns in both directions so that the taper roller bearings settle.



- -> Secure dial gauge retainer VW 387 onto housing.
- Insert crown wheel adjusting device VW 521/4 and VW 521/8 (gearboxes without polygon bearings) or VW 521/12 (gearboxes with polygon bearings).
- 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).
- Set dial gauge to "0" with 2 mm preload.

- 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 mm 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 Catalogue



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

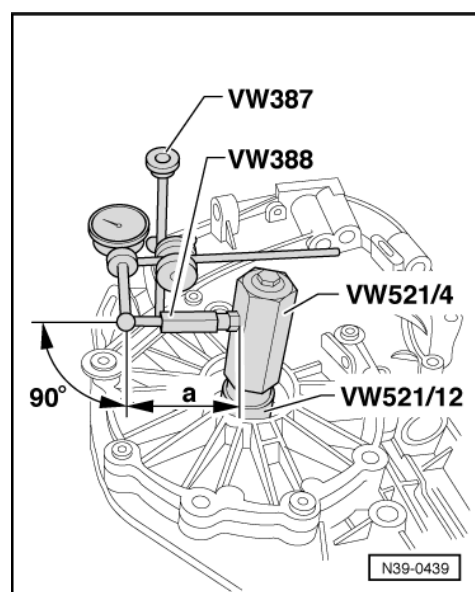
- Determine shim(s) as accurately as possible from table. Part numbers

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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.



-> Performing check measurement

- After installing shims "S1" and "S2", turn the differential 5 turns in both directions so that the taper roller bearings settle.

Note:

For gearbox without polygon bearings, use special tool VW 521/8 instead of VW 521/12 as illustrated.

- Measure backlash four times on circumference.
 - Specification: 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 when the adjustment is repeated.
- ♦ The individual measurements must not differ by more than 0.06 mm from each other.

7 - Servicing propshaft

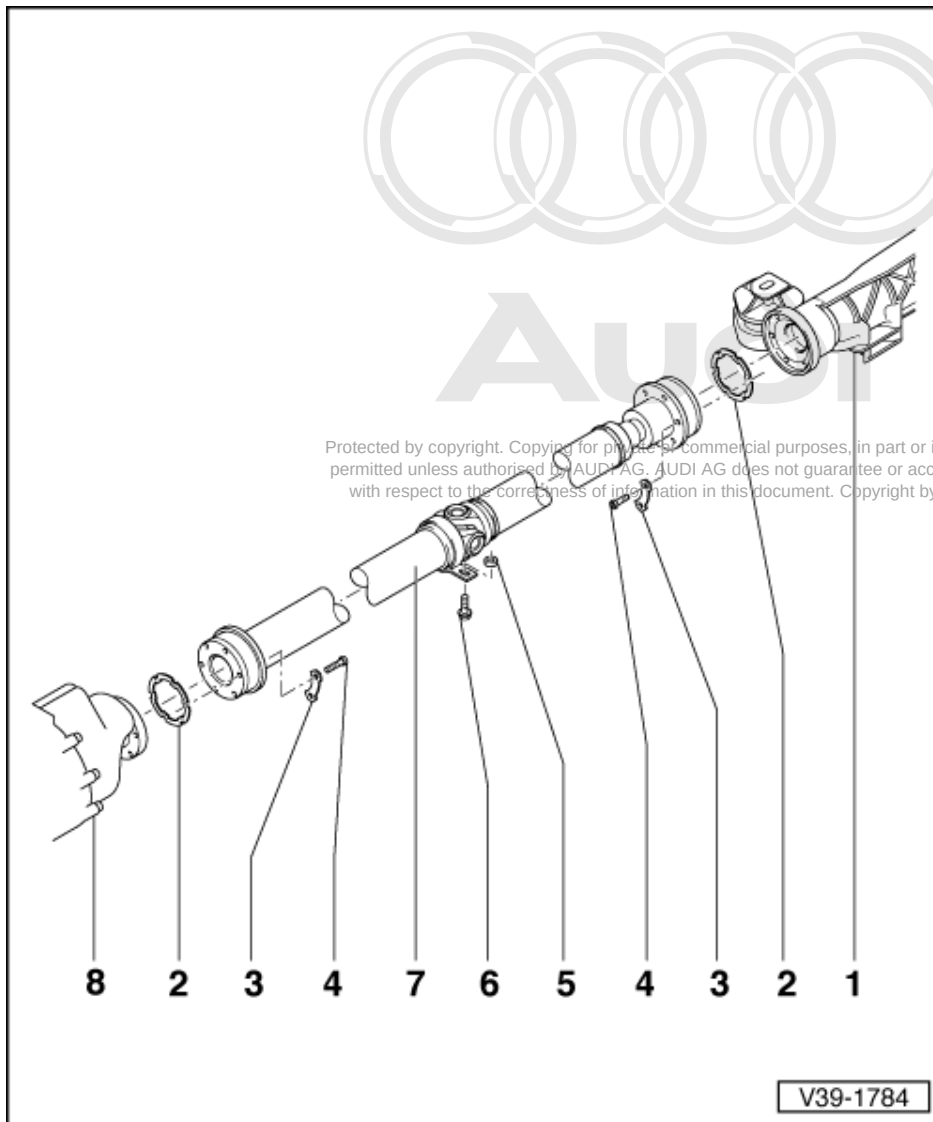
7.1 - Servicing propshaft

Notes:

- ♦ Repair instructions => Page 9 .
- ♦ 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 propshaft is only detached at the gearbox or from rear final drive then propshaft is to be tied-up or supported at constant velocity joint.
- ♦ Before removing, mark position of propshaft joint in relation to flange. Reinstall in same position, otherwise this can cause excessive imbalance, bearing damage and droning noise.
- ♦ If complaints are received (noises, vibrations), it is essential to check whether correct adjustment of propshaft rectifies the fault before replacing propshaft.
- ♦ After removing propshaft from rear final drive, additional balance disc (thick washer) that may be located between lock plate and bolt head must not be reinstalled.



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1 Rear final drive

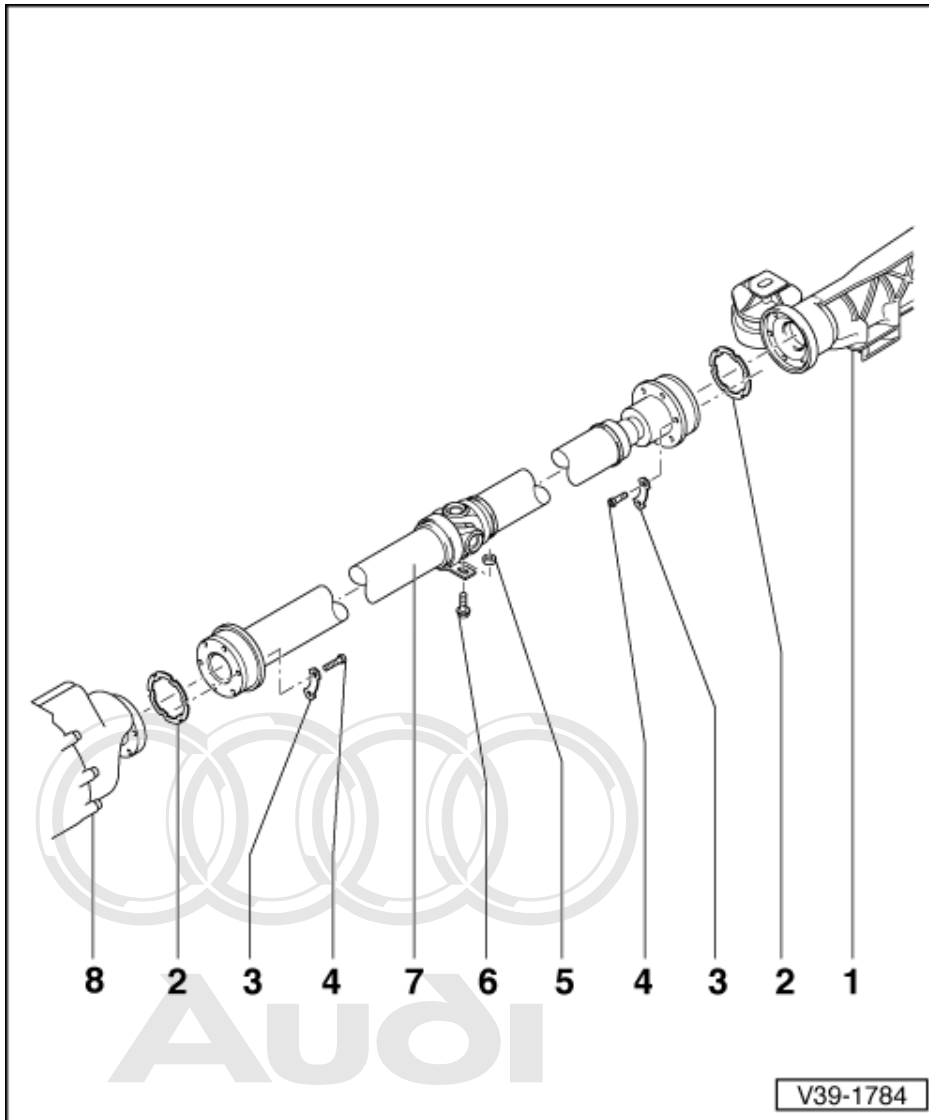
2 Gasket

- ◆ Replace
- ◆ Pull off protective foil and stick self-adhesive side of gasket onto flange shaft
- ◆ Remove grease from flange shaft

3 Base plate

4 Bolts - 55 Nm

- ◆ Self-locking
- ◆ Replace
- ◆ Threads for bolts in flange shafts must always be cleaned (e.g. with a thread tap).



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- 5 Shims
 - ♦ Adjusting propshaft
=> Page 189
- 6 Bolt - 23 Nm
 - ♦ Qty. 2
- 7 Propshaft
 - ♦ Adjusting => Page 189
- 8 Manual gearbox

7.2 - Removing and installing propshaft

Special tools, testers and auxiliary equipment required

- ♦ Assembly device 3298

Removing

- Observe notes=> Page 183 .



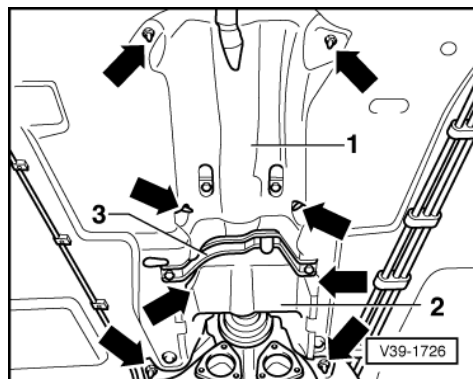
- Remove rear section of exhaust system (behind exhaust pipe clamp(s):

=> 4-cyl. fuel injection engine, Mechanics; Repair group 26

=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26

=> 6-cyl. fuel injection engine, Mechanics; Repair group 26

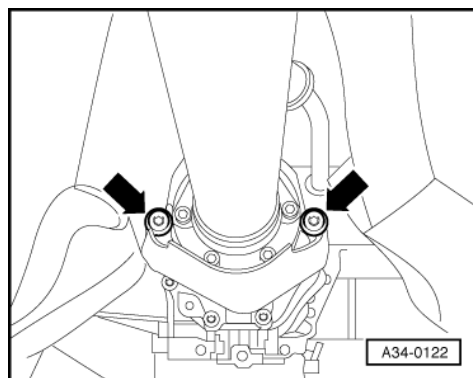
Note:



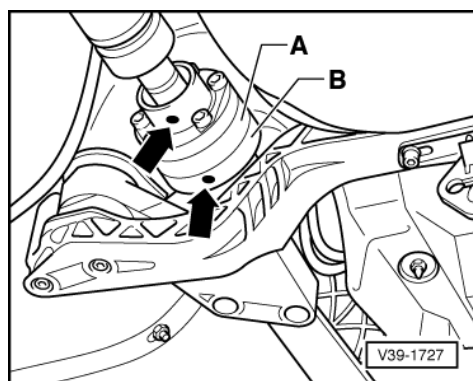
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Avoid excessive bending of the flexible pipe connection (decoupling element) on the front exhaust pipe. The angle between the catalytic converter and the front exhaust pipe must not exceed 10°, otherwise the flexible connection will be damaged.

- -> Remove heat shields -1- and -2- -arrows-.
- Unbolt cross member -3- below propshaft.



- -> Remove heat shield for propshaft (if fitted) from cover for Torsen differential -arrows-.

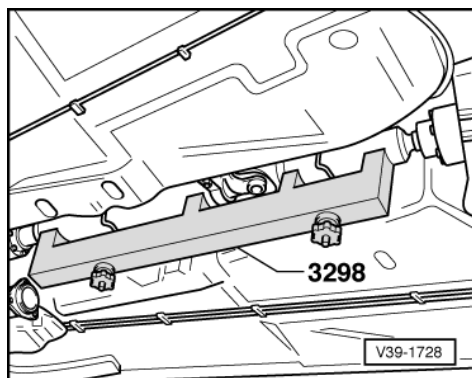


- -> Check for presence of a factory mark (coloured dot -arrows-) at the prop shaft and at the rear final drive flange/prop shaft. If there is no mark, make a coloured mark on rear final drive -B- to indicate the position of prop shaft flange -A-.

Note:

This marking is only required if same propshaft is to be re-installed later.

- Release fastening bolts for prop shaft flange.
- Unscrew three upper securing bolts on each propshaft constant velocity joint.
- Loosen securing bolts of centre propshaft mounting slightly.



- -> Attach 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 propshaft out at rear final drive with assembly device.

Note:

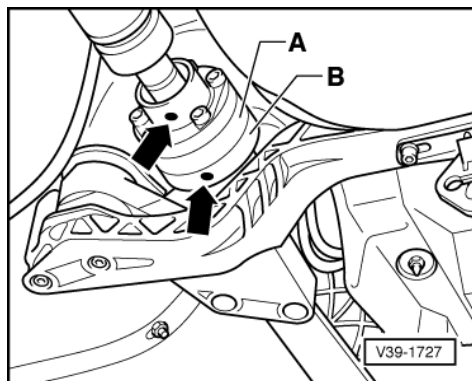
Only transport and store propshaft when extended.

Installing

Install in reverse order, paying attention to the following:

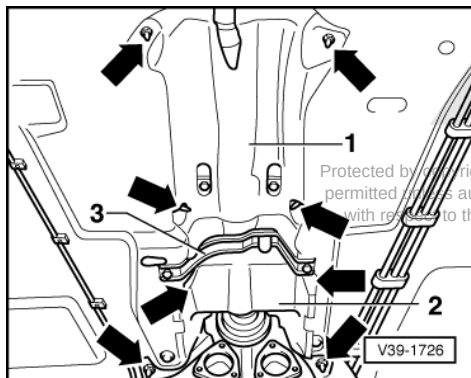
Notes:

- ♦ It is essential that locking fluid remaining in the threads in the flange shafts on the gearbox and rear final drive is cleaned out after removing propshaft. Otherwise there is a danger that new bolts will seize when they are screwed in and then shear if they have to be removed later.
- ♦ Threaded holes can be cleaned with a thread tap.
- ♦ Replace gaskets on flange shafts (pull off 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 being installed and factory marking on rear final drive flange is no longer visible, radial run-out on rear final drive flange must be measured => Page 188 and coloured marking on propshaft must then be aligned with new marking on flange.
 - ♦ Replace prop shaft bolts (self-locking).
- Adjust propshaft after installing => Page 189 .



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- -> Install heat shields -1- and -2- above propshaft.
- Observe position of cross member -3- below propshaft.
 - Side with shoulder points in direction of travel to left.
- Align exhaust system free of stress

=> 4cyl. fuel injection engine, Mechanics; Repair group 26

=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26

=> 6-cyl. fuel injection engine, Mechanics; Repair group 26

Tightening torques

Component	Nm
Propshaft to gearbox (drive flange) M8	55
Prop shaft to final drive (input flange) M8	55
Propshaft centre mounting to body	23
Heat shield for propshaft to gearbox	23
Cross member to body	25
Catalytic converter to front exhaust pipe	25
Clamp for exhaust pipe	40

7.3 - Measuring radial run-out at flange shaft of rear final drive

Special tools, testers and auxiliary equipment required

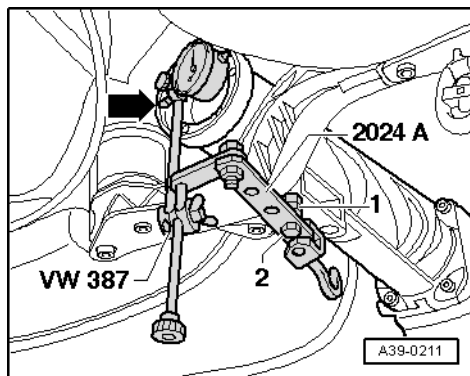
- ♦ Universal dial gauge bracket VW 387
- ♦ Lug from lifting appliance 2024 A
- ♦ Dial gauge

Notes:

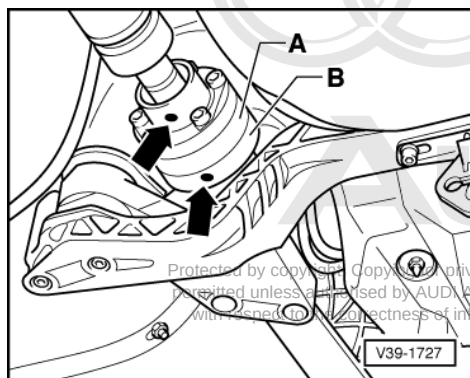
- ♦ It is always necessary to measure radial run-out when thrust tube has been removed. Remove old paint marking and make new marking.

- ◆ If a new propshaft is being installed and marking on flange shaft of rear final drive is no longer visible, point of maximum radial run-out must be measured with dial gauge and marked with paint.
- ◆ Paint marking on propshaft is then brought into alignment with this paint marking => Page 187 .
- ◆ 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 183 .

- 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 the dial gauge to the ground diameter in propshaft flange -arrow- and set to "0" with a preload of 1 mm.
- 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.
- Make a paint mark at point of greatest radial run-out on flange exterior (equates to greatest distance from rotational axis).
- Remove the old marking on the propshaft flange.



- -> When installing propshaft, marking on propshaft flange -A- must be aligned with marking on rear final drive flange -B- -arrows-.
- Install propshaft => Page 187 .

Tightening torques

Component	Nm
Front cross member for rear final drive to body M10	40

7.4 - Adjusting propshaft

Special tools, testers and auxiliary equipment required

- ◆ Assembly device 3298



- Observe notes=> Page 183 .

Adjusting operation should be carried out with scrupulous care as a poorly adjusted propshaft is frequently a cause of vibrations and rumbling noises.

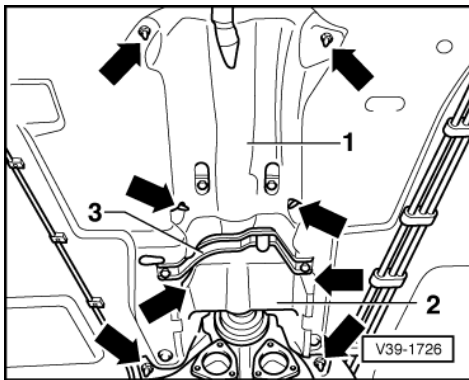
- Remove rear section of exhaust system (rearwards of exhaust pipe clamp(s):

=> 4-cyl. fuel injection engine, Mechanics; Repair group 26

=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26

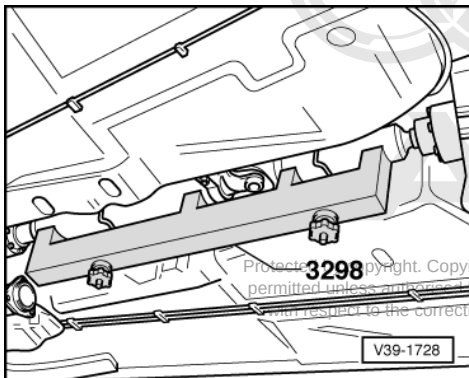
=> 6-cyl. fuel injection engine, Mechanics; Repair group 26

Note:



Avoid excessive bending of the flexible pipe connection (decoupling element) on the front exhaust pipe. The angle between the catalytic converter and the front exhaust pipe must not exceed 10°, otherwise the flexible connection will be damaged.

- -> Remove heat shields -1- and -2- -arrows-.
- Unbolt cross member -3- below propshaft.
- Loosen securing bolts of centre propshaft mounting slightly.



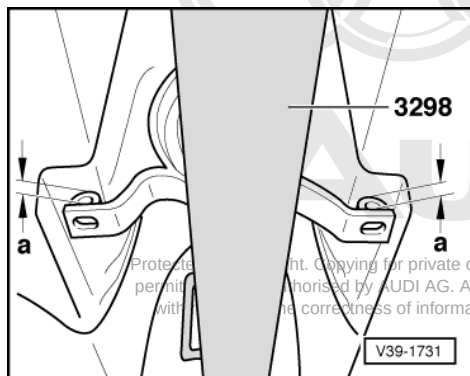
- -> Attach assembly device 3298 and tighten plastic nuts.

Note:

Never fit assembly appliance onto balance plates.

- Remove securing bolts and shims from centre mounting.

Adjusting propshaft height



- Align centre propshaft mounting so that the dimension -a- on left-hand side is the same as dimension -a- on right-hand side.
- -> Measure dimension -a-.
- Determine shim from table. Part numbers

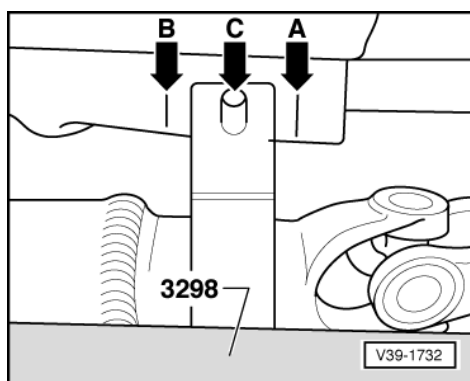
=> Parts Catalogue

The following shims are available:

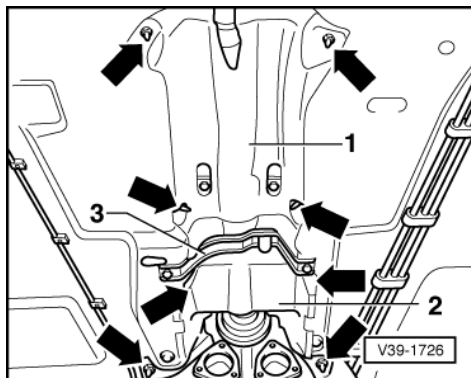
Dimension -a- (mm)	Shim thickness (mm)
0 ... 3.0	-
3.1 ... 5.0	2
5.1 ... 7.0	4
7.1 ... 9.0	6
9.1 ... 11.0	8
11.1 ... 13.0	10

- Install correct shims on left and right.

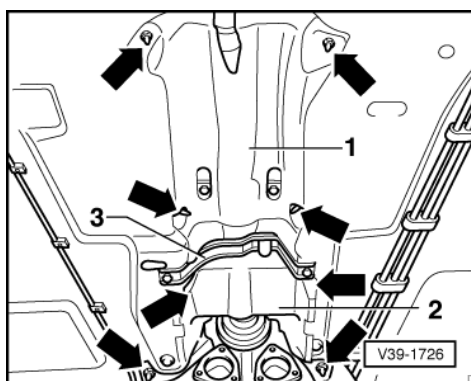
Aligning propshaft longitudinally



- -> Slide propshaft with assembly device to rear onto stop.
- Mark position of centre mounting on body -arrow A-.
- Then slide propshaft with assembly device to front onto stop.
- 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 shields -1- and -2- above propshaft.



- -> Observe position of cross member -3- below propshaft.
- Side with shoulder points in direction of travel to left.
- Align exhaust system free of stress

=> 4cyl. fuel injection engine, Mechanics; Repair group 26

=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26

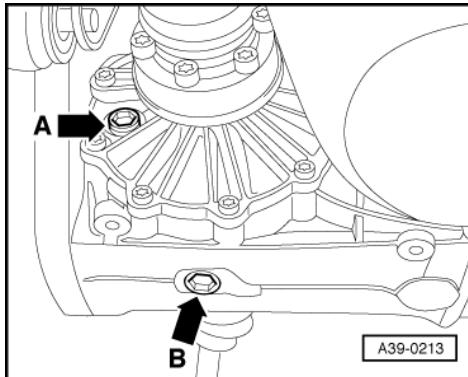
=> 6-cyl. fuel injection engine, Mechanics; Repair group 26

Tightening torques

Component	Nm
Propshaft centre mounting to body	23
Cross member to body	25
Clamp for exhaust pipe	40

8 - Checking oil level in rear final drive

8.1 - Checking oil level in rear final drive



- -> Unscrew oil filler plug -arrow A-.
- Specification: 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	25

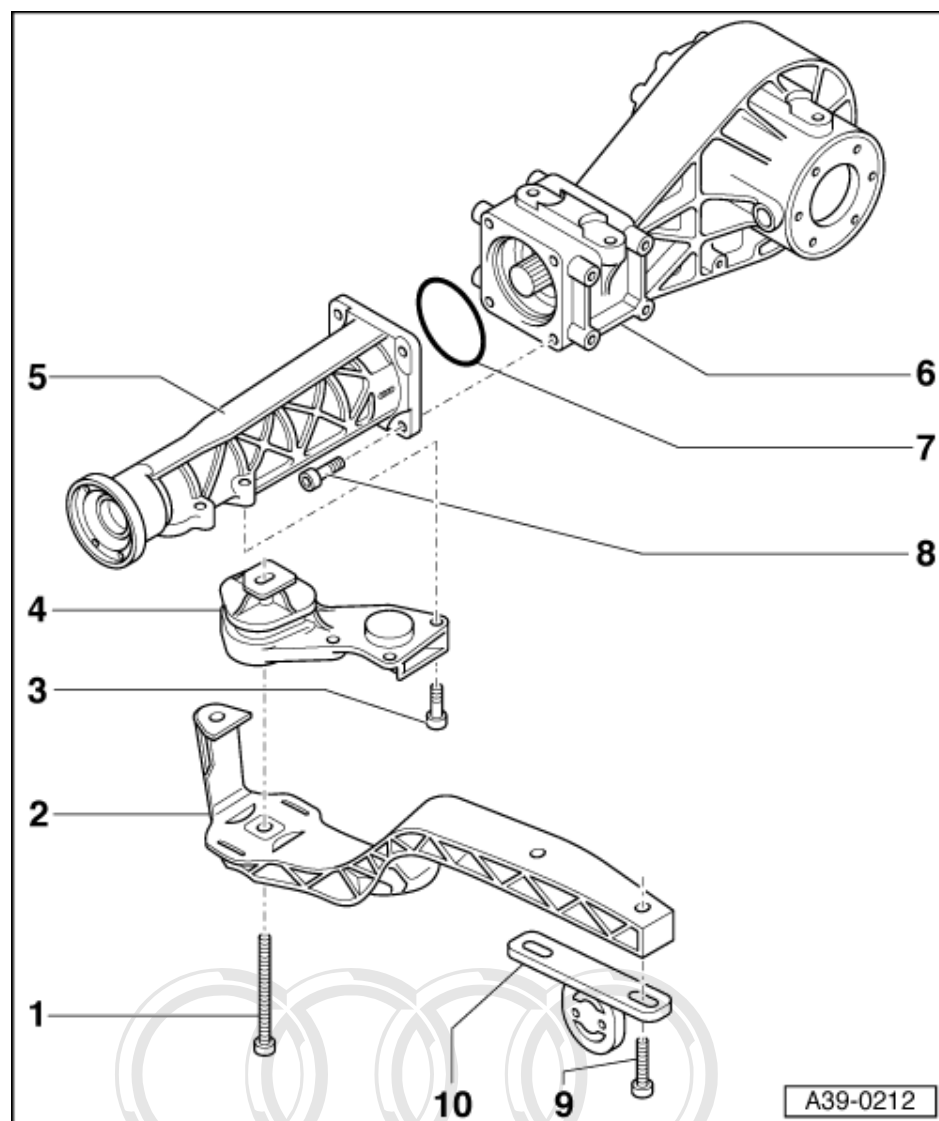


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9 - Removing and installing thrust tube

9.1 - Removing and installing thrust tube



9.2 - Assembly overview

- 1 Bolt - 40 Nm
- 2 Front cross member
- 3 Bolt - 40 Nm
- 4 Gearbox support
- 5 Thrust tube
- 6 Housing of rear final drive
- 7 O-ring
 - ♦ Replace
- 8 Bolt - 35 Nm
- 9 Bolt - 20 Nm
- 10 Bracket

- ♦ For exhaust system

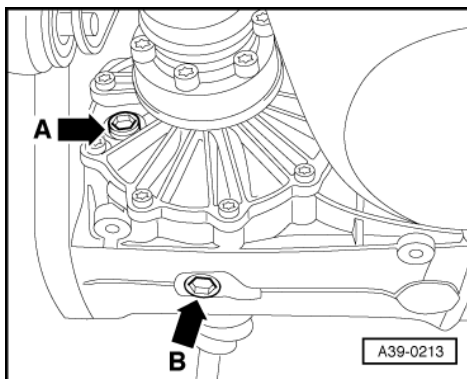
9.3 - Removing and installing thrust tube

Special tools, testers and auxiliary equipment required

- ♦ Multi-purpose tool VW 771 and 771/15
- ♦ Drip tray V.A.G 1306
- ♦ Universal mount V.A.G 1359/2
- ♦ Engine/gearbox jack V.A.G 1383 A

Removing

- Rear final drive installed

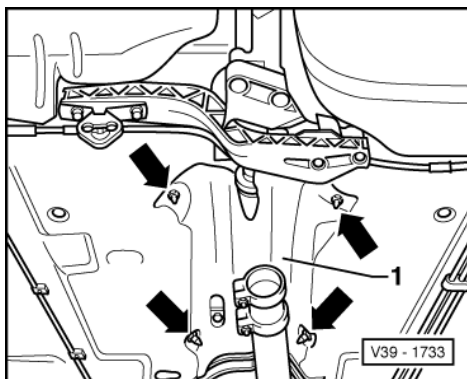


- -> Place drip tray V.A.G 1306 underneath and drain gearbox oil-arrow B-.
- Remove exhaust system behind front exhaust pipe:

=> 4-cyl. injection engine, Mechanics; Repair group 26; Removing and installing parts of exhaust system Removing and installing parts of exhaust system

=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26

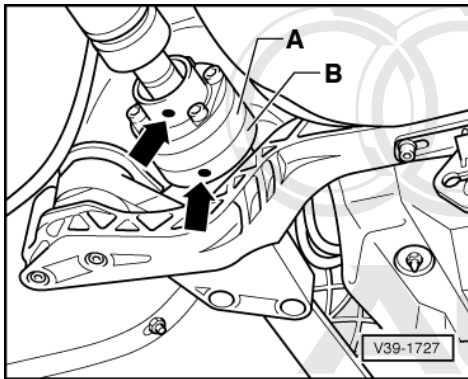
=> 6-cyl. fuel injection engine, Mechanics; Repair group 26



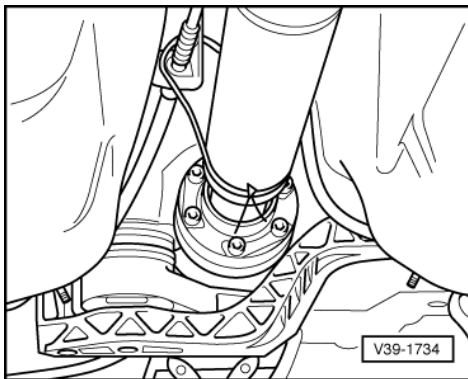
- -> Remove heat shield -1- -arrows-.
- Remove heat shield next to rear final drive.



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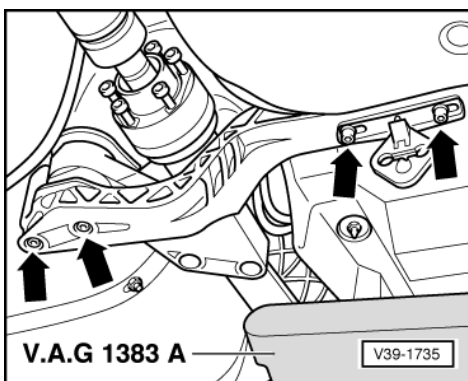
- -> Check whether there is a factory marking (paint spot) on propshaft. If there is no mark, make a coloured mark on rear final drive -B- to indicate the position of prop shaft flange -A-.
- Unscrew fastening bolts for propshaft flange.



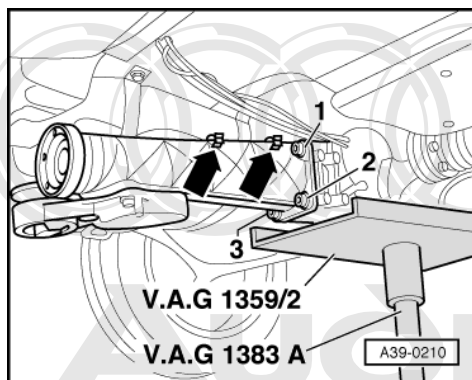
- -> Secure propshaft to handbrake cable bracket with wire.

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 183.



- Support final drive with gearbox lifter V.A.G 1383 A.
- -> Unscrew bolts -arrows- from front of cross member for rear final drive.
- Detach front cross member.



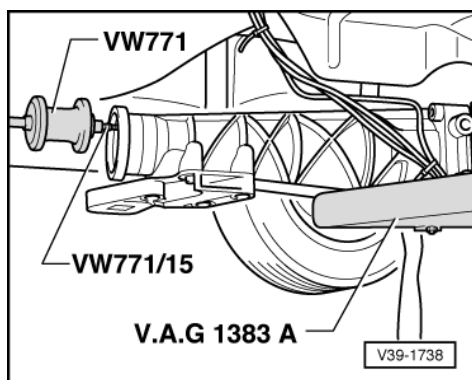
- -> Unclip electrical wiring and hoses for differential lock actuator at clips -arrows-.
- Lower final drive about 10 cm.

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Remove 4 bolts for thrust tube - 1, 2, 3, 4 -

Note:

Fourth bolt is not visible in illustration.



- -> Pull off flange shaft with thrust tube.

Installing

Install in reverse order, paying attention to the following:

Notes:

- ◆ It is essential that locking fluid remaining in the threads in the flange shafts on the gearbox and rear final drive is cleaned out after removing propshaft. Otherwise there is a danger that new bolts will seize when they are screwed in and then shear if they have to be removed later.
 - ◆ 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 propshaft, measure radial run-out at flange on final drive=>Page 188 and bring marking on propshaft into alignment with new marking on flange.
 - Align exhaust system free of stress

=> 4-cyl. fuel injection engine, Mechanics; Repair group 26

=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26



=> 6-cyl. fuel injection engine, Mechanics; Repair group 26

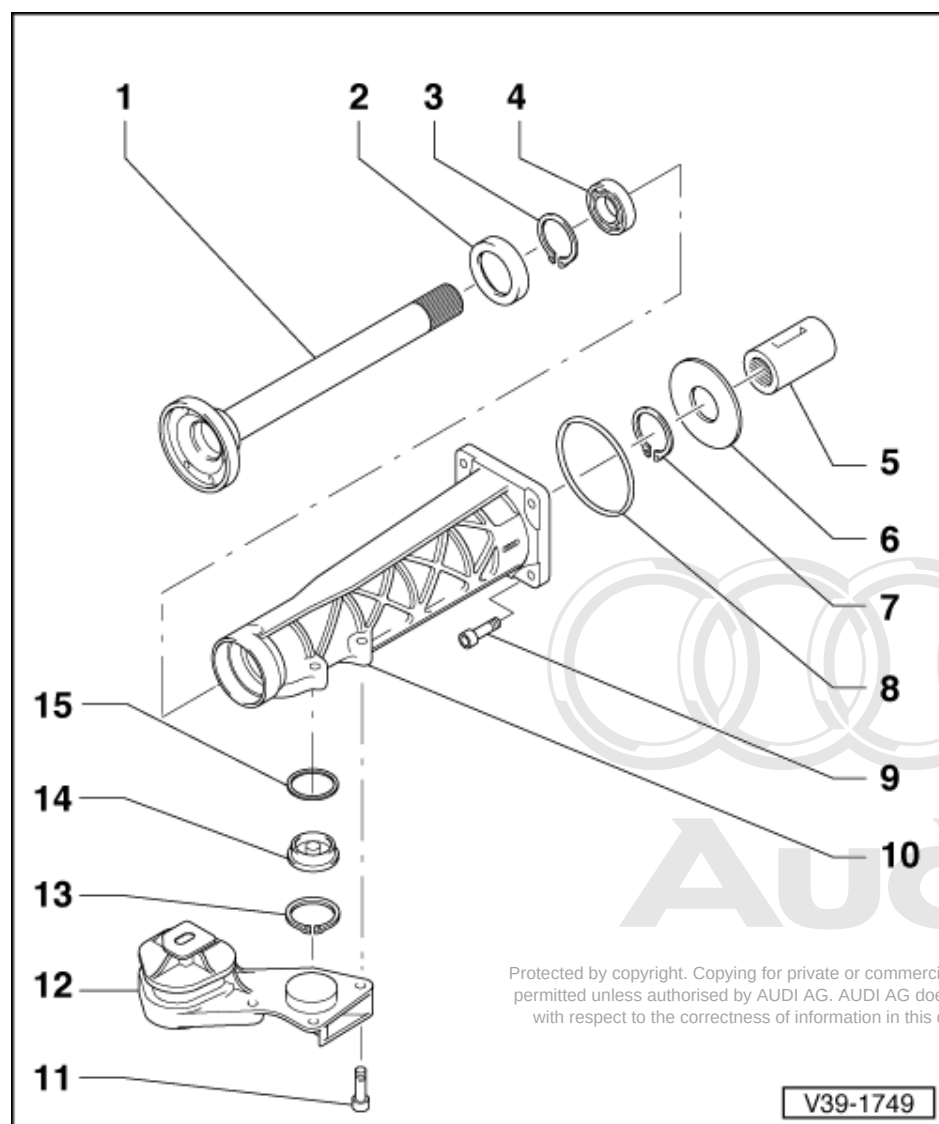
- Top-up gear oil in rear final drive and check oil level => Page 193 .

Tightening torques

Component	Nm
Thrust tube to rear final drive	35
Propshaft to final drive (input flange) M8	55
Front cross member for rear final drive to body M10	40
Front cross member for rear final drive with ex- haust system bracket to body M8	23
Clamp for exhaust pipe	40

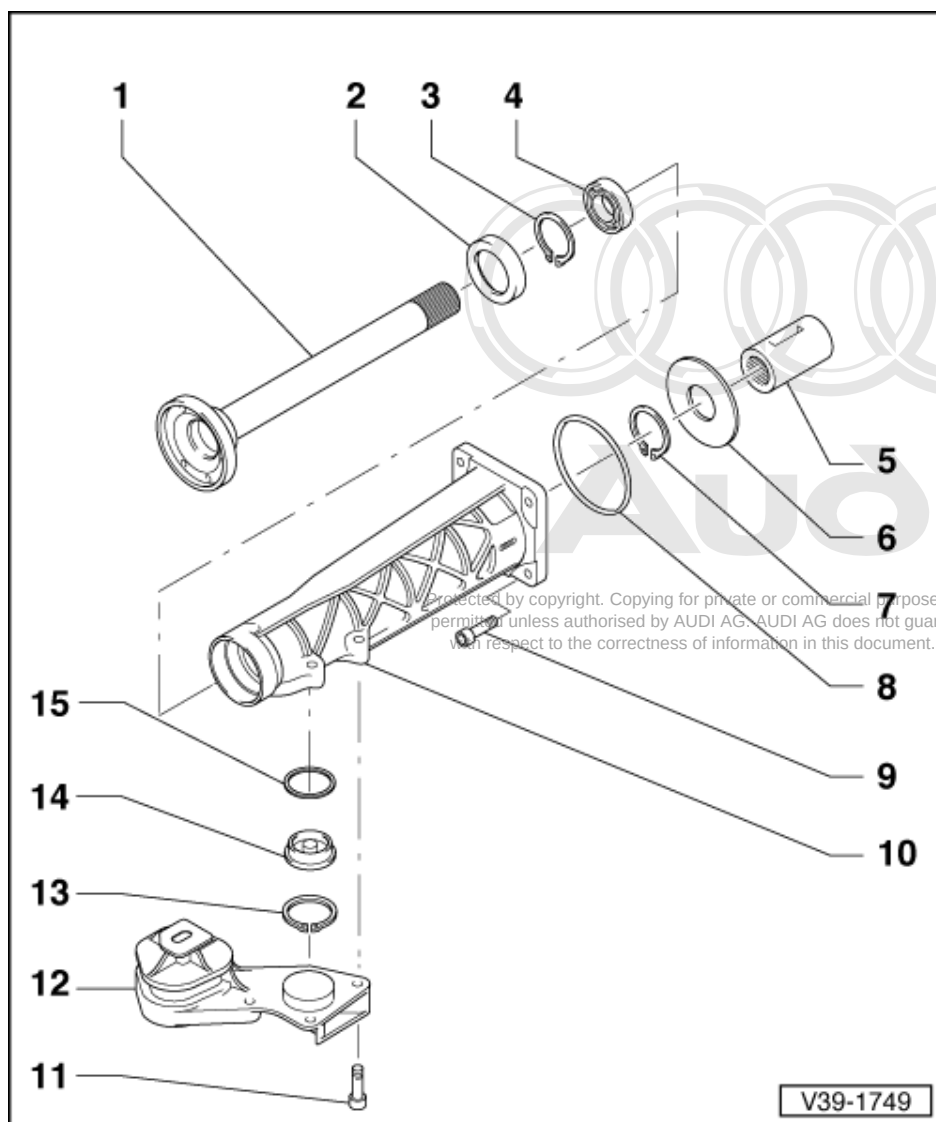
10 - Dismantling and assembling thrust tube - assembly overview

10.1 - Dismantling and assembling thrust tube - assembly overview





- 8 O-ring
 - ♦ Replace
- 9 Bolt - 35 Nm
 - ♦ Secures thrust tube to rear final drive housing



- 10 Thrust tube
- 11 Bolt - 40 Nm
 - ♦ Secures gearbox support to thrust tube
- 12 Gearbox support
- 13 Circlip
 - ♦ Removing => Page 201
- 14 Cover cap
 - ♦ Removing => Page 201
- 15 O-ring
 - ♦ Replace

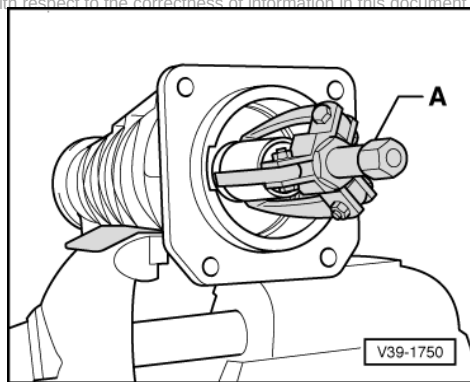
10.2 - Dismantling and assembling thrust tube

Special tools, testers and auxiliary equipment required

- ◆ Thrust plate VW 402
- ◆ Press tool VW 409
- ◆ Press tool VW 412
- ◆ Thrust pad VW 433
- ◆ Multi-purpose tool VW 771 and 771/15
- ◆ Drift 2051
- ◆ Drift 2062
- ◆ Bucket tappet compressor 2078
- ◆ Internal puller Kukko 21/5

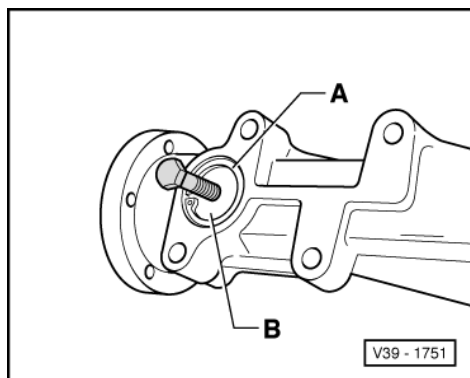
Note:

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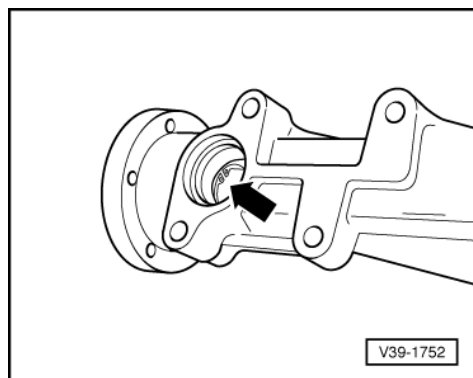


Dismantling

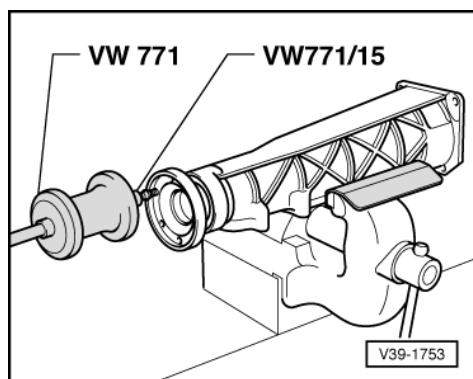
- Clamp thrust tube in vice using soft jaws.
- -> Pull off sleeve.
- A - Internal puller 30 ... 37 mm, e.g. Kukko 21/5
- Detach gearbox support



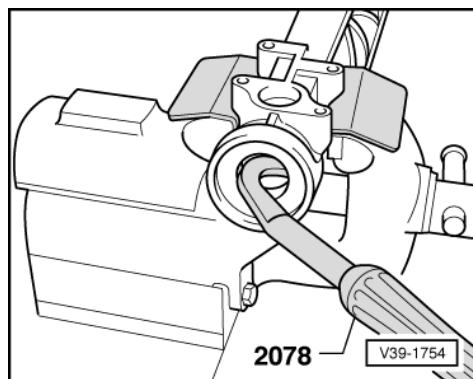
- -> Remove circlip -> -A-.
- Screw M8 bolt into thread in cover cap -B- and pull out cover cap.



- -> Open out circlip -arrow- on flange shaft and push circlip towards splines.

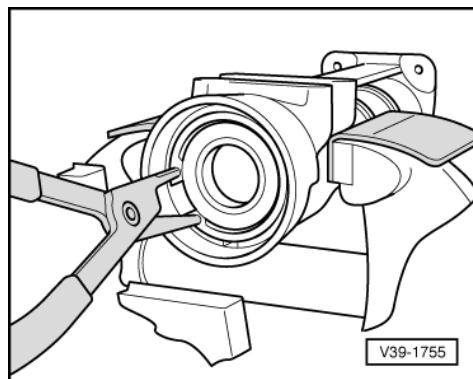


- -> Remove flange shaft.
- Take circlip out of thrust tube.

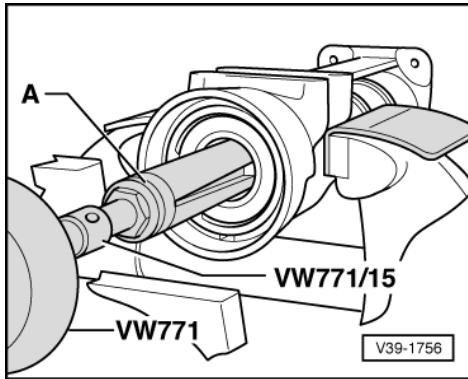


- -> Lever out seal.

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- -> Remove circlip.



- -> Pull out grooved ball bearing for flange shaft.

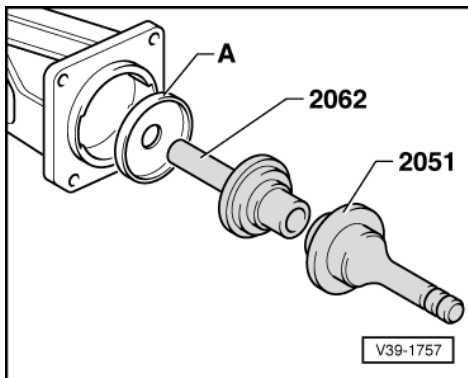
A - Internal puller 30 ... 37 mm, e.g. Kukko 21/5

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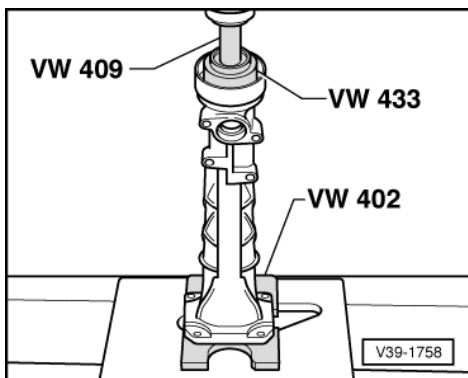
Note:

Removal causes damage to bearing.

Only if baffle plate is damaged:

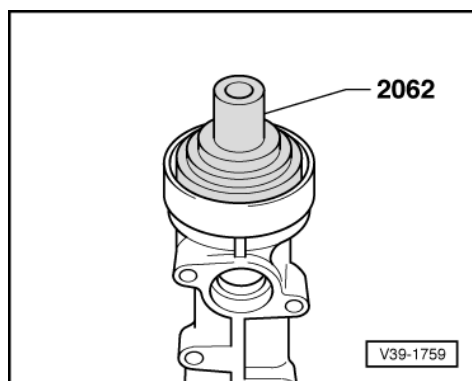


- If baffle plate is damaged, press it out with flange shaft.
- -> To install, drive in baffle plate -A- onto stop.

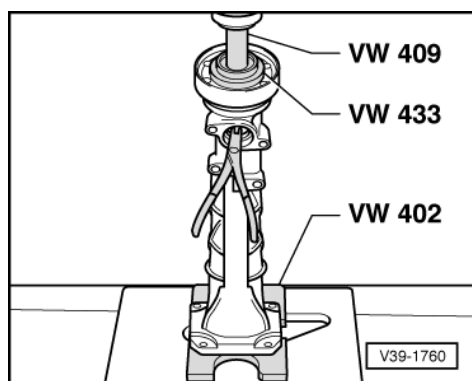


Assembling

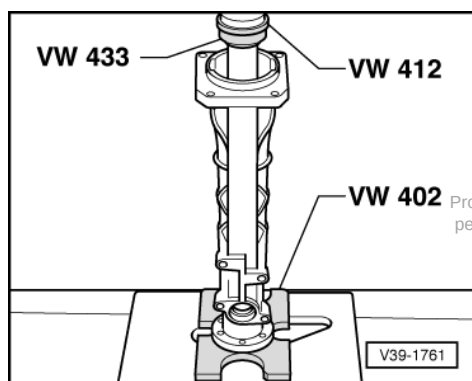
- -> Press grooved ball bearing into thrust tube.
- Fit outer circlip.



- Pack space between sealing lip and dust lip of seal with multi-purpose grease.
- -> Drive in seal as far as stop.



- -> 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.

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11 - Replacing flange shaft oil seals

11.1 - Replacing flange shaft oil seals

Special tools, testers and auxiliary equipment required

- ♦ Drift 2062

- ◆ Bucket tappet compressor 2078
- ◆ Assembly device 3066
- ◆ Drip tray V.A.G 1306
- ◆ Universal mount V.A.G 1359/2
- ◆ Engine/gearbox jack V.A.G 1383 A

- Observe general repair instructions=> Page 9.

- Rear final drive installed

Note:

Procedure is identical for left and right-hand seals.

Removing

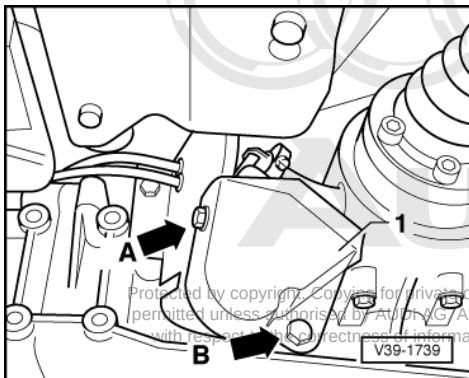
- Remove exhaust system behind front exhaust pipe:

=> 4-cyl. fuel injection engine, Mechanics; Repair group 26

=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26

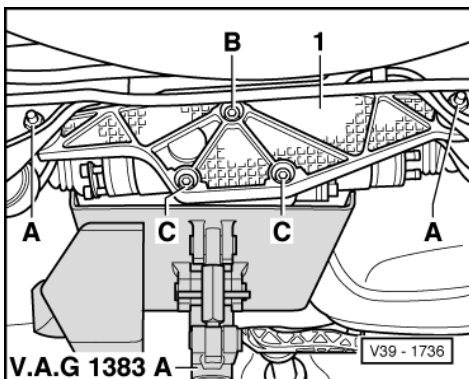
=> 6-cyl. fuel injection engine, Mechanics; Repair group 26

- Place drip tray V.A.G 1306 underneath and drain off about 0.5 l gearbox oil.
- Remove heat shield next to rear final drive.



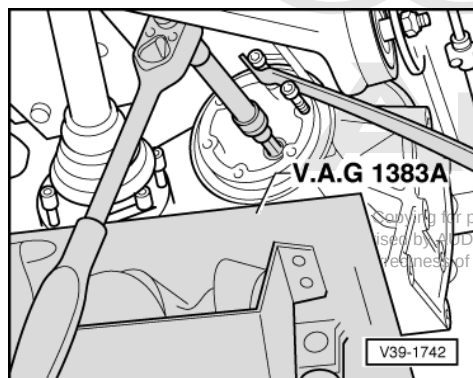
- -> Remove heat shield -1- for differential lock actuator -arrows A and B-.
- Unclip electrical wiring and hoses for differential lock actuator.
- Support rear final drive with gearbox lifter V.A.G 1383 A.
- Unbolt left and right-hand drive shafts from rear final drive and tie up

=> Running gear, Four-wheel drive; Repair group 42; Removing and installing drive shaft Removing and installing drive shaft

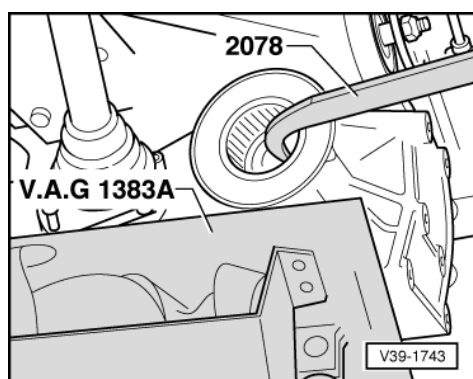




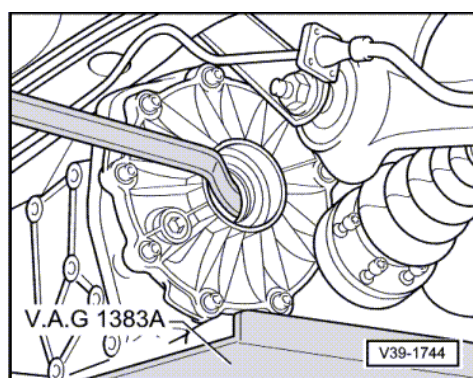
- -> Unscrew bolts from rear cross member -1-.
- A - Cross member to subframe
- B - Cross member to rear final drive
- C - Cross member to rear final drive
- Push cross member towards left and take it out downwards to right.
- Lower final drive a little with gearbox jack.



- -> Remove 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.



- -> Lever out left flange shaft oil seals using a suitable lever.

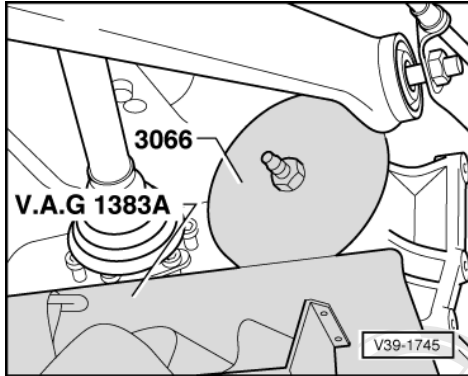


- -> Lever out right flange shaft oil seals using a suitable lever.

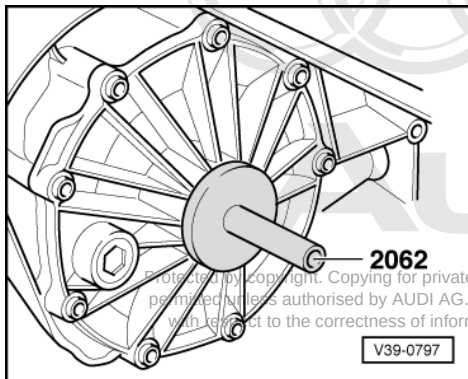
Installing

Install in reverse order, paying attention to the following:

- Clean seat for oil seal.
- Coat outer circumference of seal with gear oil.
- Pack space between sealing and dust lips with multi-purpose grease.

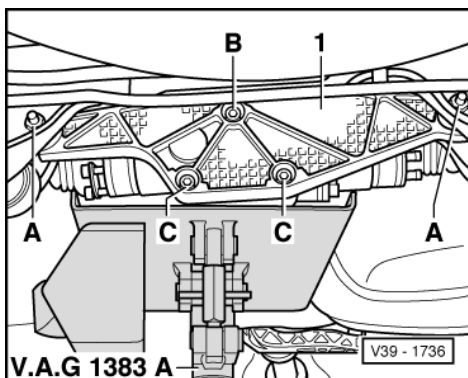


- -> Using assembly device 3066 with thrust plate, pull in oil seal for left flange shaft onto stop by turning hexagon nut.



- -> Drive in oil seal for right flange shaft onto stop with drift 2062; do not cant seal.
- Insert flange shaft.
- Screw in taper head bolt to secure flange shaft.
- Bolt on drive shaft

=> Running gear, Four-wheel drive; Repair group 42; Removing and installing drive shaft Removing and installing drive shaft



- -> When installing rear cross member -1-, tighten bolts in sequence -A-, -B-, -C-.



- Align exhaust system free of stress
- => 4-cyl. fuel injection engine, Mechanics; Repair group 26
- => 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26
- => 6-cyl. fuel injection engine, Mechanics; Repair group 26
- Top-up gear oil in rear final drive and check oil level => Page **193** .

Tightening torques

Component		Nm
Rear cross member for rear final drive to subframe		50
Rear cross member to rear final drive	M10x35	40
	M10x45	55
Flange shaft to final drive		10 + 90o 1)
Drive shaft to flange shaft	M8	40
	M10	77
Heat shield for differential lock actuator to bracket	M6	10
	M8	22

1) 90o= 1/4 turn

12 - Removing and installing rear final drive

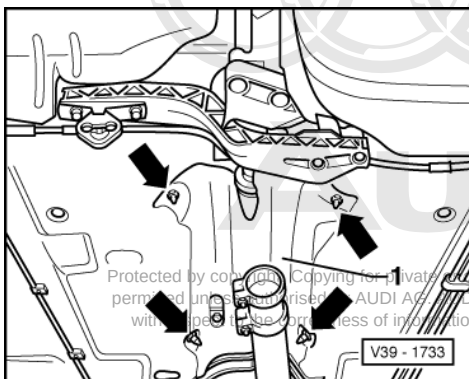
12.1 - Removing and installing rear final drive

Special tools, testers and auxiliary equipment required

- ♦ Universal mount V.A.G 1359/2
- ♦ Engine/gearbox jack V.A.G 1383 A

Removing

- Observe general repair instructions=> Page **9** .
- Remove rear section of exhaust system (rearwards of exhaust pipe clamp(s):

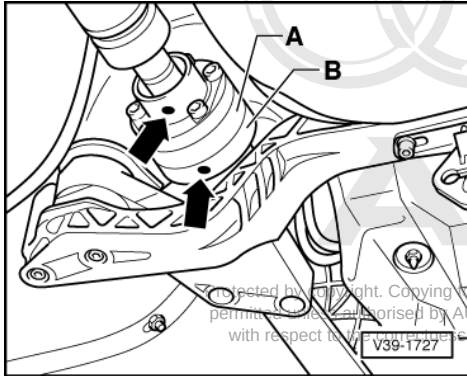


=> 4-cyl. fuel injection engine, Mechanics; Repair group 26

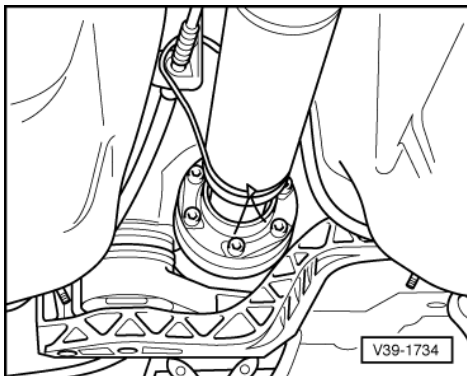
=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26

=> 6-cyl. fuel injection engine, Mechanics; Repair group 26

- -> Remove heat shield -1- -arrows-.
- Remove heat shield next to rear final drive.



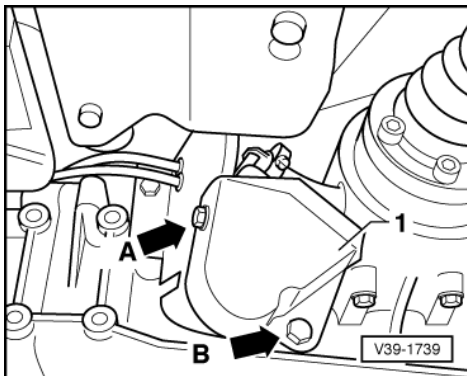
- -> Check for presence of a factory mark (coloured dot -arrows-) at the prop shaft and at the rear final drive flange/prop shaft. If there is no mark, make a coloured mark on rear final drive -B- to indicate the position of prop shaft flange -A-.
- Release fastening bolts for prop shaft flange.



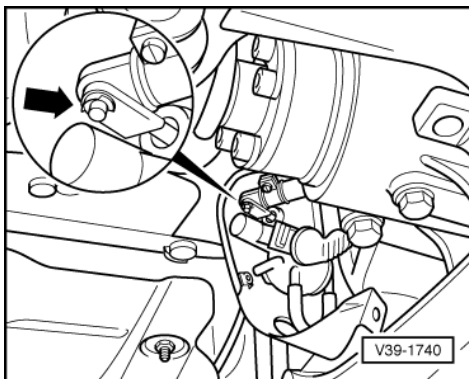
- -> Secure propshaft to handbrake cable bracket with wire.

Note:

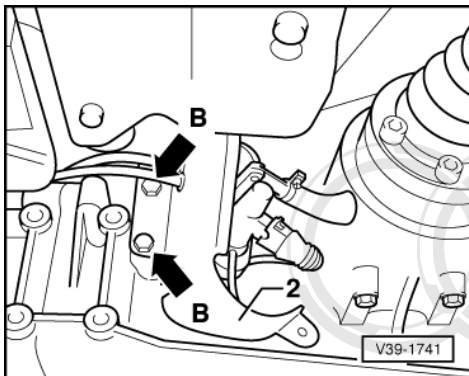
Do not bend the propshaft more than 25° at the central joint, otherwise the universal joint will be damaged.



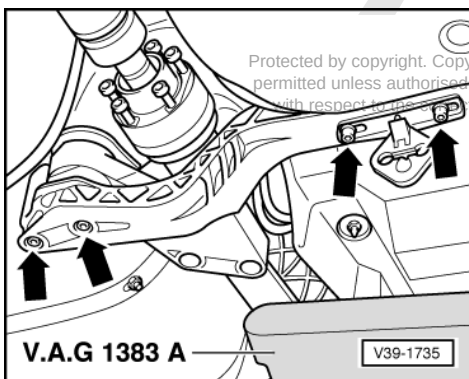
- -> Remove heat shield -1- for differential lock actuator -arrows A and B-.



- -> Using a screwdriver, prise off circlip -arrow- on connection between differential lock actuator and differential lock.
- Lift out connecting pin.
- Unclip electrical wiring and hoses for differential lock actuator.



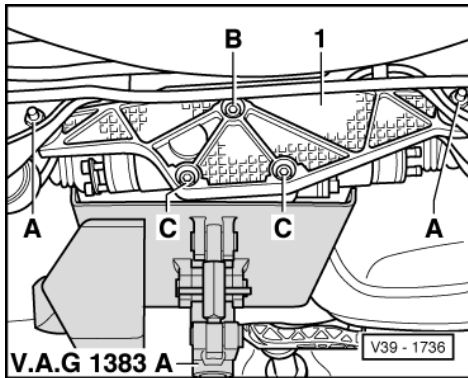
- -> Unbolt bracket -2- for vacuum element and switch for differential lock on rear final drive -arrows B-.
- Move bracket clear to side with wiring and hoses connected, and tie up with wire.



- Unbolt left and right-hand drive shafts from rear final drive and tie up

=> Running gear, Four-wheel drive; Repair group 42; Removing and installing drive shaft Removing and installing drive shaft

- Support final drive with gearbox lifter V.A.G 1383 A.
- -> Unscrew bolts -arrows- from front of cross member for rear final drive.
- Detach front cross member.



- -> Unscrew bolts from rear cross member -1-.

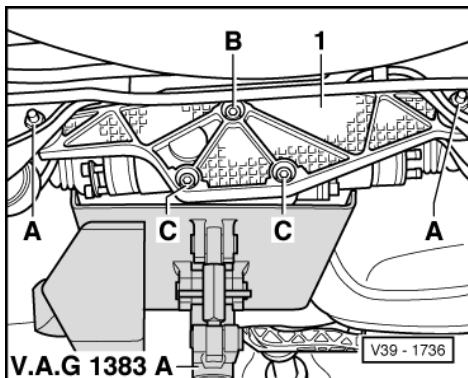
A - Cross member to body
 B - Cross member to rear final drive
 C - Cross member to rear final drive

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- Push cross member towards left and take it out downwards to right.
- Lower final drive with gearbox jack.

Installing

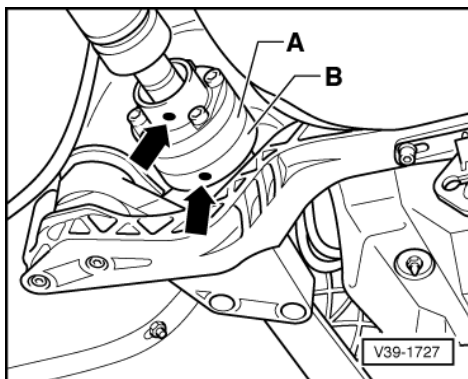
Install in reverse order, paying attention to the following:



- -> When installing rear cross member -1-, tighten bolts in sequence -A-, -B-, -C-.

Notes:

- ♦ It is essential that locking fluid remaining in the threads in the flange shaft on rear final drive is cleaned out after removing propshaft. Otherwise there is a danger that new bolts will seize when they are screwed in and then shear if they have to be removed later.
- ♦ Threaded holes can be cleaned with a thread tap.





- ♦ -> To prevent imbalance, install flanges of prop shaft -A- and rear final drive -B- in such a way that the coloured markings are in a line -arrows-.
- ♦ Replace gasket between prop shaft and input flange (remove protective sheet and bond gasket to flanged shaft). The adhesive surface must be free of grease.
- ♦ Replace prop shaft bolts (self-locking).

- Bolt on propshaft => Page **187**
- Align exhaust system free of stress

=> 4-cyl. fuel injection engine, Mechanics; Repair group 26

=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26

=> 6-cyl. fuel injection engine, Mechanics; Repair group 26

- Top-up gear oil in rear final drive and check oil level => Page **193**.

Tightening torques

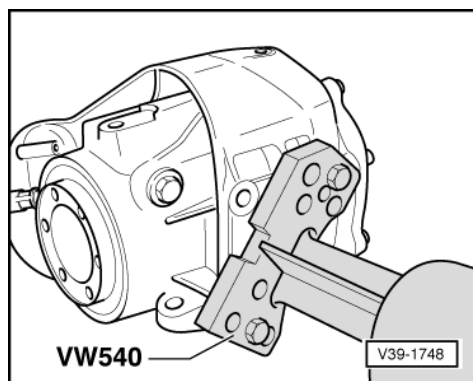
Component	Nm
Front cross member for rear final drive to body	40
Front cross member for rear final drive with exhaust system bracket to body	23
Rear cross member for rear final drive to subframe	50
Rear cross member to rear final drive	M10x35 40 M10x45 55
Bracket for vacuum element to rear final drive	M8 22
Heat shield for differential lock actuator	M6 10
to bracket	M8 22
Drive shaft to flange shaft	M8 40 M10 77
Propshaft to final drive (input flange)	M8 55
Clamp for exhaust pipe	40

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12.2 - Securing rear final drive to repair stand

Special tools, testers and auxiliary equipment required

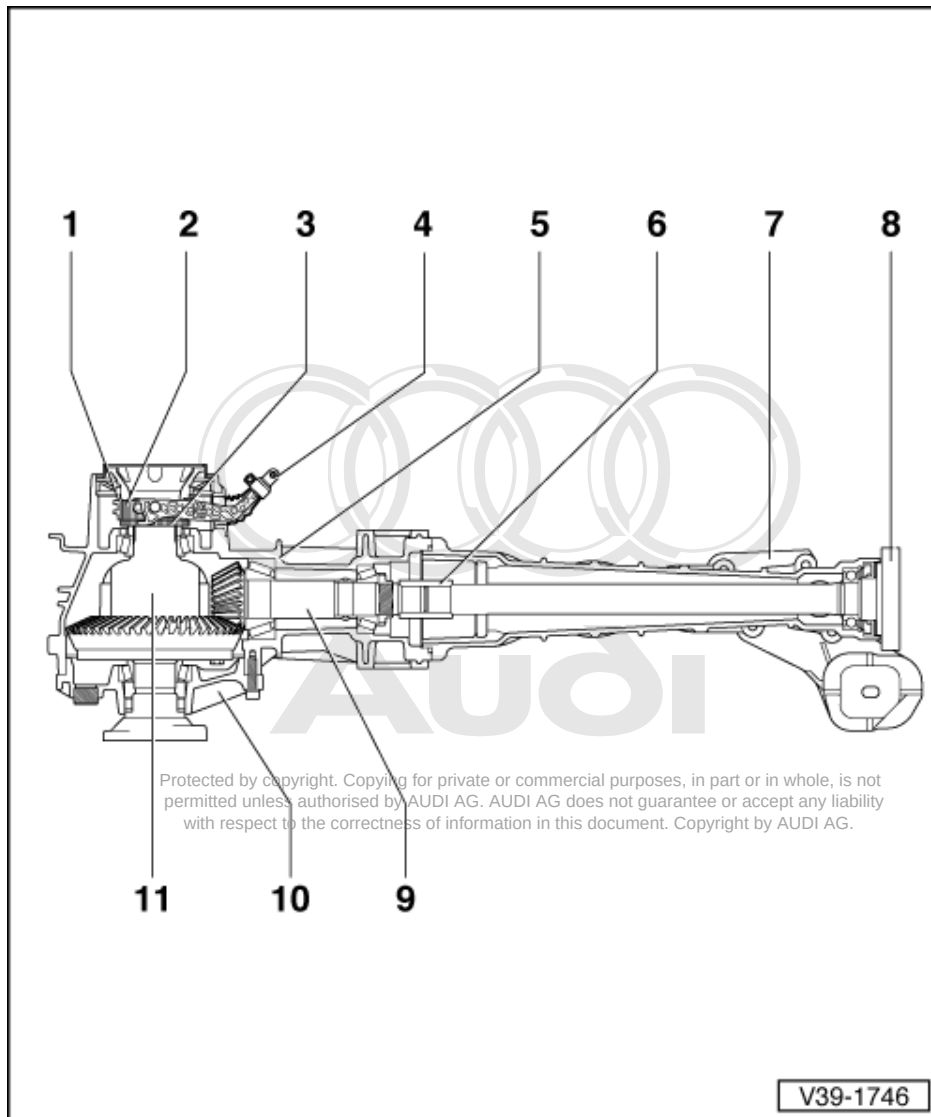
- ♦ Engine and gearbox support VW 540



- -> 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

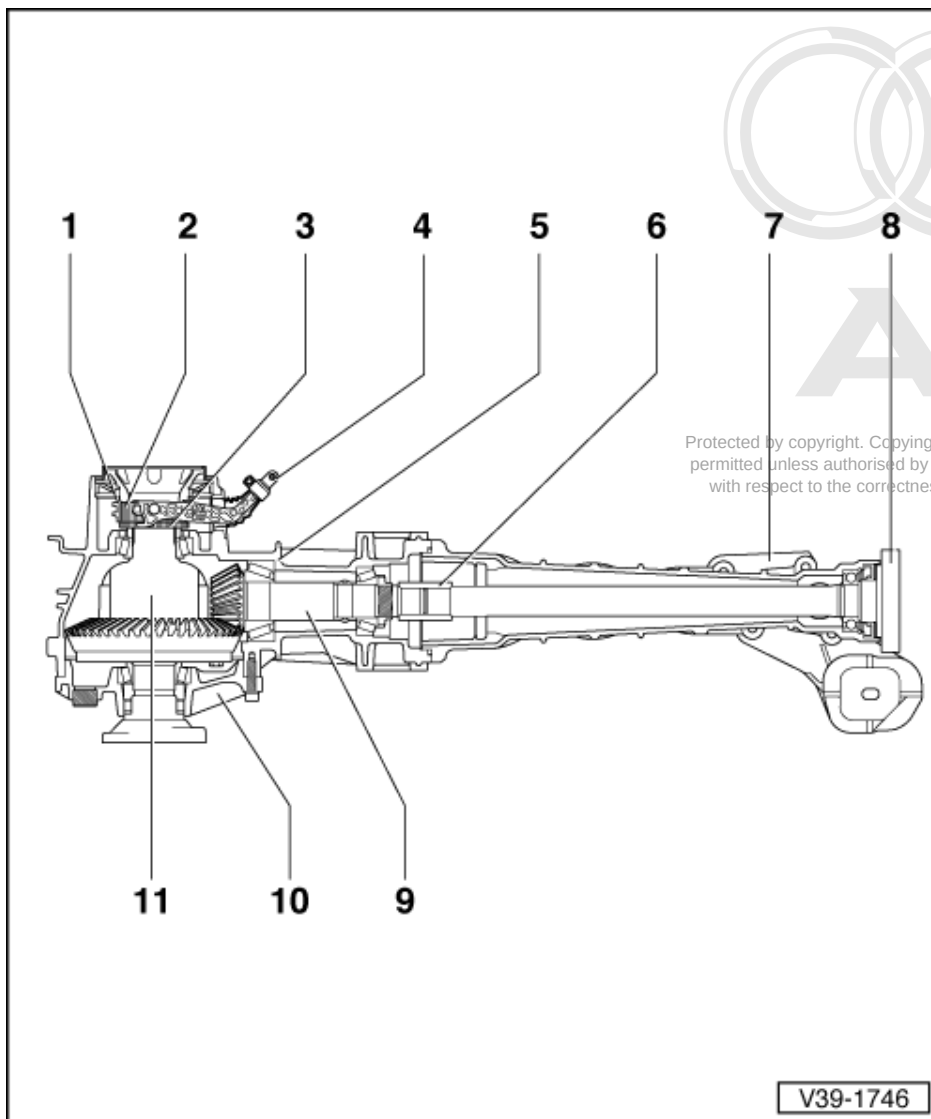


13.2 - Assembly overview

Notes:

- ◆ Removing thrust tube from rear final drive with final drive installed => Page 195 .
- ◆ Removing thrust tube from rear final drive with final drive removed => Page 215 .

- 1 Locking collar
- 2 Synchro-hub
- 3 Coupling body for differential lock
- 4 Selector fork



5 Final drive housing

6 Sleeve

7 Gearbox support

8 Flange shaft

- ♦ Removing => Page 202

9 Drive pinion

- ♦ Paired with crown wheel
- ♦ Removing and installing
=> Page 233

10 Final drive cover

11 Differential with crown wheel

- ♦ Must be removed before dismantling drive pinion
- ♦ Crown wheel is paired with drive pinion
- ♦ Removing and installing
=> Page 216
- ♦ Dismantling and assembling =>Page 222

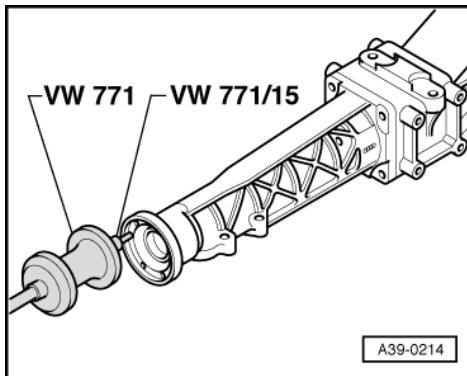
Removing thrust tube from rear final drive

Special tools, testers and auxiliary equipment required

- ◆ Multi-purpose tool VW 771 and 771/15
- ◆ Drip tray V.A.G 1306

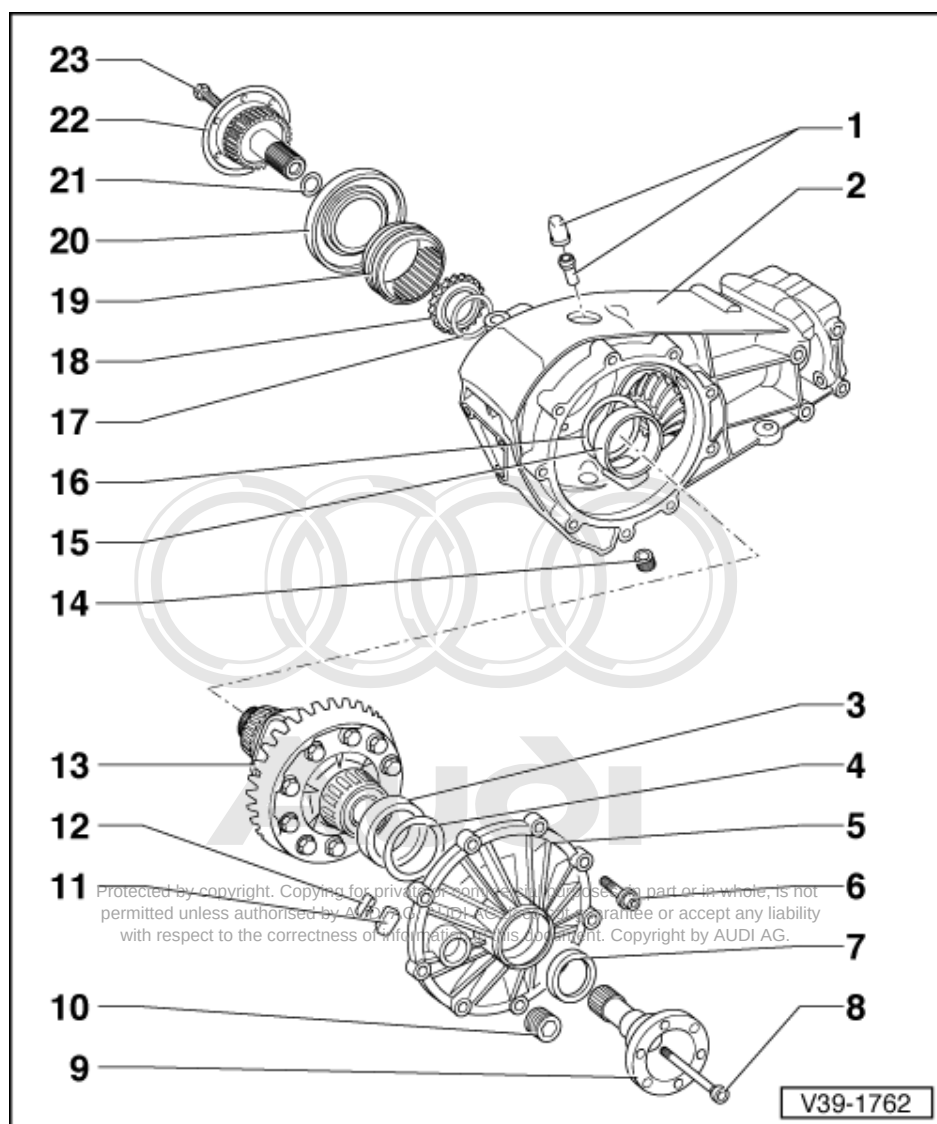
- Rear final drive removed

- Secure rear final drive to repair stand => Page 212
- 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.

13.3 - Removing and installing differential



Notes:

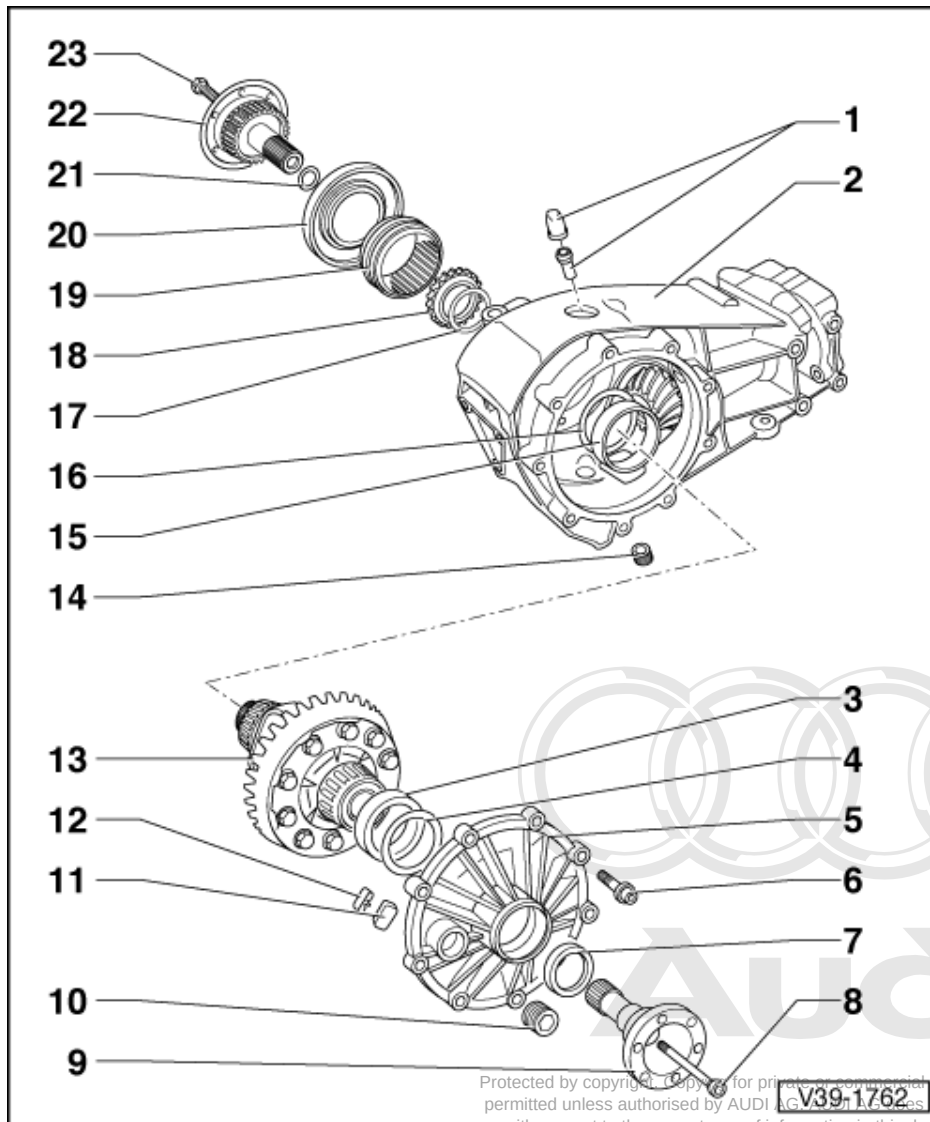
- ♦ Observe the general repair instructions =>Page 9 .
- ♦ Adjustments are required when replacing components marked 1) => Adjustment overview, Page 262 .

1 Breather

- ♦ Insertion depth
=>Fig. 221

2 Final drive housing 1)

- ♦ With drive pinion
- ♦ Removing and installing drive pinion => Page 233



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3 Outer race for large taper roller bearing 1)

- ♦ Driving out
=> Fig. 228
- ♦ Driving in
=> Fig. 228

4 Shim "S1"

- ♦ Note thickness
- ♦ Adjustment overview
=> Page 262

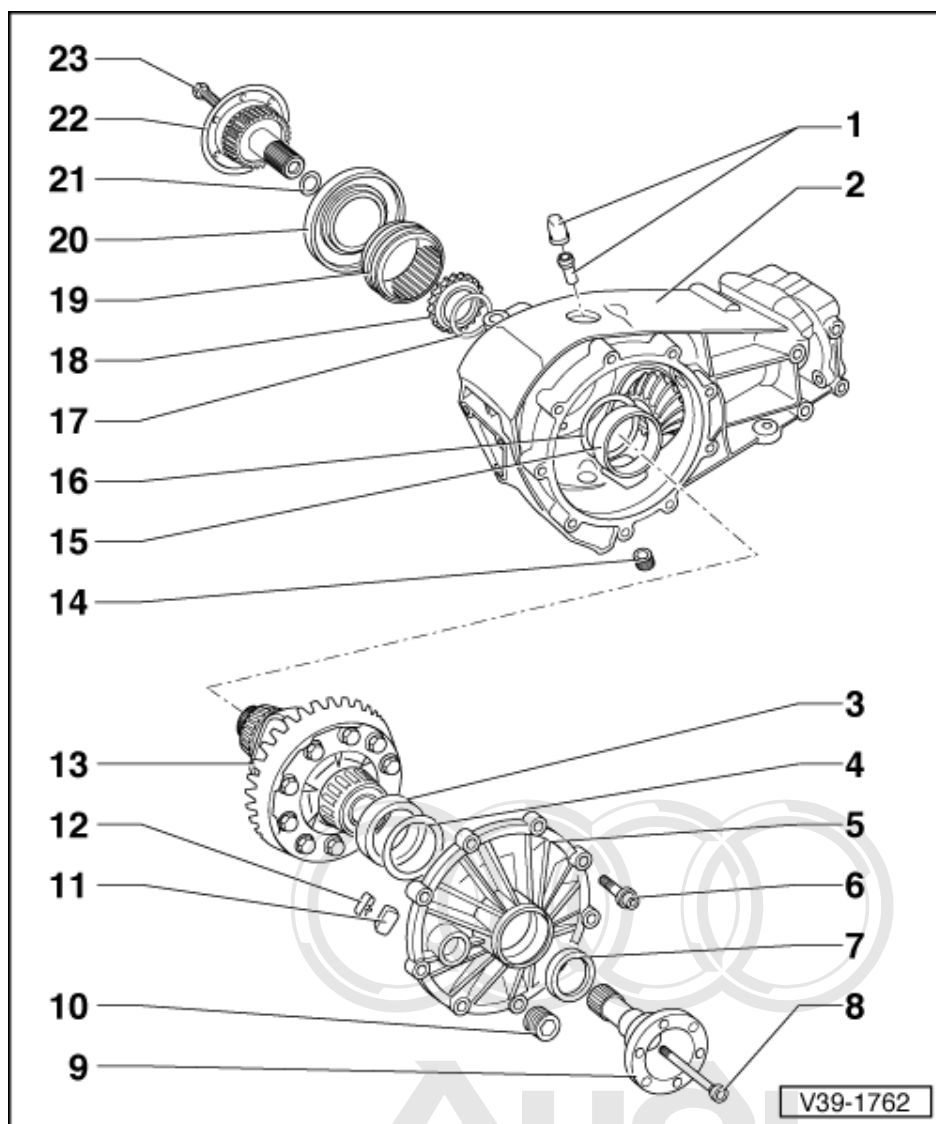
5 Cover for final drive 1)

- ♦ Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces
- ♦ Installation position: Magnet faces down

6 Bolt - 25 Nm

7 Seal, right

- ♦ Levering out=>Page 206
- ♦ Use 2062 to insert as far as stop=>Page 207



8 Taper head bolt M8 - 10 Nm + 1/4 turn (90°) further

9 Flange shaft, right

- ♦ Removing => Page 222
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10 Oil filler plug - 25 Nm

11 Magnet

- ♦ Installation position
=> Fig. 221

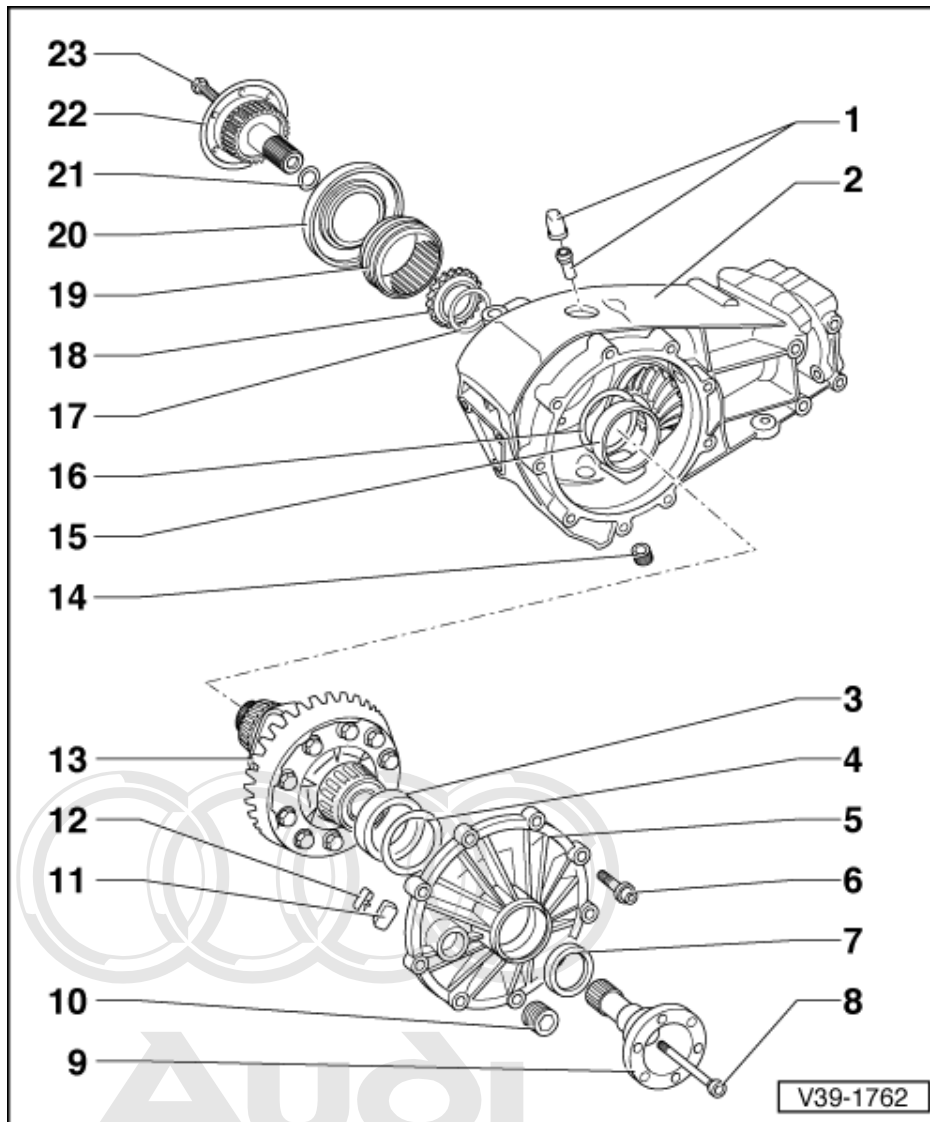
12 Clip for magnet

- ♦ Replace
- ♦ Installation position
=> Fig. 221

13 Differential with crown wheel 1)

- ♦ Removing => Page 221
- ♦ Dismantling and assembling => Page 222

14 Oil drain plug - 25 Nm



15 Outer race for small taper roller bearing 1)

♦ Driving out
=> Fig. 230

♦ Driving in
=> Fig. 231

16 Shim "S2"

- ♦ Note thickness
- ♦ Adjustment overview
=> Page 262

17 Shim for coupling body

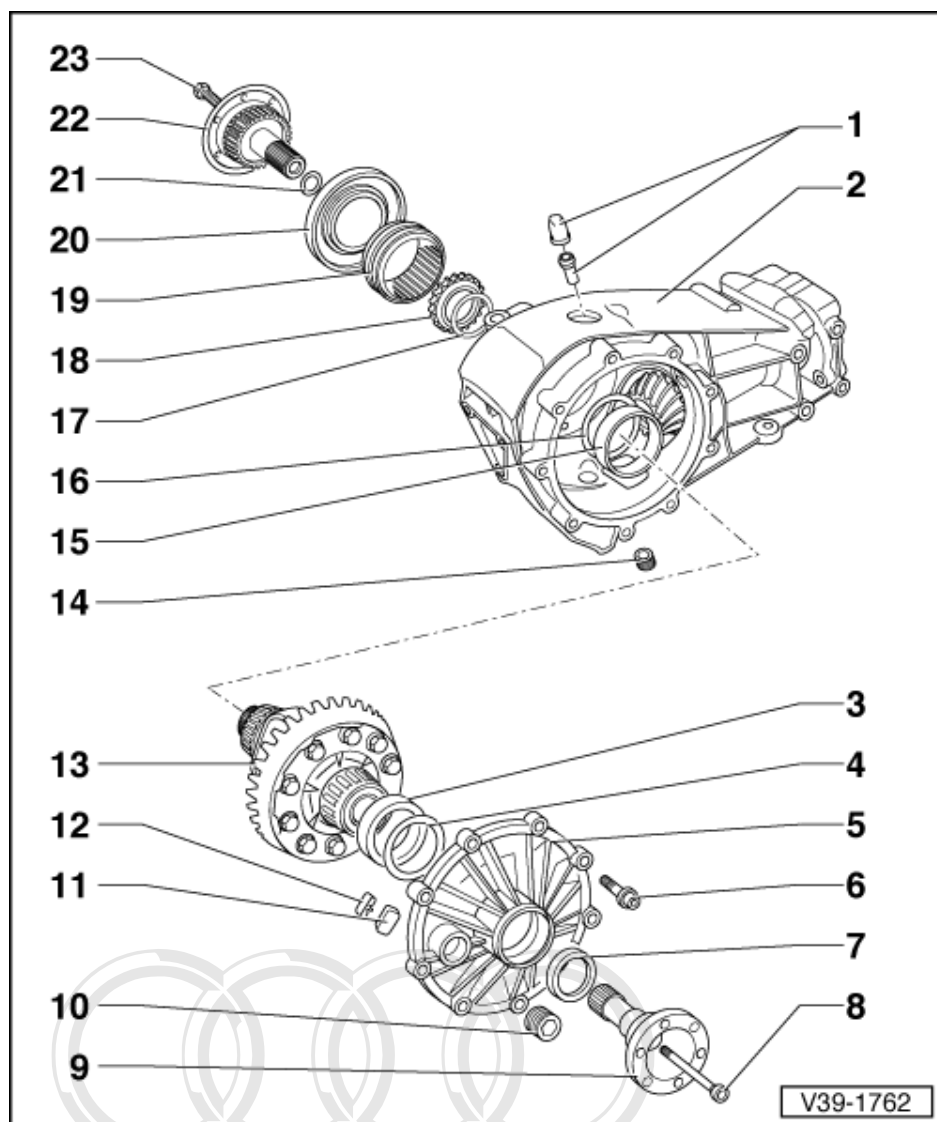
- ♦ Determining thickness
=> Fig. 257

18 Coupling body for differential lock

- ♦ Installation position
=> Fig. 257

19 Locking collar

- ♦ Installation position: Step towards coupling body
- ♦ Remove and install together with selector fork

**20 Seal, left**

- ♦ Levering out=>Page 206
- ♦ Use 3066 to insert as far as stop => Page 207

21 Shim for flange shaft

- ♦ When removing, ensure that shim is not lost
- ♦ Determining thickness
=> Page 257

♦ Adjustment overview

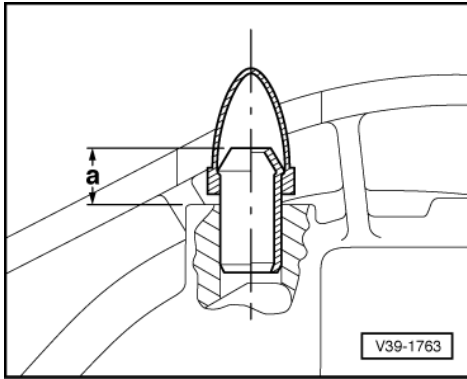
=> Page 262

22 Flange shaft, left

- ♦ Removing => Page 222
- ♦ Adjusting => Page 257

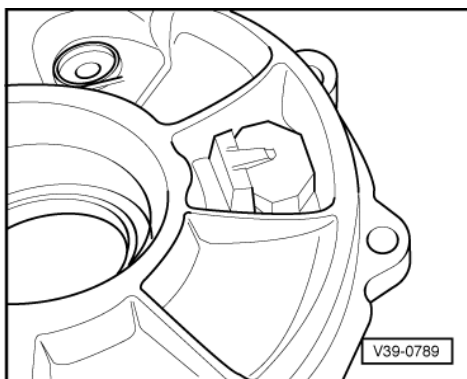
23 Taper head bolt M8 - 10 Nm + 1/4 turn (90o) further

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→ Fig.1 Insertion depth of breather sleeve

- ♦ Dimension a = 11 mm



→ Fig.2 Installation position of magnet

- Always replace clip when performing repairs.

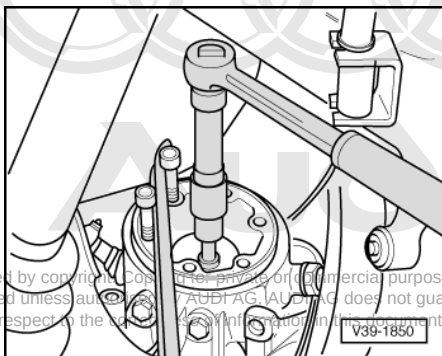
Removing and installing differential

Special tools, testers and auxiliary equipment required

- ♦ Drip tray V.A.G 1306

Removing

- Rear final drive removed
- Secure complete rear final drive to repair stand => Page 212 .
- Place drip tray V.A.G 1306 underneath and drain gearbox oil.



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- -> 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.
- Remove coupling body for differential lock => Page 251 . Selector fork and locking collar remain installed
- Unscrew securing bolts from cover for final drive.
- Take cover for final drive off axle housing and remove differential.

Installing

Install in reverse order, paying attention to the following:

- Insert differential.
- Clean sealing surface and coat thinly with sealing paste AMV 188 001 02.
- Fit cover for final drive onto final drive housing and using diagonal sequence tighten to 25 Nm.
- Install coupling body for differential lock with relevant shim => Page 251 onwards.
- Pack space between sealing and dust lips with multi-purpose grease.
- Insert flange shafts and tighten to 10 Nm + 90o.

Notes:

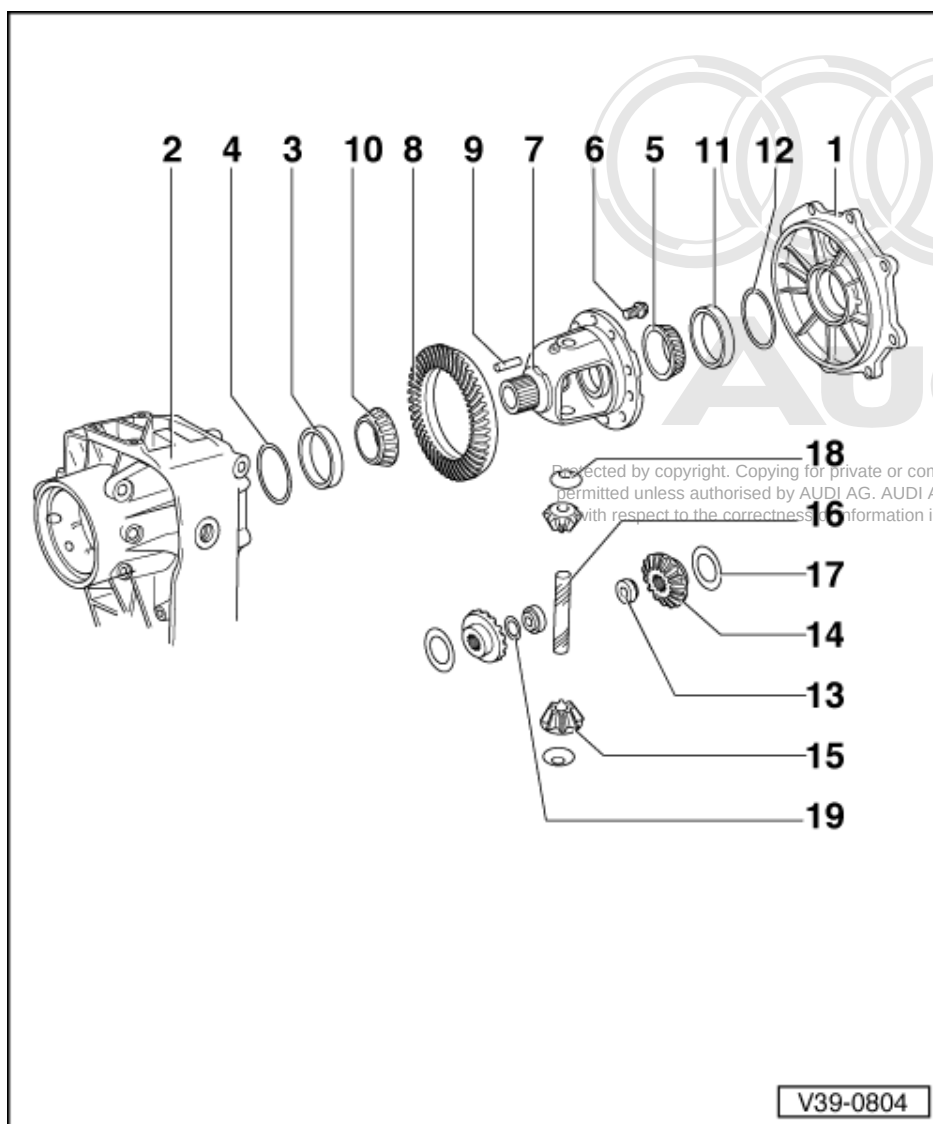
- ♦ A shim is fitted between differential and left flange shaft => Page 257 .
- ♦ Left flange shaft should only be adjusted if left flange shaft, differential housing or bevel gears have been replaced.
- Top-up gear oil in rear final drive and check oil level => Page 193 .

14 - Dismantling and assembling differential

14.1 - 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
- ♦ Thrust pad VW 433
- ♦ Thrust plate VW 447 H
- ♦ Installation and removal tool VW 459
- ♦ Thrust pad VW 511 i
- ♦ Drift sleeve 40-21
- ♦ Thrust plate 40-105
- ♦ Thrust pad 3118
- ♦ Drift 3138
- ♦ Taper roller bearing puller V.A.G 1582 and V.A.G 1582/6
- ♦ Two-arm puller Kukko 20/10



Notes:

- ◆ Observe the general repair instructions =>Page 9 .
- ◆ 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 262 .

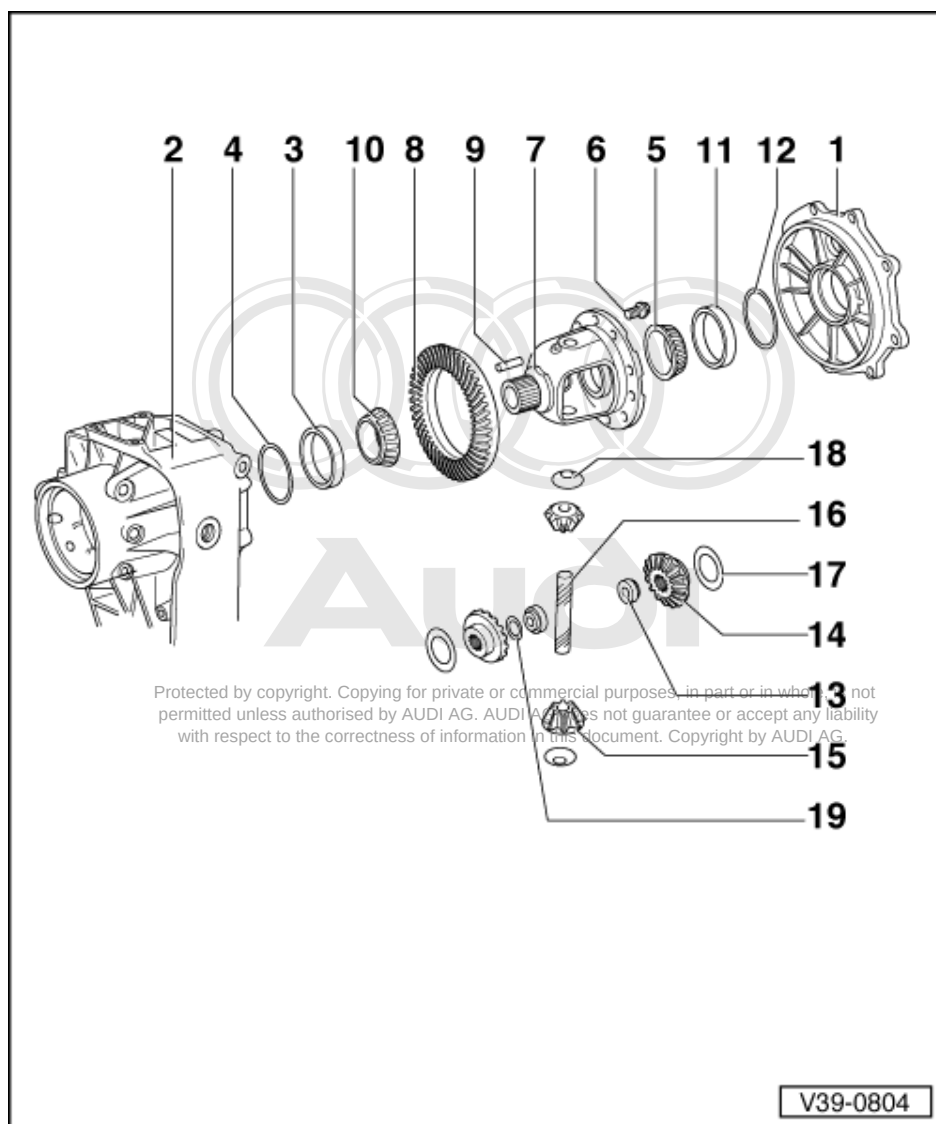
1 Cover for final drive 1)

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

2 Final drive housing 1)

3 Outer race for large taper roller bearing 1)

- ◆ Driving out
=> Fig. 228
- ◆ Driving in
=> Fig. 228

**4 Shim "S2"**

- ◆ Note thickness
- ◆ Adjustment overview
=> Page **262**

5 Inner race for small taper roller bearing 1)

- ◆ Pulling off
=> Fig. **229**
- ◆ Pressing on
=> Fig. **230**

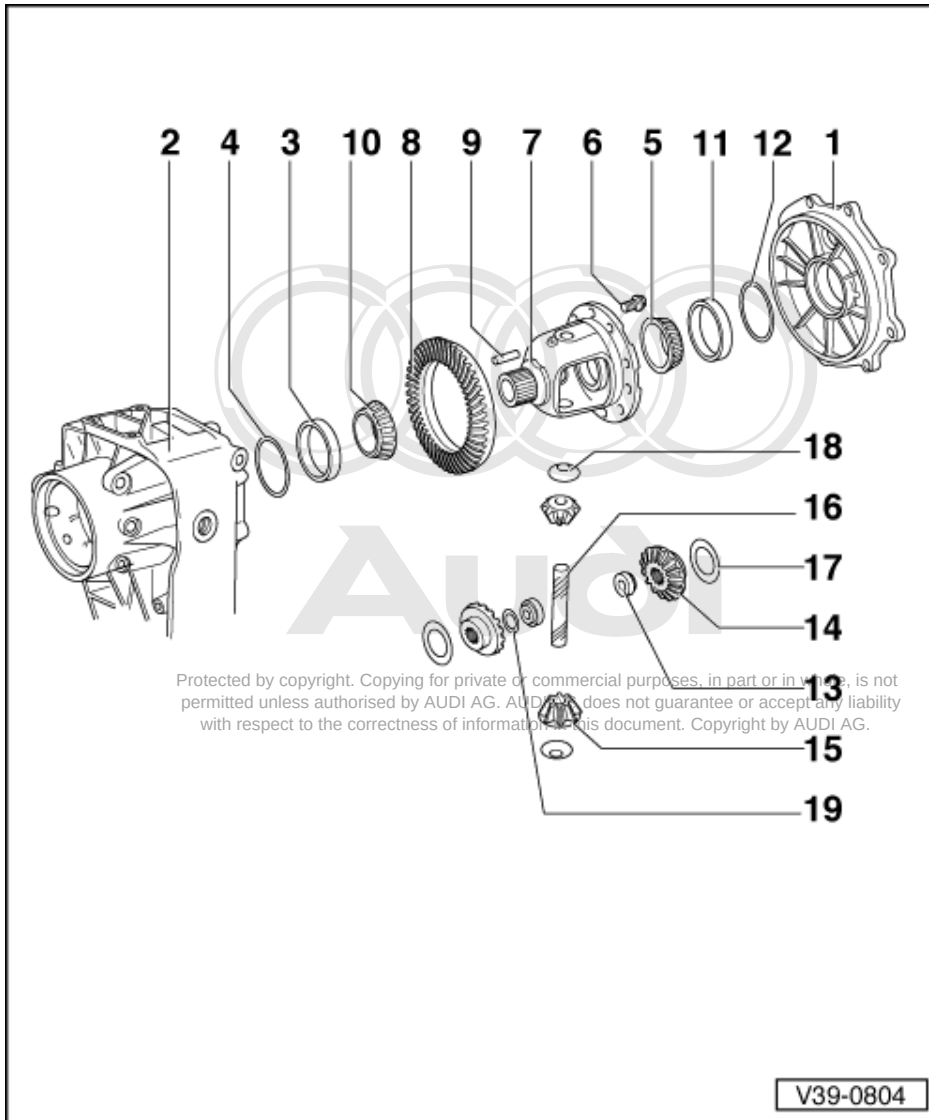
6 Bolt - 60 Nm + turn 45ofurther

- ◆ Replace
- ◆ Allocation

=> Parts Catalogue

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

7 Differential housing 1)



8 Crown wheel 1)

- ◆ Paired with drive pinion (final drive set)
- ◆ Assignment according to gearbox code letters

=> Parts Catalogue

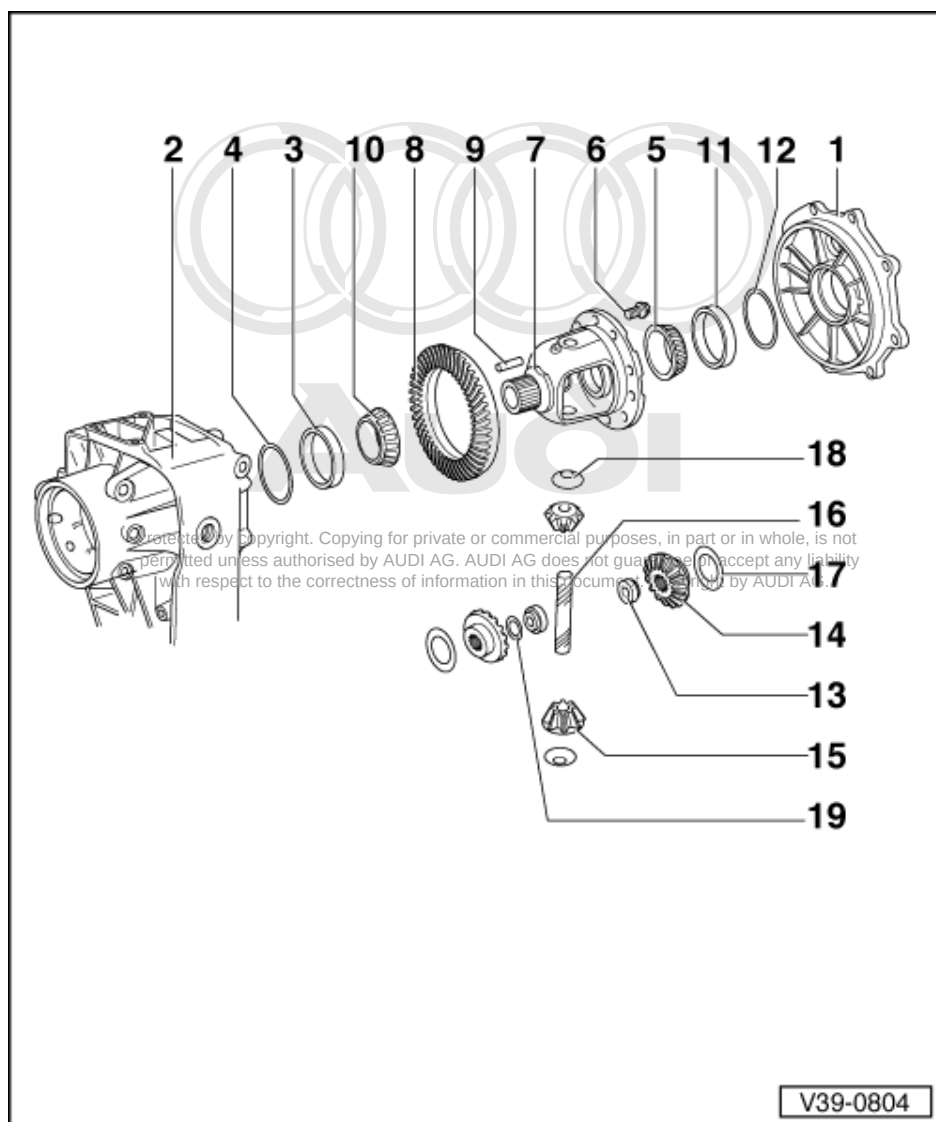
- ◆ Drive off differential housing with a drift
=> Fig. 231
- ◆ Fit to differential housing
=> Fig. 231

9 Spring pin

- ◆ For securing shaft for bevel gears
- ◆ Drive in flush

10 Inner race for large taper roller bearing 1)

- ◆ Pulling off
=> Fig. 229
- ◆ Pressing on
=> Fig. 229



11 Outer race for small taper roller bearing 1)

- ♦ Driving out
=> Fig. 230
- ♦ Pressing in
=> Fig. 231

12 Shim "S1"

- ♦ Note thickness
- ♦ Adjustment overview
=> Page 262

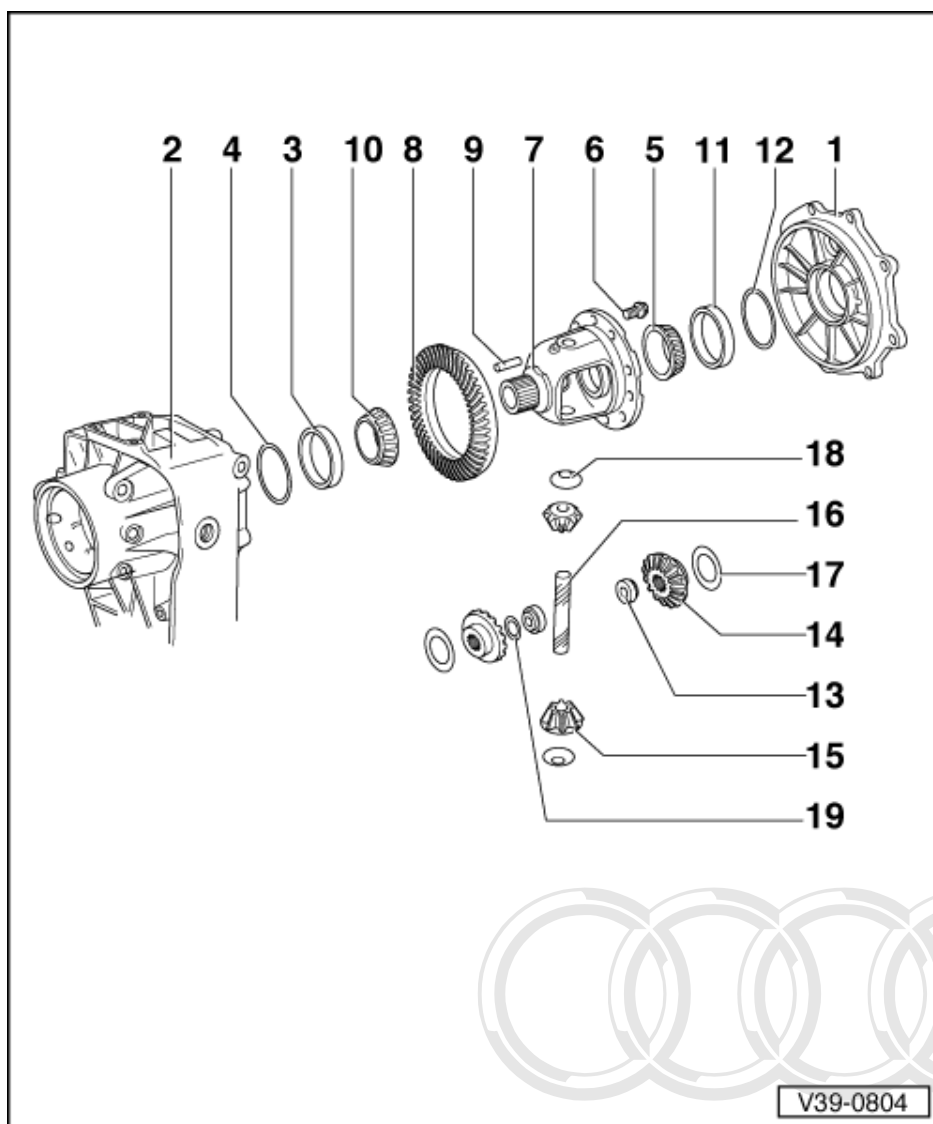
13 Threaded piece

14 Sun wheels

- ♦ Installing
=> Fig. 232
- ♦ Adjusting
=> Fig. 232

15 Planet wheels

- ♦ Installing
=> Fig. 232



16 Shaft for bevel gears

- ◆ Drive out with drift
- ◆ Drive in carefully so that the thrust washers are not damaged
- ◆ Secure with spring sleeve

17 Shim

- ◆ Re-determining thickness
=> Fig. 232

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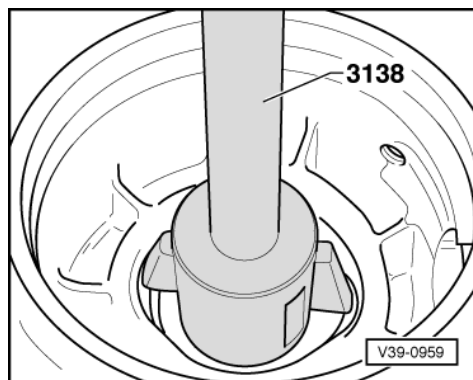
18 Thrust washer

- ◆ Check for cracks and chipping

19 Shim for flange shaft

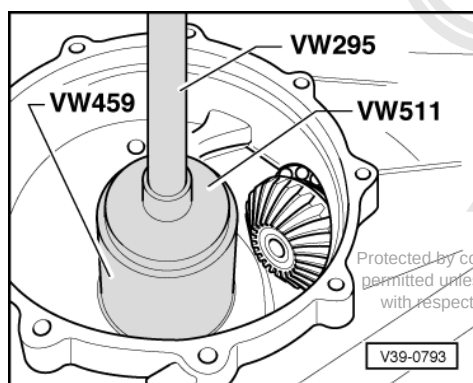
- ◆ When removing, ensure that shim is not lost
- ◆ Determining thickness
=> Page 257
- ◆ Adjustment overview
=> Page 262

V39-0804



-> Fig.1 Driving out outer race for large taper roller bearing out of final drive housing

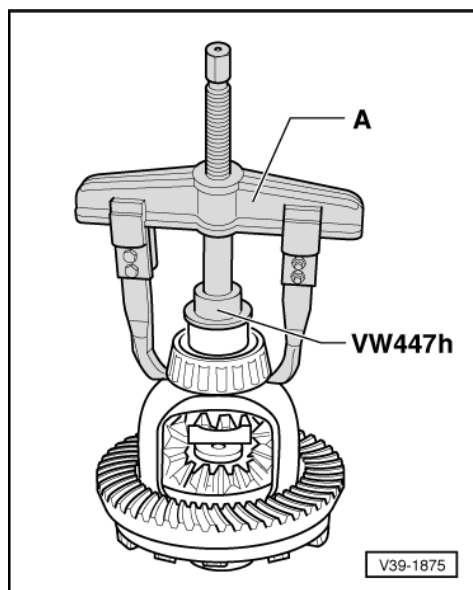
- After removing check shims for damage.



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-> Fig.2 Driving outer race for large taper roller bearing into final drive housing

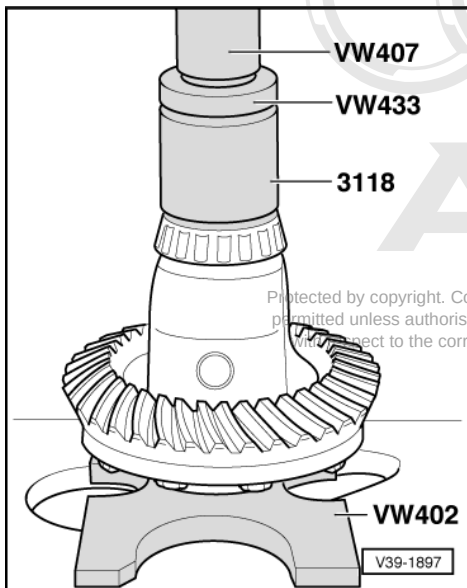
- Position outer race using VW 295 and light even blows with a hammer.
- Then drive in onto stop as shown in illustration.



-> **Fig.3 Pulling off inner race for large taper roller bearing**

- Fit thrust plate VW 447 h onto differential housing before fitting puller.

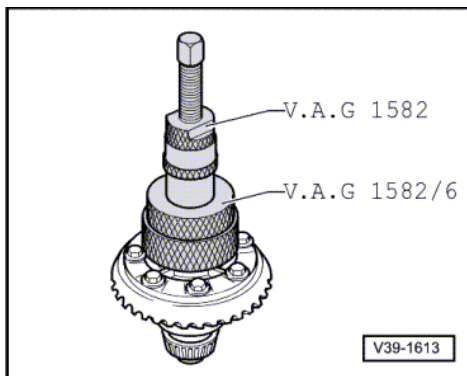
A - Two arm puller, e.g. Kukko 20/10



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

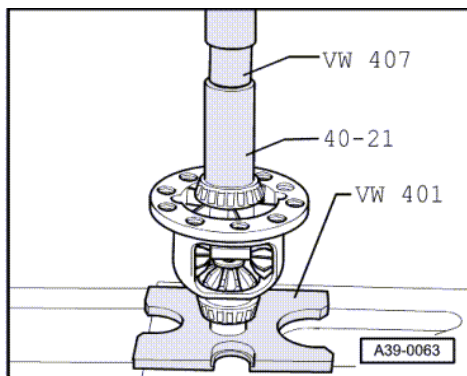
Warning
Wear protective gloves.

- Heat the bearing to approx. 100 oC, position and push to final position.



-> **Fig.5 Pulling off inner race for small taper roller bearing**

- Fit thrust plate 40-105 onto differential housing before fitting puller.



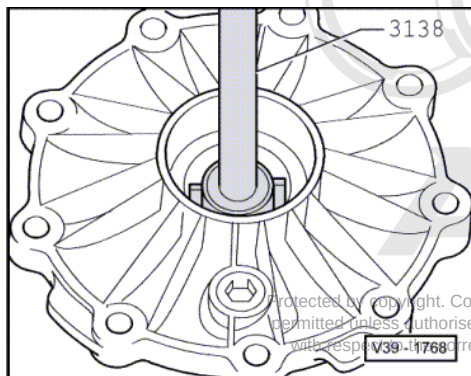


-> Fig.6 Pressing on inner race for small taper roller bearing

Warning

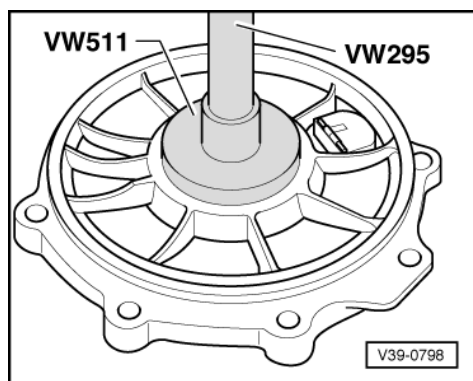
Wear protective gloves.

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

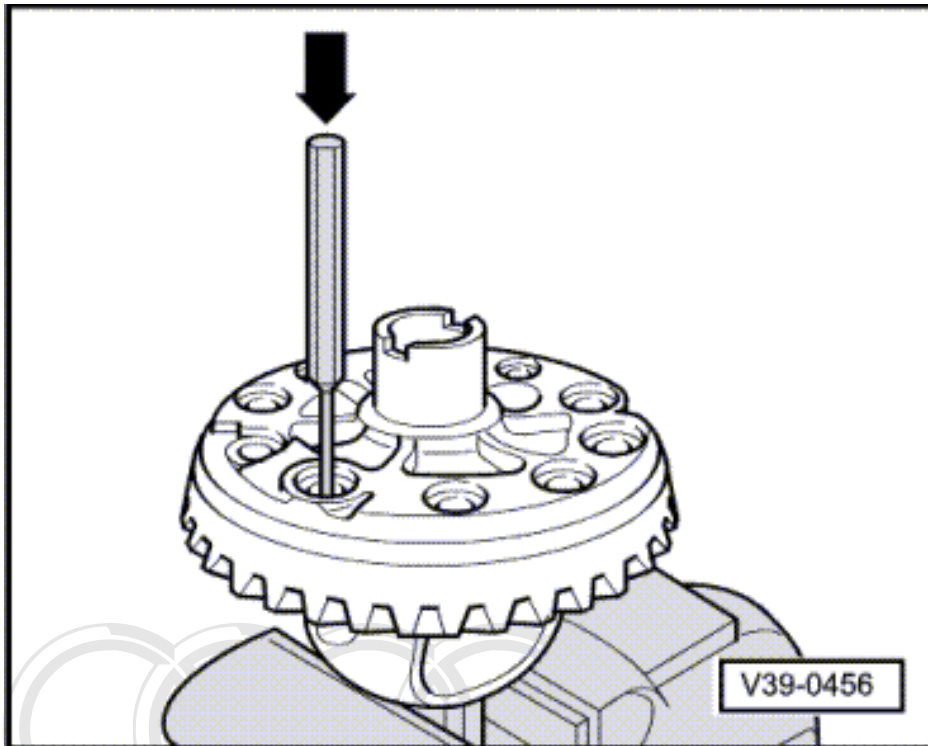


-> Fig.7 Driving out outer race for small taper roller bearing out of cover

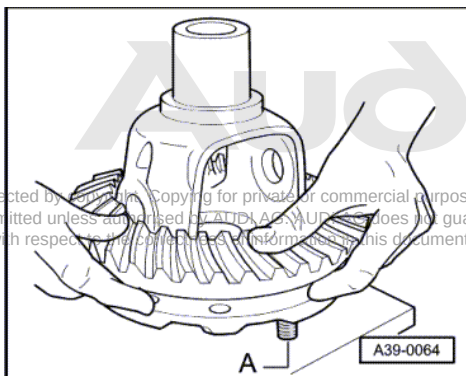
- After removing check shims for damage.



-> Fig.8 Pressing outer race for small taper roller bearing into cover



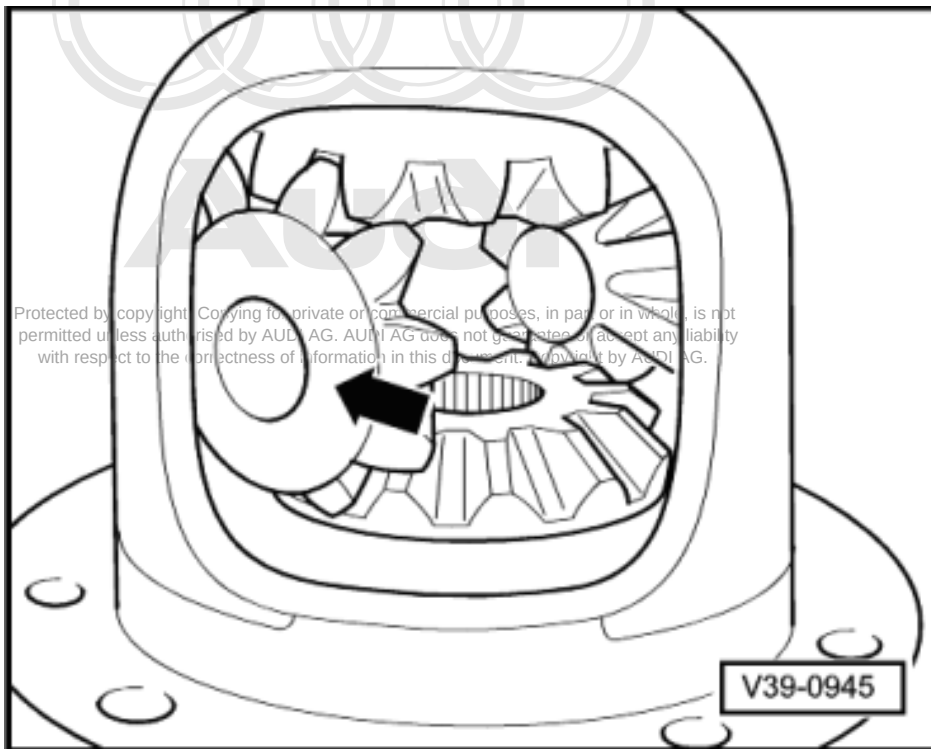
-> Fig.9 Driving crown wheel off housing



-> Fig.10 Installing crown wheel

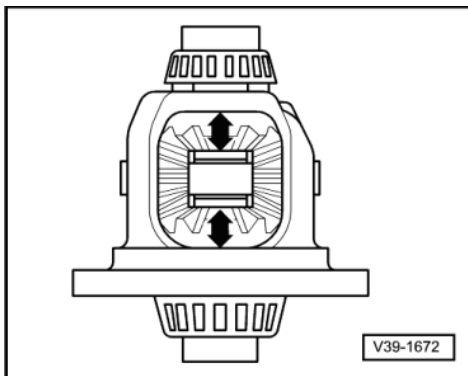
Warning
Wear protective gloves.

- 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 bevel gears

- If sun wheels have been replaced, measure and select new shims => Fig. 12 .
- Insert sun wheels with measured shims.
- Insert planet wheels spaced 180° apart, and then rotate into place -arrow-.
- Fit and align thrust washers.
- Insert threaded pieces.
- Drive planet pinion shaft into final position and secure.



-> Fig.12 Adjusting bevel gears

- Insert sun wheels with thinnest shims (0.5 mm).
- Insert planet wheels with thrust washers offset by 180°.

Note:

Do not now interchange bevel gears and thrust washers.

- Drive in shaft for bevel gears
- Press planet wheels outwards.
- Press sun wheels in direction indicated (arrows), and check play.
- Determine thickest shims for sun wheels (on each side) which can still just be fitted.

- The same thickness of shim should be used on both sides.
- Select required shims from table. Part numbers

=> Parts Catalogue

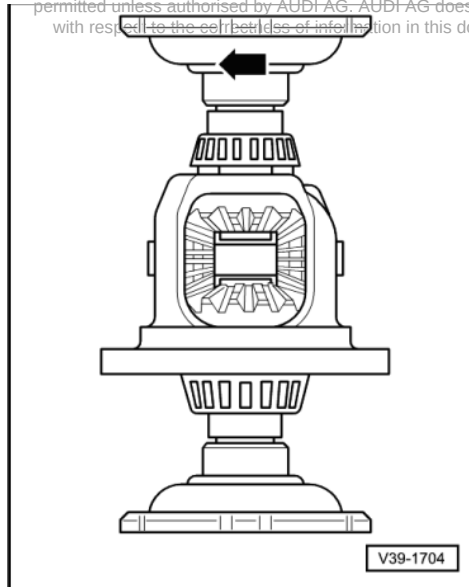
- Adjust play by inserting an appropriate shim.
- Specification: max. 0.10 mm

The following shims are available

Shim thickness (mm)		
0.50	0.70	0.90
0.60	0.80	1.00

Note:

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-> The adjustment is also correct if no further play is perceptible, although it is still possible to rotate the bevel gears -arrow-.

15 - Removing and installing and dismantling and assembling drive pinion

15.1 - Removing and installing and dismantling and assembling drive pinion

Special tools, testers and auxiliary equipment required

- ◆ Crankshaft seal installing tool VW 204 B
- ◆ Thrust plate VW 401
- ◆ Thrust plate VW 402
- ◆ Press tool VW 411
- ◆ Press tool VW 412
- ◆ Drift VW 460/2
- ◆ Thrust pieces for drive pinion bearing VW 470/1
- ◆ Threaded spindle VW 517
- ◆ Tube VW 519
- ◆ Engine and gearbox support VW 540
- ◆ Installing ring 2003/3

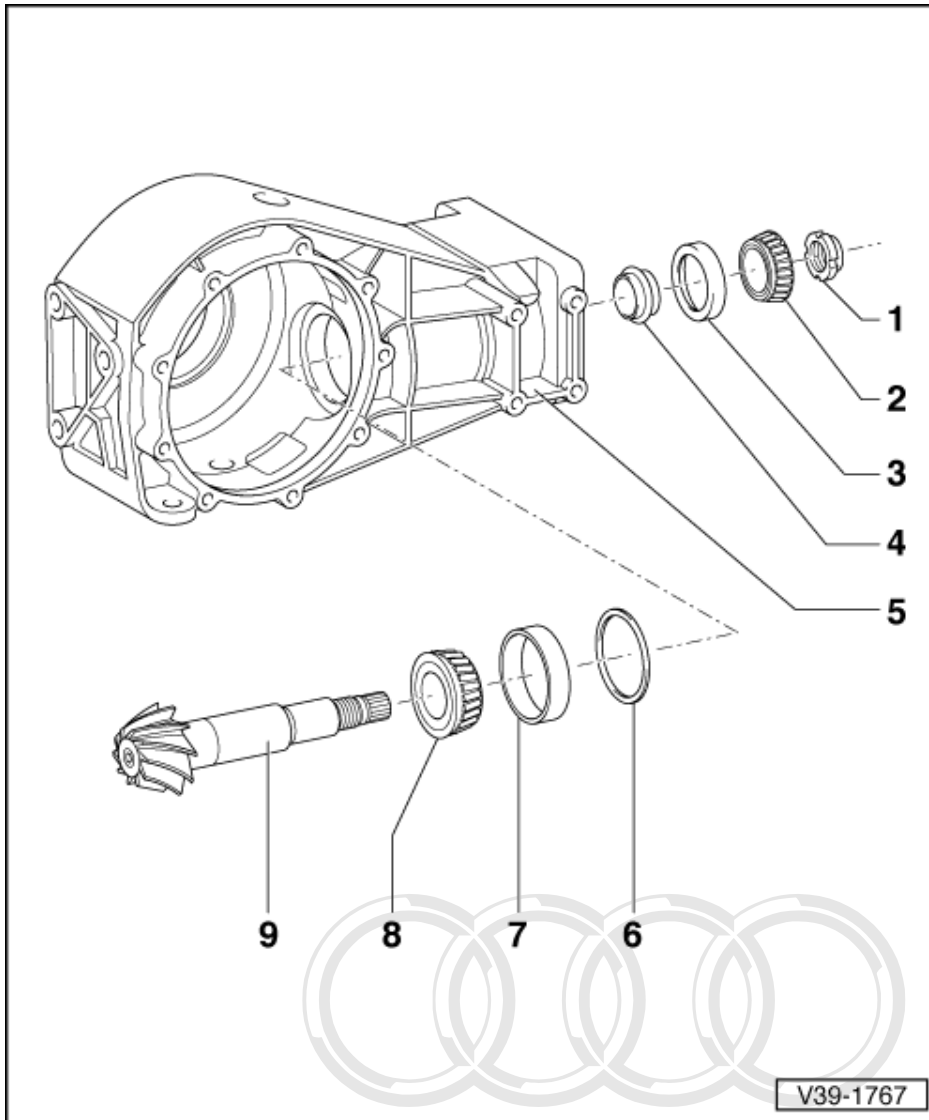


- ♦ Thrust pad 2050
- ♦ Pinion assembly device 2052/2
- ♦ Thrust plate 3005
- ♦ Thrust pad 3062
- ♦ Drift 3138
- ♦ Assembly device 3253 with 3253/3 and 3253/4
- ♦ Holding tool 3304
- ♦ Engine/gearbox jack V.A.G 1383 A
- ♦ Universal mount V.A.G 1359/2
- ♦ Separating tool Kukko 17/2
- ♦ Internal puller Kukko 21/7
- ♦ Counter support Kukko 22/1
- ♦ Counter support Kukko 22/2
- ♦ Torque gauge 0 ... 600 Ncm
- ♦ Socket attachment (long) 32 mm

Notes:

- ♦ Observe the general repair instructions => Page 9 .
- ♦ Securing rear final drive to repair stand => Page 212 .
- ♦ 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.
- ♦ Removing differential => Page 221 .
- ♦ Adjustments are required when replacing components marked 1) => Adjustment overview, Page 262 .

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1 Drive pinion nut

- ◆ Replace
- ◆ Removing => Fig. 237
- ◆ Tightening
=> Fig. 240
- ◆ Measuring frictional torque
=> Fig. 240
- ◆ Locking
=> Fig. 241

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2 Inner race for small taper roller bearing 1)

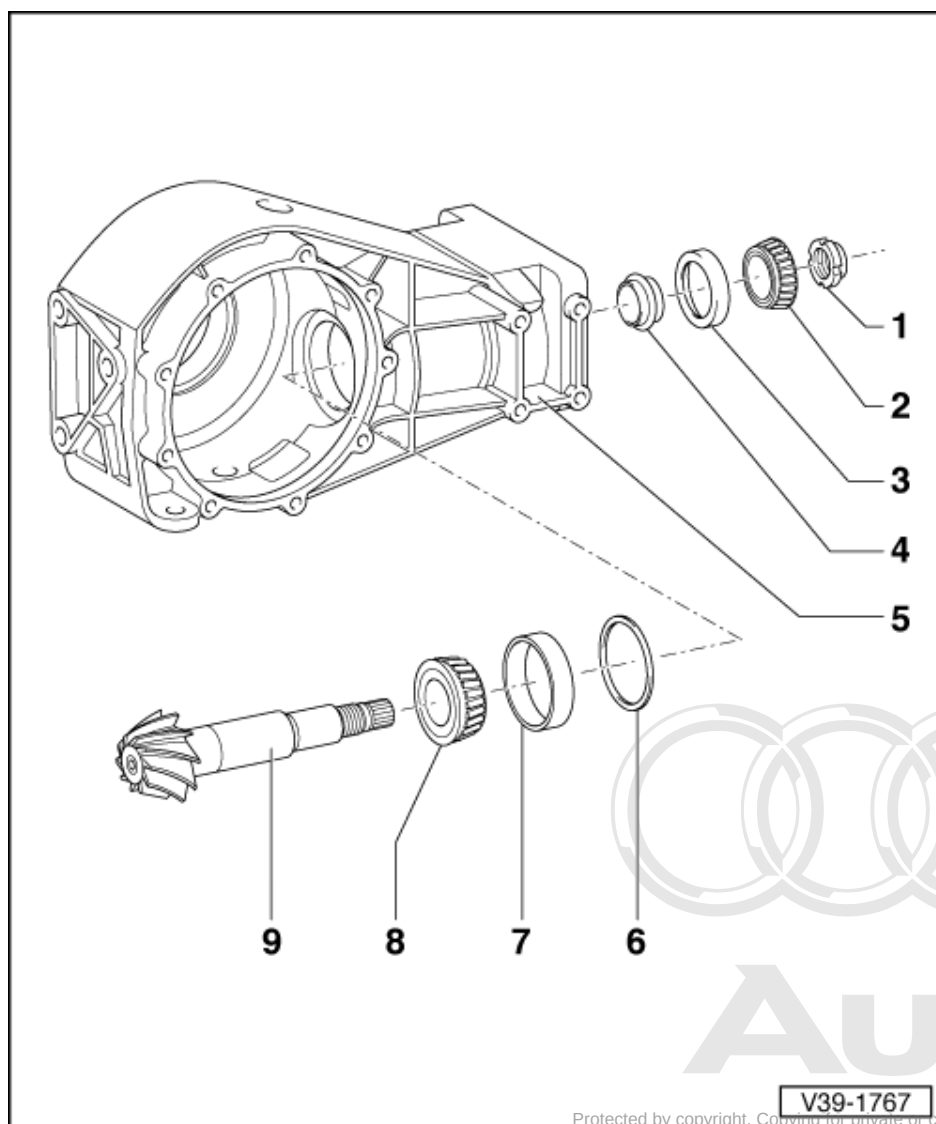
- ◆ Pressing out drive pinion
=> Fig. 238
- ◆ Installing
=> Fig. 240

3 Pulling out outer race for small taper roller bearing 1)

- ◆ Pull out
=> Fig. 238
- ◆ Pressing in
=> Fig. 239

4 Spacer sleeve 1)

- ◆ Always replace



5 Final drive housing 1)

6 Shim "S3"

- ◆ Note thickness
- ◆ Adjustment overview
=> Page 262

7 Outer race for large taper roller bearing 1)

- ◆ Driving out
=> Fig. 238
- ◆ Pulling in
=> Fig. 239

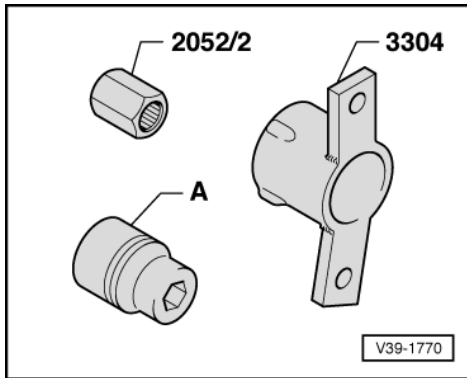
8 Inner race for large taper roller bearing 1)

- ◆ Pressing off
=> Fig. 238
- ◆ Pressing on
=> Fig. 239

9 Drive pinion 1)

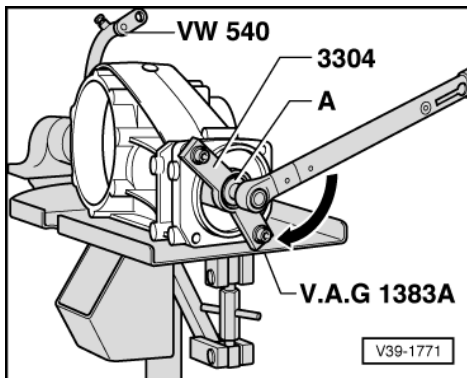
- ◆ Is mated with crown wheel, replace together as a set

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-> Fig.1 Tool for slackening and tightening drive pinion nut

A - 32 mm socket insert

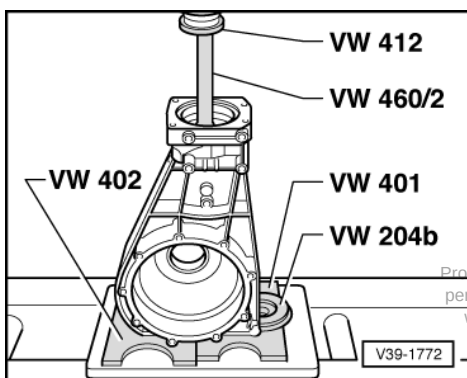


-> Fig.2 Removing nut for drive pinion

- Secure retainer 3304 with two hexagon bolts.

A - 32 mm socket insert

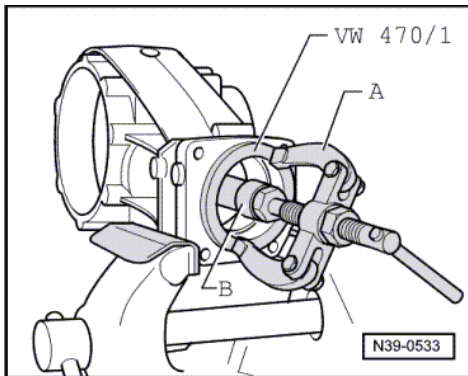
- Final drive must be supported when loosening nut (e.g. using universal support V.A.G 1359/2 in combination with gearbox jack V.A.G 1383 A).



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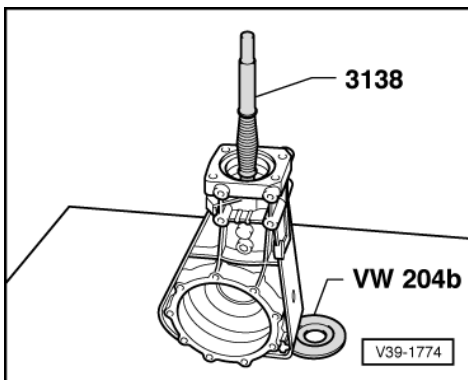


-> Fig.3 Pressing drive pinion out of inner race for small taper roller bearing



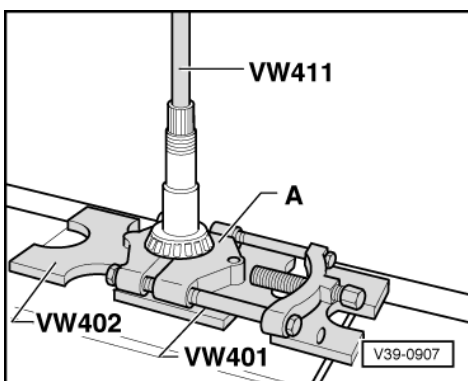
-> Fig.4 Pulling out outer race for small taper roller bearing

- A - Counter support e.g. Kukko 22/2
- B - Internal puller 46 ... 58 mm, e.g. Kukko 21/7



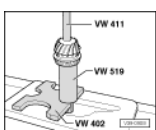
-> Fig.5 Driving out outer race for large taper roller bearing

- 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

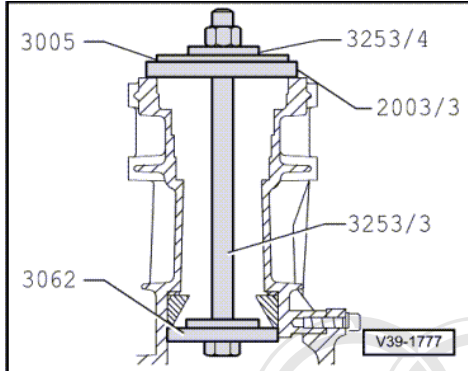


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-> Fig.7 Pressing inner race for large taper roller bearing onto drive pinion

Warning
Wear protective gloves.

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

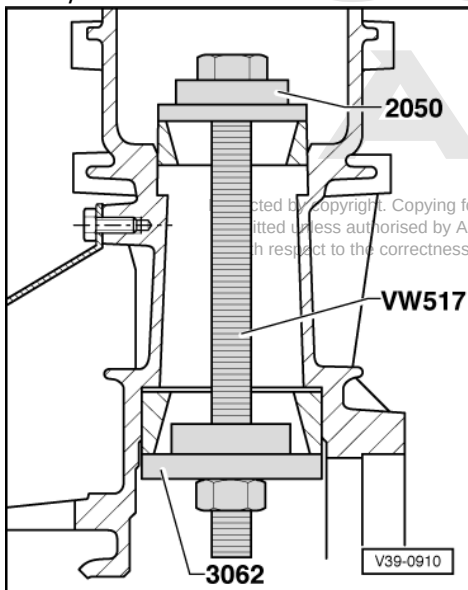


-> Fig.8 Inserting outer race for large taper roller bearing

- Insert predetermined shim "S3" for drive pinion => Page 264 .

Note:

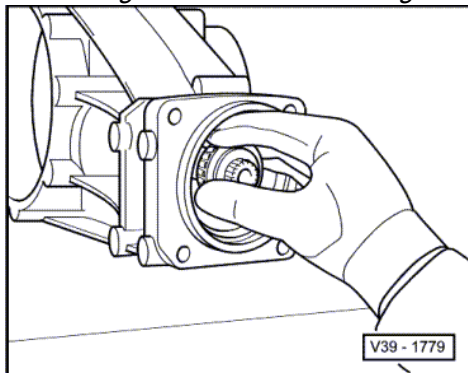
Inscription "Oben" with thrust washer 3253/4 faces the nut of the puller.



-> Fig.9 Pressing in outer race for small taper roller bearing

Note:

Oil bearing outer race and housing bore thoroughly.



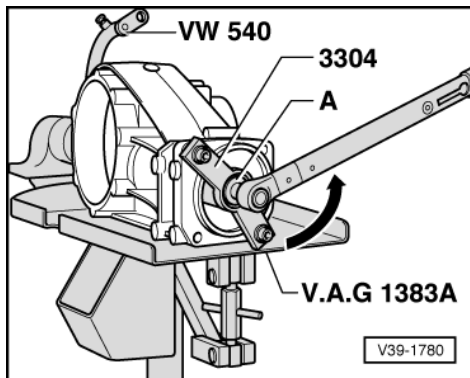


-> Fig.10 Pressing inner race for small taper roller bearing onto drive pinion

- Insert drive pinion with new spacer sleeve.

Warning
Wear protective gloves.

- Heat inner race for small taper roller bearing to approx. 100 °C.
- Press drive pinion upwards and fit bearing onto drive pinion as far as stop.



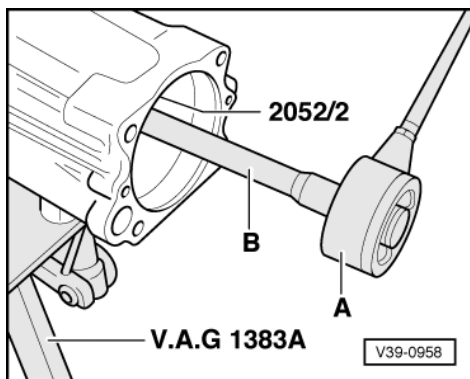
-> Fig.11 Tightening drive pinion nut and setting frictional torque

- 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:

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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.



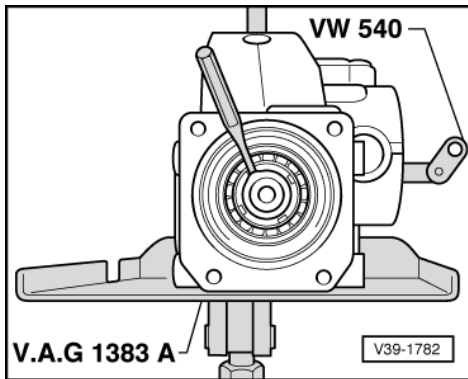
-> Fig.12 Measuring frictional torque

- A - Torque gauge, commercially available, 0 ... 600 Ncm
- B - 32 mm socket

- The following frictional torques should be set:

New bearings	Used bearings ¹⁾
250 ... 300 Ncm	30 ... 60 Ncm

- 1) run at least 50 km (30 miles)



-> Fig.13 Securing drive pinion nut

- Peen drive pinion nut with a drift.

16 - Servicing differential lock actuator

16.1 - Servicing differential lock actuator

16.2 - Removing and installing control unit for differential lock actuator

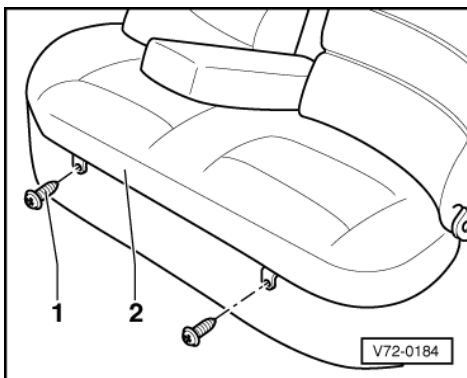
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Notes:

- ♦ Control unit -J187 is secured to a mounting plate under rear seat together with longitudinal acceleration switch for ABS.
- ♦ Operational check of control unit -J187 for differential lock

=> Binder "Current flow diagrams, Electrical Fault-finding and Fitting Locations"; Model year 1992 ä; Fault finding programme No. 36

Saloon



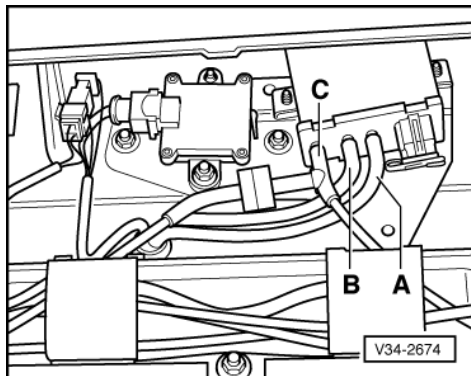
- -> Unscrew self-tapping screws -1- on left and right (8 Nm).
- Lift rear bench seat -2- slightly and take it out forward.



Avant

- Fold rear seat bench forwards.

All vehicles:



- -> Disconnect vacuum hoses at control unit -J187:

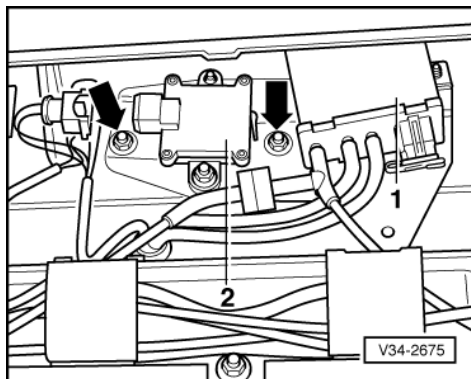
- A - To vacuum element (blue)
- B - To vacuum element (yellow)
- C - Connector piece (black) with connections to engine/intake manifold (blue) and vacuum reservoir (red)

Note:

Diagram of vacuum hose connections at vacuum element on rear final drive => Page 247

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- Unplug electrical connections from control unit -J187 -Item 1- and longitudinal acceleration switch for ABS -2-.



- -> Unscrew nuts -arrows- on mounting plate.
- Take out mounting plate with control unit -J187 -Item 1- and longitudinal acceleration switch for ABS -2-.
- Detach control unit -J187 from mounting plate.

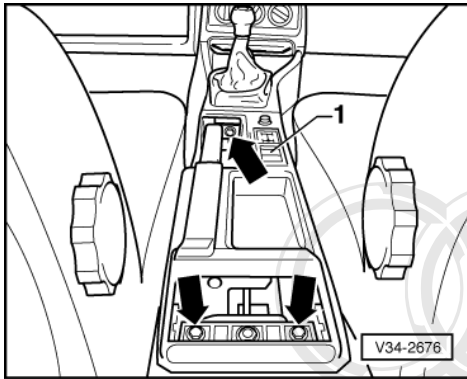
16.3 - Removing and installing differential lock control switch

Notes:

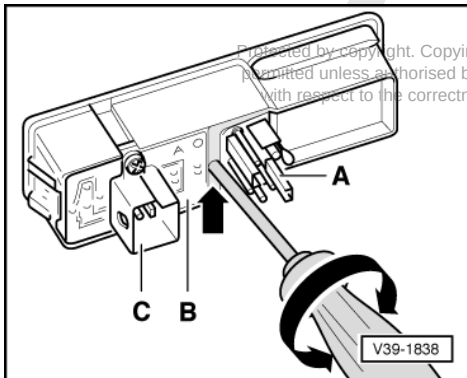
- ♦ Switch for differential lock is installed with a trim surround in centre console.
- ♦ Operational check of differential lock switch

=> Binder "Current flow diagrams, Electrical Fault-finding and Fitting Locations"; Model year 1992 ä; Fault finding programme No. 36

- Detach cap on centre console.
- Remove ashtray from rear section of centre console.

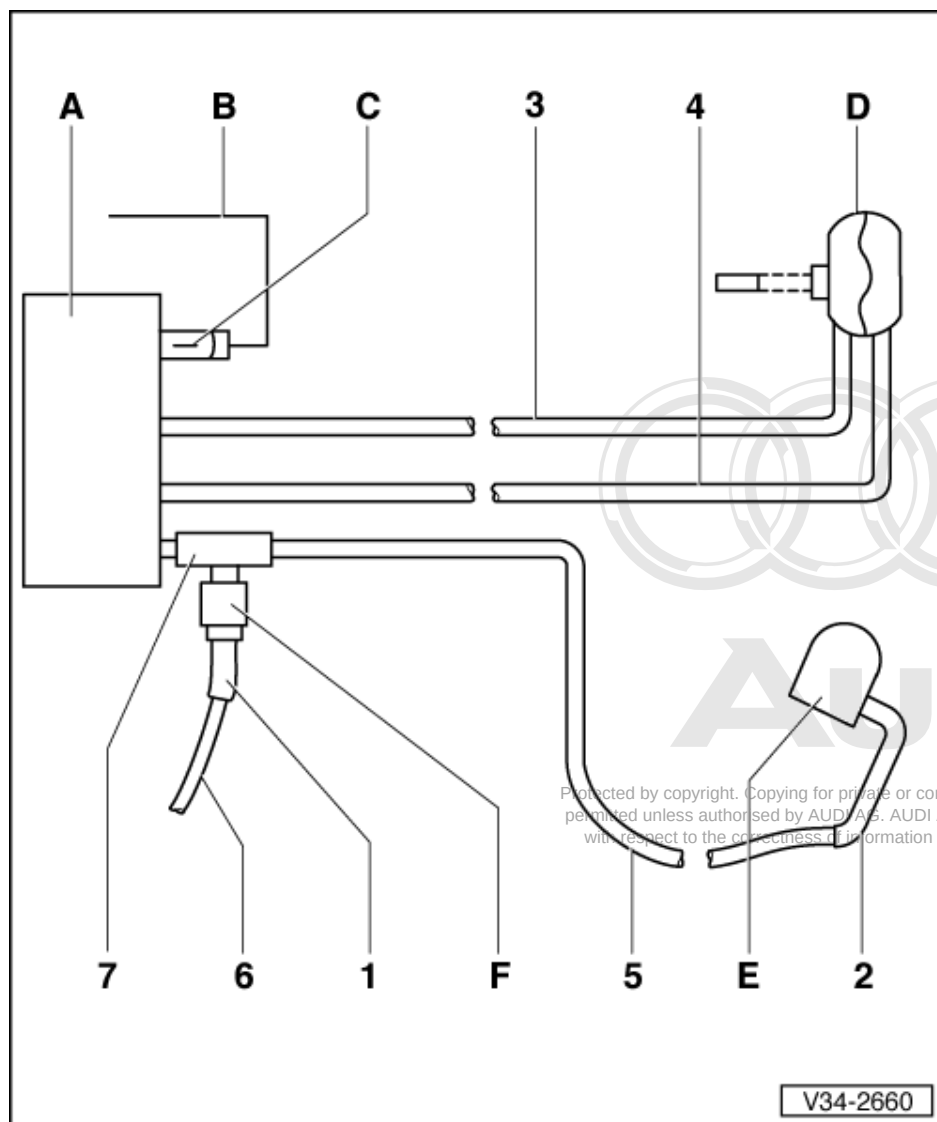


- -> Unscrew bolts -arrows- on rear section of mounting plate.
- Pull up hand brake as far as possible.
- Lift rear section of centre console.
- Push switch -1- out of rear section of centre console from underneath.
- Detach cable connection.



- -> Insert small screwdriver between switch -A- and conductor plate -B- -arrow-.
- Press switch out of front catch by turning screwdriver.
- Take switch out of trim surround.
- Conductor plate -B- can be removed from trim panel together with plug housing -C-.

16.4 - Routing diagram for piping and hoses



Saloon

A - Control unit for differential lock -J187

- ♦ Under rear seat bench

B - Electric cable

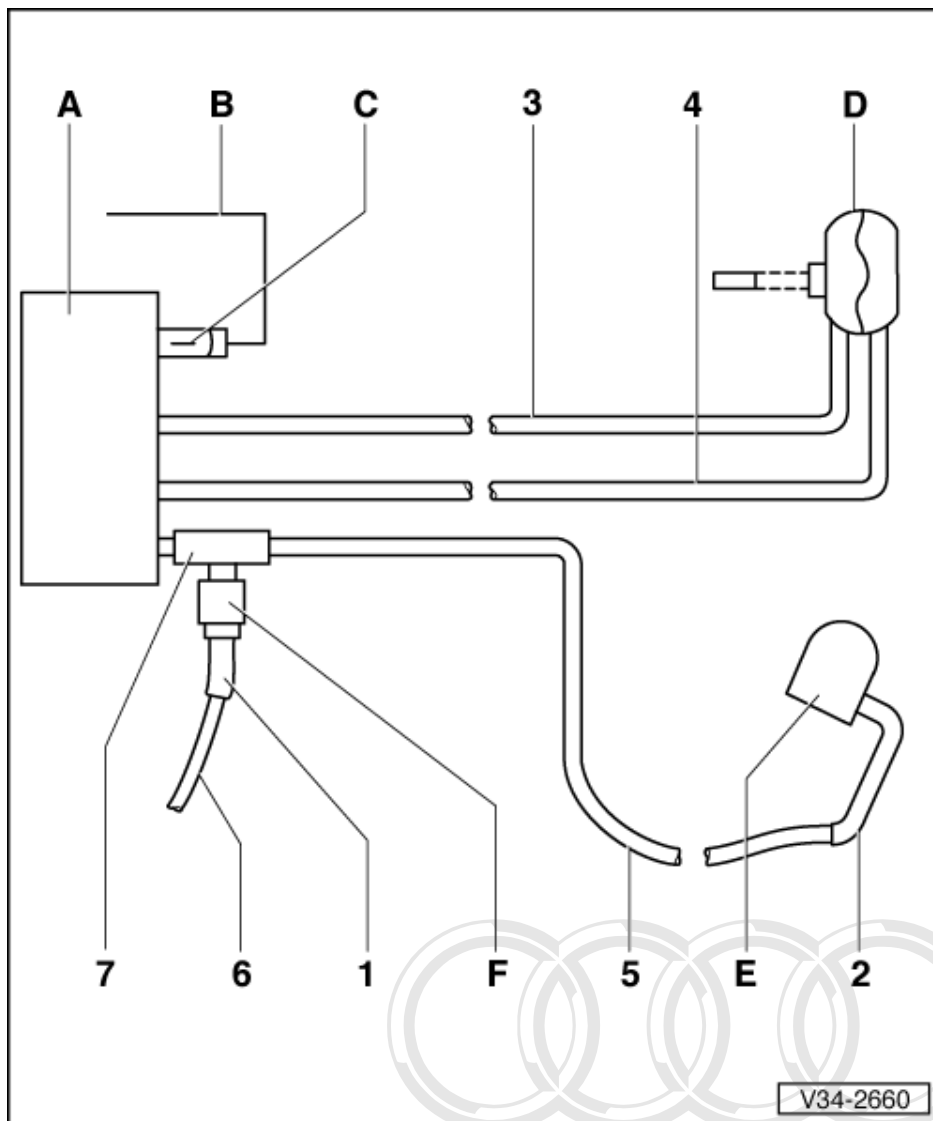
- ♦ To switch for differential lock control and to speedometer

C - Connector

- ♦ At control unit -J187

D - Vacuum element

- ♦ At rear final drive



E - Vacuum reservoir

- ◆ Location: In top right of boot, below hinge for boot lid. To remove, take off boot trim panel

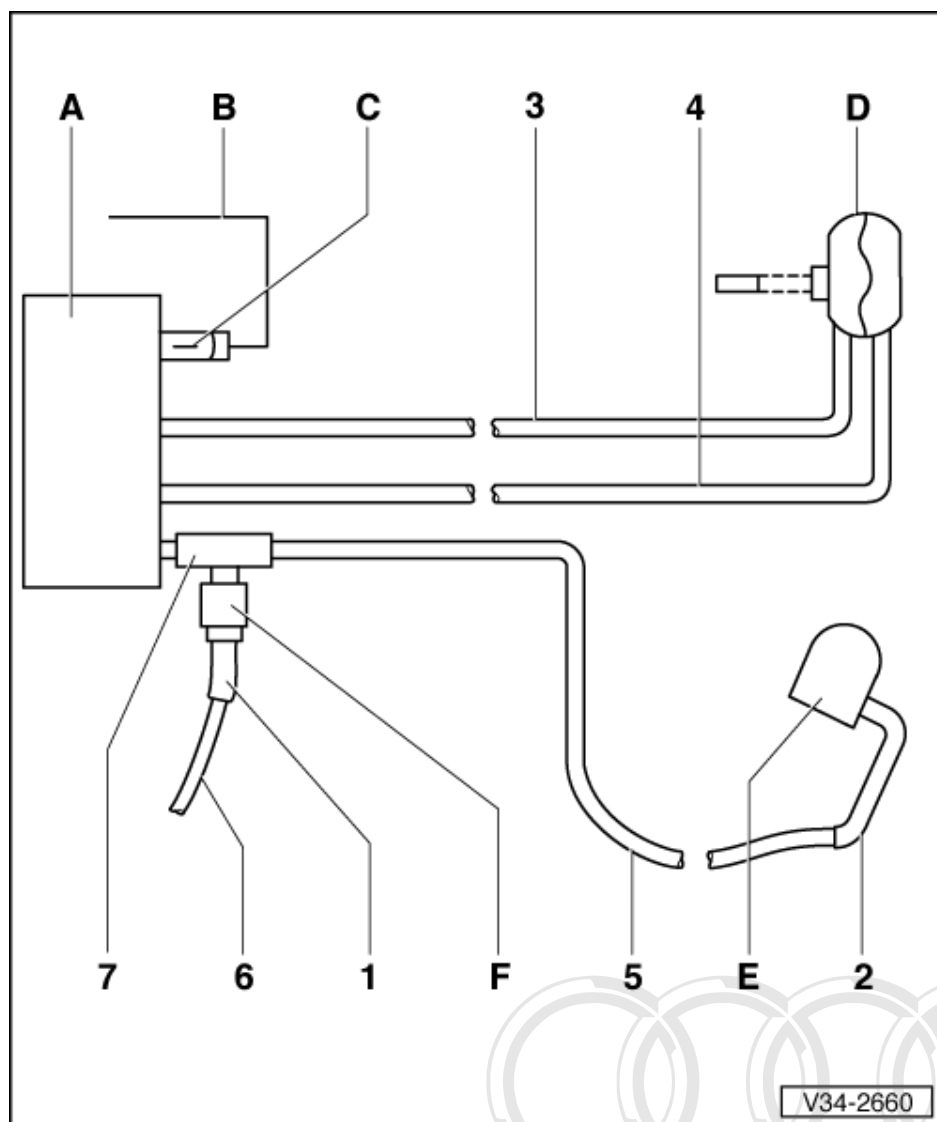
F - Non-return valve

- ◆ Under rear seat bench

Note:

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Hoses and pipes are supplied as single-coloured replacement parts. When installing a hose or pipe, cut to length and mark with a strip of adhesive tape of appropriate colour or inscribe appropriate colour.

**Hoses 3.5 x 2**

No.	Length (mm)	Colour	Qty.
1	45	Black	1
2	240	Black	1

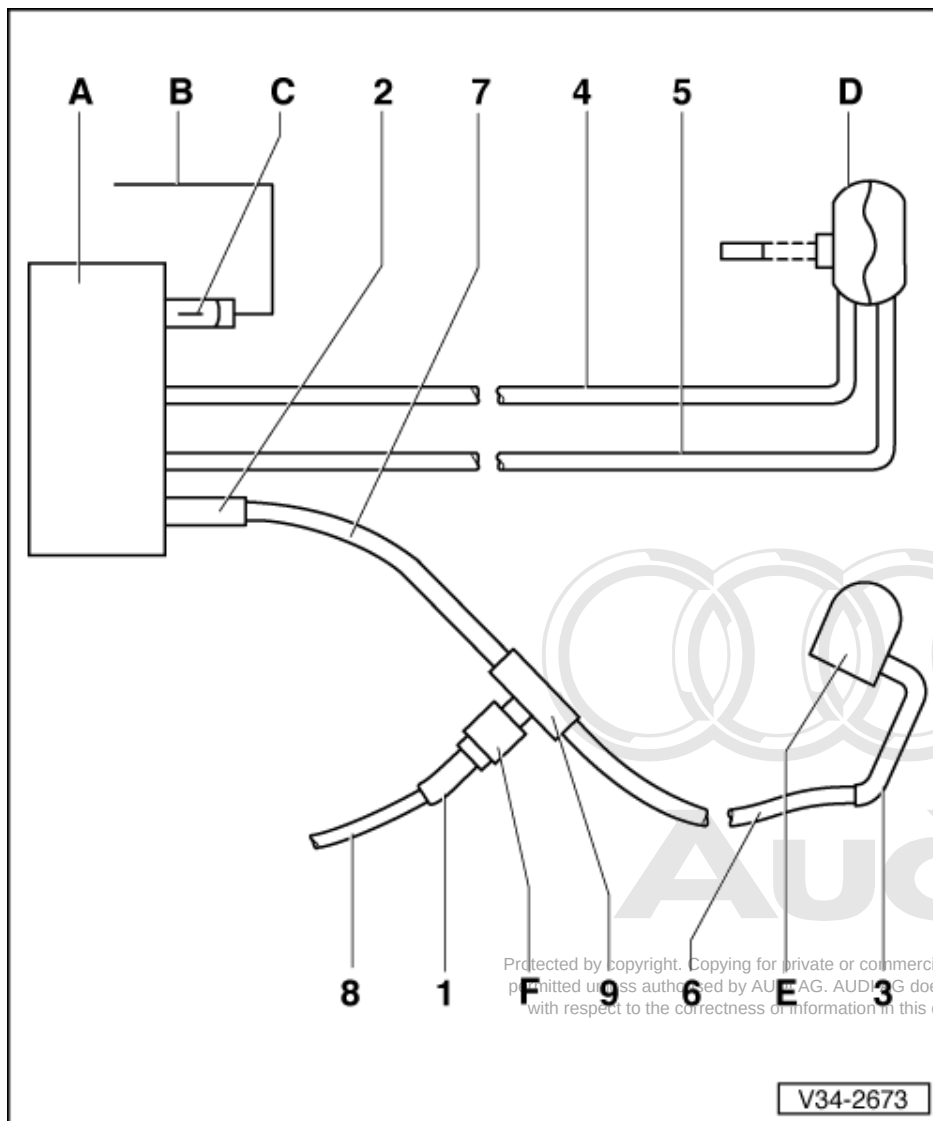
Hoses 3.5 x 2.25

No.	Length (mm)	Colour	Qty.
3	850	Yellow	1
4	820	Blue	1

Pipes 4 x 1

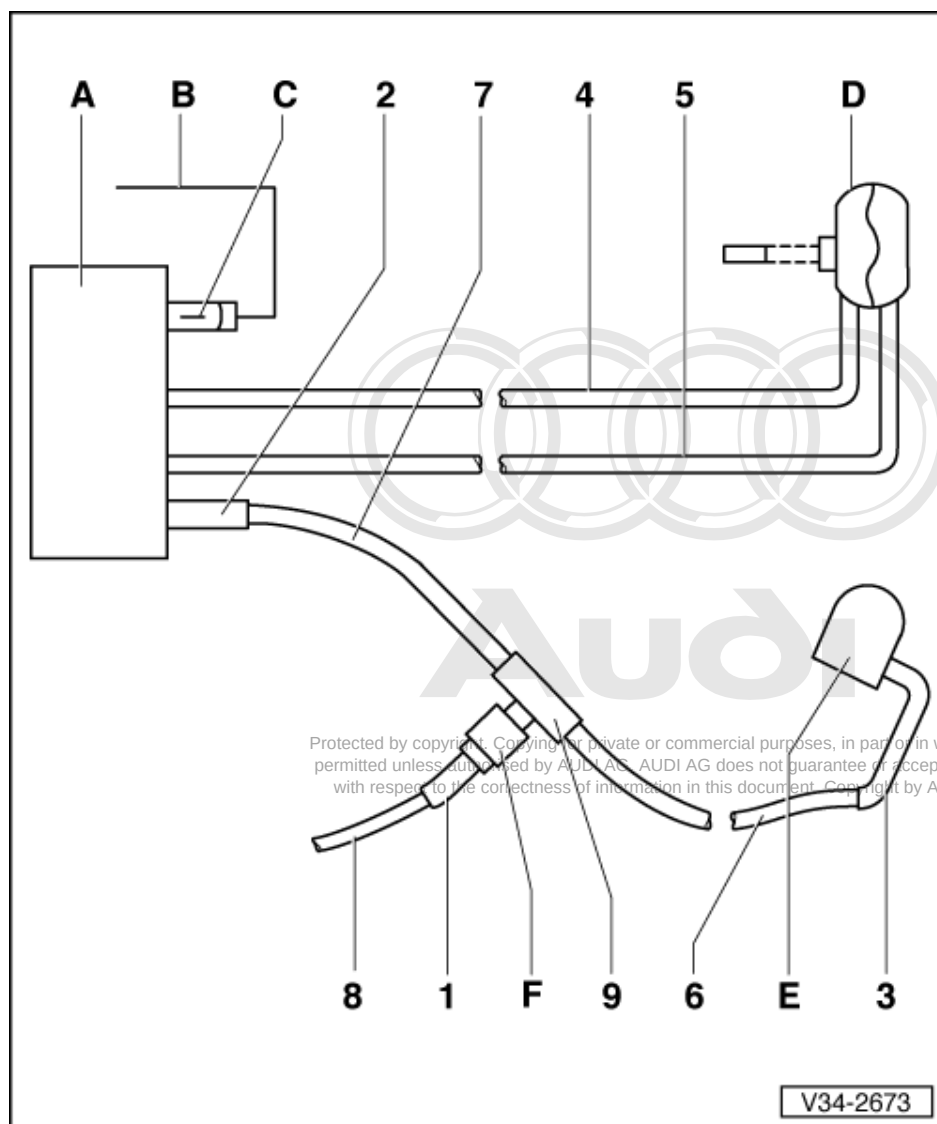
No.	Length (mm)	Colour	Qty.
5	2000	Red	1
6 1)	4200	Blue	1
7	Connector (under rear seat bench)		1

1) Pipe runs to engine or brake servo unit, respectively



Avant

- A - Control unit for differential lock -J187**
- ♦ Under rear seat bench
- B - Electric cable**
- ♦ To switch for differential lock control and to speedometer
- C - Connector**
- ♦ At control unit -J187
- D - Vacuum element**
- ♦ At rear final drive

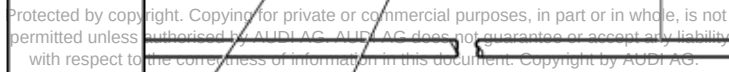


E - Vacuum reservoir

- ♦ Location: In area of rear left wheel house, accessible through cover
- F - Non-return valve**
- ♦ Under rear seat bench

Note:

Hoses and pipes are supplied as single-coloured replacement parts. When installing a hose or pipe, cut to length and mark with a strip of adhesive tape of appropriate colour or inscribe appropriate colour.



Hoses 3.5 x 2.25			
No.	Length (mm)	Colour	Qty.
4	850	Yellow	1
5	820	Blue	1

V34-2673



- 1) Pipe runs to engine or brake servo unit, respectively

16.5 - Removing and installing vacuum element

- Final drive installed

Removing

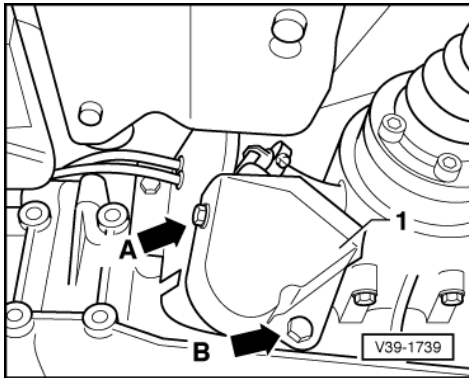
- Loosen rear clamps and disconnect exhaust system

=> 4-cyl. fuel injection engine, Mechanics; Repair group 26

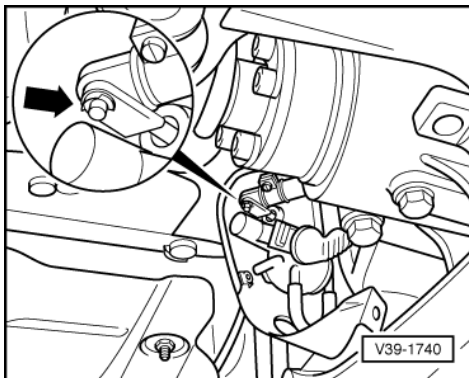
=> 5-cyl. fuel injection engine (2-valve), Mechanics; Repair group 26

=> 6-cyl. fuel injection engine, Mechanics; Repair group 26

- Detach main and rear silencers from retaining loops.



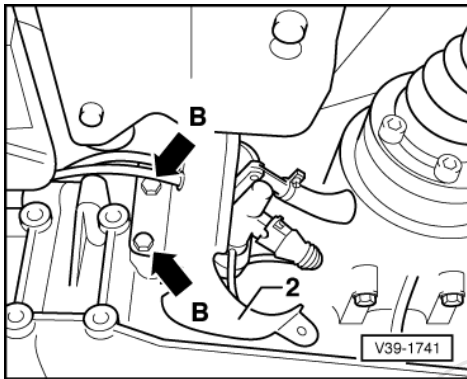
- -> Remove heat shield -1- for differential lock actuator -arrows A and B-.



- -> Using a screwdriver, prise off circlip -arrow- on connection between differential lock actuator and differential lock.
- Lift out connecting pin.
- Unclip electrical wiring and hoses for differential lock actuator.



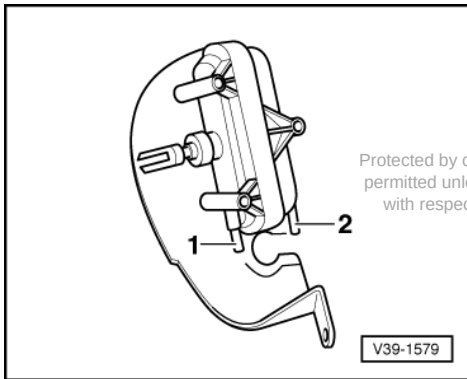
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- ➔ Unbolt bracket -2- for vacuum element and switch for differential lock on rear final drive -arrows B-.
- Disconnect vacuum hoses from vacuum element - pay attention to coloured markings.
- Unbolt vacuum element from bracket.

Installing

Install in reverse order, paying attention to the following:



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- ➔ Pay attention to coloured marking of vacuum hoses:
- Yellow hose to connection -1-
- Blue hose to connection -2-
- Adjust clevis at vacuum element => Page 254 .

Tightening torques

Component		Nm
Vacuum element to bracket	M5	2.5
Bracket for vacuum element to rear final drive	M8	23
Heat shield for differential lock actuator	M6	10
to bracket	M8	22
Clamp for exhaust pipe		40

16.6 - Dismantling and assembling differential lock

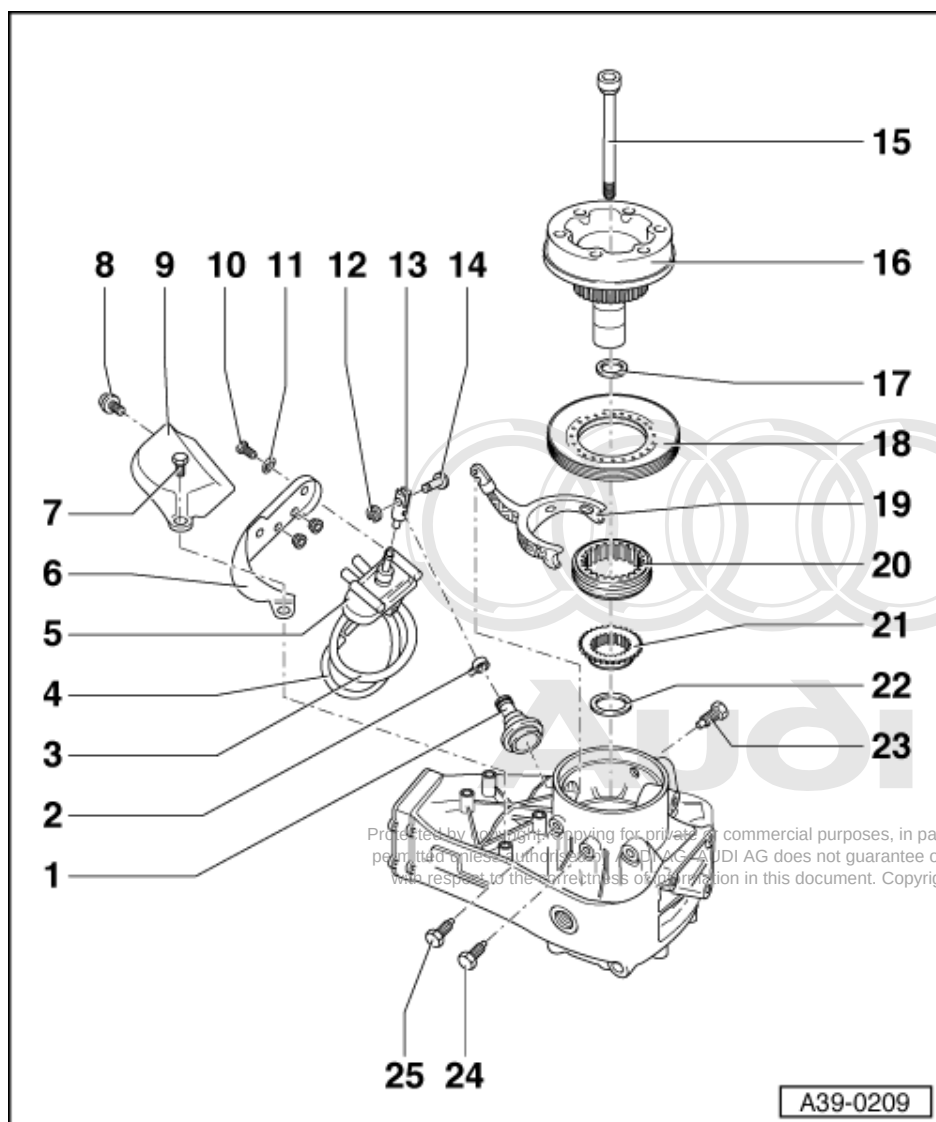
Notes:

- ♦ Can be disassembled with final drive installed.
- ♦ Differential lock of rear final drive can be locked by means of control unit up to 25 km/h.
- ♦ Differential lock is switched off automatically once speed rises above 25 km/h.



♦ Fault finding at differential lock

=> Binder "Current flow diagrams, Electrical Fault-finding and Fitting Locations"; Model year 1992 ä; Fault finding programme No. 36

**1 Bellows**

- ♦ For removing and installing, remove bracket together with vacuum element => Page 250

2 Clip

- ♦ For attaching bellows to selector fork

3 Yellow vacuum hose

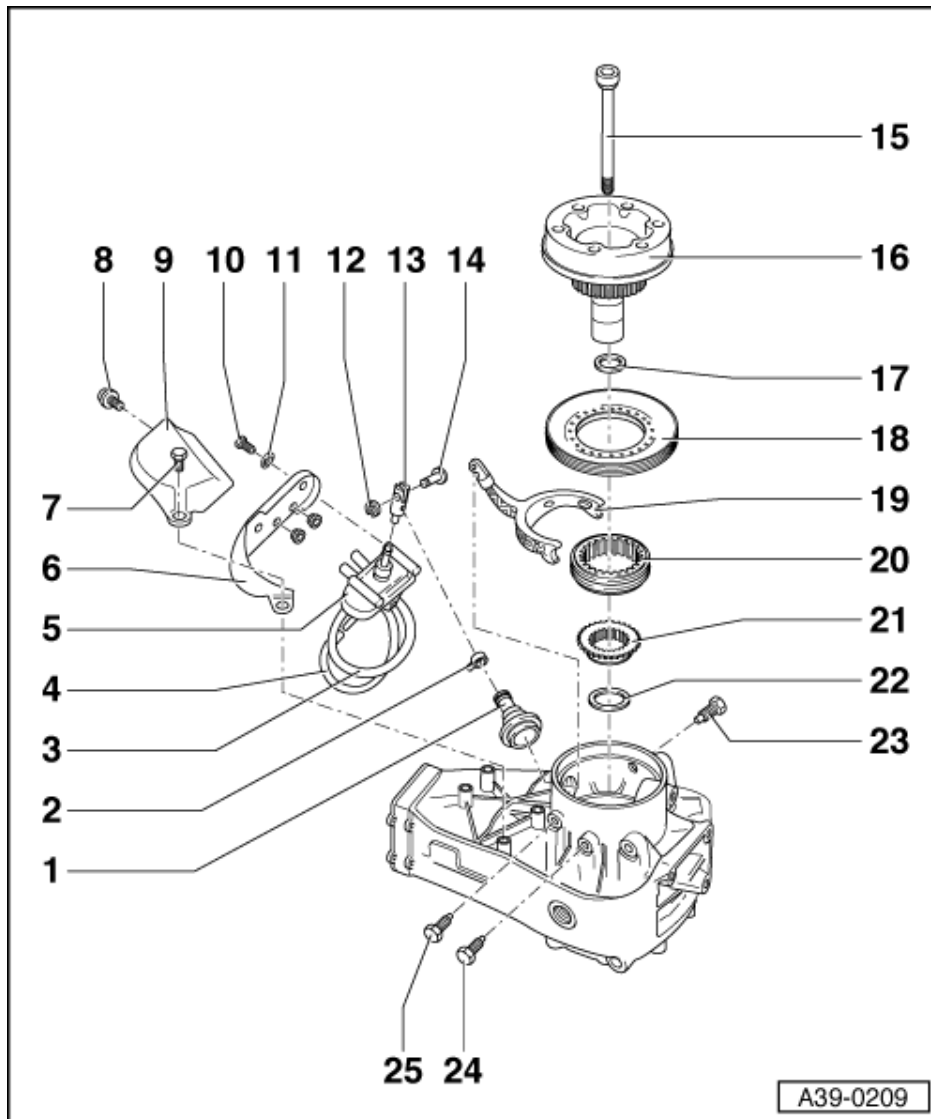
- ♦ Fit onto outer connection of vacuum element

4 Blue vacuum hose

- ♦ Fit onto inner connection of vacuum element

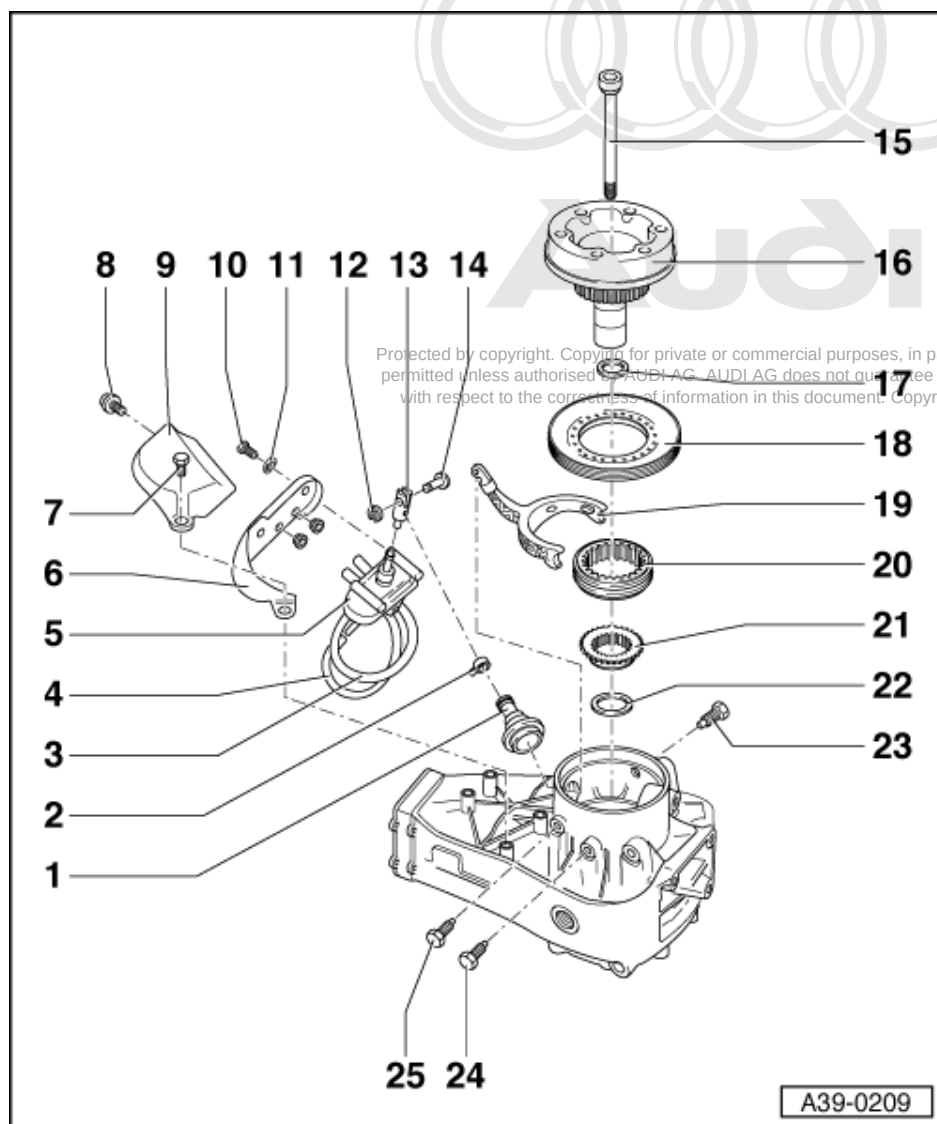
5 Vacuum element

- ♦ Removing and installing
=> Page 250



- 6 Bracket**
- ♦ For vacuum element
- 7 Bolt - 22 Nm**
- 8 Bolt - 10 Nm**
- 9 Heat shield**
- 10 Bolt - 2.5 Nm**
- ♦ Qty. 3
 - ♦ With corrugated washer
 - ♦ For attaching vacuum element to bracket
- 11 Grommet**
- ♦ Qty. 2
- 12 Locking clip**
- ♦ Fit onto pin

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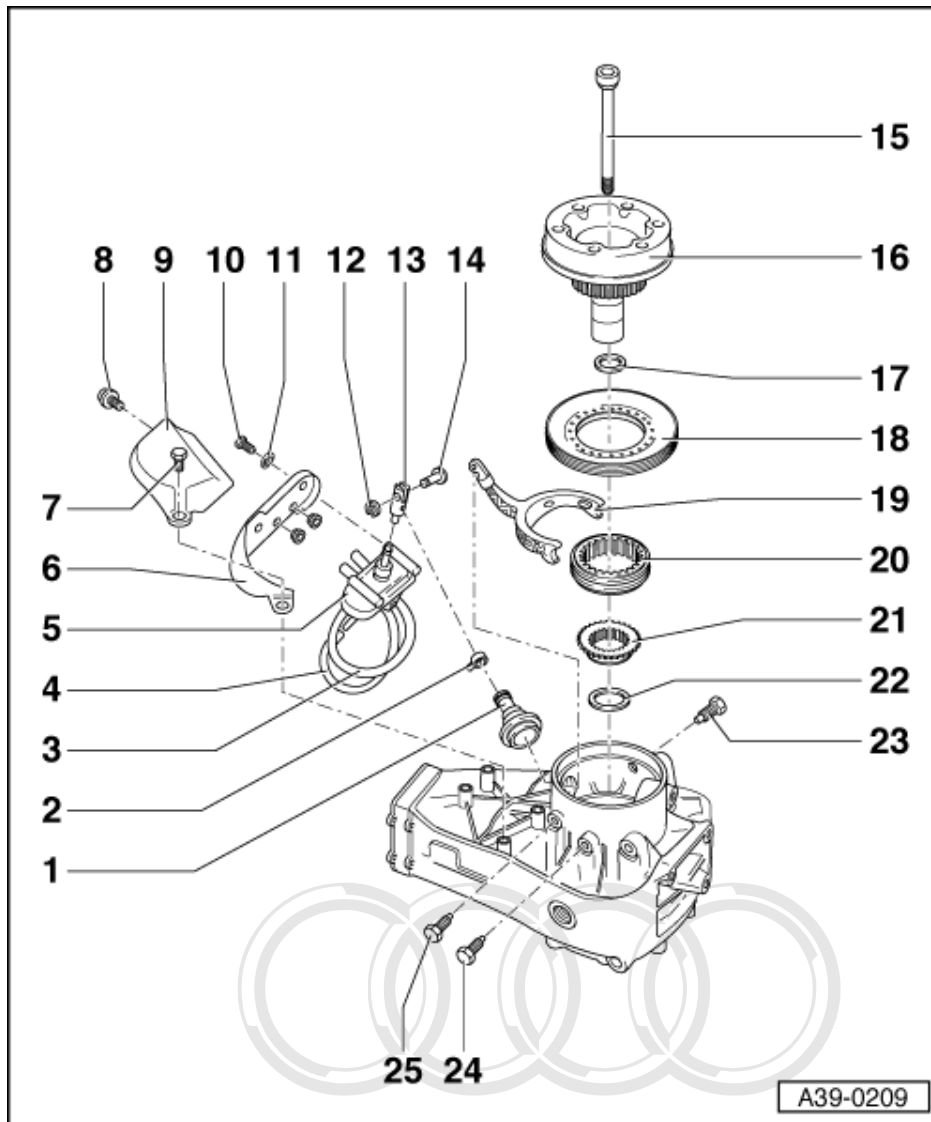
**13 Clevis**

- ♦ Adjusting:
 - Final drive has to be completely assembled.
 - Remove pin at clevis.
 - Centre operating travel of vacuum element by turning clevis so that the two end positions of selector fork are completely reached (stop produced by stud bolt -Item **24** -).

14 Pin

15 Taper head bolt - 10 Nm + 1/4 turn (90°) further

16 Flange shaft, left



17 Shim for flange shaft

- ♦ Take care not to lose shim when dismantling
- ♦ Determining thickness
=> Page 257

18 Oil seal

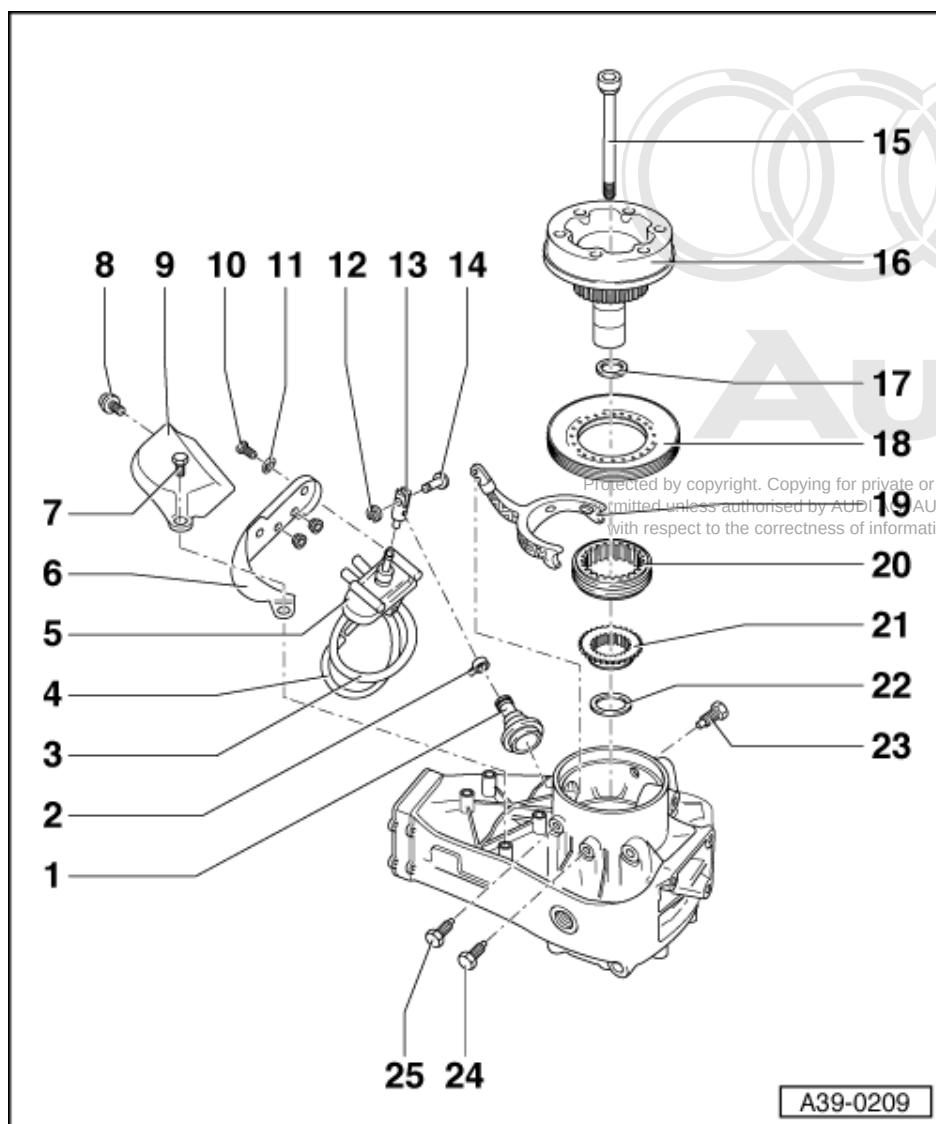
- ♦ Always replace
- ♦ Removing => Page 205
- ♦ Installing => Page 207

19 Selector fork

- ♦ Remove and install together with locking collar

20 Locking collar

- ♦ Installation position: Step towards coupling body
- ♦ Remove and install together with selector fork



21 Coupling body for differential lock

- ♦ Installation position
=> Fig. 257

22 Shim for coupling body

- ♦ Determining thickness
=> Fig. 257

23 Trunnion bolt - 35 Nm

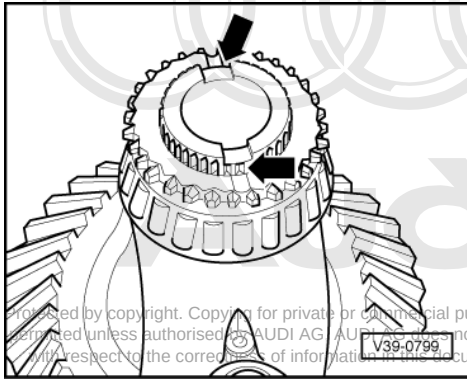
- ♦ Guide for selector fork

24 Trunnion bolt - 35 Nm

- ♦ Stop for selector fork

25 Trunnion bolt - 35 Nm

- ♦ Guide for selector fork

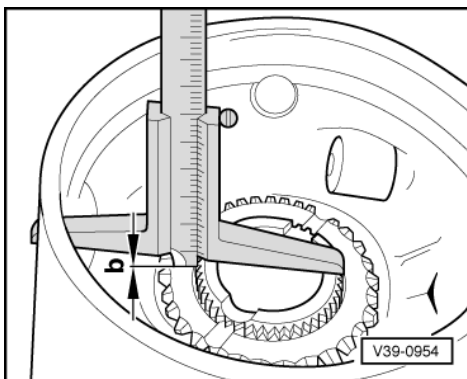


-> Fig.1 Installation position of coupling body

Note:

Shown in illustration with differential removed.

The oiling slots -arrows- at differential and coupling body should be aligned.



-> Fig.2 Determining thickness of shim for coupling body

- Measure dimension -b-.
- Determine shim from table. Part numbers

=> Parts Catalogue

Dimension -b-	Thickness (mm)
0.00 ... 4.10	No shim
4.11 ... 4.40	0.3
4.41 ... 4.70	0.6
4.71 ... 4.90	0.9

16.7 - Adjusting flange shaft, left

Special tools, testers and auxiliary equipment required

- ♦ Universal dial gauge bracket VW 387

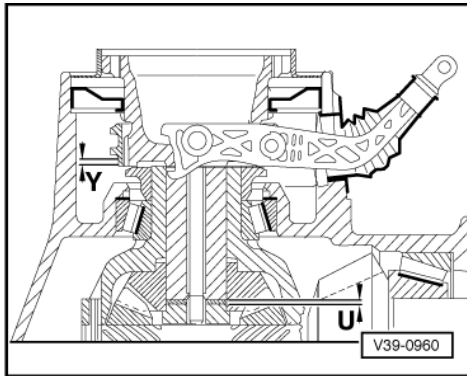


- ♦ Dial gauge

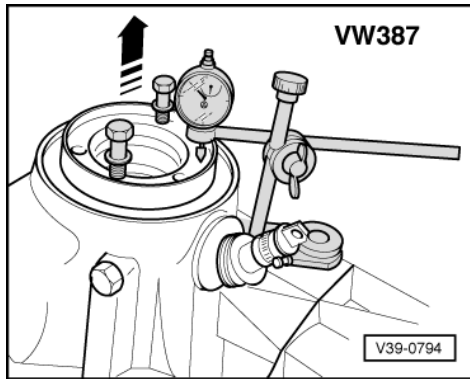
Notes:

- ♦ This operation should only be carried out if left flange shaft, differential housing or bevel gears have been replaced.
- ♦ The purpose of this adjustment is to achieve a clearance -Y- of 0.2 ... 0.5 mm between flange shaft and differential housing. This is the only way to ensure smooth operation of parts as well as precise gearshifts.

Determining size of shim "u"



- -> Determine gap -y- between flange shaft and differential housing as follows.



- -> Attach dial gauge with universal dial gauge holder VW 387 to rear final drive.
- Press flange shaft in towards differential. Apply dial gauge to flange shaft and set to "0" with a preload of 1 mm.
- Pull out flange shaft in direction of arrow as far as stop and measure clearance.
 - Specification: 0.2 ... 0.5 mm
- If clearance is insufficient, install appropriately thicker shims, if clearance is too large, install appropriately thinner shims.
- Select required shims from table. Part numbers

=> Parts Catalogue

The following shims are available

Shim thickness (mm)		
0.3	0.6	0.9

17 - Adjusting drive pinion and crown wheel

17.1 - Adjusting drive pinion and crown wheel

General notes:

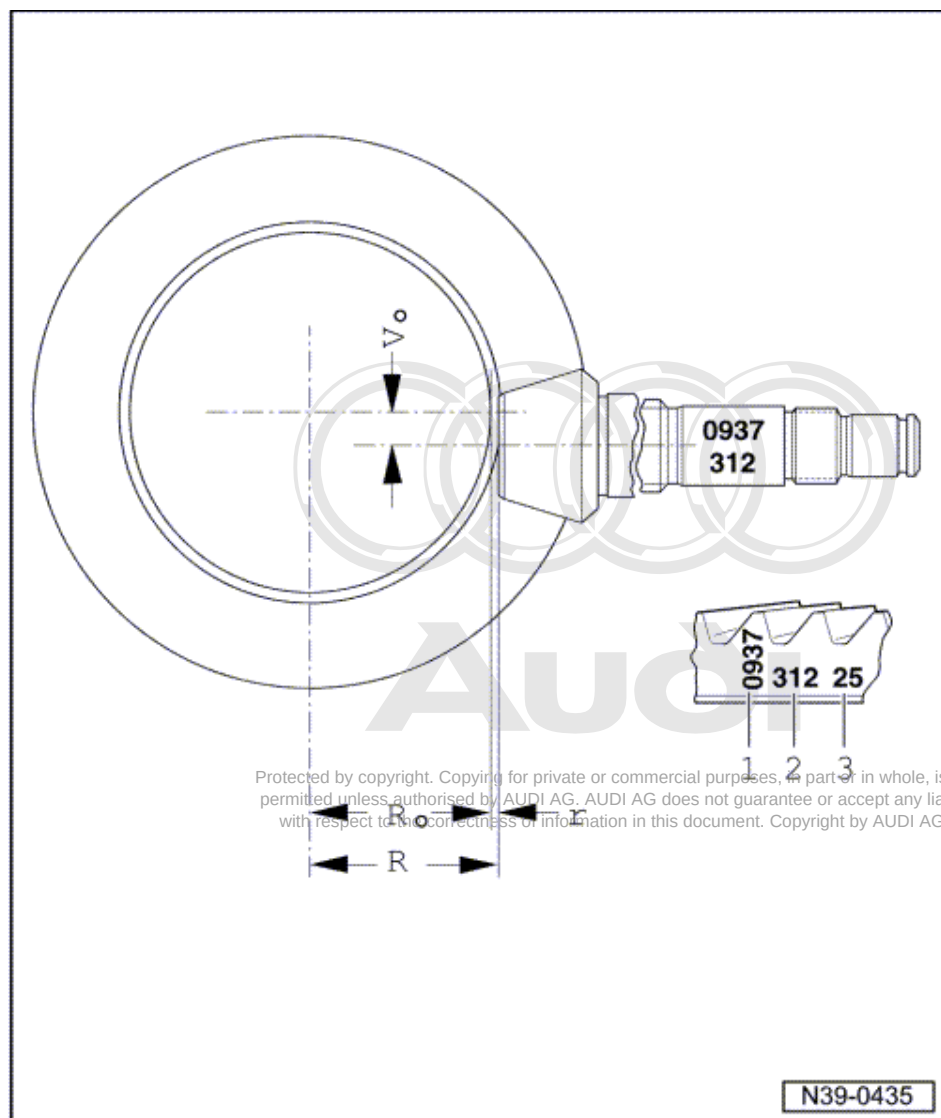
- ♦ Careful adjustment of the drive pinion and crown wheel is important for the service life and smooth running of the final drive. For this reason, the drive pinion and crown wheel are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions 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.



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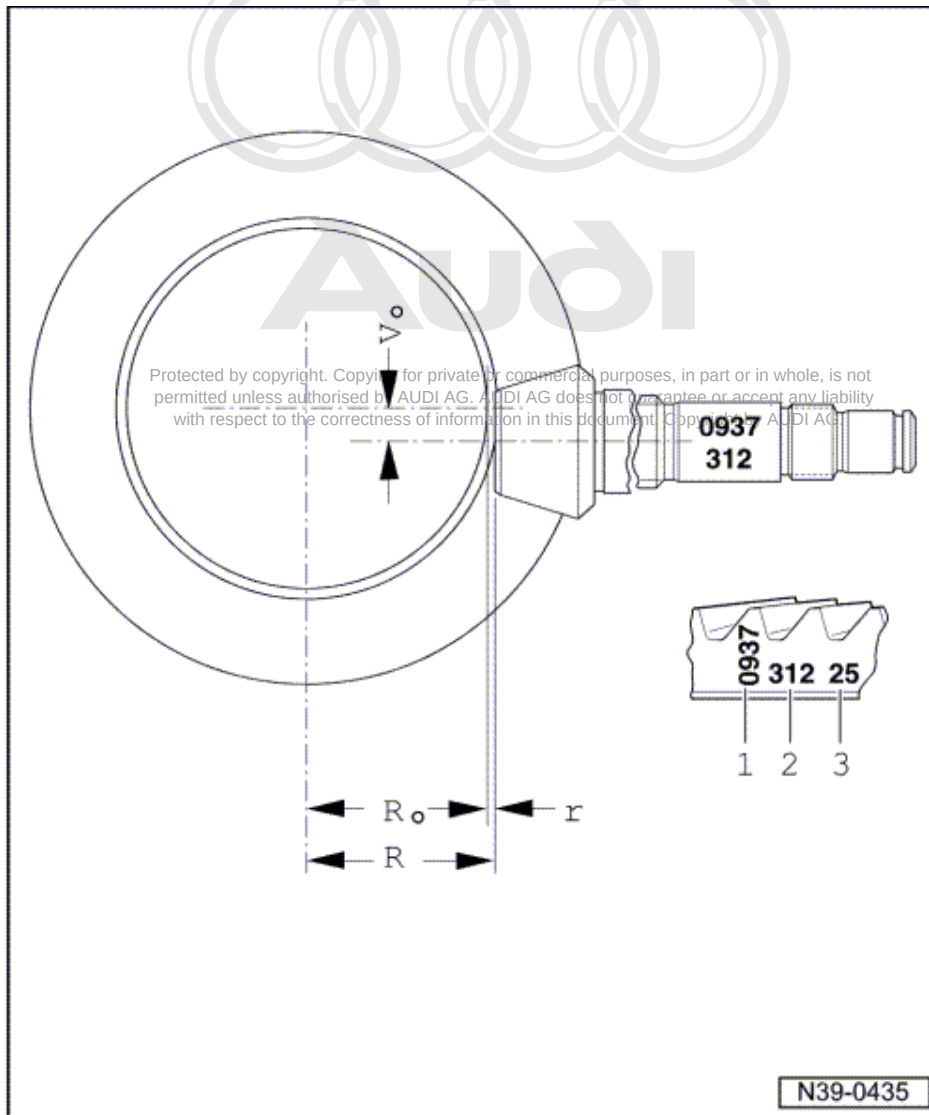
17.2 - Adjusting final drive sets; identification



- 1 "0937" indicates Oerlikon final drive set with a ratio of 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 test machine master gauge used "Ro".

Ro -Crown wheel = 53.15 mm



R - Actual dimension between crown wheel and face of drive pinion at point with quietest running for this gear set
 $R = R_o + r$
 V_o - Hypoid offset

17.3 - Sequence for re-adjusting final drive set

The following work sequence 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 **263**.

17.4 - Adjustment overview**Note:**

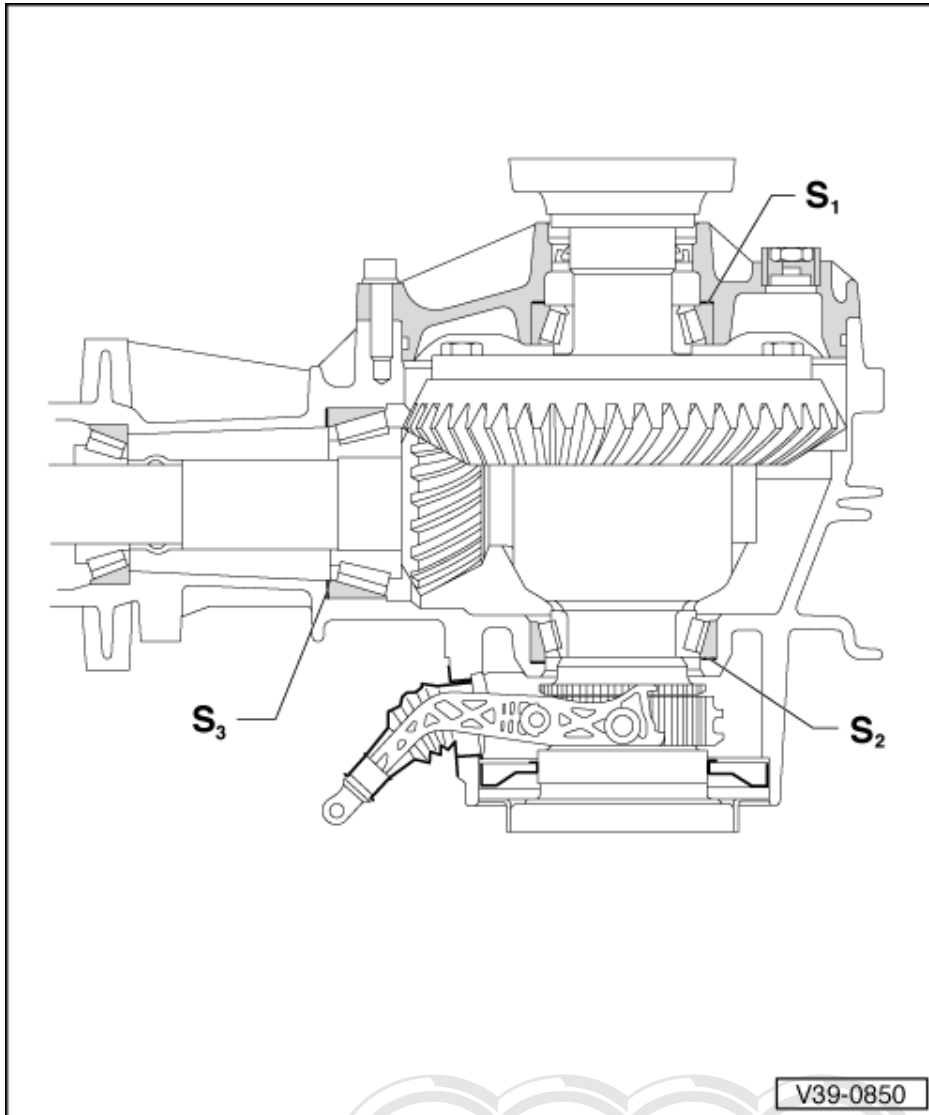
If repairs have been carried out on rear final drive it is only necessary to adjust drive pinion or final drive set if components have been replaced which have a direct effect on the adjustments of the final drive. Refer to following table to avoid unnecessary adjustments:

Parts replaced: ▼	To be adjusted:			
	Crown wheel "S1"+"S2" 1) => Page 270	Drive pinion "S3" 1) using deviation "r" => Page 264	Backlash => Page 272	Flange shaft, left only for final drive with differ- ential lock => Page 257
Final drive housing	X	X	X	
Differential housing	X		X	X
Taper roller bearings for drive pinion		X	X	
Taper roller bearing for differential	X		X	
Final drive set 2)	X	X	X	
Final drive cover	X		X	
Flange shaft				X
Bevel gears				X

- 1) Shims; installation position => Page **263**.
- 2) Drive pinion and crown wheel; only replace together.

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17.5 - Position of shims



Note:

Adjustment overview when replacing individual components of rear final drive =>Page **262**.

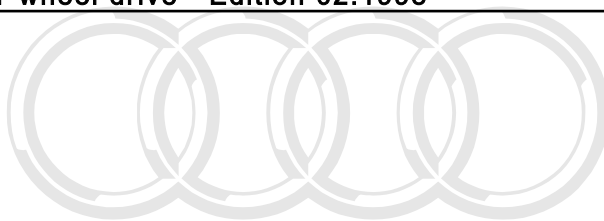
- S1 -** Adjustment shim for crown wheel in cover for final drive
- S2 -** Adjustment shim for crown wheel in final drive housing
- S3 -** Adjustment shim for drive pinion in final drive housing

Special tools, testers and auxiliary equipment required

- ◆ Dial gauge extension VW 382/10
- ◆ Universal mandrel VW 385/1
- ◆ 2 x centring disc VW 385/3
- ◆ Measuring plunger VW 385/14
- ◆ Measuring plate VW 385/17
- ◆ Dial gauge extension VW 385/20
- ◆ Master gauge VW 385/30
- ◆ End measuring plate VW 385/33
- ◆ Universal dial gauge bracket VW 387
- ◆ Measuring lever VW 388
- ◆ Threaded spindle VW 517
- ◆ Engine and gearbox support VW 540



- ♦ Adjustment tool for crown wheel VW 521/4
- ♦ Adjustment tool for crown wheel VW 521/8
- ♦ Thrust plate 30-205
- ♦ Installing ring 2003/3
- ♦ Pinion assembly device 2052/2
- ♦ Thrust plate 3005
- ♦ Thrust pad 3062
- ♦ Assembly device 3253 with 3253/3 and 3253/4
- ♦ Holding tool 3304
- ♦ Engine/gearbox jack V.A.G 1383 A
- ♦ Universal mount V.A.G 1359/2
- ♦ Dial gauge extension 30 mm
- ♦ Dial gauge
- ♦ Torque gauge 0 ... 600 Ncm
- ♦ Socket attachment (long) 32 mm



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17.6 - Adjusting drive pinion

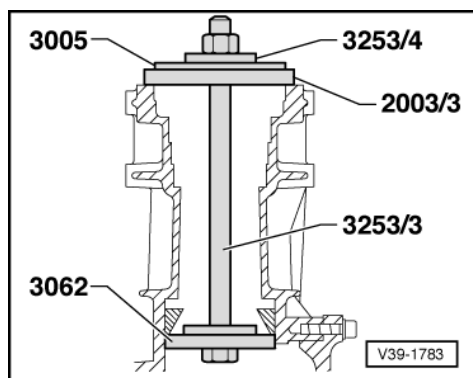
Notes:

- ♦ Before adjusting pinion, adjust the crown wheel (determine total shim thickness "Stotal" for shims "S1" + "S") => Page 270 .
- ♦ 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. Adjustment overview => Page 262

Determining thickness of shim "S3"

(Adjusting preload of taper roller bearing for drive pinion)

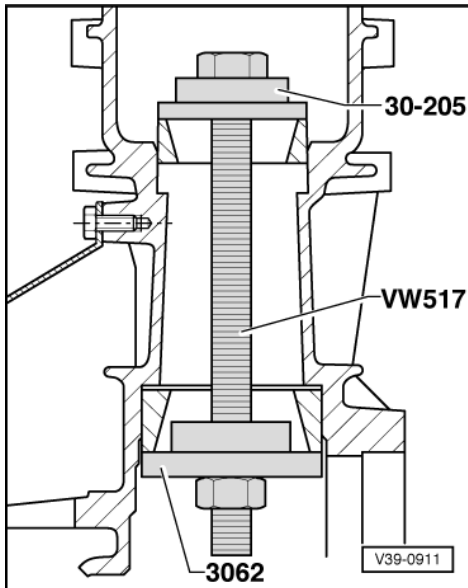
- Secure rear final drive to repair stand => Page 212 .



- -> Pull outer race for large taper roller bearing into housing without shim.

Note:

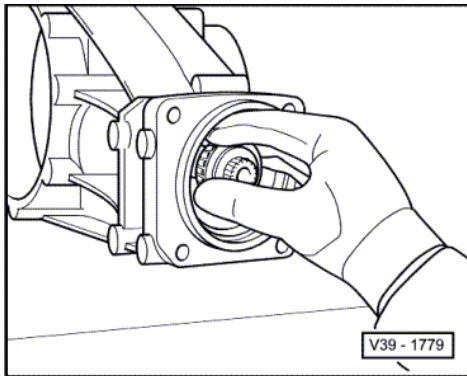
Oil bearing outer race and housing bore thoroughly.



- -> Pull outer race for small taper roller bearing into housing.

Note:

Oil bearing outer race and housing bore thoroughly.

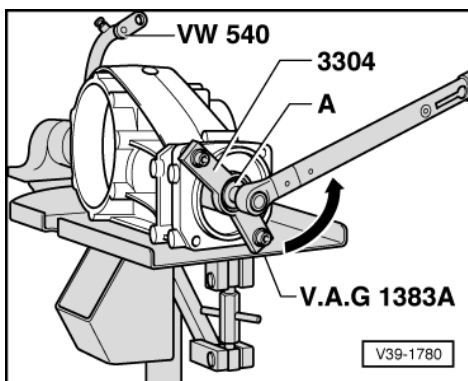


- -> Insert drive pinion without spacer sleeve.

Warning
Wear protective gloves.

- Heat inner race for taper roller bearing to approx. 100 °C and fit onto drive pinion.

Note:



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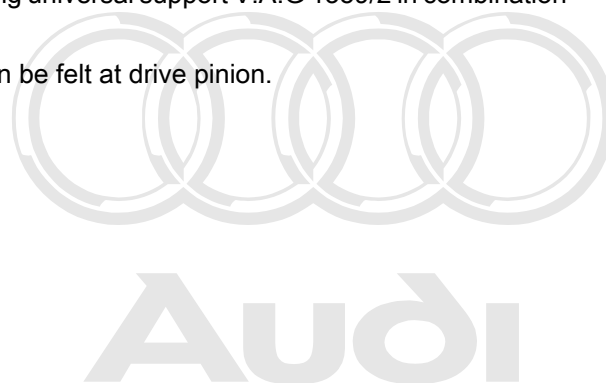
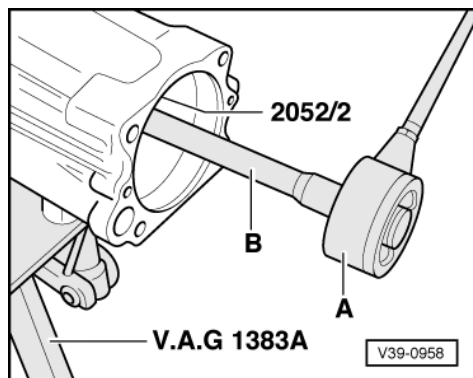


Only install spacer sleeve for final frictional torque measurement (after determining shim "S3").

- -> Fit support tool 3304 with two hexagon bolts M8 x 30.

A - 32 mm socket insert

- 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.



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- Gradually increase tightening torque, checking friction torque at regular intervals, until specified friction torque is obtained.

A - -> Torque gauge, commercially available, 0 ... 600 Ncm

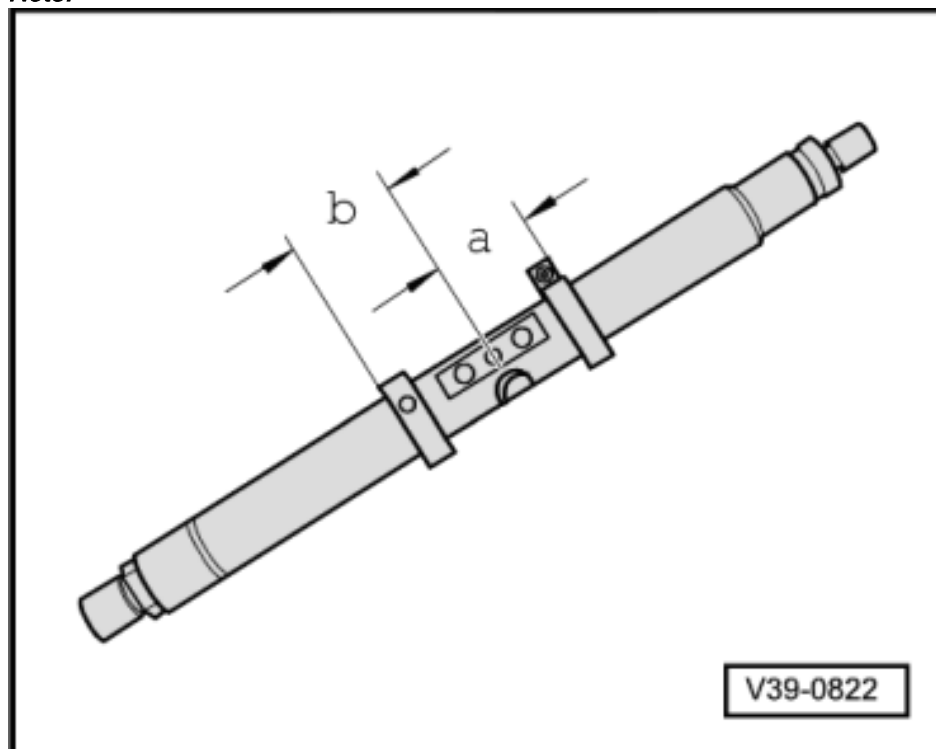
B - Extension with 32 mm socket insert

- The following frictional torques should be set:

New bearings	Used bearings ¹⁾
200 ... 250 Ncm	30 ... 60 Ncm

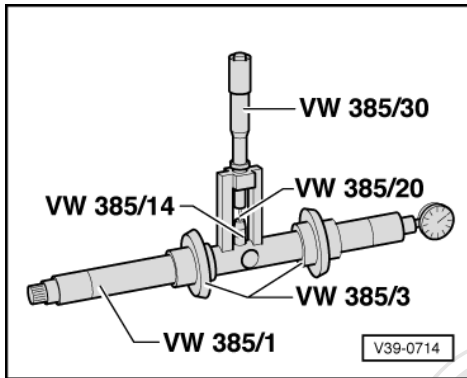
¹⁾ run at least 50 km (30 miles)

Note:

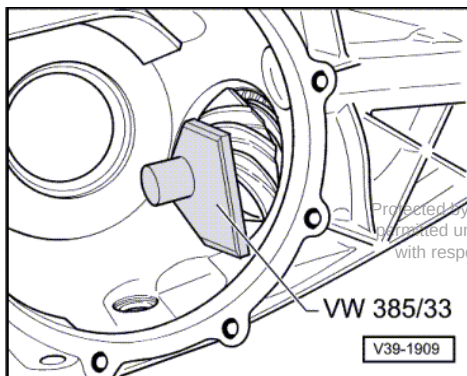


If the specified frictional torque is exceeded, the spacer sleeve must be replaced and the adjustment repeated. It is not possible to re-use a spacer sleeve that has been excessively compressed.

- -> Set adjustment ring of universal mandrel VW 385/1.
 - Dimension "a" = 75 mm
- Set sliding adjustment ring.
 - Dimension "b" = 35 mm



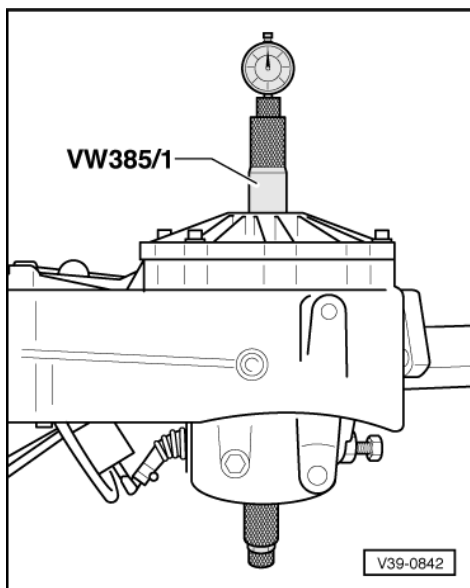
- -> Assemble universal mandrel as illustrated.
 - Dial gauge extension VW 385/20 = 3 mm long
- Set universal master gauge VW 385/30.
 - Ro = 53.15 mm
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.



Note:

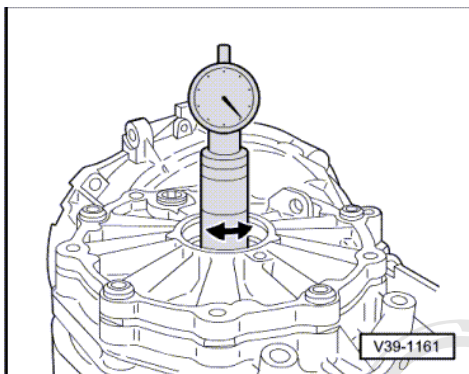
Before performing following measurements turn drive pinion at least five turns in both directions, so that the taper roller bearings settle. Otherwise a false reading will be obtained.

- -> Place end measuring plate VW 385/33 onto drive pinion head.



- -> Remove master gauge and insert measuring mandrel in the housing.
- The centring disc 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 dimension "e"



- -> Turn mandrel until the dial gauge point touches the end measuring plate on drive pinion 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"

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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 Catalogue

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 install with determined shim(s) "S3" and new spacer sleeve => Page 233 onwards.
- Insert inner race for small taper roller bearing and tighten drive pinion nut until specified frictional torque is achieved => Page 266 .

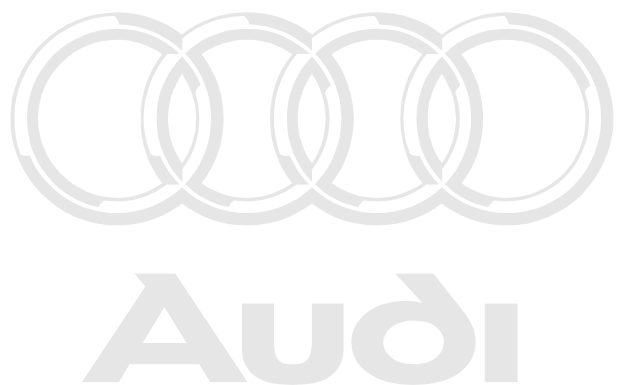
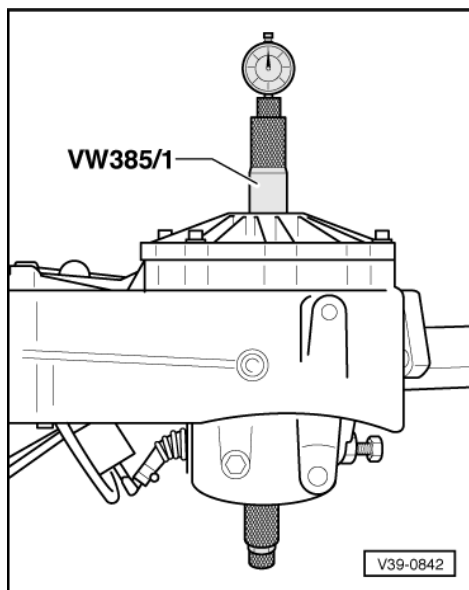
Note:

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	Used bearings ¹⁾
250 ... 300 Ncm	30 ... 60 Ncm

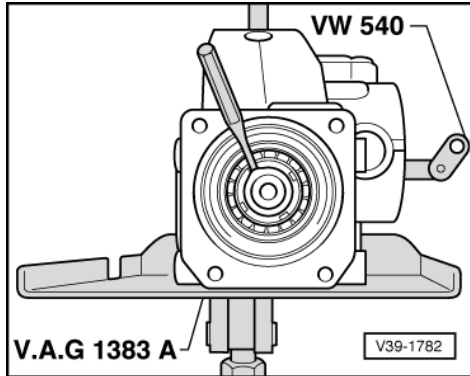
1) run at least 50 km (30 miles)



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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.
- Install thrust tube with flange for propshaft
=>Page 197
- The radial run-out at flange for propshaft must always be measured and marked =>Page 188 .

17.7 - Adjusting crown wheel

(Adjusting differential)

Repairs after which the crown wheel must be adjusted => adjustment overview on Page 262 .

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

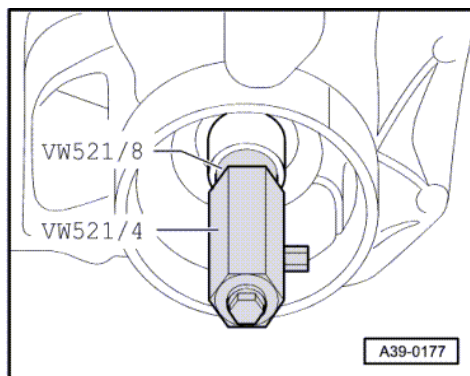
(Adjusting preload of taper roller bearing for differential)

- Drive pinion removed or crown wheel dismantled from differential housing
- Remove seal and left and right differential outer races for taper roller bearings and take out shims => Page 230 .
- Drive left outer race for taper roller bearing for differential (housing side) with shim "S2" into final drive housing => Page 228 . For measurement purposes use a 1.00 mm thick "S2*" shim (2 shims, 1 of 0.80 mm and 1 of 0.20 mm).

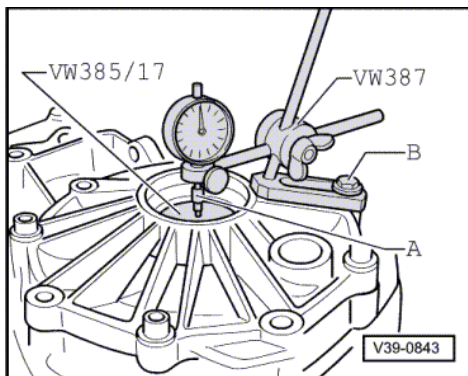
Note:

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. 231
- Insert differential into housing. The crown wheel is positioned on the right side (cover side).
- Fit cover and tighten bolts to 25 Nm.



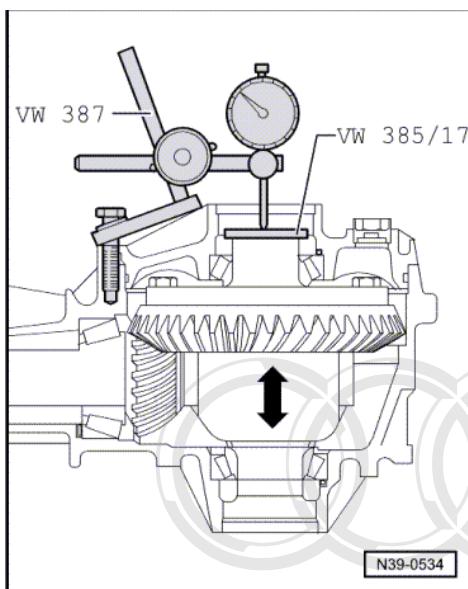
- -> Install special tools VW 521/4 and 521/8 onto housing side in differential housing.
- Turn cover side of differential housing upwards.



- 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

- Place dial gauge extension on centre of measuring plate VW 385/17.



- 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 measurement has to be repeated, differential must again be turned 5 turns in each direction to settle the taper roller bearing.

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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:

$$\text{"S1"} = \text{"Stotal"} - \text{"S2"}$$

Example:

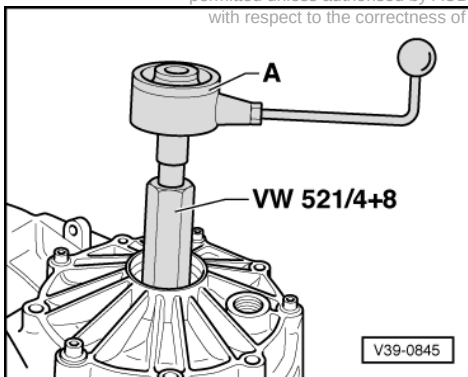
Total shim thickness "Stotal" for shims "S1" + "S2"	1.80 mm
- Inserted shim(s) "S2"	1.00 mm
= Thickness of shim "S1"	0.80 mm

- Determine shim(s) as accurately as possible from table => Page 274 .

Measuring friction torque (check)

- Drive pinion removed
- Differential fitted with shims "S1*" and "S2"

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- -> Fit torque gauge 0 ... 600 Ncm -A- onto differential.
- Read off friction torque.

Frictional torque specifications:

New bearings	Used bearings ¹⁾
250 ... 300 Ncm	30 ... 60 Ncm

- 1) run at least 50 km (30 miles)

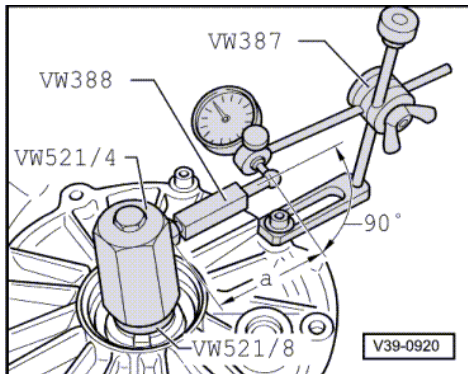
Note:

If final drive set is being re-adjusted, adjustment of drive pinion should be performed now, and adjustment should be checked =>Page 264 .

Adjusting backlash

(Position of crown wheel in gearbox housing)

- Drive pinion with shim "S3" installed
- Differential with shims "S1*" + "S2*" installed
- Insert differential in final drive housing, install 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).
 - Set dial gauge to "0" with 1 mm preload.
 - 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 this means that the installation of the crown wheel is not correct or that the crown wheel and pinion themselves are defective. 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 mm divided by 4 = 0.29 mm

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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 Catalogue

The following shims are available for "S2"

Shim thickness (mm) 1)		
0.15	0.60	1.50
0.20	0.65	1.65
0.25	0.80	
0.55	1.35	

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

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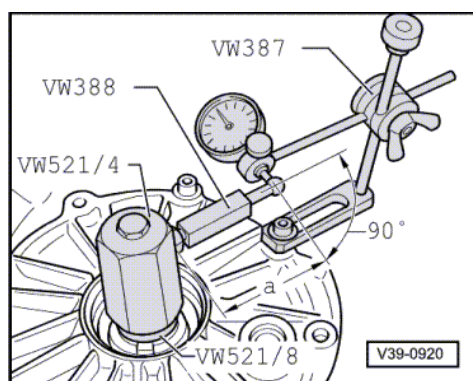
- Determine shim(s) as accurately as possible from table. Part numbers

=> Parts Catalogue

The following shims are available for "S1"

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.



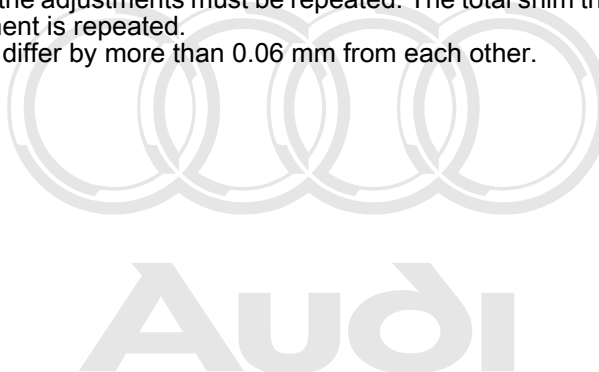
-> Performing check measurement

- 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.

- Specification: 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 when the adjustment is repeated.
- ♦ The individual measurements must not differ by more than 0.06 mm from each other.



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