

Workshop Manual Audi A4 1995 ➤

5 and 6-speed manual gearbox 01E, front-wheel drive

Edition 01.2012



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List of Workshop Manual Repair Groups

Repair Group

00 - Technical data

30 - Clutch

34 - Controls, housing

35 - Gears, shafts

39 - Final drive - rear differential



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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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00 – Technical data

1 Gearbox identification

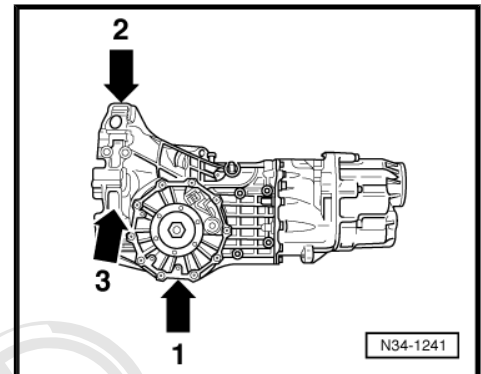
The 5 and 6-speed manual gearbox 01E, front-wheel drive is installed in the Audi A4 in conjunction with the 6-cylinder turbo diesel engine.

Allocation

⇒ „1.1 Code letters, allocation, transmission ratios, capacities“, page 1

Location on gearbox

- ◆ Code letters and gearbox serial number -arrow 1- and -arrow 2-
- ◆ Manual gearbox 01E -arrow 2-



Code letters and gearbox serial number -arrow 1-

Example:	DQS	116906
	Code letters	Gearbox serial number

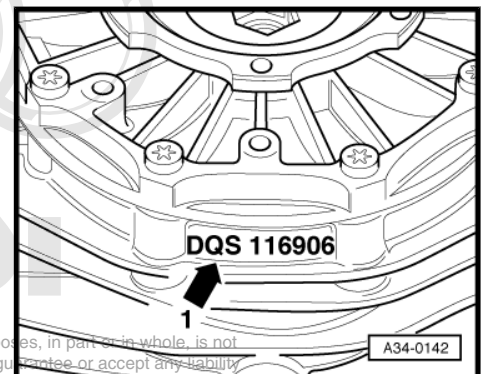
Additional data are manufacture-related.



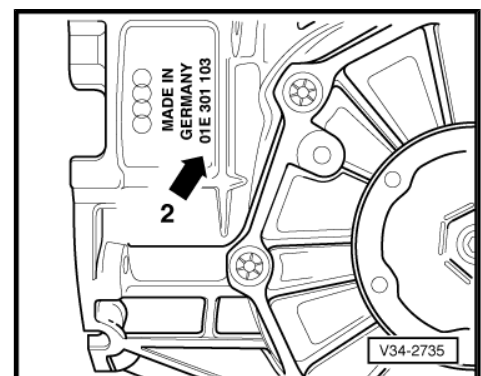
Note

The code letters for the gearbox are also given on the vehicle data stickers.

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Manual gearbox 01E -arrow 2-



1.1 Code letters, allocation, transmission ratios, capacities

The following data can be found in the ⇒ Electronic parts catalogue .

- ◆ Gear oil specification



◆ Correct type of clutch plate and pressure plate

Manual gearbox		5 and 6-speed 01E, front-wheel drive		
Code letters		DQS	DSE 1)	ELQ
Manufactured	from to	01.97 04.01	01.97 07.99	02.99 09.01
Allocation	Model Engine	Audi A4 1995 ► 2.5 ltr. - 110 kW TDI	Audi A4 1995 ► 2.5 ltr. - 110 kW TDI	Audi A4 1995 ► 2.5 ltr. - 110 kW TDI
Ratio $Z_2 : Z_1 = i$	Final drive	31 : 8 = 3.875	31 : 8 = 3.875	31 : 8 = 3.875
	1st gear	28 : 8 = 3.500	28 : 8 = 3.500	28 : 8 = 3.500
	2nd gear	34 : 18 = 1.889	34 : 18 = 1.889	34 : 18 = 1.889
	3rd gear	32 : 26 = 1.231	32 : 27 = 1.185	32 : 26 = 1.231
	4th gear	27 : 31 = 0.871	26 : 32 = 0.813	27 : 31 = 0.871
	5th gear	26 : 39 = 0.667	24 : 40 = 0.600	26 : 39 = 0.667
	6th gear	23 : 41 = 0.561	-	23 : 41 = 0.561
	Reverse gear	38 : 11 = 3.455	38 : 11 = 3.455	38 : 11 = 3.455
Capacity		2.4 ltr.	2.4 ltr.	2.4 ltr.
Drive shaft flange Ø		130 mm 2)	130 mm 2)	130 mm 2)
Overall ratio i_{ov} in top gear		2.174	2.325	2.174
1) Export version for France				
2) For triple roller joint/drive shaft with centring diameter 130 mm				

Manual gearbox		5 and 6-speed 01E, front-wheel drive		
Code letters		FRF	Protected by copyright. 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.	
Manufactured	from to	04.01 05.03		
Allocation	Model Engine	Audi A4 1995 ► 2.5 ltr. - 110 kW TDI		
Ratio $Z_2 : Z_1 = i$	Final drive	31 : 8 = 3.875		
	1st gear	28 : 8 = 3.500		
	2nd gear	34 : 18 = 1.889		
	3rd gear	32 : 26 = 1.231		
	4th gear	27 : 31 = 0.871		
	5th gear	26 : 39 = 0.667		
	6th gear	23 : 41 = 0.561		
	Reverse gear	38 : 11 = 3.455		
Capacity		2.4 ltr.		
Drive shaft flange Ø		130 mm 1)		
Overall ratio i_{ov} in top gear		2.174		
1) For triple roller joint/drive shaft with centring diameter 130 mm				

2 Transmission layout

Identification and ratio

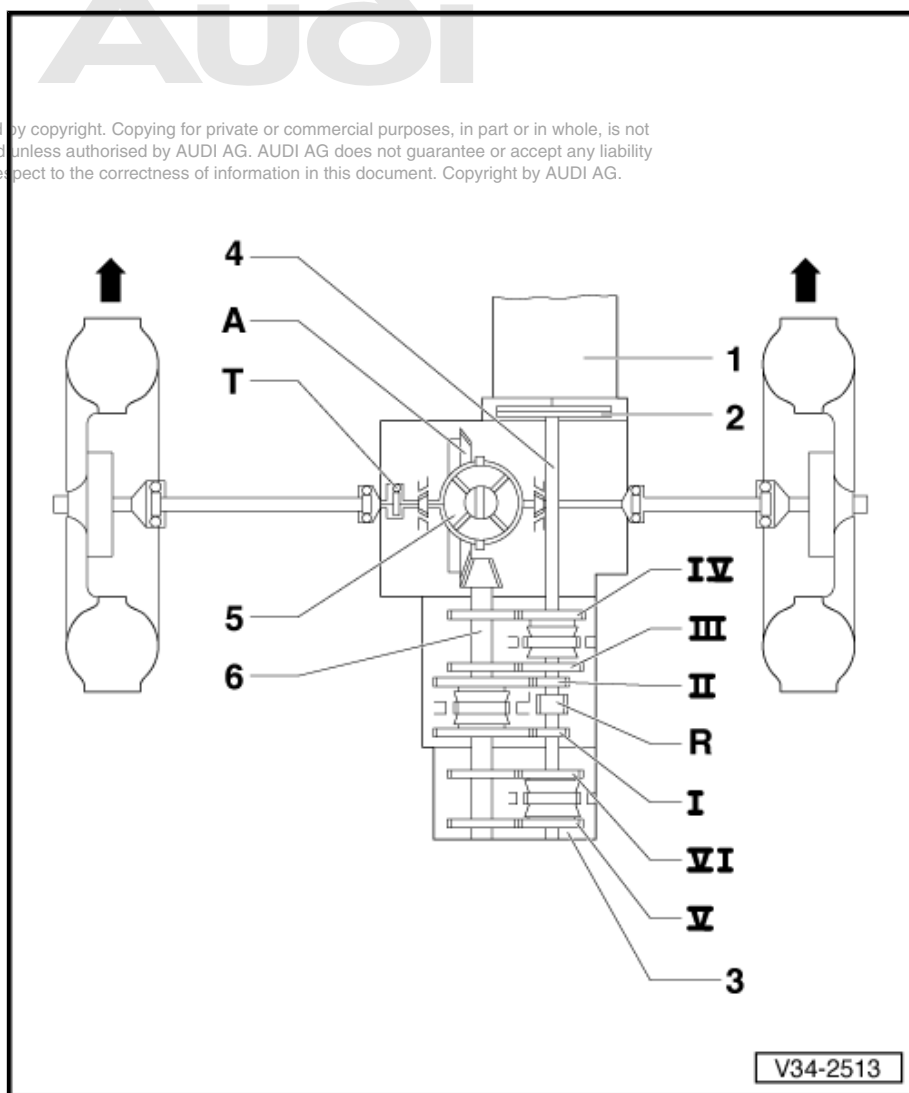


Note

-Arrows- point in direction of travel.

- 1 - Engine
- 2 - Clutch
- 3 - Manual gearbox
- 4 - Input shaft (main shaft)
- 5 - Differential
- 6 - Pinion shaft (output shaft)
- I - 1st gear
- II - 2nd gear
- III - 3rd gear
- IV - 4th gear
- V - 5th gear
- VI - 6th gear
- R - Reverse gear
- A - Final drive
- T - Speedometer drive (electronic)

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3 Calculating ratio „i“

Transmission ratio

Transmission ratio = $\frac{\text{No. of teeth on driven gear}}{\text{No. of teeth on drive gear}}$

Ratios	Formula
i_G = Gear ratio	$Z_{G2} : Z_{G1}$
i_A = Axle ratio	$Z_{A2} : Z_{A1}$
i_{ov} = Overall ratio	$i_G \times i_A$

Example:

	5th gear	Final drive
Drive gear	$Z_{G1} = 40$	$Z_{A1} = 8$
Driven gear	$Z_{G2} = 24$	$Z_{A2} = 31$

Calculations:

$$i_G = 24 : 40 = 0.600$$

$$i_A = 31 : 8 = 3.875$$

$$i_{ov} = (24 : 40) \times (31 : 8) = 0.600 \times 3.875 = 2.325$$



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4 General repair instructions

Proper tools and the maximum possible care and cleanliness are essential for satisfactory repairs to the transmission units. The usual basic safety precautions also naturally apply when carrying out repair work.

A number of generally applicable instructions for the various repair procedures - which were previously repeated at numerous places in the Workshop Manual - are summarised here. They apply to the work described in this Manual.

Special tools

For a complete list of special tools used in this Workshop Manual
⇒ Workshop equipment and special tools catalogue .

Gearbox

When installing a new gearbox, check the oil level and fill up with oil if necessary ⇒ [page 80](#) .

Capacities ⇒ [page 1](#) .

For gear oil specification, refer to ⇒ Electronic parts catalogue .

Thoroughly clean all joints and connections and the surrounding areas before dismantling.

When installing gearbox ensure dowel sleeves are correctly seated.

Sealants

- ◆ Thoroughly clean housing contact surfaces before applying sealing paste .
- ◆ Apply sealing paste -AMV 188 001 02- evenly and not too thickly.
- ◆ Breather holes must remain free of sealing paste .

O-rings, oil seals and gaskets

Always renew O-rings, oil seals and gaskets.

After removing gaskets and oil seals, always inspect the contact surface on the housing or shaft for burrs resulting from removal or for other signs of damage.

Before installing oil seals, lightly oil the outer circumference of the seal and fill the space between the sealing lips -arrow- about half full with grease -G 052 128 A1- .

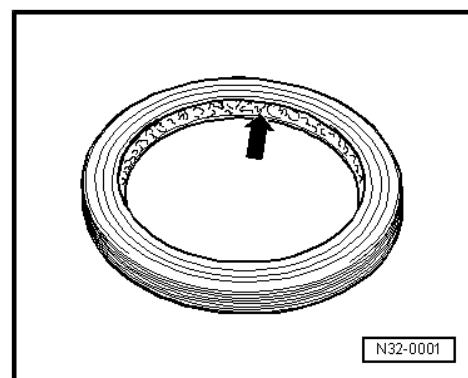
The open side of the oil seal should face the side containing the fluid.

When installing a new oil seal, position the seal such that the sealing lip does not contact the shaft in the same place as the old seal (make use of installation depth tolerances).

Lightly lubricate O-rings before installation to prevent them from being trapped and damaged during assembly.

After renewing gaskets and oil seals, check and, if necessary, top up oil level in gearbox ⇒ [page 80](#) .

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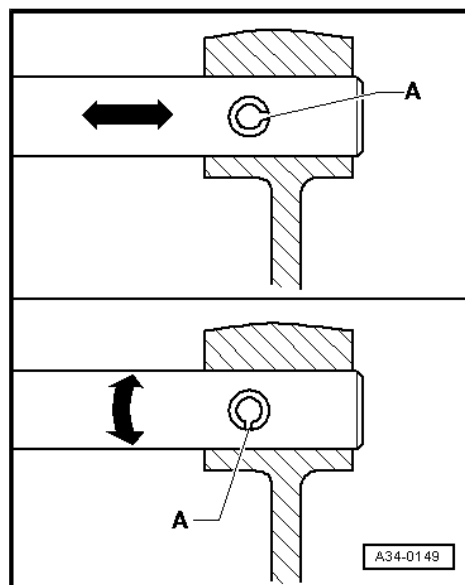
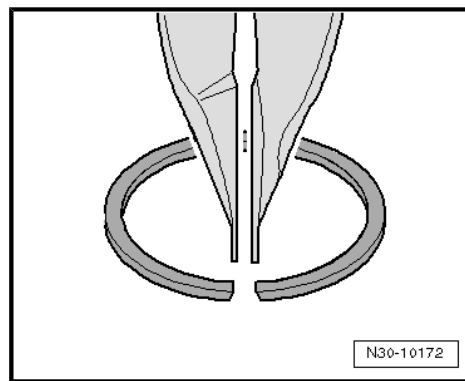
Locking elements

- ◆ Do not over-stretch circlips.
- ◆ Installation position for some circlips: the circlip is fitted so that the narrow part of the gap is at the top. This also gives the pliers a better grip when removing and installing.
- ◆ Renew circlips which have been damaged or over-tensioned.
- ◆ Circlips must be properly seated in the base of the groove.
- ◆ Renew spring pins. Position: the slit -A- should be in line with the line of force -arrow-.



Note

The spring pin or roll pin which secures the selector fork to the selector plate for 5th and 6th gear may only be removed and installed using press tool -3276-.

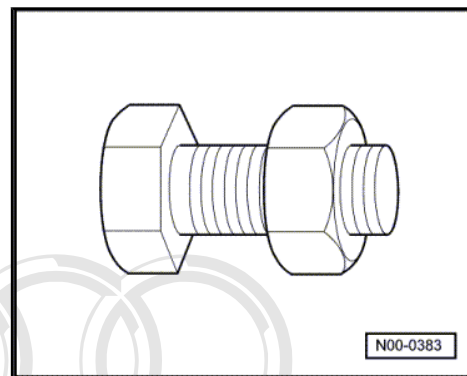


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Nuts, bolts

- ◆ Loosen the nuts and bolts in reverse sequence to the specified tightening sequence.
- ◆ Nuts and bolts which secure covers and housings should be loosened and tightened in diagonal sequence and in stages if no tightening sequence is specified.
- ◆ Loosen and tighten particularly sensitive parts in diagonal sequence and in stages, taking care to keep them straight.
- ◆ The tightening torques stated apply to non-oiled nuts and bolts.
- ◆ Always renew self-locking bolts and nuts.
- ◆ Use a wire brush to clean the threads of bolts which are secured with locking fluid. Then apply locking fluid - AMV 185 101 A1- to bolt threads before installing.
- ◆ Threaded holes which take self-locking bolts or bolts coated with locking fluid must be cleaned (using a thread tap or similar). Otherwise there is a danger of the bolts shearing off the next time they are removed.



Bearings

- ◆ Install needle bearings so the lettering (side with thicker metal) faces towards the installing tool.
- ◆ Mark the needle bearings of 1st to 6th speed selector gears when removing. This ensures the same installation position when re-installing.
- ◆ Grease needle bearing for gearbox input shaft in rear side of flywheel.
- ◆ Lubricate all bearings in gearbox housing with gear oil before installing.
- ◆ Use inductive heater -VAS 64 14- to heat inner races of tapered roller bearings to approx. 100°C before installing. Press home onto stop when installing so there is no axial clearance.
- ◆ Do not interchange the outer or inner races of bearings of the same size (the bearings are paired).
- ◆ Always renew the tapered roller bearings on one shaft together and use new bearings from a single manufacturer.

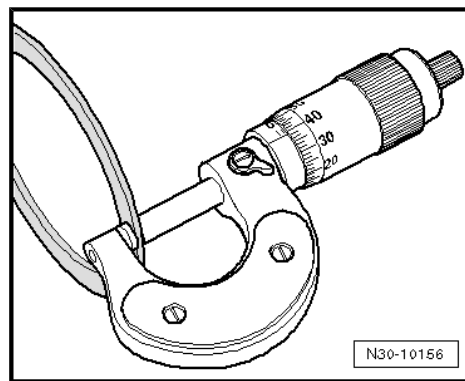
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Shims

- ◆ Use a micrometer to measure the shims at several points. Tolerance variations make it possible to obtain the exact shim thickness required.
- ◆ Check for burrs and damage.
- ◆ Do not install shims which are damaged or not in perfect condition.

Gear wheels, synchro-hubs, inner races for selector gears

- ◆ Before installing, heat inner races for selector gears to approx. 100° C using inductive heater -VAS 6414- .
- ◆ Use inductive heater -VAS 6414- to heat gear wheels and synchro-hubs to approx. 100°C before installing. Press home onto stop when installing so there is no axial clearance.
- ◆ Note correct installation position.



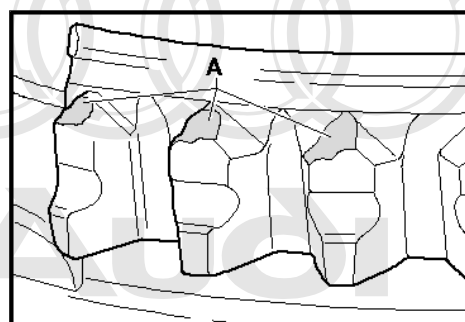
Selector gears

- ◆ After installing, check that 1st to 6th speed selector gears have an axial clearance of 0.15 ... 0.35 mm and check that they rotate freely.

Abnormal wear on selector gears and locking collars

- ◆ Abnormal wear on synchro-ring or selector gear:

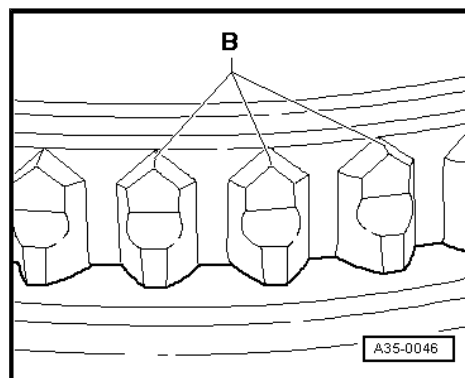
A - Worn chamfer on dog teeth of synchro-ring or selector gear.



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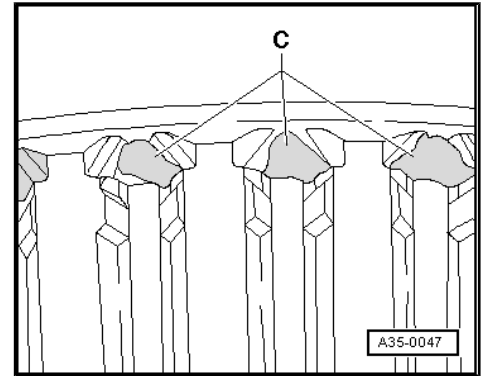
- ◆ In comparison: intact synchro-ring or selector gear:

B - Intact chamfer on dog teeth of synchro-ring or selector gear.



- ◆ Abnormal wear on locking collar:

C - Worn chamfer on internal splines of locking collar.



- ◆ In comparison: intact locking collar:

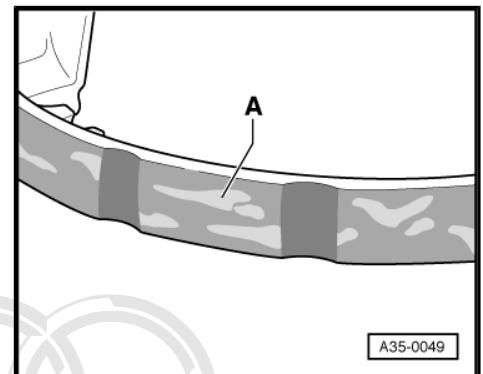
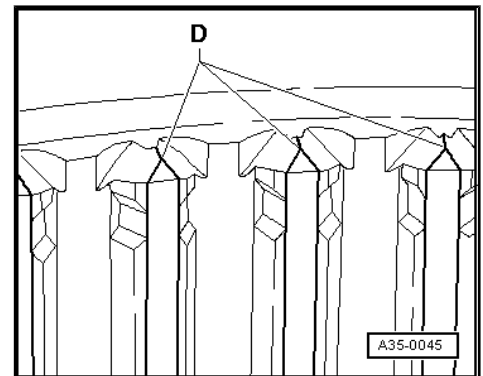
D - Intact chamfer on internal splines of locking collar.

Synchro-rings

- ◆ Do not interchange synchro-rings. When reusing always fit to the same selector gear.
- ◆ Check for wear; renew if necessary.
- ◆ Lubricate with gear oil when installing.

Checking synchro-rings with molybdenum coating

- ◆ The friction surface of an intact synchro-ring with molybdenum coating has a graphite grey, slightly porous appearance. Clean synchro-ring and make sure that friction surface is free of oil.
- ◆ The synchro-ring must be renewed if very shiny areas -A- have formed on the friction surface or if the brass-coloured metal underneath is already visible.



Clutch actuation

- ◆ When removing gearbox, remove clutch slave cylinder without disconnecting pipes.
- ◆ Do not depress the clutch pedal after removing the clutch slave cylinder if the hydraulic pipe is still connected. Otherwise the piston will be pressed out of the clutch slave cylinder. As a result the clutch slave cylinder will be destroyed.
- ◆ If the clutch pedal does not return to its initial position after releasing it (clutch pedal in rest position), you must bleed the clutch system (further measures [⇒ „1.5 Notes on removing and installing clutch master cylinder and slave cylinder“, page 17](#)).
- ◆ The clutch system should be bled at the same intervals as the brake system.
- ◆ Ensure that the pressure plate is kept straight; loosen and tighten bolts consecutively in steps of 90° (1/4 turn each).
- ◆ If the clutch has burnt out, thoroughly clean the gearbox housing in area of clutch and parts of the engine facing the gearbox in order to prevent odours.

30 – Clutch

1 Servicing clutch mechanism

Overview

- ◆ ⇒ „1.1 Exploded view - pedal cluster (LHD vehicles)“, page 10
- ◆ ⇒ „1.2 Removing and installing clutch pedal and over-centre spring“, page 11
- ◆ ⇒ „1.3 Exploded view - pedal cluster (RHD vehicles)“, page 13
- ◆ ⇒ „1.4 Exploded view - hydraulic system“, page 15
- ◆ ⇒ „1.5 Notes on removing and installing clutch master cylinder and slave cylinder“, page 17
- ◆ ⇒ „1.6 Function check for clutch master cylinder and slave cylinder“, page 18
- ◆ ⇒ „1.7 Removing and installing clutch master cylinder“, page 19
- ◆ ⇒ „1.8 Bleeding clutch system“, page 23



Caution

Follow steps required when disconnecting battery ⇒ Electrical system; Rep. gr. 27.



Note

- ◆ 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 A2-.
- ◆ Before working on pedal cluster, remove storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68.
- ◆ Make sure that no brake fluid escapes into the footwell, the plenum chamber or onto the gearbox below. If this does happen, clean the affected area thoroughly.
- ◆ When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.

1.1 Exploded view - pedal cluster (LHD vehicles)

1 - Mounting bracket

- ☐ Removing and installing
⇒ Brake system; Rep. gr. 46

2 - Pivot pin

- ☐ For clutch pedal and brake pedal
- ☐ Installation position:
groove -arrow- towards clutch pedal

3 - Retaining clip

4 - Hexagon socket head bolt

- ☐ 25 Nm

5 - Brake pedal

6 - Clutch pedal

- ☐ Removing and installing
⇒ [page 11](#)

7 - Pin

- ☐ Clip onto clutch pedal

8 - Retaining clip

9 - Clutch master cylinder

- ☐ Removing and installing
⇒ [page 19](#)

10 - Hexagon socket head bolt

- ☐ 20 Nm

11 - Mounting

- ☐ Insert in mounting
bracket with over-centre
spring

12 - Over-centre spring

- ☐ For correct version, refer to ⇒ Electronic parts catalogue
- ☐ Remove and install with clutch pedal ⇒ [page 11](#)

13 - Hexagon socket head bolt

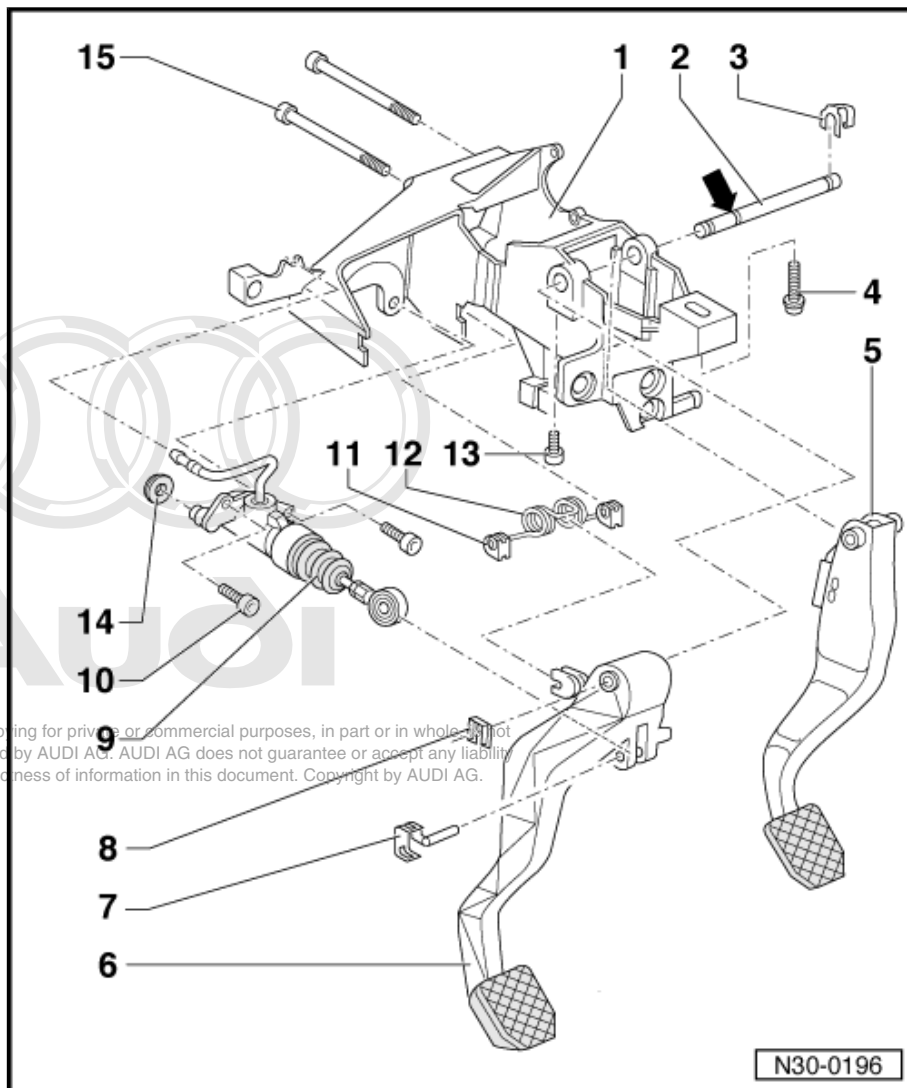
- ☐ 5 Nm
- ☐ Secures clutch and brake pedal pivot pin

14 - Seal

- ☐ Must not be removed

15 - TORX bolt

- ☐ 25 Nm
- ☐ Also secures brake master cylinder with brake servo



1.2 Removing and installing clutch pedal and over-centre spring

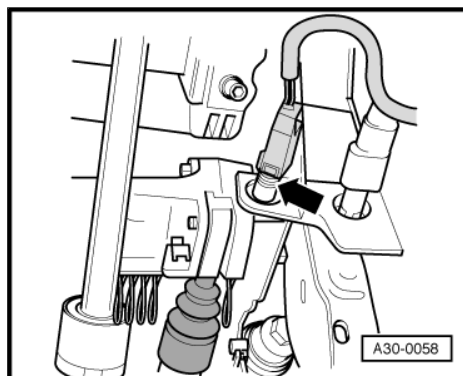
Removing

- Remove storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .

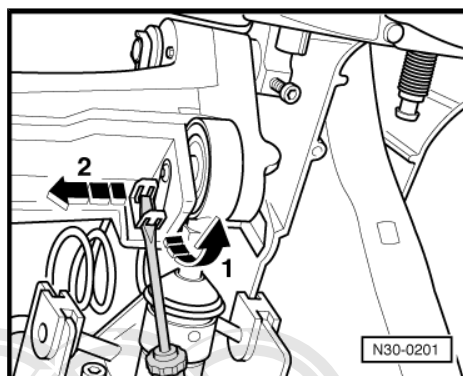


Note

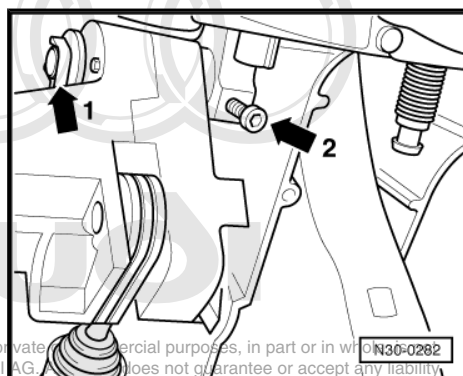
- ◆ *Make sure that clutch pedal switch -arrow- is not pressed out of retaining clip, as this would damage the thread of the switch and the switch would have to be renewed.*
- ◆ *Clutch pedal switch -arrow- may only be fitted once so as to ensure a firm fit.*



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



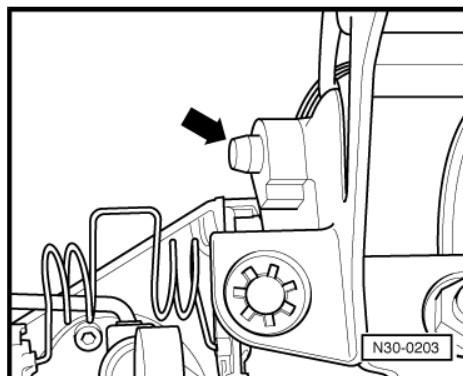
- Press clutch pedal retaining clip -arrow 1- off pivot pin with a screwdriver.
- Remove bolt -arrow 2-.
- Press pivot pin for clutch pedal and brake pedal out to the right until the clutch pedal can be removed.
- If necessary press brake pedal retaining clip off pivot pin with a screwdriver.
- Take out clutch pedal and over-centre spring.



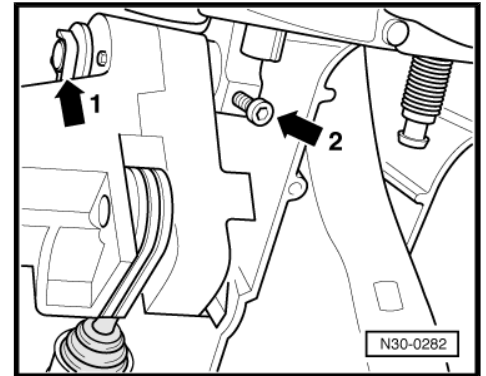
Installing

Installation is carried out in reverse sequence, note the following:

- Align pivot pin for clutch pedal/brake pedal so it protrudes out of mounting bracket on clutch pedal side -arrow-.
- First engage clutch pedal in over-centre spring, then attach to pivot pin.
- Connect clutch master cylinder to clutch pedal. Clip pin onto clutch pedal.



- Do not tighten bolt -arrow 2- until both retaining clips have been fitted on pivot pin for clutch pedal/brake pedal (-arrow 1- for clutch pedal; retaining clip for brake pedal not shown).



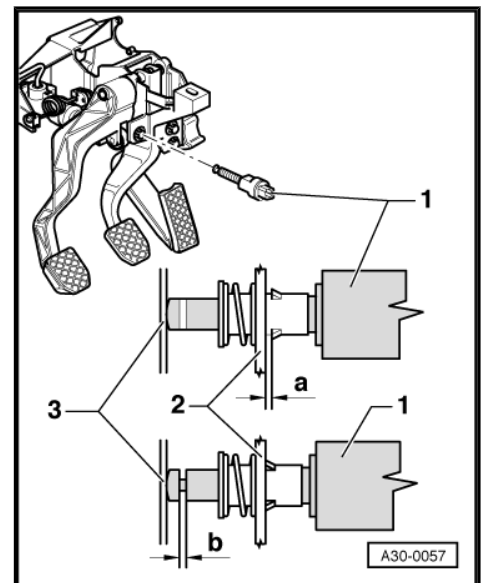
- Check setting of clutch pedal switch -1- over clutch pedal as follows:

- ◆ Switch -1- must make full contact with clutch pedal -3- and be fully actuated.
- ◆ Tolerance for adjustment: gap -a- between retaining clip and mounting bracket -2- (or gap -b- on switch -1-) must not be more than 0.5 mm.
- ◆ To adjust, hold retaining clip and turn clutch pedal switch -1-.



Note

Clutch pedal switch -F36- may only be fitted once so as to ensure a firm fit.



1.3 Exploded view - pedal cluster (RHD vehicles)

1 - Mounting bracket

- ❑ Removing and installing
⇒ Brake system; Rep.
gr. 46

2 - Bearing bush

- Driving out $\Rightarrow$ page 15
- Driving in $\Rightarrow$ page 15

3 - Washer

4 - Brake pedal

- Bearing pin will only fit in one position in bearing bush
⇒ Item 13 (page 14)

5 - Hexagon socket head bolt

- ☐ 25 Nm

6 - Seal

- ☐ Must not be removed

7 - Clutch master cylinder

8 - Hexagon socket head bolt

- 20 Nm

9 - Retaining clip

10 - Clutch pedal

11 - Needle bearing

- ☐ Pulling out ⇒ page 15
- ☐ Clamp in vice with aluminium protective jaw covers to press in

12 - Cap

13 - Bearing bush

- ❑ With internal splines to accommodate pins of brake pedal ⇒ [Item 4 \(page 14\)](#) and lever ⇒ [Item 17 \(page 14\)](#)

14 - Mounting

- ❑ Insert in mounting bracket with over-centre spring

15 - Over-centre spring

- ❏ For correct version, refer to ⇒ Electronic parts catalogue

16 - Bolt

- ☐ 25 Nm
- ☐ Self-locking
- ☐ Renew

17 - Lever

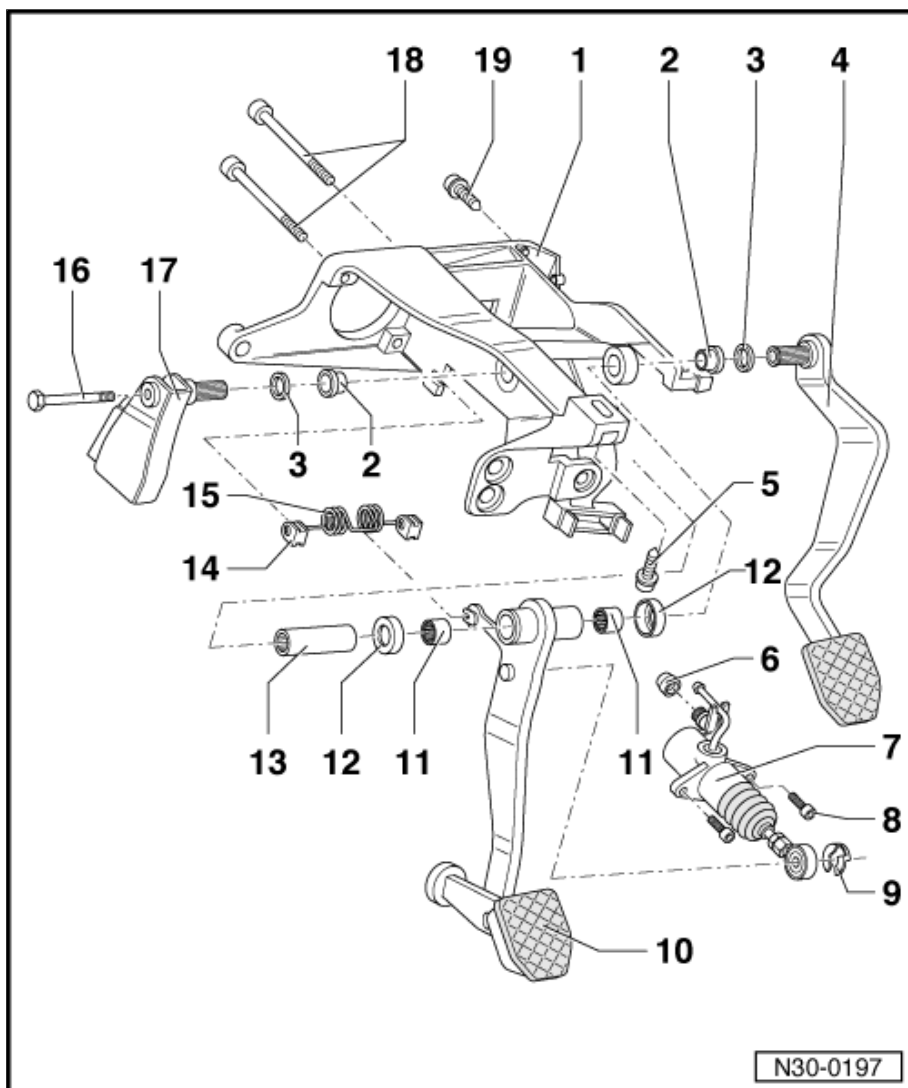
- ☐ Bearing pin will only fit in one position in bearing bush → Item 13 (page 14)

18 - TORX bolt

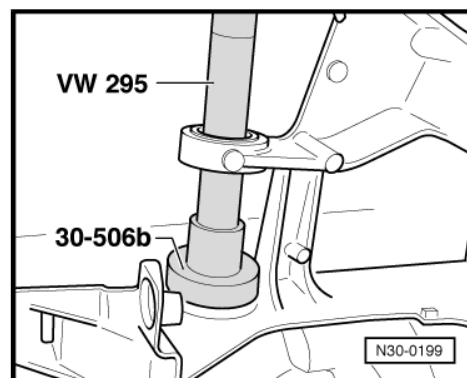
- ☐ 25 Nm
- ☐ Also secures brake master cylinder with brake servo

19 - Bolt

- 25 Nm

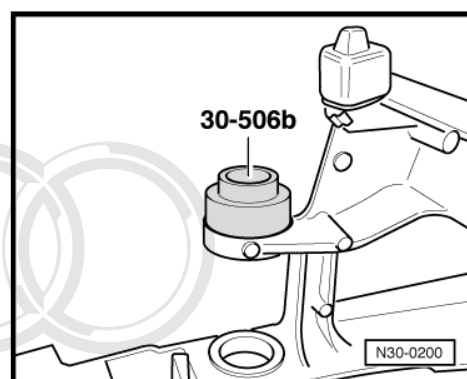


Knocking bush out of mounting bracket



Knocking bush into mounting bracket

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

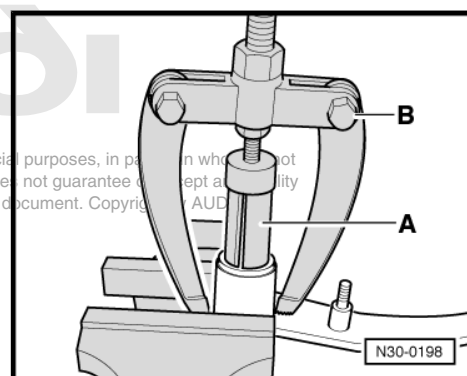


Pulling out needle bearing

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

B - Counter-support , e.g. -Kukko 22/2-

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1.4 Exploded view - hydraulic system

1 - Brake fluid reservoir

2 - Supply hose

3 - Pipe/hose assembly

- ☐ Between clutch master cylinder and clutch slave cylinder
- ☐ Disconnecting from clutch master cylinder and installing
⇒ [page 17](#)
- ☐ Allocation for LHD and RHD vehicles ⇒ Electronic parts catalogue

4 - Mounting bracket

5 - Clutch pedal

- ☐ Removing and installing
⇒ [page 11](#)

6 - Hexagon socket head bolt

- ☐ 20 Nm

7 - Pin

8 - Clutch master cylinder

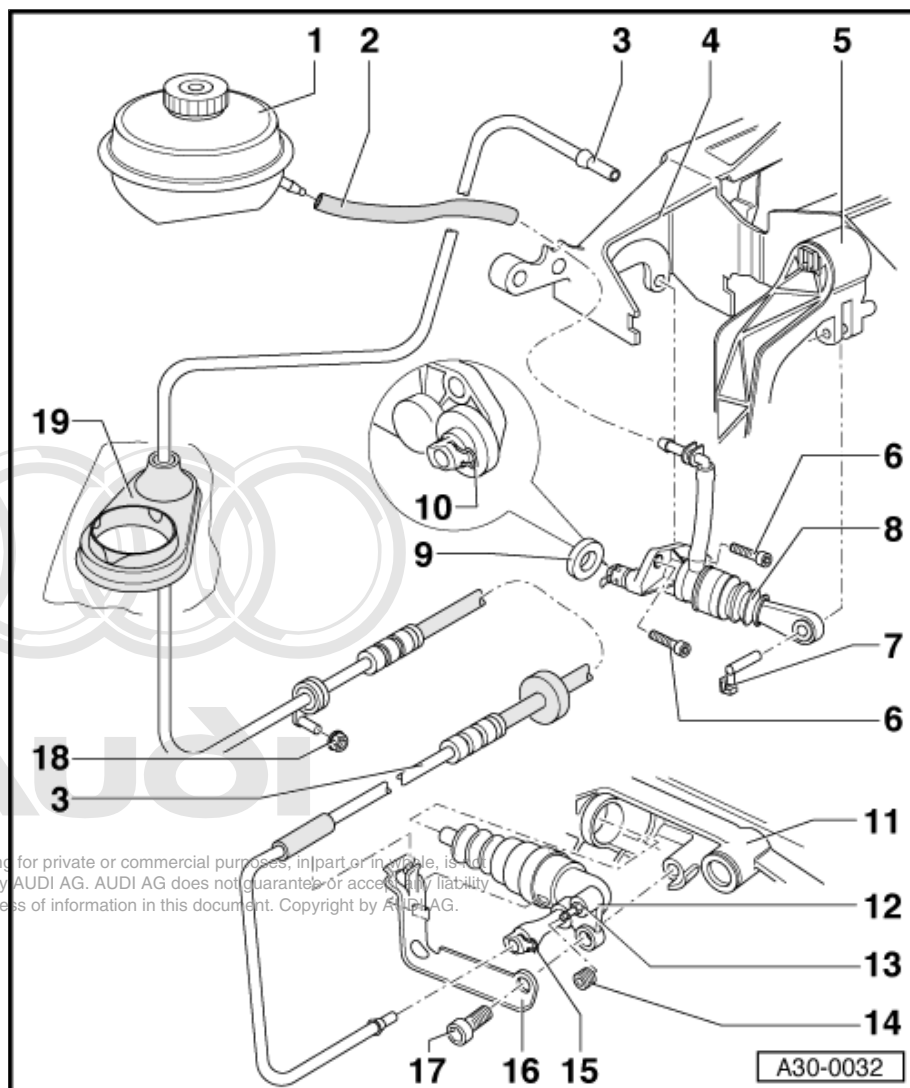
- ☐ With plug-in connection for pipe/hose assembly
- ☐ Removing and installing
⇒ [page 19](#)

9 - Seal

- ☐ Must not be removed

10 - Retaining clip

- ☐ Pull out retaining clip to disconnect pipe
⇒ [page 17](#)



11 - Gearbox

12 - Clutch slave cylinder

- ☐ Do not operate clutch pedal after slave cylinder has been removed
- ☐ Do not allow brake fluid to come into contact with gearbox.
- ☐ Grease lightly before installing ⇒ [page 17](#)
- ☐ When installing, push in until securing bolt can be fitted
- ☐ With plug-in connection for pipe/hose assembly
- ☐ Disconnecting pipe/hose assembly ⇒ [page 17](#)
- ☐ Removing and installing ⇒ [page 28](#)
- ☐ Follow correct procedure when bleeding ⇒ [page 23](#)

13 - Bleeder valve

- ☐ Tighten to 4.5 Nm
- ☐ Follow correct procedure when bleeding ⇒ [page 23](#)
- ☐ If bleeder valve has broken off, it can be removed with 3 mm Allen key

14 - Dust cap

15 - Retaining clip

- ☐ Pull out retaining clip to disconnect pipe ⇒ [page 17](#)

16 - Bracket

- ☐ Secured to gearbox

17 - Hexagon socket head bolt

- ☐ 23 Nm
- ☐ Self-locking
- ☐ Always renew

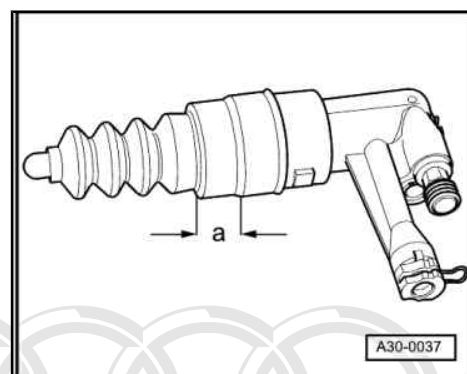
18 - Nut

- ☐ 2 Nm

19 - Gasket

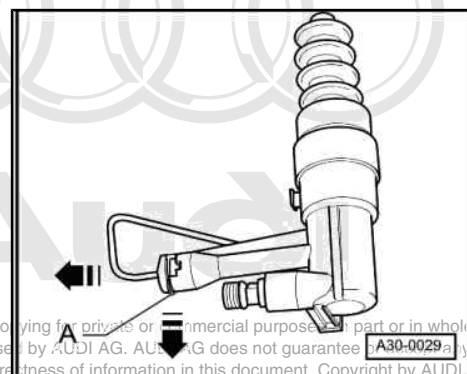
Inserting clutch slave cylinder

- Before inserting slave cylinder in gearbox housing, lubricate area -a- of sleeve with lithium grease -G 052 150 A2- .
- Lightly lubricate surface where plunger and clutch release lever make contact with copper grease (commercially available).



Removing and installing pipe/hose assembly on clutch master cylinder and clutch slave cylinder

- To remove, release retaining clip -A- using a screwdriver and pull out as far as stop.
- Detach pipe/hose assembly from clutch master cylinder or clutch slave cylinder.
- To install, press in retaining clip onto clutch master cylinder or clutch slave cylinder as far as stop.
- Push pipe/hose assembly onto connection on clutch master cylinder or clutch slave cylinder so that retaining clip snaps into place.
- Pull pipe/hose assembly to check that it is securely seated.



1.5 Notes on removing and installing clutch master cylinder and slave cylinder

- ◆ Before renewing the clutch master cylinder or slave cylinder on the assumption that it is defective, you must first carry out the appropriate function check
⇒ [„1.6 Function check for clutch master cylinder and slave cylinder“, page 18](#) .
- ◆ If the slave cylinder is removed from gearbox with the pipe/hose assembly still attached, make sure you do not press the clutch pedal. Otherwise, the piston will be pressed out of the slave cylinder and be destroyed.
- ◆ After installing the slave cylinder, carefully press the clutch pedal. If you feel an unusually strong point of resistance when depressing the clutch pedal, you must not press it down further. The plunger of the slave cylinder is likely to have been guided past the clutch release lever. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

1.6 Function check for clutch master cylinder and slave cylinder

Before you renew the clutch master cylinder or slave cylinder you must - in the case of the following faults - first carry out the appropriate checks.

Noises when operating the clutch:

- ◆ First check the over-centre spring / clutch pedal switch for noise.
- ◆ If you hear a noise, remove over-centre spring and repeat check.
- ◆ Renew relevant component.

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After releasing clutch pedal it still remains depressed / does not return to its initial position.

- ◆ Check whether the clutch pedal returns all the way to its initial position, thereby uncovering the vent opening in the master cylinder.
- ◆ The vent opening is integrated in the clutch master cylinder. It is not visible from the outside.
- ◆ The vent opening must be uncovered, otherwise the permanent self-bleeding function for the hydraulic clutch system will no longer be effective.
- ◆ Make the customer aware that the driver must NOT rest his/her foot on the clutch pedal for long periods of time. This could impair the self-bleeding function of the clutch system as the vent opening in the master cylinder can no longer function.
- ◆ The self-bleeding function of the clutch system can be impaired if the footwell trim or floor mats get trapped, if the clutch pedal switch jams or if the driver rests his foot on the clutch pedal for long periods of time.

Check the complete hydraulic system for leaks.

- ◆ Check brake fluid level in brake fluid reservoir.
- ◆ Check clutch master cylinder and slave cylinder as well as the pipe/hose assembly including connections for external leaks (visual inspection).
- ◆ If you identify any leaks you must renew the leaking component.
- ◆ Bleed clutch system ⇒ [page 23](#).

High pedal force:

- ◆ Clutch plate worn
- ◆ Mechanically defective pressure plate/clutch plate
⇒ [page 33](#).

Pedal forces:

- Clutch lining when new: approx. 115 N
- Clutch lining at wear limit: approx. 160 N

Clutch does not disengage or does not disengage fully:

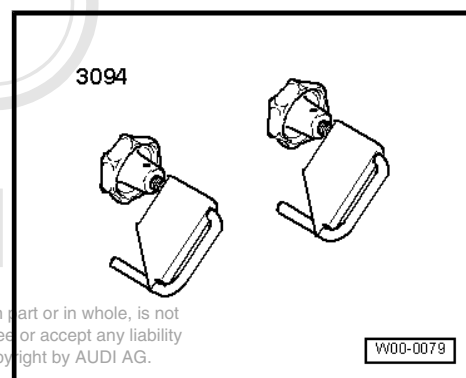
- ◆ Air in hydraulic system: bleed clutch system ⇒ [page 23](#) and check hydraulic system for external and internal leaks.
- ◆ Clutch plate does not move smoothly on input shaft splines (due to corrosion or dirt, etc.).

- ◆ Needle bearing in flywheel (centring bearing for input shaft) defective, renew needle bearing ⇒ Engine, mechanics; Rep. gr. 13 .
- ◆ Foreign body in clutch system.
- ◆ Mechanically defective pressure plate/clutch plate
⇒ [page 33](#) .
- ◆ Wrong components used or components forgotten when carrying out repair work (e.g. intermediate plate).

1.7 Removing and installing clutch master cylinder

Special tools and workshop equipment required

- ◆ Hose clamp -3094-



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Removing



Note

If you suspect a defective clutch master cylinder, perform function test prior to renewing
⇒ „1.5 Notes on removing and installing clutch master cylinder and slave cylinder“, [page 17](#) .



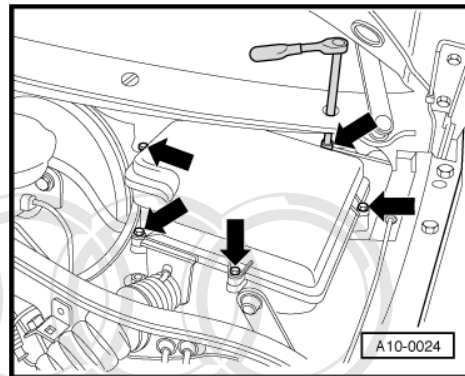
Caution

- ◆ **Follow steps required when disconnecting battery ⇒ Electrical system; Rep. gr. 27 .**

- If fitted, remove cover over plenum chamber.
- With the ignition switched off, disconnect battery earth strap
⇒ Electrical system; Rep. gr. 27 .
- Take the electronics box out of the plenum chamber as follows:

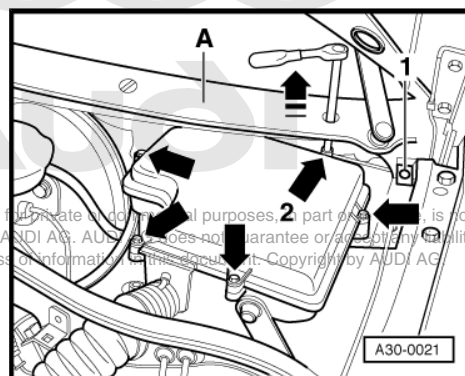
Old version with assembly hole in cowl panel trim:

- Unscrew bolts -arrows- and take off the cover.



New version without assembly hole in cowl panel trim:

- Pull off retaining clip -1- and lift cowl panel trim -A- slightly. Now remove bolt -arrow 2-.
- Remove remaining bolts -arrows- and pull off cover.



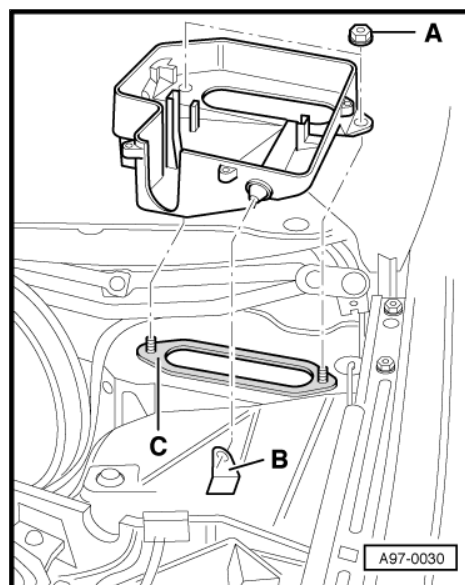
All versions:

- Remove engine control unit; if necessary, remove auxiliary relay carrier and auxiliary fuse box ⇒ **Electrical system; Rep. gr. 97**.
- Unplug connector from connector point.
- Pull engine wiring harness together with rubber grommet out through opening in electronics box.
- Unscrew both nuts -A-.
- Lift electronics box off studs at rear and detach from securing point -B-.

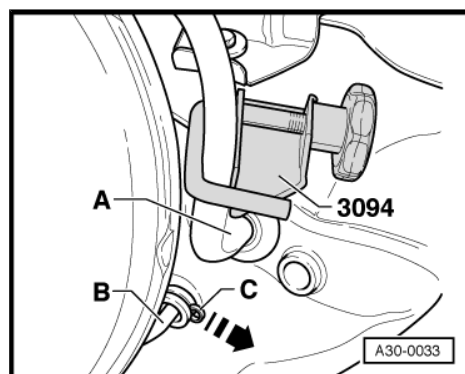


Note

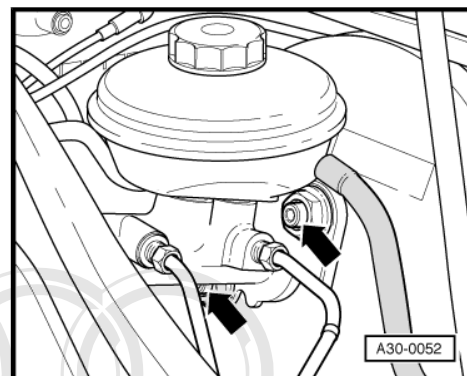
- ◆ *In the following steps make sure that no brake fluid escapes into the plenum chamber or onto the gearbox below. If this does happen, clean the affected area thoroughly.*
- ◆ *When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.*



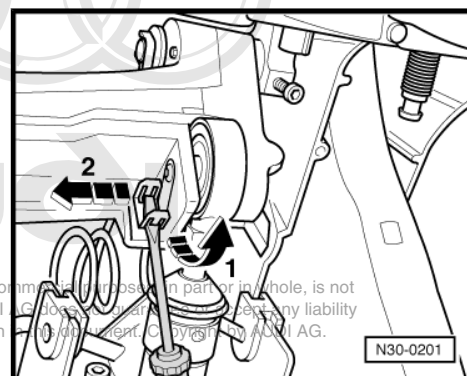
- Clamp off supply hose -A- from brake fluid reservoir using hose clamp -3094-. Disconnect hose from clutch master cylinder and plug hose.
- Remove rubber grommet from bulkhead above connecting pipe for supply hose.
- Use screwdriver to prise out clip -C- and pull out pipe -B- slightly.



- Remove the two TORX bolts -arrows-.
- Remove storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .



- Detach clutch pedal from clutch master cylinder. To do so, use screwdriver to prise out pin locking element -arrow 1-, pull out pin -arrow 2- and press out clutch pedal.

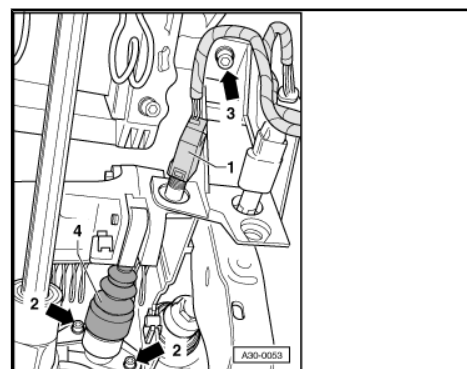


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Note

- ◆ *When performing the following steps, make sure clutch pedal does not press the clutch pedal switch -1- out of the retaining clip, as this would damage the thread of the switch and the switch would have to be renewed.*
- ◆ *Switch may only be fitted once so as to ensure a firm fit.*
- Unscrew securing bolts for clutch master cylinder -arrow 2- and mounting bracket -arrow 3-.
- Pull entire pedal cluster slightly towards passenger compartment and take out clutch master cylinder -4-.

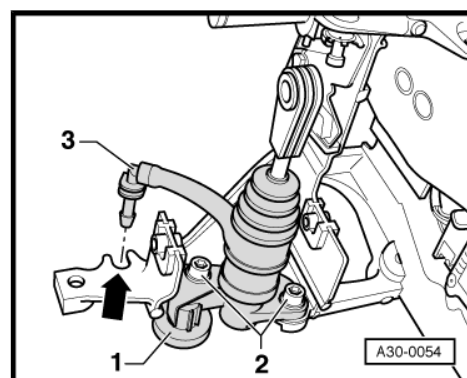


Installing

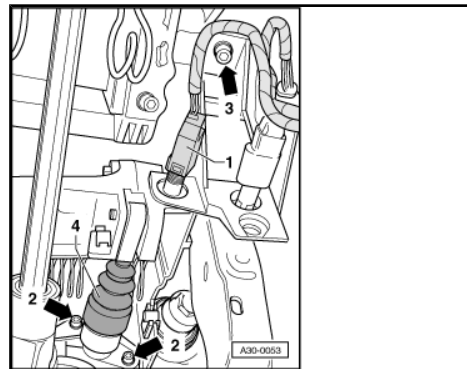
Installation is carried out in reverse sequence; note the following:

- Fit clutch master cylinder so that seal -1- makes full surface contact with washer behind mounting bracket and tighten bolts -2- to 20 Nm.
- Press guide -arrow A- on connecting pipe -3- into recess -arrow B- on mounting bracket.

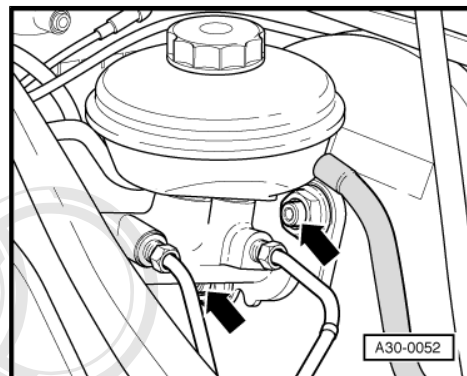
A second mechanic is required for the next step.



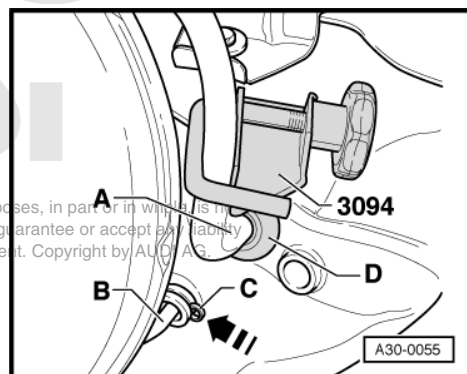
- Slide complete pedal cluster forwards towards bulkhead, fit bolt -arrow 3- and tighten it by hand. Have second mechanic guide connecting pipe into clutch master cylinder from plenum chamber.



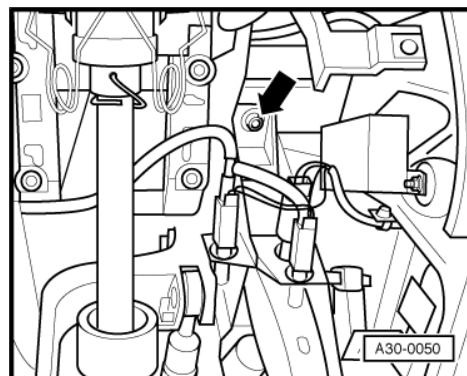
- Tighten bolts for brake servo -arrows- to 25 Nm.



- Press in retaining clip -C- as far as it will go.
- Push pipe -B- into clutch master cylinder until it engages audibly.
- Fit rubber grommet -D- on connecting pipe for supply hose -A- in bulkhead.
- Push supply hose -A- from brake fluid reservoir on as far as it will go.
- Detach hose clamp -3094- from supply hose -A-.



- Tighten hexagon socket head bolt -arrow- securing pedal cluster to central tube for dash panel to 25 Nm.
- Connect clutch master cylinder to clutch pedal. Clip pin onto clutch pedal.
- After installing clutch master cylinder, bleed clutch system
⇒ [page 23](#) .

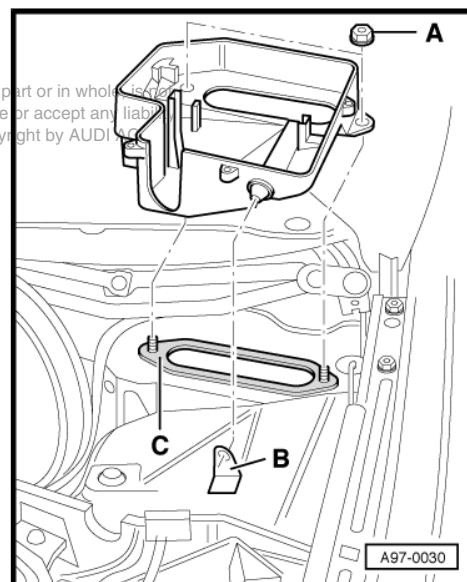
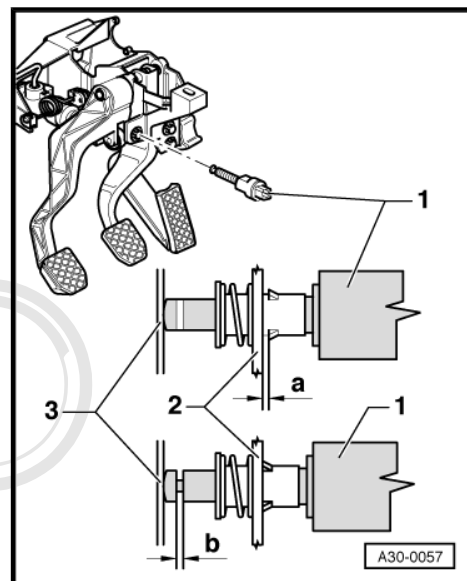


- Check setting of clutch pedal switch -1- over clutch pedal as follows:
- ◆ Switch -1- must make full contact with clutch pedal -3- and be fully actuated.
- ◆ Tolerance for adjustment: gap -a- between retaining clip and mounting bracket -2- (or gap -b- on switch -1-) must not be more than 0.5 mm.
- ◆ To adjust, hold retaining clip and turn clutch pedal switch -1-.

**Note**

Clutch pedal switch -F36- may only be fitted once so as to ensure a firm fit.

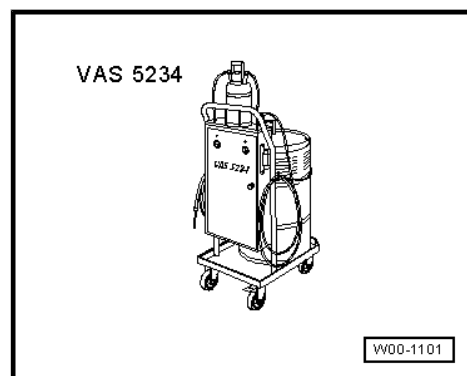
- Install storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .
- Always renew gasket -C-.
- Make sure gasket does not conceal opening in body and raised metal edge.
- Fit electronics box at attachment point -B- and tighten nuts -A- to 4 Nm.
- Press on cover hand-tight and tighten bolts in a diagonal sequence to 4 Nm (also see marking on cover).
- Route engine wiring harness and plug in connector in connector point.
- Install engine control unit and, if removed, also auxiliary relay carrier and auxiliary fuse carrier ⇒ Electrical system; Rep. gr. 97 .
- Follow steps required after connecting battery ⇒ Electrical system; Rep. gr. 27 .



1.8 Bleeding clutch system

Special tools and workshop equipment required

- ◆ Brake filling and bleeding equipment -VAS 5234- or brake filling and bleeding equipment -V.A.G 1869-



- ◆ Brake fluid specification ⇒ Brake system; Rep. gr. 47 .



Note

- ◆ *The clutch system must be bled after performing work on the hydraulic clutch mechanism.*
- ◆ *Before bleeding the clutch system, pull back the clutch pedal to the normal position and top up brake fluid to „Max“ marking on brake fluid reservoir.*
- ◆ *Open the bleeder valve before switching on the bleeding appliance.*
- ◆ *When performing the following steps, make sure that no brake fluid escapes onto the gearbox.*
- ◆ *The clutch system should be bled at the same intervals as the brake system.*

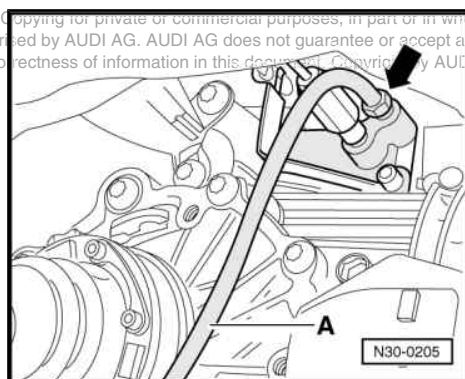
Procedure

- Connect brake filling and bleeding equipment -V.A.G 1869- or -VAS 5234- , but do not switch on at this stage ⇒ Brake system; Rep. gr. 47 ; Bleeding brake system .
- 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 bleeding appliance and allow about 100 cm³ of brake fluid to drain out.
- ◆ Operating pressure 2.0 bar



Note

- ◆ *Ensure bleeder hose is correctly fitted during bleeding operation.*
- ◆ *Do not allow brake fluid to come into contact with the gearbox.*
- Close bleeder valve; tightening torque: 4.5 Nm.
- Depress clutch pedal several times after bleeding process is completed.
- Repeat bleeding procedure if necessary.
- Disconnect bleeder hose and fit protective cap.
- Remove brake filling and bleeding equipment -VAS 5234- or -V.A.G 1869- from brake fluid reservoir.
- If originally fitted, install noise insulation beneath gearbox.



2 Servicing clutch release mechanism

Overview:

- ◆ ⇒ „2.1 Exploded view - clutch release mechanism“, page 25
- ◆ ⇒ „2.2 Removing and installing clutch slave cylinder“, page 28

2.1 Exploded view - clutch release mechanism

1 - Clutch slave cylinder

- ☐ Do not operate clutch pedal after slave cylinder has been removed
- ☐ Removing and installing ⇒ page 28
- ☐ When installing, press in so that securing bolt can be fitted easily
- ☐ Grease lightly before installing ⇒ page 17
- ☐ Disconnecting pipe/hose assembly ⇒ page 17
- ☐ Follow correct procedure when bleeding ⇒ page 23
- ☐ Tighten bleeder valve to 4.5 Nm

2 - Bolt

- ☐ 23 Nm
- ☐ Clutch slave cylinder to gearbox
- ☐ Self-locking
- ☐ Always renew

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3 - Bracket for pipe/hose assembly

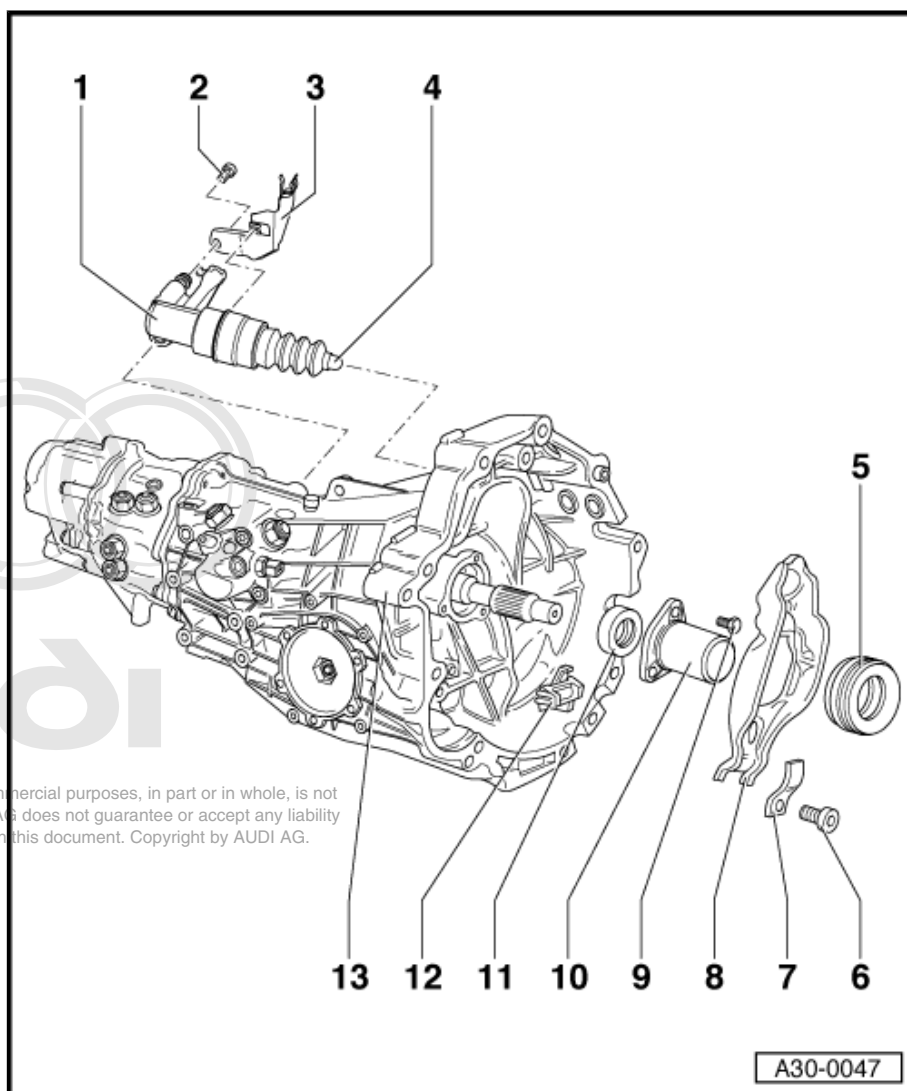
- ☐ Engage on clutch slave cylinder
- ☐ Bolt to gearbox with clutch slave cylinder

4 - Plunger

- ☐ Lubricate end of plunger with copper grease (commercially available)

5 - Release bearing

- ☐ With or without plastic ring, depending on design
- ☐ Checking and servicing release bearing with glued plastic ring ⇒ page 27
- ☐ Checking release bearing with mechanically attached plastic ring ⇒ page 27
- ☐ Renew if groove worn on plastic ring is too deep ⇒ page 27
- ☐ Do not wash out bearing; wipe clean only
- ☐ Renew bearing if noisy
- ☐ Retainer lugs on release bearing must engage in release lever



6 - Bolt

- ☐ 25 Nm
- ☐ Self-locking
- ☐ Renew

7 - Leaf spring**8 - Clutch release lever**

- ☐ Removing ⇒ [page 27](#)
- ☐ Must engage in lugs on intermediate piece when installed ⇒ [page 27](#)
- ☐ Before installing, lubricate area which makes contact with plunger of slave cylinder with copper grease (commercially available).

9 - Bolt

- ☐ 15 Nm
- ☐ 3x

10 - Guide sleeve**11 - Oil seal**

- ☐ For input shaft
- ☐ Removing ⇒ [page 26](#)
- ☐ Installing ⇒ [page 26](#)

12 - Intermediate piece

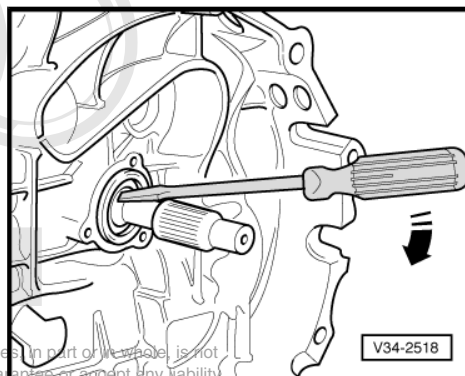
- ☐ Renew if damaged

13 - Gearbox**Removing input shaft oil seal**

- Pry out oil seal carefully using a screwdriver -arrow-.

**Note**

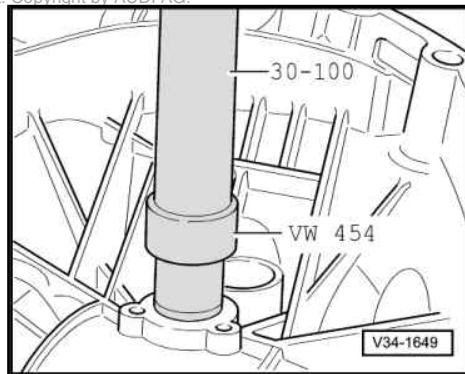
Take care not to damage contact surface for oil seal on input shaft.



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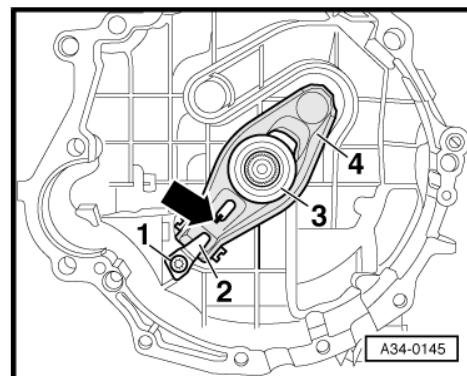
Installing input shaft oil seal

- Pack space between sealing lip and dust lip of new oil seal for input shaft with a thin coat of sealing grease -G 052 128 A1- .
- Fit a thin insulating hose tightly over splines of input shaft.
- Drive in input shaft oil seal.
 - Installation depth when fitted at factory: 3.5 mm.
 - Installation depth on used input shaft (when repairing): 4.5 mm.
- Remove insulating hose.



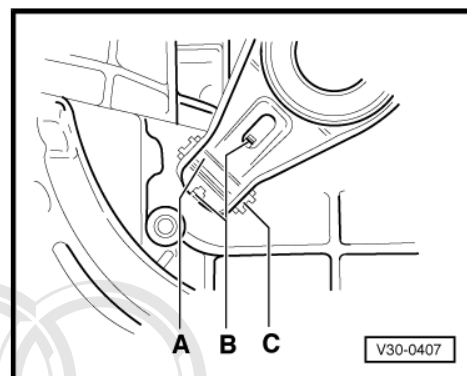
Removing clutch release lever

- Slacken bolt -1-, remove leaf spring-2- and press back catch -arrow-.
- Remove clutch release lever -4- together with release bearing -3-.
- Disengage retaining tabs of release bearing at release lever.



Installing clutch release lever

- Before installing clutch release lever, apply a thin coat of copper grease (commercially available) to contact surface for plunger of clutch slave cylinder.
- Insert clutch release lever -A- into intermediate piece -C- and engage (detent -B- will become visible).
- Insert leaf spring [⇒ Item 7 \(page 26\)](#) and tighten new bolt [⇒ Item 6 \(page 26\)](#) to 25 Nm.



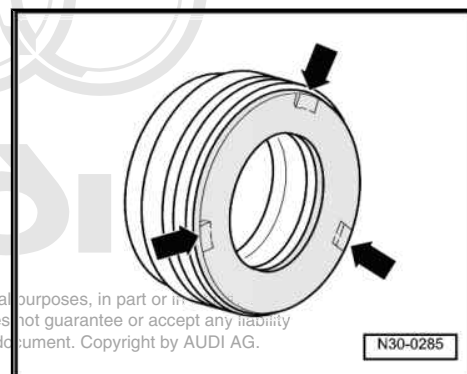
Checking and servicing release bearing with glued plastic ring

- Identification: inner side of plastic ring has three lugs -arrows-.

The plastic ring -arrows- may come loose from the release bearing when the gearbox or release bearing is removed. The release bearing does not have to be renewed if this happens.

- Before installing the gearbox, glue the loose plastic ring back onto the bearing with adhesive -AMV 195 KD1 01-.

- The three square lugs -arrows- on the plastic ring engage in the recesses of the bearing ring.



Note

The release bearing must be renewed if the groove worn on the plastic ring is deeper than 0.8 mm.

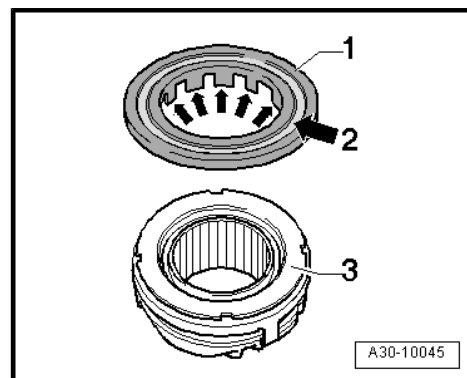
Checking release bearing with mechanically attached plastic ring

- Identification: retaining tabs around plastic ring -arrows-.



Note

- ◆ *The release bearing must be renewed if the plastic ring -1- has come loose.*
- ◆ *The release bearing -3- must be renewed if the groove -arrow 2- worn on the plastic ring -1- is deeper than 0.8 mm.*

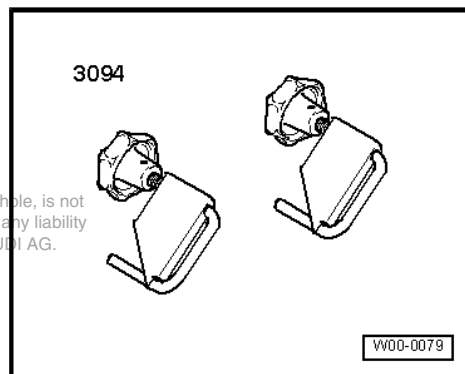




2.2 Removing and installing clutch slave cylinder

Special tools and workshop equipment required

- ◆ Hose clamps, up to Ø 25 mm -3094-



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- ◆ Lithium grease -G 052 150 A2-
- ◆ Copper grease (commercially available)

Removing clutch slave cylinder



Note

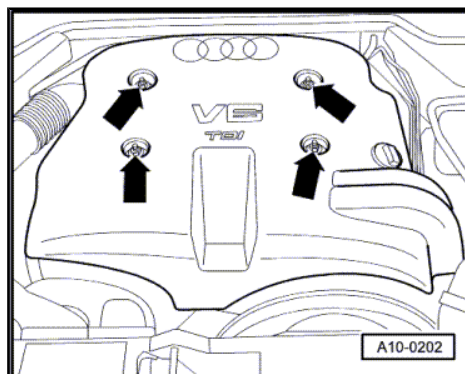
- ◆ If you suspect a defective clutch master cylinder, perform function test prior to renewing
⇒ „1.5 Notes on removing and installing clutch master cylinder and slave cylinder“, page 17.
- ◆ Do not allow brake fluid to come into contact with the gearbox. If necessary, clean the gearbox housing.



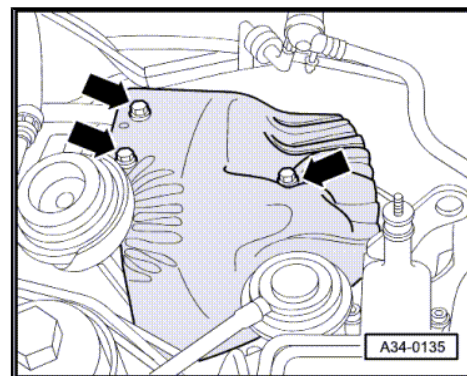
Caution

Make sure you do not press the clutch pedal if the clutch slave cylinder is removed from the gearbox with the pipe/hose assembly still attached. Otherwise, the piston will be pressed out of the slave cylinder and be destroyed.

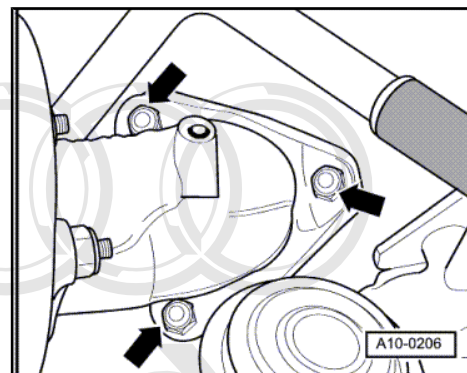
- Detach engine cover panel above cylinder head cover -arrows-.



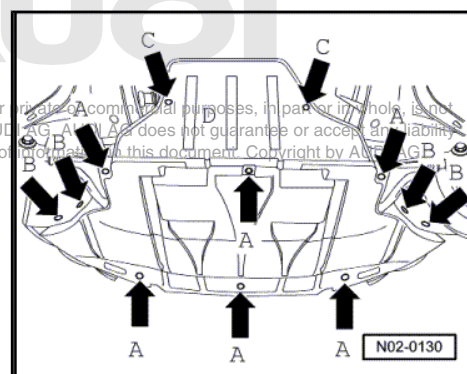
- Remove heat shield above turbocharger -arrows-.



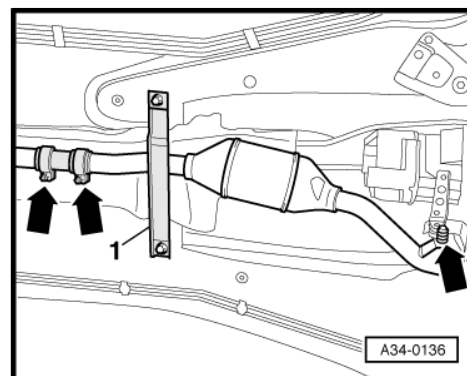
- Unbolt front exhaust pipe from turbocharger manifold -arrows-.



- Remove rear section -D- of noise insulation.

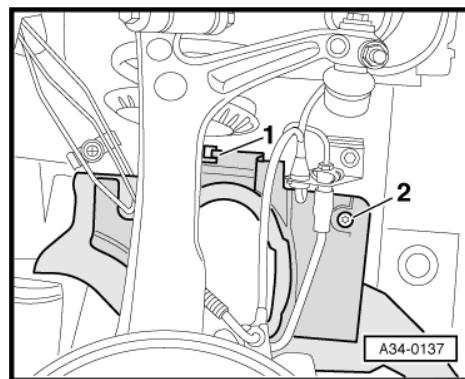


- Detach cross member -1-.
- Remove front exhaust pipe complete with catalytic converter -arrows-.

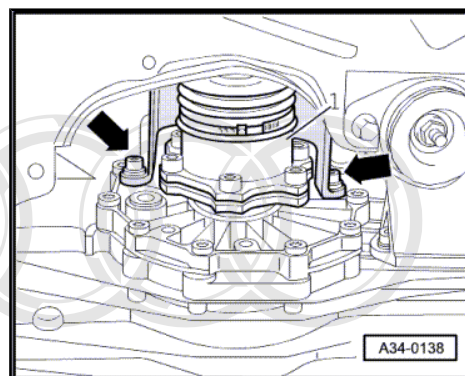


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- Remove bolt -2- on noise insulation above drive shaft (left-side).
- Disengage hook -1- and remove noise insulation.



- Detach heat shield for drive shaft from gearbox -arrows-.



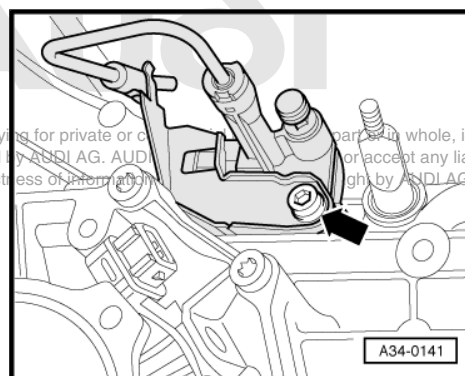
- Remove bolt -arrow- and take out clutch slave cylinder from the rear.



Caution

Do not depress clutch pedal after removing slave cylinder. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

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- Using hose clamp -3094- , clamp off pipe/hose assembly.
- Release retaining clip -A- using a screwdriver and pull out as far as stop.
- Detach pipe/hose assembly from clutch slave cylinder.

Installing clutch slave cylinder

Installation is carried out in reverse sequence; note the following:



Note

- ◆ Do not allow brake fluid to come into contact with the gearbox. If necessary, clean the gearbox housing.
- ◆ If the clutch slave cylinder is inserted at an angle, there is a danger that the operating rod will be guided past the clutch release lever.
- ◆ To facilitate assembly, engage 6th gear (6-speed gearbox) or 4th gear (5-speed gearbox) before fitting the clutch slave cylinder.
- ◆ When installing, press in slave cylinder so that securing bolt can be fitted easily.
- ◆ Renew securing bolt for slave cylinder.

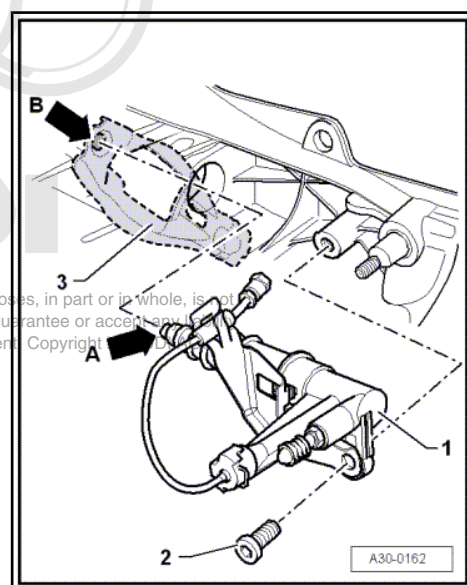
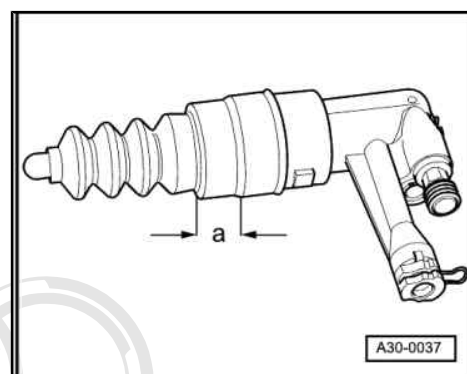
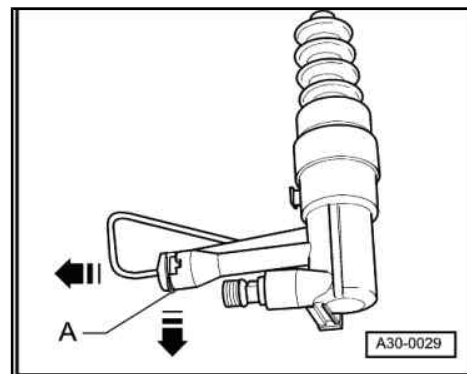
- Before inserting slave cylinder in gearbox housing, lubricate area -a- of sleeve with lithium grease -G 052 150 A2- .
- Lightly lubricate surface where plunger and clutch release lever make contact with copper grease (commercially available).

- Guide slave cylinder -1- into mounting hole in gearbox housing, keeping it as far as possible in line with the operating direction of the plunger -arrow A-.
- At the same time insert in recess -arrow B- on clutch release lever -3-.
- Secure slave cylinder -1- with new bolt -2-. Tightening torque [⇒ Item 2 \(page 25\)](#)



Note

If the slave cylinder is inserted at an angle, there is a danger that the plunger -arrow A- will be guided past the recess -arrow B- on the clutch release lever.



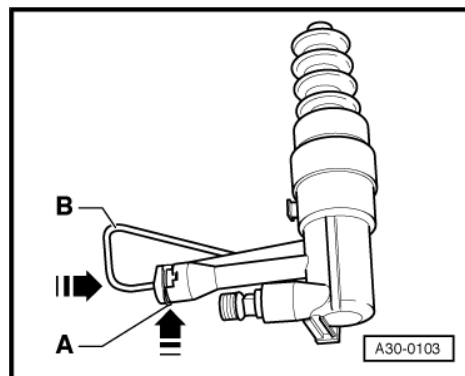
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- To connect pipe to clutch slave cylinder, press in retaining clip -A- as far as it will go.
- Push pipe -B- into clutch slave cylinder until it engages audibly.
- Pull pipe/hose assembly to check that it is securely seated.



Caution

- ◆ *After installing the slave cylinder carefully press the clutch pedal.*
- ◆ *If you feel an unusually strong point of resistance when depressing the clutch pedal, you must not press it down further.*
- ◆ *The plunger of the slave cylinder is likely to have been guided past the clutch release lever.*
- ◆ *The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.*
- ◆ *For comparison: normal pedal force is approx. 115 N.*



- Install exhaust system so it is free of stress ⇒ Engine, mechanics; Rep. gr. 26.
- Install heat shield for drive shaft (left-side).
- Bleed clutch system ⇒ [page 23](#).
- Install noise insulation panels.

Tightening torques

Component	Nm
Heat shield for drive shaft to gearbox	23
Front exhaust pipe to turbocharger	25
Heat shield to turbocharger	10
Clamp for exhaust pipe	40
Underbody cross member to body	20

3 Servicing clutch

Overview

- ◆ ⇒ „3.1 Exploded view - clutch unit“, page 33
- ◆ ⇒ „3.2 Removing and installing clutch“, page 35



Note

- ◆ Refer to general repair instructions ⇒ [page 5](#) .
- ◆ Check that dowel sleeves for centralising engine/gearbox are in the cylinder block; install if necessary.
- ◆ If the dowel sleeves are not fitted, this will lead to gear-change problems, clutch malfunction and in some cases gearbox noise (gears will make rattling noises).
- ◆ Renew clutch plate and pressure plate if riveted fastening is damaged or loose.
- ◆ Select the correct clutch plate and pressure plate according to engine code ⇒ *Electronic 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 for clutch plate splines -G 000 100- to the splines. Then move clutch plate backwards and forwards on input shaft until hub moves freely on shaft. It is important to remove excess grease.
- ◆ Pressure plates have an anti-corrosion coating and are greased. Only the contact surface may be cleaned, otherwise the service life of the clutch will be considerably reduced.
- ◆ The friction surface of the pressure plate and the dual-mass flywheel must be cleaned (degreased) thoroughly.
- ◆ If the clutch has burnt out, thoroughly clean the gearbox housing in area of clutch and parts of the engine facing the gearbox in order to prevent odours.

3.1 Exploded view - clutch unit



Note

- ◆ The gearbox has to be removed before working on the clutch ⇒ [page 69](#) .
- ◆ If components are marked, coloured marking on dual mass flywheel must be aligned with coloured marking on pressure plate.

1 - Dual-mass flywheel

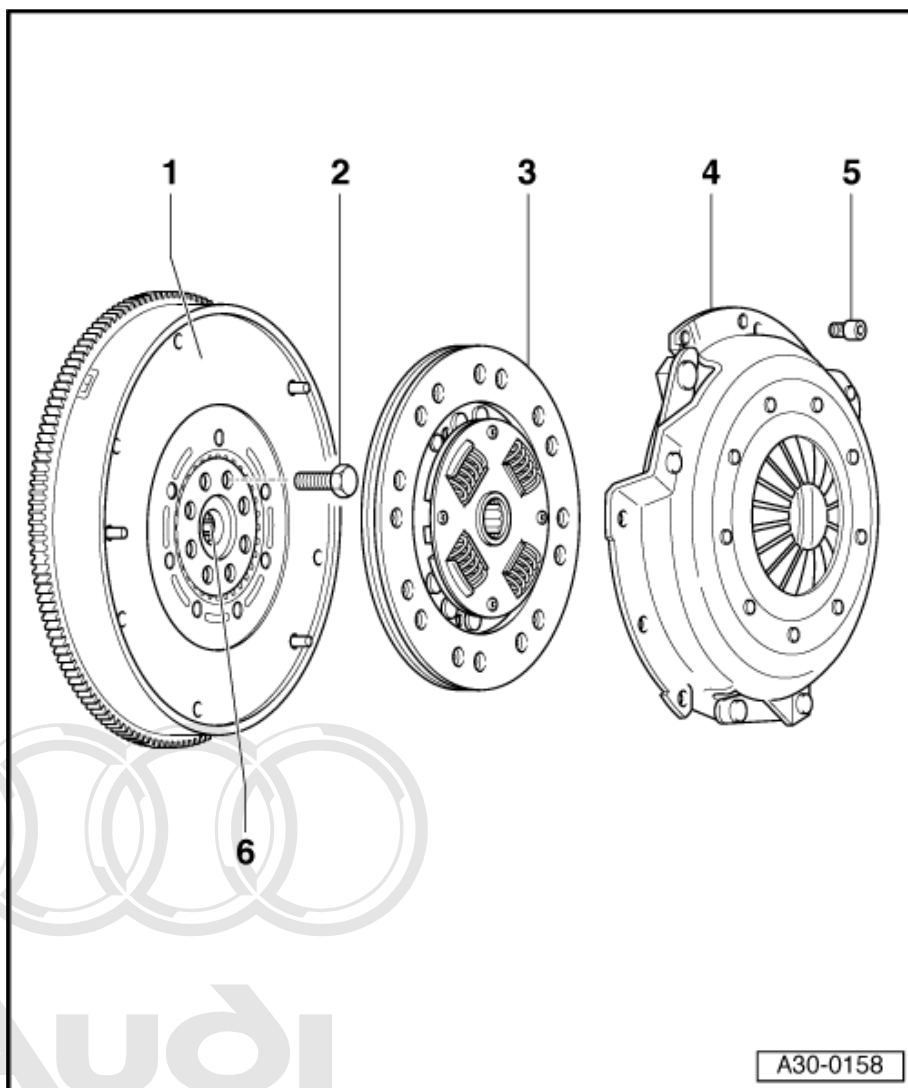
- ☐ Ensure that dowel pins fit tightly
- ☐ Contact surface for clutch lining must be free of grooves, oil and grease
- ☐ Removing and installing ⇒ Engine, mechanics; Rep. gr. 13

2 - Bolt for flywheel

- ☐ 60 Nm and then turn 180° further
- ☐ Renew

3 - Clutch plate

- ☐ Installation position: Clutch lining must make full contact with flywheel
- ☐ The marking „Getriebeseite“ (gearbox side), if provided, faces towards pressure plate/gearbox
- ☐ Coil springs (damper assembly) point towards pressure plate and gearbox
- ☐ Select diameter of clutch plate according to engine code ⇒ Electronic parts catalogue
- ☐ Centralising ⇒ [page 36](#)
- ☐ Lightly grease splines ⇒ [page 33](#)



4 - Pressure plate

- ☐ Removing and installing ⇒ [page 35](#)
- ☐ Checking ends of diaphragm spring ⇒ [page 35](#)
- ☐ Checking spring connection and rivets ⇒ [page 35](#)
- ☐ Checking wire ring ⇒ [page 35](#)

5 - Bolt

- ☐ 22 Nm

Observe tightening sequence ⇒ [page 36](#)

6 - Needle bearing

- ☐ Check for damage or wear
- ☐ Driving in and driving out ⇒ Engine, mechanics; Rep. gr. 13

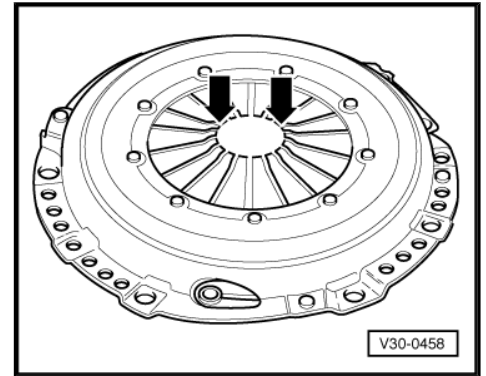
Checking ends of diaphragm spring

- Wear up to half the thickness of the diaphragm spring -arrows- is permissible.



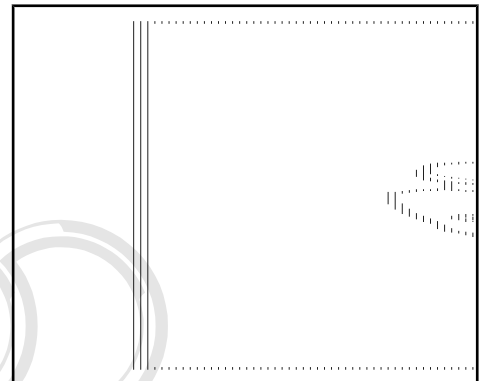
Note

When performing repairs always match up clutch pressure plate and clutch plate by checking engine code ⇒ Electronic parts catalogue .



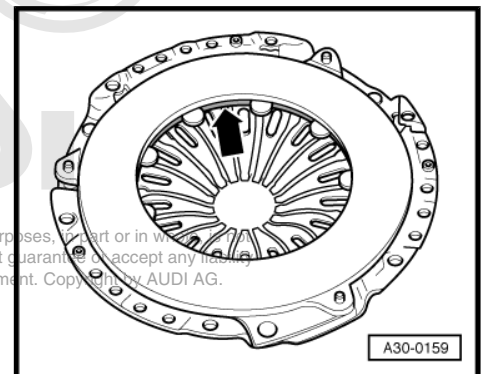
Checking spring connections and rivets

- Check spring connection between pressure plate and cover -centre arrow- for cracks and make sure rivet fastenings -right arrows- are seated tightly.
- Renew pressure plate if spring connections are broken or badly bent, or if riveted fastenings are loose.



Checking wire ring

- Check that wire ring in pressure plate -arrow- is not damaged.
- Renew pressure plate if wire ring is broken.

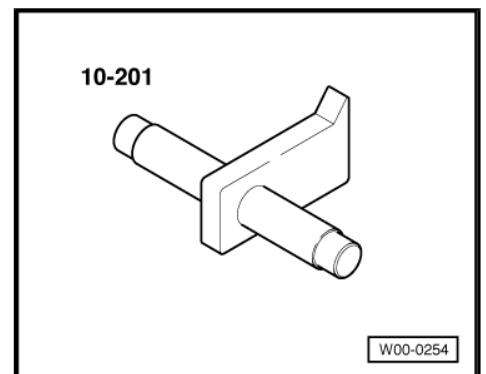


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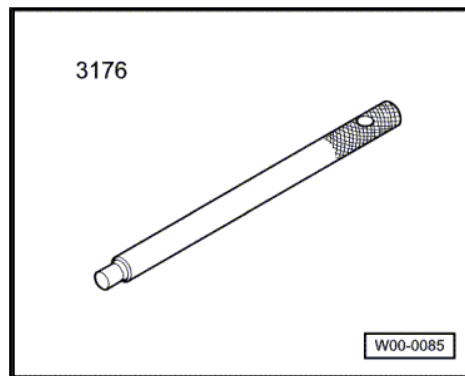
3.2 Removing and installing clutch

Special tools and workshop equipment required

- ◆ Counterhold tool -10 - 201-



◆ Centring mandrel -3176-



◆ Grease for clutch plate splines -G 000 100-

Removing

- Attach counterhold tool -10 - 201- before loosening bolts.

To prevent the pressure plate from becoming distorted during removal (causes clutch grab when driving off), always adhere to the following procedure when unbolting the pressure plate:

- Loosen all bolts consecutively in clockwise direction and in steps of 90° (1/4 turn) until the pressure plate is released.

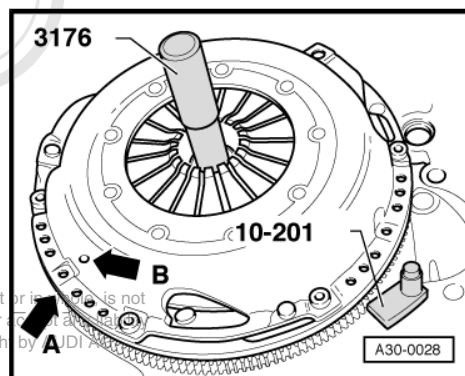
Installing

- Re-position counterhold tool -10 - 201- to tighten bolts.
- Installation position of clutch plate: coil springs (damper assembly) or marking „Getriebeseite“ point towards pressure plate and gearbox.



Note

If components are marked, coloured marking arrow A on dual mass flywheel must be aligned with coloured marking arrow B on pressure plate.



- Use centring mandrel -3176- to centralise clutch plate.

To prevent the pressure plate from becoming distorted during installation (causes clutch grab when driving off), always adhere to the following procedure when installing the pressure plate:

- Position pressure plate on centring pins.
- Screw in all bolts evenly by hand until bolt heads make contact with pressure plate.
- Tighten all bolts consecutively in clockwise direction and in steps of 90° (1/4 turn) until housing makes contact with flywheel.
- Tighten all bolts to final torque (22 Nm) consecutively in clockwise direction.

34 – Controls, housing

1 Servicing selector mechanism (vehicles up to approx. 05.99)

Overview

- ◆ ⇒ „1.1 Exploded view - gear lever and push rod (rear)“, page 37
- ◆ ⇒ „1.2 Exploded view - selector rod, connecting rod and push rod (front)“, page 39
- ◆ ⇒ „1.3 Removing and installing selector mechanism (vehicles up to 05.99)“, page 40
- ◆ ⇒ „1.4 Adjusting selector mechanism (vehicles up to 05.99)“, page 43

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1.1 Exploded view - gear lever and push rod (rear)



Note

Lubricate all bearings and moving surfaces. Select correct type of grease from ⇒ Electronic parts catalogue .

1 - Ball stop

- ☐ Insert spring and bush in ball stop and fit on gear lever so that spring and bush are on the right when looking forwards
- ☐ Install before fitting circlip
⇒ [Item 19 \(page 38\)](#)

2 - Spring

3 - Spacer bush

4 - Circlip

- ☐ Renew circlips if they have been over-stretched

5 - Rubber ring

6 - Bush

7 - Mounting frame (bottom section)

8 - Mounting frame (top section)

9 - Boot

- ☐ Retaining hook on rear of cover; pry out carefully from centre console

10 - Bush

11 - Gear knob

12 - Spring

13 - Bush

- ☐ Installation position: rounded end faces gear lever

14 - Gear lever

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

15 - Spacer tube

16 - Nut

- ☐ 8 Nm

17 - Noise insulation

18 - Nut

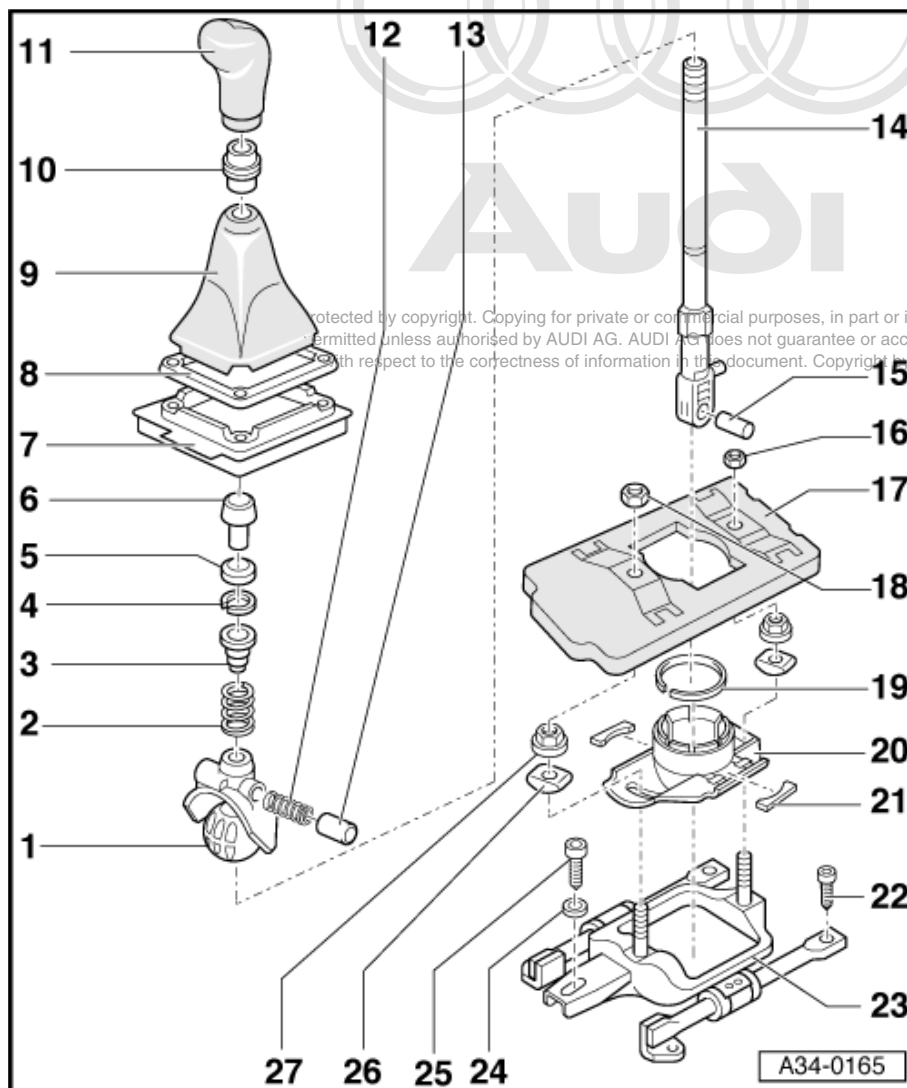
- ☐ 8 Nm

19 - Circlip

- ☐ Renew
- ☐ Take out before removing ball stop
- ☐ Installation position: rounded side faces ball housing ⇒ [Item 20 \(page 38\)](#)

20 - Ball housing

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



- 21 - Buffer
- 22 - Bolt
 - ☐ 23 Nm
- 23 - Push rod (rear)
 - ☐ In selector mechanism
- 24 - Washer
- 25 - Bolt
 - ☐ 23 Nm
- 26 - Connecting piece
- 27 - Flange nut
 - ☐ 23 Nm

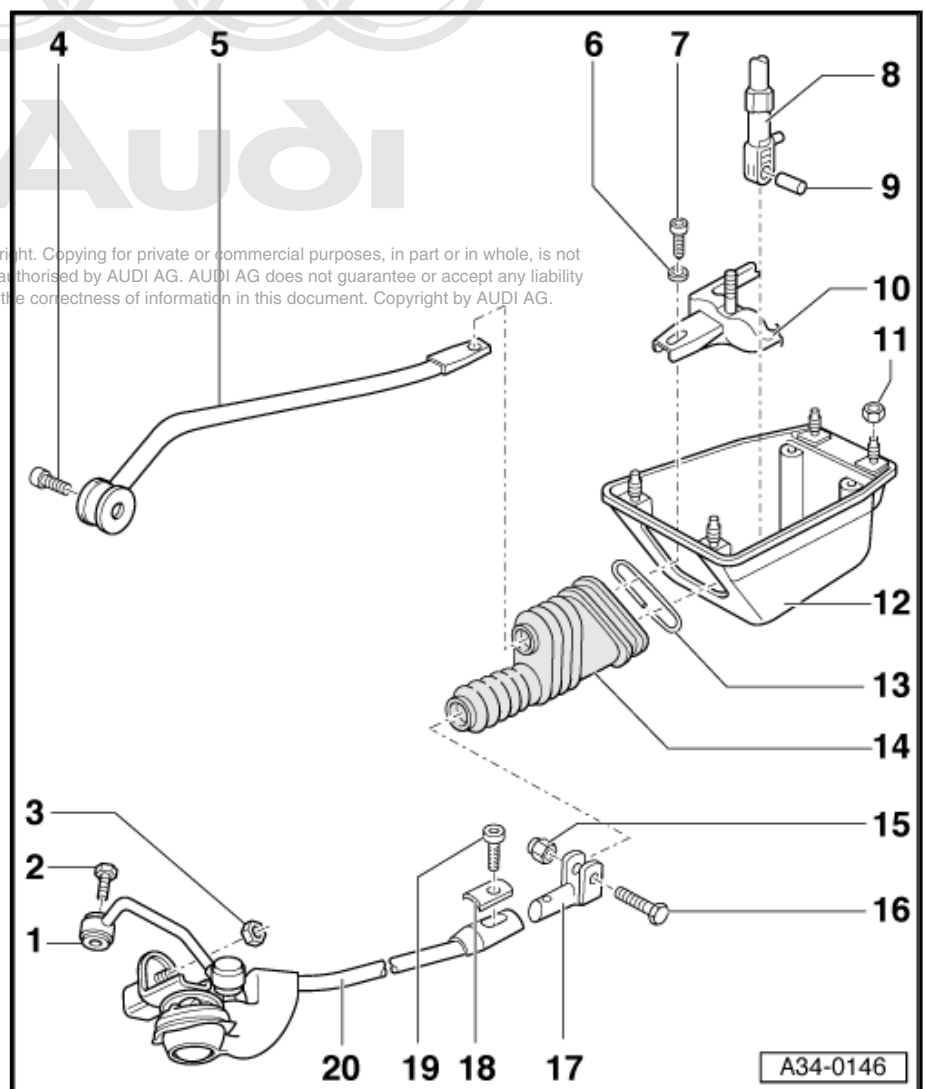
1.2 Exploded view - selector rod, connecting rod and push rod (front)



Lubricate all bearings and moving surfaces. Select correct type of grease from ⇒ Electronic parts catalogue .

- 1 - Connecting rod
 - ☐ Do not separate from selector rod
 - ☐ Observe note
⇒ [page 42](#)
- 2 - Bolt
 - ☐ 23 Nm
- 3 - Nut
 - ☐ 23 Nm
 - ☐ Self-locking
 - ☐ Always renew
- 4 - Bolt
 - ☐ 40 Nm
 - ☐ Part of push rod (front)
- 5 - Push rod (front)
 - ☐ With bearing bush, bolt and washers
- 6 - Washer
- 7 - Bolt
 - ☐ 23 Nm
- 8 - Gear lever
 - ☐ Only fits in one position in ball housing
- 9 - Spacer tube
- 10 - Push rod (rear)
 - ☐ In selector mechanism
- 11 - Nut
 - ☐ 10 Nm

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12 - Selector housing

13 - Tensioning ring

14 - Boot

- ☐ Carefully pull over selector rod and push rod
- ☐ Align with markings on selector rod and push rod when installing

15 - Nut

- ☐ 10 Nm
- ☐ Self-locking
- ☐ Renew

16 - Bolt

17 - Selector fork

18 - Clamp

19 - Bolt

- ☐ 23 Nm

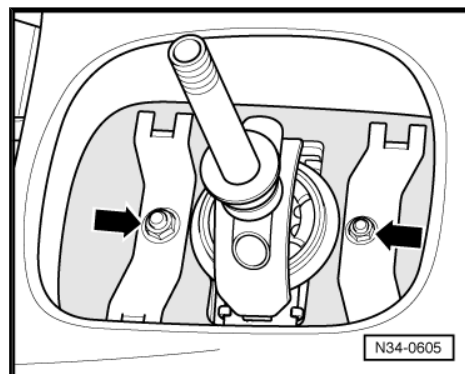
20 - Selector rod

- ☐ Do not separate connecting rod from selector rod

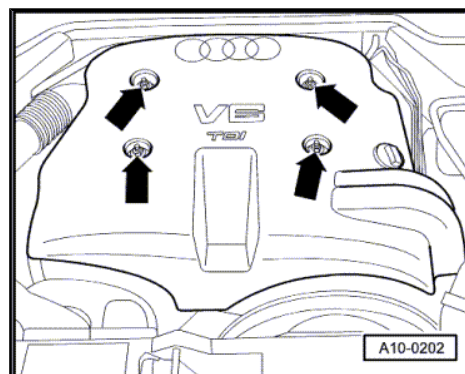
1.3 Removing and installing selector mechanism (vehicles up to 05.99)

Removing

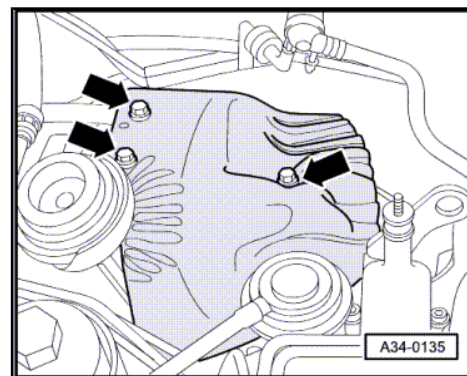
- Remove gear knob and gear lever boot.
- Remove centre console ⇒ General body repairs, interior; Rep. gr. 68 .
- Detach noise insulation.
- Remove noise insulation for selector mechanism housing -arrows-.



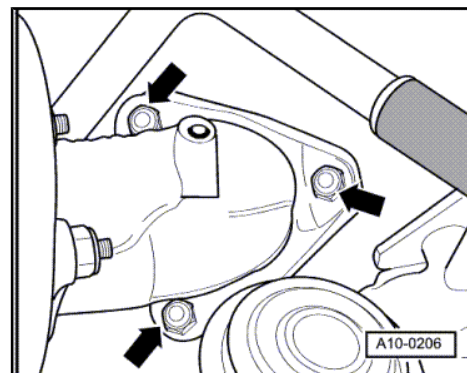
- Detach engine cover panel above cylinder head cover -arrows-.



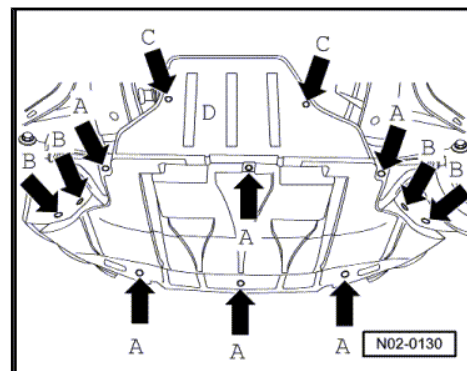
- Remove heat shield above turbocharger -arrows-.



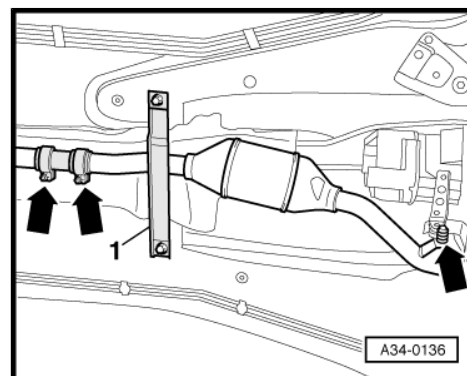
- Unbolt front exhaust pipe from turbocharger manifold -arrows-.



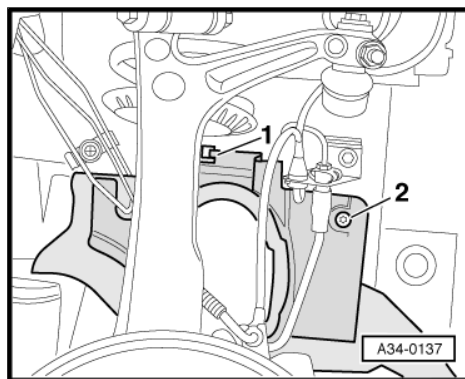
- Remove rear section -D- of noise insulation.



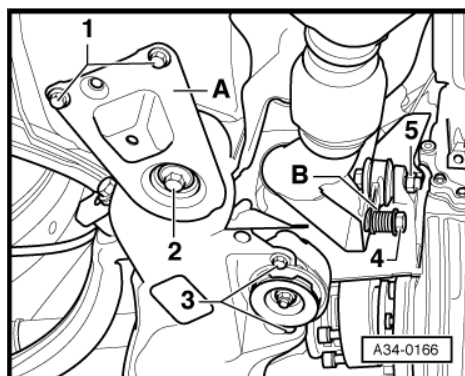
- Detach cross member -1-.
- Remove front exhaust pipe complete with catalytic converter -arrows-.



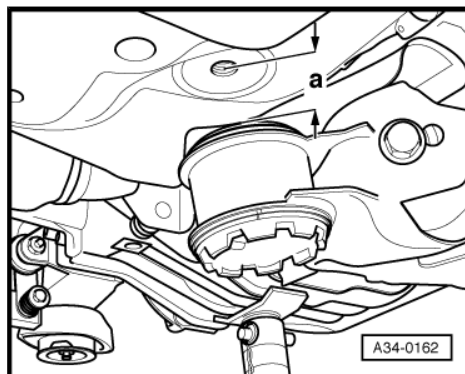
- Loosen bolt -2- on noise insulation cover above drive shaft (left-side).
- Disengage retainer -1- and remove noise insulation cover.



- Remove bolts -1- and -2- on both sides.



- Lower subframe at the rear.
- ◆ Dimension -a- max. 50 mm

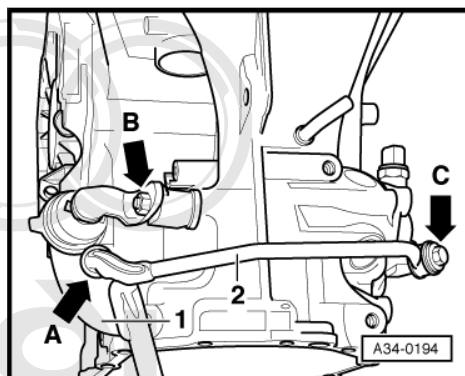


Important note for the following operations:



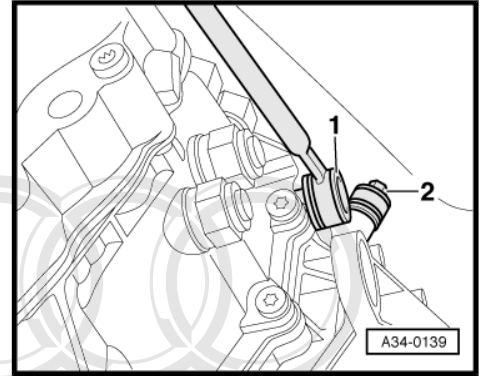
Caution

- ◆ When removing selector mechanism, do NOT pull ball head -arrow A- on connecting rod -2- off selector rod -1-.
- ◆ The ball head will break if it is pulled off!

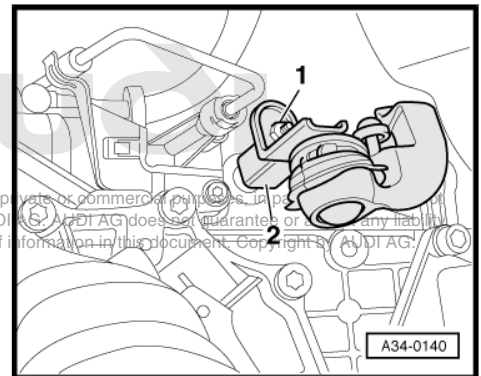


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- Unscrew connecting rod -2- on right side of gearbox.
- Remove hexagon socket head bolt from push rod -1-.



- Unscrew nut -1- and pull selector rod lever -2- off gearbox selector shaft.
- Remove heat shield (front) above exhaust system.
- Pivot selector housing with selector rod and push rod downwards and remove.



Installing

Installation is carried out in reverse sequence; note the following:



Note

Always renew self-locking nuts and bolts.

- Bolt subframe to body ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Install exhaust system and ensure stress-free alignment ⇒ Engine, mechanics; Rep. gr. 26 .
- Adjust selector mechanism ⇒ [page 43](#) .

Tightening torques

Component	Nm
Selector housing to body	10
Selector rod to gearbox	23 ¹⁾
Connecting rod to gearbox	23
Push rod to gearbox	40
Front exhaust pipe to turbocharger	25
Heat shield to turbocharger	10
Clamp for exhaust pipe	40
Underbody cross member to body	20
• ¹⁾ Always renew nut	

1.4 Adjusting selector mechanism (vehicles up to 05.99)

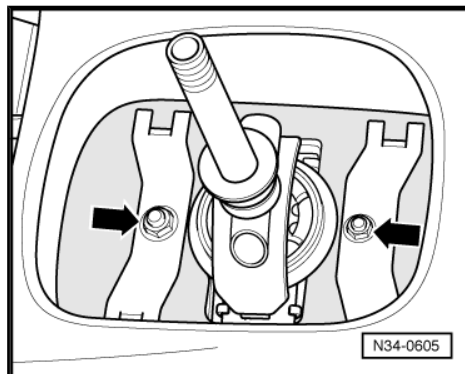
The following are prerequisites for correct gear lever alignment:

- Gear selector linkage must be in proper condition and undamaged.
- Selector mechanism must move freely.
- Gearbox, clutch and clutch mechanism must be in proper condition.

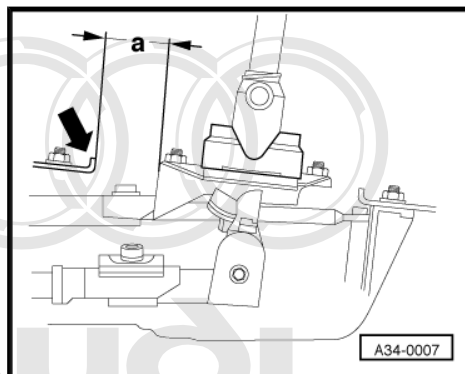
- Gearbox in neutral.

Procedure

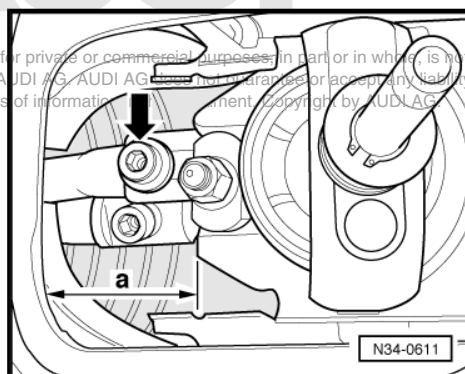
- Unscrew gear knob from gear lever.
- Remove gear lever boot.
- Remove noise insulation for selector mechanism housing -arrows-.



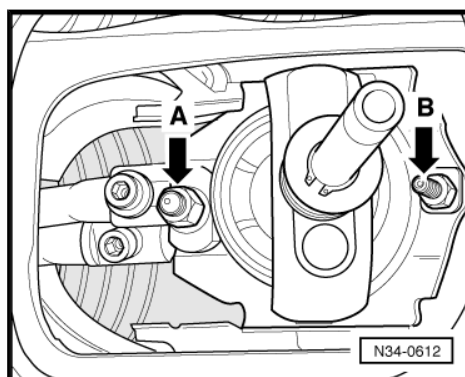
- Measure distance -a- between body and rear push rod (in selector mechanism).
- ◆ Specification: distance -a- = 37 mm
- If distance measured is not correct, adjust dimension -a- as follows:



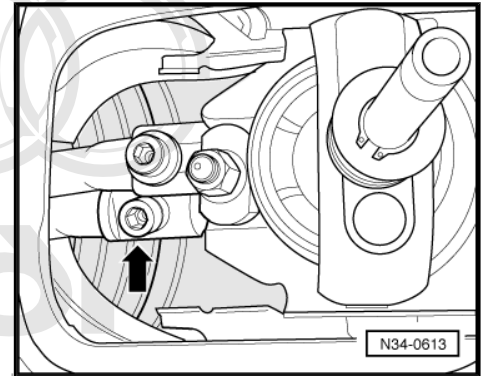
- Loosen bolt -arrow- for push rod.
- ◆ Rear push rod (in selector mechanism) should move freely in both directions on slide.
- Set to distance -a- by moving rear push rod (in selector mechanism).
- Tighten bolt for push rod.



- Loosen nuts for ball housing -arrow A- and -arrow B-.
- Align ball housing so it is horizontal.
- Tighten nuts for ball housing -arrow A- and -arrow B-.



- Slacken bolt -arrow- for selector rod.
- ◆ Connection between selector rod and selector mechanism should move freely.

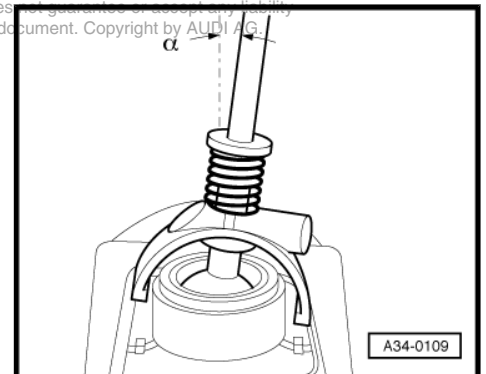


- Adjust gear lever as follows:

- ◆ Gear lever vertical, inclined max. 3° to the right - angle -a-.

**Note**

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

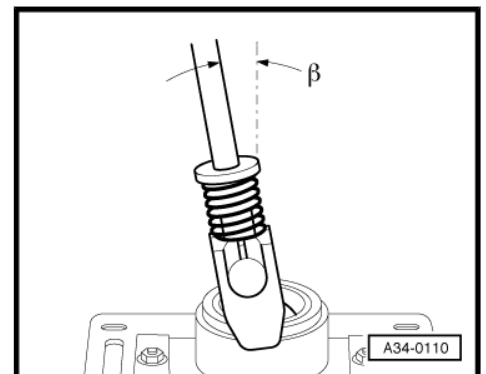


- ◆ Gear lever inclined slightly (approx. 7°) to the rear - (angle -b-).

**Note**

The illustration shows the gear lever from the right.

- Hold gear lever in this position.
- Tighten bolt for selector rod.

**Note**

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

1.4.1 Checking gear lever setting

- With the gearbox in neutral, the gear lever should rest in the 3rd/4th gear gate.
- Check operation of 1st/2nd gear stop.
- Engage 2nd gear and push gear lever to the left against stop.
- Reduce pressure on gear lever until it moves back to pressure point.
- ◆ Spring-back travel measured at gear lever handle: 3 ... 5 mm
- Press clutch pedal.
- Select all gears several times.
- Check operation of reverse gear lock.
- ◆ It should only be possible to engage reverse gear after pressing the gear lever down to overcome the reverse gear detent.

- ◆ The gear lever should return by itself from the reverse gear gate to the 3rd/4th gear gate.
- If the gear lever setting is not correct, carry out fine adjustment.

Fine adjustment

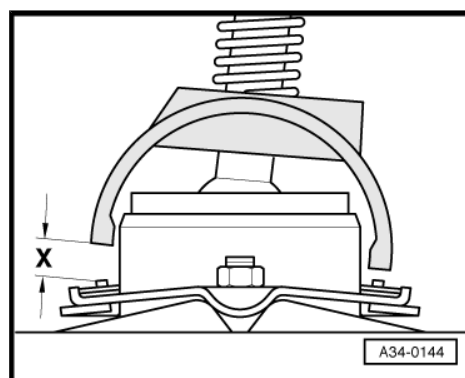
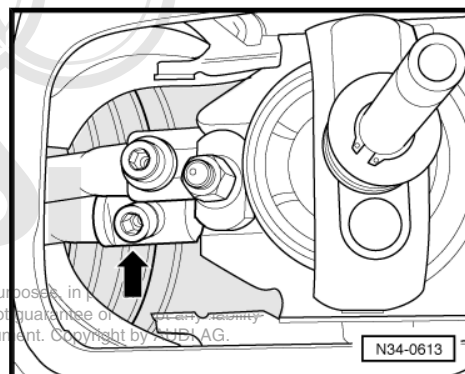
- If the gear lever setting is incorrect it can be adjusted as follows:
- Slacken bolt -arrow- for selector rod.



Note

The angle of forwards/backwards inclination of the gear lever must not be changed while the following adjustments are being made.

- Move gear lever to the left or to the right until distance-x- is 9.5 mm.
- Hold gear lever in this position.
- Tighten bolt for selector rod to 23 Nm.
- Check gear lever setting again.
- Install boot, cover and gear knob.



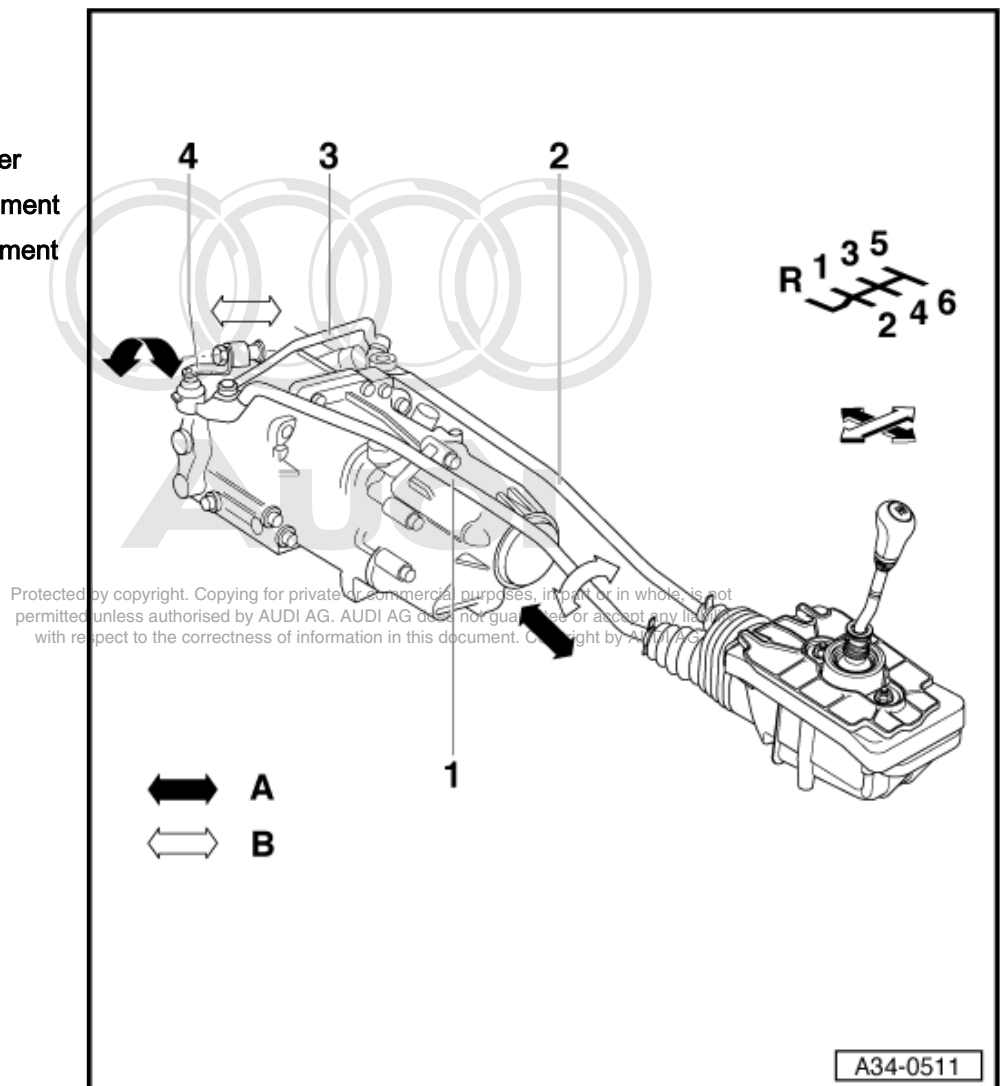
2 Servicing selector mechanism (vehicles from 05.99 to 11.00)

Overview

- ◆ ⇒ „2.1 Fitting location of selector mechanism (vehicles from 05.99 to 11.00)“, page 47
- ◆ ⇒ „2.2 Exploded view - selector mechanism (vehicles from 05.99 to 11.00)“, page 48
- ◆ ⇒ „2.3 Exploded view - gear lever and push rod (rear)“, page 49
- ◆ ⇒ „2.4 Exploded view - selector rod, connecting rod and push rod (front)“, page 50
- ◆ ⇒ „2.5 Removing and installing gear lever with push rod (rear) (vehicles from 05.99 to 11.00)“, page 52
- ◆ ⇒ „2.6 Removing and installing selector mechanism (vehicles from 05.99 onwards)“, page 54
- ◆ ⇒ „2.7 Adjusting selector mechanism (vehicles from 05.99 to 11.00)“, page 57

2.1 Fitting location of selector mechanism (vehicles from 05.99 to 11.00)

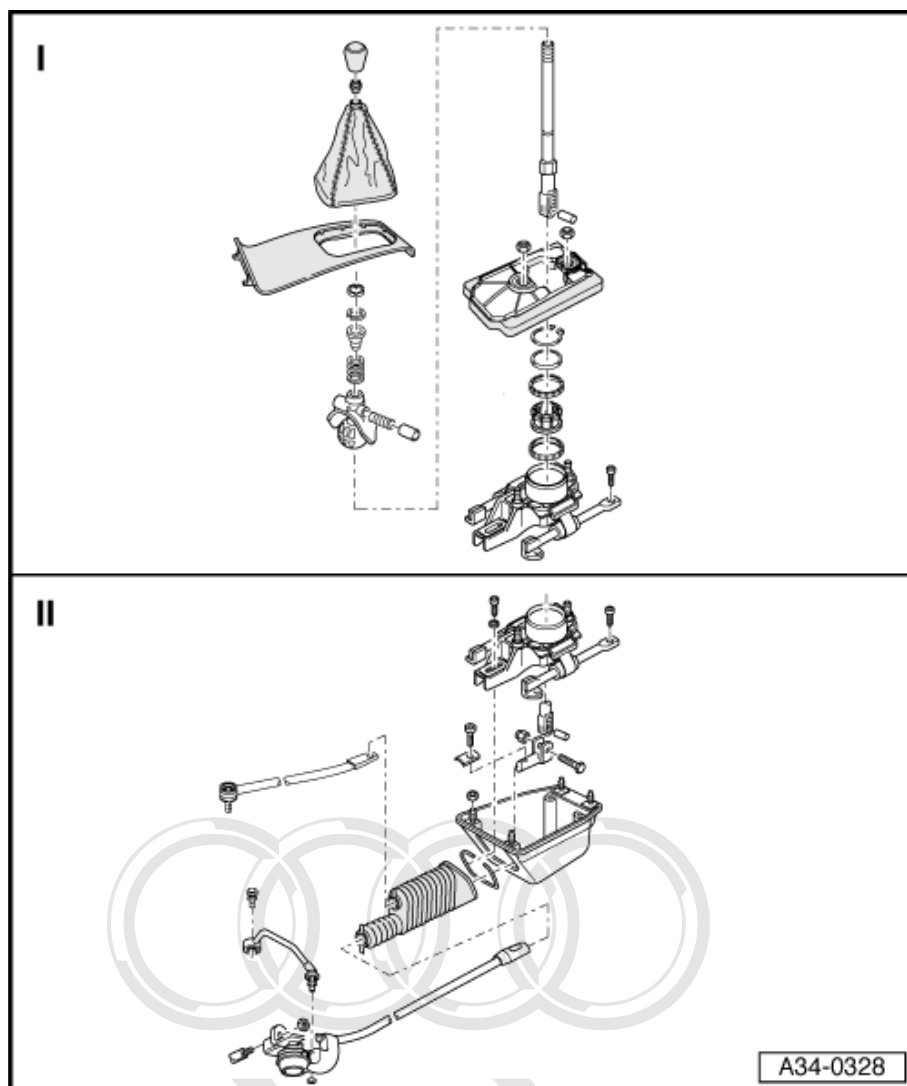
- 1 - Selector rod
- 2 - Push rod (front)
- 3 - Connecting rod
- 4 - Gearbox selector lever
- A - Gear selection movement
- B - Gate selection movement



2.2 Exploded view - selector mechanism (vehicles from 05.99 to 11.00)

I - Exploded view - gear lever and push rod (rear)
⇒ [page 49](#)

II - Exploded view - selector rod, connecting rod and push rod (front) ⇒ [page 50](#)



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2.3 Exploded view - gear lever and push rod (rear)



Note

Lubricate all bearings and moving surfaces. Select correct type of grease from ⇒ Electronic parts catalogue .

1 - Gear knob

- ☐ Unscrew from gear lever

2 - Upper bush

3 - Gear lever boot

4 - Cover for centre console

- ☐ Retainer on rear of cover; pry out carefully from centre console
- ☐ Removing and installing ⇒ [page 53](#)

5 - Lower bush

6 - Rubber ring

7 - Circlip

- ☐ Always renew

8 - Spacer bush

9 - Spring

10 - Ball stop

- ☐ Removing and installing ⇒ [page 52](#)
- ☐ Insert spring and bush in ball stop and fit on gear lever so that spring and bush are on the right when looking forwards
- ☐ Install before fitting circlip ⇒ [Item 17 \(page 49\)](#)

11 - Spring

12 - Bush

- ☐ Installation position: rounded end faces gear lever

13 - Gear lever

- ☐ Only fits in one position in ball stop ⇒ [Item 10 \(page 49\)](#)
- ☐ Removing and installing ⇒ [page 52](#)

14 - Spacer tube

15 - Nut

- ☐ 10 Nm

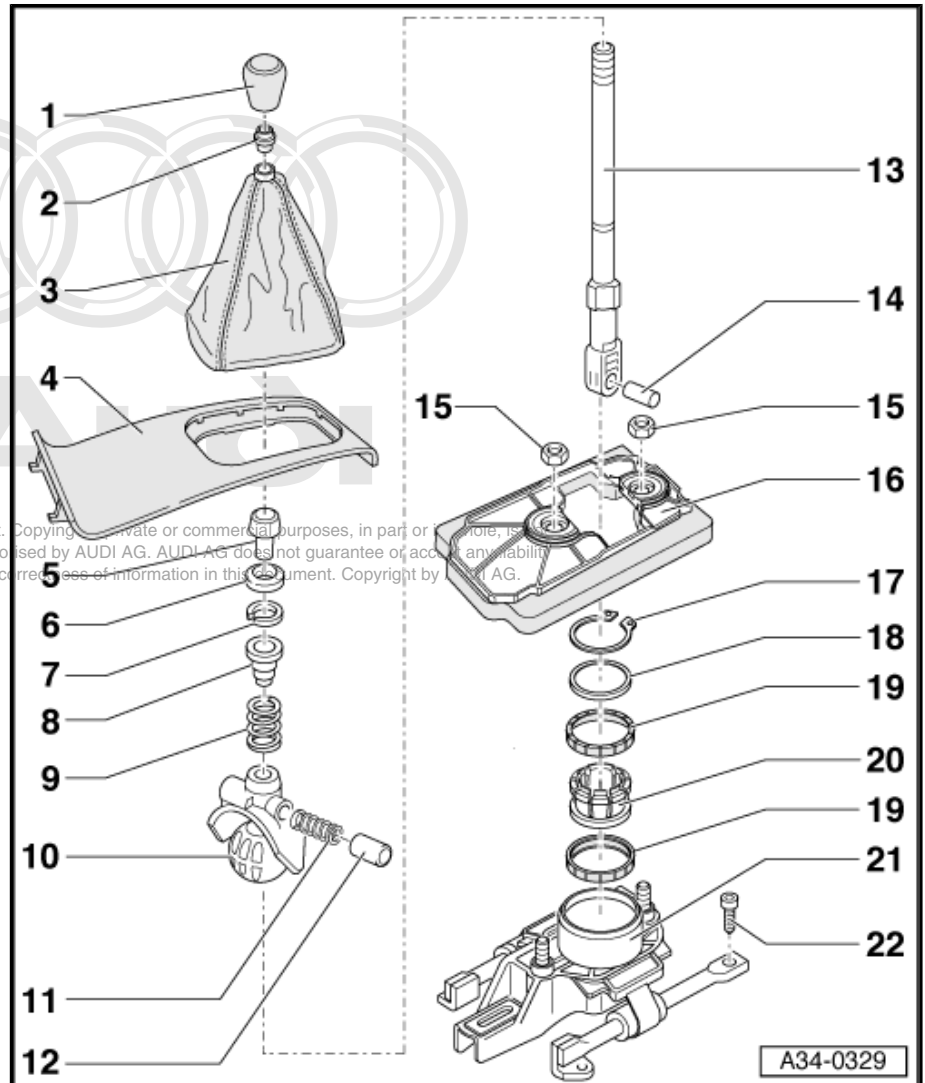
16 - Cover

17 - Circlip

- ☐ Take out before removing ball stop

18 - Washer

- ☐ Lip points towards ball guide ⇒ [Item 20 \(page 50\)](#)



19 - Rubber ring

20 - Ball guide

- ☐ Removing and installing ⇒ [page 52](#)

21 - Push rod (rear)

- ☐ With ball housing
- ☐ Removing and installing ⇒ [page 52](#)

22 - Bolt

- ☐ 6 Nm
- ☐ 4x
- ☐ Push rod (rear) to selector housing ⇒ [page 50](#)

2.4 Exploded view - selector rod, connecting rod and push rod (front)



Note

Lubricate all bearings and moving surfaces. Select correct type of grease from ⇒ *Electronic parts catalogue*.

1 - Push rod (rear)

- ☐ With ball housing
- ☐ Removing and installing ⇒ [page 52](#)

2 - Bolt

- ☐ 6 Nm
- ☐ 4x
- ☐ Push rod (rear) to selector housing

3 - Bolt

- ☐ 23 Nm

4 - Washer

5 - Bolt

- ☐ 23 Nm

6 - Clamp

7 - Nut

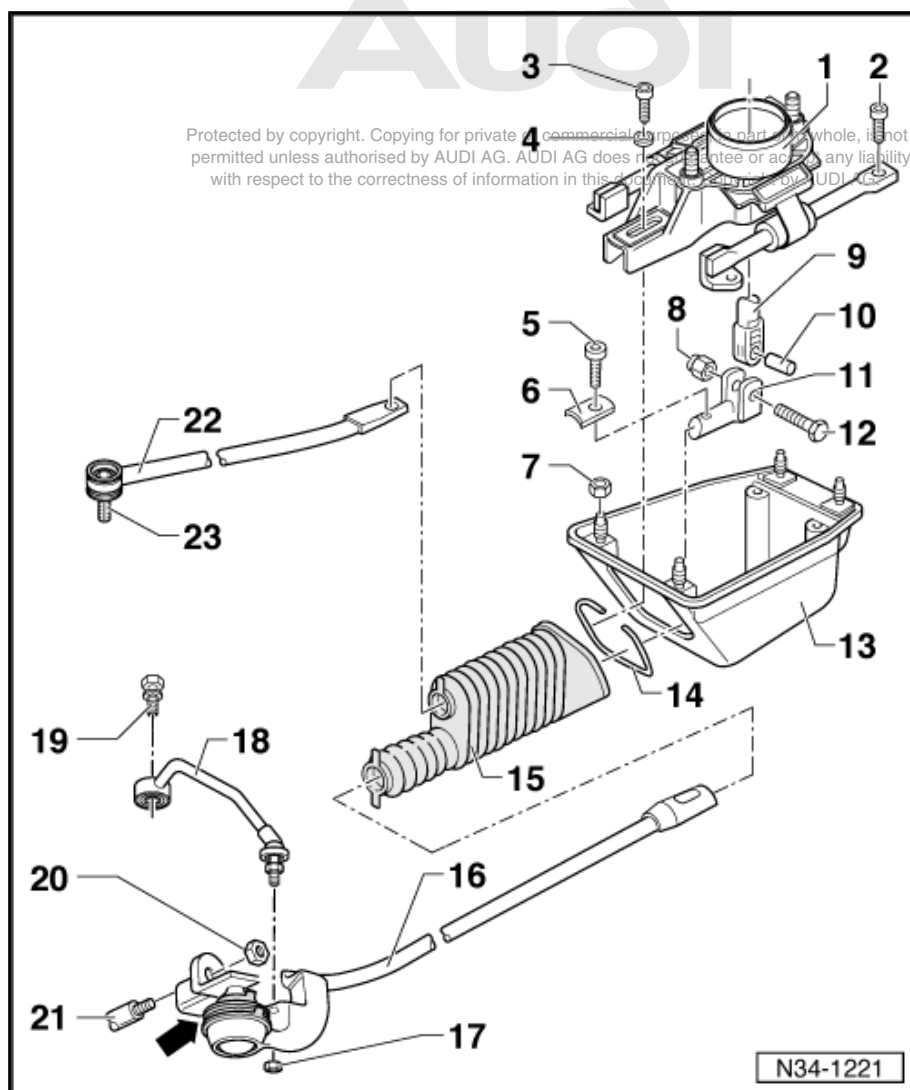
- ☐ 10 Nm
- ☐ 4x
- ☐ Secures selector housing to body

8 - Nut

- ☐ 10 Nm
- ☐ Secures selector fork
- ☐ Self-locking
- ☐ Always renew

9 - Gear lever

- ☐ Only fits in one position in ball housing



10 - Spacer tube

11 - Selector fork

12 - Bolt

- ☐ Secures selector fork

13 - Selector housing

14 - Tensioning ring

15 - Boot

- ☐ To remove, carefully pull bellows over selector rod and push rod
- ☐ Align with markings on selector rod and push rod when installing

16 - Selector rod

- ☐ Different versions ⇒ [page 52](#)
- ☐ Observe note ⇒ [page 57](#)

17 - Nut

- ☐ 10 Nm

18 - Connecting rod

- ☐ Different versions ⇒ [page 52](#)
- ☐ Observe note ⇒ [page 57](#)

19 - Bolt

- ☐ 23 Nm
- ☐ Connecting rod to gearbox

20 - Nut

- ☐ 23 Nm
- ☐ Self-locking
- ☐ Always renew

21 - Selector shaft

- ☐ In gearbox

22 - Push rod (front)

- ☐ Tighten hexagon socket head bolt for securing to gearbox housing to 40 Nm
- ☐ Different versions available; for correct version refer to → [Electronic parts catalogue](#)

23 - Washer

- ☐ Peened to push rod (front)
- ☐ Re-install front push rod with same number of washers.



2.4.1 Different attachment of connecting rod

Method of attaching connecting rod was modified on vehicles from approx. 11.00 onwards.

I - Identification

- Detail view -I-

-Arrow A- old version (with ball head)

-Arrow B- new version (with securing clip)



Note

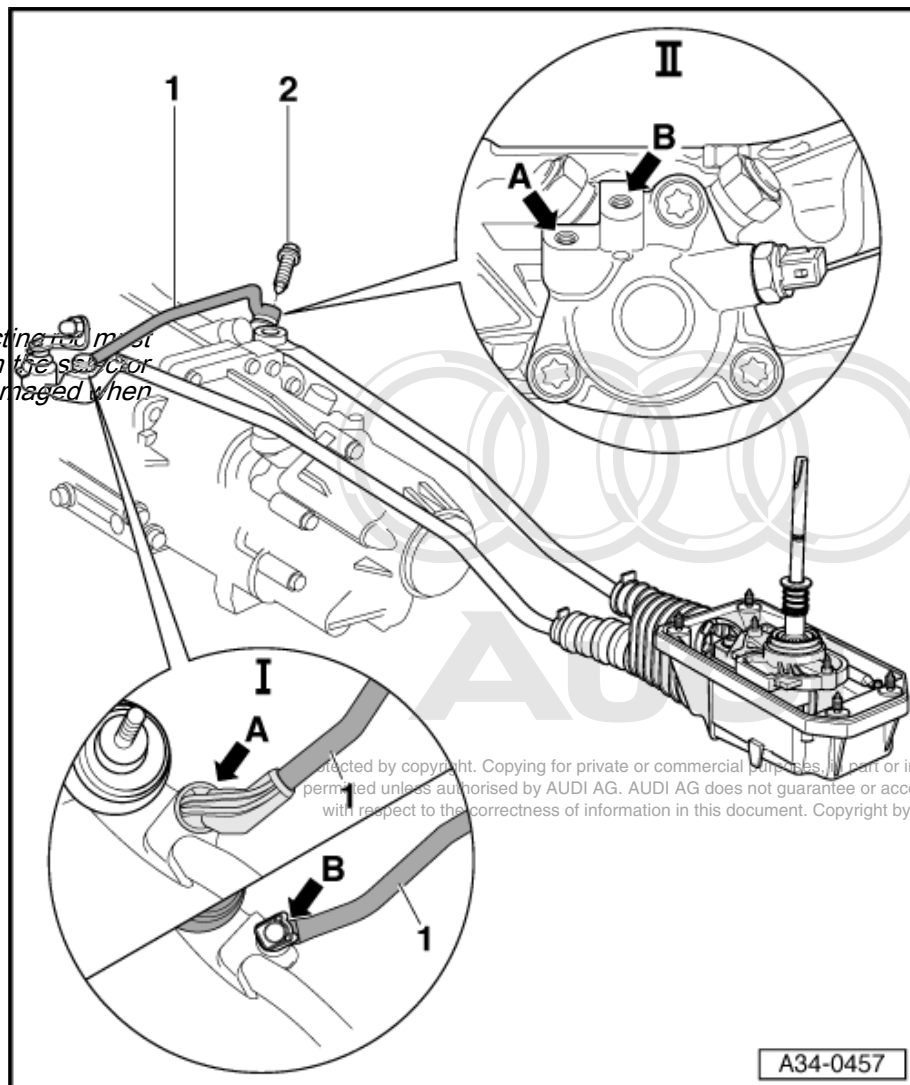
The old version connecting rod must NOT be detached from the selector rod; the ball head is damaged when it is removed.

II - Threaded holes

- Detail view -II-

- Secure old version of connecting rod -1- with bolt -2- to rear hole
- arrow A- in cover for selector shaft (23 Nm).

- Secure new version of connecting rod -1- with bolt -2- to front hole
- arrow B- in cover for selector shaft (23 Nm).



2.5 Removing and installing gear lever with push rod (rear) (vehicles from 05.99 to 11.00)

Removing

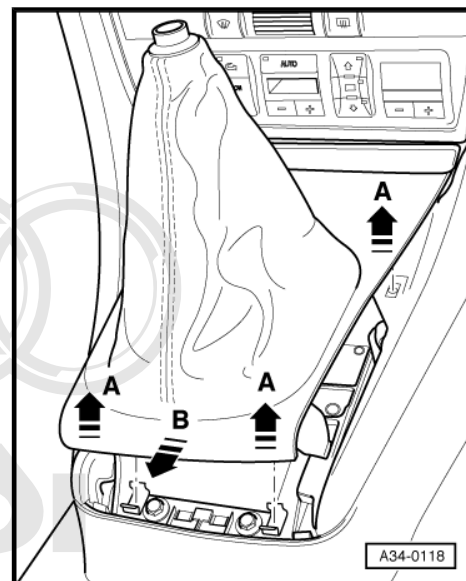
- Unscrew gear knob from gear lever.



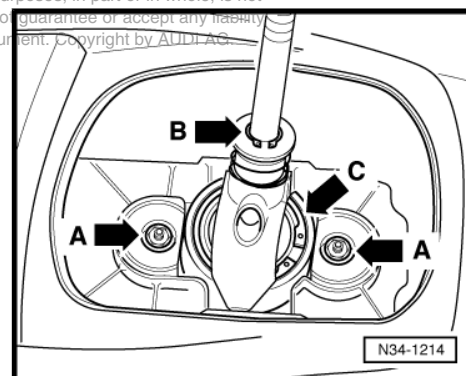
Note

The gear lever boot is removed together with the cover for the centre console.

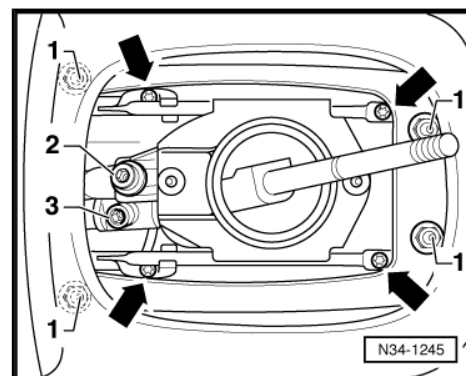
- Lift cover for centre console slightly -arrows A-.
- Pull cover slightly towards rear -arrow B- and then lift off complete cover.



- Unscrew noise insulation for selector housing -arrow A-.
- First remove circlip -arrow B- and carefully release spring.
- Remove spacer bush and spring.
- Now remove circlip -arrow C-.
- Pull ball stop with ball guide and rubber rings upwards out of ball housing with push rod (rear).
- Detach ball stop from gear lever, at the same time carefully releasing spring and bush.



- Remove nuts -1- for selector housing.
- ◆ This lowers the selector housing.
- Unscrew hexagon socket head bolt -2- and detach push rod (front).
- Unscrew hexagon socket head bolt -3- and detach selector rod.
- Then detach entire push rod (rear) from selector housing -arrows-.
- Remove gear lever with push rod (rear) from selector housing.



Installing

Installation is carried out in reverse sequence; note the following:

- Adjust selector mechanism → [page 57](#) .

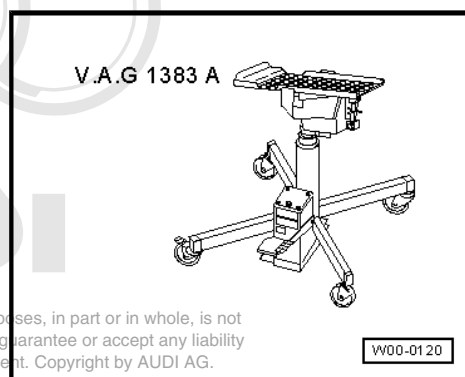
Tightening torques

Component	Nm
Push rod (rear) to selector housing	6
Selector rod to selector fork/gear lever	23
Push rod (front) to push rod (rear)	23
Selector housing to body	10
Cover to push rod (rear)	6
Noise insulation to selector housing	10

2.6 Removing and installing selector mechanism (vehicles from 05.99 onwards)

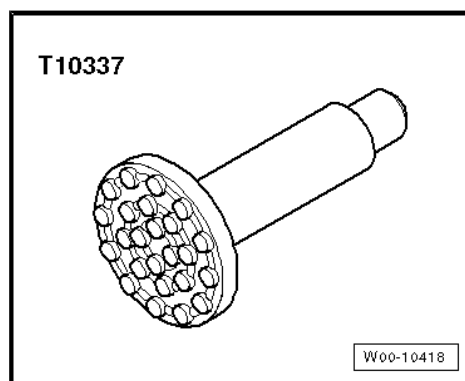
Special tools and workshop equipment required

- ◆ Engine and gearbox jack -V.A.G 1383 A-



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- ◆ Gearbox support -T10337-



Removing

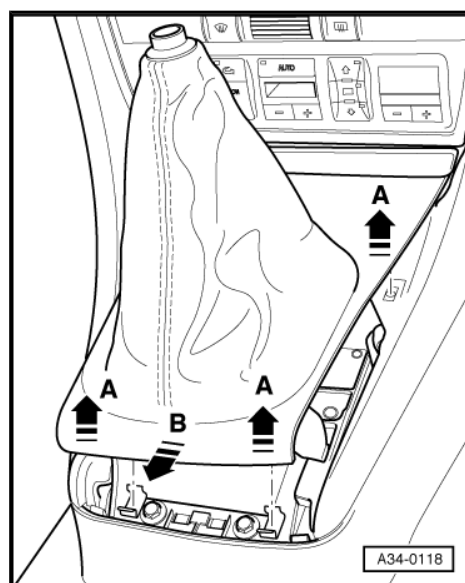
- Unscrew gear knob from gear lever.



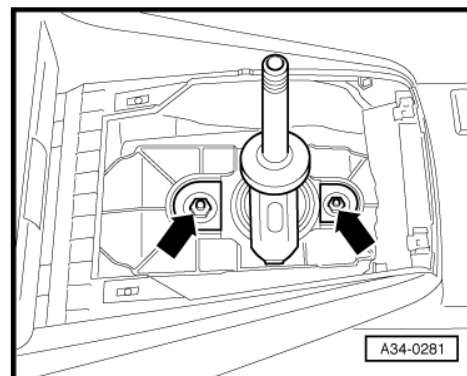
Note

The gear lever boot is removed together with the cover for the centre console.

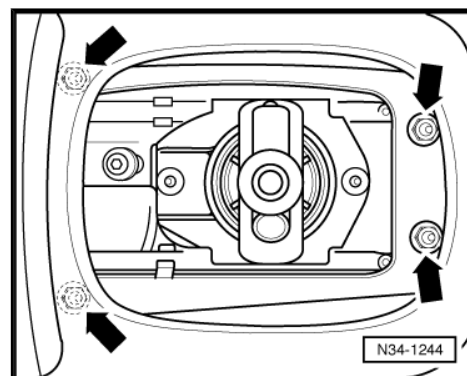
- Lift off cover for centre console slightly -arrows A-.
- Pull cover slightly towards rear -arrow B- and then lift off complete cover.
- If fitted, lift out additional noise insulation over selector mechanism.



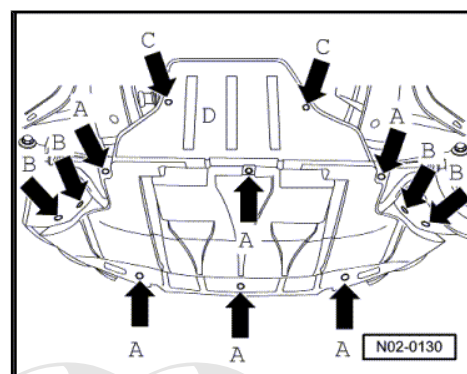
- Remove noise insulation for selector mechanism housing -arrows-.



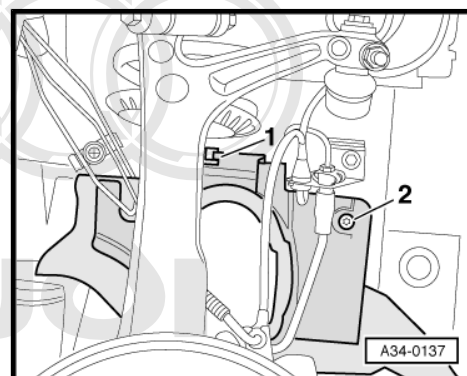
- Remove nuts securing selector mechanism housing -arrows-.



- If fitted, remove rear section -D- of noise insulation.



- If fitted, loosen bolt -2- for noise insulation above drive shaft (left-side).
- Disengage retainer -1- and remove noise insulation cover.



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- Detach heat shield for drive shaft from gearbox -arrows-.
- Detach drive shaft (left-side) -1- from gearbox and tie up to front.



Note

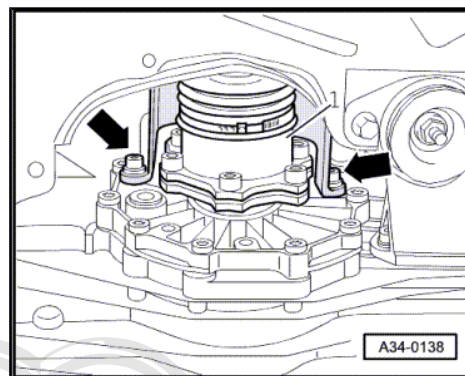
Make sure you do not damage surface coating on drive shaft.

- Disconnect exhaust system at clamp(s) ⇒ Engine, mechanics; Rep. gr. 26 .



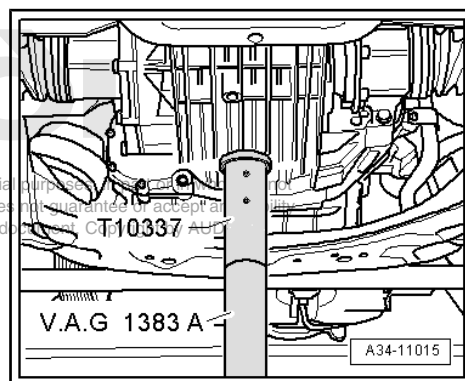
Caution

Flexible element in front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.

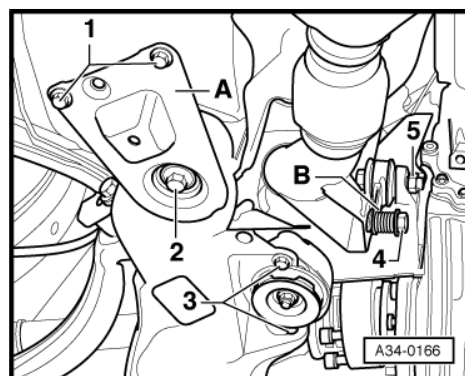


- Take up some of the weight of the gearbox with engine and gearbox jack -V.A.G 1383 A- and gearbox support -T10337-.

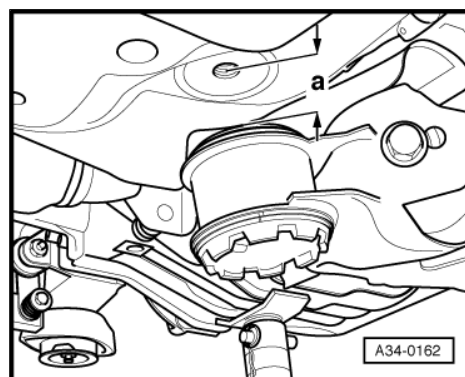
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- Remove bolts -1- and -2- on both sides.



- Lower subframe at the rear.
- Distance -a- = max. 50 mm

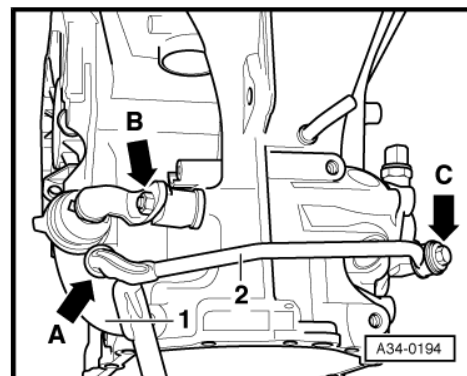


Important note for the following operations:



Caution

- ◆ *When removing the selector mechanism on a vehicle up to approx. 11.00, do NOT pull ball head -arrow A- on connecting rod -2- off selector rod-1-.*
- ◆ *The ball head will break if it is pulled off!*

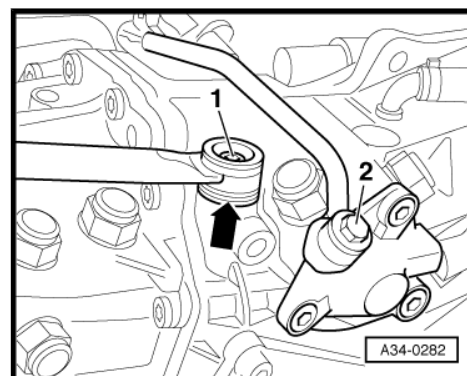


- Unscrew connecting rod -2- on right side of gearbox.
- Remove hexagon socket head bolt -1- from push rod.



Note

Washers can be fitted between gearbox and push rod -arrow-; the same number of washers must be reinstalled when assembling.

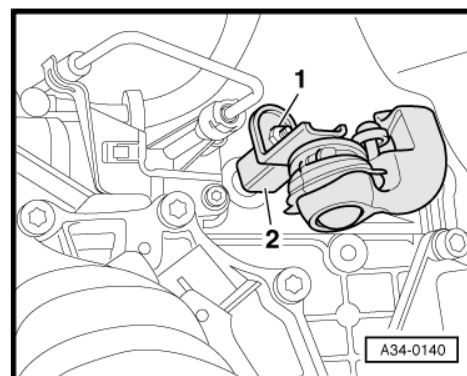


- Unscrew nut -1- and detach gearbox selector lever -2- from selector shaft.
- Swivel selector housing down together with selector rod and push rod and remove.

Installing

Installation is carried out in reverse sequence; note the following:

- Bolt subframe to body ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Bolt drive shaft to flange shaft ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Assemble exhaust system and ensure stress-free alignment ⇒ Engine, mechanics; Rep. gr. 26 .
- Adjust selector mechanism ⇒ [page 57](#) .



Tightening torques

Component	Nm
Selector housing to body	10
Selector rod to gearbox	23 ¹⁾
Connecting rod to gearbox	23
Push rod to gearbox	40
Noise insulation to selector housing	10
Heat shield for drive shaft to gearbox	23
• ¹⁾ Always renew nut	

2.7 Adjusting selector mechanism (vehicles from 05.99 to 11.00)

The following are prerequisites for correct gear lever alignment:



Note

- ◆ Gear selector linkage must be in proper condition and undamaged.
- ◆ Selector mechanism must move freely.
- ◆ Gearbox, clutch and clutch mechanism must be in proper condition.
- ◆ Gearbox in neutral.

Procedure

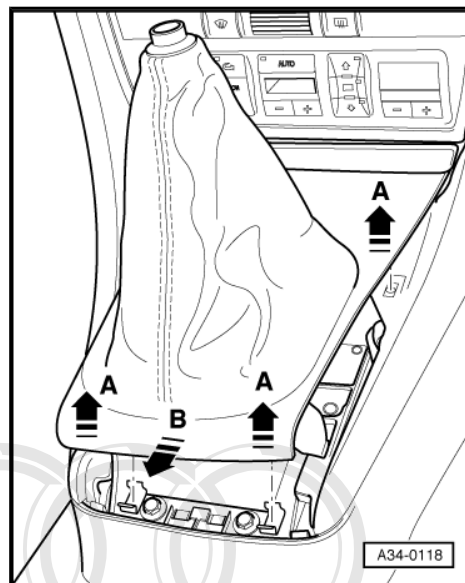
- Unscrew gear knob from gear lever.



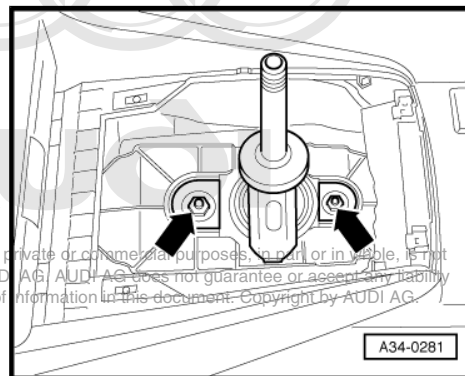
Note

The gear lever boot is removed together with the cover for the centre console.

- Lift off cover for centre console slightly -arrows A-.
- Pull cover slightly towards rear -arrow B- and then lift off complete cover.



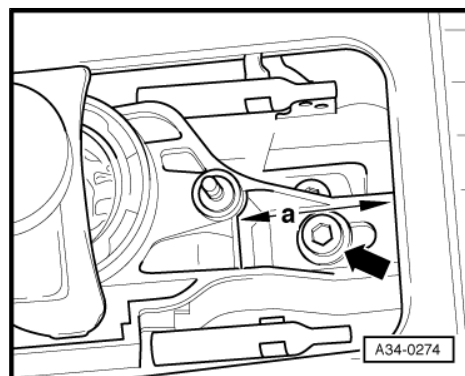
- Remove noise insulation for selector mechanism housing -arrows-.



- Measure distance -a- between body and selector mechanism.
- Specification: distance -a- = 43 mm.

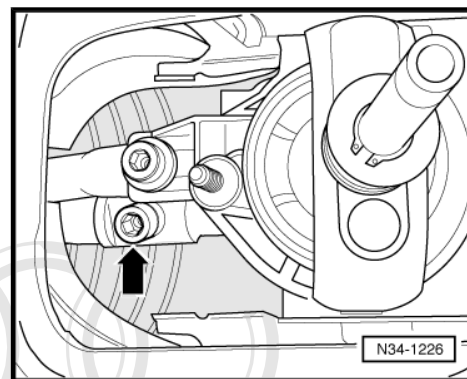
If distance -a- is not as specified:

- Loosen bolt -arrow- for push rod.
- Connection between push rod and selector mechanism should move freely.
- Adjust distance -a- by moving selector mechanism.
- Re-tighten bolt -arrow- for push rod.

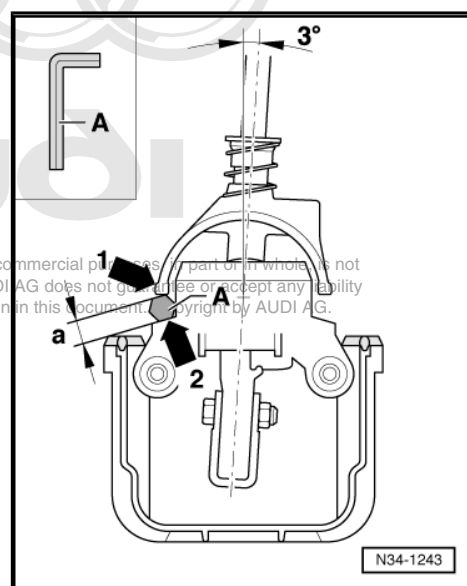


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- Slacken bolt -arrow- for selector rod.
- Connection between selector rod and selector mechanism should move freely.



- Insert 14 mm Allen key -A- between left side of ball stop -arrow 1- (as seen facing forward) and slanting side surface of ball stop -arrow 2- and hold in position.
- The Allen key must make contact over the full length of the slanting surface -arrow 2-.



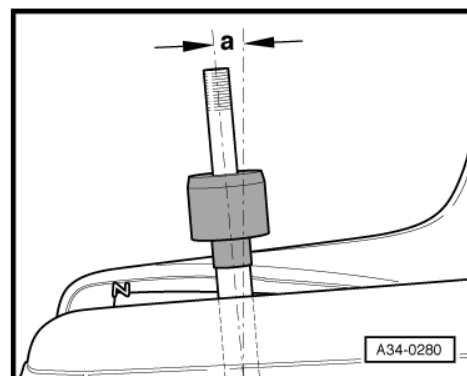
- Align the gear lever as follows:
- Gear lever inclined slightly to the rear (angle -a- approx. 7°)



Note

The illustration shows the gear lever from the right.

- Hold gear lever in this position.



- Tighten bolt securing selector rod -arrow-.

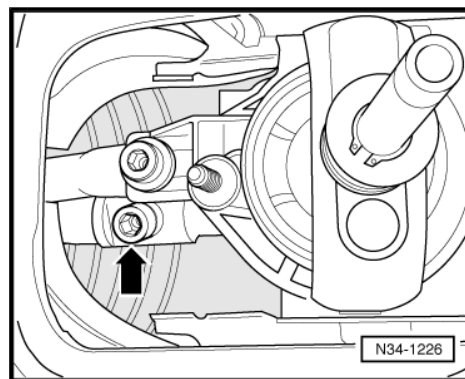


Note

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

Tightening torques

Component	Nm
Selector rod to selector fork/gear lever	23
Push rod (front) to push rod (rear)	23
Noise insulation to selector housing	10



Checking gear lever setting

- With the gearbox in neutral, the gear lever should rest in the 3rd/4th gear gate.
- Press clutch pedal.
- Select all gears several times.
- Pay attention to function of reverse gear detent mechanism.
- The gear lever should return by itself from the reverse gear gate to the 3rd/4th gear gate.

If the gear lever sticks or baulks repeatedly when engaging a gear, perform the adjustment procedure again.

- Install trim parts and gear knob.



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3 Servicing selector mechanism (vehicles from 11.00 onwards)

Overview

- ◆ ⇒ „3.1 Fitting location of selector mechanism (vehicles from 11.00 onwards)“, page 61
- ◆ ⇒ „3.2 Exploded view - selector mechanism (vehicles from 11.00 onwards)“, page 62
- ◆ ⇒ „3.3 Exploded view - gear lever and push rod (rear)“, page 63
- ◆ ⇒ „3.4 Exploded view - selector rod, connecting rod and push rod (front)“, page 64
- ◆ ⇒ „2.6 Removing and installing selector mechanism (vehicles from 05.99 onwards)“, page 54
- ◆ ⇒ „3.5 Adjusting selector mechanism (vehicles from 11.00 onwards)“, page 65

3.1 Fitting location of selector mechanism (vehicles from 11.00 onwards)

1 - Selector rod

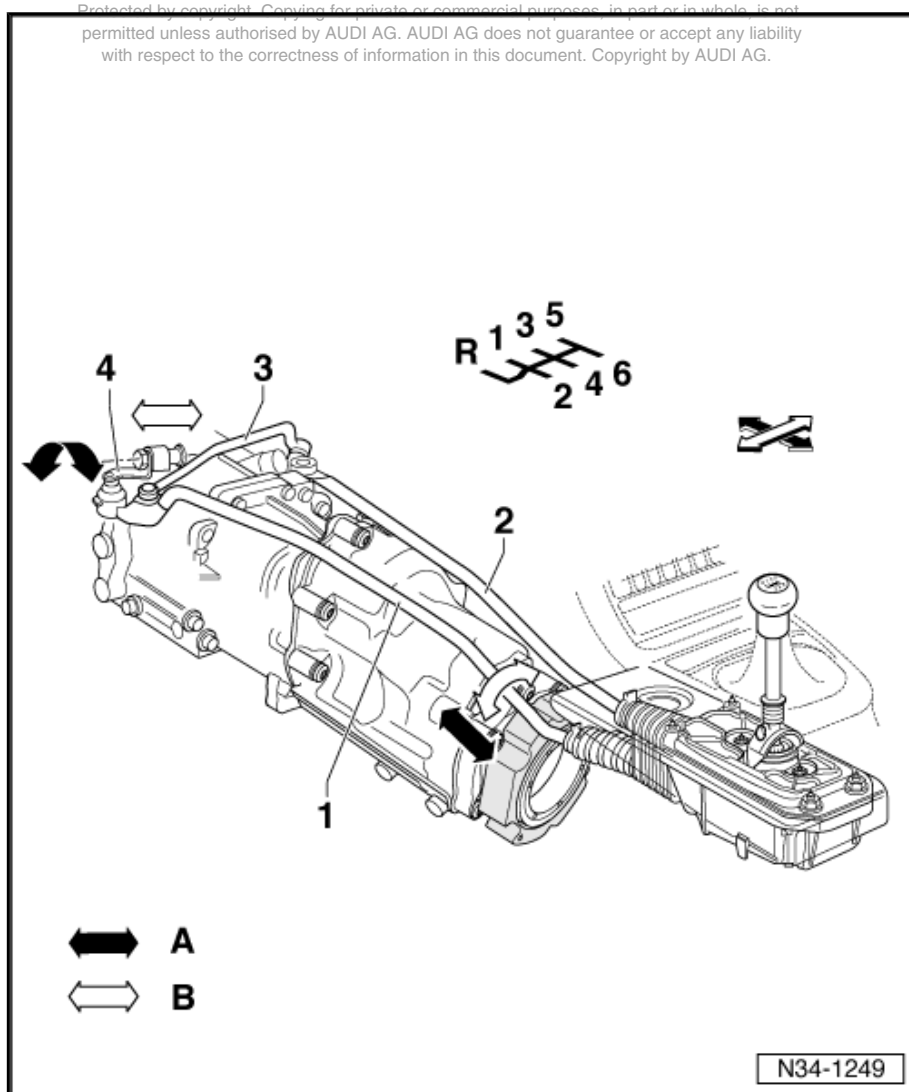
2 - Push rod (front)

3 - Connecting rod

4 - Gearbox selector lever

A - Gear selection movement

B - Gate selection movement

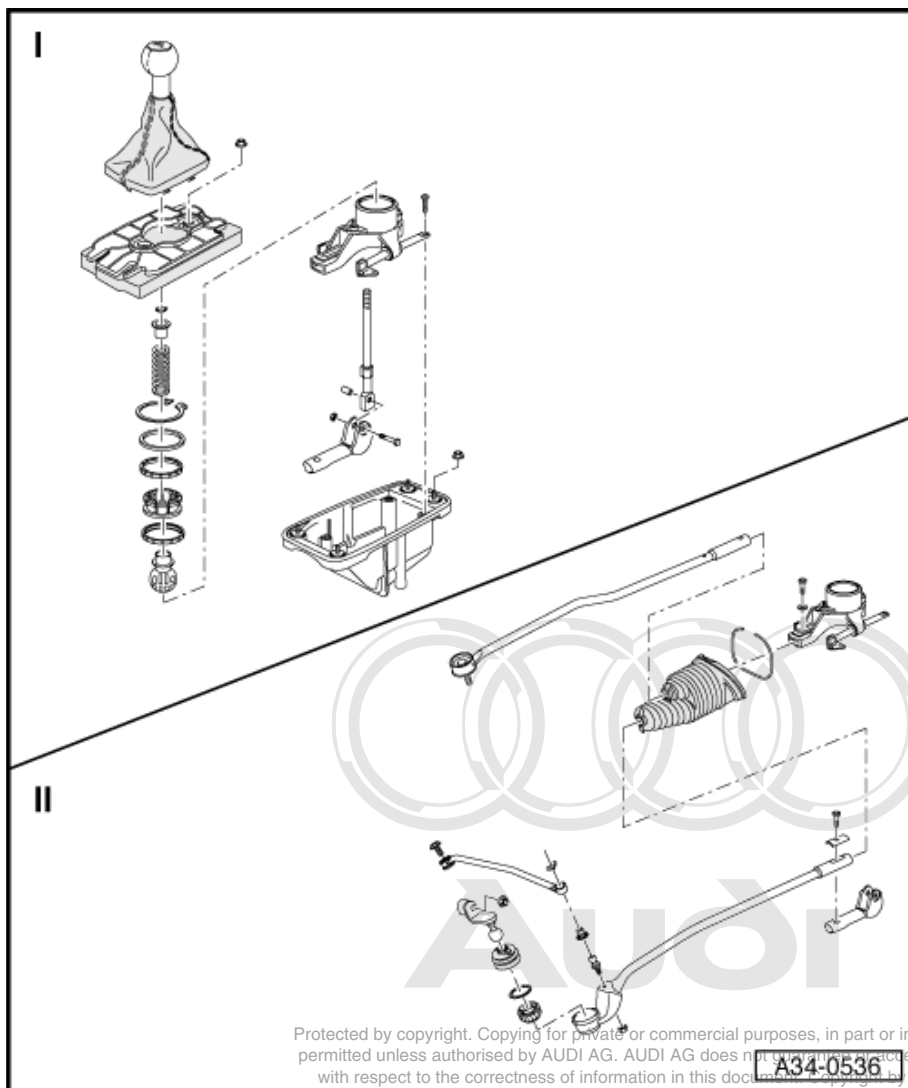


3.2 Exploded view - selector mechanism (vehicles from 11.00 onwards)

I - Exploded view - gear lever and push rod (rear)

⇒ [page 63](#)

II - Exploded view - selector rod, connecting rod and push rod (front) ⇒ [page 64](#)



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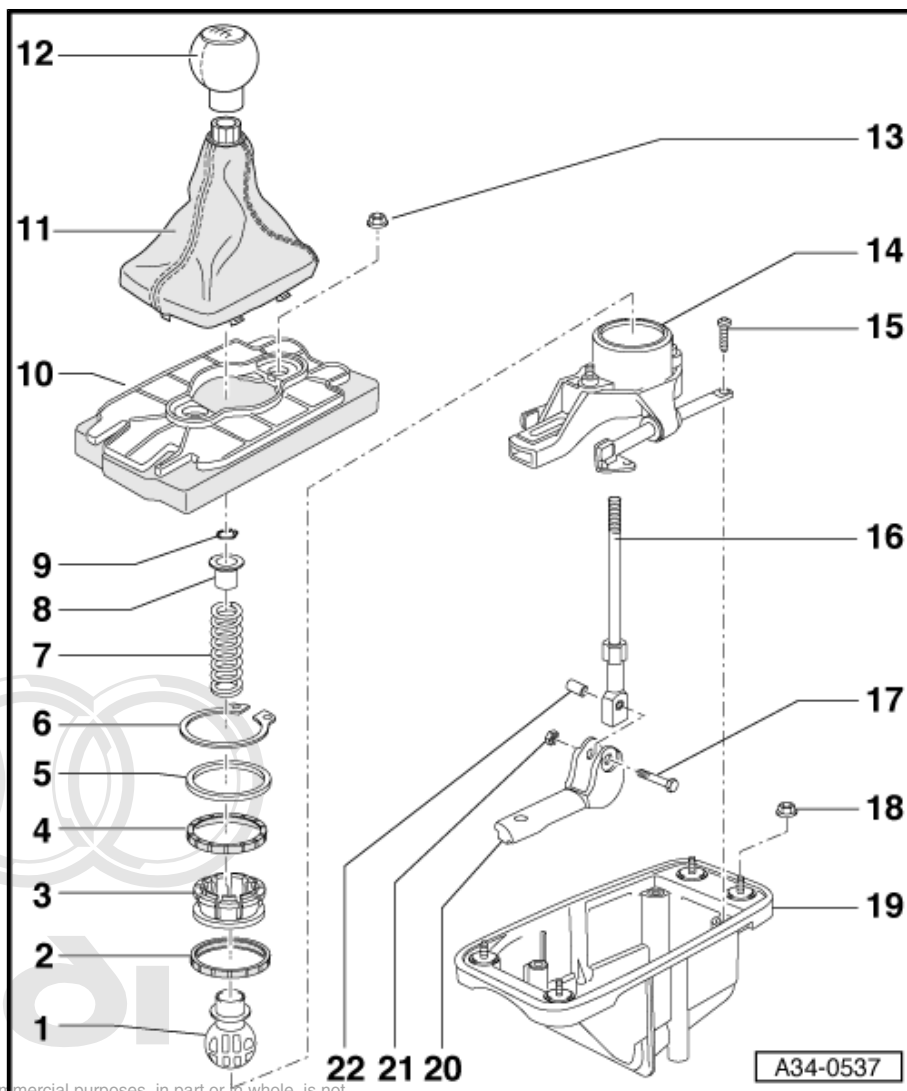
3.3 Exploded view - gear lever and push rod (rear)



Note

Lubricate all bearings and moving surfaces. Select correct type of grease from ⇒ *Electronic parts catalogue*.

- 1 - Ball
- 2 - Rubber ring
- 3 - Ball guide
- 4 - Rubber ring
- 5 - Washer
 - ☐ Lip points towards ball guide
⇒ [Item 3 \(page 63\)](#)
- 6 - Circlip
 - ☐ Take out before removing ball
- 7 - Spring
- 8 - Spacer bush
- 9 - Circlip
- 10 - Noise insulation
- 11 - Gear lever boot
- 12 - Gear knob
 - ☐ Unscrew to remove
- 13 - Nut
 - ☐ 10 Nm
- 14 - Push rod (rear)
 - ☐ With ball housing
- 15 - Bolt
 - ☐ 6 Nm
 - ☐ 4x
 - ☐ Push rod (rear) to selector housing
- 16 - Gear lever
 - ☐ Removing and installing ⇒ [page 52](#)
- 17 - Bolt
- 18 - Hexagon nut
 - ☐ 10 Nm
 - ☐ 4x
 - ☐ Secures selector housing to body
- 19 - Selector housing
- 20 - Selector fork
- 21 - Hexagon nut
 - ☐ 10 Nm
 - ☐ Secures selector fork



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- ☐ Self-locking
- ☐ Always renew

22 - Spacer tube

3.4 Exploded view - selector rod, connecting rod and push rod (front)

1 - Ball socket

- ☐ To remove, bend open peened points on selector rod
⇒ [Item 19 \(page 65\)](#).

2 - Washer

3 - Ball socket

- ☐ To remove, pull off retaining clip
⇒ [Item 9 \(page 64\)](#).

4 - Boot

5 - Gearbox selector lever

6 - Nut

- ☐ 23 Nm
- ☐ Self-locking
- ☐ Always renew

7 - Bolt

- ☐ 23 Nm
- ☐ Connecting rod to gear-box

8 - Connecting rod

- ☐ To remove, pull off retaining clip
⇒ [Item 9 \(page 64\)](#).

9 - Retaining clip

10 - Bolt

- ☐ 40 Nm

11 - Push rod (front)

- ☐ With bolt and washers

12 - Bolt

- ☐ 23 Nm

13 - Washer

14 - Push rod (rear)

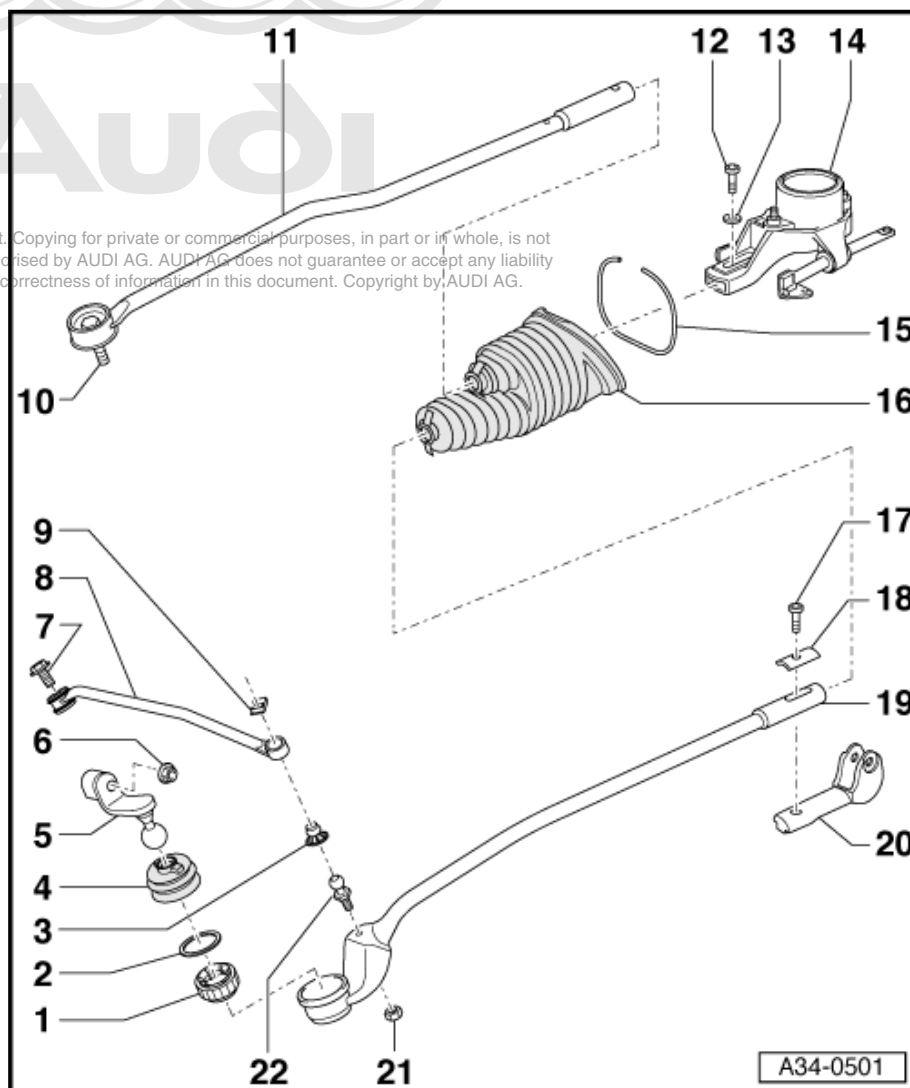
15 - Tensioning ring

16 - Boot

- ☐ To remove, carefully pull bellows over selector rod and push rod
- ☐ Align with markings on selector rod and push rod when installing

17 - Bolt

- ☐ 23 Nm



- 18 - Clamp
- 19 - Selector rod
- 20 - Selector fork
- 21 - Hexagon nut
 - 10 Nm
- 22 - Ball stud

3.5 Adjusting selector mechanism (vehicles from 11.00 onwards)

The following are prerequisites for correct gear lever alignment:



Note

- ◆ *Gear selector linkage must be in proper condition and undamaged.*
- ◆ *Selector mechanism must move freely.*
- ◆ *Gearbox, clutch and clutch mechanism must be in proper condition.*
- ◆ *Gearbox in neutral.*

Procedure

- Unscrew gear knob from gear lever.

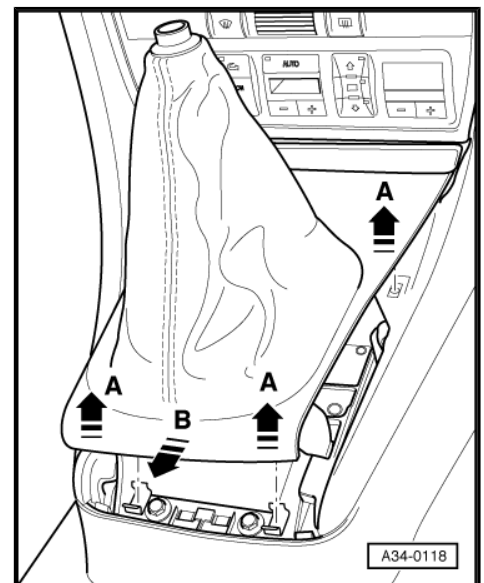


Note

The gear lever boot is removed together with the cover for the centre console.

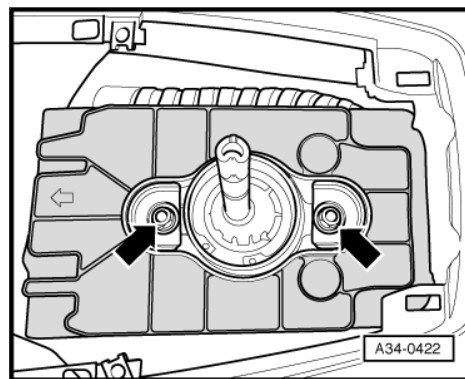
- Lift off cover for centre console slightly -arrows A-.
- Pull cover slightly towards rear -arrow B- and then lift off complete cover.
- If fitted, lift out noise insulation over selector mechanism.

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A34-0118

- Unscrew noise insulation for selector housing -arrows-.



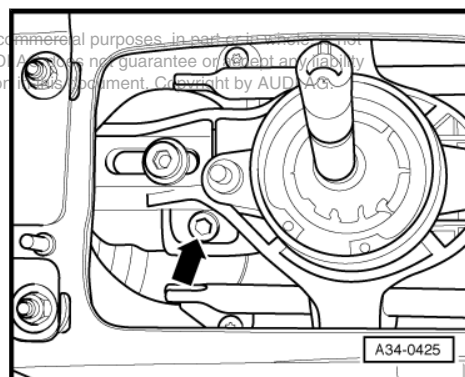
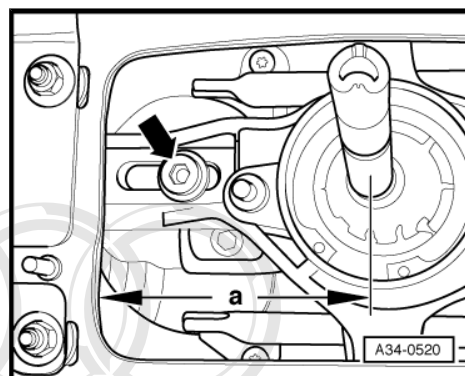
- Measure distance -a- between body and gear lever.
- Specification: distance -a- = 95 mm.



Note

Measurement is taken from centre of gear lever to edge of body.

- If measurement does not match specification, adjust dimension -a- as follows:
- Loosen bolt -arrow- for push rod.
- ◆ Rear push rod (in selector mechanism) should move freely in both directions on slide.
- Set to distance -a- by moving rear push rod (in selector mechanism).
- Re-tighten bolt -arrow- for push rod.
- Slacken bolt -arrow- for selector rod.
- ◆ Connection between selector rod and selector mechanism should move freely.



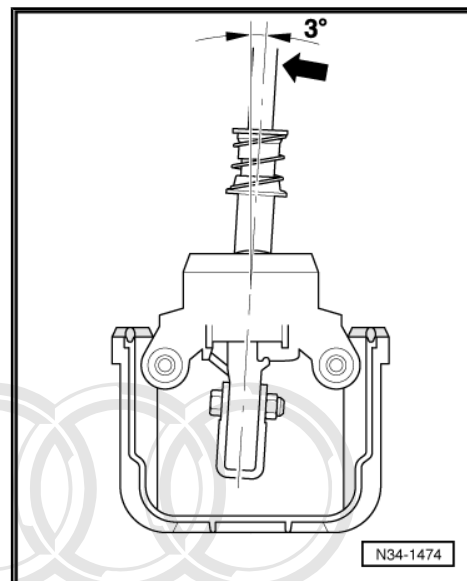
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- Align gear lever so that it points slightly (3°) to the right, as seen in direction of travel.

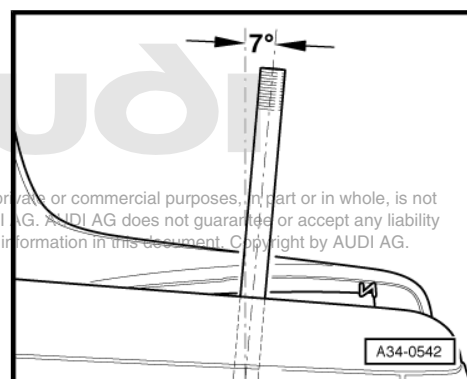


Note

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



- Simultaneously align the gear lever so that it is positioned slightly to the rear (7°).
- Hold gear lever in this position.



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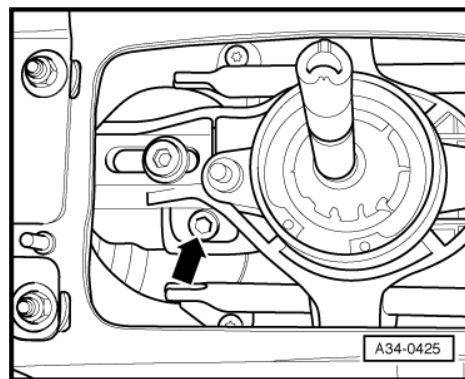
- Tighten bolt securing selector rod -arrow-.

**Note**

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

Tightening torques

Component	Nm
Selector rod to selector fork/gear lever	23
Push rod (front) to push rod (rear)	23
Noise insulation to selector housing	10

**Checking gear lever setting**

- With the gearbox in neutral, the gear lever should rest in the 3rd/4th gear gate.
- Press clutch pedal.
- Select all gears several times.
- Pay attention to function of reverse gear detent mechanism.
- The gear lever should return by itself from the reverse gear gate to the 3rd/4th gear gate.

If the gear lever sticks or baulks repeatedly when engaging a gear, perform the adjustment procedure again.

- Install trim parts and gear knob.

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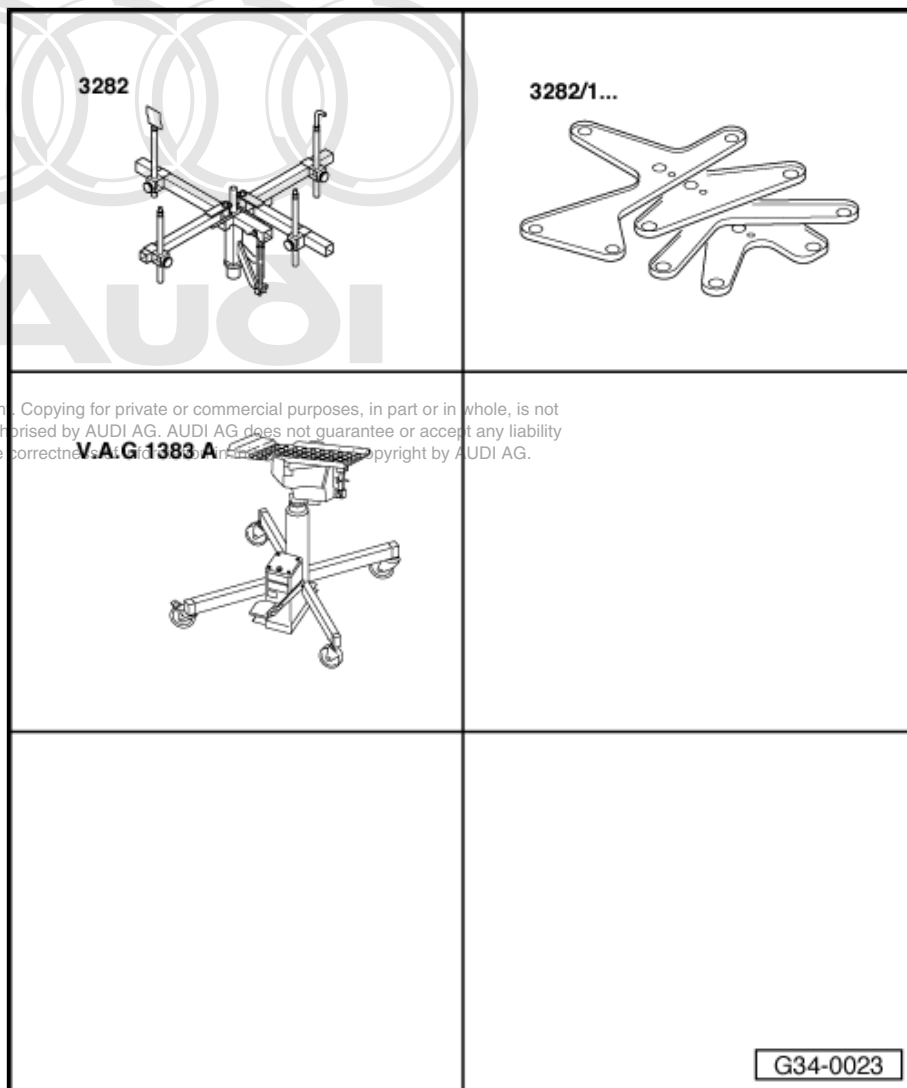
4 Removing and installing gearbox

Overview

- ◆ ⇒ „4.1 Removing gearbox“, page 69
- ◆ ⇒ „4.2 Installing gearbox“, page 75
- ◆ ⇒ „4.3 Transporting gearbox“, page 78

Special tools and workshop equipment required

- ◆ Gearbox support -3282-
- ◆ Adjustment plate -3282/12-
- ◆ Engine and gearbox jack - V.A.G 1383/A-



4.1 Removing gearbox

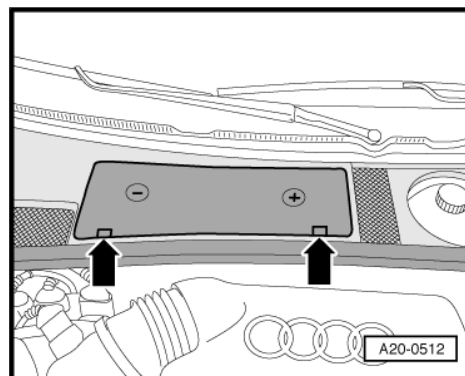


Caution

- ◆ *Follow steps required when disconnecting battery ⇒ Electrical system; Rep. gr. 27.*

- Obtain radio code on vehicles with coded radio.

- Remove cover above battery -arrows-.

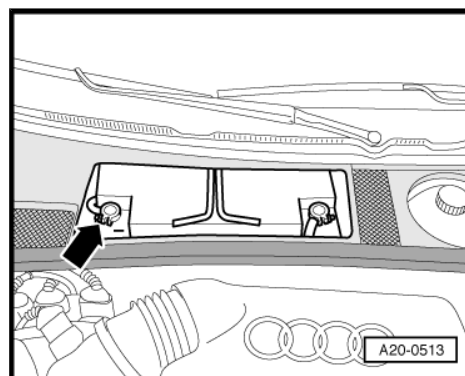


- With ignition switched off, disconnect battery earth strap -arrow-.

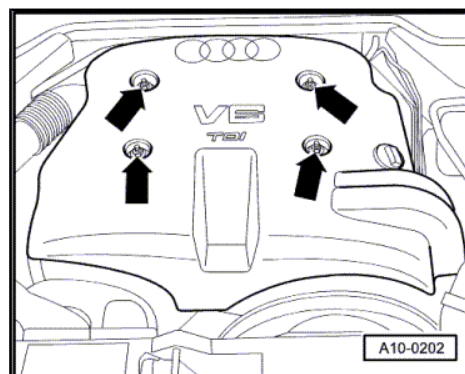


Note

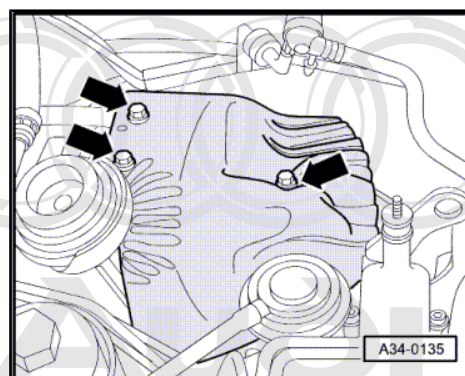
- ◆ For better access to the bolts securing the engine to the gearbox, remove the front exhaust pipe and catalytic converter first.
- ◆ All cable ties which are released or cut open during removal must be fitted in the same position when installing.



- Detach engine cover panel above cylinder head cover -arrows-.

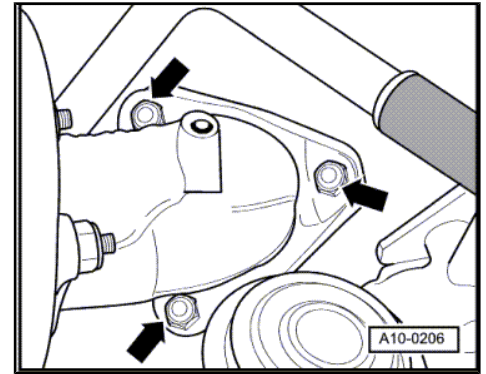


- Remove heat shield above turbocharger -arrows-.

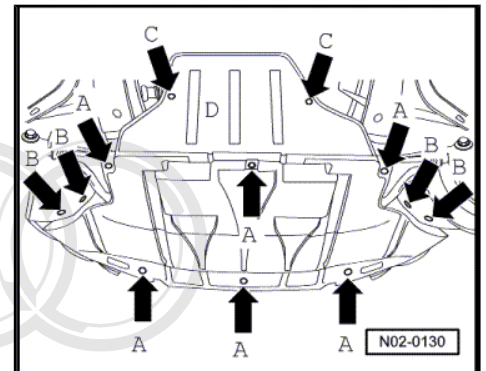


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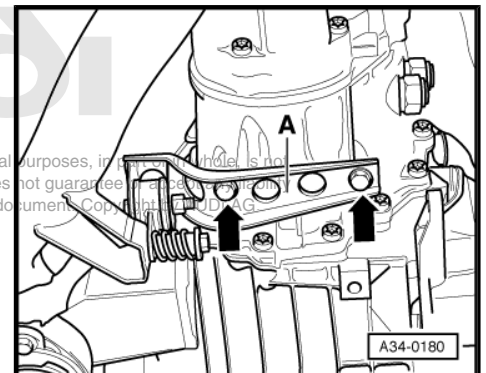
- Unbolt front exhaust pipe from turbocharger manifold -arrows-.



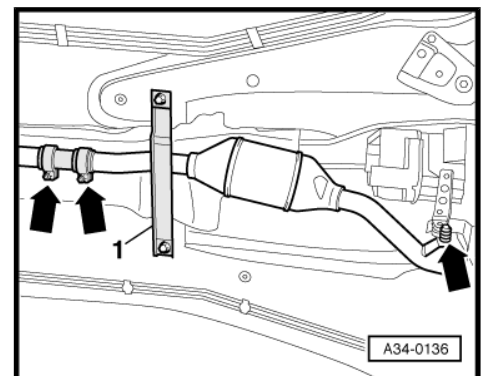
- Remove noise insulation panels -arrows A ... C-.
- Detach bracket for noise insulation.



- Unscrew bolts -arrows- for bracket -A-.



- Detach cross member -1-.
- Release clamp for exhaust pipe -left arrows- and remove front exhaust pipe complete with catalytic converter.
- Remove bolts securing engine to gearbox (accessible from above).

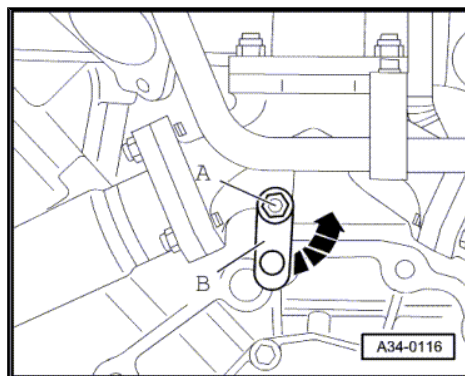


- Slacken bolt -A- (at rear of turbocharger) a few turns and pivot brace -B- to one side in direction of -arrow-. Then tighten bolt -A- again lightly.

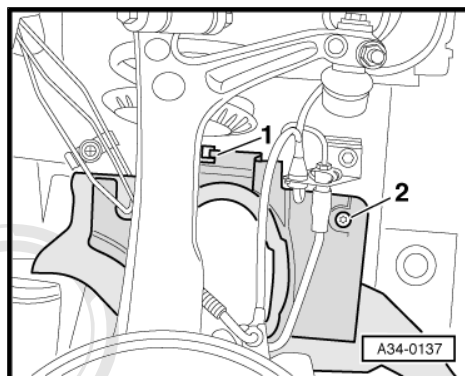


Note

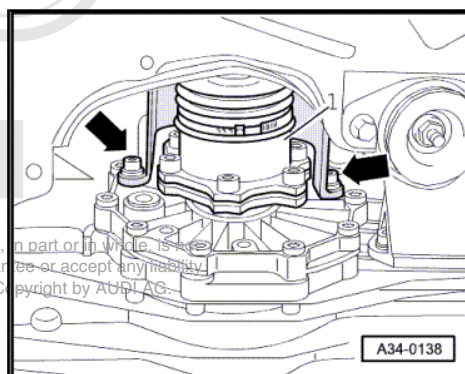
The illustration shows the engine from the rear with the gearbox removed.



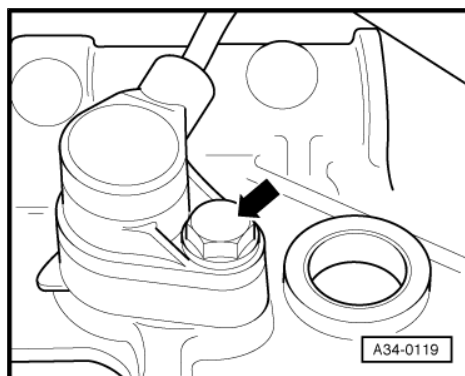
- Loosen bolt -2- on noise insulation cover above drive shaft (left-side).
- Disengage retainer -1- and remove noise insulation cover.



- Detach heat shield for drive shaft from gearbox -arrows-.
- Unbolt drive shafts -1- from gearbox (left and right sides), lift clear and tie in position, taking care not to damage protective coating.

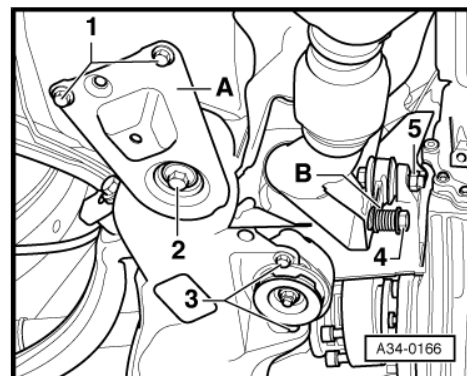


- Remove engine speed sender -G28- on left of gearbox -arrow- and move clear.
- Unplug connector from speedometer sender -G22- .
- Unplug connector from reversing light switch -F4- .
- Unclip wiring for speedometer sender and reversing light switch on gearbox.
- Unscrew securing bolts for starter.
- Pull out starter slightly (starter cables remain connected).
- Remove all engine/gearbox securing bolts from below (leave one bolt in place to hold engine and gearbox together).

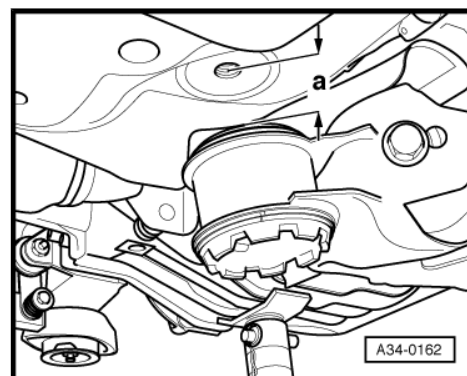


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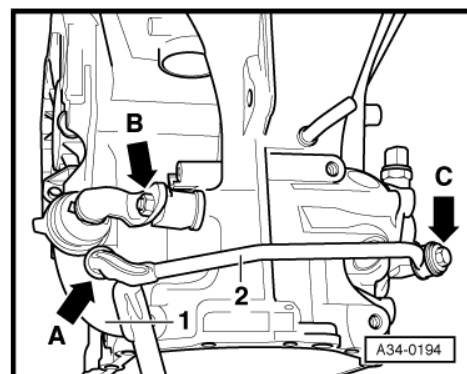
- Remove bolts -1- and -2- on right and left and detach support -A-.



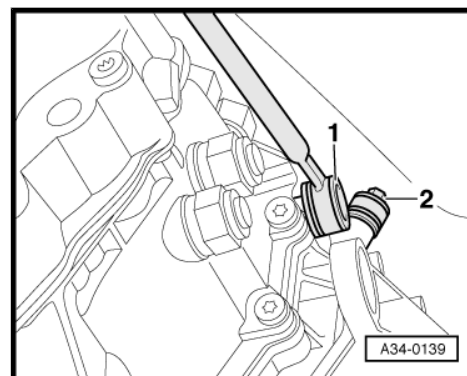
- Lower subframe at rear and slide a wooden wedge or similar spacer into gap.
- ◆ Dimension -a- max. 50 mm

**Note**

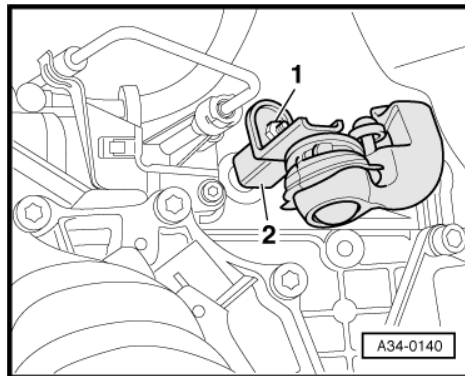
- ◆ *Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted. Any unauthorized use is prohibited. Liability for damages is excluded. © 2012 Audi AG.*
When removing selector mechanism, do NOT pull ball head -arrow A- on connecting rod -2- off selector rod -1-; ball head will be damaged if it is removed.
- ◆ **Unscrew nut -arrow B- and bolt -arrow C- to remove selector rod.**



- Unbolt connecting rod -2- for selector rod on right side of gearbox.
- Remove hexagon socket head bolt from push rod -1-.

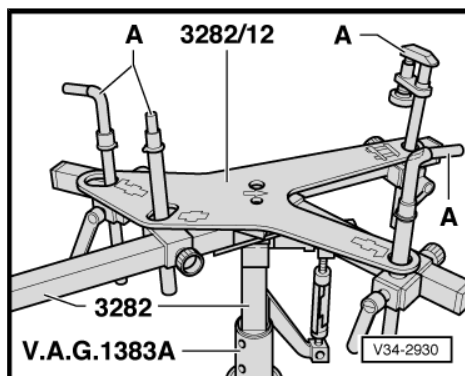


- Unscrew nut -1- and pull gearbox selector lever -2- off gearbox selector shaft.



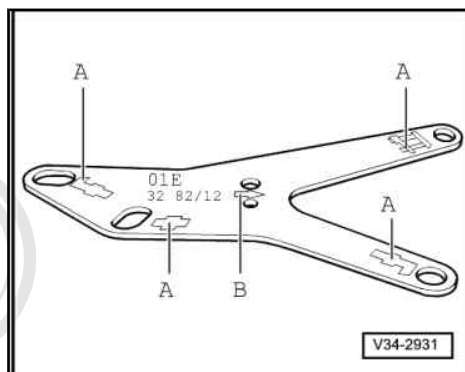
- To remove manual gearbox 01E (front-wheel drive) set up gearbox support -3282- with adjustment plate -3282/12- and place on engine and gearbox jack -V.A.G 1383/A- .

A - Support elements

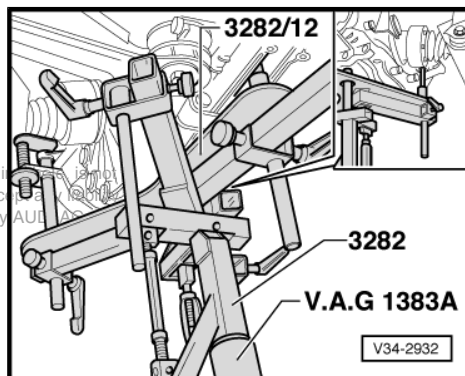


Note

- ◆ The support elements are shown in schematic form -A-, arrow -B- points in the direction of travel.
- ◆ Adjustment plate -3282/12- can only be fitted in one correct position.
- ◆ The elongated holes in the adjustment plate -3282/12- allow for different versions of the gearbox housing and gearbox cover.



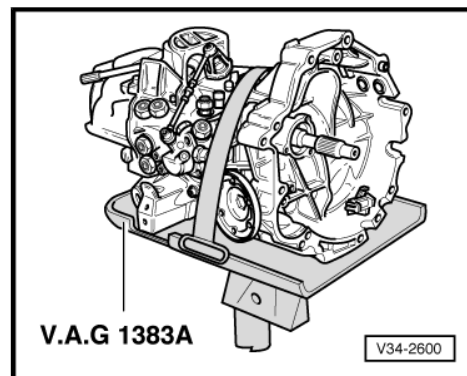
- Place engine and gearbox jack -V.A.G 1383/A- with gearbox support -3282- underneath gearbox and support gearbox.
- Secure gearbox to gearbox support -3282- .



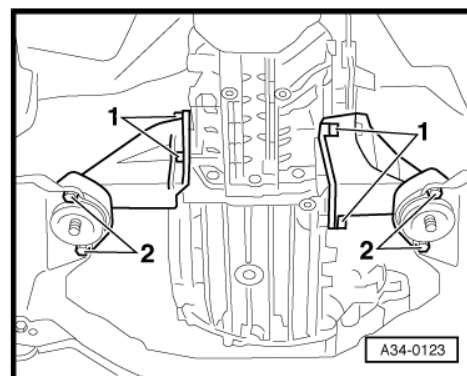
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**Note**

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



- Unscrew bolts -1- and -2- and detach gearbox supports (right and left) from gearbox and subframe together with bonded rubber mountings.
- Remove last bolt securing engine to gearbox.
- Press gearbox off dowel sleeves and lower carefully with engine and gearbox jack -V.A.G 1383 A- just far enough to gain access to the clutch slave cylinder.

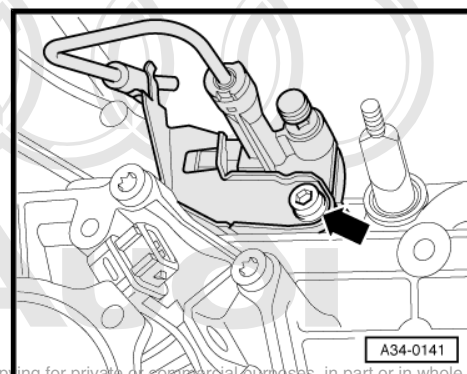
**Note**

When lowering gearbox, take care not to damage pipe/hose assembly for clutch slave cylinder.

- Remove bolt -arrow- and take out clutch slave cylinder from the rear. Do not disconnect hoses/pipes.

**Caution**

Do not depress clutch pedal after removing slave cylinder. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.



- Lower gearbox completely.

**Note**

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

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4.2 Installing gearbox

Installation is carried out in reverse sequence; note the following:

- Always renew self-locking nuts and bolts.
- Check that dowel sleeves for centralising engine/gearbox are in the cylinder block, install if necessary.
- 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 for clutch plate splines -G 000 100- to the splines. Do not grease the guide sleeve.
- It should be possible to push the clutch plate back and forth slightly on the input shaft.

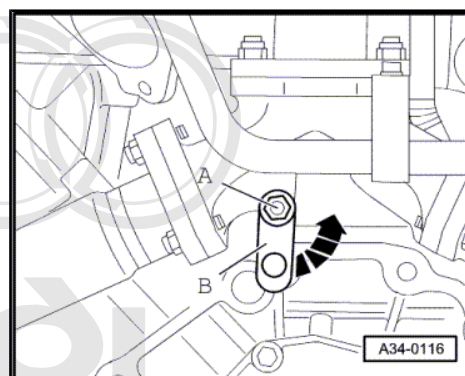
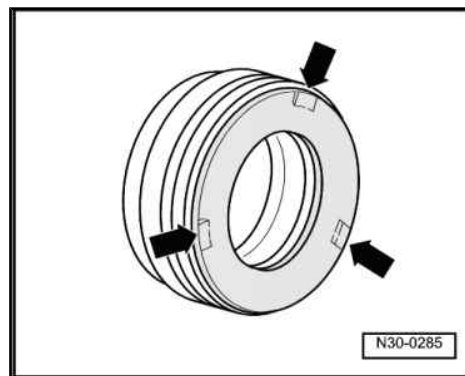
- Check clutch release bearing for wear and renew if necessary
⇒ [Item 5 \(page 25\)](#) .
- If plastic ring -arrows- has come loose, service release bearing
as required ⇒ [page 27](#) .



Note

The release bearing must be renewed if the groove worn on the plastic ring is deeper than 0.8 mm.

- Before installing, use a thread tap to clean all remaining locking fluid out of tapped hole for bolted connection between clutch slave cylinder and gearbox.
- Using copper grease (commercially available), lightly lubricate surface where plunger and clutch release lever make contact.
- Before installing gearbox, check that brace -B- is still moved to one side -direction of arrow-.
- Before installing gearbox, tie electrical wiring off to one side so that it cannot be trapped between the engine and the gearbox.



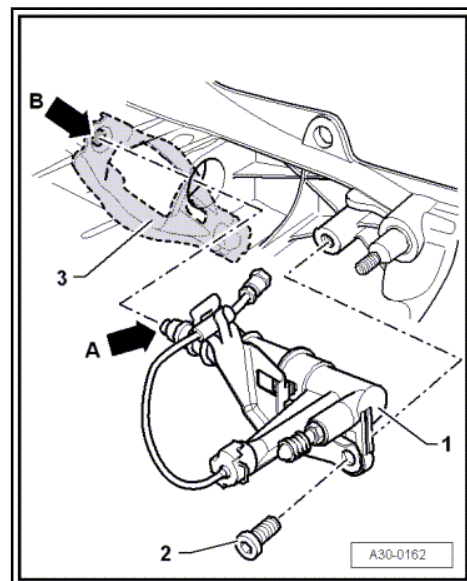
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- Lightly lubricate surface where plunger and clutch release lever make contact -arrow B- using copper grease (commercially available).
- Raise gearbox far enough to be able to install clutch slave cylinder with bracket for pipe/hose assembly.
- Guide slave cylinder -1- into opening in gearbox housing, keeping it as straight as possible (without tilting plunger -arrow A-) and insert in recess -arrow B- on clutch release lever -3-.

**Note**

If the slave cylinder -1- is inserted at an angle, there is a danger that the plunger -arrow A- will be guided past the clutch release lever -3-.

- Secure slave cylinder with new bolt -2-. Tightening torque [⇒ Item 2 \(page 25\)](#)
- When aligning the gearbox with the engine, turn crankshaft back and forth slightly to make it easier to insert the gearbox input shaft splines into the clutch plate.

**Caution**

- ◆ **Press the clutch pedal carefully after installing the gearbox.**
- ◆ **If you feel an unusually strong point of resistance when depressing the clutch pedal, you must not press it down further.**
- ◆ **The plunger of the slave cylinder is likely to have been guided past the clutch release lever.**
- ◆ **The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.**
- ◆ **For comparison: normal pedal force is approx. 115 N.**

- Screw in bottom engine/gearbox securing bolts and bolts for starter; at the same time, install starter ⇒ Electrical System; Rep. gr. 27 .
- Tighten top bolts securing engine to gearbox to specified torque [⇒ page 78](#) .
- Bolt subframe to body ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Install exhaust system so it is free of stress ⇒ Engine, mechanics; Rep. gr. 26 .
- Check setting of selector mechanism and push rod and adjust if necessary:
 - ◆ [⇒ „1.4 Adjusting selector mechanism \(vehicles up to 05.99\)“, page 43](#)
 - ◆ [⇒ „2.7 Adjusting selector mechanism \(vehicles from 05.99 to 11.00\)“, page 57](#)
 - ◆ [⇒ „3.5 Adjusting selector mechanism \(vehicles from 11.00 onwards\)“, page 65](#)
- Check gear oil level in gearbox [⇒ page 80](#) .

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- Follow steps required after connecting battery ⇒ Electrical system; Rep. gr. 27 .

Tightening torques



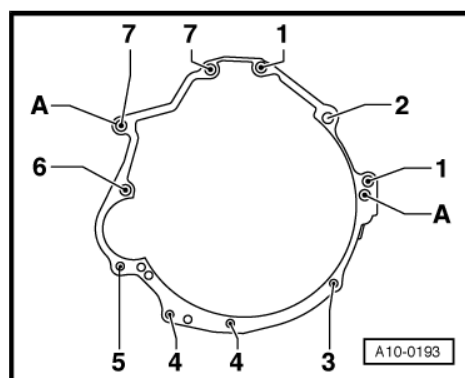
Note

- ◆ *Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.*
- ◆ *Additional lubricant such as engine or gear oil may be used, but do not use graphite lubricant.*
- ◆ *Do not use parts which have been degreased.*
- ◆ *Tolerance for tightening torques is $\pm 15\%$.*

- Engine/gearbox connection (illustration shows gearbox flange).

Item	Bolt	Qty.	Nm
1	M12 x 80	2	65
2	M12 x 90	1	65
3	M10 x 50 ¹⁾	1	45
4	M10 x 45	2	45
5	M10 x 135	1	65
6	M12 x 110	1	65
7	M12 x 67	2	65
A	Dowel sleeves for centralising		

¹⁾ Special bolt



Component	Nm
Clutch slave cylinder to gearbox ¹⁾	23
Gearbox support to gearbox	40
Gearbox support to subframe	20
Engine speed sender -G28-	10
Heat shield for drive shaft	23
Push rod to gearbox	40
Selector rod to gearbox ²⁾	23
Connecting rod for selector rod to gearbox	23
Catalytic converter to mounting lugs	25
Front exhaust pipe to turbocharger	25
Heat shield to turbocharger	10
Clamp for exhaust pipe	40
Bracket for noise insulation to subframe	10
Underbody cross member to body	20
• ¹⁾ Renew bolts • ²⁾ Renew nut	

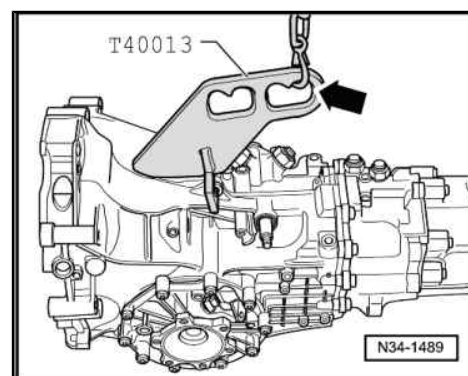
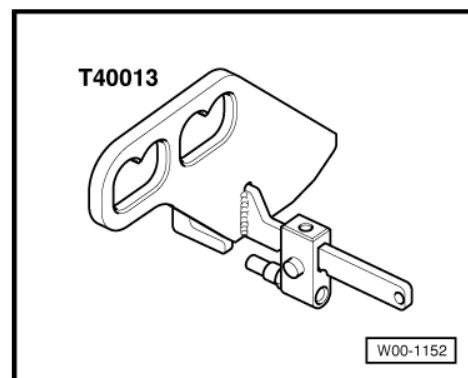
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4.3 Transporting gearbox

Special tools and workshop equipment required

◆ Lifting aid -T40013-

- Insert lifting aid -T40013- in lifting eye on gearbox and secure.
- Push together adjusting mechanism of lifting aid as far as stop.
- Engage hook of workshop hoist in 4th notch -arrow- on lifting aid .
- Lift gearbox with workshop hoist and lifting aid -T40013- .



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5 Checking oil level in manual gearbox

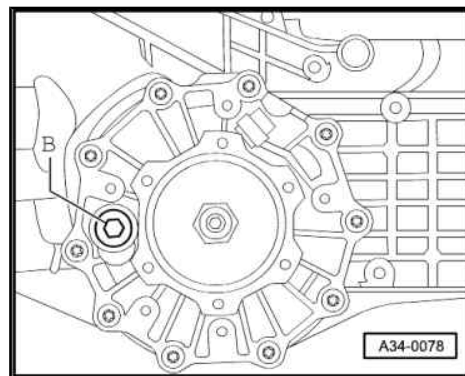


Note

- ◆ *The vehicle should be perfectly horizontal when checking gearbox oil level. An inspection pit or a 4-post lifting platform is ideal.*
- ◆ *The prescribed oil level is to be adhered to exactly; the gearbox reacts very sensitively to over-filling.*
- Remove oil filler plug -B- (in front of flange shaft (left-side)) to check gearbox oil level.
- ◆ Specification: oil level up to bottom lip of filler hole
- Top up with gear oil if necessary. Specifications ⇒ Electronic parts catalogue .
- Screw in oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	40



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6 Dismantling and assembling gearbox

Overview

- ◆ ⇒ „6.1 Exploded view - dismantling and assembling gearbox“, page 81
- ◆ ⇒ „6.2 Exploded view - removing and installing gear cluster/bearing plate and end cover“, page 82
- ◆ ⇒ „6.3 Exploded view - removing and installing 5th and 6th gear“, page 83
- ◆ ⇒ „6.4 Exploded view - removing and installing input shaft, pinion shaft and internal selector mechanism from bearing plate“, page 85
- ◆ ⇒ „6.5 Assembly sequence - dismantling and assembling gearbox“, page 85

6.1 Exploded view - dismantling and assembling gearbox



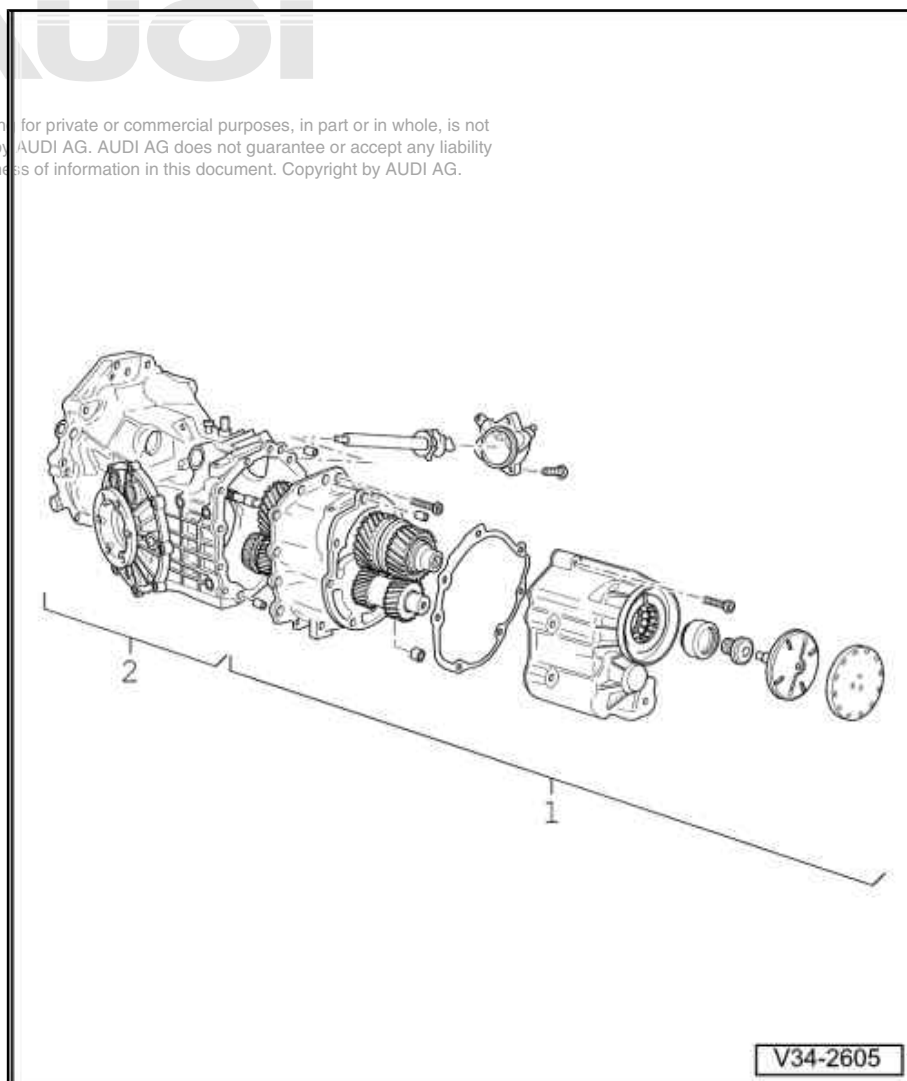
Note

Refer to general repair instructions ⇒ [page 5](#).

1 - Exploded view - gear cluster/bearing plate and end cover

2 - Exploded view - gearbox housing with differential

- ☐ Servicing gearbox housing ⇒ [page 117](#)
- ☐ Removing and installing differential ⇒ [page 156](#)



6.2 Exploded view - removing and installing gear cluster/bearing plate and end cover

1 - Gearbox housing

2 - Selector shaft with selector cylinder

- ☐ Different versions for 5-speed and 6-speed gearboxes ⇒ [page 127](#)
- ☐ Removing ⇒ [page 90](#)
- ☐ Installing ⇒ [page 102](#)
- ☐ Dismantling and assembling ⇒ [page 126](#)

3 - Bolt

- ☐ 25 Nm
- ☐ Without washer
- ☐ 12x

4 - Selector shaft cover

- ☐ Removing ⇒ [page 90](#)
- ☐ Installing ⇒ [page 102](#)

5 - Bolt

- ☐ 25 Nm
- ☐ Without washer
- ☐ 3x

6 - Bolt

- ☐ 25 Nm
- ☐ 7x

7 - Sealing cap

- ☐ Removing ⇒ [page 89](#)

8 - Oil collector

- ☐ Removing ⇒ [page 90](#)

9 - Multi-point socket head bolt

- ☐ 150 Nm
- ☐ Slackening ⇒ [page 91](#)
- ☐ Tightening ⇒ [page 101](#)

10 - 2nd inner race for four-point bearing

- ☐ Roller bearing end
- ☐ Removing ⇒ [page 90](#)
- ☐ Installing ⇒ [page 102](#)

11 - End cover

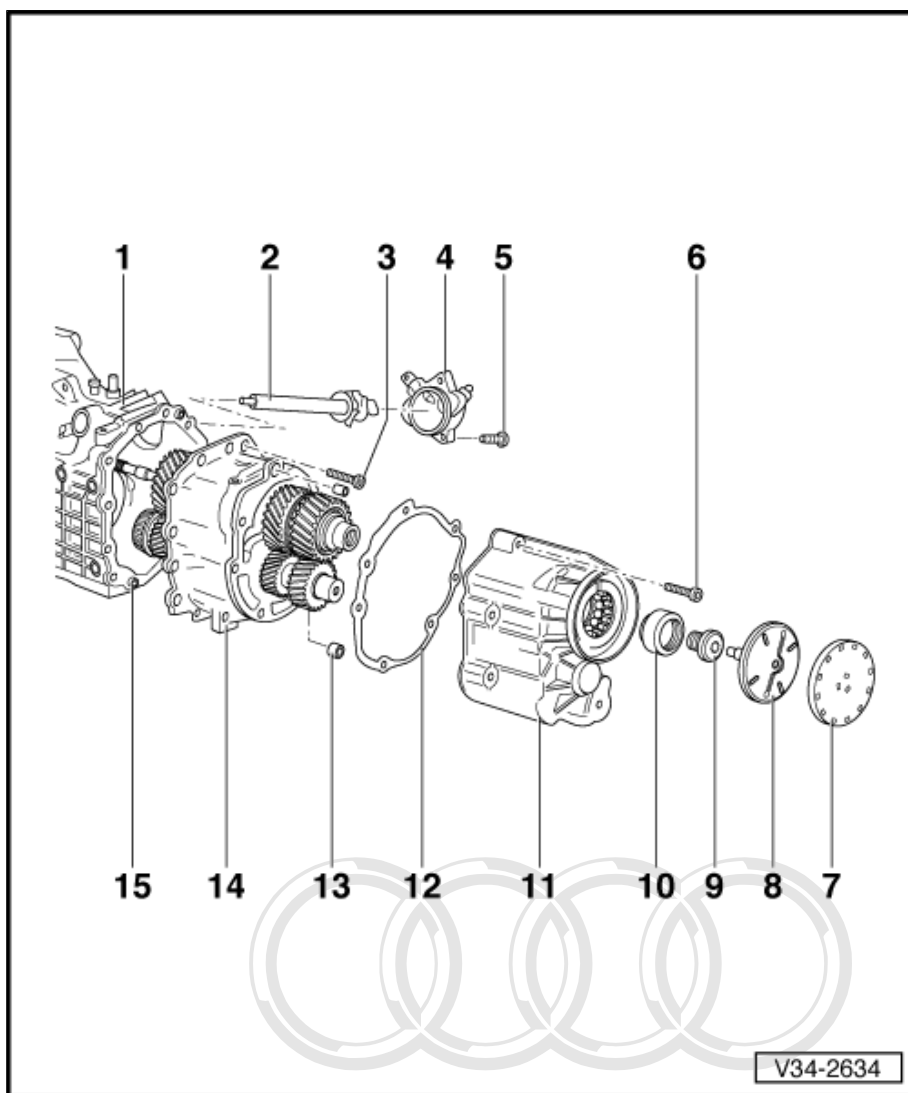
- ☐ Can be removed without also removing the gear cluster/bearing plate
- ☐ Servicing ⇒ [page 103](#)

12 - Gasket

- ☐ Renew

13 - Dowel sleeve

- ☐ 2x



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14 - Gear cluster

15 - Dowel sleeve

- ☐ 2x

6.3 Exploded view - removing and installing 5th and 6th gear

1 - 1st inner race for four-point bearing

- ☐ Ball bearing end
- ☐ Pulling off [⇒ page 91](#)
- ☐ Driving on [⇒ page 100](#)

2 - Needle bearing for 5th gear

3 - Inner race for 5th speed selector gear

- ☐ Pulling off [⇒ page 92](#)
- ☐ Driving on [⇒ page 100](#)

4 - 5th speed selector gear

- ☐ Pulling off [⇒ page 91](#)
- ☐ Installing [⇒ page 100](#)

5 - Roll pin

- ☐ Pressing out [⇒ page 92](#)
- ☐ Pressing in [⇒ page 100](#)

6 - Yoke

- ☐ Only renew complete with selector rod for 5th and 6th gear [⇒ Item 9 \(page 83\)](#)
- ☐ Pulling off [⇒ page 92](#)

7 - Selector fork for 5th and 6th gear

- ☐ Can be renewed individually

8 - Spacer

- ☐ Not fitted on 6-speed gearbox
- ☐ Installation position: larger diameter facing bearing flange
- ☐ Installing [⇒ page 99](#)

9 - Selector rod for 5th and 6th gear

- ☐ Renew only complete with yoke [⇒ Item 6 \(page 83\)](#)
- ☐ Removing [⇒ page 92](#)
- ☐ Installing [⇒ page 95](#)

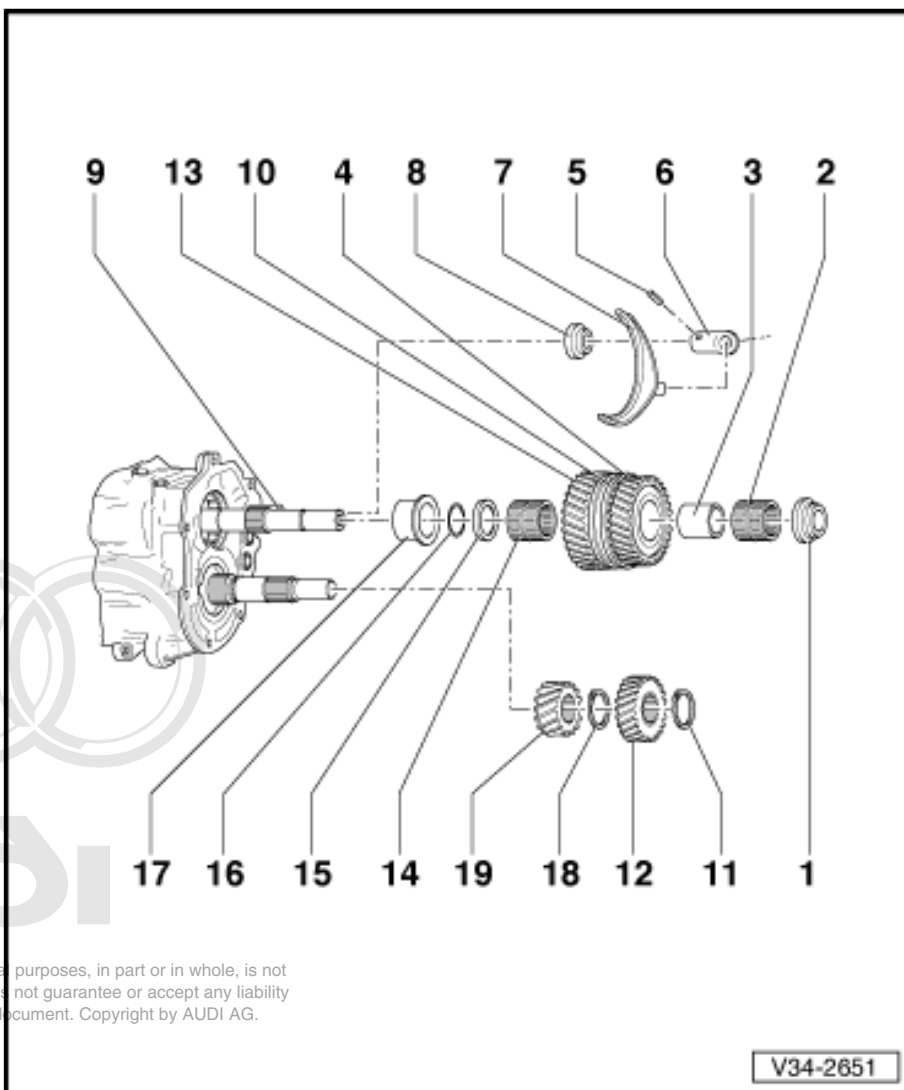
10 - Locking collar/synchro-hub for 5th and 6th gear

- ☐ Removing [⇒ page 92](#)
- ☐ Installing [⇒ page 99](#)

11 - Circlip

12 - 5th gear wheel

- ☐ Pulling off [⇒ page 91](#)



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- ☐ Pressing on ⇒ [page 100](#)

13 - 6th speed selector gear

- ☐ Not fitted on 5-speed gearbox
- ☐ Pull off together with synchro-hub and inner race for 5th gear ⇒ [page 92](#)

14 - Needle bearing for 6th gear

- ☐ Not fitted on 5-speed gearbox

15 - Thrust washer for needle bearing for 6th gear

- ☐ Not fitted on 5-speed gearbox
- ☐ Installation position: groove faces circlip, smooth contact surface towards needle bearing

16 - Circlip

17 - Inner race for roller bearing

- ☐ Take off by hand ⇒ [page 93](#)

18 - Circlip

- ☐ Not fitted on 5-speed gearbox
- ☐ Re-determining thickness ⇒ [page 97](#)

19 - 6th gear wheel

- ☐ Not fitted on 5-speed gearbox
- ☐ To press off, remove bearing plate ⇒ [page 93](#)
- ☐ Pressing off ⇒ [page 94](#)
- ☐ Pressing on ⇒ [page 94](#)



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6.4 Exploded view - removing and installing input shaft, pinion shaft and internal selector mechanism from bearing plate

1 - Bearing plate

- ☐ Servicing ⇒ [page 109](#)

2 - Selector rod for 5th and 6th gear

- ☐ Only renew complete with yoke for 5th and 6th gear
⇒ [Item 6 \(page 83\)](#)

3 - Yoke for reverse gear

- ☐ Pulling out ball sleeve
⇒ [page 112](#)
- ☐ Driving in ball sleeve
⇒ [page 112](#)

4 - Input shaft

- ☐ Dismantling and assembling ⇒ [page 129](#)

5 - Selector fork for 3rd and 4th gear

- ☐ Can be renewed individually
- ☐ Installation position: rib faces yoke

6 - Selector rod for 3rd and 4th gear

- ☐ Only renew complete with yoke for 3rd and 4th gear

7 - Pinion shaft

- ☐ Dismantling and assembling ⇒ [page 136](#)

8 - Selector rod for 1st and 2nd gear

- ☐ Only renew together with selector fork for 1st and 2nd gear (secured together by means of a pin)

9 - Yoke for 1st and 2nd gear

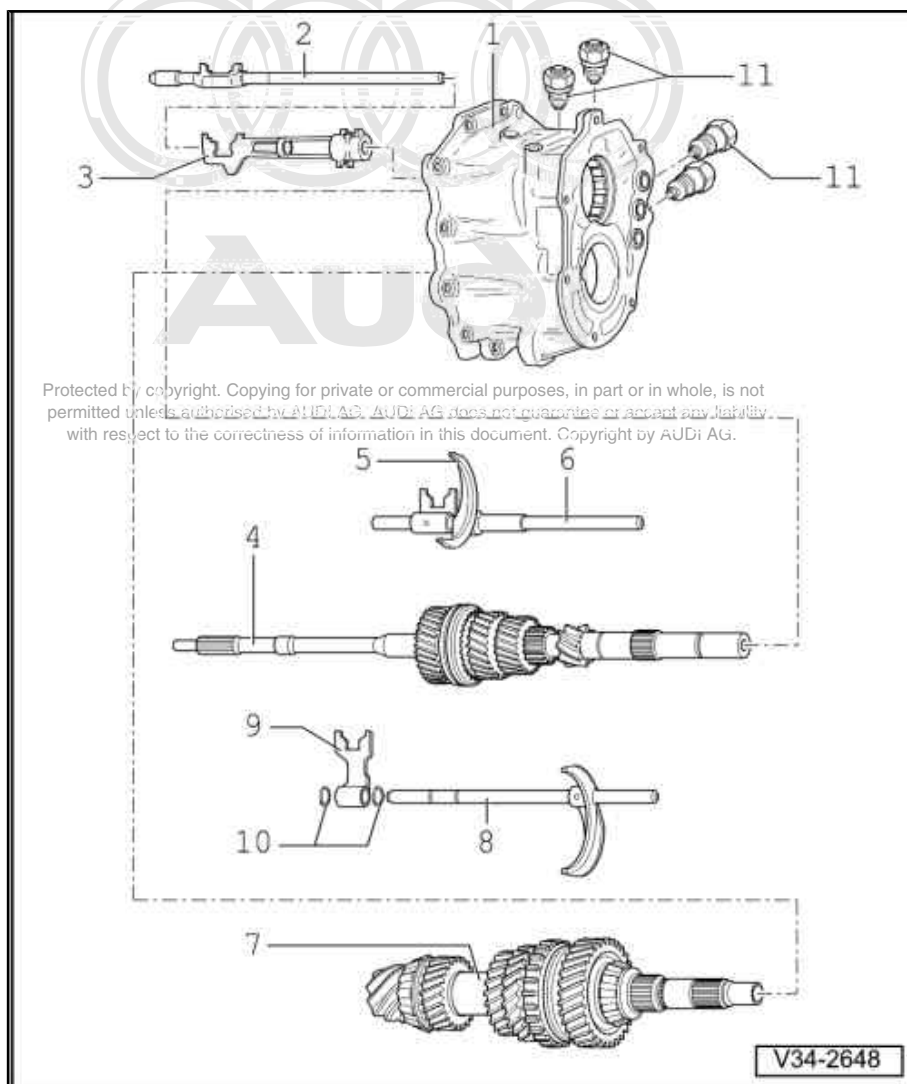
- ☐ Can be renewed individually

10 - Circlip

- ☐ 2x

11 - Locking bolts for selector rods

- ☐ 4x
- ☐ Apply sealing paste -AMV 188 001 02- when installing
- ☐ Tighten to 50 Nm



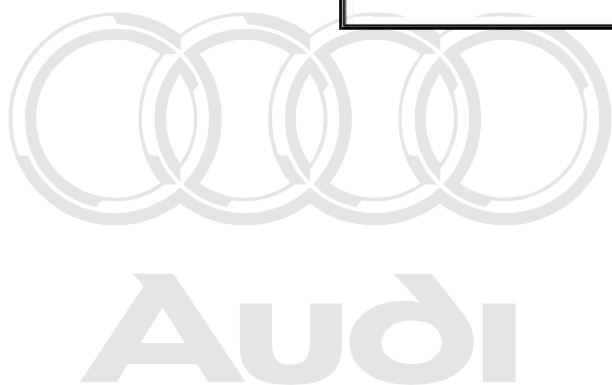
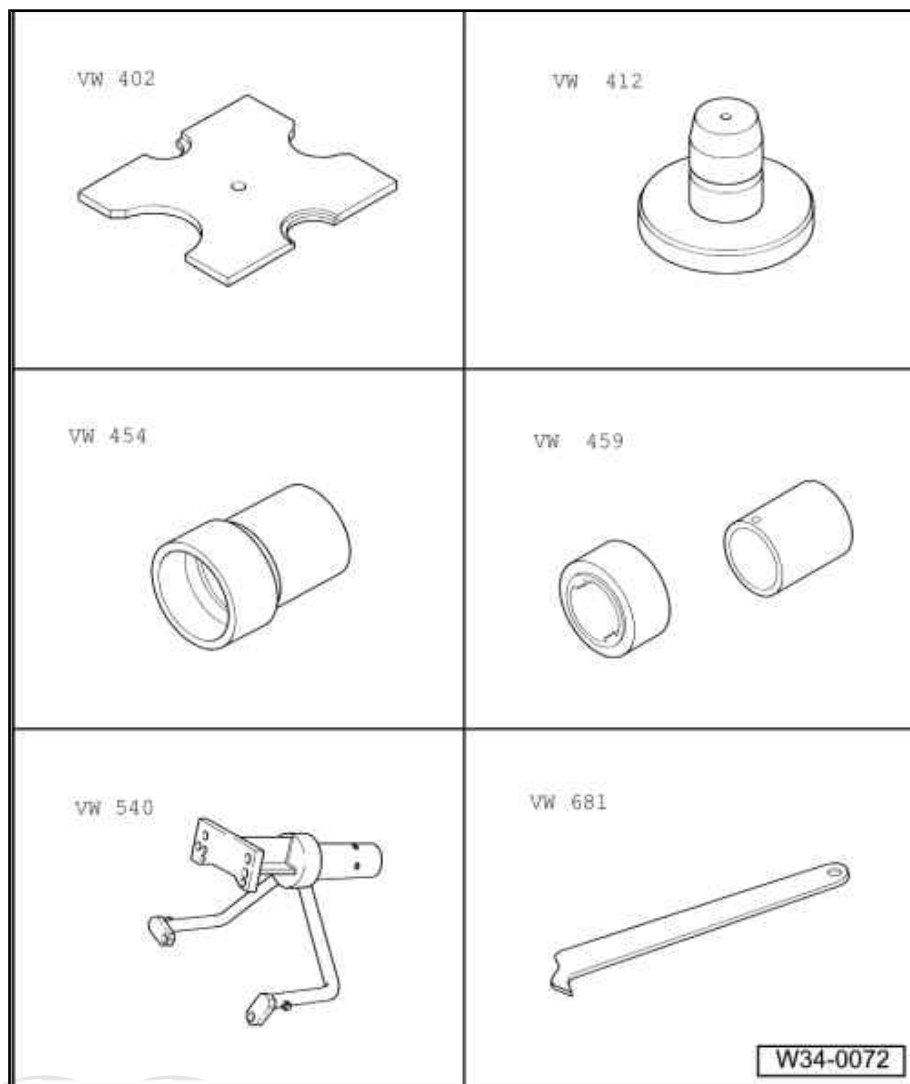
6.5 Assembly sequence - dismantling and assembling gearbox

Removing and installing end cover, 5th and 6th gear, bearing plate, input shaft, pinion shaft and selector rods



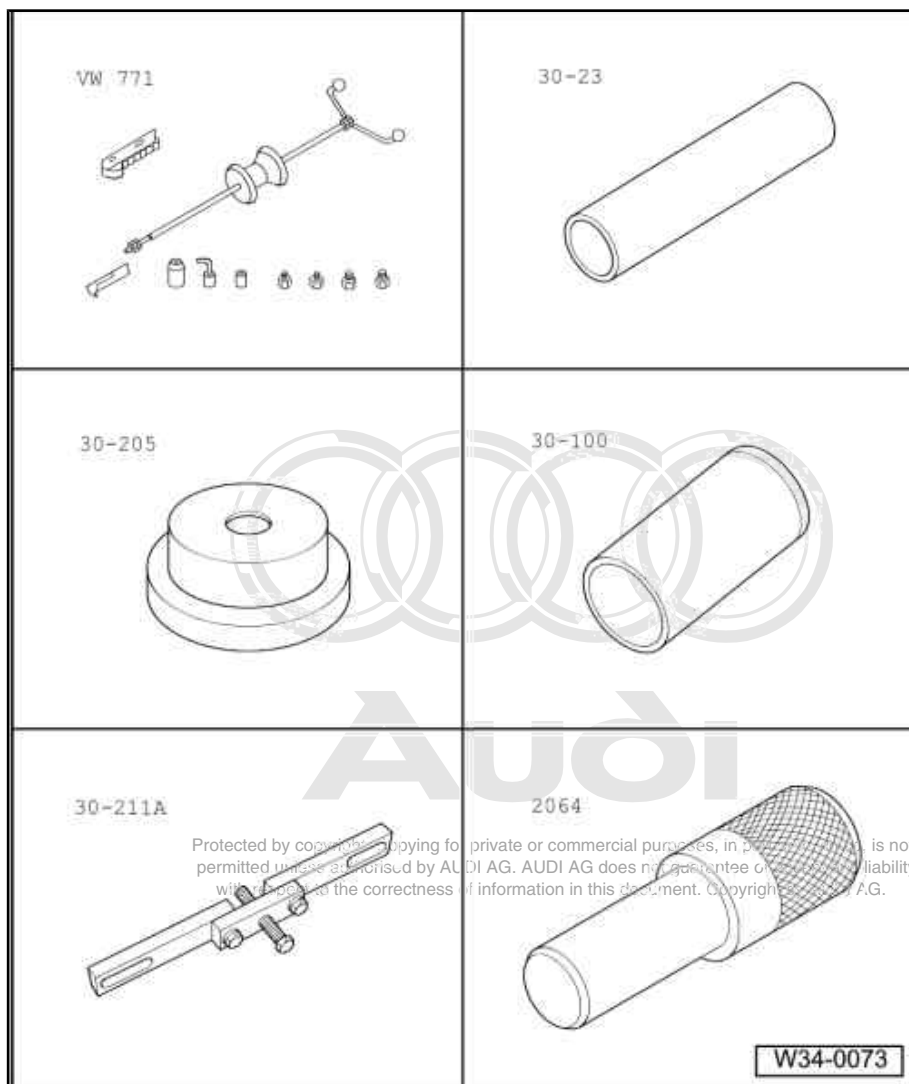
Special tools and workshop equipment required

- ◆ Thrust plate -VW 402-
- ◆ Press tool -VW 412-
- ◆ Press tool -VW 454-
- ◆ Removal and installing tool -VW 459-
- ◆ Engine and gearbox support -VW 540-
- ◆ Oil seal extractor lever -VW 681-

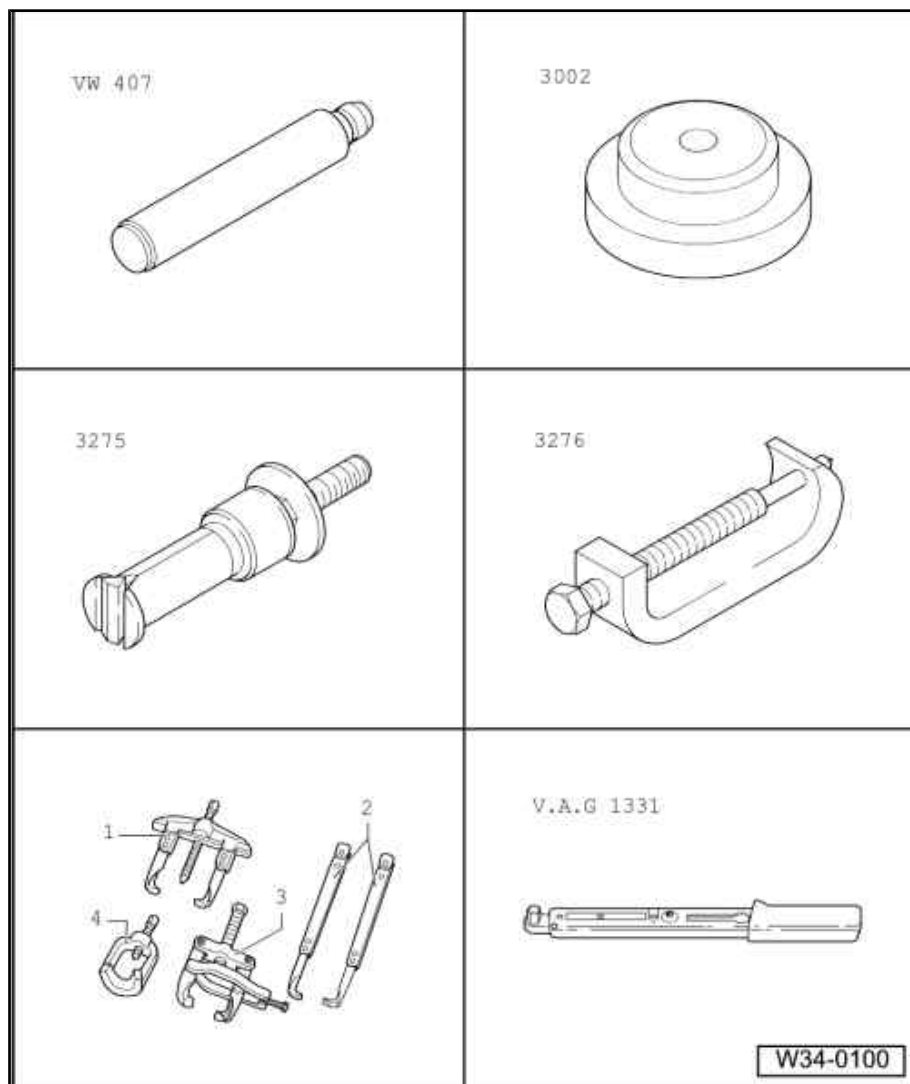


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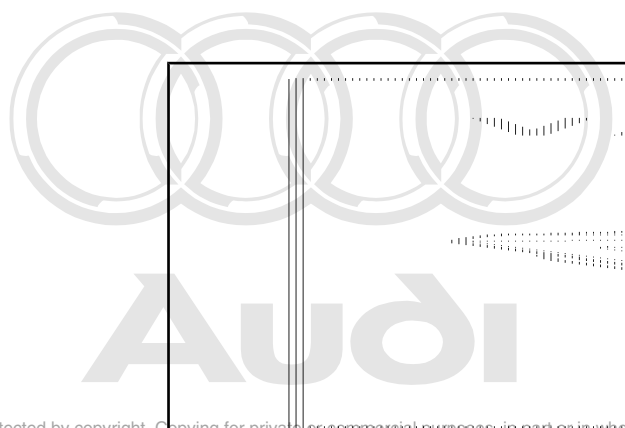
- ◆ Multi-purpose tool - VW 771-
- ◆ Extension -30-23-
- ◆ Thrust plate -30-205-
- ◆ Drift sleeve -30-100-
- ◆ Support bridge -30-211 A-
- ◆ Locking pin -2064-



- ◆ Press tool -VW 407-
- ◆ Thrust piece -3002-
- ◆ Internal puller -3275-
- ◆ Press tool -3276-
- ◆ -1- Two-arm puller -Kukko 20/10-
- ◆ -2- Puller hook -Kukko 1-200-
- ◆ Torque wrench - V.A.G 1331-

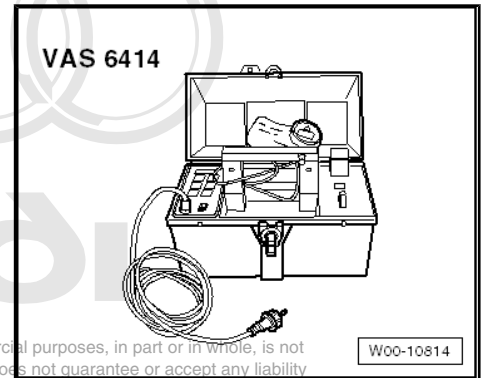


- ◆ Drip tray for workshop hoist -VAS 6208-



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- ◆ Inductive heater -VAS 6414-



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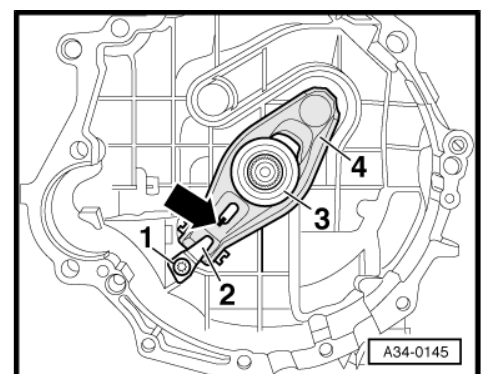
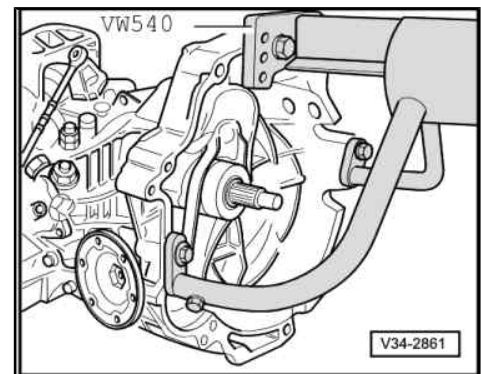
- ◆ Sealing paste -AMV 188 001 02-
- ◆ Sealing grease -G 052 128 A1-
- ◆ Depth gauge

Dismantling gearbox

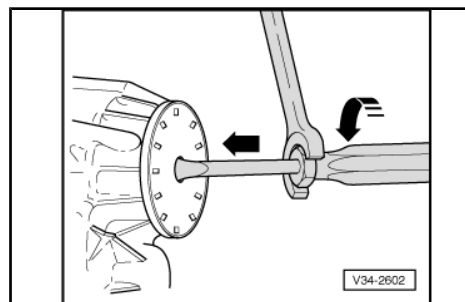


Note

- ◆ Refer to general repair instructions [⇒ page 5](#).
- ◆ Before installing, heat tapered roller bearing inner races, gear wheels and synchro-hubs to approx. 100 °C (max.) using inductive heater -VAS 6414- (wear protective gloves).
- Secure gearbox to engine/gearbox support -VW 540- .
- Position drip tray, e.g. drip tray for workshop hoist -VAS 6208- below.
- Drain gear oil.
- Slacken bolt -1-, remove leaf spring-2- and press back catch -arrow-.
- Remove clutch release lever -4- together with release bearing -3-.
- Unbolt guide sleeve.
- Pierce rubber in centre of cap with a large screwdriver.



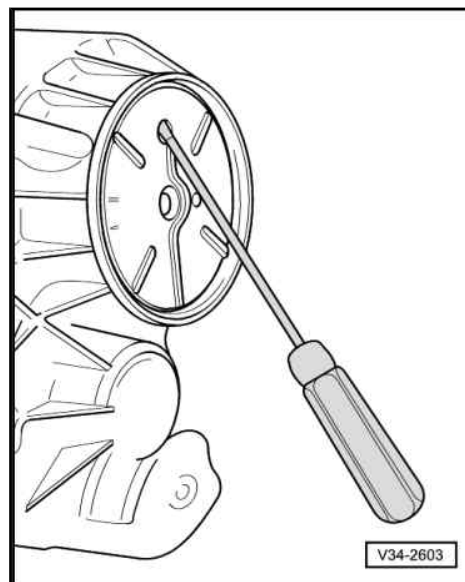
- Insert screwdriver sideways between cap and oil collector, push in until it touches the edge and turn screwdriver to lever off cap.



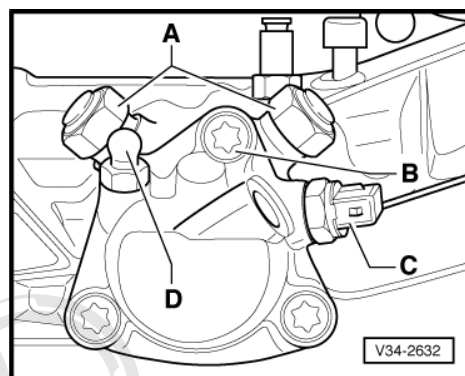
- Insert screwdriver into hole and lever off oil collector.


Note

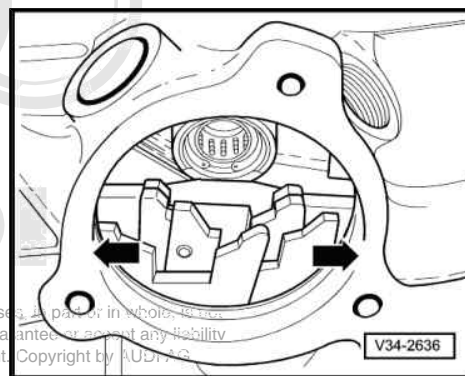
Renew oil collector if damaged.



- Remove locking bolts -A- for selector shaft from gearbox housing.
- Remove 3 bolts -B- for selector shaft cover and remove cover.
- Pull out selector shaft.

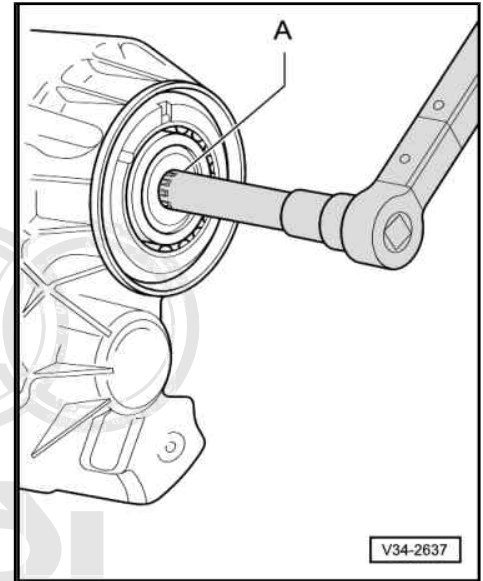


- Lock input shaft by engaging two gears (e.g. reverse and 2nd gear); do this by moving two gear selector plates -arrows-.



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- Remove multi-point socket-head bolt -A- for input shaft.

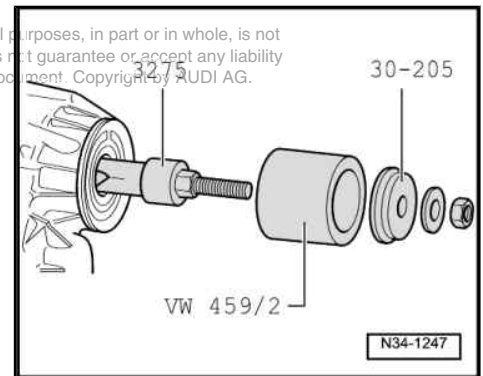


- Pull 2nd inner race for four-point bearing (roller bearing end) off input shaft.

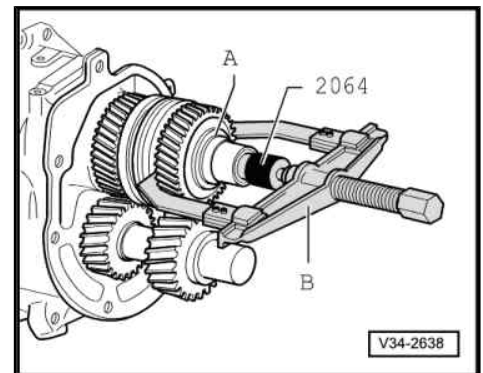


Note

- ◆ The internal puller -3275- engages in a circular groove in the inner race when pulling off.
- ◆ Small outside diameter of thrust plate -30-205- faces washer.

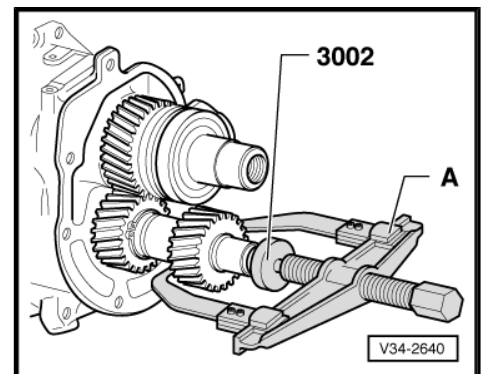


- Unscrew bolts securing end cover to bearing plate.
- Remove end cover with end cover/bearing plate gasket.
- Detach 5th speed selector gear with spring together with 1st inner race -A- for four-point bearing (ball bearing end) for input shaft.
- B - Two-arm puller (commercially available), e.g. -Kukko 20/10-
- Remove 5th gear synchro-ring.
- Detach circlip for 5th gear wheel.
- Lock input shaft in position by engaging two gears
⇒ [page 90](#) .



- Pull off 5th gear wheel.

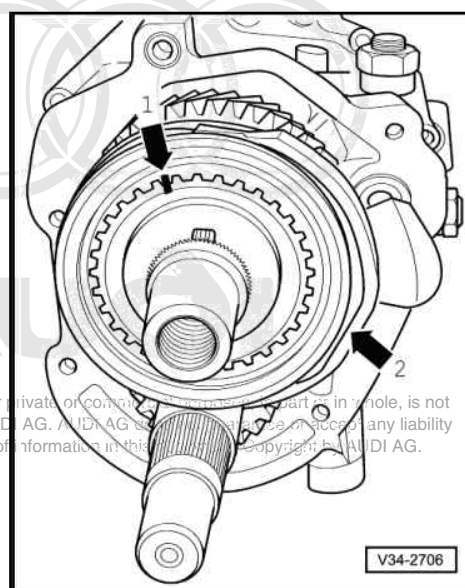
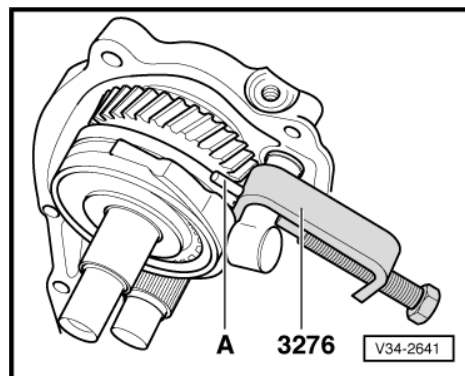
A - Two-arm puller (commercially available), e.g. -Kukko 20/10-



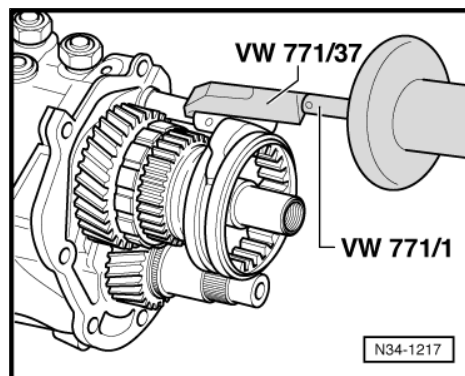
- Press out roll pin -A- for selector fork for 5th and 6th gear.


Note

- ◆ *Do not damage synchro-ring for 6th gear when pressing out roll pin.*
- ◆ *Do not drive out roll pin, otherwise selector rod bearing will be damaged.*
- Pull yoke and selector rod together with selector fork for 5th and 6th gear and locking collar as far as possible away from bearing plate (until stop is felt).
- Mark relative positions of locking collar for 5th and 6th gears and synchro-hub (paired) -arrow 1-.

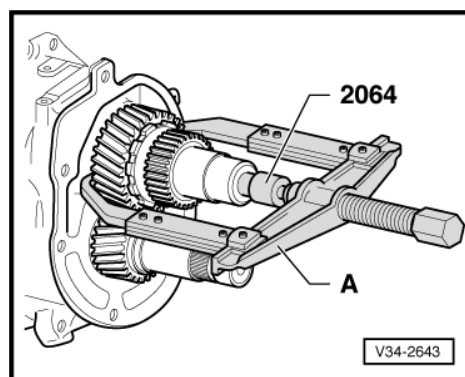


- Pull yoke together with selector fork and locking collar off selector rod.



- Pull off 6th speed selector gear, synchro-ring for 6th gear, synchro-hub for 5th and 6th gears and needle bearing inner race for 5th speed selector gear.

A - Two-arm puller (commercially available), e.g. -Kukko 20/10-, with hooks (200 mm)



- Unscrew locking bolts for selector rods.

A - 1st and 2nd gear

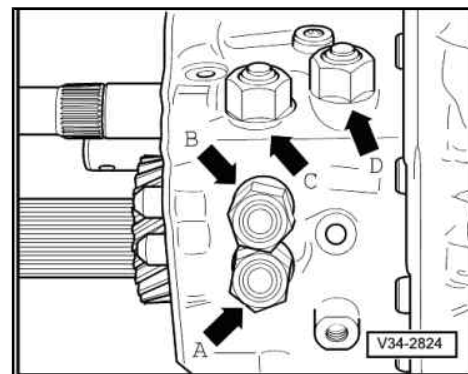
B - 3rd and 4th gear

C - 5th and 6th gear

D - Reverse gear

- Drive out dowel sleeves at bearing plate and unscrew bearing plate from gearbox housing.

- Separate bearing plate with input shaft, pinion shaft and internal selector mechanism (as a single unit) from gearbox housing.

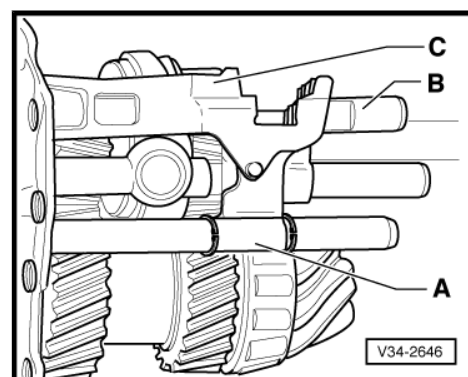


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- Remove circlip from selector rod for 1st and 2nd gear and detach yoke -A-.

- Pull out selector rod -B- for 5th and 6th gear.

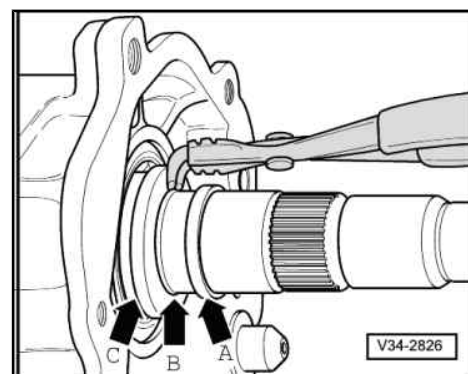
- Remove yoke -C- for reverse gear.



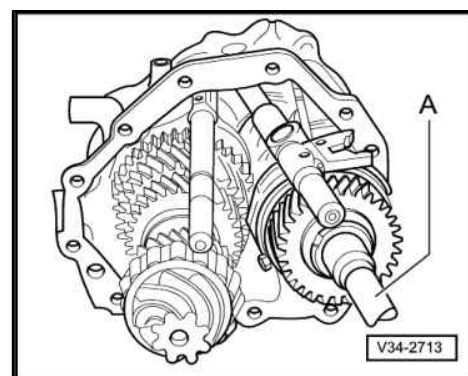
- Pull thrust washer -arrow A- for needle bearing for 6th gear off shaft.

- Remove circlip -arrow B- for inner race for roller bearing using pliers.

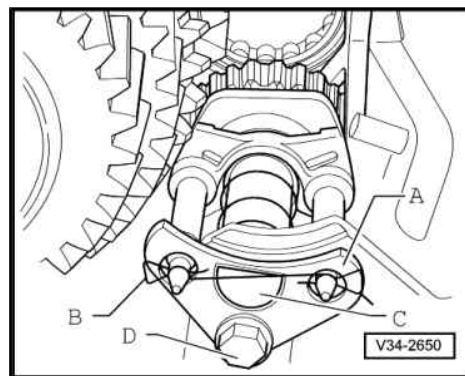
- Take out inner race -arrow C- for roller bearing (not a press fit).



- Take input shaft -A- with selector rod and selector fork for 3rd and 4th gear out at an angle from bearing plate.



- Unscrew hexagon bolt -D- and take off spring clip -B- and retaining plate -A-. Then pull out shaft -C- for reverse gear wheel.
- Take out spring, synchro-ring and reverse gear wheel.
- Remove relay lever for reverse gear.
- Detach circlip for 6th gear wheel.



- Press off 6th gear wheel.

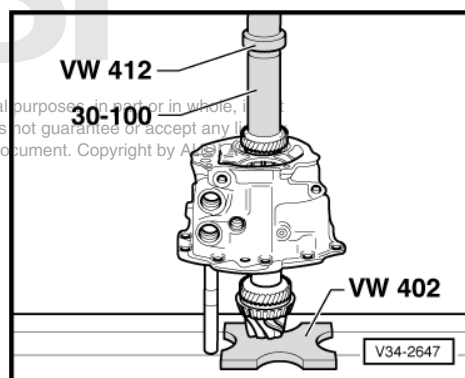
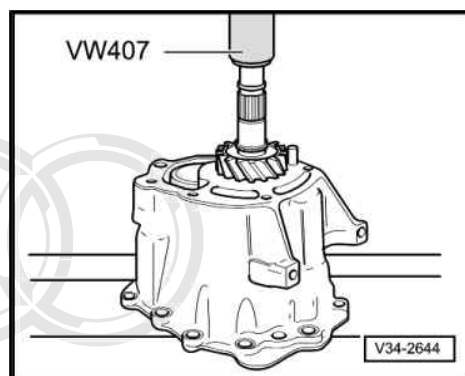

Note

Because of the type of fit, it may be possible to press gear off easily.

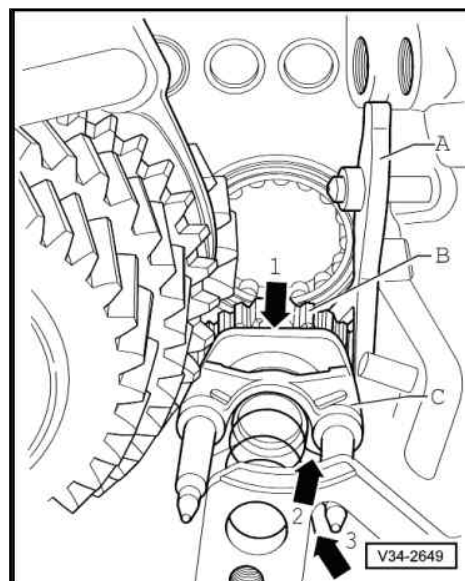
- Remove pinion shaft from bearing plate together with selector rod and selector fork for 1st and 2nd gears.

Assembling gearbox

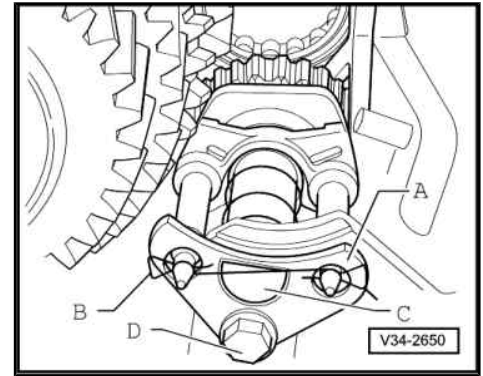
- Insert pinion shaft into bearing plate together with selector fork and selector rod for 1st and 2nd gears (without yoke).
- Heat 6th gear wheel to approx. 100 °C and fit in position.
- ◆ Installation position: shoulder towards tapered roller bearing
- Press onto stop with drift sleeve -30-100-
- Fit circlip.



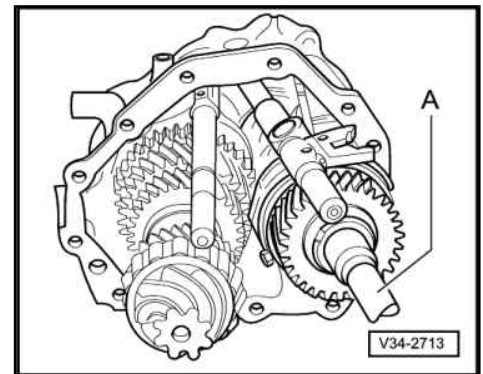
- Fit relay lever -A- for reverse gear onto bolt for relay lever.
- Fit reverse gear wheel -B- and engage relay lever with groove on reverse gear wheel.
- Insert synchro-ring-C-.
- ◆ Installation position: position flat on circumference of synchro-ring towards input shaft (not as yet fitted) -arrow 1-.
- Insert spring.
- ◆ Installation position: hook single angled end into recess on synchro-ring -arrow 2-. Turn double angled end anti-clockwise and insert into opening on bearing plate -arrow 3-.



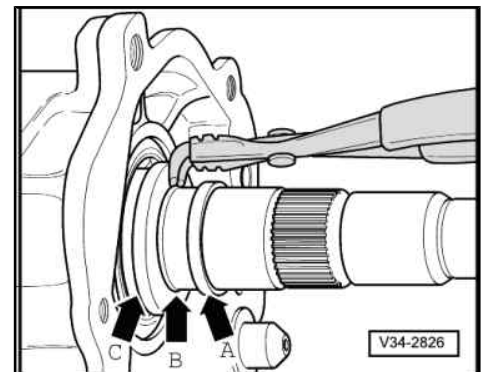
- Insert shaft for reverse gear wheel -C-.
- Fit retaining plate-A-.
- ◆ Installation position: chamfers of holes for locking pins of the synchro-ring face bearing plate.
- Insert spring clip -B- into synchro-ring locking pins.
- Renew self-locking bolt -D- and tighten to 25 Nm.



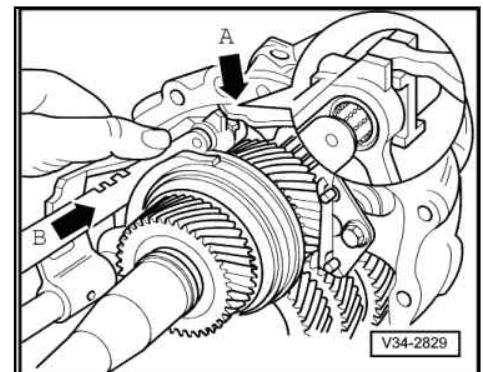
- Slide input shaft -A- with selector rod and selector fork for 3rd and 4th gear at an angle into the bearing plate.
- ◆ Selector fork installation position: rib towards yoke
⇒ [Item 5 \(page 85\)](#)



- Slide roller bearing inner race -arrow C- onto input shaft at flange for end cover (clearance fit).
- Use pliers to fit circlip -arrow B-.

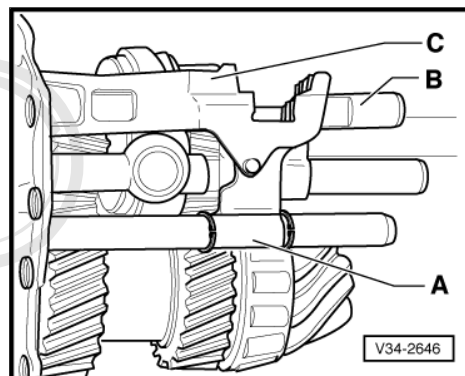


- Engage recess in yoke for reverse gear with the free end of relay lever -arrow A-.
- Slide selector rod for 5th and 6th gear through yoke for reverse gear in direction of -arrow B-.



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- Slide yoke -A- for 1st and 2nd gear onto selector rod and secure with circlips.
- Lubricate selector rods and all bearings of input shaft and pinion shaft in gearbox housing and on bearing flange with gear oil.

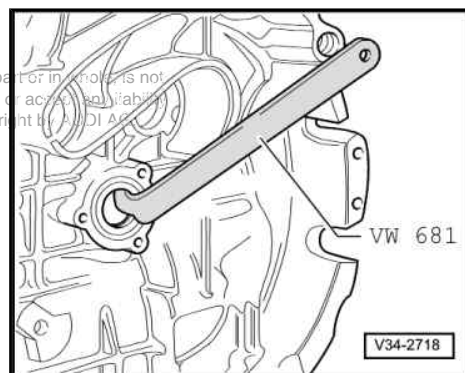


- Using oil seal extractor lever -VW 681- carefully lever used oil seal for input shaft out of gearbox housing.
- Coat sealing surfaces **between bearing plate and gearbox housing** with sealing paste -AMV 188 001 02-.
- Insert complete bearing plate in gearbox housing.



Note

When inserting the complete bearing plate, ensure that the selector rods align with their bearings.



- Drive in 2 dowel sleeves for bearing plate/gearbox housing.
- Tighten bolts in diagonal sequence to 25 Nm.
- Apply sealing paste -AMV 188 001 02- to locking bolts for selector rods and tighten bolts to 50 Nm.

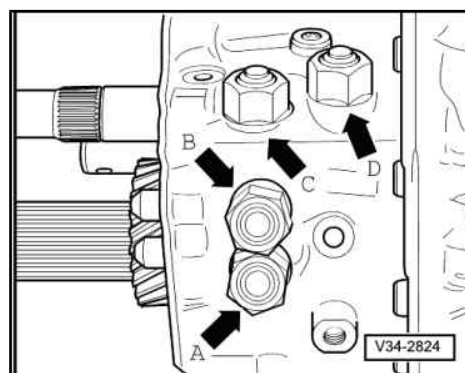
A - 1st and 2nd gear

B - 3rd and 4th gear

C - 5th and 6th gear

D - Reverse gear

5-speed gearbox only:



Note

- ♦ The circlips for the tapered roller bearings only have to be re-measured now (see below) if the pinion shaft or tapered roller bearings for pinion shaft are being renewed.
- ♦ If neither the pinion shaft nor the tapered roller bearings have been renewed, refit the original circlips.

- Re-determine circlips for tapered roller bearing:
- Press on tapered roller bearing as far as stop.
- Insert circlip of any thickness into groove.

- Push circlip upwards and measure gap between tapered roller bearing inner race and circlip using depth gauge.
- Remove circlip fitted for measurement.
- Select 1st circlip from table. For part numbers, refer to ⇒ Electronic parts catalogue .

Measuring range (mm)	Circlip thickness (mm)
3.84 ... 3.93	1.66
3.94 ... 4.02	1.75
4.03 ... 4.11	1.84
4.12 ... 4.20	1.93
4.21 ... 4.29	2.02
4.30 ... 4.38	2.11
4.39 ... 4.47	2.20
4.48 ... 4.56	2.29

- Fit 1st circlip.
- Determine the thickest 2nd circlip which will still just fit.
- Select circlip from table. For part numbers, refer to ⇒ Electronic parts catalogue .

Circlip thickness (mm)		
2.14	2.20	2.26
2.17	2.23	2.29

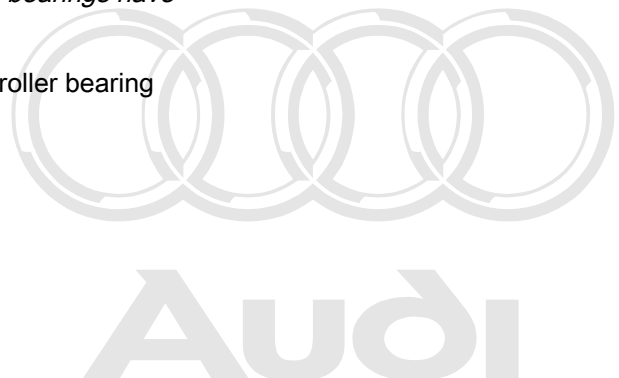
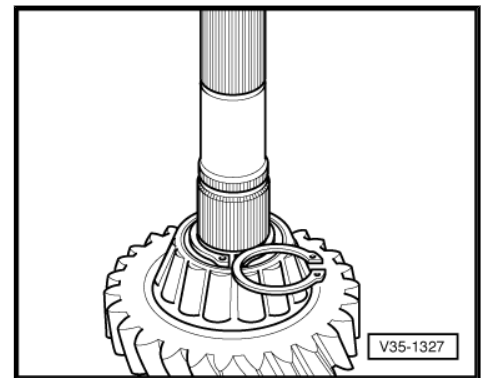
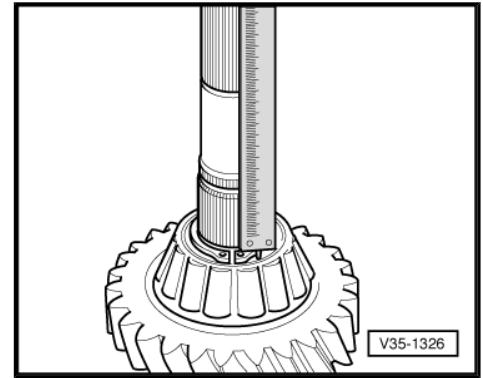
- Fit 2nd circlip in addition to 1st circlip.

6-speed gearbox only:



Note

- ◆ *The circlips for the tapered roller bearings and 6th gear wheel only have to be re-measured now (see below) if the pinion shaft or tapered roller bearings for pinion shaft are being renewed.*
- ◆ *If neither the pinion shaft nor the tapered roller bearings have been renewed, refit the original circlips.*
- Re-determine thickness of circlips for tapered roller bearing and 6th gear wheel:
- Press on tapered roller bearing as far as stop.
- Insert circlip of any thickness into groove.



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- Push circlip upwards and measure gap between tapered roller bearing inner race and circlip using depth gauge.
- Remove circlip fitted for measurement.
- Select 1st circlip from table. For part numbers, refer to ⇒ Electronic parts catalogue .

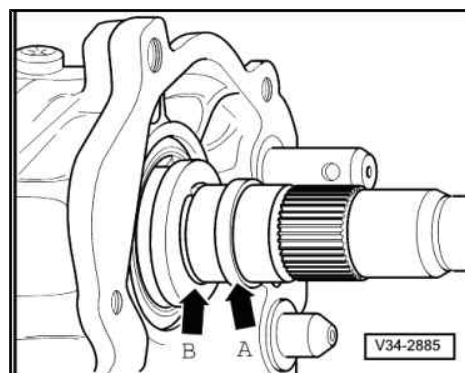
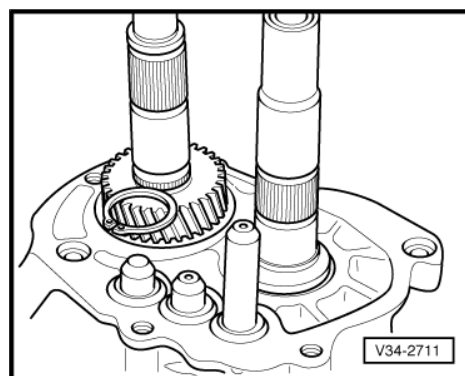
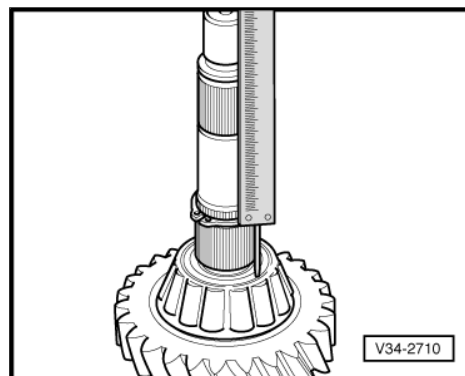
Measuring range (mm)	Circlip thickness (mm)
32.44 ... 32.53	1.66
32.54 ... 32.62	1.75
32.63 ... 32.71	1.84
32.72 ... 32.80	1.93
32.81 ... 32.89	2.02
32.90 ... 32.98	2.11
32.99 ... 33.07	2.20
33.08 ... 33.16	2.29

- Fit 1st circlip.
- Press 6th gear wheel onto stop.
- ◆ Installation position: shoulder towards bearing plate.
- Determine the thickest 2nd circlip which will still just fit.
- ◆ Specified axial clearance: max. 0.05 mm
- Select circlip from table. For part numbers, refer to ⇒ Electronic parts catalogue .

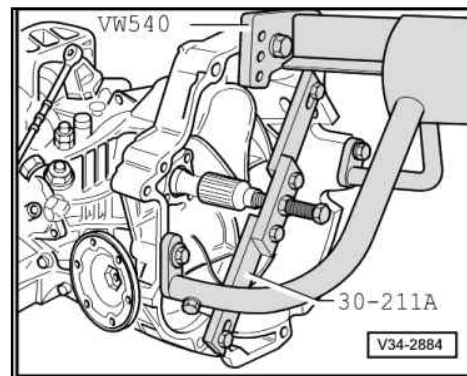
Circlip thickness (mm)		
2.11	2.20	2.29
2.14	2.23	
2.17	2.26	

- Fit 2nd circlip in addition to 1st circlip.
- Fit thrust washer -arrow A- for 6th speed selector gear needle bearing.
- ◆ Installation position: shoulder towards circlip -arrow B-, smooth contact surface towards end of shaft.
- Lubricate needle bearing for 6th speed selector gear with gear oil and fit in position.
- Fit 6th speed selector gear with spring and synchro-ring.
- ◆ Synchro-ring installation position: the lugs of the synchro-ring engage into the recesses below in the selector gear.

All versions:



- Support input shaft with support bridge -30-211A- .



Installation position of synchro-hub for 5th and 6th gear:

- ◆ Side with projecting face -arrow 1- faces end of shaft.
- ◆ The oil drilling of the input shaft -arrow 2- and the oil groove of the synchro-hub -arrow 3- are in line
- Heat synchro-hub for 5th and 6th gear to approx. 100 °C, fit and drive on; ensure there is no play.
- Check axial clearance of 6th speed selector gear.

5-speed gearbox only:

- Fit spacer -A- between bearing plate and yoke for 5th gear -B-.
- ◆ Installation position: larger diameter facing bearing plate.

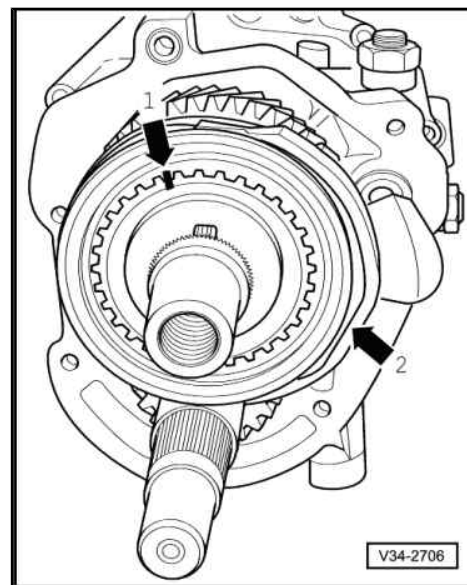
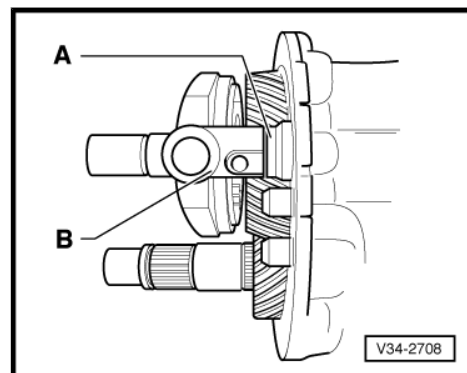
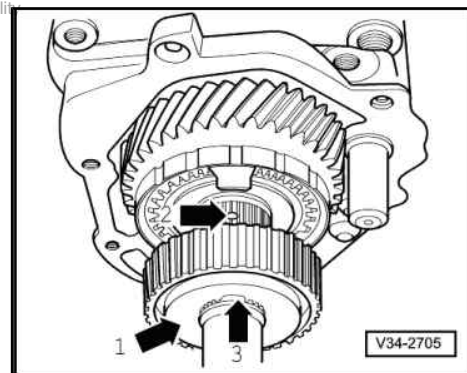
All versions:

- Align markings -arrow 1- on paired synchro-hub and locking collar for 5th and 6th gears.
- Fit locking collar with selector fork -arrow 2- onto synchro-hub, and at the same time fit yoke for 5th and 6th gears onto selector rod.



Note

- ◆ Rib on selector fork -arrow 2- must face towards end of shaft.
- ◆ When sliding yoke onto selector rod for 5th and 6th gear pay attention to holes for roll pin.

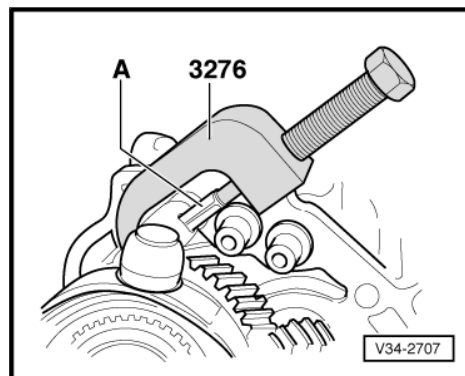


- Press in roll pin -A- so that it is flush.

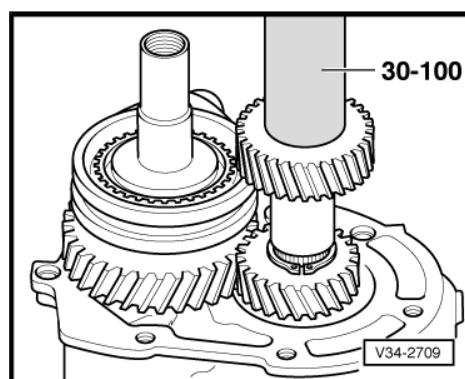


Note

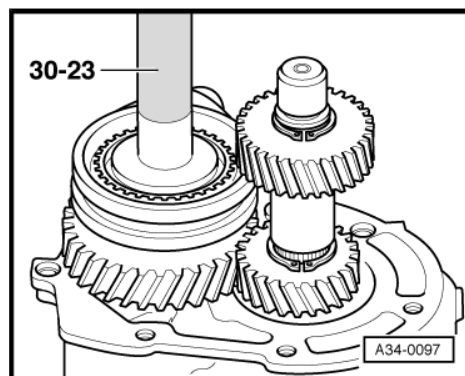
- ◆ Do not drive in roll pin, otherwise selector rod bearing will be damaged.
- ◆ When fitting the roll pin, the slot must be in line with the direction of force, as shown in the illustration.



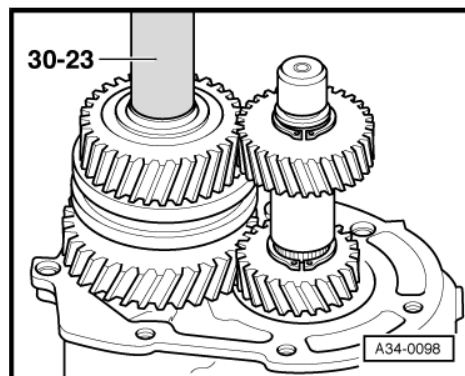
- Heat 5th gear wheel to approx. 100 °C, fit in position and drive onto stop so it is free of play.
- ◆ Installation position: shoulder towards bearing plate.
- Fit circlip.



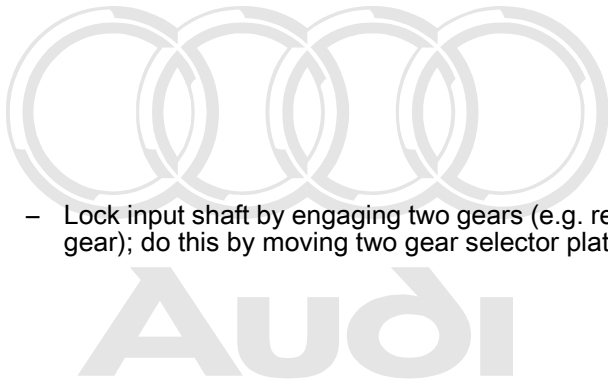
- Fit inner race for 5th speed selector gear needle bearing such that there is no axial clearance.
- Lubricate needle bearing with gear oil and fit bearing.
- Place synchro-ring for 5th gear in locking collar.
- Fit 5th speed selector gear with spring.



- Heat 1st inner race of four-point bearing (ball bearing side) for input shaft to approx. 100 °C, fit on input shaft and drive onto stop so it is free of play.
- Insert dowel sleeves in bearing plate.
- Fit new gasket for end cover.
- Fit end cover.
- Tighten bolts for end cover in diagonal sequence.



- Drive on 2nd inner race for four-point bearing (roller bearing side).
- Remove support bridge -30-211A- .

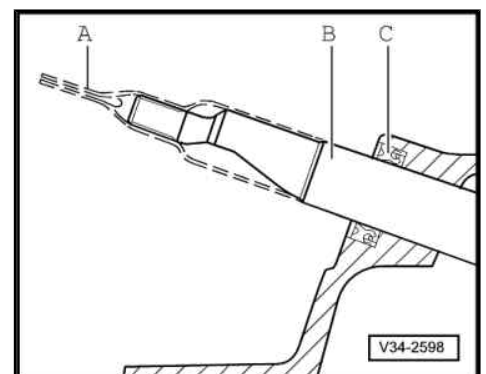
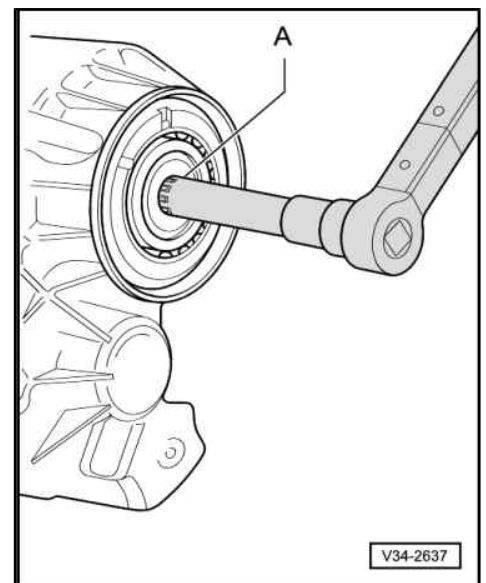
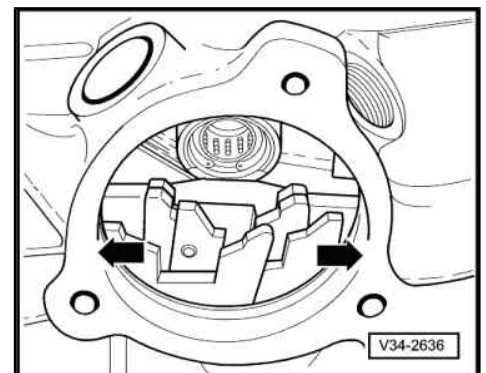
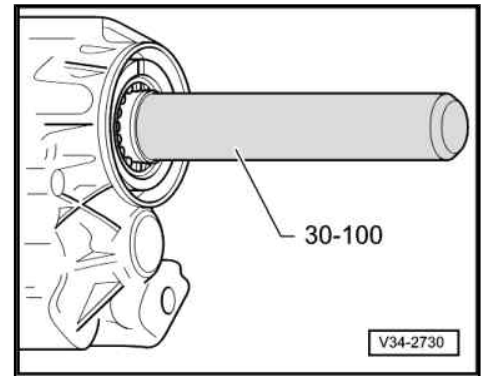


- Lock input shaft by engaging two gears (e.g. reverse and 2nd gear); do this by moving two gear selector plates -arrows-.

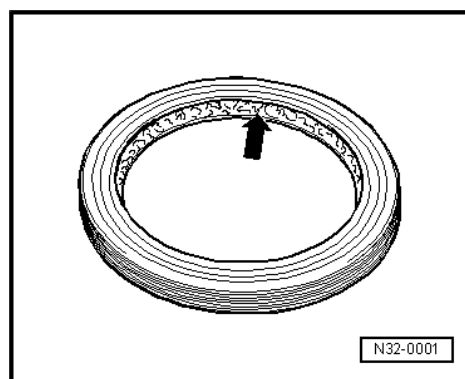
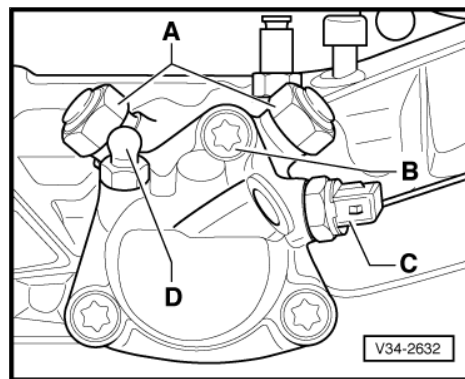
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- Tighten multi-point socket-head bolt -A- to 150 Nm.
- Press on new oil collector.
- ◆ Installation position: large oil holes and projections aligned with groove in end cover
- Press in new sealing cap.

- Push assembly sleeve -A- , -01E 311 120- , onto selector shaft -B-.
- Install complete selector shaft.



- Apply sealing paste -AMV 188 001 02- to locking bolts -A- for selector shaft, fit bolts in gearbox housing and tighten to 50 Nm.
- Lightly lubricate new O-ring for cover for selector shaft and fit in position.
- Fit cover for selector shaft.
- Apply sealing paste -AMV 188 001 02- to bolts -B- (3x), fit bolts and tighten.
- Make sure that input and output shafts are able to turn.
- ♦ Shafts will be difficult to turn when parts have been renewed.
- Fit a thin insulating hose tightly over splines of input shaft.
- Before installing new oil seal for input shaft, lightly oil the outer circumference of the seal and fill the space between the sealing lips -arrow- about half full with grease -G 052 128 A1- .



- Drive in input shaft oil seal.

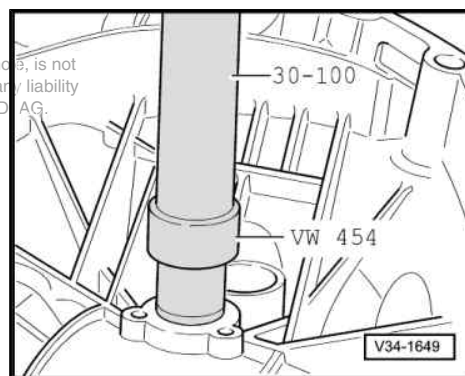
Installation depth: 3.5 mm



Note

Driving-in depth when re-installing a used input shaft (repairs): 4.5 mm.

- Remove insulating hose.
- Install release bearing, clutch release lever and guide sleeve ⇒ [page 25](#) .
- Select all gears.
- Check gear oil level in gearbox ⇒ [page 80](#) .



7 End cover

Overview

◆ ⇒ „7.1 Exploded view - end cover“, page 103

◆ ⇒ „7.2 Servicing end cover“, page 104

7.1 Exploded view - end cover

1 - End cover

- ☐ If renewed, re-determine thickness of circlip
⇒ [Item 4 \(page 103\)](#)

2 - Roller bearing for input shaft

- ☐ Pressing out
⇒ [page 105](#)
- ☐ Pressing in flush
⇒ [page 106](#)

3 - Four-point bearing for input shaft

- ☐ Removing ⇒ [page 106](#)
- ☐ Installing ⇒ [page 106](#)
- ☐ If renewed, re-determine thickness of circlip
⇒ [Item 4 \(page 103\)](#)

4 - Circlip

- ☐ Re-determining thickness ⇒ [page 106](#)
- ☐ Installing ⇒ [page 106](#)

5 - Baffle plate

- ☐ Always renew
- ☐ Removing ⇒ [page 106](#)
- ☐ Installing and peening in position when renewing four-point bearing for input shaft ⇒ [page 107](#)
- ☐ Installing and peening in position when renewing end cover ⇒ [page 107](#)

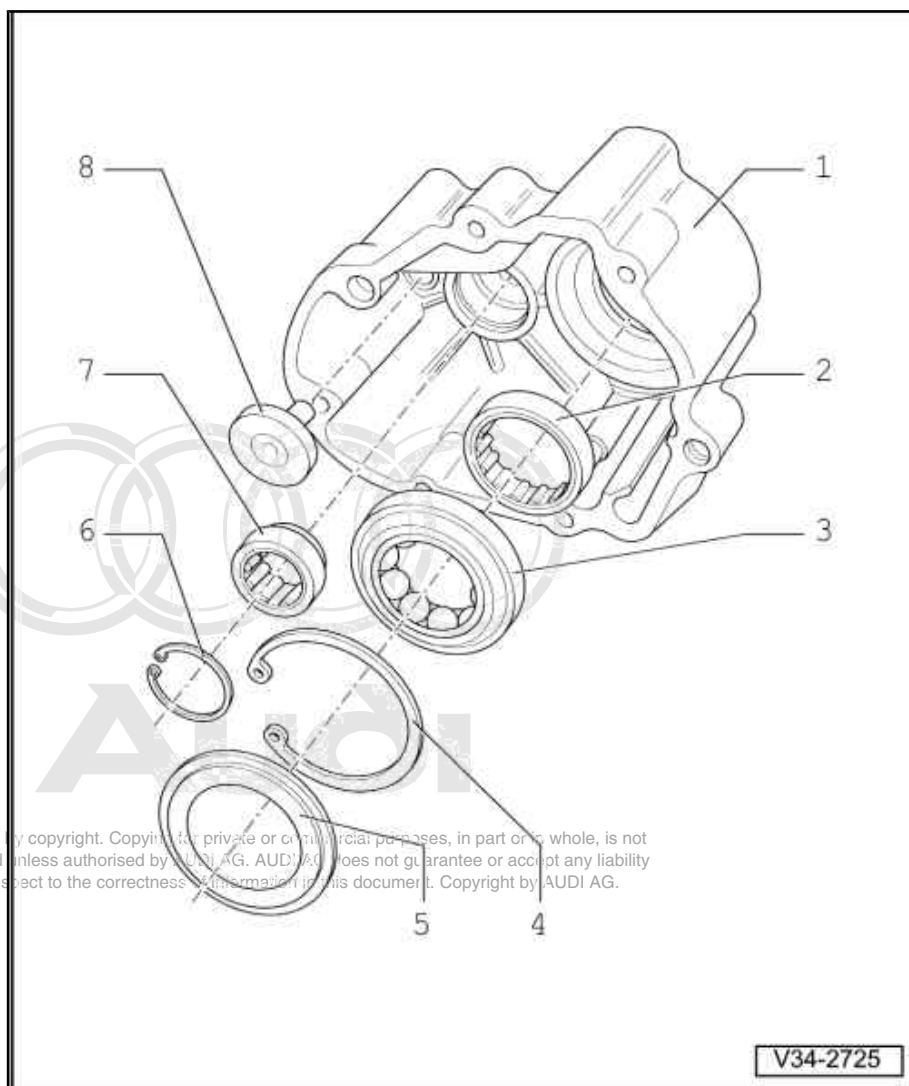
6 - Circlip

7 - Roller bearing for pinion shaft

- ☐ Will be damaged during removal
- ☐ Always renew
- ☐ Pulling out ⇒ [page 107](#)
- ☐ Driving in ⇒ [page 108](#)
- ☐ Installation position ⇒ [page 108](#)

8 - Magnet

- ☐ Old magnet is destroyed if renewed
- ☐ Drive in new magnet, for example with press tool -VW 408 A-

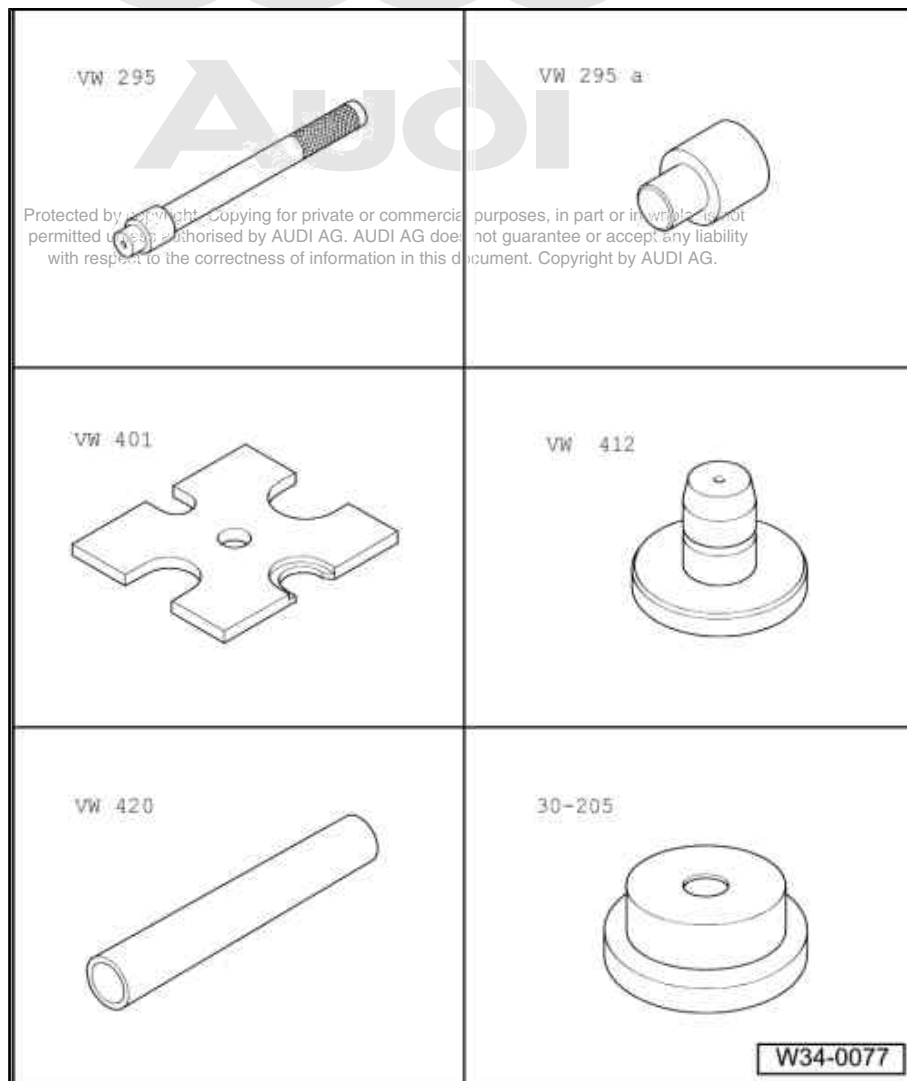




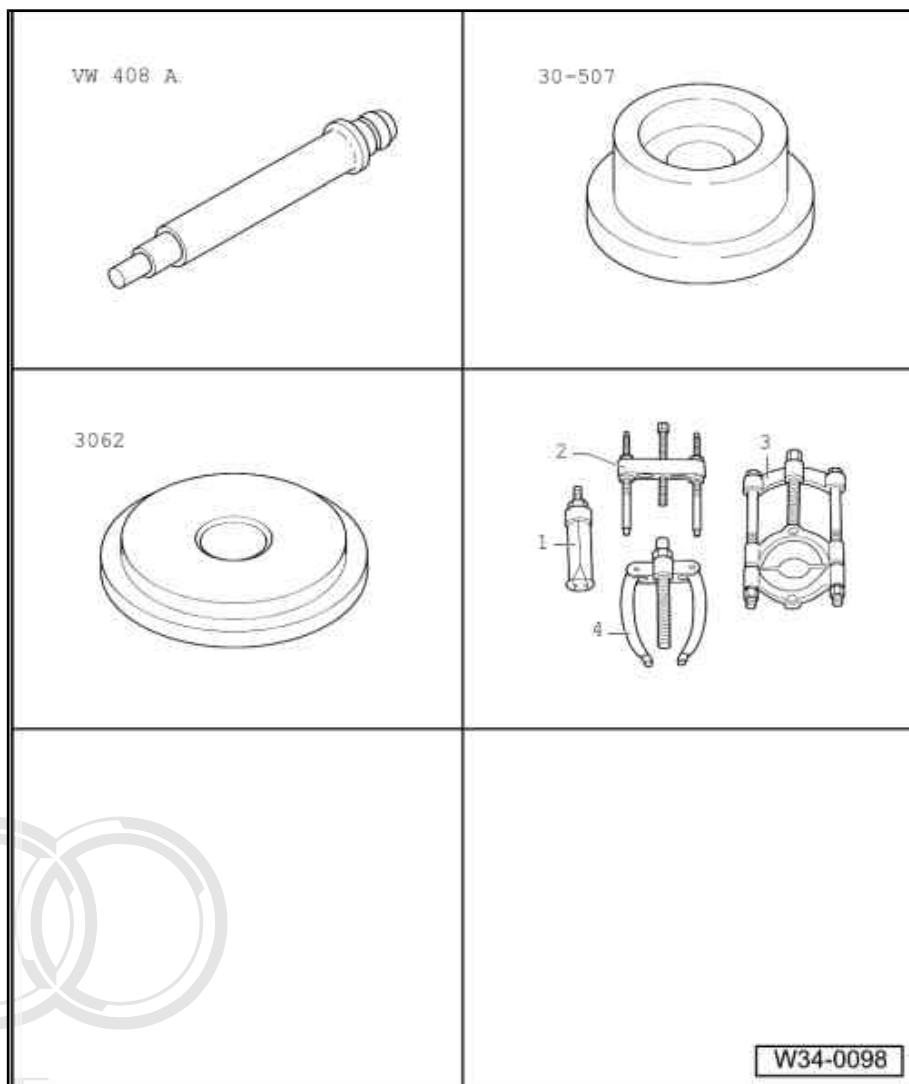
7.2 Servicing end cover

Special tools and workshop equipment required

- ◆ Drift -VW 295-
- ◆ Adapter -VW 295A-
- ◆ Thrust plate -VW 401-
- ◆ Press tool -VW 412-
- ◆ Tube -VW 420-
- ◆ Thrust plate -30-205-

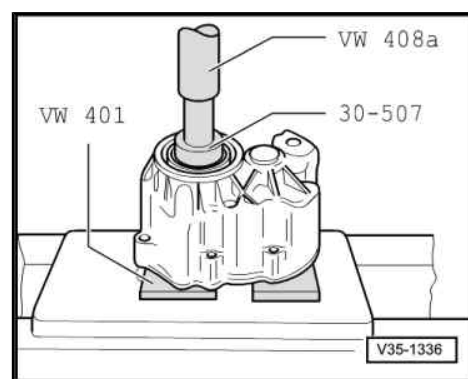


- ◆ Press tool -VW 408 A-
- ◆ Press tool -30-507-
- ◆ Thrust pad -3062-
- ◆ -1- Internal puller -Kukko 21/4-
- ◆ -4- Counter-support -Kukko 22/1-
- ◆ Depth gauge



Pressing roller bearing for input shaft out of end cover

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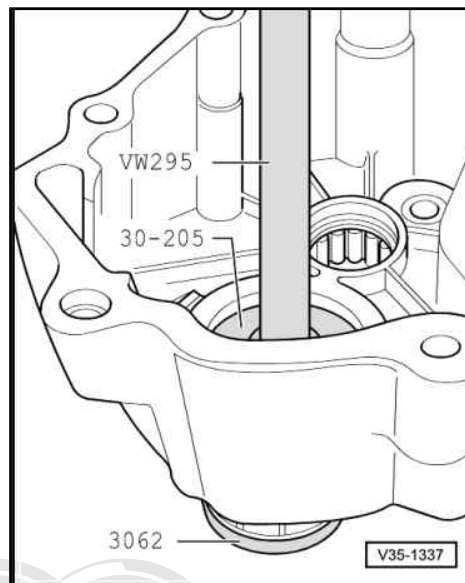
Pressing roller bearing for input shaft into end cover

Place thrust plate -30-205- onto bearing with recess facing upwards.



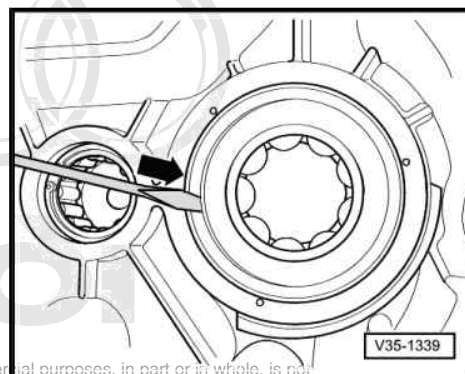
Note

To press in the roller bearing, place thrust pad -3062- under the seating collar for the roller bearing on the end cover.



Removing four-point bearing for input shaft from end cover

- Position screwdriver as illustrated, drive into baffle plate -arrow- and lever out.
- Remove circlip.
- Take out bearing and remove peening marks if necessary.



Installing four-point bearing for input shaft in end cover

Installation position of circlip:

- ◆ Ends of circlip -arrows- towards roller bearing for pinion shaft.



Note

The thickness of the circlip must be re-determined if the bearing or the end cover are renewed.

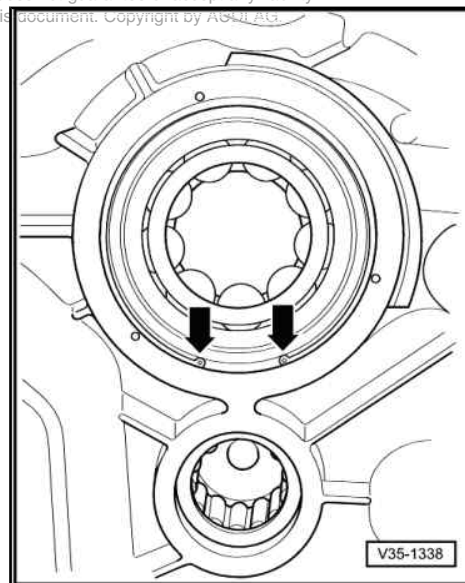
Determining thickness of circlip for four-point bearing for input shaft

- Press outer race of four-point bearing onto stop.
- Determine the thickest circlip which will still just fit.
- ◆ Axial play: max. 0.08 mm
- Select circlip from table. For part numbers, refer to ⇒ Electronic parts catalogue .

Circlips available

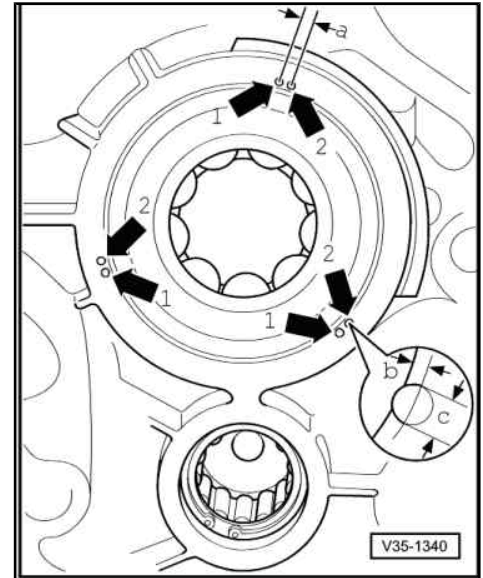
Circlip thickness (mm)	
2.55	2.65
2.60	2.70

- Fit circlip.

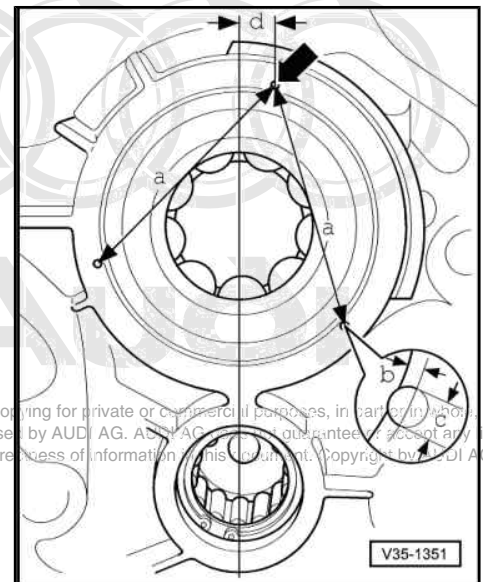


Peening baffle plate in position when renewing four-point bearing for input shaft

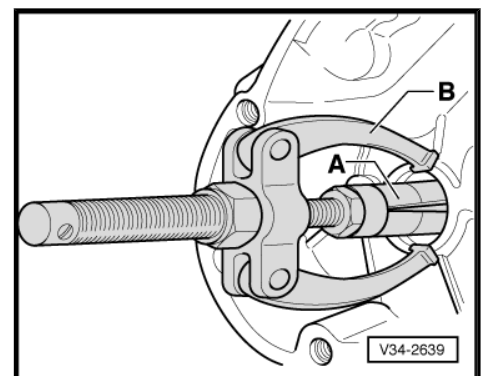
- Use a blunt punch with a ball shaped end (ball diameter 5 mm) to peen in position.
- Insert baffle plate.
- First peen at points marked with -arrows 1-.
- Then peen at points marked with -arrows 2- at distance -a- from first position.
- ◆ Dimension -a- = 5 mm
- Observe position and diameter of peening marks:
- ◆ Dimension -b- = 2 mm
- ◆ Dimension -c- = 3 mm

**Peening baffle plate in position when renewing end cover**

- Use a blunt punch with a ball shaped end (ball diameter 5 mm) to peen in position.
- Insert baffle plate.
- Peen in first peening point -arrow- at a distance -d- from the centre line of the two shafts.
- ◆ Dimension -d- = 10 mm
- Observe position and diameter of peening marks:
- ◆ Dimension -b- = 2 mm
- ◆ Dimension -c- = 3 mm
- Peen in second and third peening points in the same manner at distance -a-.
- ◆ Dimension -a- = 70 mm

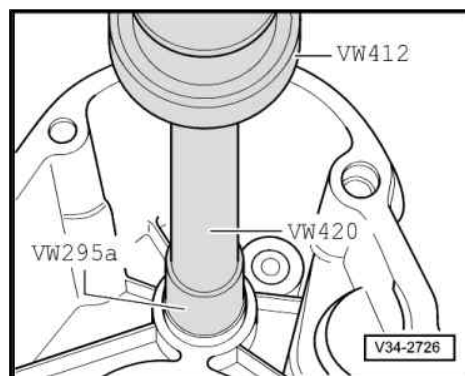
**Pulling roller bearing for pinion shaft out of end cover**

- Remove circlip.
- A - Internal puller 22... 28 mm -Kukko 21/4-
- B - Counter-support -Kukko 22/1-



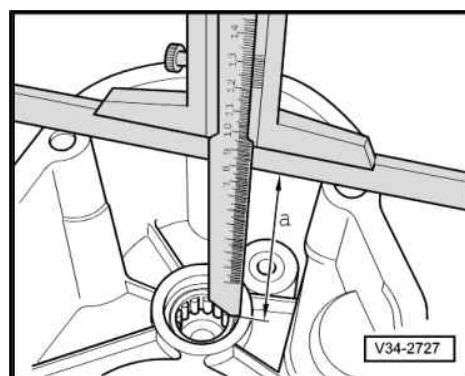
Driving roller bearing for pinion shaft into end cover

- Note installation position ⇒ [page 108](#) .



Installation position of roller bearing for pinion shaft

- Dimension -a- = 98.6 mm



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8 Bearing plate

Overview

- ◆ ⇒ „8.1 Exploded view - bearing plate“, page 109
- ◆ ⇒ „8.2 Servicing bearing plate“, page 111
- ◆ ⇒ „8.3 Re-determining thickness of shim S4“, page 113

8.1 Exploded view - bearing plate

1 - Bearing plate

- ☐ If renewed, re-determine thickness of shim „S4“

2 - Outer race for tapered roller bearing for pinion shaft

- ☐ Driving out ⇒ [page 144](#)
- ☐ Pressing in ⇒ [page 145](#)
- ☐ If renewed, re-determine thickness of shim „S4“

3 - Shim „S4“

- ☐ Table of adjustments ⇒ [page 168](#)
- ☐ Re-determining ⇒ [page 113](#)

4 - Roller bearing for input shaft

- ☐ Pressing out ⇒ [page 113](#)
- ☐ Pressing in ⇒ [page 113](#)
- ☐ Measuring installation depth ⇒ [page 113](#)

5 - Ball sleeves

- ☐ For selector rods
- ☐ Removing and installing ⇒ [page 111](#)
- ☐ Renew after removing

6 - Bolt

- ☐ 35 Nm
- ☐ For relay lever

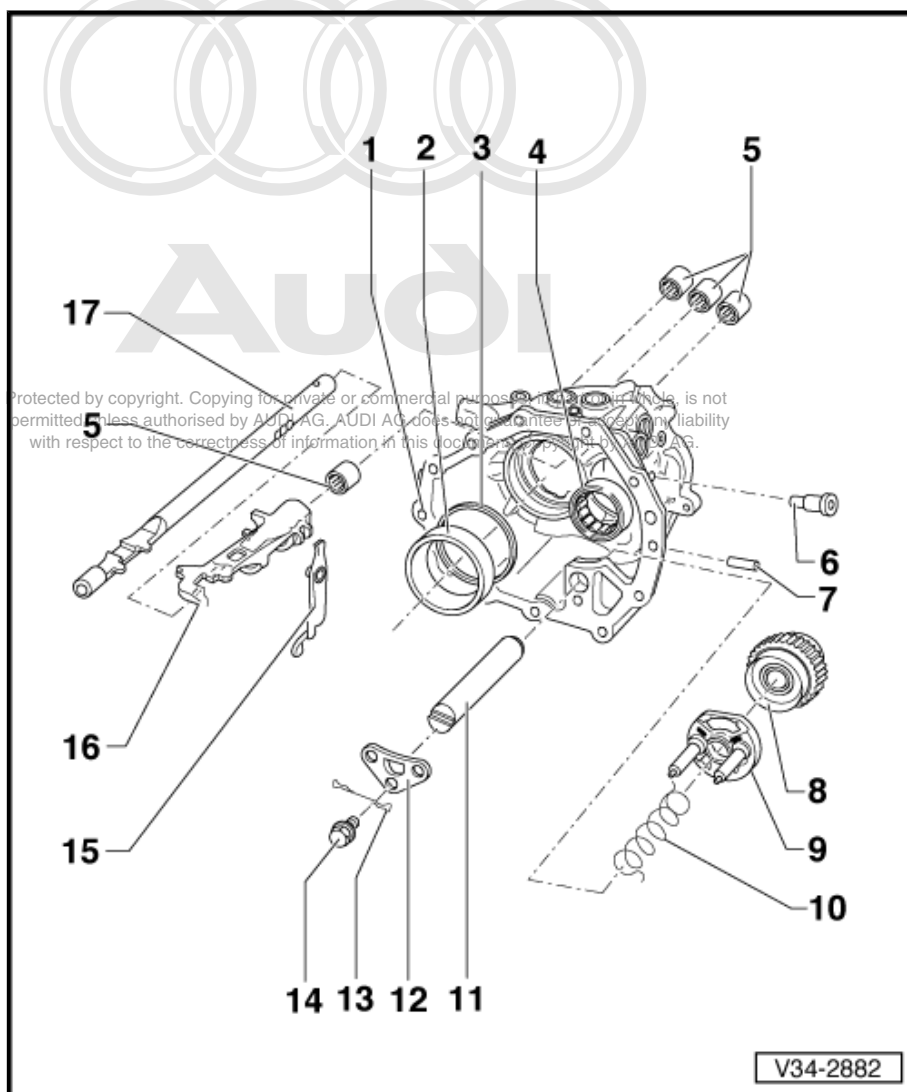
7 - Dowel pin (7 x 28)

- ☐ Press in flush

8 - Reverse selector gear

9 - Synchro-ring for reverse gear

- ☐ With locking pins
- ☐ Checking for wear ⇒ [page 112](#)
- ☐ Installation position: flat on circumference of synchro-ring faces towards input shaft ⇒ [page 94](#)





10 - Spring

- ☐ Installation position: hook single angled end into recess on synchro-ring. Turn double angled end anti-clockwise and insert into opening on bearing plate.

11 - Shaft for reverse selector gear

12 - Retaining plate

- ☐ Installation position: chamfers of holes for locking pins of synchro-ring face towards bearing plate
⇒ [page 95](#)

13 - Spring clip

14 - Bolt

- ☐ 25 Nm
- ☐ Self-locking
- ☐ Renew

15 - Relay lever for reverse gear

16 - Yoke for reverse gear

- ☐ Pulling out ball sleeve ⇒ [page 112](#)
- ☐ Driving in ball sleeve ⇒ [page 112](#)

17 - Selector rod for 5th and 6th gear

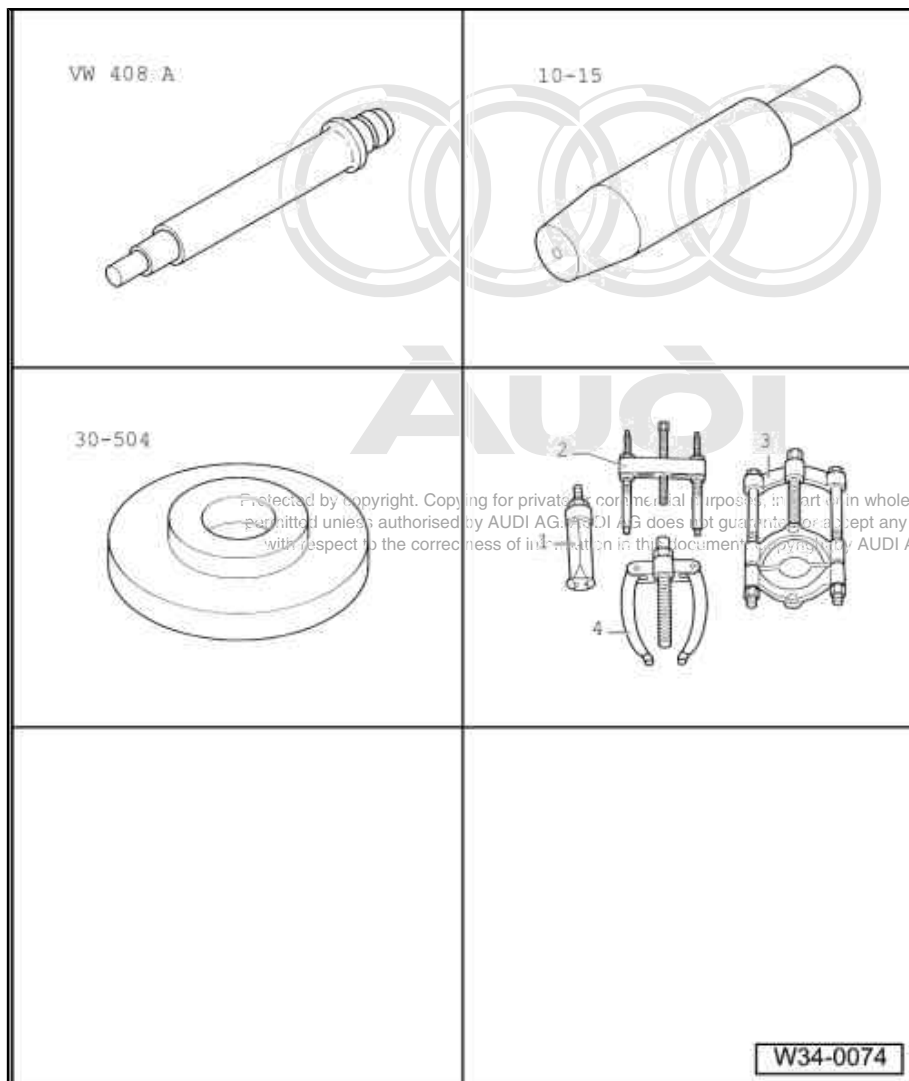
- ☐ Renew only complete with yoke ⇒ [Item 6 \(page 83\)](#)

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8.2 Servicing bearing plate

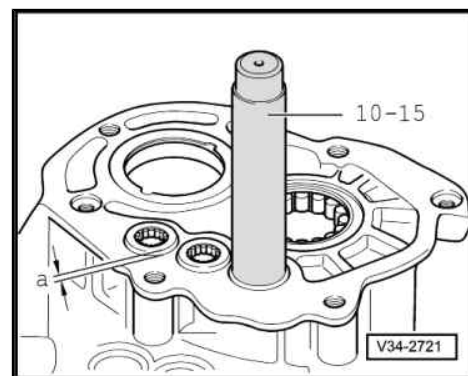
Special tools and workshop equipment required

- ◆ Press tool -VW 408 A-
- ◆ Guide pin -10-15-
- ◆ Press tool -30-504-
- ◆ -1- Internal puller -Kukko 21/2-
- ◆ -4- Counter-support -Kukko 22/1-



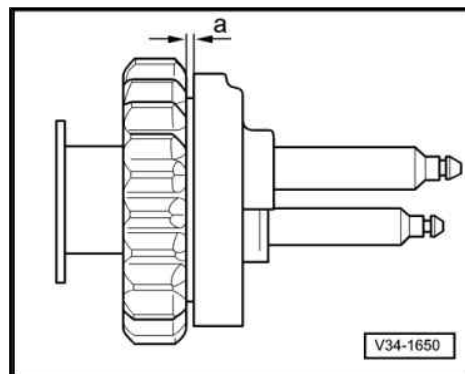
Removing and installing ball sleeves for selector rods

- ◆ Install ball sleeve so the lettering (side with thicker metal) faces towards installing tool.
- ◆ Dimension for pressing in -a- = 2.5 mm



Checking synchro-ring for wear

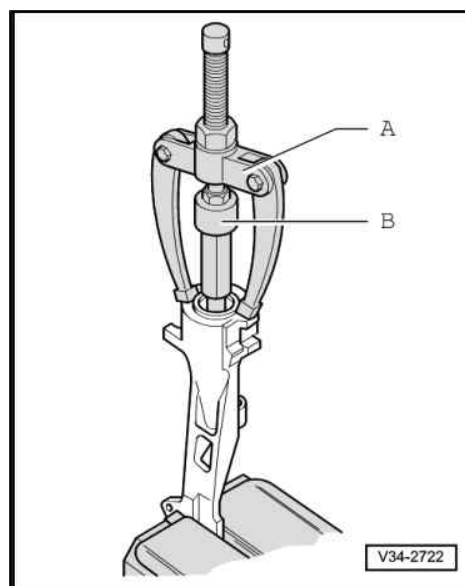
- Press synchro-ring against cone on selector gear.
- Measure gap -a- with a feeler gauge:
- Dimension, new: 0.75 ... 2.3 mm.
- Wear limit 0.2 mm.



Pulling ball sleeve out of yoke for reverse gear

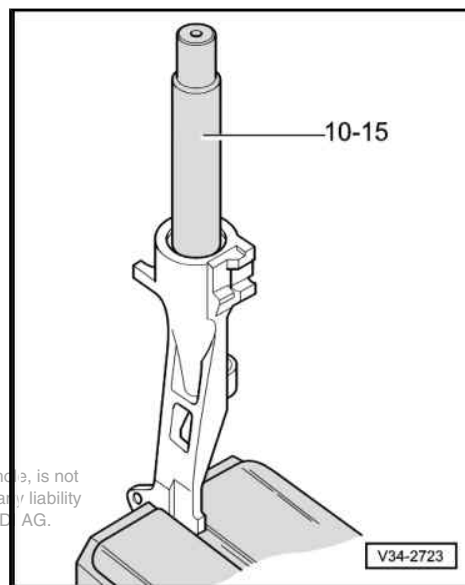
A - Counter-support -Kukko 22/1-

B - Internal puller 14.5... 18.5 mm -Kukko 21/2-



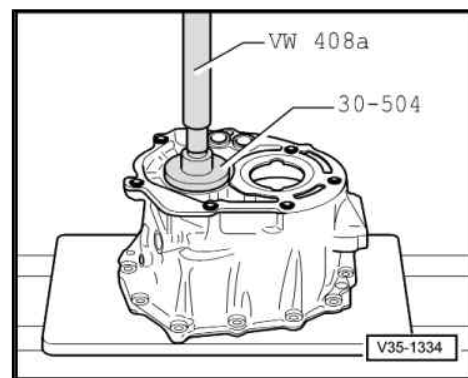
Driving ball sleeve flush into yoke for reverse gear

- ◆ Install ball sleeve with the inscribed side (thicker metal) facing the drift.



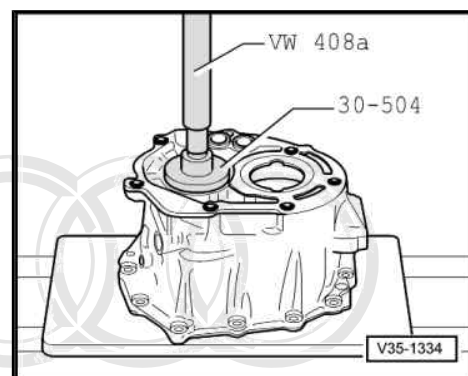
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Pressing roller bearing for input shaft out of bearing plate



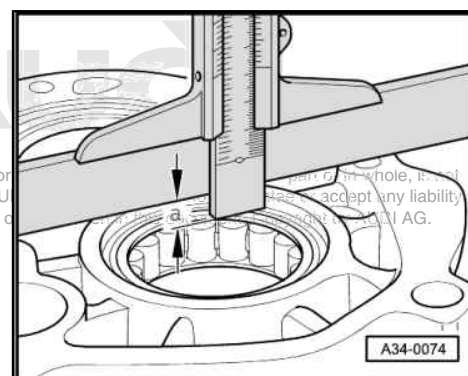
Pressing roller bearing for input shaft into bearing plate

- Measuring installation depth [⇒ page 113](#)



Measuring installation depth of roller bearing for input shaft

- Installation depth -a- = 7 mm.



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8.3 Re-determining thickness of shim „S4“

This adjustment is necessary when the following components are renewed:

- ◆ Bearing plate
- ◆ Inner race for 1st speed selector gear needle bearing
- ◆ Synchro-hub for 1st and 2nd gear
- ◆ Inner race for 2nd speed selector gear needle bearing
- ◆ 3rd gear wheel
- ◆ Spacer sleeve
- ◆ 4th gear wheel

The procedure restores the required preload of the tapered roller bearings for the pinion shaft.

- 1 - Bearing plate
- 2 - Shim „S4“
- 3 - Needle bearing inner race for 1st speed selector gear
- 4 - Synchro-hub for 1st and 2nd gear
- 5 - Needle bearing inner race for 2nd speed selector gear
- 6 - 3rd gear wheel
- 7 - Spacer sleeve
- 8 - 4th gear wheel
- 9 - Pinion shaft

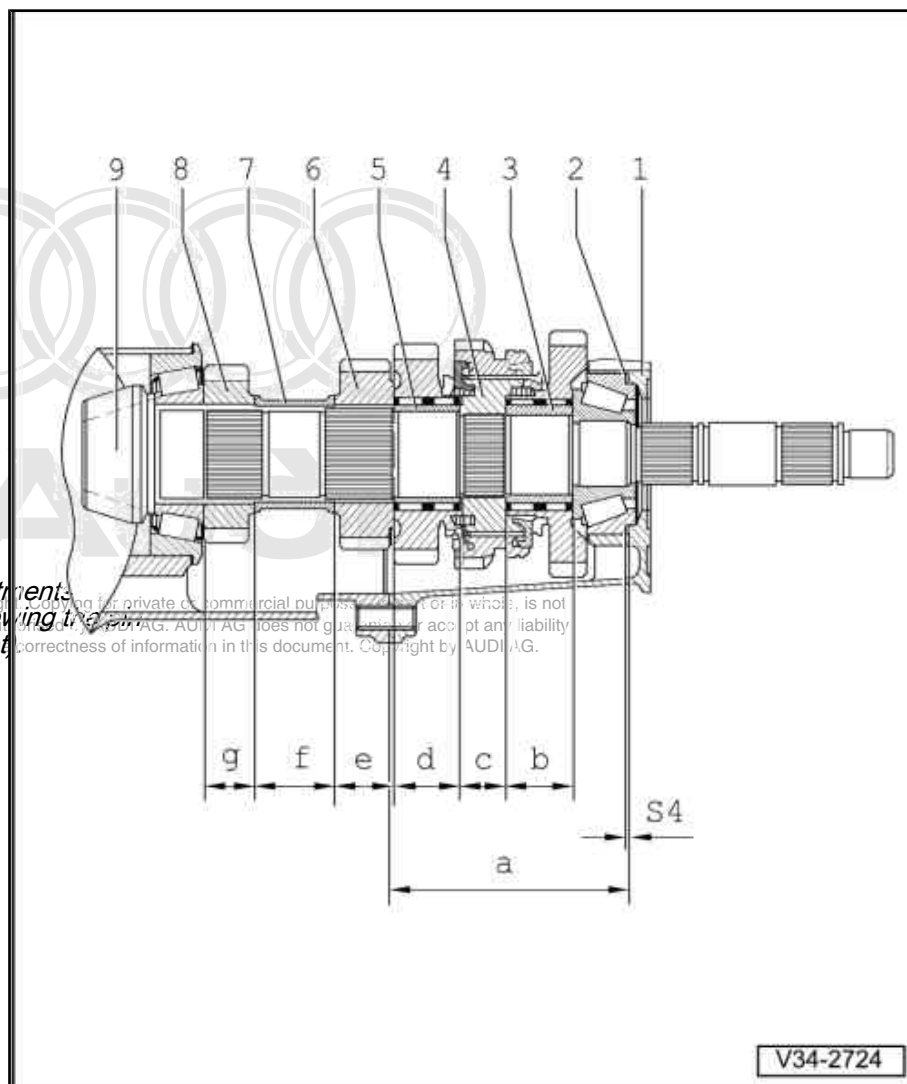


Note

Refer to table of adjustments

⇒ **page 168** when renewing the pinion shaft (final drive set)

- a - Bearing plate housing depth
- b - Length of needle bearing inner race for 1st speed selector gear
- c - Length of centre of synchro-hub for 1st and 2nd gears
- d - Length of needle bearing inner race for 2nd speed selector gear
- e - Length of 3rd gear wheel
- f - Length of spacer sleeve
- g - Length of 4th gear wheel
- S4 - Thickness of shim „S4“



V34-2724

8.3.1 A - Determining thickness of shim when renewing bearing plate

- Use depth gauge (accurate to within $\frac{5}{100}$ mm or less)

- Measure difference in depth -a- on old and new bearing plates.

Example:

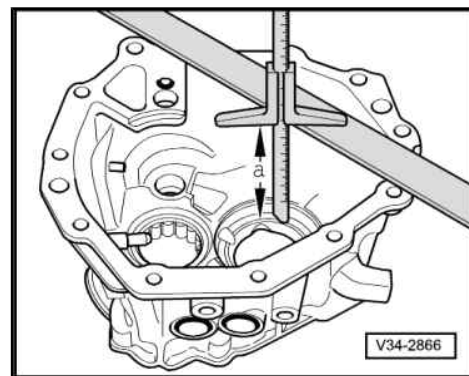
Depth -a- (old bearing plate)	118.40 mm
Depth -a- (new bearing plate)	118.65 mm
Difference	= 0.25 mm

- If the new bearing plate is deeper, install a thicker „S4“ shim.
- If the old bearing plate is deeper, install a thinner „S4“ shim.

Example:

Previous shim „S4“	0.95 mm
Difference	+ 0.25 mm
New shim „S4“	= 1.20 mm

Shims available ⇒ [page 177](#) .



8.3.2 B - Determining thickness of shim when renewing needle bearing for 1st gear

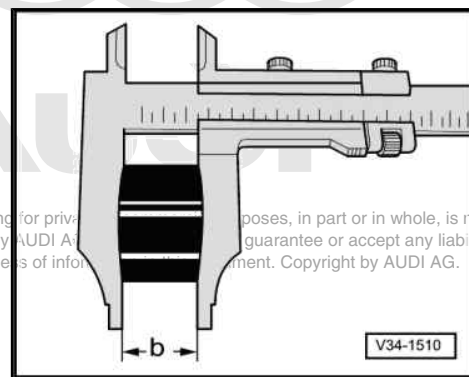
- Use a caliper gauge which is accurate to within at least ⁵/₁₀₀ mm.
- Measure difference in length -b- on old and new needle bearing inner races.

Example:

Length -b- on old inner race	33.35 mm
Length -b- on new inner race	33.40 mm
Difference	= 0.05 mm

- If the old inner race is longer, install a thicker „S4“ shim.
- If the old inner race is shorter, install a thinner „S4“ shim.

Shims available ⇒ [page 177](#) .



8.3.3 C - Determining thickness of shim

Determining thickness of shim when renewing components

⇒ [Item 4 \(page 114\)](#) to ⇒ [Item 8 \(page 114\)](#)

- Use a caliper gauge which is accurate to within at least ⁵/₁₀₀ mm.
- Determine difference in dimensions between old and new component in the same manner.
- ◆ Length of centre of synchro-hub ⇒ [Item c \(page 114\)](#) for 1st and 2nd gears (⇒ [Item 4 \(page 114\)](#)).
- ◆ Length of needle bearing inner race ⇒ [Item d \(page 114\)](#) for 2nd speed selector gear (⇒ [Item 5 \(page 114\)](#)).
- ◆ Length ⇒ [Item e \(page 114\)](#) of 3rd gear wheel (⇒ [Item 6 \(page 114\)](#)).
- ◆ Length ⇒ [Item f \(page 114\)](#) of spacer sleeve (⇒ [Item 7 \(page 114\)](#)).
- ◆ Length ⇒ [Item g \(page 114\)](#) of 4th gear wheel (⇒ [Item 8 \(page 114\)](#)).



- Determine shim(s) according to table ⇒ [page 177](#) . For part numbers, refer to ⇒ Electronic parts catalogue .



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9 Gearbox housing

Overview

- ◆ ⇒ „9.1 Exploded view - gearbox housing“, page 117
- ◆ ⇒ „9.2 Servicing gearbox housing“, page 120
- ◆ ⇒ „9.3 Dismantling and assembling selector shaft assembly“, page 126

9.1 Exploded view - gearbox housing

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Note

- ◆ Refer to general repair instructions ⇒ [page 5](#).
- ◆ Adjustment work is required when renewing the parts marked with ¹⁾ ⇒ „4.3 Table of adjustments“, page 168.

1 - Oil seal

- ☐ For flange shaft
- ☐ Pulling out ⇒ [page 122](#)
- ☐ Driving in ⇒ [page 122](#)
- ☐ Pack space between sealing lip and dust lip half full with sealing grease -G 052 128 A1-
- ☐ Renewing with gearbox installed ⇒ [page 146](#)

2 - Cover for final drive ¹⁾

3 - O-ring

- ☐ For cover for final drive
- ☐ Renew

4 - Shim „S1“

- ☐ Note thickness
- ☐ Table of adjustments ⇒ [page 168](#)

5 - Outer race for large tapered roller bearing ¹⁾

- ☐ For differential
- ☐ Driving out and driving in ⇒ [page 165](#)

6 - Outer race for small tapered roller bearing ¹⁾

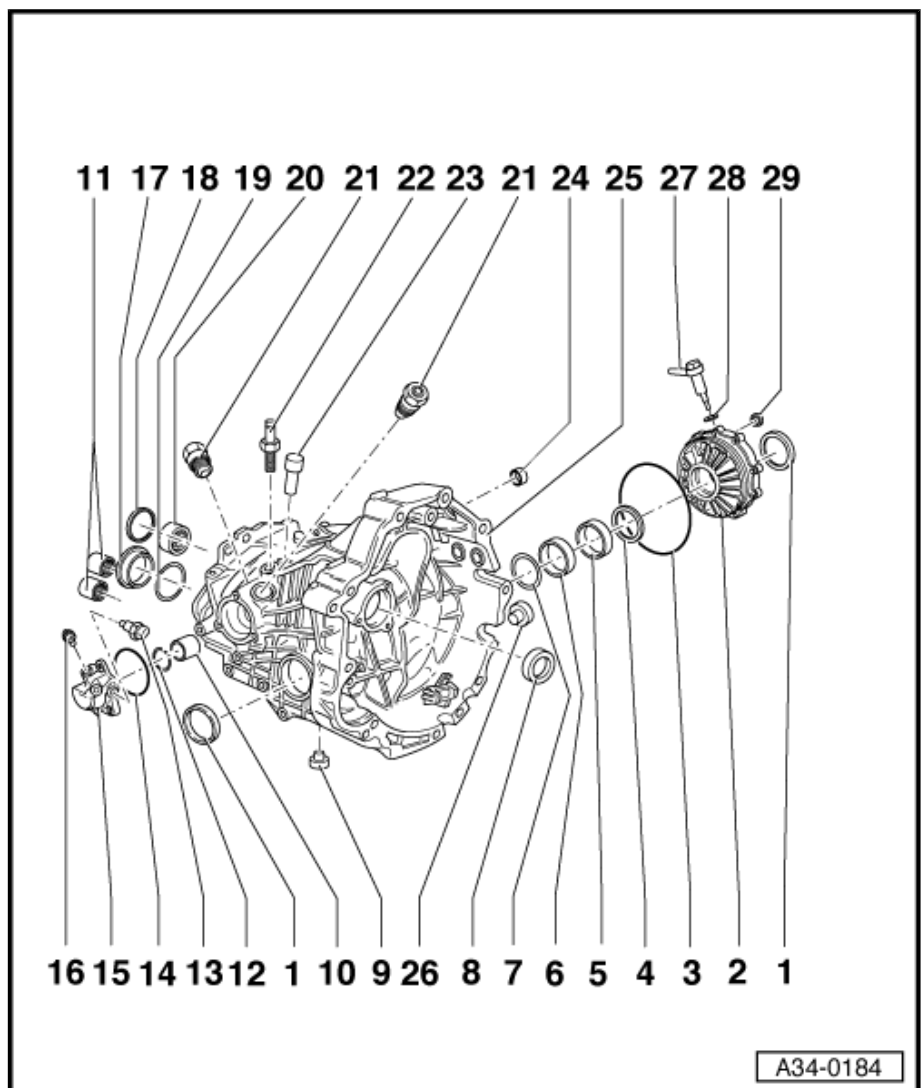
- ☐ For differential
- ☐ Driving out and driving in ⇒ [page 164](#)

7 - Shim „S2“

- ☐ Note thickness
- ☐ Table of adjustments ⇒ [page 168](#)

8 - Oil seal

- ☐ For input shaft
- ☐ Levering out ⇒ [page 122](#)





- ☐ Driving in [⇒ page 123](#)
- ☐ Always renew if input shaft is removed
- ☐ Renewing when gearbox is not dismantled [⇒ page 123](#) and [⇒ page 123](#)

9 - Oil drain plug

- ☐ 40 Nm

10 - Ball sleeve

- ☐ For selector shaft
- ☐ Renew after removing
- ☐ Pulling out [⇒ page 123](#)
- ☐ Driving in [⇒ page 123](#)

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11 - Ball sleeves

- ☐ For selector rods
- ☐ Renew after removing
- ☐ Pulling out as for [⇒ Item 10 \(page 118\)](#) , [⇒ page 123](#)
- ☐ Driving in as for [⇒ Item 10 \(page 118\)](#) , [⇒ page 123](#)

12 - Circlip

- ☐ Installation position: eyes facing up

13 - Reversing light switch -F4-

- ☐ Removing and installing [⇒ page 125](#)

14 - O-ring

- ☐ For cover for selector shaft
- ☐ Renew

15 - Selector shaft cover

- ☐ Removing [⇒ page 90](#)
- ☐ Installing [⇒ page 102](#)

16 - Ball-head pin

- ☐ 20 Nm
- ☐ For connecting rod

17 - Outer race for large tapered roller bearing ¹⁾

- ☐ For pinion shaft
- ☐ Pulling out [⇒ page 140](#)
- ☐ Pressing in [⇒ page 141](#) and [⇒ page 141](#)

18 - Circlip

- ☐ Removing [⇒ page 126](#)

19 - Shim „S3“

- ☐ Note thickness
- ☐ Table of adjustments [⇒ page 168](#)

20 - Needle bearing for input shaft

- ☐ Pulling out [⇒ page 125](#)
- ☐ Driving in [⇒ page 125](#)
- ☐ Measuring installation depth [⇒ page 125](#)

21 - Locking bolt for selector shaft

- ☐ Removing [⇒ page 90](#)
- ☐ Fit bolt with sealing paste -AMV 188 001 02- [⇒ page 102](#)
- ☐ Tighten to 50 Nm

22 - Trunnion bolt

- ☐ 40 Nm

- ☐ For push rod

23 - Breather

- ☐ Clip cap on
- ☐ Installation depth of sleeve ⇒ [page 124](#)

24 - Oil seal for selector shaft

- ☐ Can be renewed when gearbox is removed but not dismantled
- ☐ Pulling out ⇒ [page 124](#)
- ☐ Driving in ⇒ [page 124](#)
- ☐ Always use assembly sleeve for installing ⇒ [page 124](#)

25 - Gearbox housing ¹⁾

26 - Magnet

- ☐ Clean
- ☐ Drive in (for example, with press tool -VW 408 A- when renewing gearbox)

27 - Speedometer sender -G22-

- ☐ Removing and installing ⇒ [page 152](#)

28 - O-ring

- ☐ Renew

29 - Oil filler plug

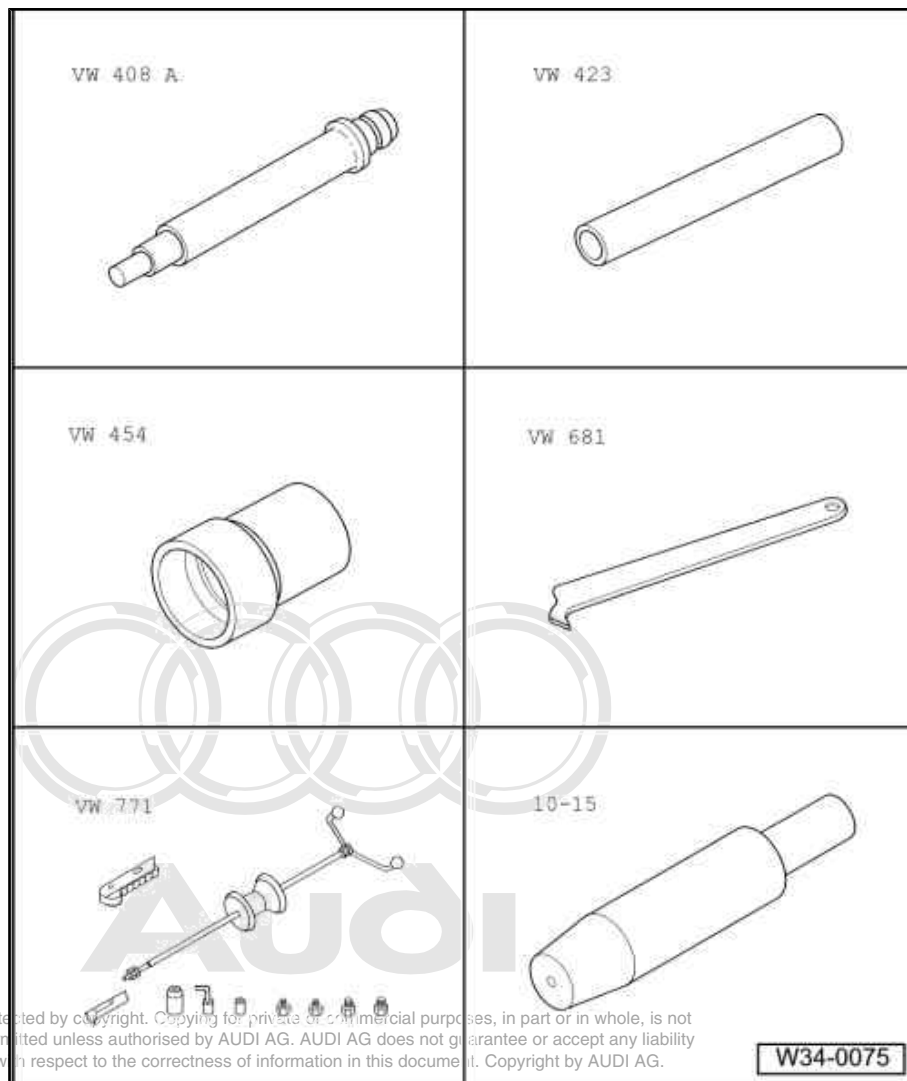
- ☐ 40 Nm

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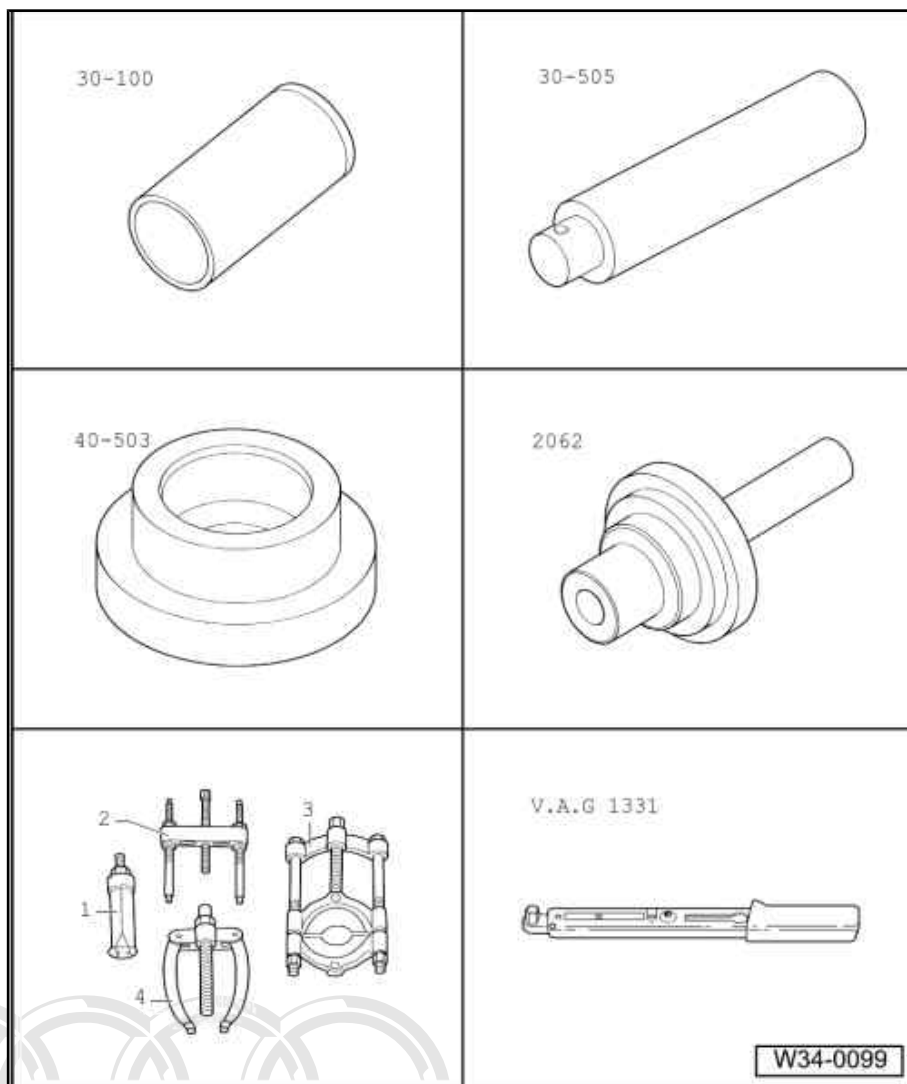
9.2 Servicing gearbox housing

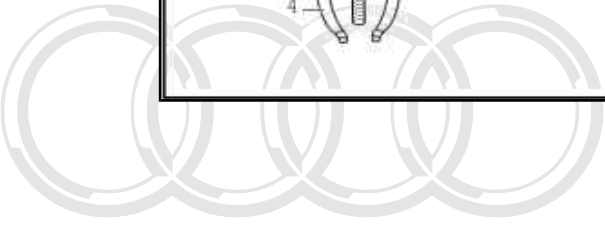
Special tools and workshop equipment required

- ◆ Press tool -VW 408 A-
- ◆ Tube -VW 423-
- ◆ Press tool -VW 454-
- ◆ Oil seal extractor lever - VW 681-
- ◆ Multi-purpose tool - VW 771-
- ◆ Guide pin -10-15-



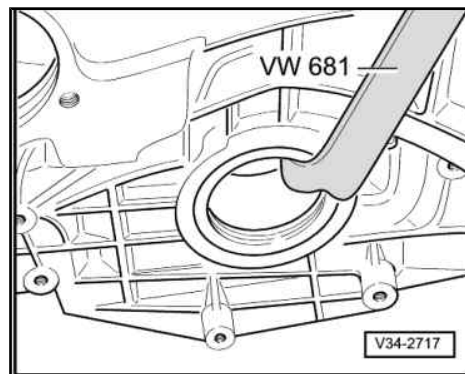
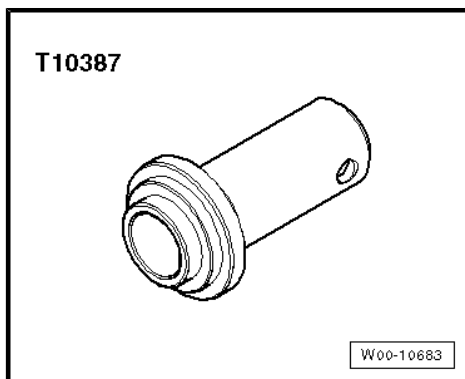
- ◆ Drift sleeve -30-100-
- ◆ Mandrel -30-505-
- ◆ Installing tool -40-503-
- ◆ Punch -2062-
- ◆ -1- Internal puller -Kukko 21/2-
- ◆ -1- Internal puller -Kukko 21/5-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Sealing grease - G 052 128 A1-




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- ◆ Thrust piece - T10387-



- ◆ Sealing grease - G 052 128 A1-
- ◆ Sealing paste -AMV 188 001 02-

Extracting flange shaft oil seal



Note

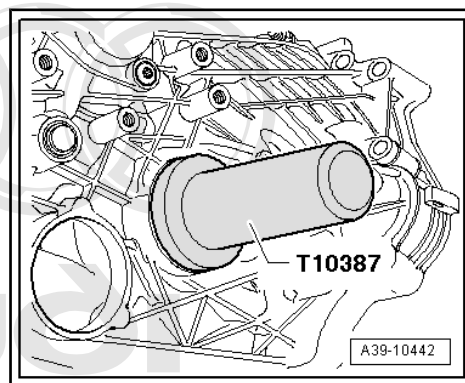
- ◆ *Illustration shows removing seal on right-hand side.*
- ◆ *The procedure is identical for left and right oil seals.*

Driving in oil seal for flange shaft



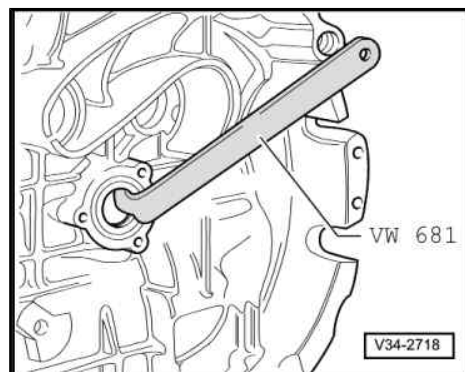
Note

- ◆ *Illustration shows installing seal on right-hand side.*
- ◆ *The procedure is identical for left and right oil seals.*
- ◆ *Installation depth when fitted at factory: 5.5 mm.*
- ◆ *When carrying out a repair, the oil seal is driven in to a depth of 6.5 mm using thrust piece -T10387-, so that the new seal does not bear on the same contact surface on the used flange shaft.*
- ◆ *The oil seal can also be installed with punch -2062-.*



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Levering out oil seal for input shaft when gearbox is dismantled

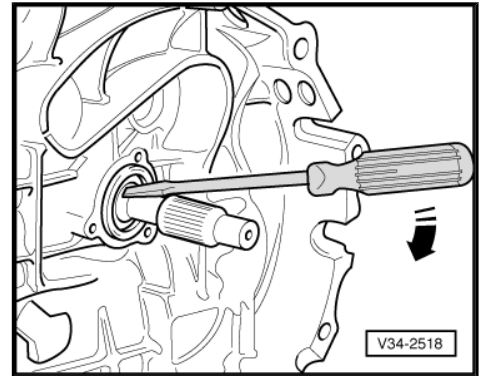


Removing oil seal for input shaft when gearbox is not dismantled

- Carefully pry out oil seal with a screwdriver.

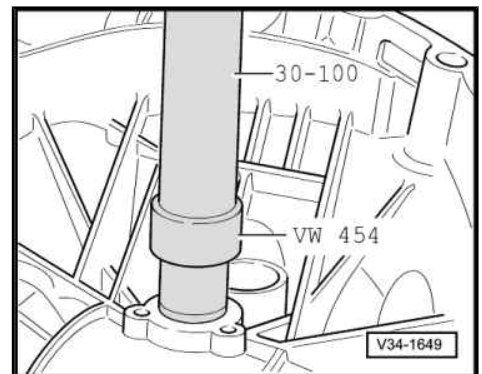
Note

- ◆ Take care not to damage contact surface for oil seal on input shaft.
- ◆ The oil seal can also be removed with extractor tool -T20143-.



Driving in input shaft oil seal

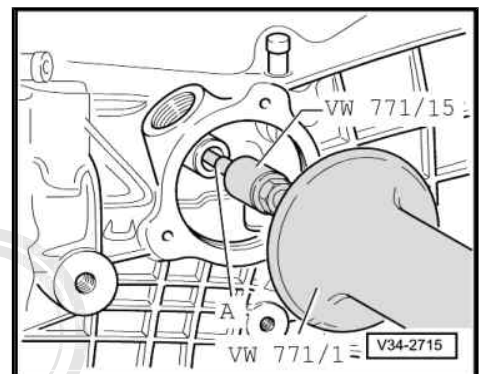
- Pack new oil seal for input shaft between sealing lip and dust lip half full with sealing grease -G 052 128 A1-.
- Fit a thin insulating hose tightly over splines of input shaft.
- Drive in input shaft oil seal.
- ◆ Installation depth when fitted at factory: 3.5 mm.
- ◆ Installation depth for used input shaft (when repairing): 4.5 mm.
- Remove insulating hose.



Pulling out ball sleeve

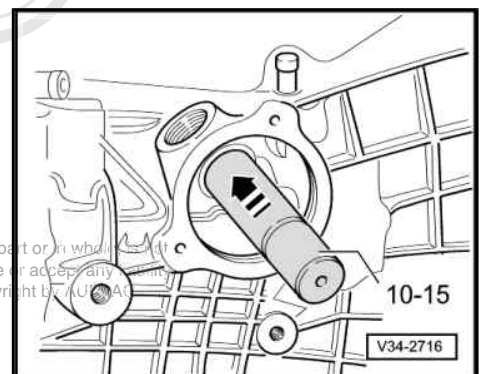
- Remove circlip.

A - Internal puller 14.5... 18.5 mm -Kukko 21/2-



Driving in ball sleeve

- Install ball sleeve with the inscribed side (thicker metal) facing the drift.
- Drive in as far as stop.
- Fit circlip.



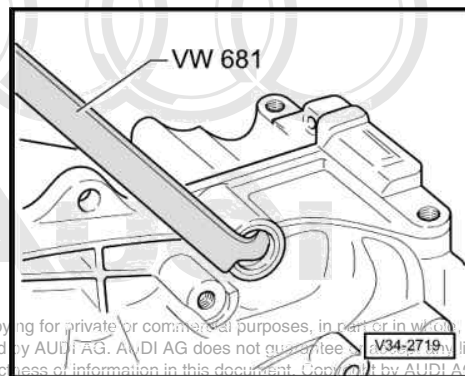
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Pulling out oil seal for selector shaft



Note

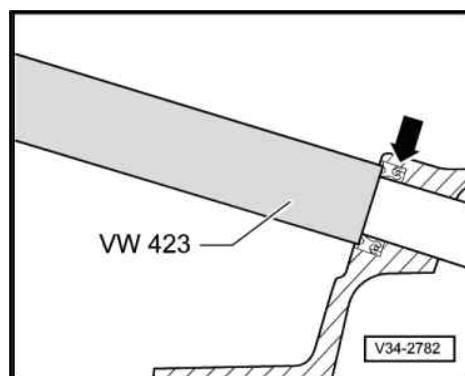
With gearbox removed but not dismantled, pry out oil seal carefully using a screwdriver or extractor tool -T20143- without damaging shaft.



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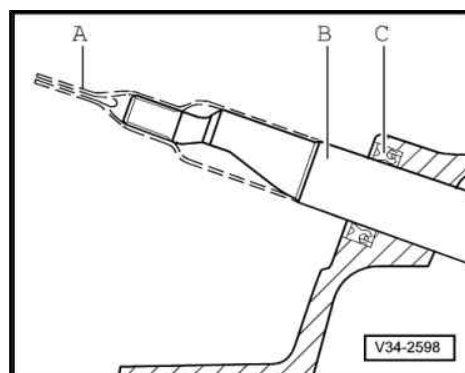
Driving in oil seal for selector shaft

- Selector shaft installed or removed.
- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1- .
- Fit assembly sleeve onto selector shaft ➔ [page 124](#) .
- Drive oil seal into housing onto stop.



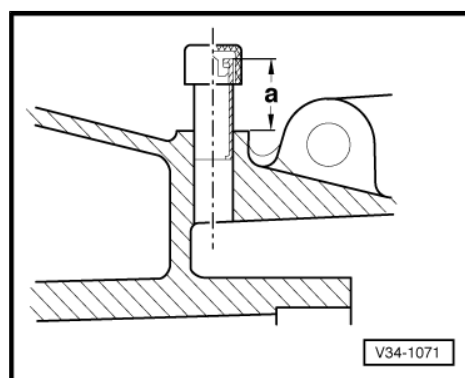
Installing oil seal and selector shaft using assembly sleeve

- Use assembly sleeve -01E 311 120- -item A- to avoid damaging the oil seal -C-.



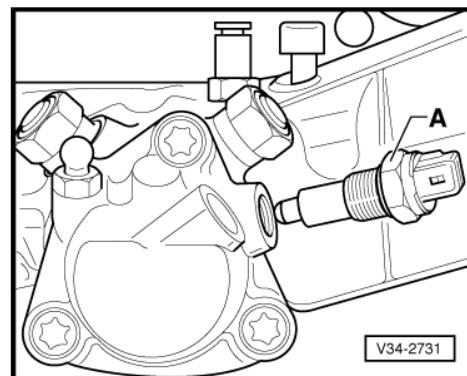
Installation depth of breather sleeve

- ♦ Dimension -a- = 21 mm



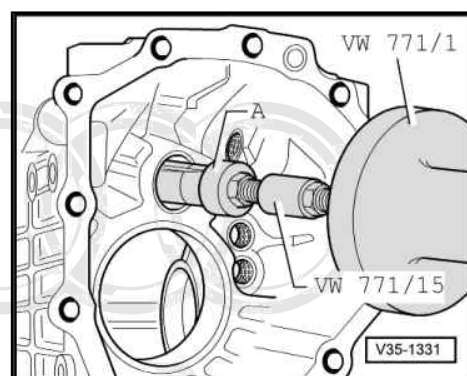
Removing and installing reversing light switch -F4-

- Tighten reversing light switch -F4- -item A- to 20 Nm when installing.



Pulling needle bearing out of gearbox housing

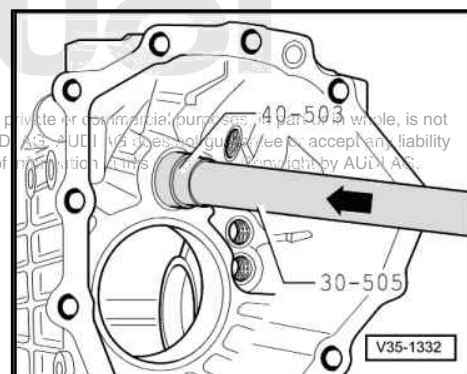
A - Internal puller 30... 37 mm -Kukko 21/5-



Driving needle bearing into gearbox housing

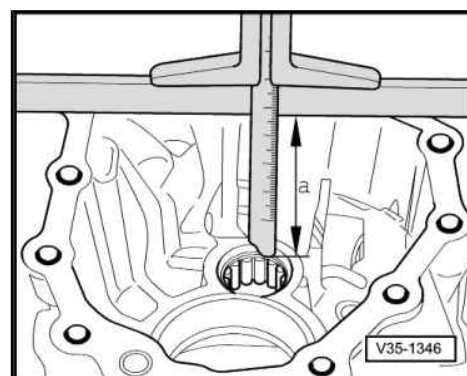
- ◆ Installation position: marking on bearing faces towards tool
- ◆ Installation depth [⇒ page 125](#)

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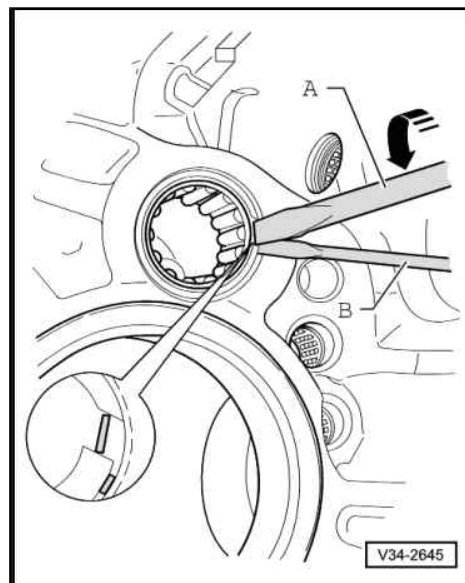
Installation depth of needle bearing

- ◆ Dimension -a- = 105 mm



Removing circlip

- Lift circlip out of the groove by turning one end of the circlip -arrow- with a screwdriver -A-.
- Secure this end with a second screwdriver -B-.
- Lever circlip out further by repositioning screwdriver -A-.



9.3 Dismantling and assembling selector shaft assembly

1 - Selector cylinder

- ☐ 5-speed gearbox
⇒ [page 127](#)
- ☐ 6-speed gearbox
⇒ [page 127](#)

2 - Spring pin

- ☐ Removing and installing
⇒ [page 127](#)
- ☐ Installation position: slot
must be in line with di-
rection of force

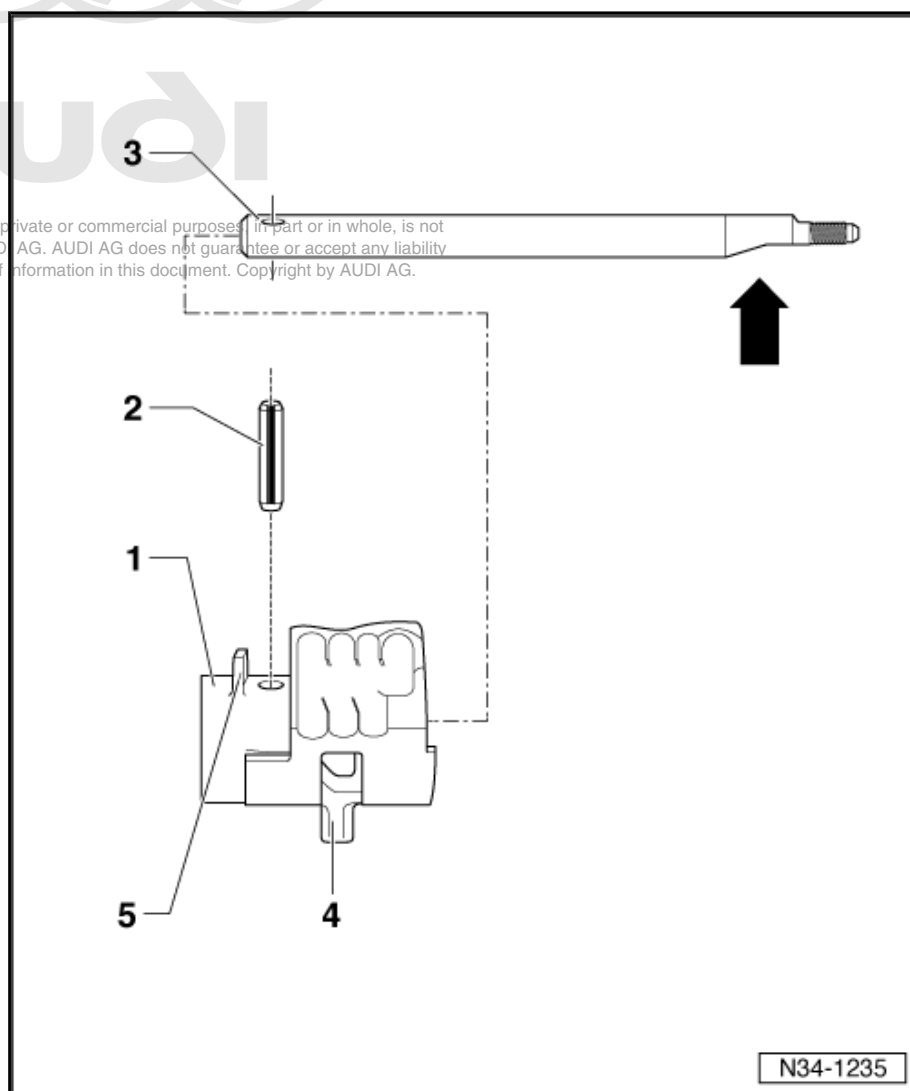
3 - Selector shaft

- ☐ Driving out ⇒ [page 127](#)
- ☐ Driving in ⇒ [page 128](#)
- ☐ Installation position: flat
-arrow- and selector fin-
ger
⇒ [Item 4 \(page 126\)](#)
face in same direction

4 - Selector finger

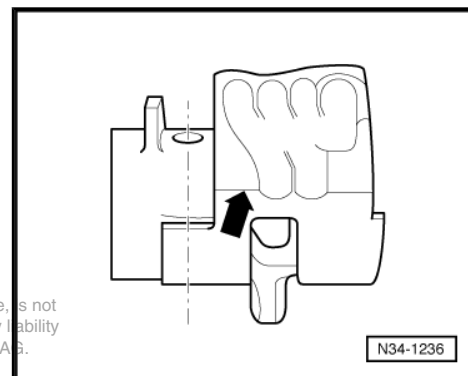
- ☐ Note correct installation
position in relation to
⇒ [Item 3 \(page 126\)](#)

5 - Cam for reversing light switch



Selector cylinder for 5-speed gearbox

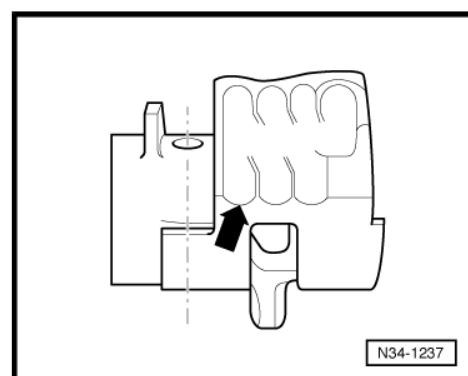
- ◆ Cam track of selector gate -arrow- runs at an angle between 4th gear (bottom) and 5th gear (top)



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Selector cylinder for 6-speed gearbox

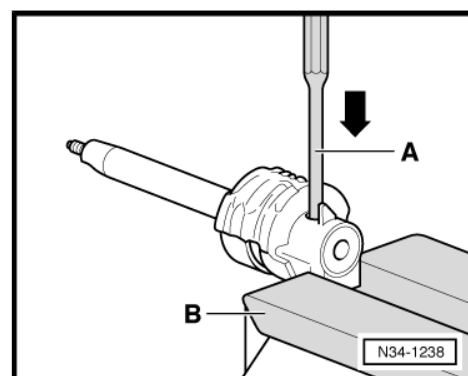
- ◆ Cam track of selector gate -arrow- runs vertically between 5th gear (top) and 6th gear (bottom).



Driving out spring pin and driving in flush

A - Drift

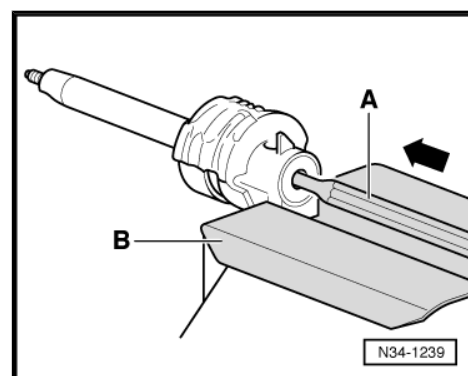
B - Protective jaw covers



Driving out selector shaft

A - Drift

B - Protective jaw covers





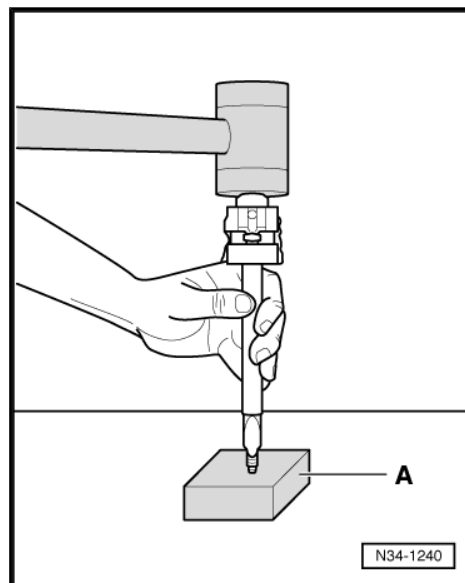
Driving in selector shaft

A - Wooden block



Note

- ◆ *Align holes in selector shaft/selector cylinder.*
- ◆ *Flat on selector shaft and selector finger on selector cylinder point in same direction.*



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35 – Gears, shafts

1 Input shaft

Overview

- ◆ [⇒ „1.1 Exploded view - input shaft“, page 129](#)
- ◆ [⇒ „1.2 Dismantling and assembling input shaft“, page 132](#)

1.1 Exploded view - input shaft



Note

- ◆ Refer to general repair instructions [⇒ page 5](#).
- ◆ When installing new gear wheels or input shaft, consult technical data [⇒ page 1](#).
- ◆ Before installing, heat synchro-hubs to approx. 100 °C using inductive heater -VAS 6414- (wear protective gloves).

1 - Gearbox housing

- ☐ Servicing [⇒ page 117](#)

2 - Needle bearing for input shaft

- ☐ Pulling out [⇒ page 125](#)
- ☐ Driving in [⇒ page 125](#)

3 - Circlip

- ☐ For needle bearing

4 - Circlip

- ☐ For input shaft

5 - Thrust washer

6 - Needle bearing for 4th gear

- ☐ Mark before removing
- ☐ Do not interchange with needle bearing for 3rd gear
- ☐ Lubricate with gear oil before installing

7 - 4th speed selector gear

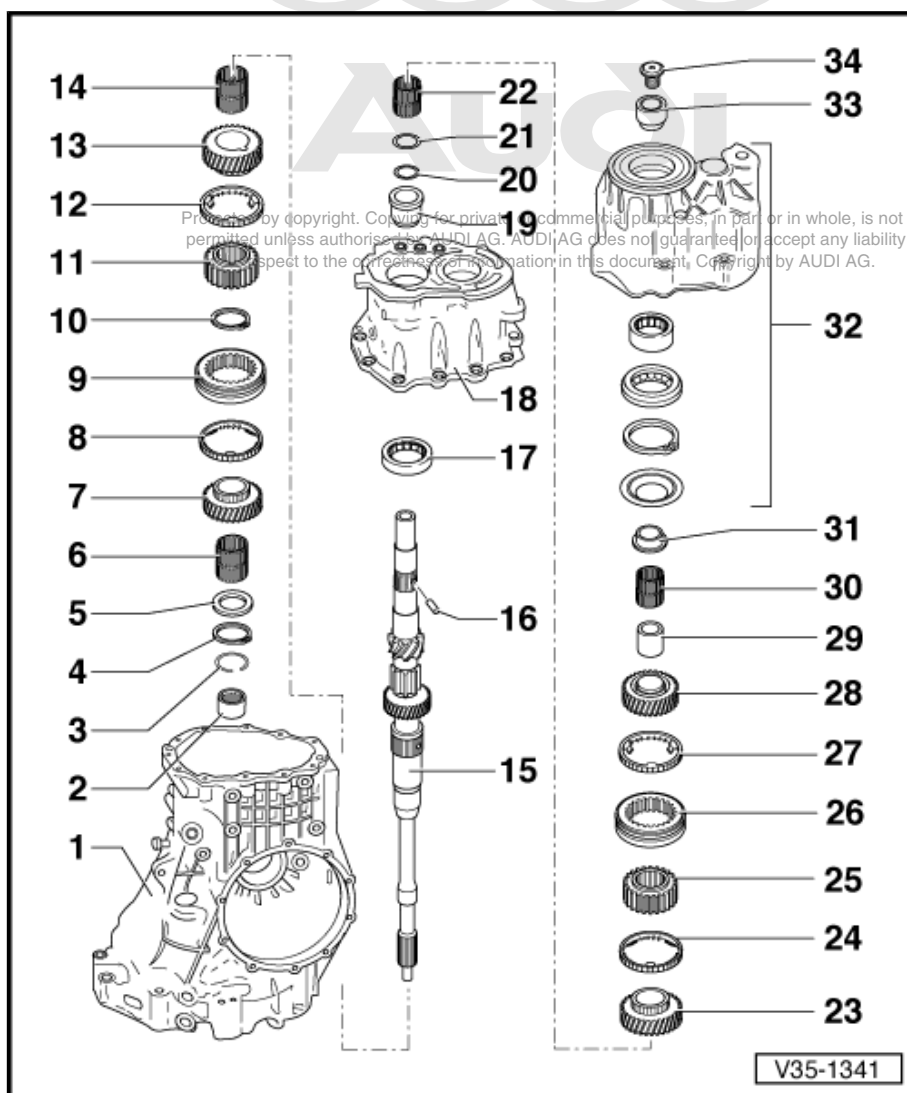
- ☐ Insert spring before installing [⇒ page 133](#)
- ☐ After installing, check axial clearance with a feeler gauge (0.15 ... 0.35 mm)

8 - Synchro-ring for 4th gear

- ☐ Checking for wear [⇒ page 133](#)

9 - Locking collar for 3rd and 4th gear

- ☐ Is paired with synchro-hub [⇒ Item 11 \(page 130\)](#)
- ☐ Mark before removing [⇒ page 92](#)



10 - Circlip

- ☐ Redetermine thickness if synchro-hub is being renewed ⇒ [page 134](#)
- ☐ Installation position: ends coincide with groove in synchro-hub

11 - Synchro-hub for 3rd and 4th gear

- ☐ Pressing off ⇒ [page 134](#)
- ☐ Installation position: ⇒ [page 134](#)
- ☐ Pressing on ⇒ [page 135](#)

12 - Synchro-ring for 3rd gear

- ☐ With molybdenum coating
- ☐ Checking for wear ⇒ [page 133](#)

13 - 3rd speed selector gear

- ☐ Insert spring before installing ⇒ [page 133](#)
- ☐ After pressing on synchro-hub for 3rd and 4th gear ⇒ [Item 11 \(page 130\)](#) , check axial clearance with a feeler gauge (0.15 ... 0.35 mm)

14 - Needle bearing for 3rd gear

- ☐ Mark before removing
- ☐ Do not interchange with needle bearing for 4th gear
- ☐ Lubricate with gear oil before installing

15 - Input shaft**16 - Spring pin**

- ☐ Drive in when renewing input shaft ⇒ [page 135](#)
- ☐ Renew

17 - Roller bearing

- ☐ For input shaft
- ☐ Pressing out ⇒ [page 113](#)
- ☐ Pressing in ⇒ [page 113](#)

18 - Bearing plate

- ☐ Servicing ⇒ [page 109](#)

19 - Inner race for roller bearing

- ☐ Remove and fit by hand

20 - Circlip**21 - Thrust washer for 6th gear needle bearing**

- ☐ Not fitted on 5-speed gearbox
- ☐ Installation position: shoulder towards circlip, smooth contact surface towards needle bearing ⇒ [page 98](#)

22 - Needle bearing for 6th gear

- ☐ Not fitted on 5-speed gearbox
- ☐ Lubricate with gear oil before installing

23 - 6th speed selector gear

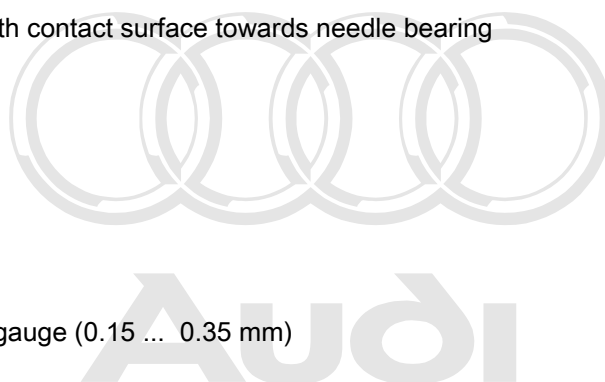
- ☐ Not fitted on 5-speed gearbox
- ☐ Insert spring before installing ⇒ [page 133](#)
- ☐ After installing, check axial clearance with a feeler gauge (0.15 ... 0.35 mm)

24 - Synchro-ring for 6th gear

- ☐ Not fitted on 5-speed gearbox
- ☐ Checking for wear ⇒ [page 133](#)

25 - Synchro-hub for 5th and 6th gear

- ☐ Pulling off ⇒ [page 92](#)



- ☐ Driving on ➔ [page 99](#)
- ☐ Installation position: projecting centre hub towards 5th speed selector gear

26 - Locking collar for 5th and 6th gear

- ☐ Is paired with synchro-hub ➔ [Item 25 \(page 130\)](#)
- ☐ Mark before removing ➔ [page 92](#)

27 - Synchro-ring for 5th gear

- ☐ Checking for wear ➔ [page 133](#)

28 - 5th speed selector gear

- ☐ Insert spring before installing ➔ [page 133](#)
- ☐ After installing, check axial clearance with a feeler gauge (0.15 ... 0.35 mm)

29 - Inner race for 5th speed selector gear needle bearing

- ☐ Pulling off ➔ [page 92](#)
- ☐ Driving on ➔ [page 100](#)

30 - Needle bearing for 5th gear

- ☐ Lubricate with gear oil before installing

31 - 1st inner race of four-point bearing for input shaft

- ☐ Ball bearing end
- ☐ Pulling off ➔ [page 91](#)
- ☐ Driving on ➔ [page 100](#)

32 - End cover

- ☐ Servicing ➔ [page 103](#)

33 - 2nd inner race of four-point bearing for input shaft

- ☐ Roller bearing end
- ☐ Pulling off ➔ [page 91](#)
- ☐ Driving on ➔ [page 101](#)

34 - Multi-point socket head bolt

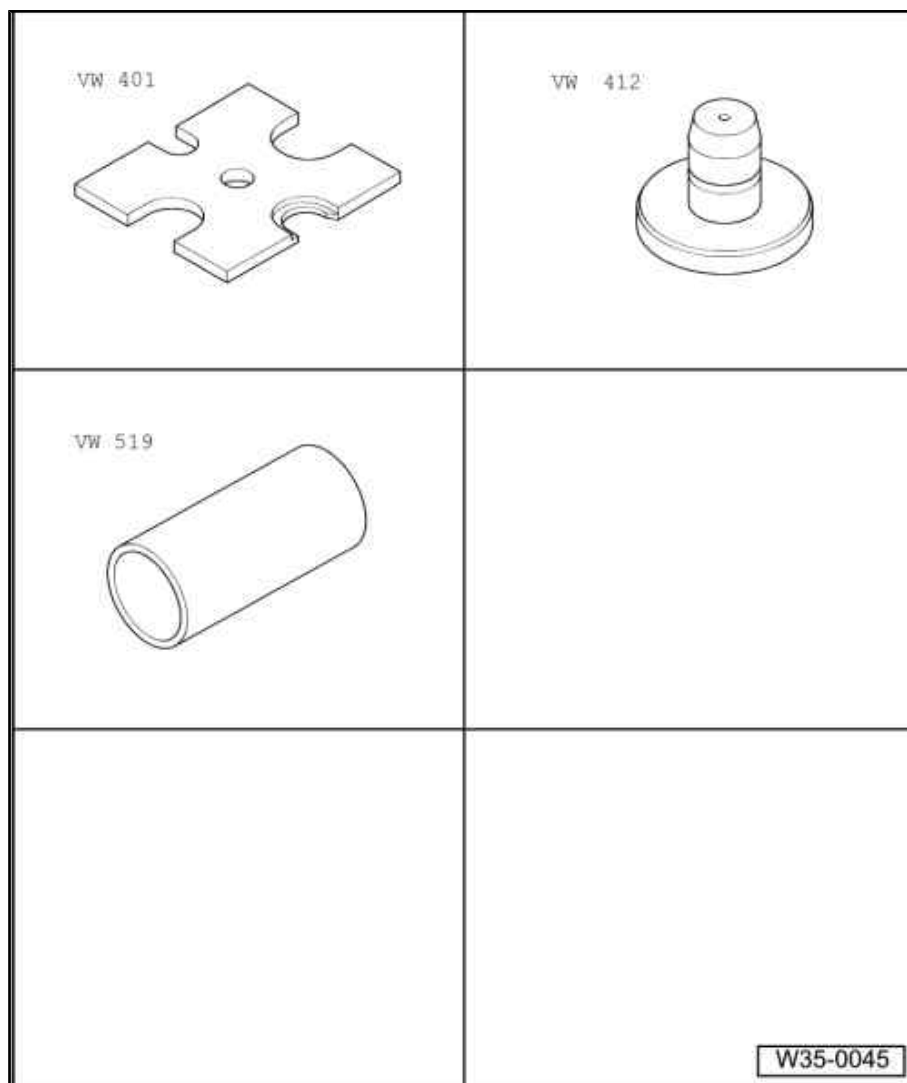
- ☐ 150 Nm
- ☐ Slackening ➔ [page 91](#)
- ☐ Tightening ➔ [page 101](#)

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1.2 Dismantling and assembling input shaft

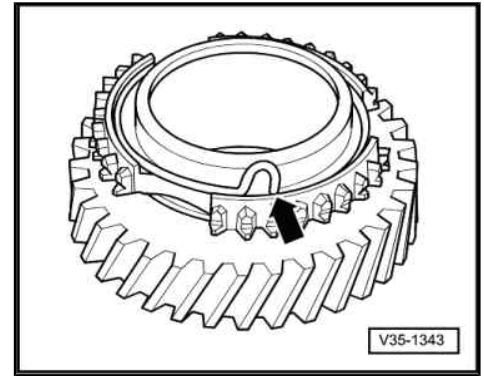
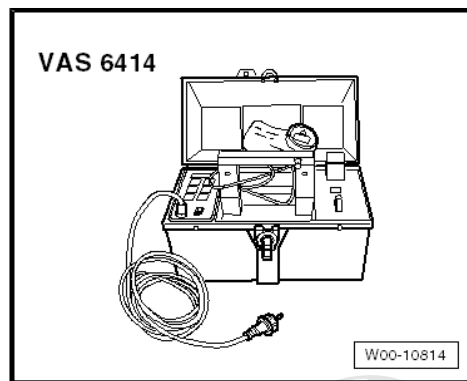
Special tools and workshop equipment required

- ◆ Thrust plate -VW 401-
- ◆ Press tool -VW 412-
- ◆ Tube -VW 519-



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- ◆ Inductive heater - VAS 6414-



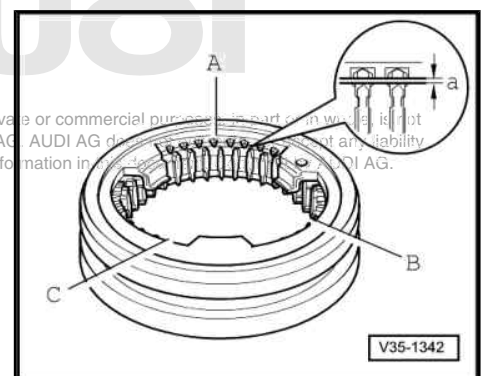
- ◆ Feeler gauge

Inserting spring in selector gear

- Insert spring -arrow- in selector gear, engaging offset end in hole.

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 average gap must not be less than 0.5 mm.



Checking synchro-ring with molybdenum coating for wear



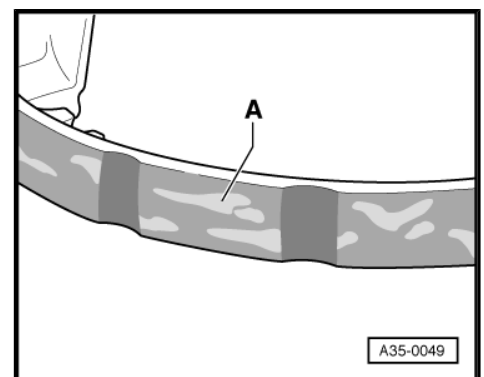
Note

Friction surface of intact synchro-ring has a graphite-grey, slightly porous appearance.

- Clean synchro-ring and make sure that friction surface is free of oil.

If very shiny areas -A- have formed on friction surface or if brass-coloured surface underneath is already visible:

- Renew synchro-ring.



Re-determining thickness of circlip

- Press synchro-hub onto stop.



Note

Note installation position when pressing on ⇒ [page 134](#) .

- Determine the thickest circlip which will still just fit.
- The opening of circlip must align with groove in synchro-hub.
- Select circlip from table.

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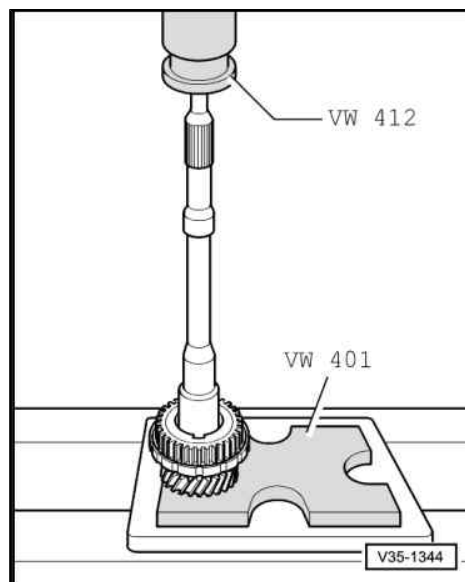
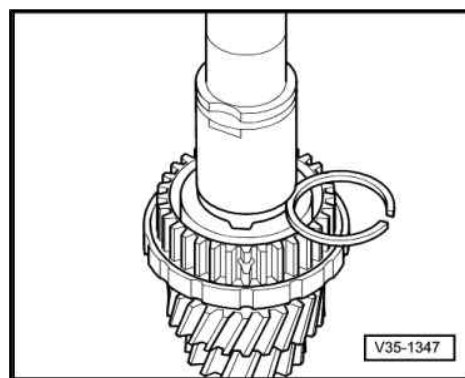
Available circlips - Thickness in mm ¹⁾

1.90	1.96	2.02
1.93	1.99	2.05

- ¹⁾ For part numbers, refer to ⇒ Electronic parts catalogue .

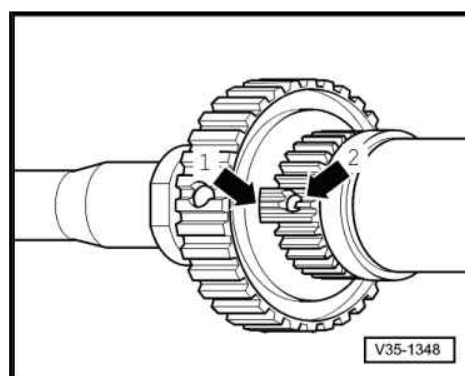
- Fit circlip.

Pressing off 3rd and 4th gear synchro-hub



Installation position of synchro-hub

- ◆ Oil groove in synchro-hub -arrow 1- must coincide with oil drilling -arrow 2- in input shaft.



Pressing on synchro-hub for 3rd and 4th gear

- Heat synchro-hub to approx. 100 °C, fit in position and press home.

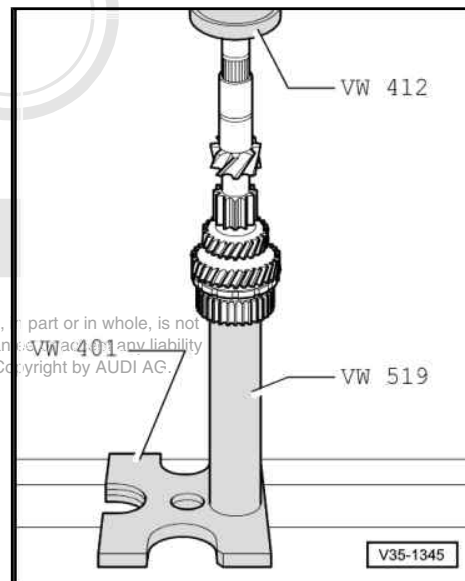


WARNING

Wear protective gloves.

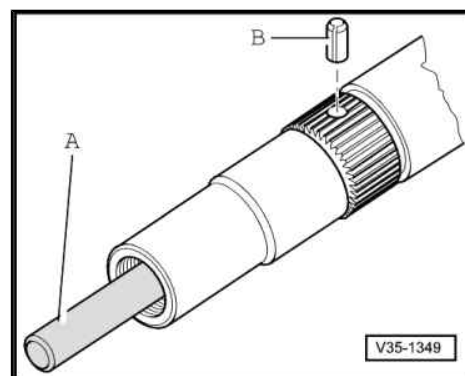
- Determine circlip and fit [⇒ page 134](#)

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Driving spring pin into input shaft

- Guide a 9 mm diameter drift -A- into oil drilling and drive spring pin -B- in until it touches drift.



2 Pinion shaft

Overview

- ◆ ⇒ „2.1 Exploded view - pinion shaft“, page 136
- ◆ ⇒ „2.2 Dismantling and assembling pinion shaft“, page 138

2.1 Exploded view - pinion shaft



Note

- ◆ Refer to general repair instructions ⇒ [page 5](#).
- ◆ Refer to technical data ⇒ [page 1](#) when installing new gear wheels or the final drive gear set.
- ◆ Before installing, heat tapered roller bearing inner races, gear wheels and synchro-hubs to approx. 100 °C (max.) using inductive heater -VAS 6414- (wear protective gloves).
- ◆ Adjustment work is required when renewing the parts marked with ¹⁾ ⇒ „4.3 Table of adjustments“, page 168.

1 - Gearbox housing ¹⁾

- Servicing ⇒ [page 117](#)

2 - Shim „S3“

- Table of adjustments
⇒ [page 168](#)

3 - Outer race for large tapered roller bearing ¹⁾

- Pulling out ⇒ [page 140](#)
- Pressing in
⇒ [page 141](#) and
⇒ [page 141](#)

4 - Pinion shaft ¹⁾

- Is mated with crown wheel (final drive gear set), always renew together as a set
- Adjusting pinion shaft and crown wheel
⇒ [page 166](#)

5 - Inner race for large tapered roller bearing ¹⁾

- Pressing off
⇒ [page 142](#)
- Pressing on
⇒ [page 142](#)

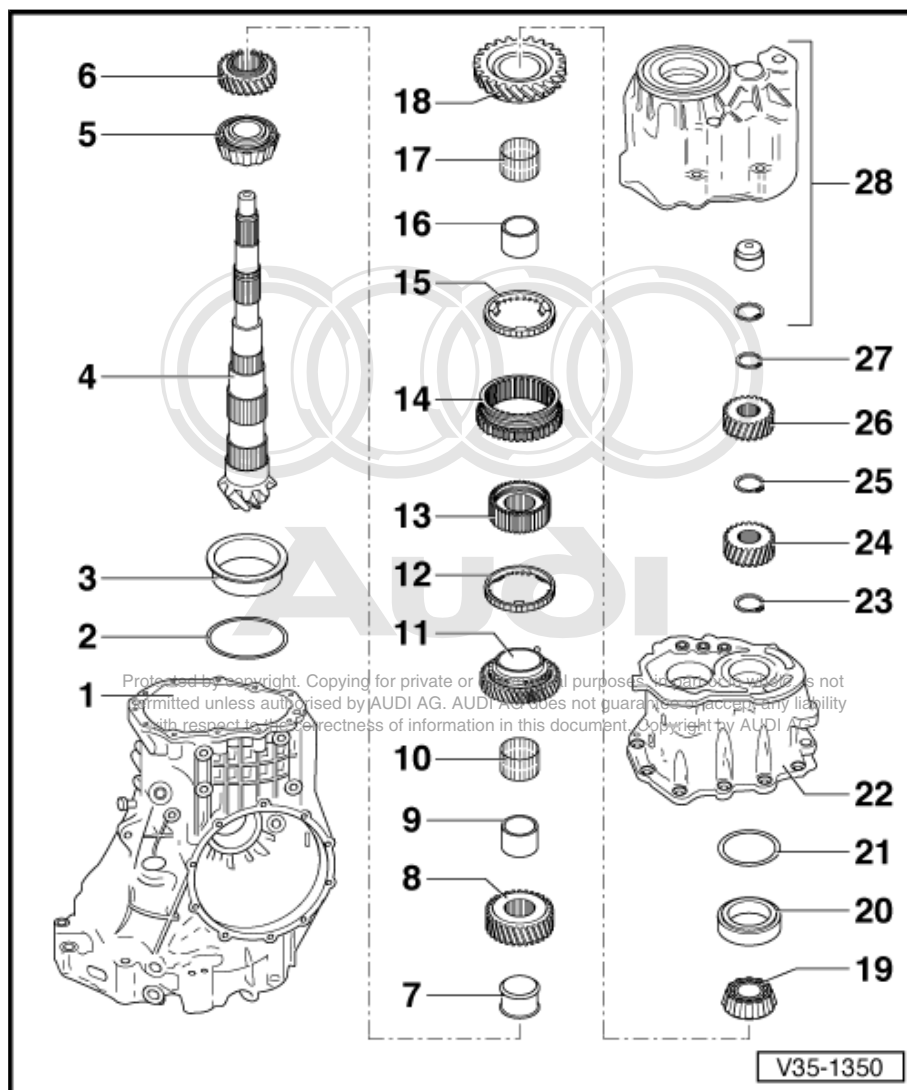
6 - 4th gear wheel

- Pressing off
⇒ [page 142](#)
- Pressing on
⇒ [page 143](#)

7 - Spacer sleeve

8 - 3rd gear wheel

- Pressing off together with ⇒ [Item 9 \(page 137\)](#) ⇒ [page 142](#)
- Pressing on ⇒ [page 143](#)



9 - Inner race for 2nd speed selector gear

- ☐ Pressing off together with ➔ [Item 8 \(page 136\)](#) ➔ [page 142](#)
- ☐ Pressing on ➔ [page 143](#)

10 - Needle bearing for 2nd speed selector gear

- ☐ Lubricate with gear oil before installing

11 - 2nd speed selector gear

- ☐ Pressing off ➔ [page 141](#)
- ☐ Before installing, fit spring and slide needle bearing onto pinion shaft
- ☐ After installing, check axial clearance with a feeler gauge (0.15 ... 0.35 mm)

12 - Synchro-ring for 2nd gear

- ☐ With molybdenum coating
- ☐ Checking for wear ➔ [page 133](#)

13 - Synchro-hub for 1st and 2nd gear

- ☐ Pressing off ➔ [page 141](#)
- ☐ Pressing on ➔ [page 144](#)
- ☐ Installation position: flush hub towards 2nd speed selector gear

14 - Locking collar for 1st and 2nd gear

- ☐ Installation position: groove for selector fork faces towards 1st speed selector gear

15 - Synchro-ring for 1st gear

- ☐ Checking for wear ➔ [page 133](#)

16 - Inner race for 1st speed selector gear

- ☐ Pressing off ➔ [page 141](#)
- ☐ Pressing on ➔ [page 144](#)

17 - Needle bearing for 1st speed selector gear

- ☐ Lubricate with gear oil before installing

18 - 1st speed selector gear

- ☐ Before installing, insert spring ➔ [page 133](#)
- ☐ After pressing on ➔ [Item 19 \(page 137\)](#), check axial clearance with a feeler gauge (0.15 ... 0.50 mm)

19 - Inner race for small tapered roller bearing ¹⁾

- ☐ Pressing off ➔ [page 141](#)
- ☐ Pressing on ➔ [page 144](#)

20 - Outer race for small tapered roller bearing ¹⁾

- ☐ Driving out ➔ [page 144](#)
- ☐ Pressing in ➔ [page 145](#)

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21 - Shim „S4“

- ☐ Table of adjustments ➔ [page 168](#)

22 - Bearing plate ¹⁾

- ☐ Servicing ➔ [page 109](#)

23 - Circlip

- ☐ Re-determining thickness (5-speed gearbox) ➔ [page 96](#)
- ☐ Re-determining thickness (6-speed gearbox) ➔ [page 97](#)

24 - 6th gear wheel

- ☐ Not fitted on 5-speed gearbox
- ☐ Pressing off ➔ [page 94](#)
- ☐ Pressing on ➔ [page 94](#)
- ☐ Installation position: shoulder towards inner race for small tapered roller bearing

25 - Circlip

- ☐ Re-determining thickness (5-speed gearbox) ⇒ [page 96](#)
- ☐ Install behind ⇒ [Item 23 \(page 137\)](#) on 5-speed gearbox
- ☐ Re-determining thickness (6-speed gearbox) ⇒ [page 97](#)

26 - 5th gear wheel

- ☐ Pulling off ⇒ [page 91](#)
- ☐ Driving on ⇒ [page 100](#)

27 - Circlip

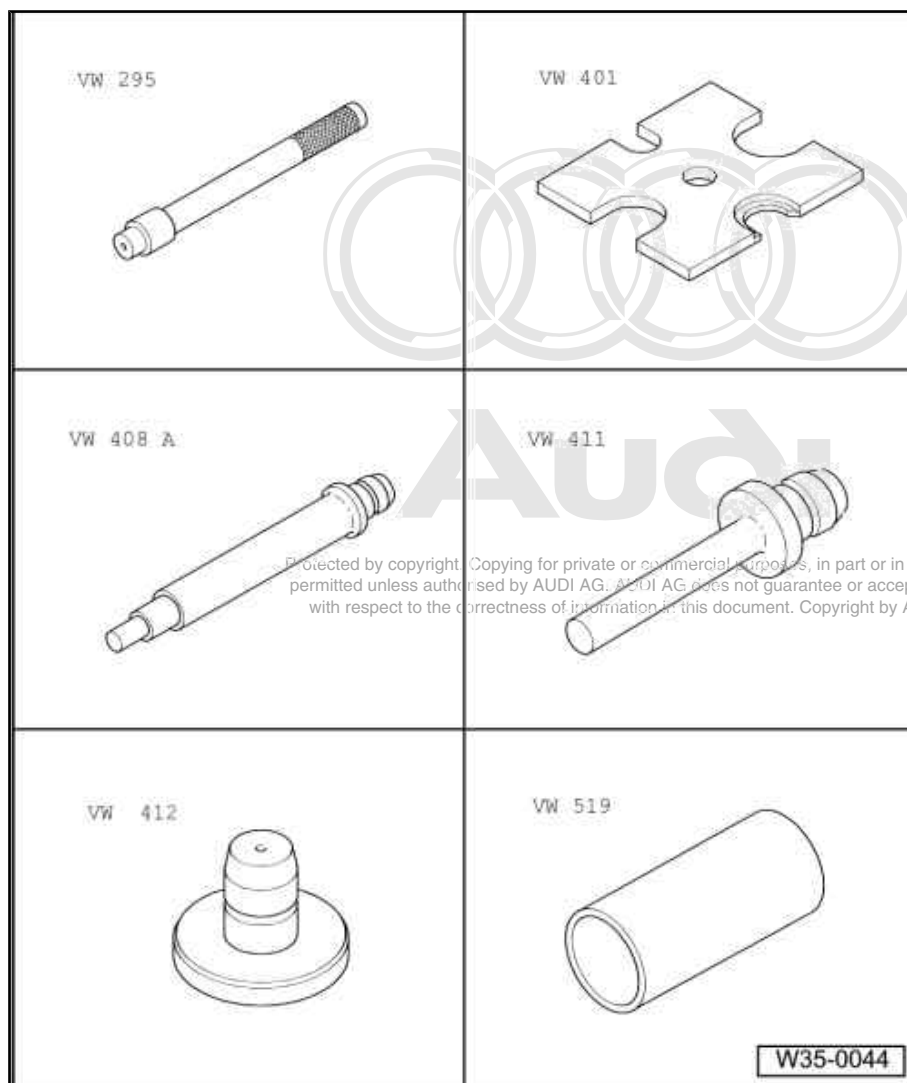
28 - End cover

- ☐ Servicing ⇒ [page 103](#)

2.2 Dismantling and assembling pinion shaft

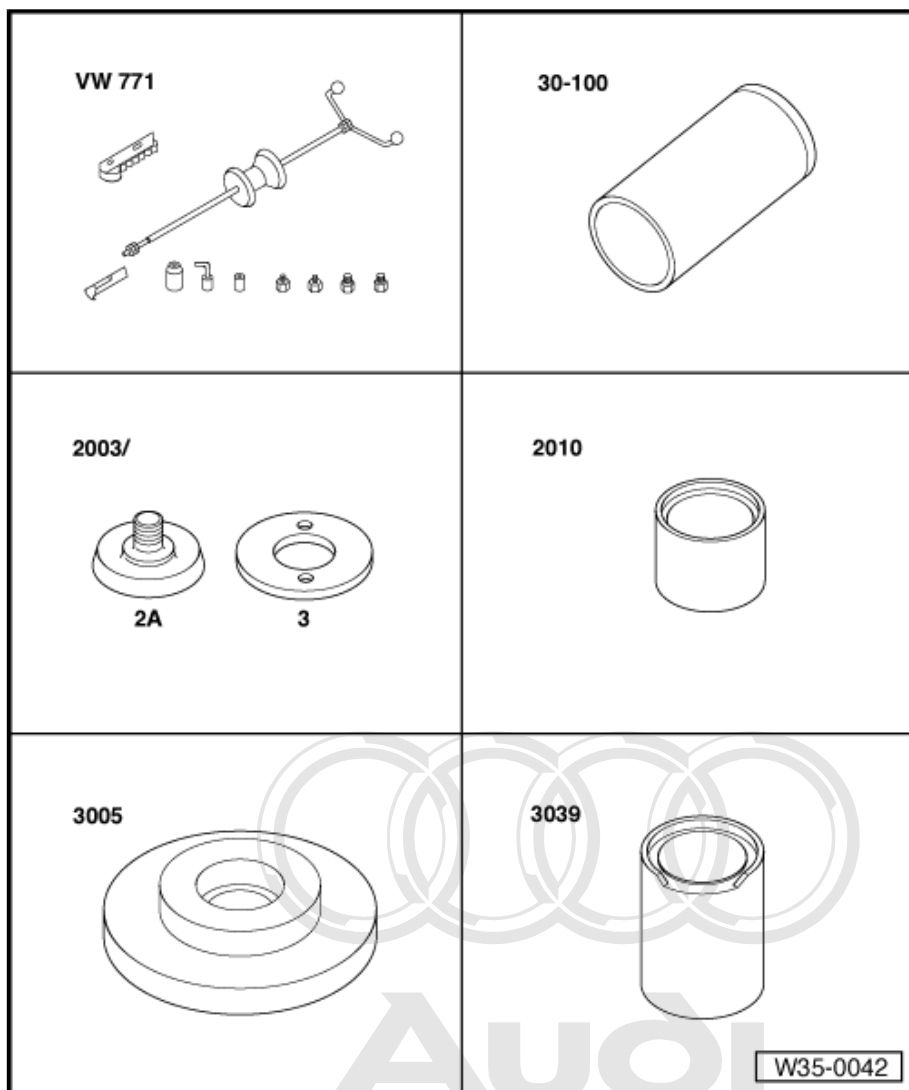
Special tools and workshop equipment required

- ◆ Drift -VW 295-
- ◆ Thrust plate -VW 401-
- ◆ Press tool -VW 408 A-
- ◆ Press tool -VW 411-
- ◆ Press tool -VW 412-
- ◆ Tube -VW 519-



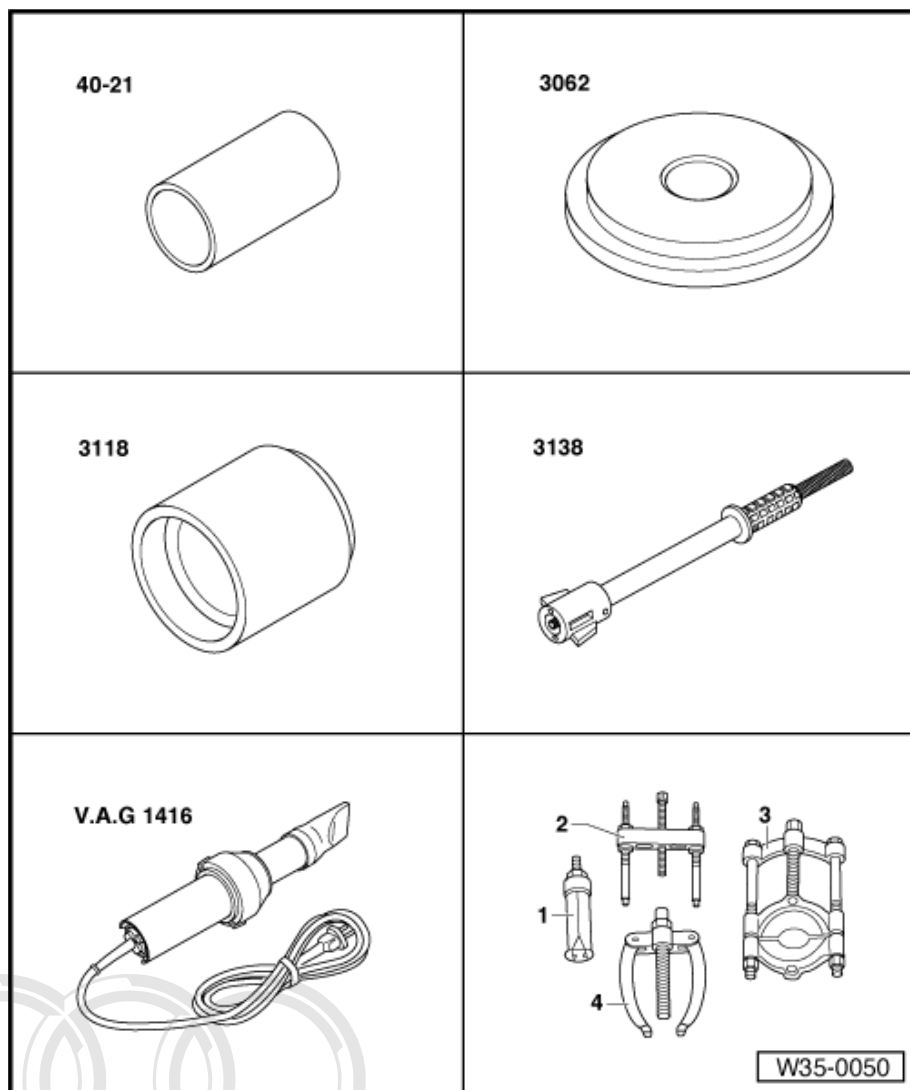
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- ◆ Multi-purpose tool - VW 771-
- ◆ Drift sleeve -30-100-
- ◆ Installing ring -2003/3-
- ◆ Tube -2010-
- ◆ Thrust plate -3005-
- ◆ Guide sleeve -3039-

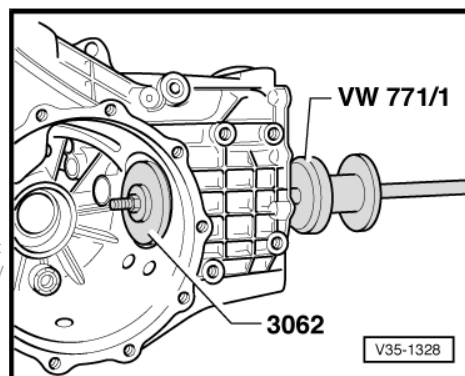
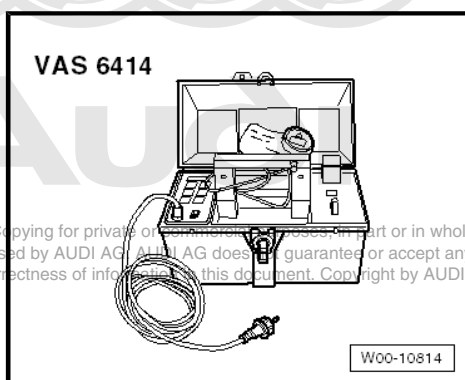


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- ◆ Press tool -40-21-
- ◆ Thrust pad -3062-
- ◆ Tube -3118-
- ◆ Drift -3138-
- ◆ Hot air blower -V.A.G 1416-
- ◆ -3- Splitter -Kukko 17/2-



- ◆ Inductive heater - VAS 6414-



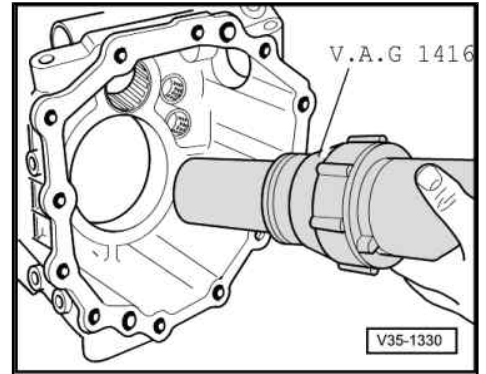
- ◆ Feeler gauge

Pulling out outer race for large tapered roller bearing

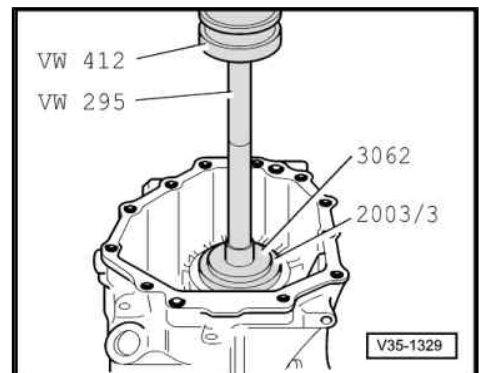
- Stepped side of thrust pad -3062- rests against the outer race

Heating gearbox housing in order to fit tapered roller bearing outer race

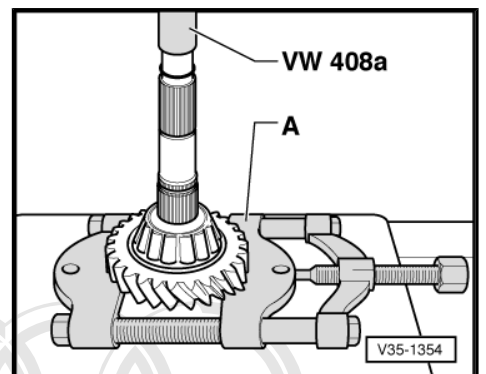
- Heat gearbox housing in area of bearing seat for approx. 15 minutes, to approx. 100 °C, with a hot air blower.

**WARNING***Wear protective gloves.***Installing outer race for large tapered roller bearing in gearbox housing and pressing home**

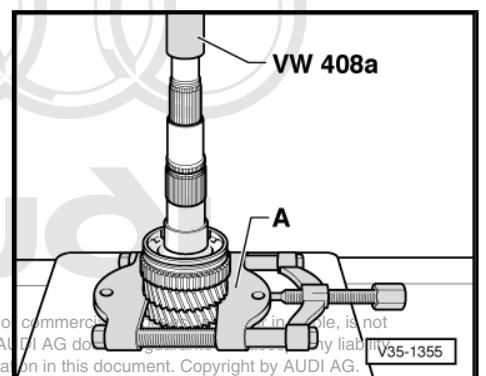
- Insert outer race only after heating gearbox housing and press home under workshop press for a further 1 ... 2 minutes (approx.) until heat exchange has taken place.

**WARNING***Wear protective gloves.***Pressing off inner race of small tapered roller bearing for pinion shaft together with 1st speed selector gear**

A - Splitter 22 ... 115 mm -Kukko 17/2-

**Pressing off 2nd speed selector gear with locking collar/synchrohub for 1st and 2nd gear and inner race for 1st speed selector gear**

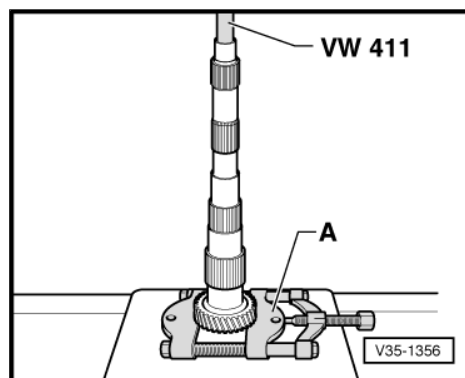
A - Splitter 22 ... 115 mm -Kukko 17/2-



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Pressing off 3rd gear wheel together with inner race for 2nd speed selector gear

A - Splitter 22 ... 115 mm -Kukko 17/2-



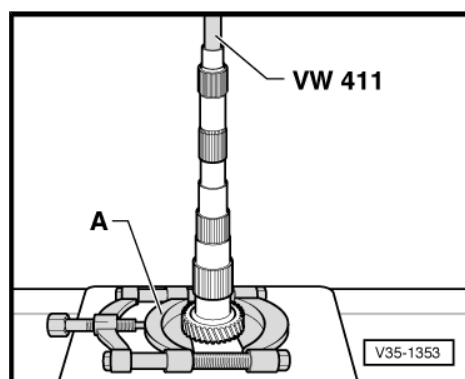
Pressing off 4th gear wheel

A - Splitter 22 ... 115 mm -Kukko 17/2-



Note

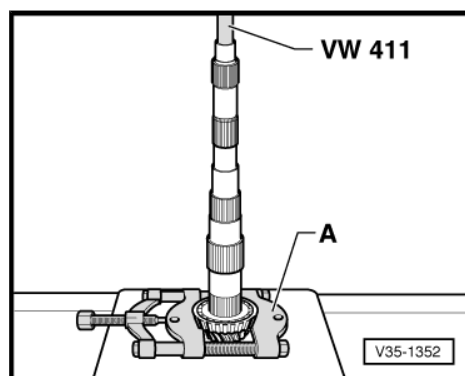
The 4th gear wheel can also be pressed off together with the 3rd gear wheel and the inner race for the 3rd speed selector gear.



Pressing off inner race for large tapered roller bearing

A - Splitter 22 ... 115 mm -Kukko 17/2-

- ◆ Pressing off destroys bearing.



Pressing on inner race for large tapered roller bearing

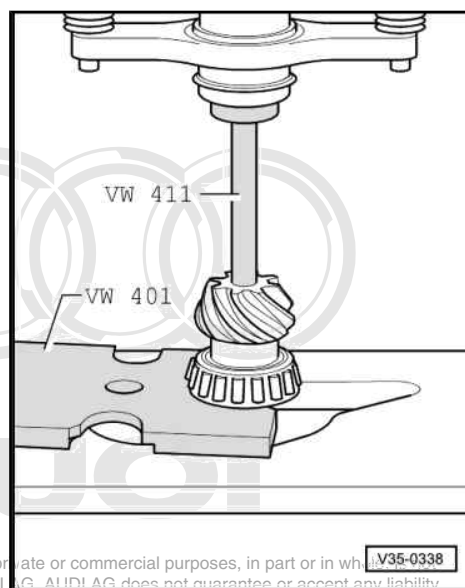
- Heat inner race to approx. 100 °C and fit.



WARNING

Wear protective gloves.

- Press home ensuring there is no axial play.



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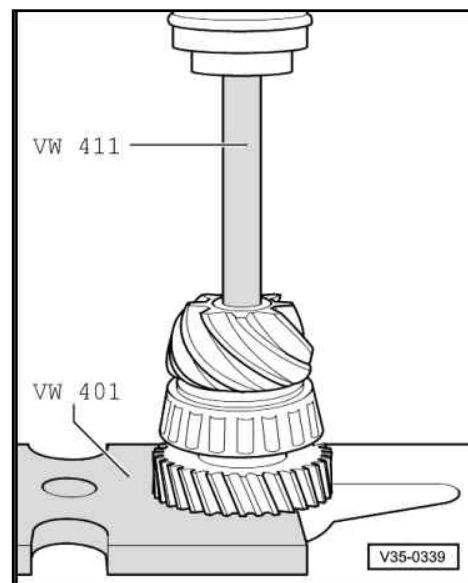
Pressing on 4th gear wheel

- Heat gear to about 100 °C, fit and press home.
- Installation position: shoulder towards 3rd gear wheel



WARNING

Wear protective gloves.



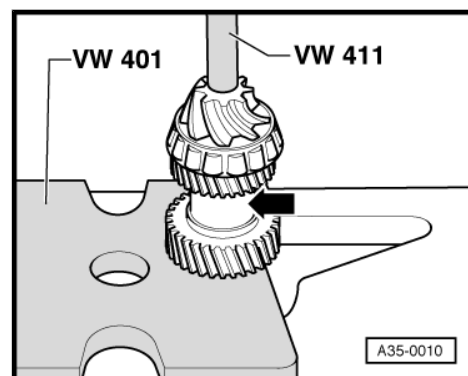
Pressing on 3rd gear wheel

- Fit spacer sleeve -arrow-.
- Heat gear to about 100 °C, fit and press home.
- Installation position: shoulder towards 4th gear wheel



WARNING

Wear protective gloves.



Pressing on inner race for 2nd speed selector gear

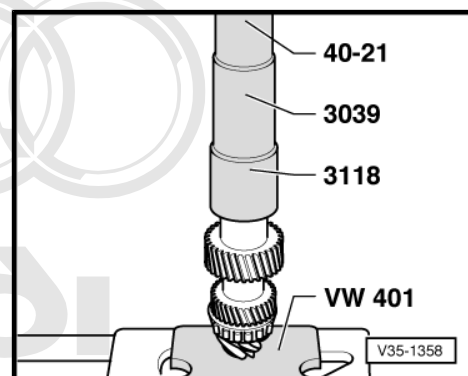
- Heat inner race to approx. 100 °C and fit.



WARNING

Wear protective gloves.

- Press home ensuring there is no axial play.



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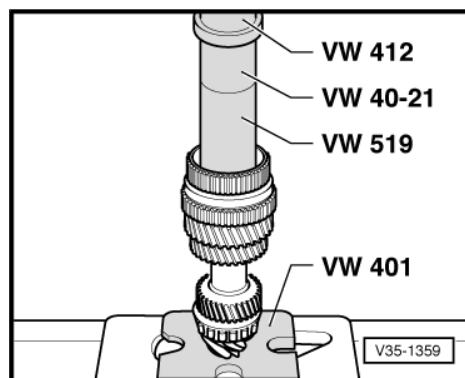
Fitting 2nd speed selector gear, pressing on synchro-hub for 1st and 2nd gear

- Oil needle bearing.
- Install needle bearing, selector gear with spring and synchro-ring for 2nd gear.
- Heat synchro-hub to approx. 100 °C and fit.
- Installation position: flush hub towards 2nd speed selector gear.



WARNING

Wear protective gloves.



- Press home ensuring there is no axial play.

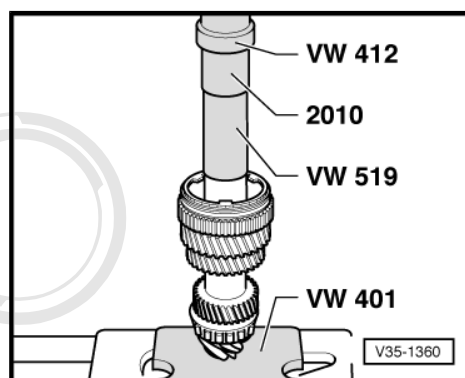
Pressing on inner race for 1st speed selector gear

- Heat inner race to approx. 100 °C and fit.



WARNING

Wear protective gloves.



- Press home ensuring there is no axial play.

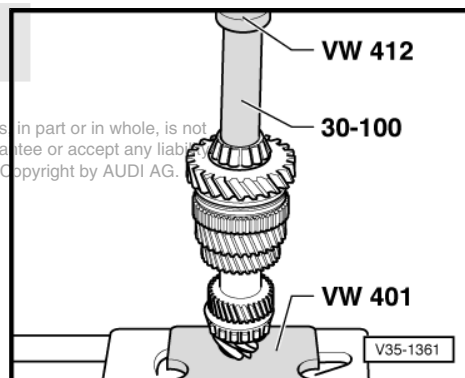
Pressing on small tapered roller bearing inner race for pinion shaft

- Oil needle bearing.
- Install needle bearing, selector gear with spring and synchro-ring for 1st gear.
- Heat inner race to approx. 100 °C and fit.



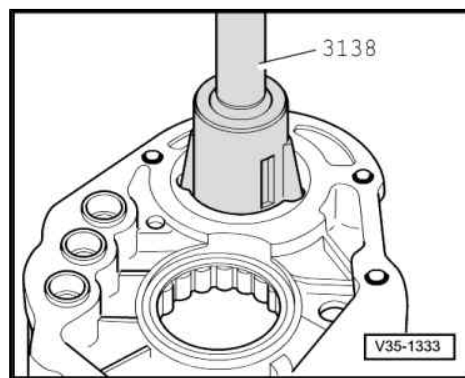
WARNING

Wear protective gloves.



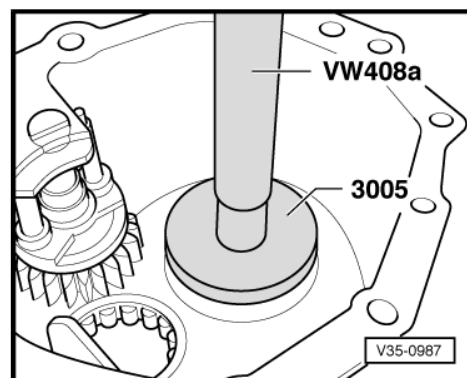
- Press home ensuring there is no axial play.

Driving out outer race for small tapered roller bearing



Pressing in outer race for small tapered roller bearing

- Insert shim „S4“ into bearing plate behind bearing seat.
- Press in outer race for small tapered roller bearing as far as stop.



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39 – Final drive - rear differential

1 Renewing oil seals for flange shafts

Overview

- ◆ ⇒ „1.1 Renewing flange shaft oil seal (left-side)“, page 146
- ◆ ⇒ „1.2 Renewing oil seal for flange shaft (right-side)“, page 149
- Gearbox in vehicle
- Refer to general repair instructions ⇒ [page 5](#) .

1.1 Renewing flange shaft oil seal (left-side)

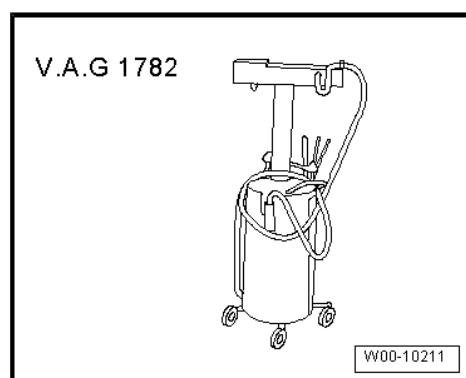
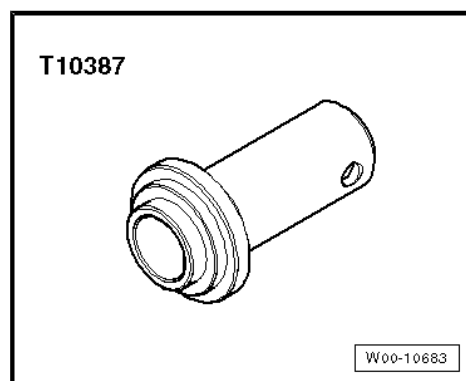
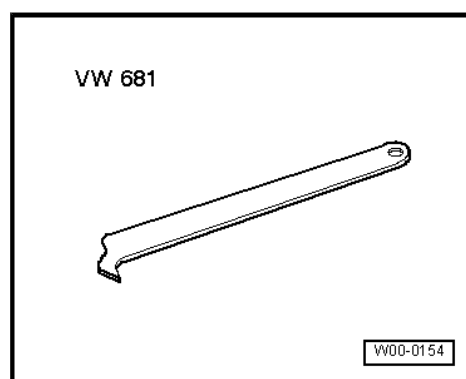
Special tools and workshop equipment required

- ◆ Oil seal extractor lever -VW 681- or extractor tool -T20143-

- ◆ Thrust piece -T10387-

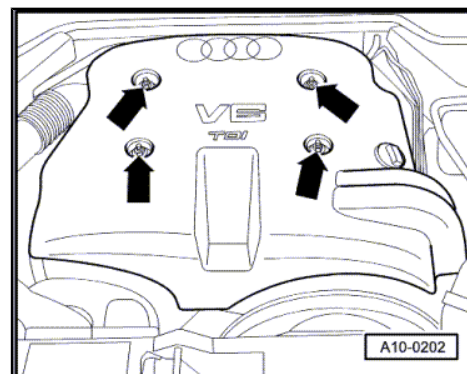
- ◆ Used oil collection and extraction unit -V.A.G 1782-

- ◆ Sealing grease -G 052 128 A1-

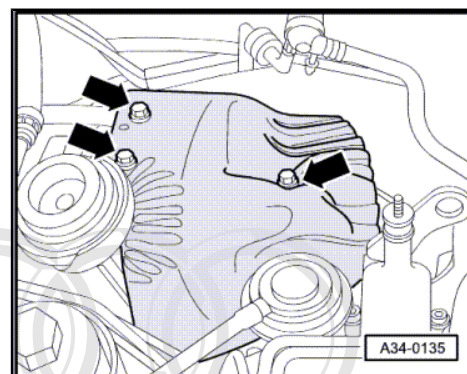


Removing oil seal for flange shaft (left-side)

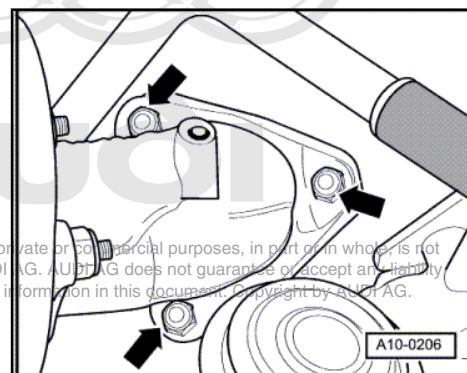
- Detach engine cover panel above cylinder head cover -arrows-.



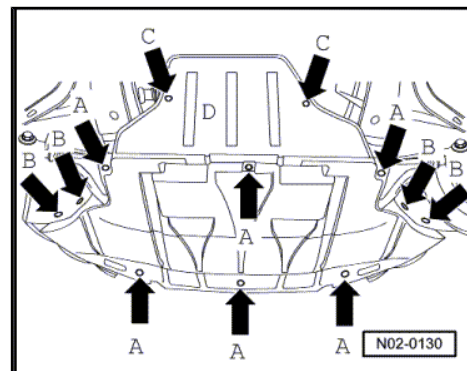
- Remove heat shield above turbocharger -arrows-.



- Unbolt front exhaust pipe from turbocharger manifold -arrows-.

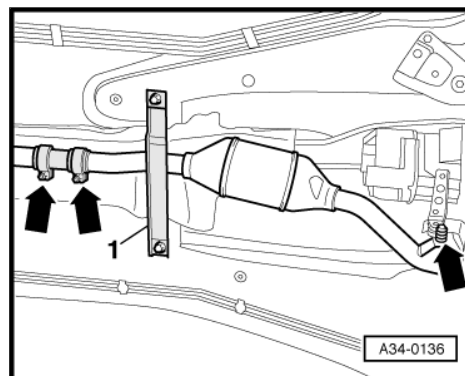


- Remove rear section -D- of noise insulation.

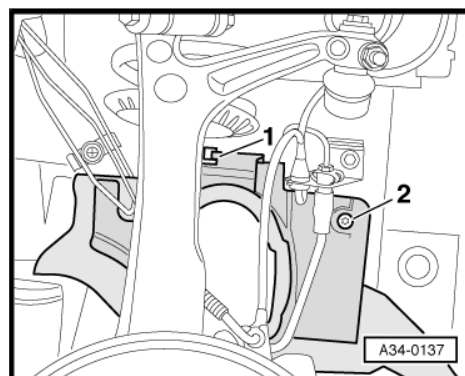


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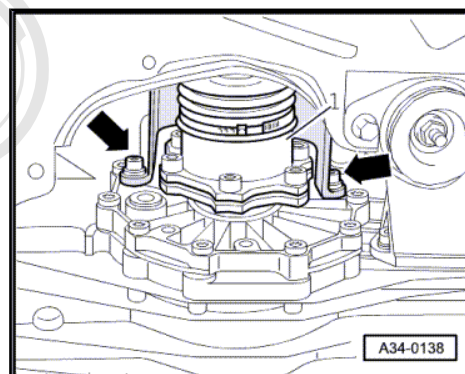
- Unbolt underbody cross member -1-.
- Remove front exhaust pipe complete with catalytic converter -arrows-.



- Loosen bolt -2- for noise insulation above drive shaft.
- Disengage retainer -1- and remove noise insulation cover.



- Detach heat shield for drive shaft from gearbox -arrows-.
- Detach drive shaft -1-.
- Place used oil collection and extraction unit -V.A.G 1782- underneath.
- Remove flange shaft securing bolt; to do so, screw two bolts into flange and counterhold flange shaft with tyre iron or other suitable lever.
- Pull out flange shaft.

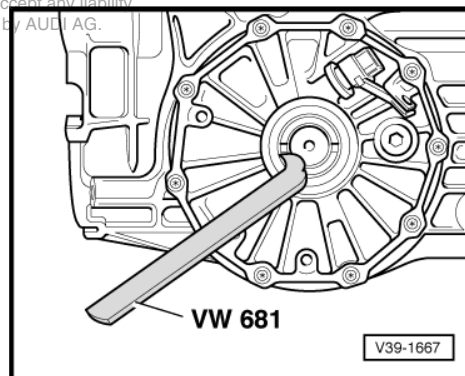


- Pull out flange shaft oil seal using oil seal extractor lever -VW 681- or extractor hook -T20143-.

Installing oil seal for flange shaft (left-side)

Installation is carried out in reverse sequence; note the following:

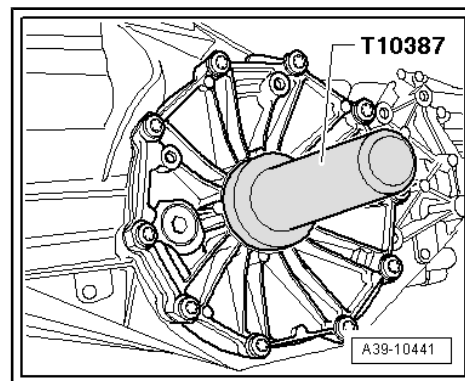
- Lightly oil outer circumference of new oil seal.
- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1-.



- Drive in new flange shaft oil seal (left-side) using thrust piece -T10387- until thrust piece reaches stop; keep seal straight when installing.

**Note**

- ◆ *Driving-in depth (standard): 5.5 mm beneath surface of cover*
- ◆ *When carrying out a repair, the oil seal is driven in to a depth of 6.5 mm using thrust piece -T10387-, so that the new seal does not bear on the same contact surface on the used flange shaft.*
- Install flange shaft.
- Bolt drive shaft to flange shaft ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Check gear oil level in gearbox ⇒ [page 80](#) .
- Install front exhaust pipe and perform stress-free alignment ⇒ Rep. gr. 26 .
- Fit drive shaft heat shield.
- Install noise insulation panels.

**Tightening torques**

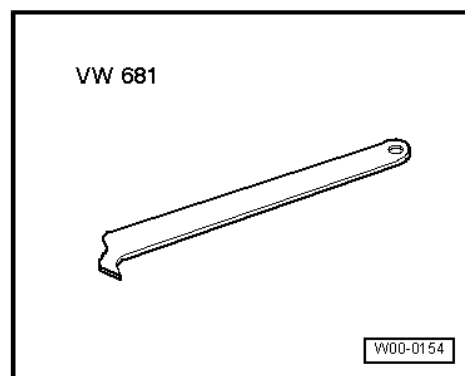
Component	Nm
Flange shaft to gearbox	10 + 90° ¹⁾
Heat shield for drive shaft	23
Front exhaust pipe to turbocharger	25
Heat shield to turbocharger	10
Clamp for exhaust pipe	40
Underbody cross member to body	20

• ¹⁾ 90° is equivalent to a quarter turn.

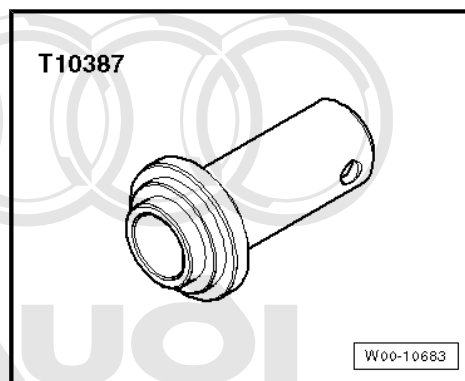
1.2 Renewing oil seal for flange shaft (right-side)

Special tools and workshop equipment required

- ◆ Oil seal extractor lever -VW 681- or extractor tool -T20143-

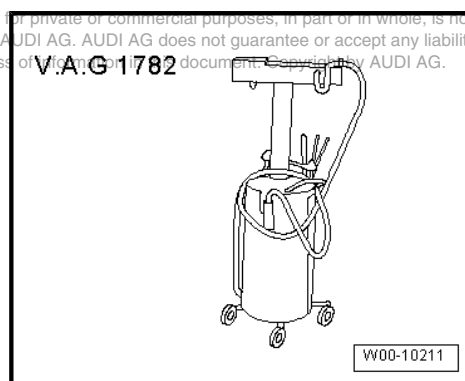


- ◆ Thrust piece -T10387-



- ◆ Used oil collection and extraction unit -V.A.G 1782-

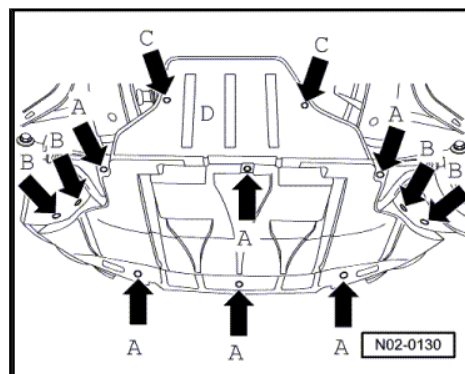
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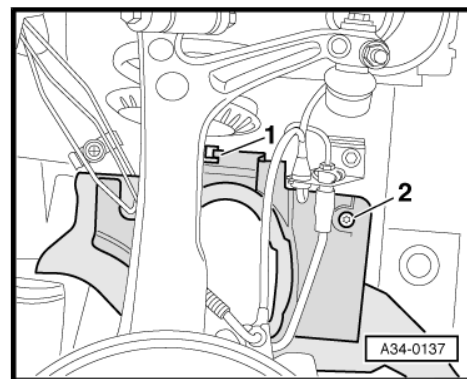
- ◆ Sealing grease -G 052 128 A1-

Removing flange shaft oil seal (right-side)

- Remove rear section -D- of noise insulation.



- Loosen bolt -2- for noise insulation above drive shaft.
- Disengage retainer -1- and remove noise insulation cover.
- Unbolt drive shaft.
- Place used oil collection and extraction unit -V.A.G 1782- underneath.
- Remove flange shaft securing bolt; to do so, screw two bolts into flange and counterhold flange shaft with tyre iron or other suitable lever.
- Pull out flange shaft.
- Pull out flange shaft oil seal using oil seal extractor lever - VW 681- or extractor hook -T20143- .



Installing flange shaft oil seal (right-side)

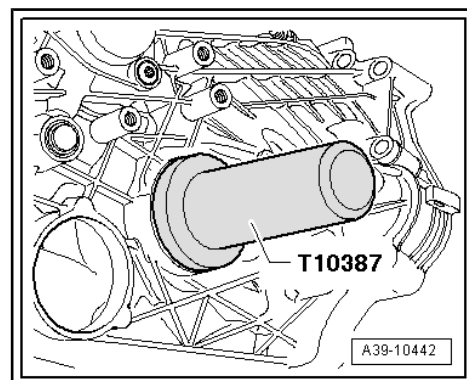
Installation is carried out in reverse sequence; note the following:

- Lightly oil outer circumference of new oil seal.
- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1- .
- Drive in new flange shaft oil seal (right-side) using thrust piece -T10387- until thrust piece reaches stop; keep seal straight when installing.



Note

- ◆ *Driving-in depth (standard): 5.5 mm beneath surface of cover*
- ◆ *When carrying out a repair, the oil seal is driven in to a depth of 6.5 mm using thrust piece -T10387- , so that the new seal does not bear on the same contact surface on the used flange shaft.*



- Install flange shaft.
- Bolt drive shaft to flange shaft ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Check gear oil level in gearbox ⇒ [page 80](#) .
- Install noise insulation panels.

Tightening torques

Component	Nm
Flange shaft to gearbox	10 + 90° ¹⁾
Heat shield for drive shaft	23
• ¹⁾ 90° is equivalent to a quarter turn.	



2 Removing and installing speedometer sender and drive wheel

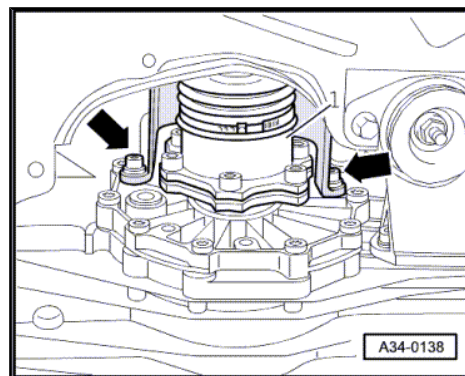
Overview

- ◆ ⇒ „2.1 Removing and installing speedometer sender G22“, page 152
- ◆ ⇒ „2.2 Removing and installing speedometer drive wheel“, page 152
- Gearbox in vehicle
- Refer to general repair instructions ⇒ page 5 .

2.1 Removing and installing speedometer sender -G22-

Removing

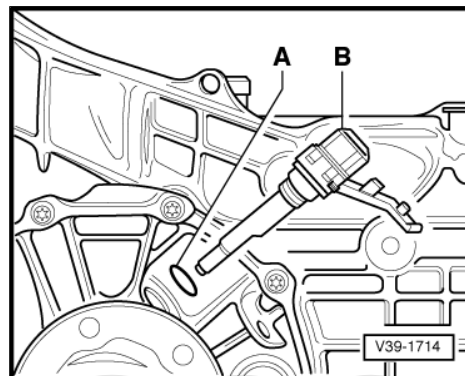
- Detach heat shield for drive shaft -1- from gearbox -arrows-.



- Unplug connector from speedometer sender -B-.
- Press down retainer, swivel speedometer sender -G22- aside and take out upwards.

Installing

- Install new O-ring -A-.
- Insert speedometer sender -B- and engage.
- Take care not to damage speedometer sender . Speedometer reading may be inaccurate if sender is damaged.



Tightening torque

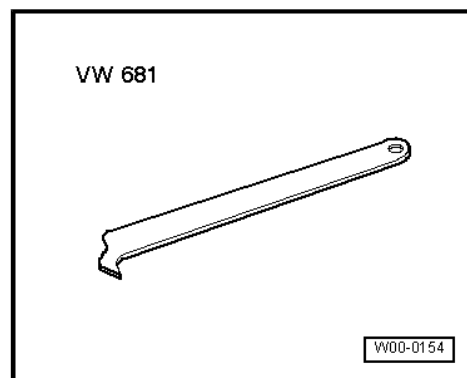
Component	Nm
Heat shield for drive shaft	23

2.2 Removing and installing speedometer drive wheel

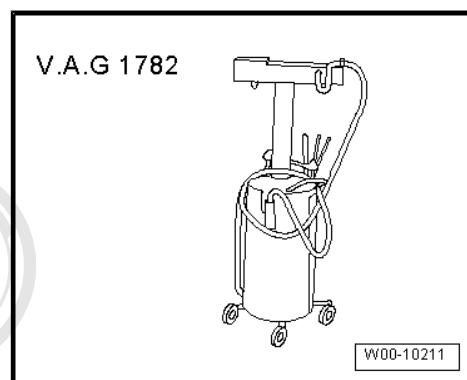
Special tools and workshop equipment required



- ◆ Oil seal extractor lever -VW 681- or extractor tool -T20143-



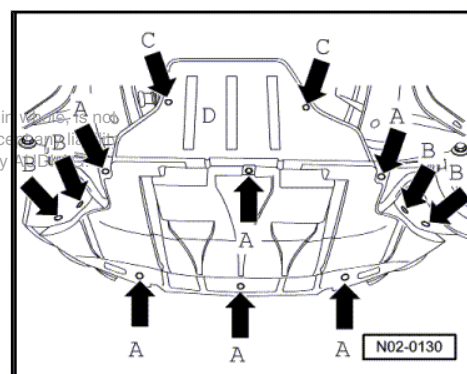
- ◆ Used oil collection and extraction unit -V.A.G 1782-



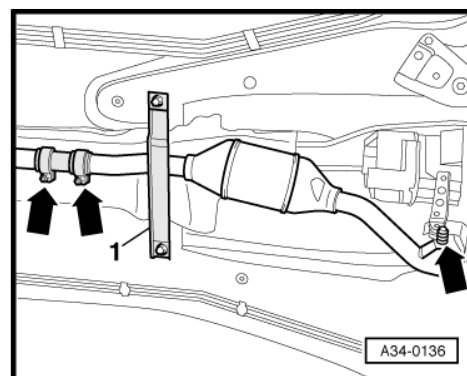
Removing:

- Remove rear section -D- of noise insulation.

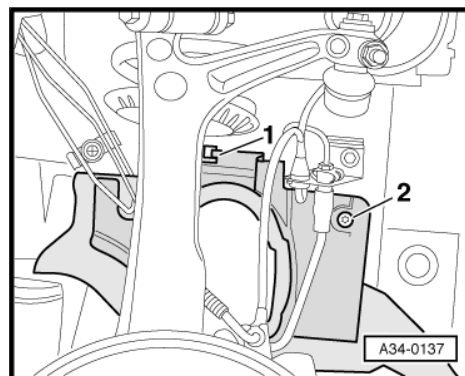
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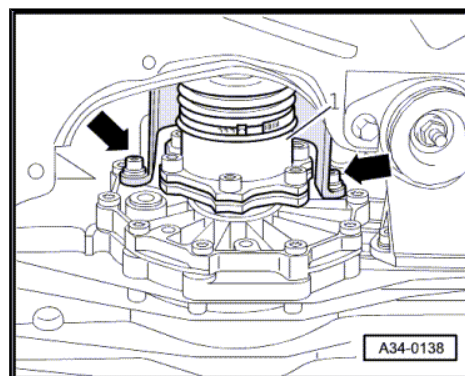
- Unbolt underbody cross member -1-.
- Remove front exhaust pipe complete with catalytic converter -arrows-.



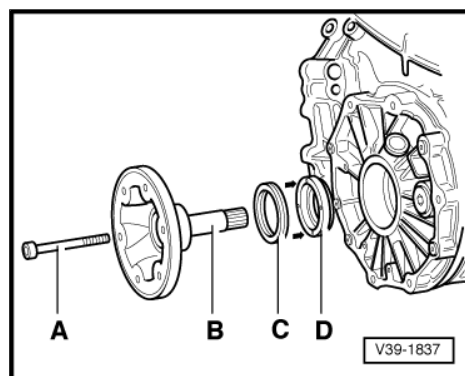
- Loosen bolt -2- for noise insulation above drive shaft.
- Disengage retainer -1- and remove noise insulation cover.



- Detach heat shield for drive shaft from gearbox -arrows-.
- Detach drive shaft -1-.
- Place used oil collection and extraction unit -V.A.G 1782- underneath.



- Remove securing bolt -A- for flange shaft -B-; to do so, screw two bolts into flange and counterhold flange shaft with suitable lever.
- Pull out flange shaft.
- Pull out flange shaft oil seal -C- using oil seal extractor lever -VW 681- or extractor hook -T20143-.
- Remove speedometer sender -G22- ⇒ [page 152](#).
- Using a screwdriver, lever out drive wheel -D- for speedometer on alternate sides at retaining clips -arrows-.



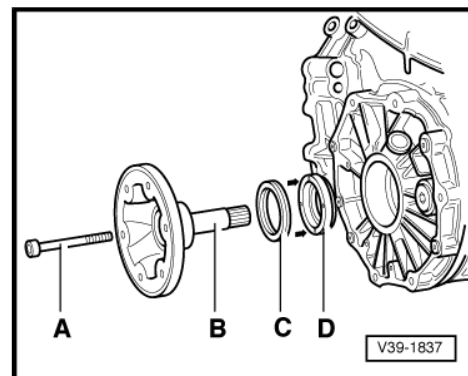
Installing:

Installation is carried out in reverse sequence; note the following:

Installation position:

Follower lugs -arrows- of drive wheel -D- locate in grooves of differential.

- Drive in new flange shaft oil seal -C- and install flange shaft ⇒ [page 148](#) .
- Bolt drive shaft to flange shaft ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Check gear oil level in gearbox ⇒ [page 80](#) .
- Install front exhaust pipe and perform stress-free alignment ⇒ Rep. gr. 26 .
- Fit drive shaft heat shield.
- Install noise insulation panels.



Tightening torques

Component	Nm
Flange shaft to gearbox	10 + 90° ¹⁾
Heat shield for drive shaft	23
Front exhaust pipe to turbocharger	25
Heat shield to turbocharger	10
Clamp for exhaust pipe	40
Underbody cross member to body	20
• ¹⁾ 90° is equivalent to a quarter turn.	

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3 Differential

Overview

- ◆ ⇒ „3.1 Removing and installing differential“, page 156
- ◆ ⇒ „3.2 Dismantling and assembling differential“, page 157

3.1 Removing and installing differential



Note

The differential can be removed and installed with the gearbox installed in the vehicle.

1 - Bolt

- ☐ 10 Nm + 1/4 turn (90°) further

2 - Flange shaft

- ☐ When removing, hold shaft with a drift or similar to stop it turning

3 - Bolt

- ☐ 25 Nm
- ☐ 10x

4 - Cover for final drive

- ☐ Removing and installing drive wheel for speedometer sender -G22- ⇒ [page 152](#)
- ☐ If renewed: adjust crown wheel ⇒ [page 177](#)

5 - Oil filler plug

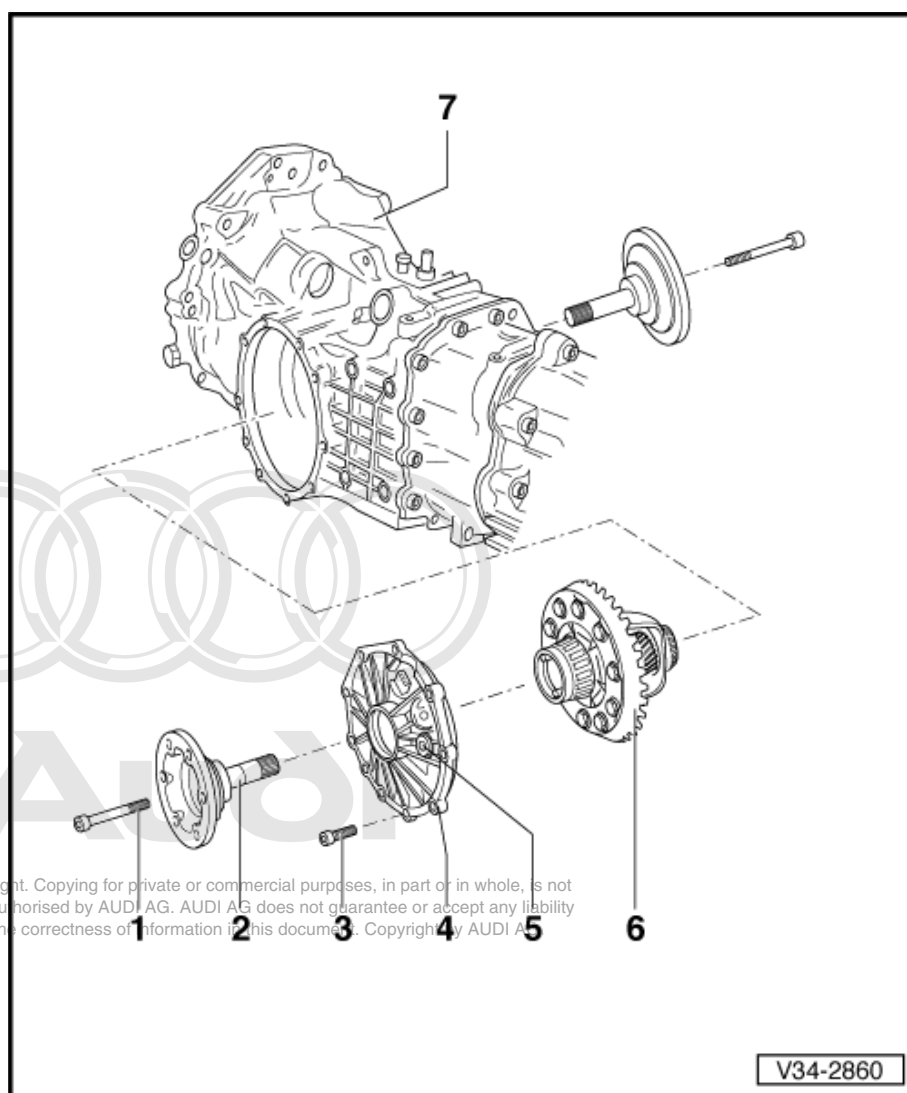
- ☐ 40 Nm
- ☐ Checking oil level in gearbox ⇒ [page 80](#)

6 - Differential

- ☐ Dismantling and assembling ⇒ [page 157](#)
- ☐ If renewed: adjust crown wheel ⇒ [page 177](#)

7 - Gearbox housing

- ☐ Servicing ⇒ [page 117](#)

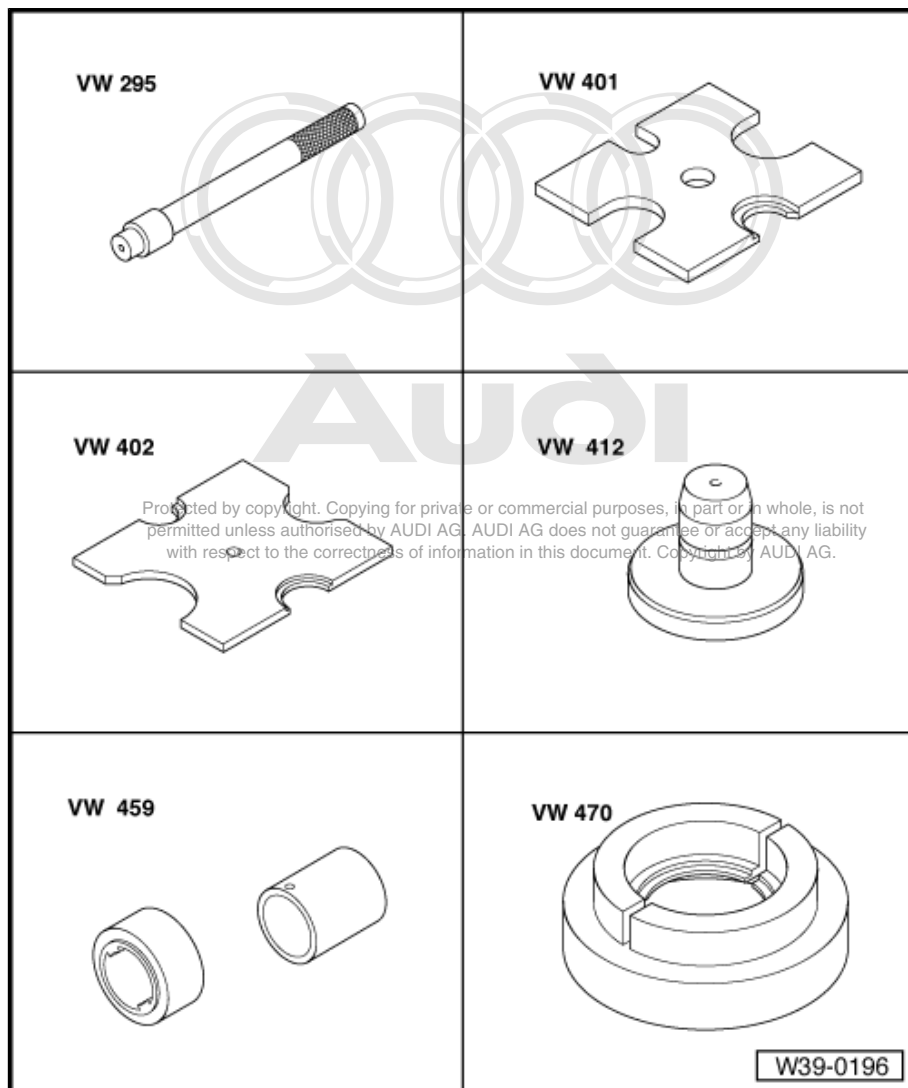


V34-2860

3.2 Dismantling and assembling differential

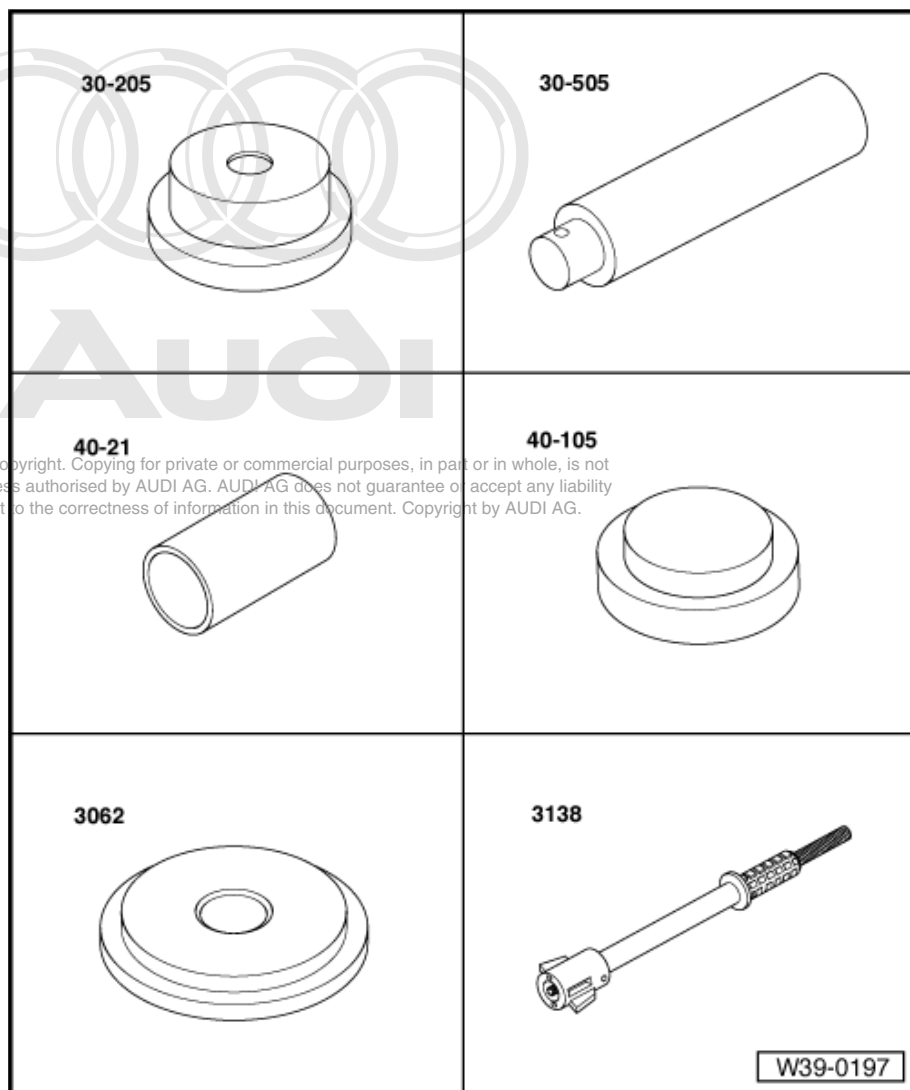
Special tools and workshop equipment required

- ◆ Drift -VW 295-
- ◆ Thrust plate -VW 401-
- ◆ Thrust plate -VW 402-
- ◆ Press tool -VW 412-
- ◆ Removal and installing tool -VW 459-
- ◆ Thrust pieces for pinion shaft bearing -VW 470-

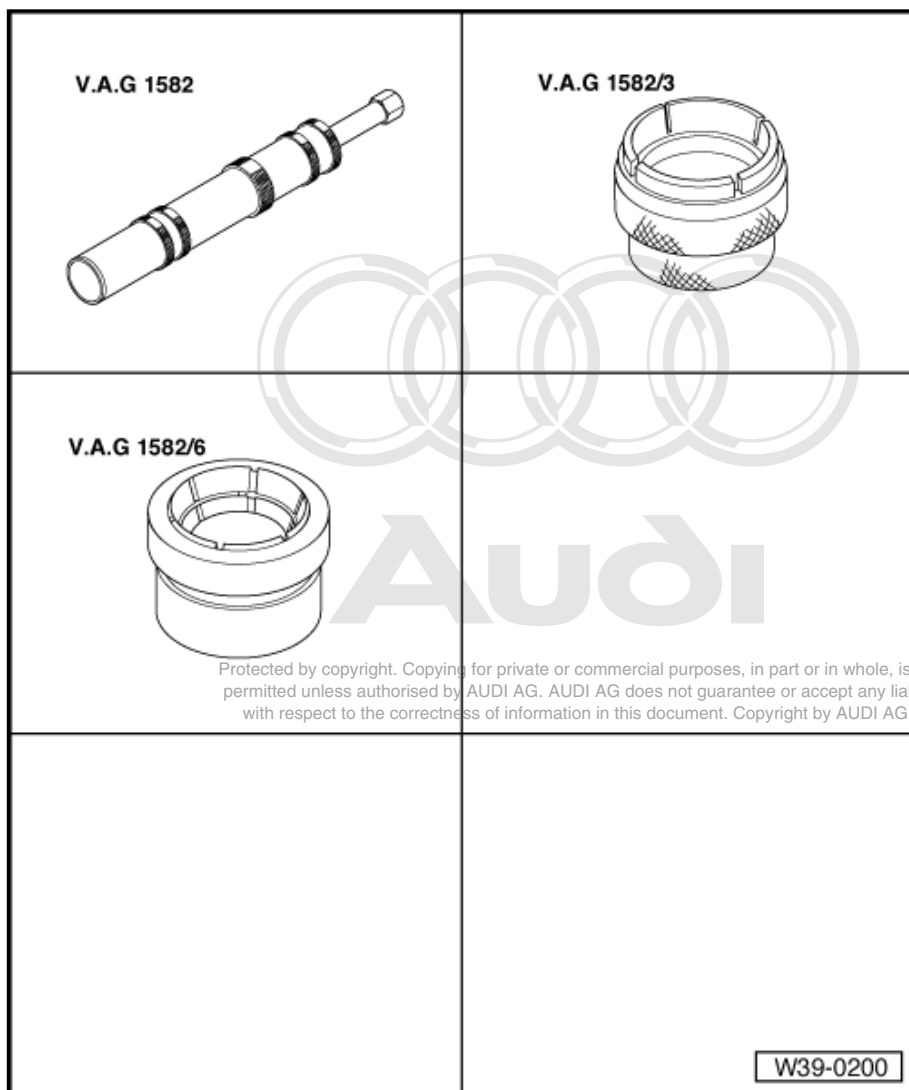


- ◆ Thrust plate -30-205-
- ◆ Mandrel -30-505-
- ◆ Drift sleeve -40-21-
- ◆ Thrust plate -40-105-
- ◆ Thrust pad -3062-
- ◆ Drift -3138-

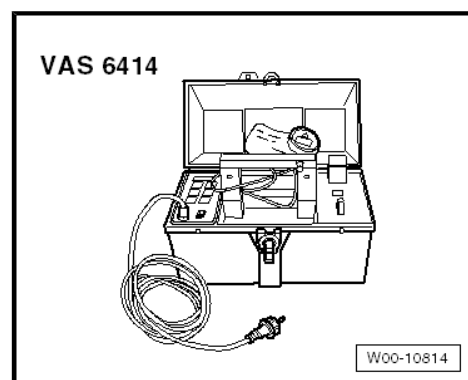
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- ◆ Tapered roller bearing puller -V.A.G 1582-
- ◆ Adapter -V.A.G 1582/3-
- ◆ Adapter -V.A.G 1582/6-



- ◆ Inductive heater -VAS 6414-



Note

- ◆ *Removing and installing differential* ⇒ [page 156](#)
- ◆ *Adjustment work is required when renewing the parts marked with ¹⁾*
⇒ *„4.3 Table of adjustments“, page 168*.

1 - Gearbox housing ¹⁾

2 - Shim „S2“

- ☐ Note thickness
- ☐ Table of adjustments
⇒ [page 168](#)

3 - Outer race for small tapered roller bearing ¹⁾

- ☐ Driving out ⇒ [page 164](#)
- ☐ Driving in ⇒ [page 165](#)

4 - Inner race for small tapered roller bearing ¹⁾

- ☐ Pulling off ⇒ [page 161](#)
- ☐ Pressing on
⇒ [page 162](#)

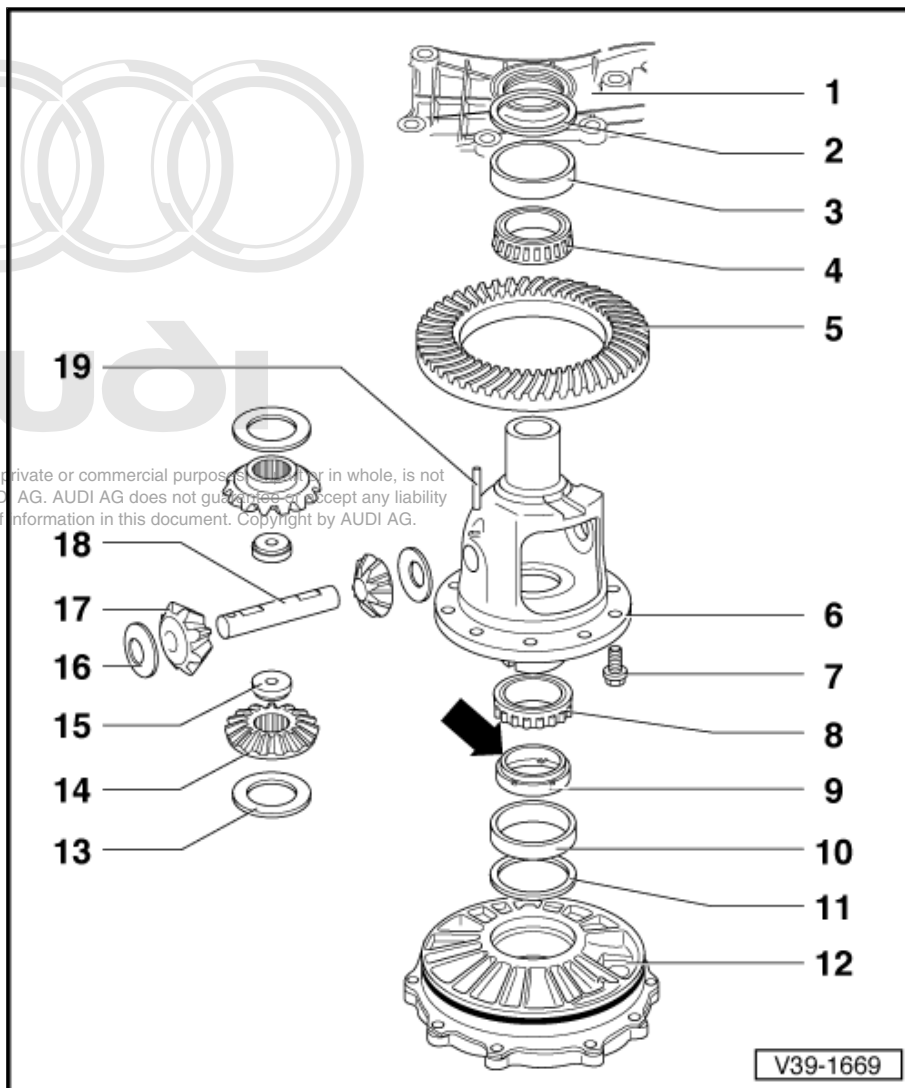
5 - Crown wheel ¹⁾

- ☐ Paired with pinion shaft (final drive set)
- ☐ Removing ⇒ [page 163](#)
- ☐ Installing ⇒ [page 163](#)

6 - Differential cage ¹⁾

7 - Bolt

- ☐ 60 Nm and then turn 45° further
- ☐ Always renew
- ☐ Use only genuine bolts
- ☐ Tighten bolts in stages and in diagonal sequence until crown wheel makes full contact with differential cage. Then tighten to specified torque.



8 - Inner race for large tapered roller bearing ¹⁾

- ☐ Pulling off ⇒ [page 162](#)
- ☐ Pressing on ⇒ [page 162](#)

9 - Drive wheel

- ☐ For speedometer sender -G22-
- ☐ Removing and installing ⇒ [page 152](#)
- ☐ Fit the drive wheel carefully onto the differential, making sure that it is kept straight. Do not use force; the drive wheel can break easily
- ☐ Installation position: shoulder -arrow- towards differential, follower lugs in recess in differential cage

10 - Outer race for large tapered roller bearing ¹⁾

- ☐ Driving out ⇒ [page 165](#)
- ☐ Driving in ⇒ [page 165](#)

11 - Shim „S1“

- ☐ Note thickness
- ☐ Table of adjustments ⇒ [page 168](#)

12 - Cover for final drive ¹⁾

- ☐ With O-ring
- ☐ Renew O-ring

- ☐ Lubricate O-ring with oil when installing

13 - Shims

- ☐ Re-determining thickness ⇒ [page 164](#)

14 - Sun wheel

- ☐ Adjusting ⇒ [page 164](#)

15 - Threaded piece

16 - Thrust washer

- ☐ Check for cracks and chipping

17 - Planet pinion

- ☐ Installing ⇒ [page 163](#)

18 - Differential pinion pin

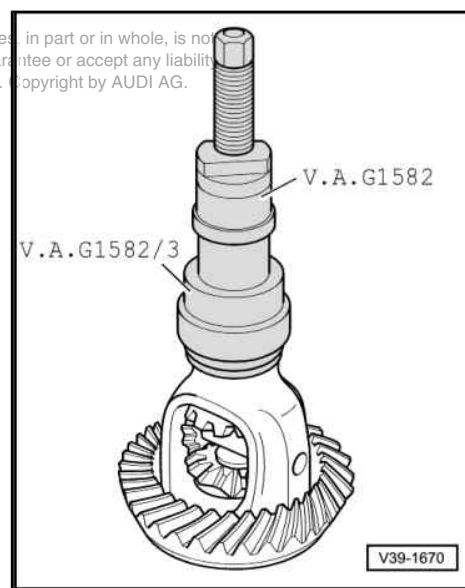
- ☐ Drive out with drift after removing roll pin
- ☐ Align thrust washers before driving in

19 - Roll pin

- ☐ Always renew
- ☐ Drive in flush

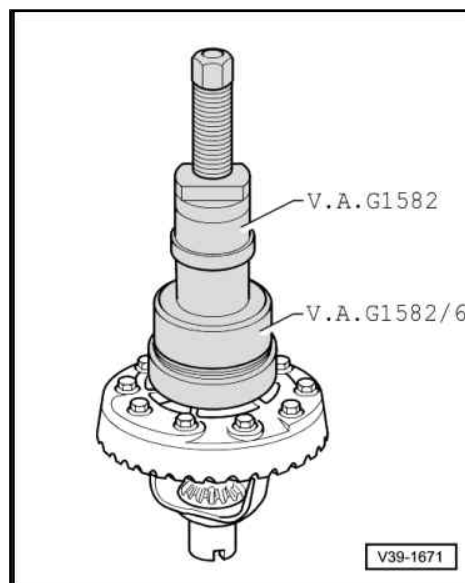
Pulling inner race for small tapered roller bearing off differential cage

- Position thrust plate -40-105- before applying puller.



Pulling inner race for large tapered roller bearing off differential cage

- Remove drive wheel for speedometer sender -G22- .
- Position thrust plate -40-105- before applying puller.



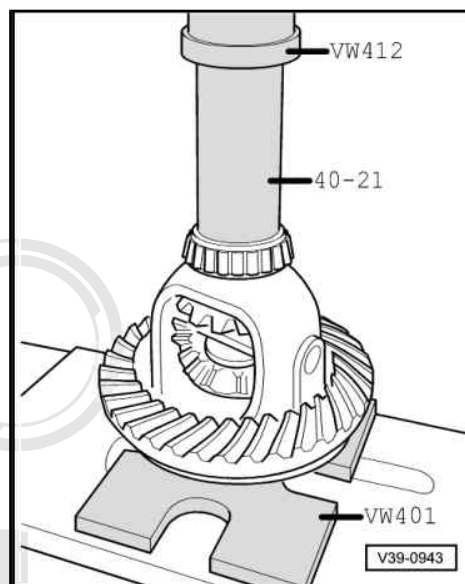
Pressing on inner race for small tapered roller bearing

- Heat inner race to approx. 100 °C, fit in position and press home.



WARNING

Wear protective gloves.



Pressing on inner race for large tapered roller bearing

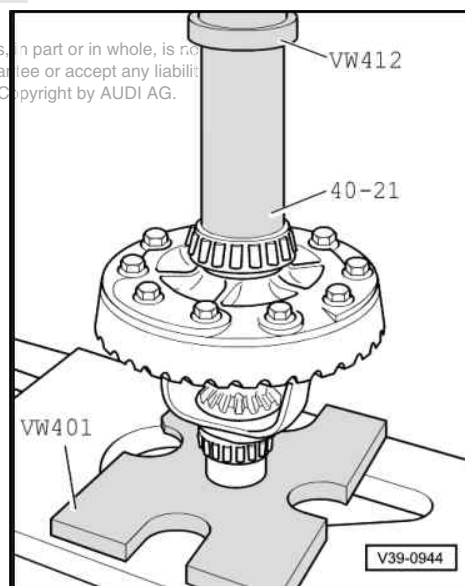
- Heat inner race to approx. 100 °C, fit in position and press home.



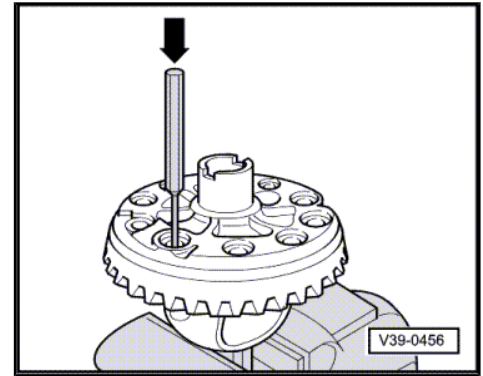
WARNING

Wear protective gloves.

- Fit drive wheel for speedometer sender -G22- .



Driving crown wheel off differential cage



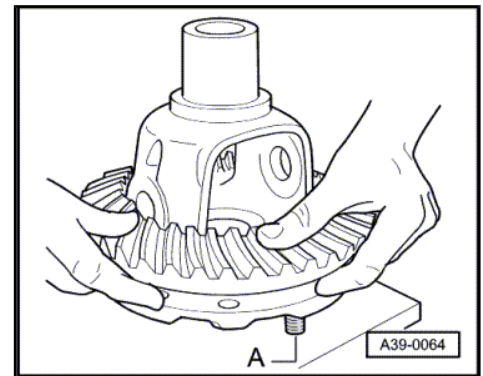
Heating crown wheel to approx. 100 °C and installing

- When fitting crown wheel, use centralising pins -A- (shop-made tool) to locate.



WARNING

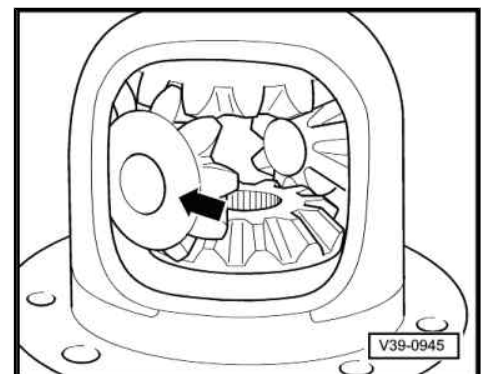
Wear protective gloves.



- Allow to cool slightly before screwing in new securing bolts.
- Then tighten bolts in stages and in diagonal sequence until crown wheel makes full contact with differential cage.
- Then tighten bolts to specified torque [⇒ Item 7 \(page 160\)](#).

Installing differential bevel gears

- Carefully lever off drive wheel for speedometer sender -G22- with a screwdriver.
- Apply a small quantity of grease to thrust washers for planet pinions and install thrust washers.
- Insert sun wheels with selected shims [⇒ page 164](#).
- Insert planet pinions (spaced 180° apart) and pivot into position [arrow](#).
- Insert threaded pieces.
 - Installation position: stepped shoulder towards sun wheel.
- Locate thrust washers and planet pinions so that they align with the holes.
- Drive differential pinion pin into final position and secure.



Adjusting differential bevel gears

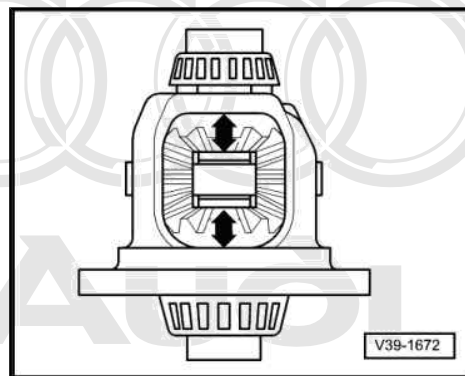
- Insert sun wheels with thinnest shims (0.5 mm).
- Insert planet pinions with thrust washers and press in differential pinion pin.



Note

Ensure that planet pinions and thrust washers are not interchanged from this point onwards.

- Press planet pinions outwards and check clearance of sun wheels by hand -arrows-.
- Adjust clearance by inserting an appropriate shim
⇒ [page 164](#).
- Specification: max. 0.10 mm.



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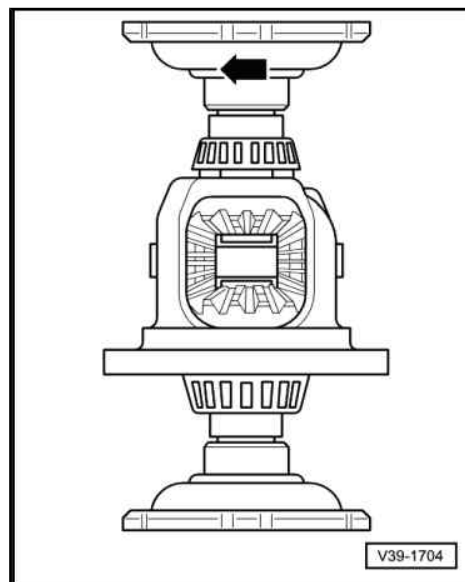
Note

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

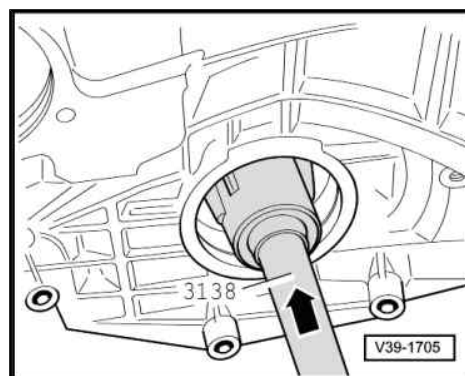
- Determine thickness of required shim according to table; for part numbers refer to ⇒ Electronic parts catalogue .

Shims available:

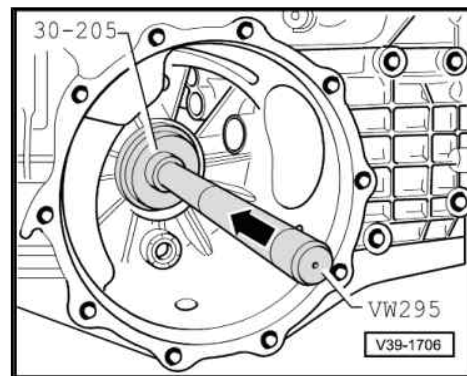
Shim thickness (mm)		
0.50	0.70	0.90
0.60	0.80	1.00



Driving outer race for small tapered roller bearing out of gearbox housing

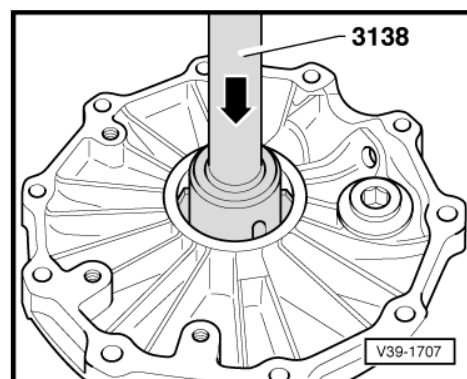


Driving outer race for small tapered roller bearing into gearbox housing

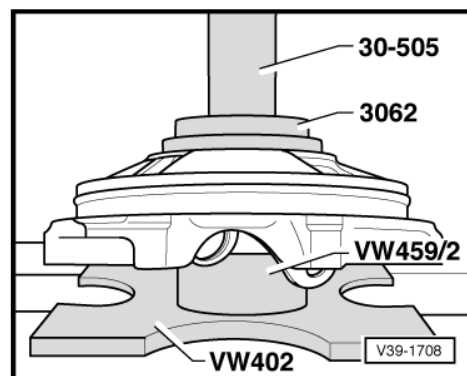


Driving outer race for large tapered roller bearing out of cover

- Use a suitable base, e.g. thrust pieces for drive pinion bearing -VW 470- with recess towards cover.



Driving outer race for large tapered roller bearing into cover



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4 Adjusting pinion shaft and crown wheel



Note

- ◆ *Careful adjustment of the crown wheel and pinion shaft is essential to ensure that the final drive gives long service and runs silently. For this reason, the pinion shaft 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 pinion shaft 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 allowance „r“ in relation to the master gauge „Ro“ is measured for the final drive gear sets supplied as replacement parts and marked on the outer circumference of the crown wheel. The final drive gear set (pinion shaft and crown wheel) may only be renewed together as a matched pair.*
- ◆ *Observe the general repair instructions for tapered roller bearings and shims ⇒ [page 5](#).*

4.1 Adjustment and marking of final drive gear set



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1 - Identification „K831“ denotes an Klingelnberg gear set with a ratio of 31 : 8.

2 - -312- number of matched pair of gears.

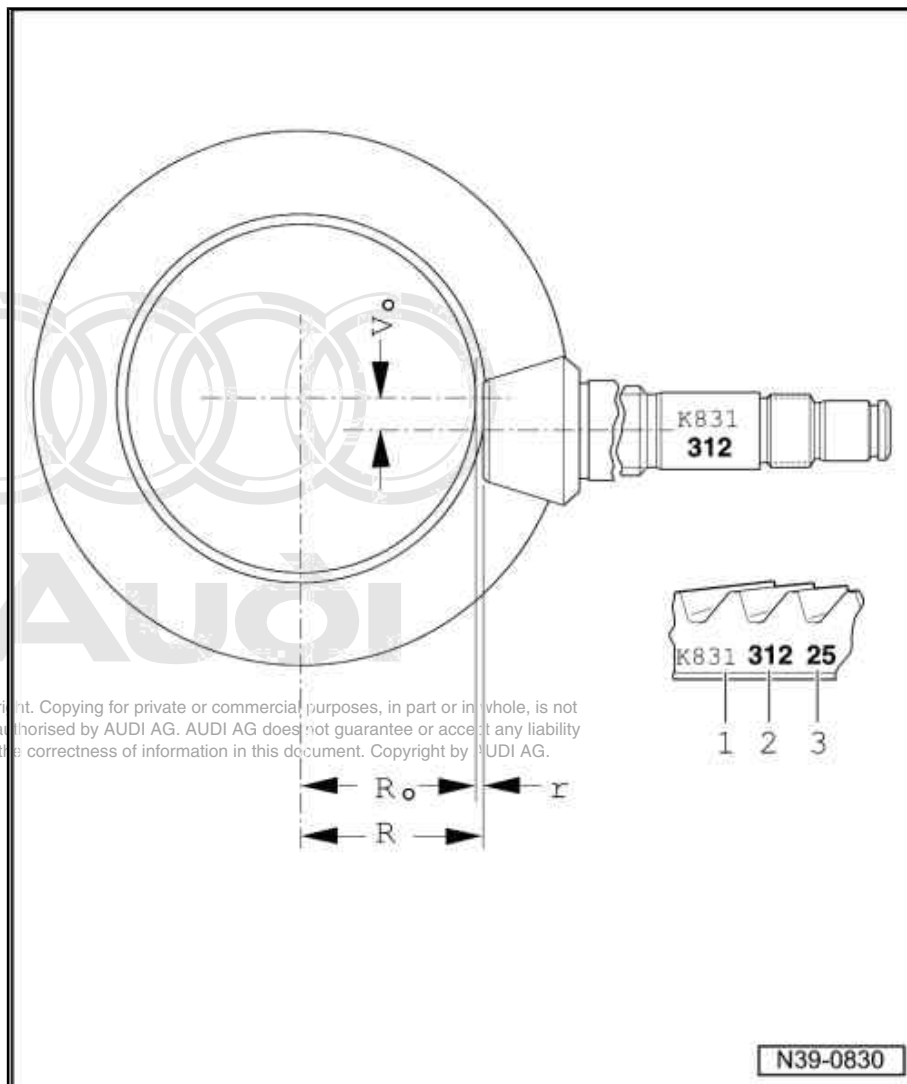
3 - Allowance „r“ is based on the master gauge used on the test machine in production. The allowance „r“ is always given in 1/100 mm. For example: „25“ indicates $r = 0.25$ mm

Ro - Length of master gauge used on test machine Ro = „59.65 mm“

R - Actual distance between centre axis of crown wheel and face of pinion shaft at point with quietest running for this gear set.

Vo - Hypoid offset

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4.2 Position of shims



Note

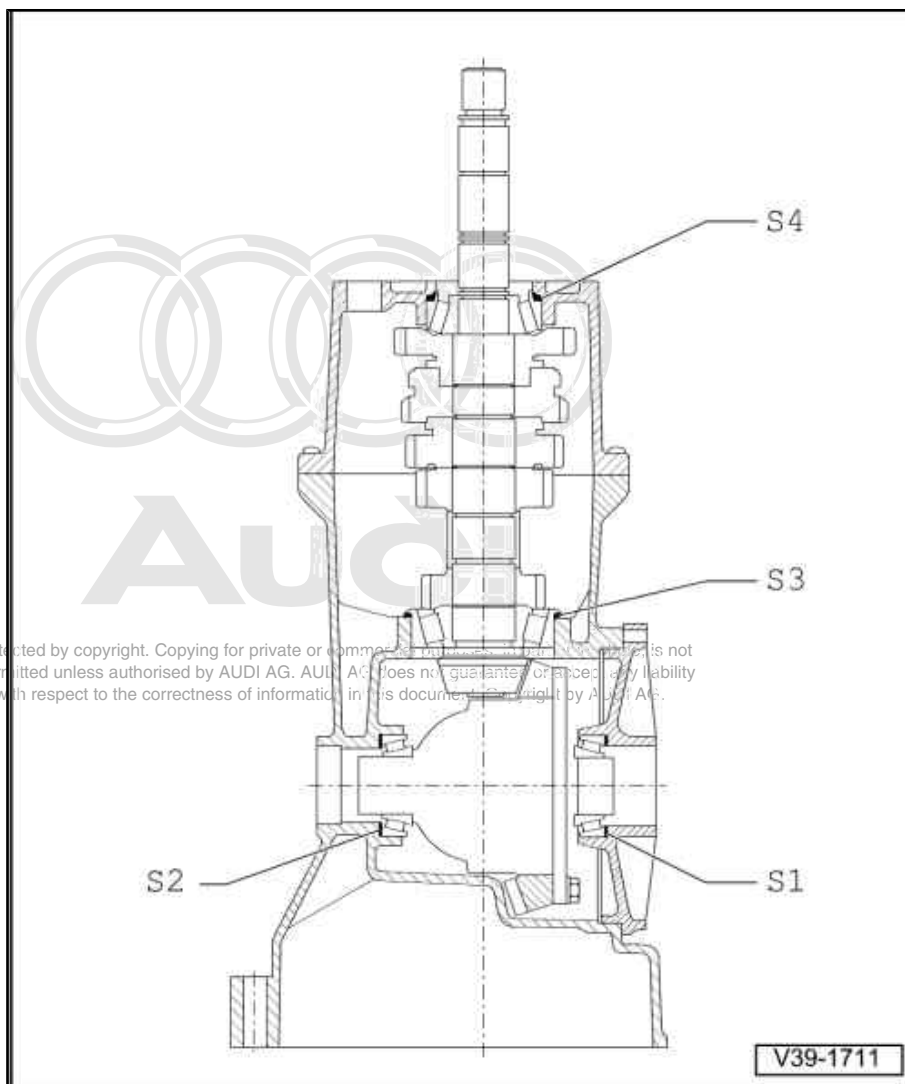
Table of adjustments when renewing individual components of gearbox ⇒ [page 168](#).

S1 - Shim for crown wheel in cover for final drive

S2 - Shim for crown wheel in gearbox housing

S3 - Shim for pinion shaft in gearbox housing

S4 - Adjustment shim for pinion shaft in bearing plate



4.3 Table of adjustments



Note

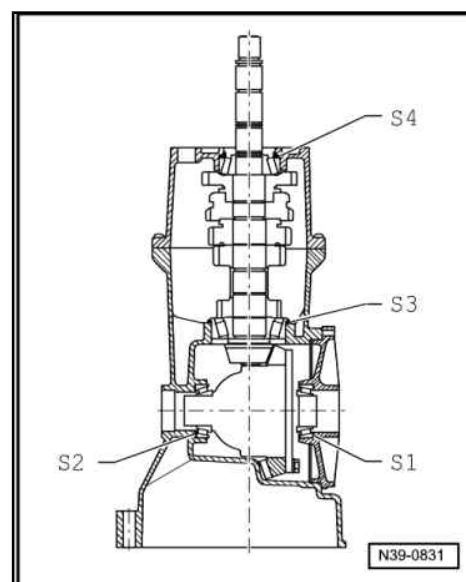
If repairs have been carried out to the gearbox, it is only necessary to adjust the pinion shaft, crown wheel or final drive set if components have been renewed which have a direct effect on the adjustment of the final drive. Refer to the following table to avoid unnecessary adjustment work:

Components requiring adjustment:	Crown wheel	Pinion shaft	Pinion shaft	Backlash
	(„S1“ + „S2“)	(„S3“ + „S4“) via allowance „r“	Shim „S4“ only	0.12 - 0.22 mm
Component renewed	⇒ page 177	⇒ page 169	⇒ page 113	⇒ page 181
Gearbox housing	X	X		X
Bearing plate			X	
Differential cage	X			X
Tapered roller bearings for pinion shaft		X		X
Tapered roller bearings for differential	X			X
Final drive gear set ¹⁾	X	X		X
Cover for final drive	X			X
¹⁾ Pinion shaft and crown wheel; only renew together. Shims, installation position ⇒ page 168 .				

4.4 Re-adjustment sequence for final drive gear set

The following work sequence is recommended to save time when the crown wheel and pinion shaft have to be adjusted:

- ◆ Determine total shim thickness „S_{total}“ (S₁ plus S₂) for specified preload on tapered roller bearings for differential
⇒ [page 180](#)
- ◆ Determine total shim thickness „S_{total}“ (S₃ plus S₄) for specified preload on tapered roller bearings for pinion shaft
⇒ [page 172](#) .
- ◆ Distribute total shim thickness „S_{total}“ (S₃ plus S₄) so that dimension from centre of crown wheel to end face of pinion corresponds to installation dimension „R“ determined during production ⇒ [page 176](#) .
- ◆ Distribute total shim thickness „S_{total}“ (S₁ plus S₂) so that specified backlash between crown wheel and pinion shaft is obtained ⇒ [page 182](#) .



Note

Overview of components and shims ⇒ [page 168](#) .

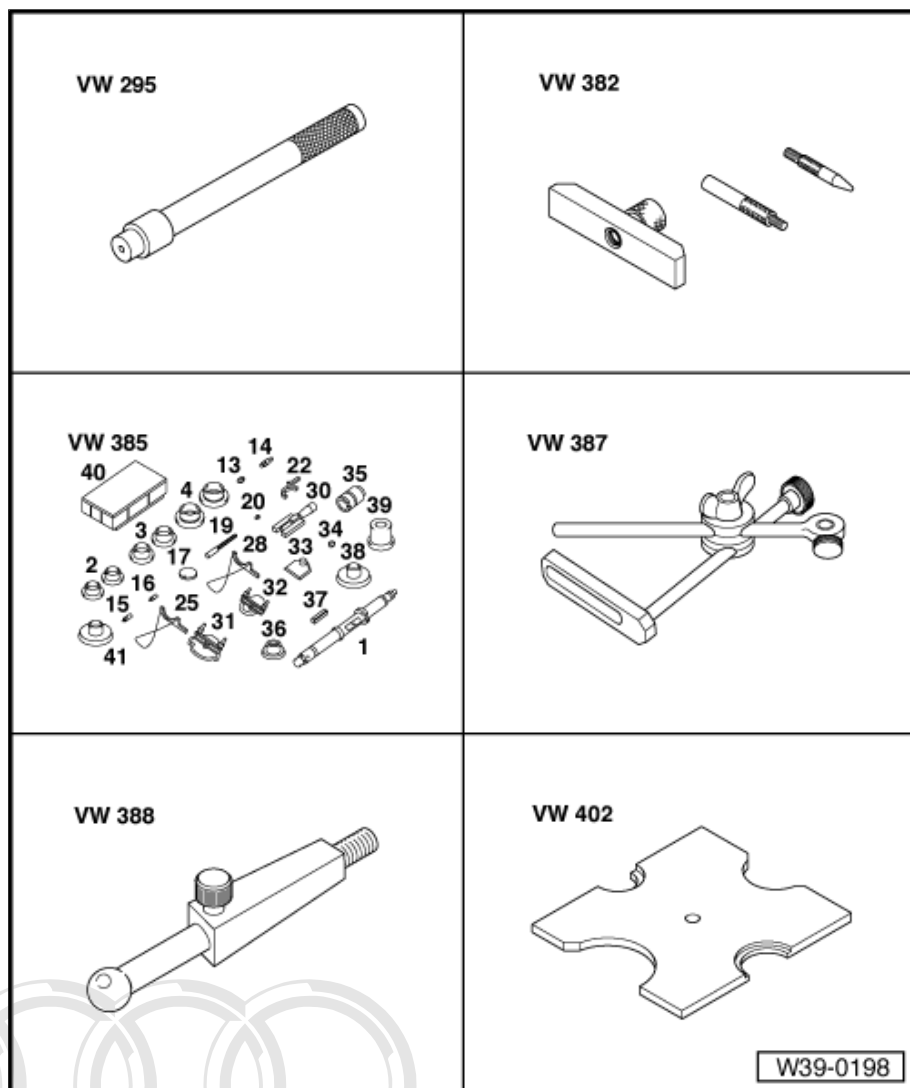
4.5 Adjusting pinion shaft

Note

The pinion shaft only needs to be re-adjusted according to the following instructions if the final drive gear set, the tapered roller bearings for the pinion shaft or the gearbox housing are being renewed. Table of adjustments ⇒ [page 168](#)

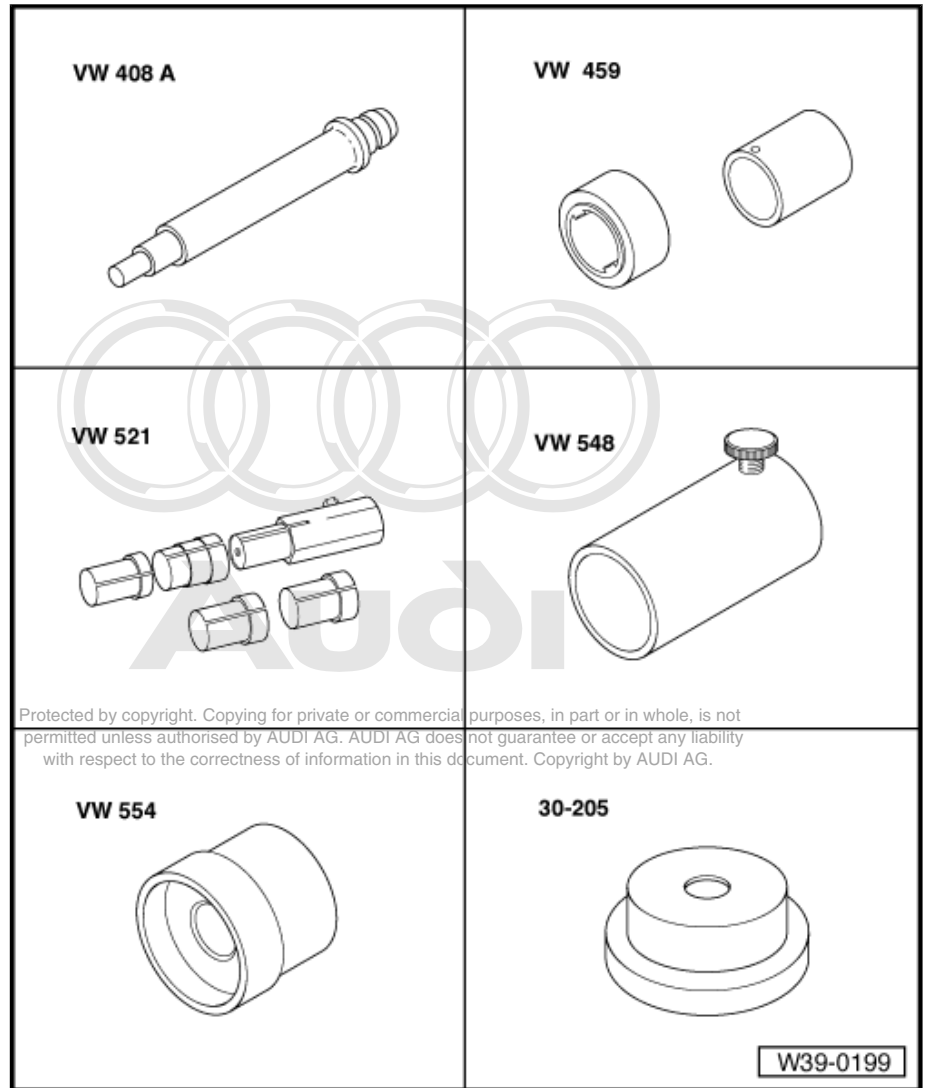
Special tools and workshop equipment required

- ◆ Drift -VW 295-
- ◆ Measuring tool -VW 382-
- ◆ Universal measuring tool - VW 385-
- ◆ Universal dial gauge bracket -VW 387-
- ◆ Measuring lever -VW 388-
- ◆ Thrust plate -VW 402-

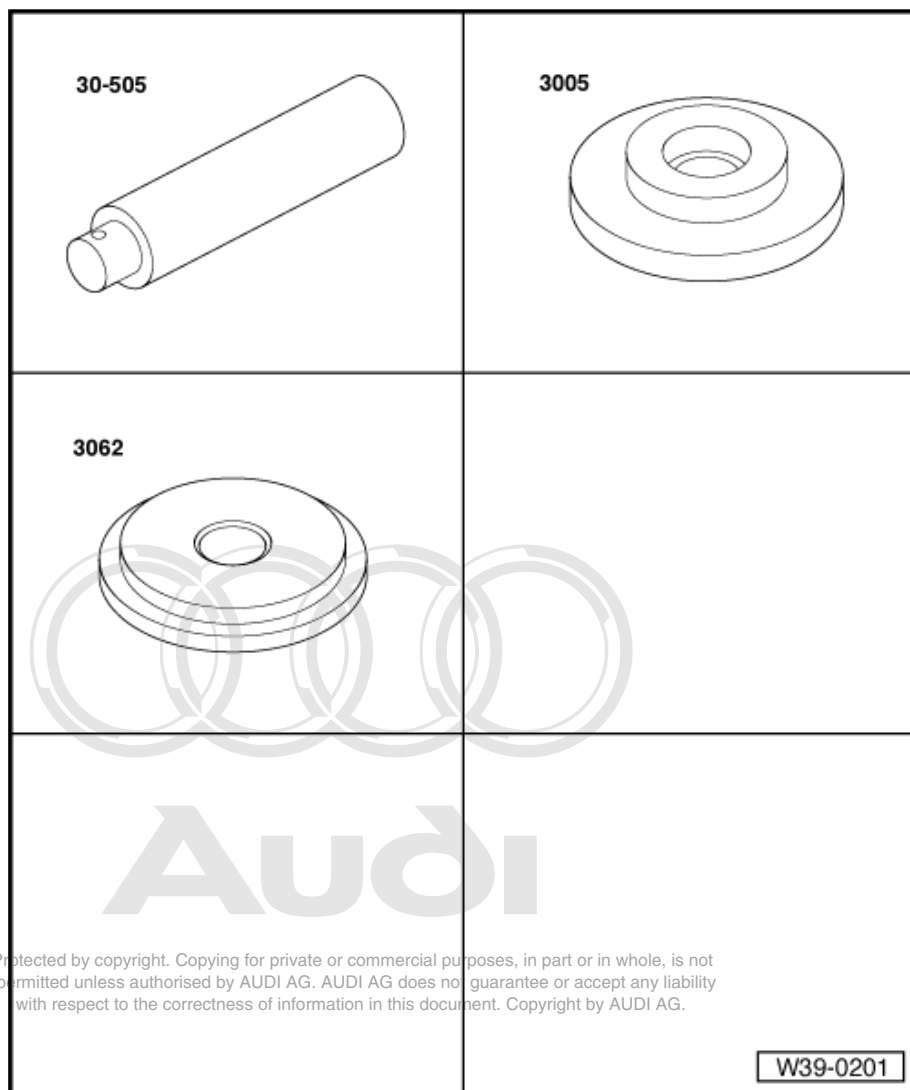


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- ◆ Press tool -VW 408 A-
- ◆ Removal and installing tool -VW 459-
- ◆ Crown wheel adjusting tool -VW 521-
- ◆ Clamp -VW 548-
- ◆ Press tool -VW 554-
- ◆ Thrust plate -30-205-



- ◆ Mandrel -30-505-
- ◆ Thrust plate -3005-
- ◆ Thrust pad -3062-
- ◆ Dial gauge
- ◆ Dial gauge extension, 30 mm



Determining total shim thickness „S_{total}“ for shims „S₃“ plus „S₄“

(Setting preload of tapered roller bearings for pinion shaft)

- Differential removed
- Fit tapered roller bearing outer race for pinion shaft in gearbox housing without shims ⇒ [page 141](#) and ⇒ [page 141](#) .

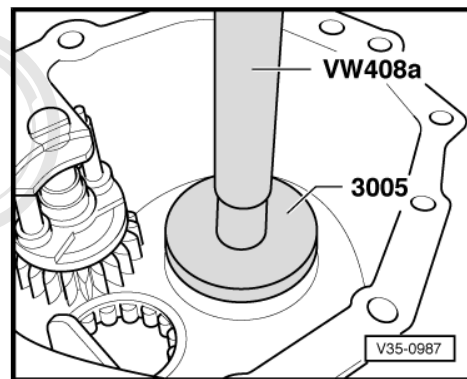
- Fit tapered roller bearing outer race for pinion shaft with a provisional shim „S4*“ (thickness 0.85 mm) in bearing plate.



Note

For measurement purposes a shim „S4“ with a thickness of 0.85 mm is inserted provisionally. This is referred to in the following as „S4“. „S4*“ is exchanged with the final shim „S4“ after determining measured value „e“.*

- Insert completely assembled pinion shaft in gearbox housing.
- Fit bearing plate with dowel sleeves and tighten bolts to 25 Nm.
- Turn pinion shaft 5 turns in each direction so that tapered roller bearings seat properly.



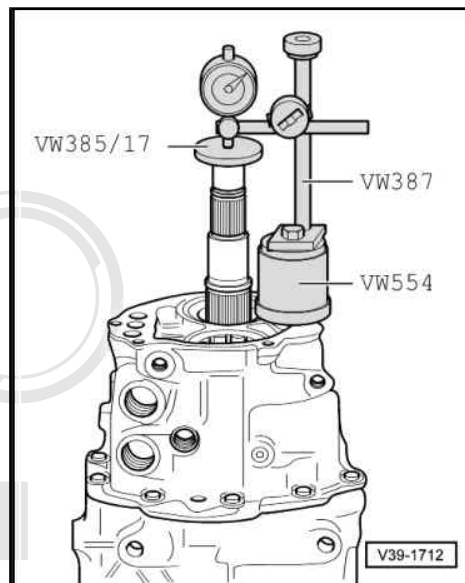
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- Set up measuring tool.
- Use dial gauge extension (length 30 mm).
- Apply dial gauge extension to centre of measuring device -VW 385/17- .
- Set dial gauge (3 mm measuring range) to zero with 2 mm preload.
- Lift pinion shaft, without turning, and read off play on dial gauge.
- ◆ Measurement in example: 0.55 mm



Note

If the measuring procedure needs to be repeated, the pinion shaft must first be rotated 5 turns in each direction again so that the tapered roller bearings seat properly. Preload dial gauge to 2 mm and set to „0“ again.



The specified bearing preload is obtained by adding a constant preload figure (0.15 mm) to the measured value obtained (0.55 mm) and the thickness of the shim installed „S4“ (0.85 mm).

Formula: „S_{total}“ = „S₄“ + dial gauge reading + bearing preload

Example:

Inserted shim „S ₄ “	0.85 mm
+ Measured value (example)	0.55 mm
+ Bearing preload (constant value)	0.15 mm
= Total shim thickness „S _{total} “ for „S ₃ “ + „S ₄ “	1.55 mm

Determining thickness of provisional shim „S₃“



Note

Provisional shim S₃ is replaced with final shim S₃ after determining measured value „e“.*

Formula: „S₃“ = „S_{total}“ – „S₄“

Example:

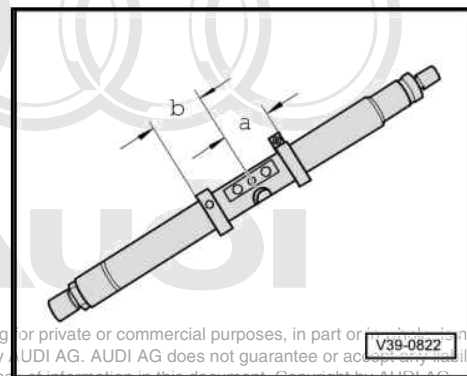
Total shim thickness „S _{total} “ for „S ₃ “ + „S ₄ “	1.55 mm
- Inserted shim „S ₄ “	0.85 mm
= Thickness of shim „S ₃ “	0.70 mm

- Remove tapered roller bearing outer race ⇒ [page 140](#) .
- Fit provisional shim „S₃“ in gearbox housing and press in outer race again ⇒ [page 141](#) and ⇒ [page 141](#) .
- Insert completely assembled pinion shaft into gearbox housing again.
- Fit bearing plate with dowel sleeves and tighten bolts to 25 Nm.
- Turn pinion shaft 5 turns in each direction so that tapered roller bearings seat properly.

Determining dimension „e“**Note**

Dimension „e“ is required to determine the final shim thickness of „S₃“ and „S₄“.

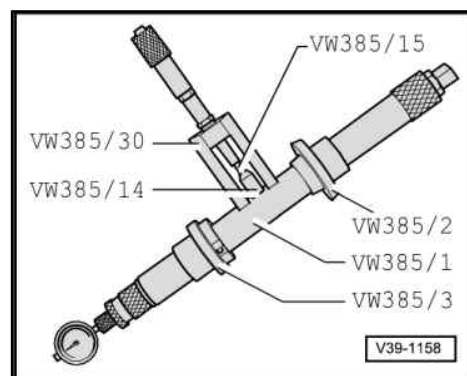
- Set adjustment rings of universal measuring tool -VW 385/1- to the following values:
 - ◆ Dimension -a- = 65 mm
 - ◆ Dimension -b- = 65 mm



- Assemble universal measuring tool -VW 385/1- as illustrated.
 - ◆ Dial gauge extension -VW 385/15- , 9.3 mm long
 - ◆ Master gauge -VW 385/30-

**Note**

The gauge -VW 385/30- can also be used in place of the master gauge -VW 385/27- (Ro = 59.65 mm).

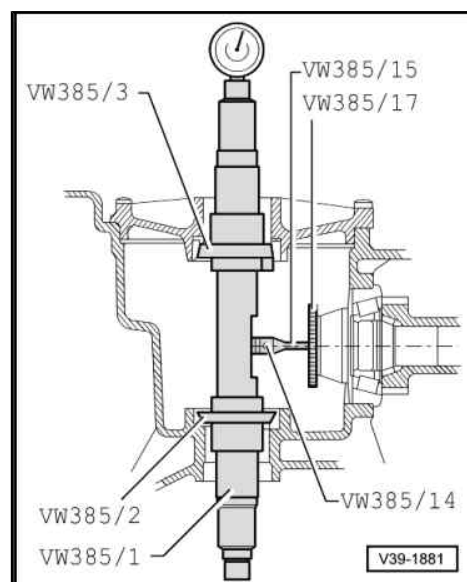
**Arrangement of measuring tools when determining dimension „e“**

- Place end measuring plate -VW 385/17- on face of pinion gear.

**Note**

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

- Remove master gauge from universal measuring tool .
- Insert universal measuring tool into gearbox housing.
- ◆ The centring disc -VW 385/3- faces towards cover for final drive.
- Fit cover for final drive and tighten 4 bolts to 25 Nm.
- Using the adjustable ring, pull 2nd centring disc -VW 385/3- out as far as possible so that the universal measuring tool can still just be turned by hand.

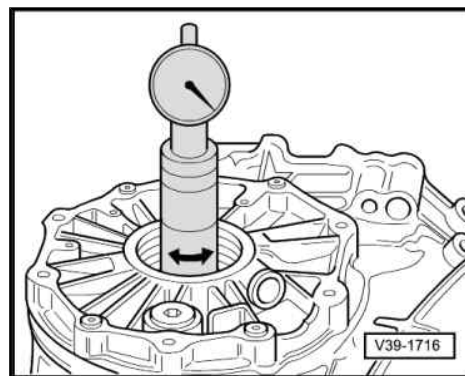


- Turn universal measuring tool until tip of dial gauge touches end measuring plate on face of pinion gear, and measure maximum deflection (return point).
- ◆ Measurement in following example: „e“ = 0.33 mm (in red scale)



Note

Then (after removing universal measuring tool), check once again that the dial gauge indicates „0“ with 2 mm preload when master gauge -VW 385/30- is in place.



Determining thickness of shim „S₃“

- ◆ The allowance „r“ referenced to the master gauge „Ro“ is measured for the final drive gear sets supplied as replacement parts and marked on the outer circumference of the crown wheel.
- ◆ Subtract value „e“ if measurement is obtained on red scale.
- ◆ Add value „e“ if measurement is obtained on black scale.

Formula:

$$„S_3“ = „S_3^{*}“ + „r“ + „e“ („e“ on black scale)$$

$$„S_3“ = „S_3^{*}“ + „r“ - „e“ („e“ on red scale)$$

Example:

Inserted shim „S ₃ [*] “	0.70 mm
+ Allowance „r“	0.38 mm
- Determined value „e“ (in red scale)	0.33 mm
= Thickness of shim „S ₃ “	0.75 mm

- Determine shim(s) as accurately as possible according to table. For part numbers, refer to ⇒ Electronic parts catalogue.

Available shims for „S₃“

Shim thickness (mm) ¹⁾		
0.45	0.61	0.80
0.49	0.65	0.85
0.53	0.69	
0.57	0.73	
• ¹⁾ The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.		

Determining thickness of shim „S₄“

$$\text{Formula: } „S_4“ = „S_{\text{total}}“ - „S_3“$$

Example:

Total shim thickness „S _{total} “ for „S ₃ “ + „S ₄ “	1.55 mm
- Thickness of shim „S ₃ “	0.75 mm
= Thickness of shim „S ₄ “	0.80 mm

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- Determine shim(s) as accurately as possible according to table. For part numbers, refer to ⇒ Electronic parts catalogue .

Shims available for „S4“

Shim thickness (mm) ¹⁾		
0.45	0.61	0.77
0.49	0.65	0.81
0.53	0.69	0.85
0.57	0.73	

• ¹⁾ The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

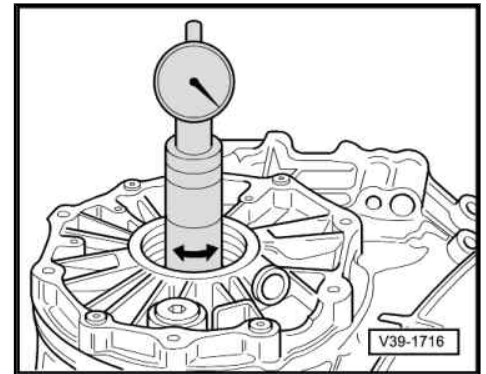
Checking dimension „r“

- Install pinion shaft with determined shims „S3“ and „S4“ and turn 5 turns in both directions.
- Insert universal measuring tool ⇒ [page 175](#) and check adjustment.
- Read off dial gauge anti-clockwise (red scale).
- ♦ If the shims have been correctly selected, the allowance „r“ (marked on outer circumference of crown wheel) should be indicated within a tolerance of ± 0.04 mm.



Note

Then (after removing universal measuring tool), check once again that the dial gauge indicates „0“ with 2 mm preload when master gauge -VW 385/30- is in place. If this is not the case, correct the adjustment.

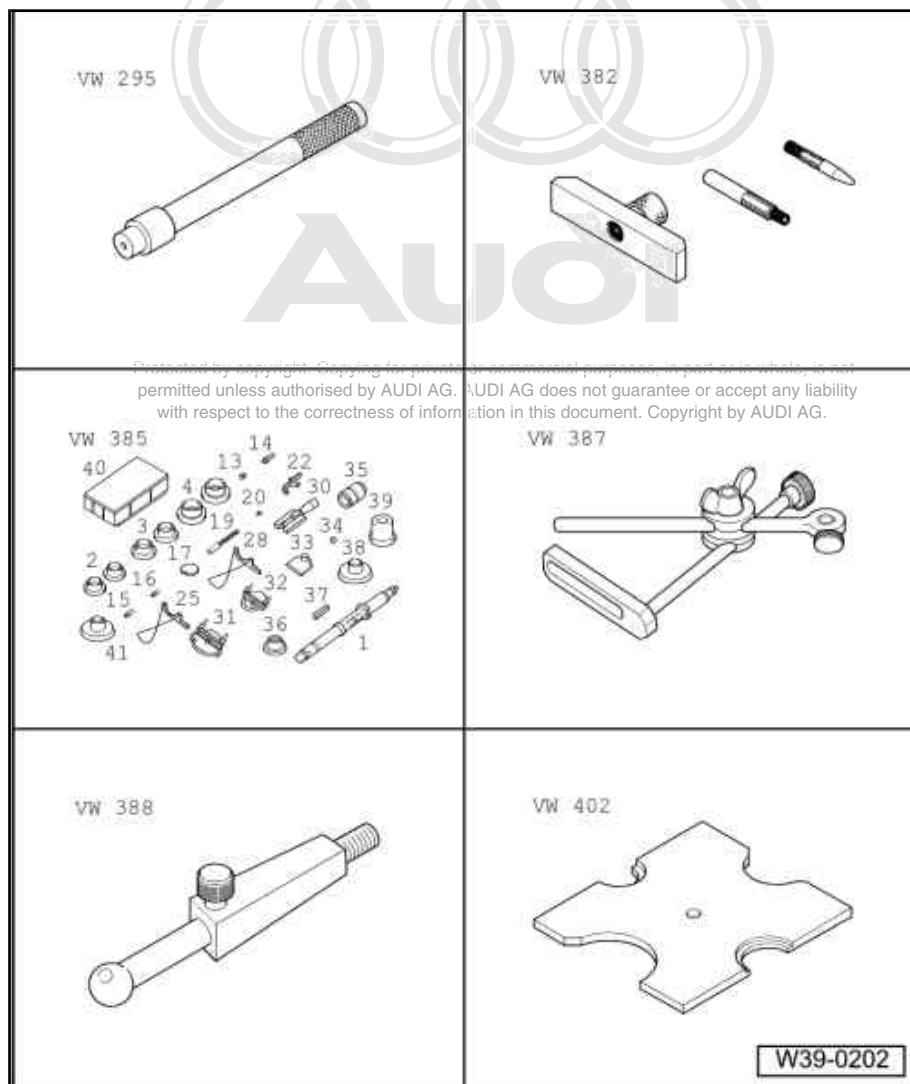


4.6 Adjusting crown wheel

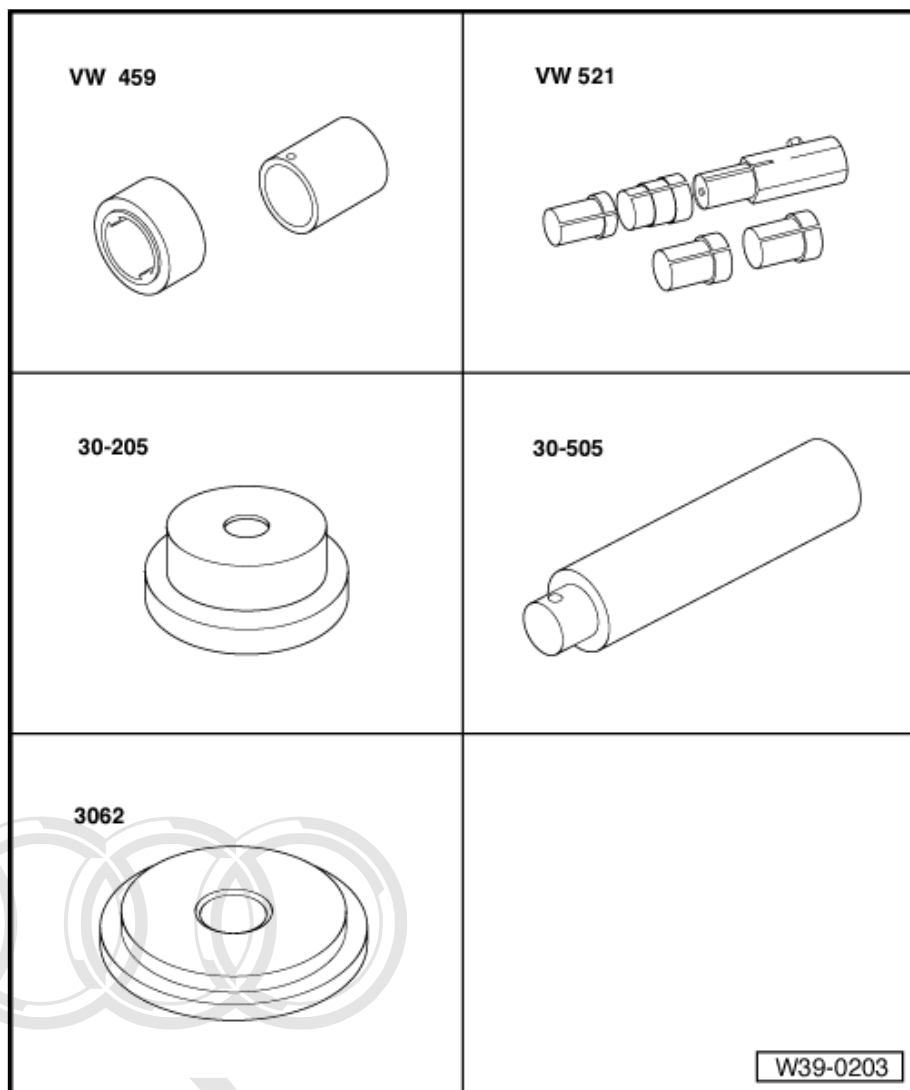
(Adjusting differential)

Special tools and workshop equipment required

- ◆ Drift -VW 295-
- ◆ Measuring tool -VW 382-
- ◆ Universal measuring tool - VW 385-
- ◆ Universal dial gauge bracket -VW 387-
- ◆ Adjustable measuring lever -VW 388-
- ◆ Thrust plate -VW 402-

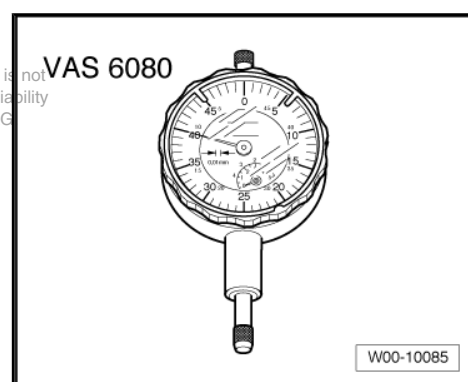


- ◆ Removal and installing tool -VW 459-
- ◆ Crown wheel adjusting tool -VW 521-
- ◆ Thrust plate -30-205-
- ◆ Mandrel -30-505-
- ◆ Thrust pad -3062-



- ◆ Dial gauge , e.g. -VAS 6080-

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- ◆ Dial gauge extension, 30 mm

The crown wheel only has to be re-adjusted if:

The gearbox housing, cover for final drive, tapered roller bearings for differential, differential cage or final drive gear set have been renewed. Table of adjustments ⇒ [page 168](#)

Determining total shim thickness „S_{total}“ for shims „S₁“ plus „S₂“

(Setting preload of tapered roller bearings for differential)

- Pinion shaft removed.
- Pull out flange shaft oil seal using oil seal extractor lever - VW 681- or extractor hook - T20143- .
- Remove tapered roller bearing outer races for differential and take out shims ⇒ [page 157](#) .
- Drive outer race for tapered roller bearing (right-side) with shim „S₂“ into gearbox housing. For measurement purposes use a 1.22 mm thick „S₂*“ shim (or 2 shims of 0.61 mm).



Note

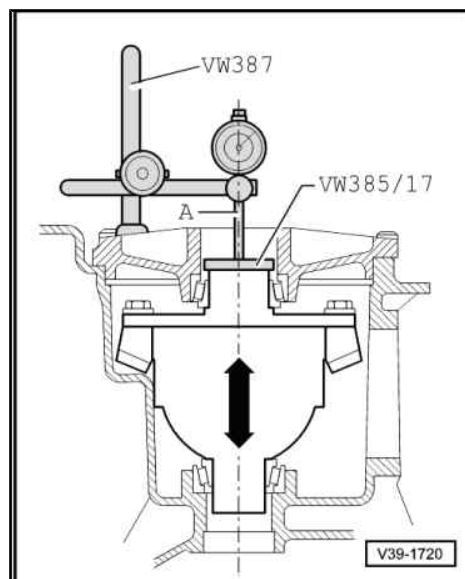
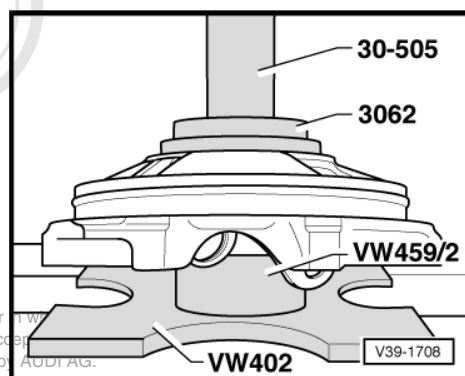
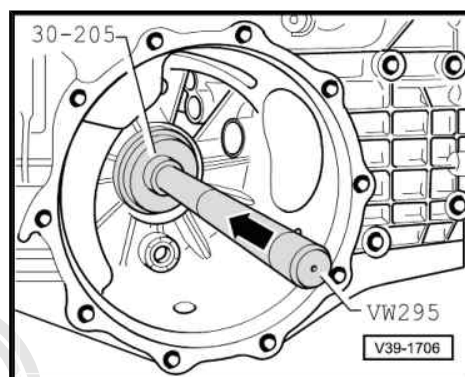
For measurement purposes a 1.22 mm thick shim „S₂*“ is inserted provisionally. This is referred to in the following as „S₂*“. „S₂*“ is exchanged with the final shim „S₂“ after determining backlash.

- Press outer race for tapered roller bearing (left-side) without shim „S₁“ into cover for final drive.
- Insert differential without drive wheel for speedometer sender -G22- into gearbox housing.

The crown wheel is located on the left side (cover side).

- Fit cover for final drive and tighten 4 bolts to 25 Nm in diagonal sequence.
- Turn gearbox so that cover for final drive points upwards.
- Turn differential 5 turns in both directions so that the tapered roller bearings settle.

- Place measuring plate -VW 385/17- on differential.
- Set up measuring tool using 30 mm dial gauge extension -A-.
- Set dial gauge e.g. -VAS 6080- (3 mm measuring range) to „0“ with 2 mm preload.
- The tip of the dial gauge must be applied to the centre of the differential.
- Raise differential without turning, read clearance off dial gauge and note down.
- Measurement in following example: 0.62 mm



 Note

- ◆ To lift differential, secure crown wheel adjusting tool -VW 521/4- and -VW 521/8- on right side of differential (housing side).
- ◆ If the measurement has to be repeated, the differential must again first be turned 5 turns in each direction to settle the tapered roller bearings.

Formula: „S_{total}“ = „S₂“ + measured value + bearing preload

Example:

Example:

Inserted shim(s) „S ₂ “	1.22 mm
+ Measured value	0.62 mm
+ Bearing preload (constant value)	0.25 mm
= Total shim thickness „S _{total} “ for „S ₁ “ plus „S ₂ “	2.09 mm

Determining thickness of shim „S₁“

 Note

- ◆ Provisional shim „S₁“ is replaced with final shim „S₁“ after determining backlash.
- ◆ Total shim thickness „S_{total}“ remains unchanged.

Formula: „S₁“ = „S_{total}“ - „S₂“

Example:

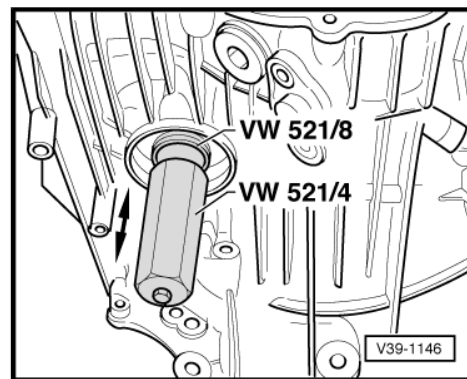
Total shim thickness „S _{total} “ for „S ₁ “ plus „S ₂ “	2.09 mm
- Inserted shim(s) „S ₂ “	1.22 mm
= Thickness of shim „S ₁ “	0.87 mm

Select correct shims from ⇒ Electronic parts catalogue .

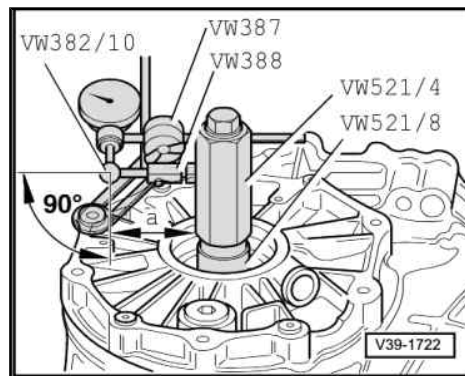
Measuring backlash

(Position of crown wheel in gearbox housing)

- Pinion shaft fitted with shims „S₃“ and „S₄“.
- Install differential with shims „S₁“ and „S₂“.
- Fit cover for final drive and tighten bolts to 25 Nm.
- Turn differential 5 turns in both directions to settle tapered roller bearings.



- Secure dial gauge bracket -VW 387- to housing.
- Insert crown wheel adjusting tool -VW 521/4- and -VW 521/8- .
- Fit dial gauge with dial gauge extension -VW 382/10- (6 mm flat).
- Set measuring lever -VW 388- to dimension „a“ = 79 mm.
- Measure play between teeth faces (backlash) as follows:
- Turn crown wheel until it makes contact with the face of one tooth (end of backlash travel).
- Preload dial gauge to 2 mm and set to „0“.
- Turn back crown wheel until it makes contact with opposite tooth face (backlash).
- Take backlash reading and note down measured value.
- Turn crown wheel through 90° and repeat measurements another 3 times.



Determining average backlash

- Add the four measured values together and divide by four.

Example:

1st measured value	0.49 mm
+ 2nd measured value	0.48 mm
+ 3rd measured value	0.50 mm
+ 4th measured value	0.49 mm
= Sum of measured values	1.96 mm

- Result: the average backlash is $1.96 \text{ mm} : 4 = 0.49 \text{ mm}$



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 gear set itself is defective. Check the installation; renew the final drive gear set if necessary.

Determining thickness of shim „S2“

Formula: „S2“ = „S2*“ – backlash + lift

Example:

Inserted shim(s) „S2*“	1.22 mm
- Average backlash	0.49 mm
+ Lift (desired average value for backlash)	0.15 mm
= Thickness of shim „S2“	0.88 mm

- Select thickness of required shim(s) from following table:

Available shims for „S₂“

Shim thickness (mm) ¹⁾²⁾		
0.45	0.61	0.77
0.49	0.65	0.81
0.53	0.69	0.85
0.57	0.73	

- 1) For part numbers, refer to ⇒ Electronic parts catalogue .
- 2) The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

Determining thickness of shim „S₁“

Formula: „S₁“ = „S_{total}“ – „S₂“

Example:

Total shim thickness „S _{total} “ for „S ₁ “ plus „S ₂ “	2.09 mm
- Thickness of shim „S ₂ “	0.88 mm
= Thickness of shim „S ₁ “	1.21 mm

– Select thickness of required shim(s) from following table:

Available shims for „S₁“

Shim thickness (mm) ¹⁾²⁾		
0.45	0.61	0.77
0.49	0.65	0.81
0.53	0.69	0.85
0.57	0.73	

- 1) For part numbers, refer to ⇒ Electronic parts catalogue .
- 2) The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

Checking adjustment

- After installing shims „S₁“ and „S₂“, turn differential 5 turns in both directions so that the tapered roller bearings settle.
- Measure backlash four times on circumference.
- Specification: 0.12 ... 0.22 mm



Note

- ◆ Adjustment must be repeated if backlash is outside tolerance. The total shim thickness „S_{total}“ must remain unchanged.
- ◆ The discrepancy between individual measured values must not exceed 0.06 mm.

