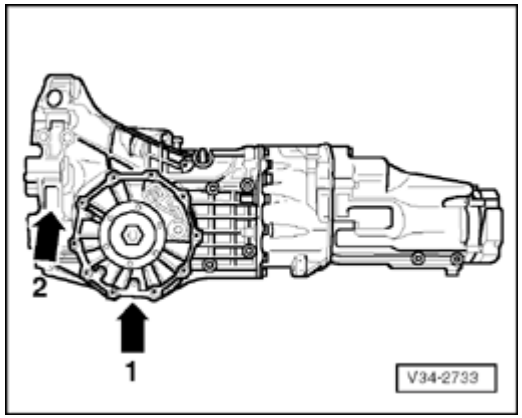
Transmission, identification

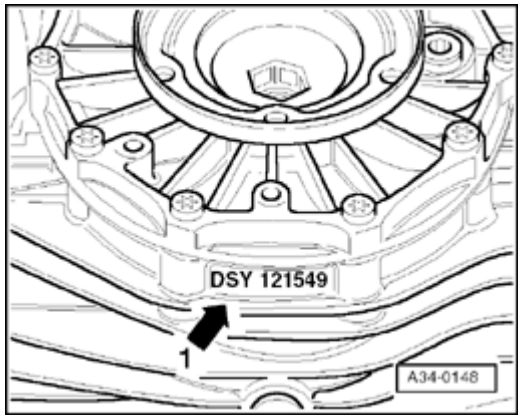
The 6-speed manual transmission 01E (all wheel drive) is installed in Audi S4 vehicles in conjunction with the 2.7 liter bi-turbo engine. Allocation ⇒ Page 00-3 .



Location on transmission

- Code letters and serial number (arrow -1-).
- Manual transmission 01E (arrow -2-).

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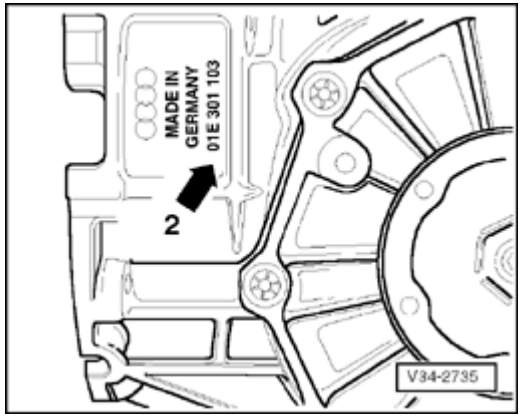
➢ **Code letters and transmission consecutive serial number (arrow -1-)**

Example:	**EDU**	**136549**
	I	I
	Code letters	Transmission consecutive serial number

Additional data depends on manufacture.

Note:

The transmission code letters are also included on the vehicle data stickers.



➢ **Manual transmission 01E (arrow -2-)**

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Code letters, allocation, ratios, and capacities

Manual transmission		6-speed 01E all wheel drive
Code letters		**EDU**
Manufactured	from	01.98
	to	
Allocation	Model	Audi A4 1995
	Engine	2.7 ltr. - 184 kW bi-turbo
Ratios:	Final drive	37 : 9 = 4.111
Z2 : Z1 = i	1st gear	28 : 8 = 3.500
	2nd gear	34 : 18 = 1.889
	3rd gear	32 : 26 = 1.231
	4th gear	29 : 30 = 0.967
	5th gear	29 : 36 = 0.806
	6th gear	26 : 38 = 0.684
	Reverse gear	38 : 11 = 3.455

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Code letters	**EDU**
Speedometer	Electronic
Capacity	2.3 liters[1)]
Specification	Gear oil: SAE 75 W 90 (synthetic oil) Part number G 00 500 0
Clutch mechanism	Hydraulic
Clutch plate diameter	240 mm [2)]
Drive shaft flange diameter	108 mm
Overall ratio iov in top gear	2.813
Allocation: rear final drive (code letters)	DQA

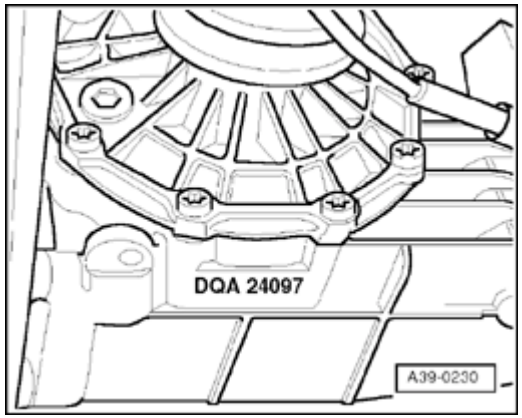
[1)] With dual-mass flywheel

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Rear final drive, identification

Final drive 01H is fitted in conjunction with manual transmission 01E (all wheel drive).

Allocation ⇒ Page 00-6



Code letters and date of manufacture of rear final drive:

Example:	**DQA**	**24**	**09**	**7**
	I	I	I	I
	Code letters	Day	Month	Year (1997) of manufacture

Note:

The code letters of the rear final drive are also included on the vehicle data stickers.

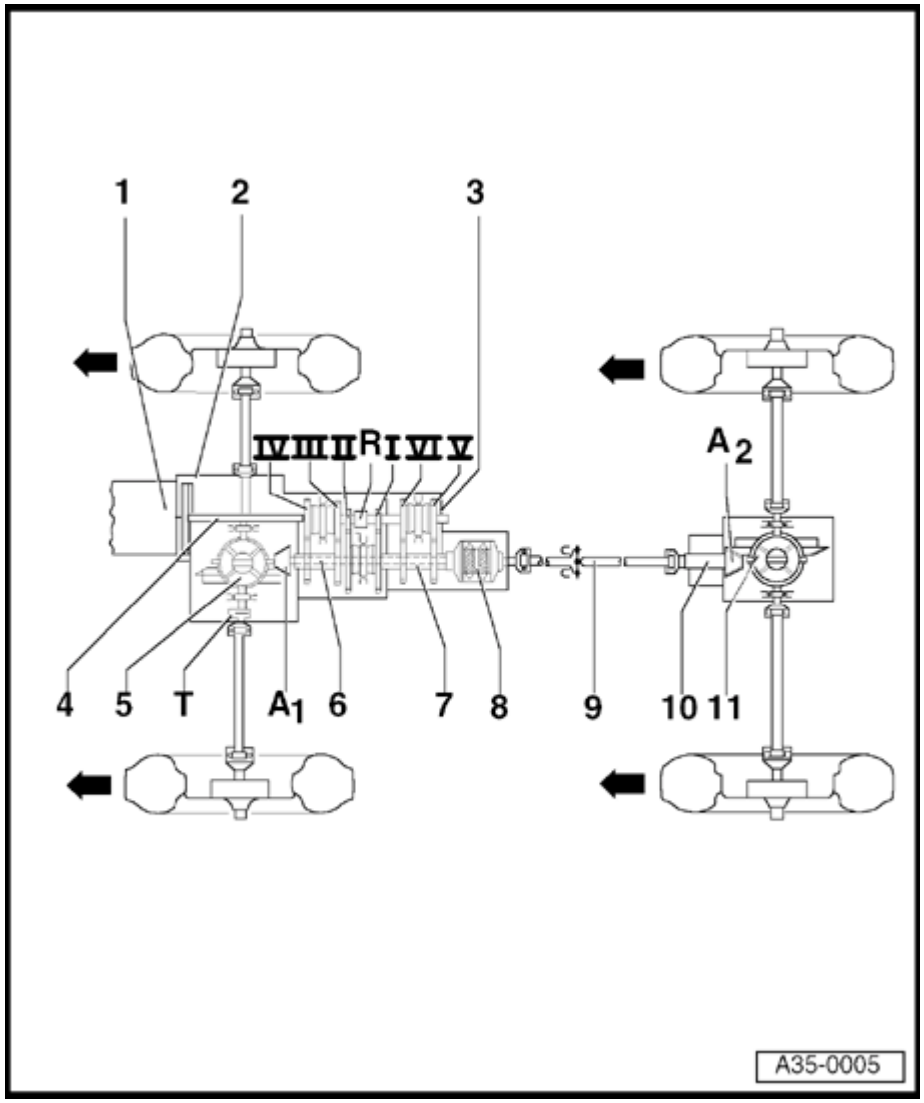
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Code letters, allocation, ratios and capacities

Rear final drive		**01H**	
Code letters		**DQA**	
Manufactured	from	01.99	
	to		
Allocation	Model	Audi A4 1995 ➢	
	Engine	2.7 ltr. - 195 kW bi-turbo	
Ratios	Final drive	37 : 9 = 4.111	
Capacity		1.9 Liter	
Specification		Gear oil: SAE 75 W 90 (synthetic oil) Part number G 00 500 0	
Drive shaft flange diameter		108 mm	
Allocation: manual transmission (code letters)		EDU	

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00-7



Transmission layout

1 - Engine

2 - Clutch

3 - Transmission

4 - Input shaft (main shaft)

5 - Front differential

6 - Front drive pinion (output shaft)

7 - Hollow shaft

8 - Torsen differential

9 - Driveshaft

10 - Rear drive pinion

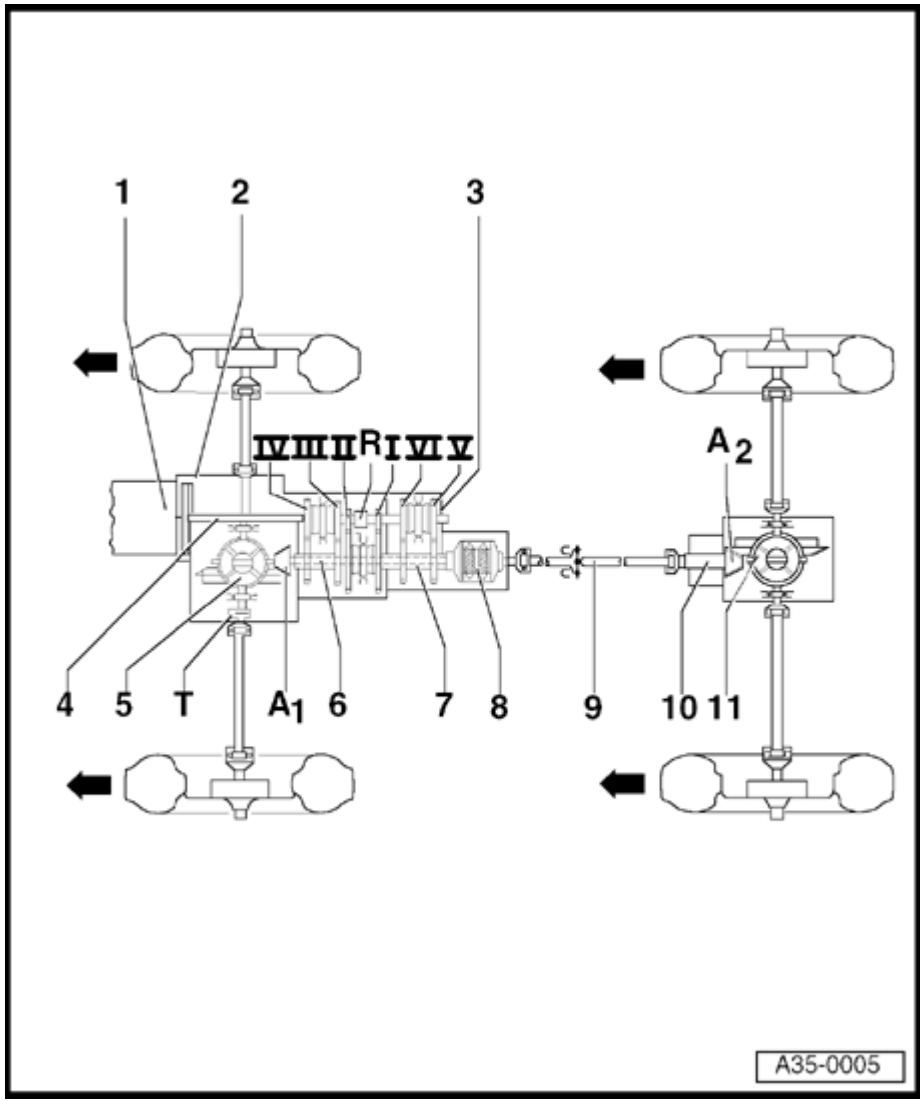
11 - Rear differential

Note:

Arrows point in forward direction of travel.

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00-8



I - 1st gear

II - 2nd gear

III - 3rd gear

IV - 4th gear

V - 5th gear

VI - 6th gear

R - Reverse gear

A1 - Front final drive

A2 - Rear final drive

T - Speedometer drive, electronic

Note:

Arrows point in forward direction of travel.

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Notes for performance test, brake test and tow starting/towing

Performance test on roller type test stand

The following must be noted when a vehicle with all wheel drive is to be driven onto a performance test stand:

- A four wheel test stand with four braked rollers must be used.

Brake test on the roller type test stand

The following must be noted when a vehicle with all wheel drive is to be driven onto a roller type test stand:

- A slow moving brake test stand (to 5,5 km/h) must be used. During this, no gear may be selected.

Tow starting and towing vehicles

⇒ *Repair Manual, Maintenance*

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00-10

Overall ratio "i," calculating

Transmission ratio

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

Ratios			**Formula**
i_G	=	gear ratio	$ZG_2 : ZG_1$
i_A	=	axle ratio	$ZA_2 : ZA_1$
i_{ov}	=	overall ratio	$i_G \times i_A$

Example:

	6th gear	**Final drive**
Drive gear	$ZG_1 = 38$	$ZA_1 = 9$
Driven gear	$ZG_2 = 26$	$ZA_2 = 37$

Calculating:

i_G = 26 : 38 = 0.684

i_A = 37 : 9 = 4.111

i_{ov} = (26 : 38) x (37 : 9) = 0.684 x 4.111 = 2.813

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Repair instructions

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

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

Special tools

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

⇒ *Special Tools Catalog*

Transmission

- When installing a replacement transmission or rear final drive, check oil level and top-up if necessary ⇒ Page 34-39 and ⇒ Page 39-80 .

- Vehicles with 2.7 ltr 195 kW engine: replacement transmissions contain an additional 0.3 ltr of oil for the lines of the

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transmission oil cooling circuit. For this reason the transmission oil lines and oil cooler must be drained when fitting a replacement transmission.

- Capacities and specifications from ⇒ Page 00-3 and ⇒ Page 00-6 .

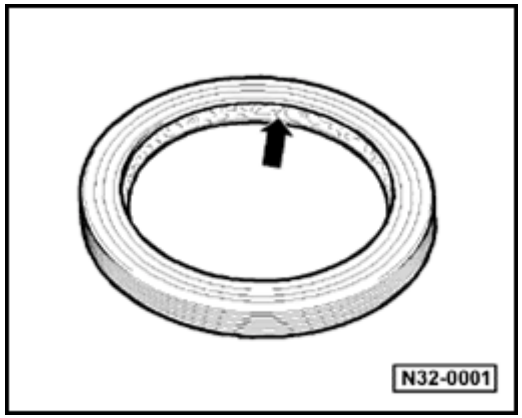
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00-12

- Thoroughly clean all connections and the surrounding area before disconnecting.
- When installing transmission, ensure dowel sleeves are correctly seated.

O-rings, seals, gaskets

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



- Before installing radial shaft oil seals, lightly oil outer edge and fill space between sealing lips (arrow) with a thin coating of sealing grease G 052 128 A1.
- The open side of the oil seals faces toward the side with fluid filling.
- When replacing oil seals, always vary the point at which the sealing lips make contact (use insertion depth tolerances).
- Lightly oil O-rings before installing; this prevents the rings being crushed when inserting.
- Check oil level after replacing gaskets and oil seals ⇒ Page 34-39

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and ⇒ Page 39-80 .

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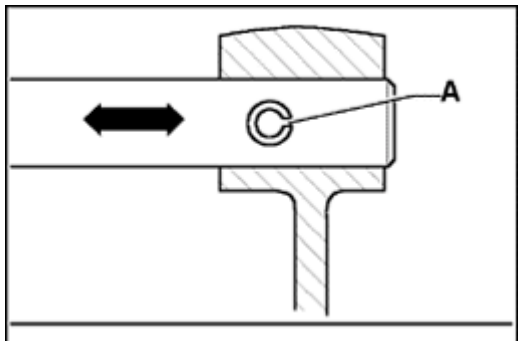
00-13

Sealants

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

Locking elements

- Do not overstretch circlips.
- Always replace circlips which have been damaged or over-tensioned.
- Circlips must be properly seated in the base of the groove.



- Replace spring pins. Position: slit -A- should be in line with the line of force (arrow).

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00-14

Nuts, bolts

- Loosen nuts or bolts, opposite to tightening sequence.
- Tighten and loosen bolts and nuts for securing covers and housings in a diagonal sequence.
- Especially delicate parts, such as clutch pressure plates, must not be distorted. Loosen and tighten bolts and nuts in stages in a diagonal sequence.
- The tightening torques stated apply to non-oiled nuts and bolts.
- Replace self-locking bolts and nuts.
- The threads of bolts which are secured by a locking fluid should be cleaned with a wire brush. Then apply AMV 185 101 A1 when inserting.
- Threaded holes into which self-locking bolts or bolts coated with locking fluid are screwed, must be cleaned (e.g. tap). Otherwise there is a danger of bolts shearing when subsequently being removed.

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Bearings

- Install needle bearings with the lettering on the bearing (the side with thicker metal) facing towards the drift or other tool used for installing.
- Mark needle bearings of 1st to 6th speed sliding gears when removing, this ensures that when installing, the same installation position can be guaranteed.
- Grease needle bearing for transmission input shaft in rear of flywheel.
- Lubricate all bearings in transmission housing with gear oil before installing.
- Heat inner races of tapered roller bearings to approx. 100 ° C before installing. Press in onto stop when installing so there is no axial clearance.
- Do not interchange the outer or inner races of bearings of the same size.
- Always replace the tapered roller bearings on one shaft together and use new bearings from a single manufacturer.

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- The tapered roller bearings for the output shaft and the differential in the transmission are low-friction bearings. Do not additionally oil new tapered roller bearings when measuring friction torque. The bearings are pre-treated at the factory with a special type of oil for this purpose.

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00-16

Shims

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

Gears, synchro-hubs, inner races for sliding gears

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

Sliding gears

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

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Synchronizer rings

- Do not interchange synchronizer rings. When reusing always fit to the same gear.
- Check for wear, replace if necessary.
- Lubricate with gear oil before installing.

Clutch mechanism

- When removing transmission, remove clutch slave cylinder without disconnecting lines.
- If the slave cylinder is removed with the hydraulic line attached, do not depress clutch pedal. Otherwise the piston will be pressed out of the slave cylinder.
- Ensure that the pressure plate is kept straight: loosen and tighten bolts in a diagonal sequence and in several gradual stages.
- To reduce odor caused by a burnt clutch, thoroughly clean the clutch bellhousing, the flywheel and the parts of the engine facing the transmission.

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- Vehicles with V6 2.7 ltr bi-turbo engine have an SAC pressure plate. On these vehicles an adjuster ring has to be reset (⇒ Page 30-42) when replacing the clutch plate on its own.

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30-1

Clutch mechanism, servicing

Note:

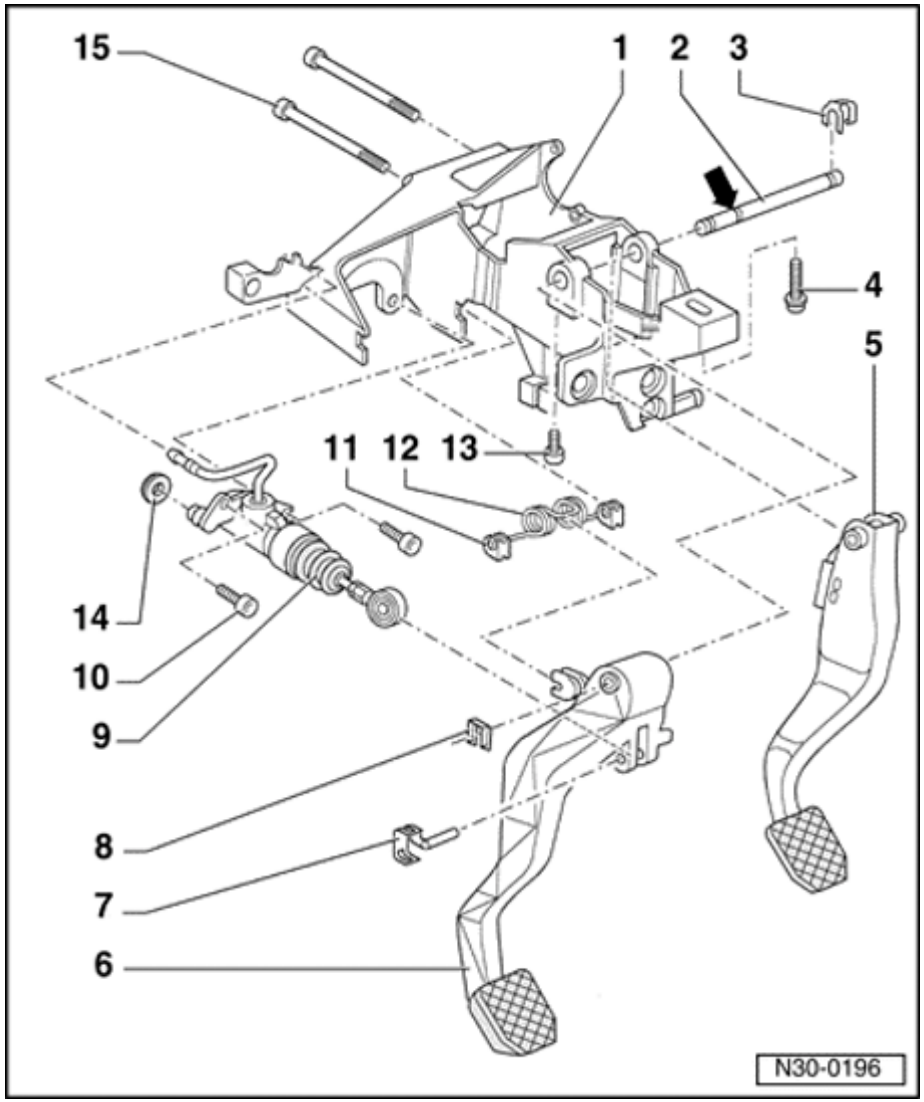
- *For vehicles with coded radio, obtain and note the radio code.*
- *Disconnect battery Ground strap with the ignition switched off.*
- *Lubricate all bearings and contact surfaces with G 052 142 A 2 polycarbamide grease.*
- *Before working on pedal cluster, remove cover below dash panel:*

⇒ *Repair Manual, Body Interior, Repair Group 68*

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

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30-2



Pedal cluster, assembly overview

1 - Mounting bracket

- Detach steering column from steering box before removing

⇒ *Repair Manual, Brake System, Repair Group 46*

2 - Pivot pin

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

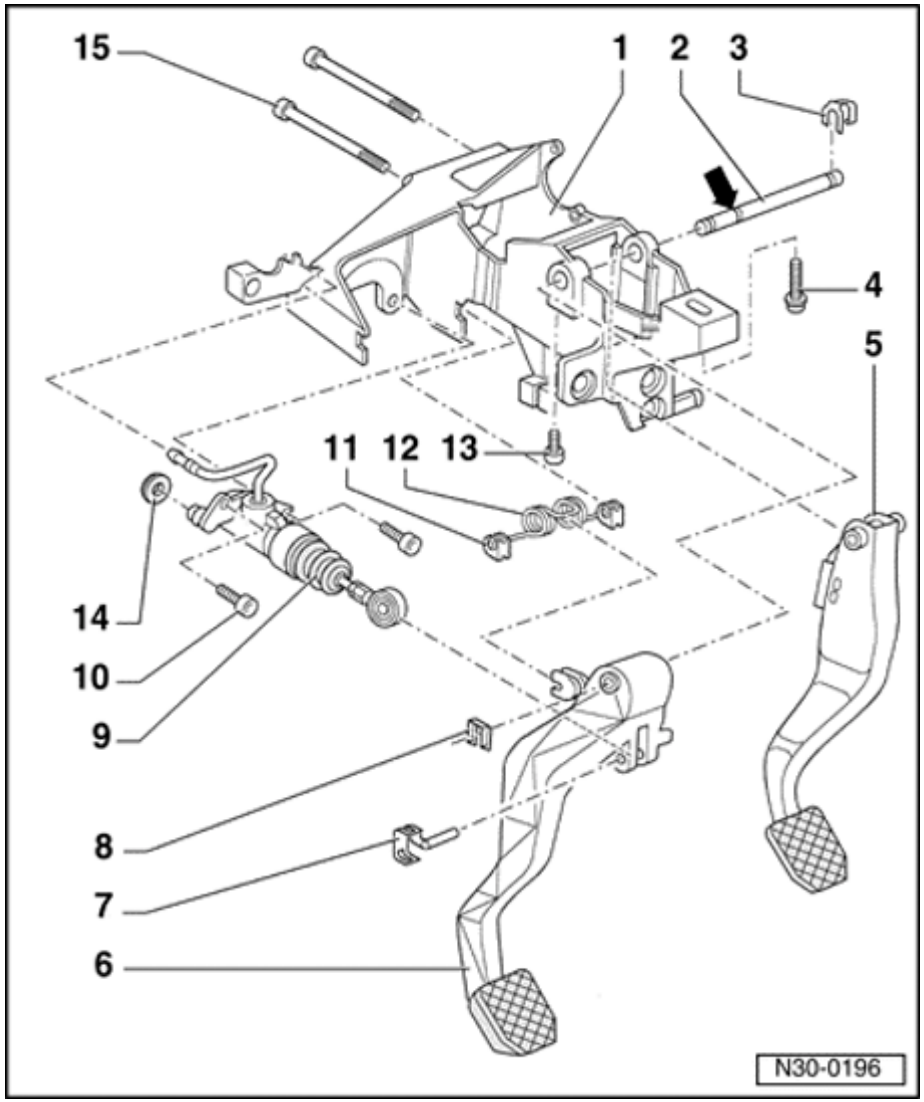
3 - Locking clip

4 - Hex socket head bolt, 25 Nm

5 - Brake pedal

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30-3



6 - Clutch pedal

- Removing and installing ⇒ Page 30-5

7 - Pin

- Clip onto clutch pedal

8 - Locking clip

9 - Master cylinder

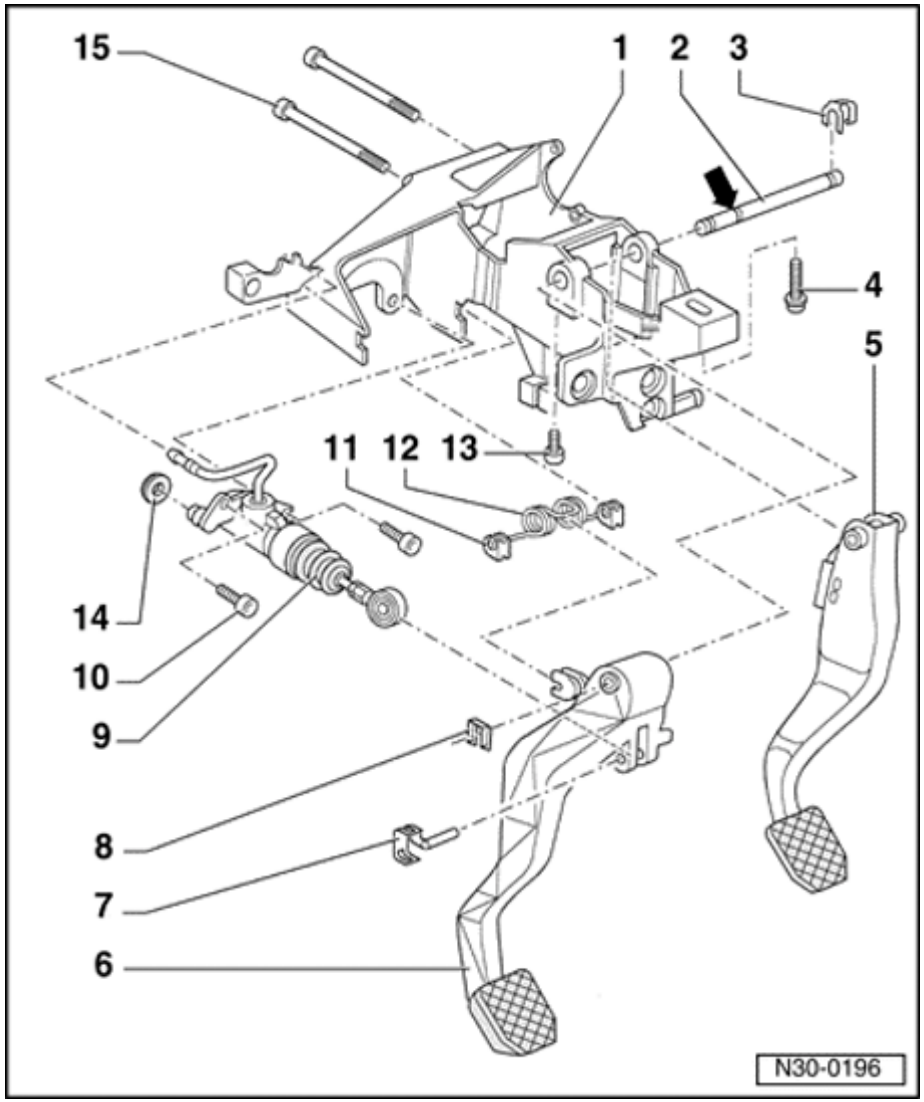
- Removing and installing ⇒ Page 30-17
- Do not operate clutch pedal after slave cylinder has been removed.

10 - Hex socket head bolt, 20 Nm

11 - Mounting

- Insert in mounting bracket with over-center spring

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12 - Over-center spring

- Allocation

⇒ *Parts catalog*

- Remove and install with clutch pedal ⇒ Page 30-5

13 - Hex 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 the brake master cylinder with brake servo

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30-5

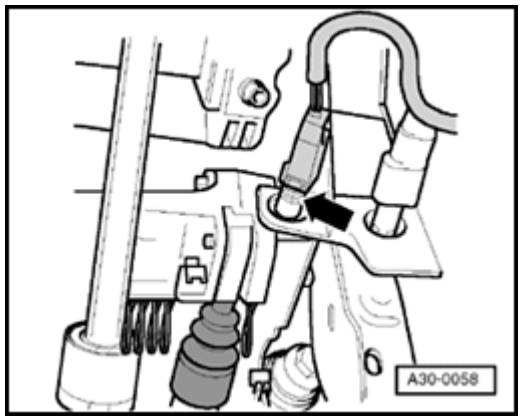
Clutch pedal and over-center spring, removing and installing

Removing

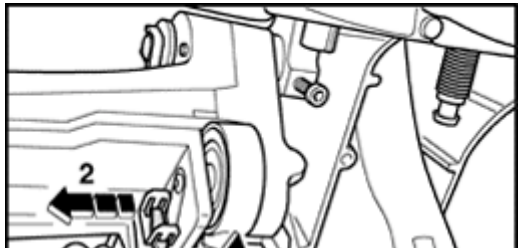
- Remove driver's side storage compartment:

⇒ *Repair Manual, Body Interior, Repair Group 68*

Note:



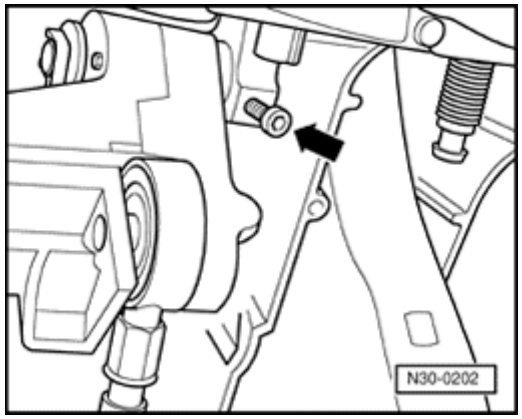
- *For the following procedures, make sure that the clutch pedal does not press out switch (arrow) from securing clip, since the thread of the switch would be damaged and the switch would have to be replaced.*
- *To ensure proper securing, the switch (arrow) may only be installed once.*



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

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30-6

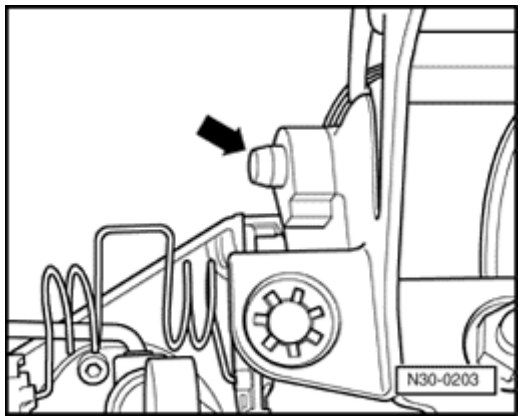


- Unscrew bolt (arrow).
- Press clutch and brake pedal pivot pin out to the right, until the clutch pedal can be removed.
- If necessary press brake pedal securing clip off pivot pin with a screwdriver.
- Take out clutch pedal and over-center spring.

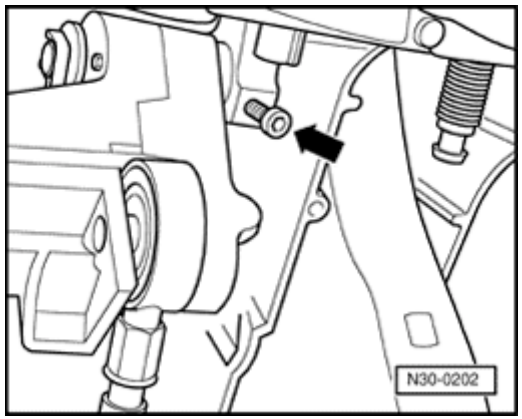
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Installing

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

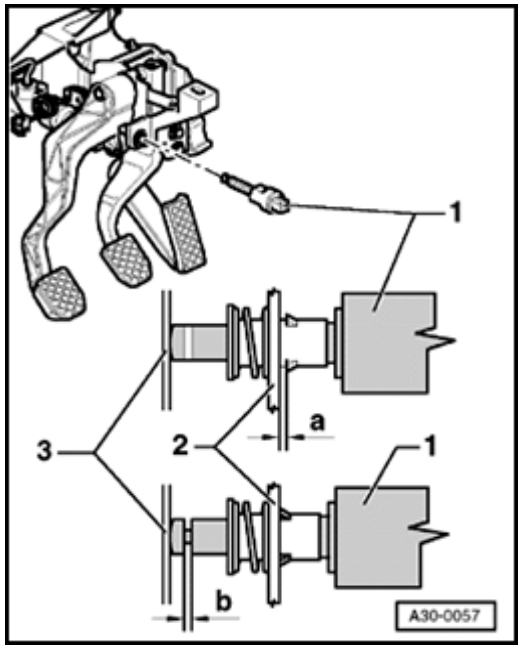


- Align clutch pedal/brake pedal pivot pin so that it protrudes out of mounting bracket at clutch pedal side (arrow).
- Hook clutch pedal into over-center spring, then fit onto pivot pin.
- Connect clutch pedal to master cylinder. Clip pin onto clutch pedal.



Do not tighten bolt (arrow) until both securing clips have been fitted on the clutch pedal/brake pedal pivot pin.

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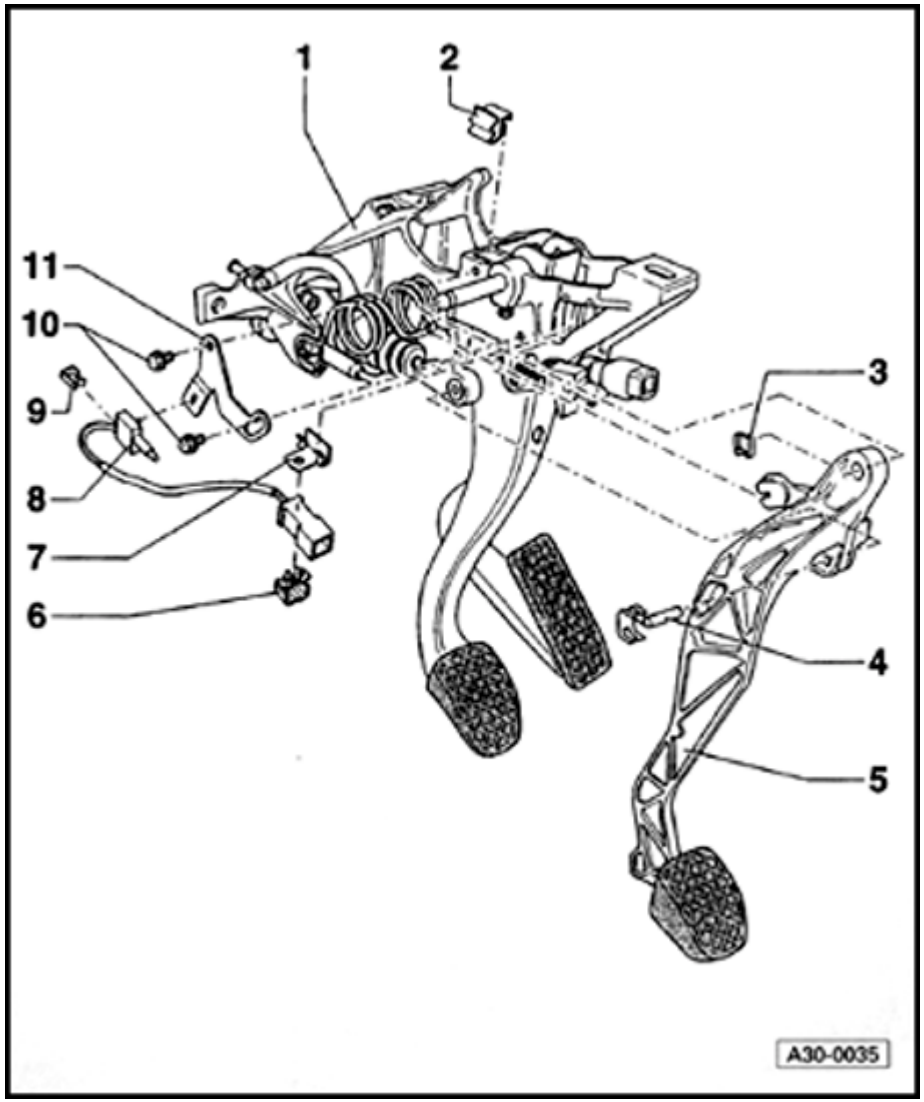


- Check adjustment of switch -1- via clutch pedal as follows:
  - Switch -1- must sit completely against clutch pedal -3- and must be completely activated.
  - Adjustment specification: The gap measurement -a- between securing clip and mounting bracket -2- or gap measurement -b- at switch -1- be no larger than 0.5 mm.
  - To adjust, clamp must be held and switch -1- must be turned.

Note:

To ensure proper securing, the switch may only be installed once.

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Clutch Pedal Position (CPP) switch -F 194-, removing and installing

Note

The clutch pedal position (CPP) switch -F194- ensures that the engine can only be started with the clutch pedal depressed.

1 - Mounting bracket

2 - Cable bracket

3 - Fuse

4 - Bolt

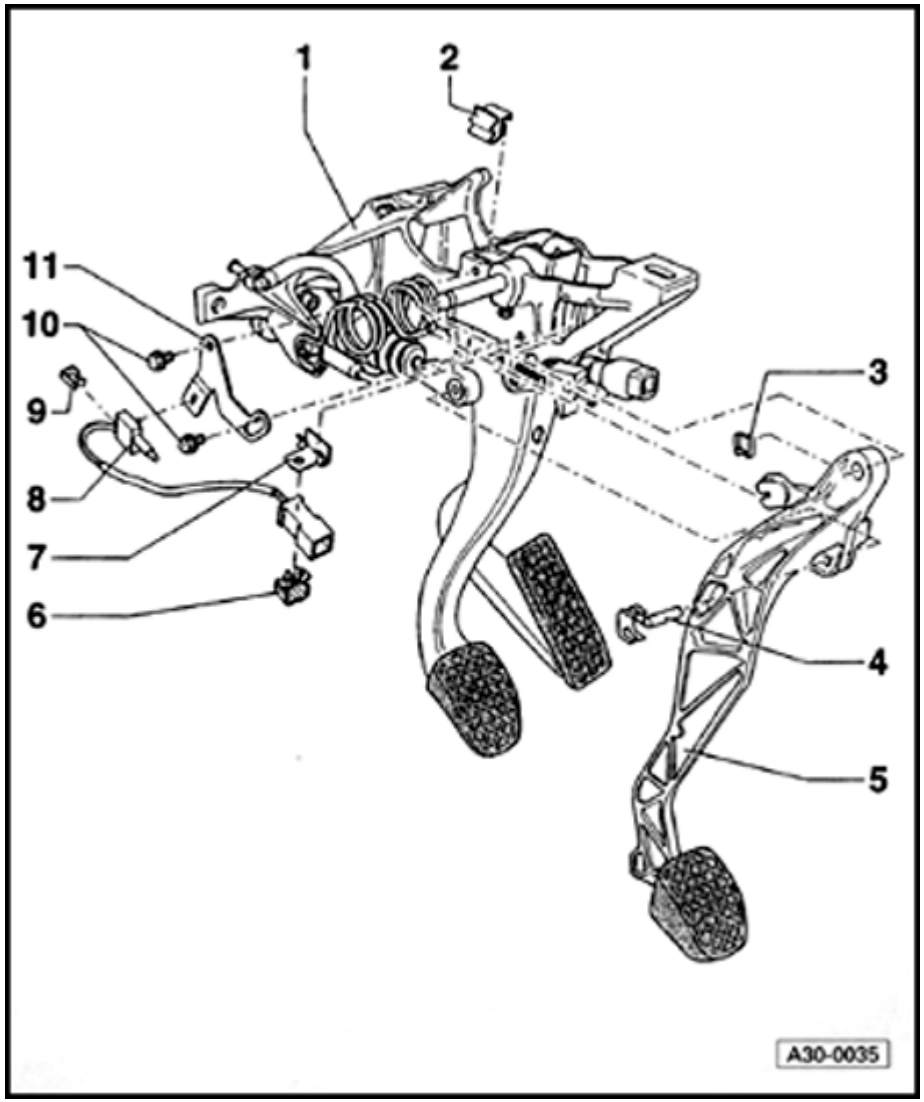
- Lock into clutch pedal

5 - Clutch pedal

- Removing and installing ⇒ Page 30-5

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30-10



6 - Clip

7 - Harness connector bracket

8 - Clutch Pedal Position (CPP) Switch -F 194-

- Adjusting ⇒ Page 30-11

9 - Clip

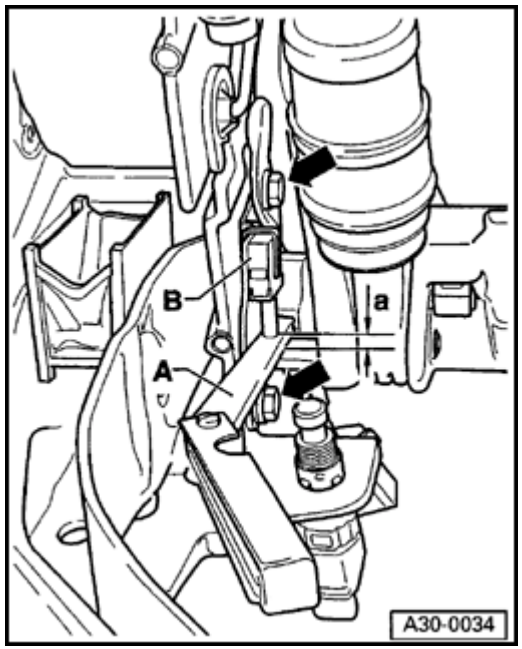
10 - Screw and washer assembly

- 8 Nm

11 - Securing plate

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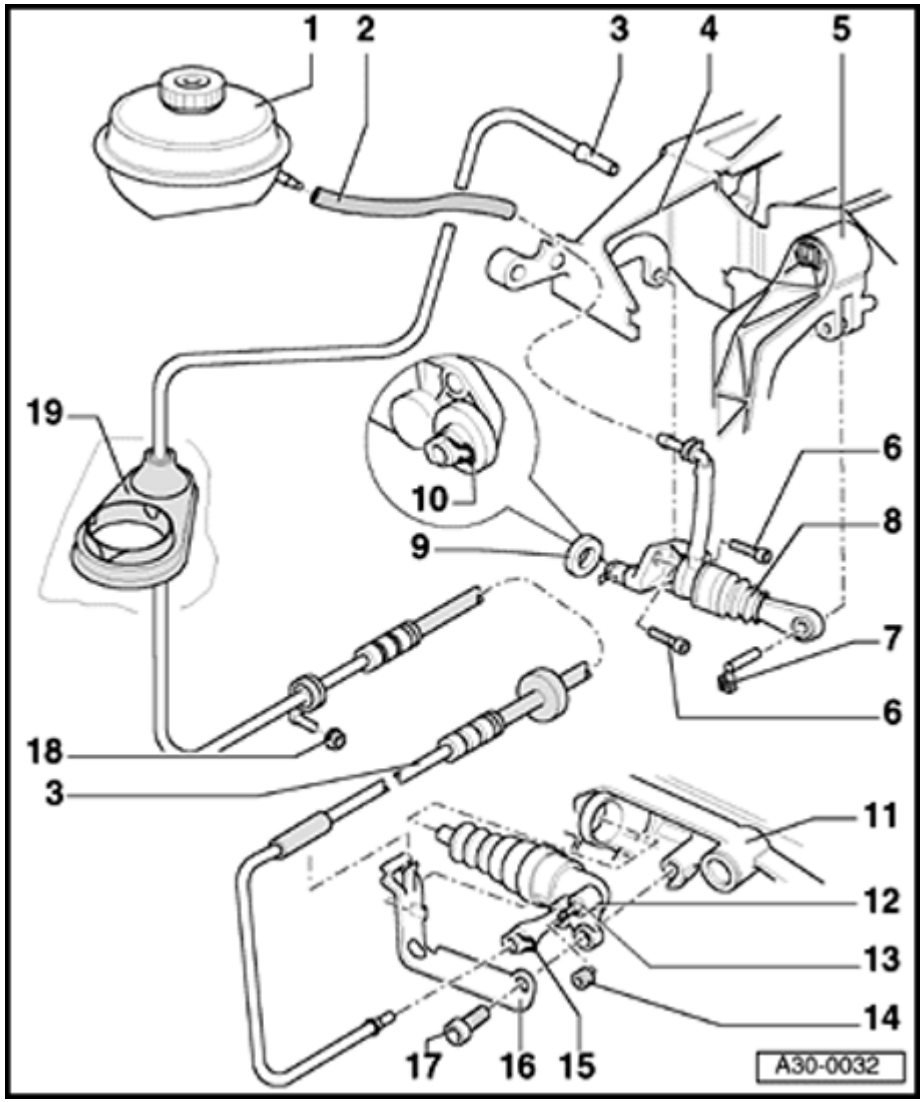
Clutch Pedal Position (CPP) switch - F194-, adjusting



- Loosen two bolts (arrow) slightly.
- Have second technician depress clutch pedal to stop.
- Insert feeler gauge -A-, with selected measurement -a- 3.2 ± 0.2 mm, between activation surface of clutch pedal and switch plunger.
- Tilt switch -B- toward feeler gauge -A- to stop and tighten both securing bolts (arrows) to 8 Nm.

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30-12



Hydraulic system, general layout

1 - Brake fluid reservoir

2 - Supply hose

3 - Line/hose assembly

- For plug-in connections on master cylinder and slave cylinder
- Disconnecting from master cylinder and installing ⇒ Page 30-18
- Disconnecting from slave cylinder ⇒ Fig. 2
- Allocation

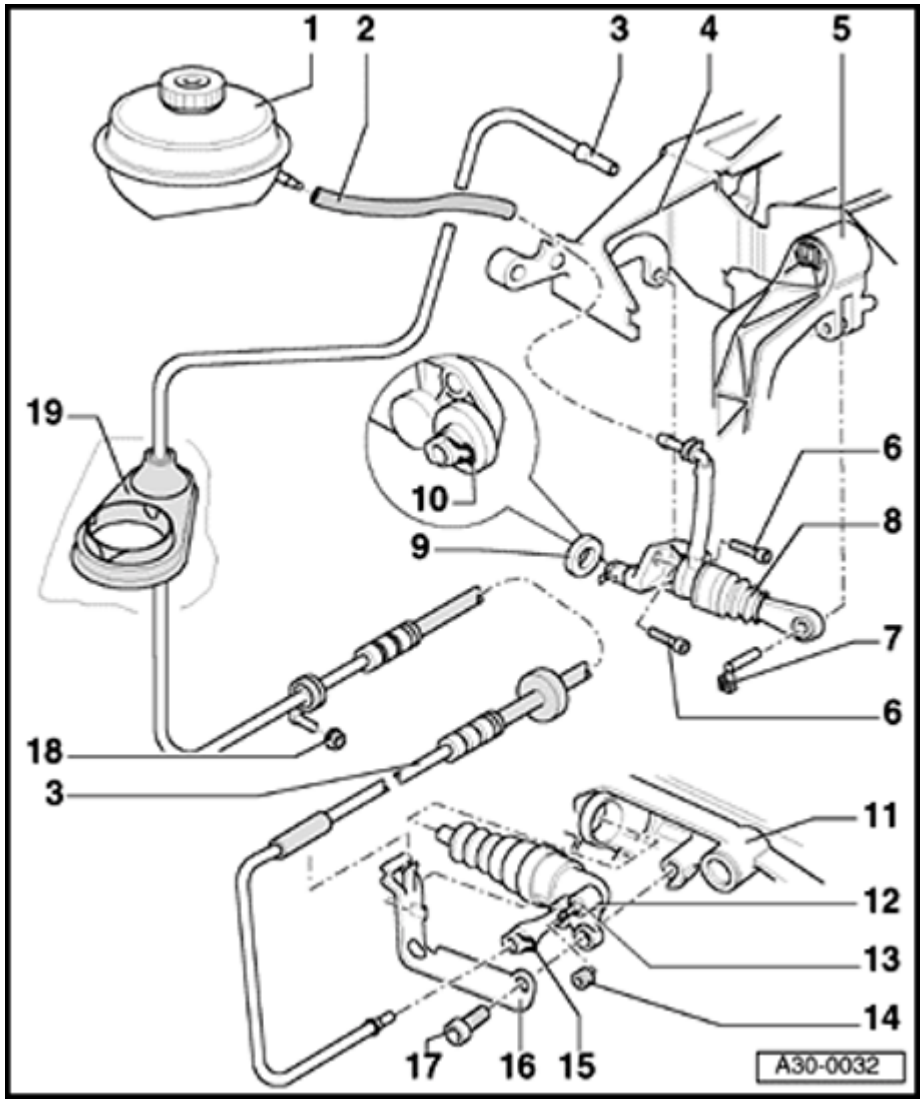
⇒ *Parts catalog*

4 - Mounting bracket

5 - Clutch pedal

- Removing and installing ⇒ Page 30-5

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6 - Hex socket head bolt, 20 Nm

7 - Pin

8 - Master cylinder

- With plug-in connection for hose/line assembly
- Removing and installing ⇒ Page 30-17

9 - Seal

- Must not be removed

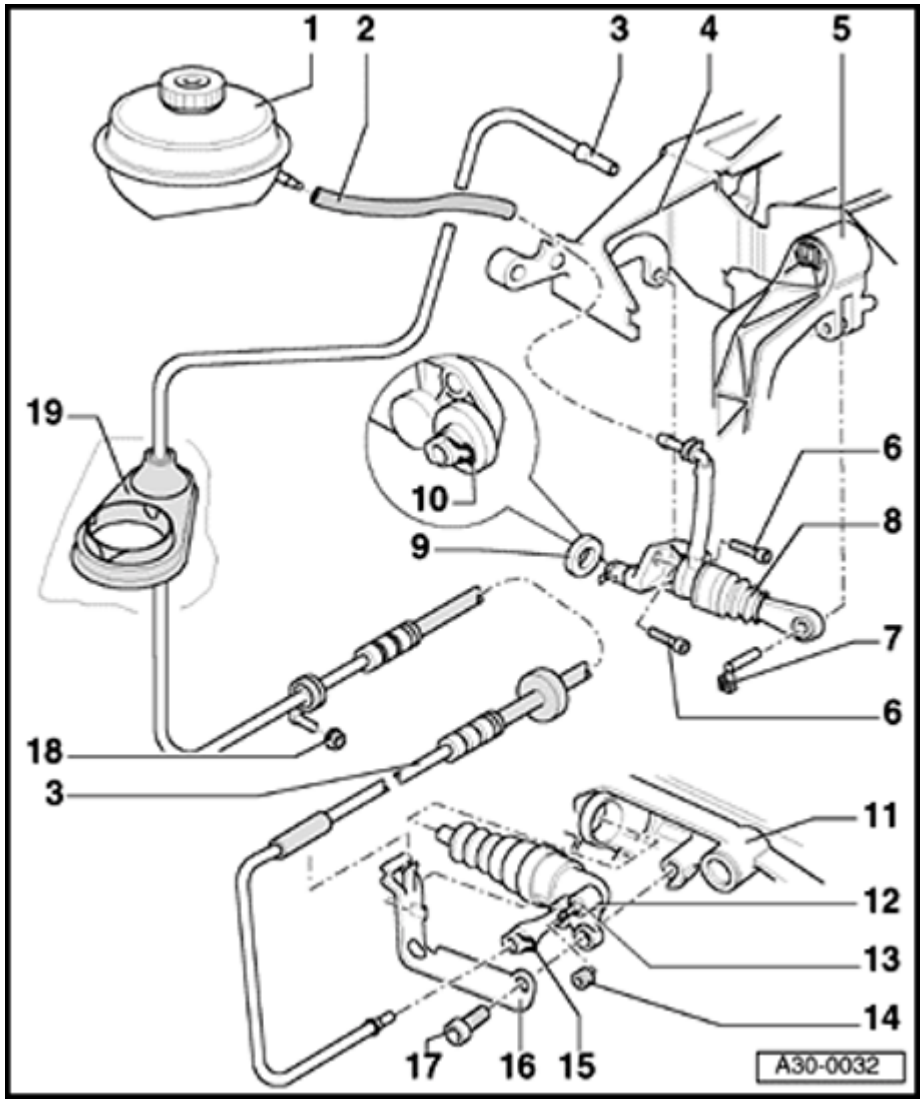
10 - Retaining clip

- Pull out retaining clip to disconnect line ⇒ Page 30-18

11 - Transmission

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30-14



12 - Plastic slave cylinder

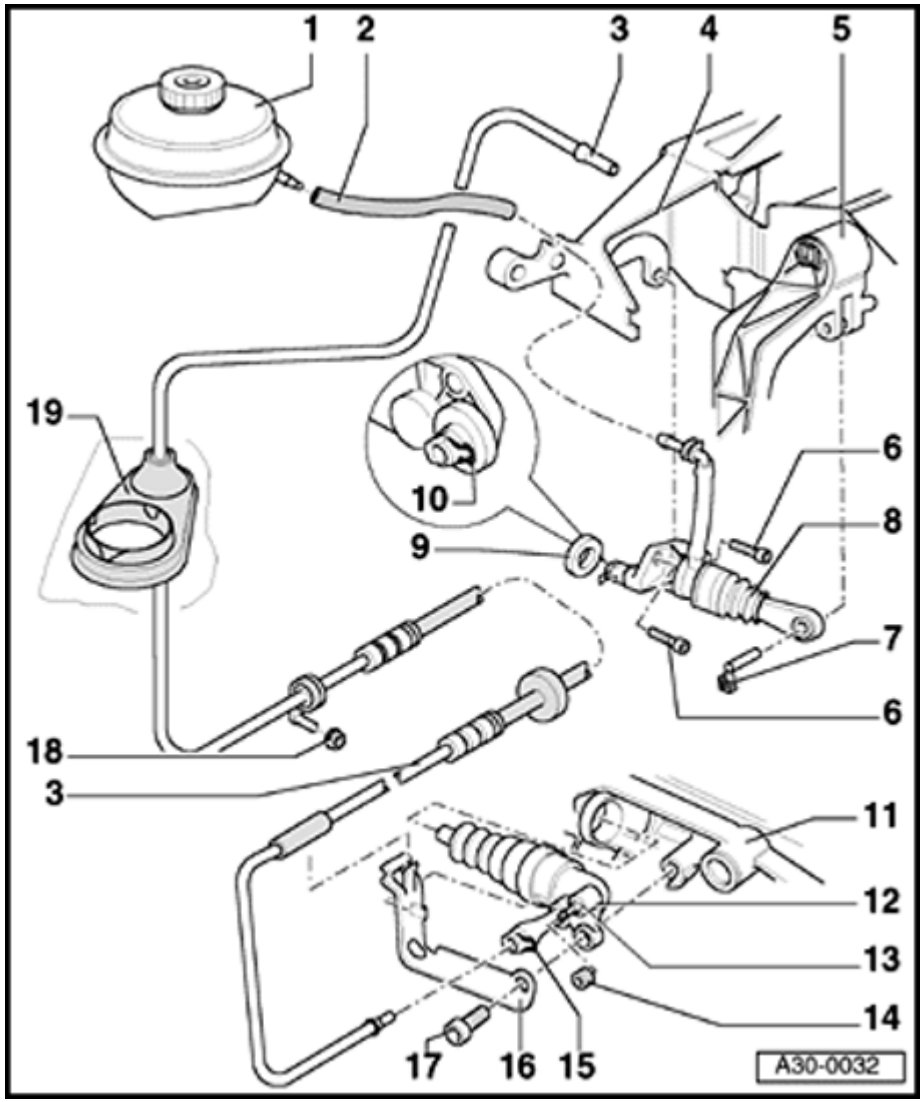
- Do not operate clutch pedal after slave cylinder has been removed
- Brake fluid must not be allowed to get onto the transmission
- Lightly grease to install ⇒ Fig. 1
- When installing push in until the securing bolt can be fitted.
- With plug-in connection for hose/line assembly
- Disconnecting hose/line assembly ⇒ Fig. 2
- Follow correct sequence of work when bleeding ⇒ Page 30-25 .

13 - Bleeder valve

- Tighten to 4.5 Nm
- Follow correct sequence of work when bleeding ⇒ Page 30-25
- A broken off bleeder valve can be removed using a 3mm hex socket wrench

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30-15



14 - Dust cap

15 - Retaining clip

- Pull out retaining clip to disconnect line ⇒ Fig. 2

16 - Bracket

- Secured to transmission

17 - Hex socket head bolt

- 20 Nm

18 - Nut

- 2 Nm

19 - Seal

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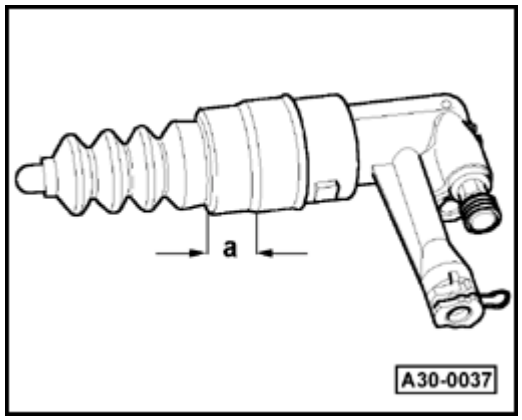


Fig. 1 Installing clutch slave cylinder

- Coat area -a- of collar with lithium grease G 052 150 A2 before installing slave cylinder into transmission housing.
- Lightly coat contact surface for plunger to clutch release lever with copper grease, e.g. Z 381 351 TE.

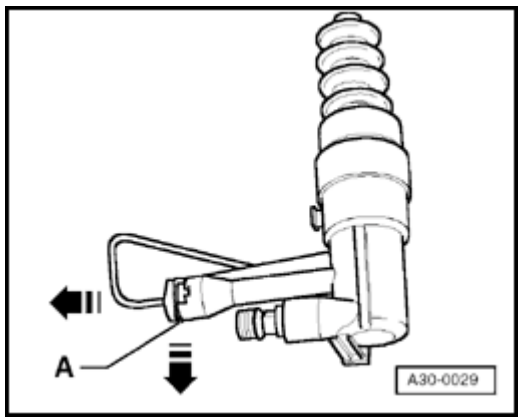


Fig. 2 Disconnecting line and clutch slave cylinder

Removing

- To disconnect line, use a screwdriver to pry out retaining clip -A- so that it clicks. Line can then be pulled out.

Installing

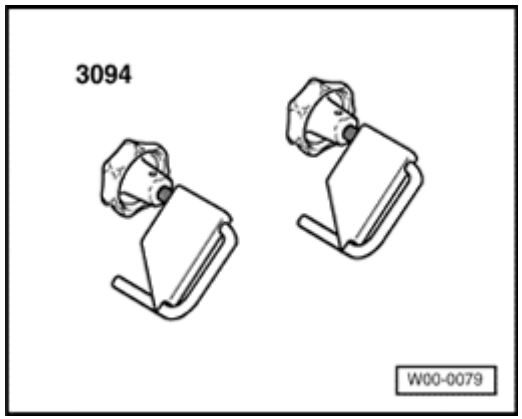
- Press in retaining clip -A- as far as it will go.
- Push line into slave cylinder until it engages audibly.

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30-17

Master cylinder, removing and installing

Special tools, testers and auxiliary items

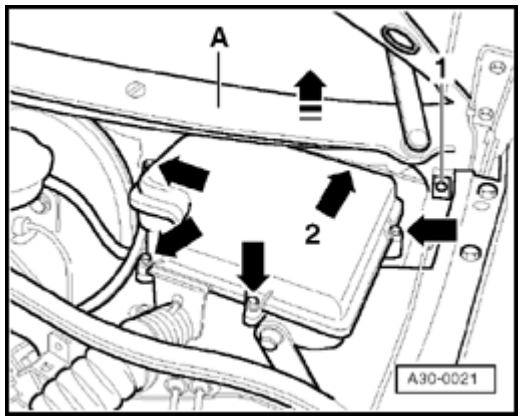


- Hose clamp 3094

Removing

- If installed, remove cover above plenum chamber.
- Disconnect battery Ground (GND) strap with the ignition switched off.

Remove E-Box from plenum chamber as follows:



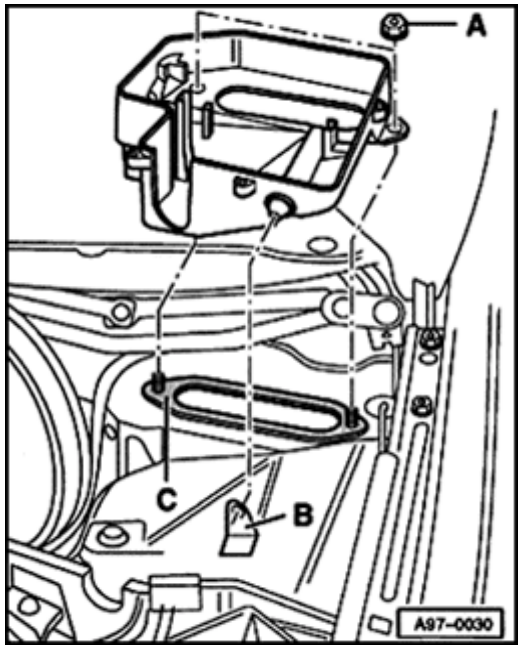
- Pull off clip -1- and lift wind grill -A- slightly. Now remove screw (arrow -2-).
- Remove remaining screws (arrows) and remove cover.
- Remove engine control unit and 8-point relay carrier (if fitted)

⇒ *Repair Manual, Electrical Equipment, Repair Group 97*

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

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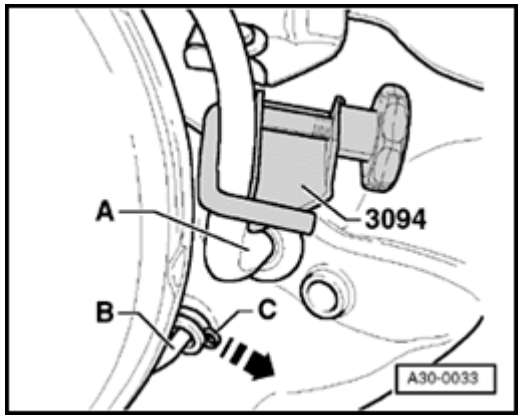
30-18



- Unscrew both nuts -A-.
- Lift E-box off studs at the rear and then pull it out of securing point -B-.

Note:

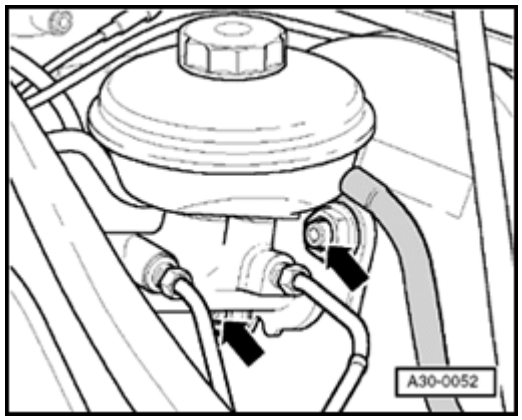
- *In the following procedures, make sure that no brake fluid escapes into the plenum chamber or onto the transmission below. If this does happen, clean the affected areas thoroughly.*
- *When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.*



- Clamp supply hose -A- from brake fluid reservoir using special tool 3094. Pull hose off master cylinder and plug hose.
- Remove rubber grommet for compensation hose above connecting line from transverse wall.
- Pry out retaining clip -C- using a screwdriver and pull line -B- out slightly.

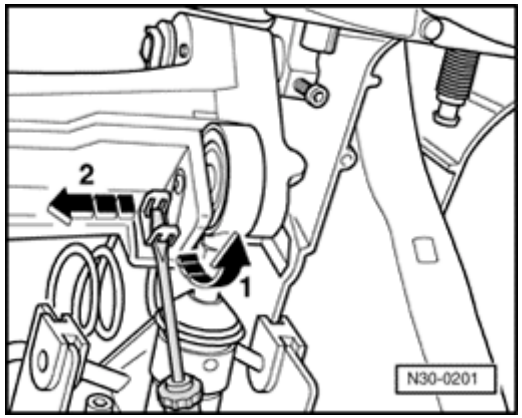
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30-19



- Remove both socket head bolts (arrows).
- Remove driver's side storage compartment:

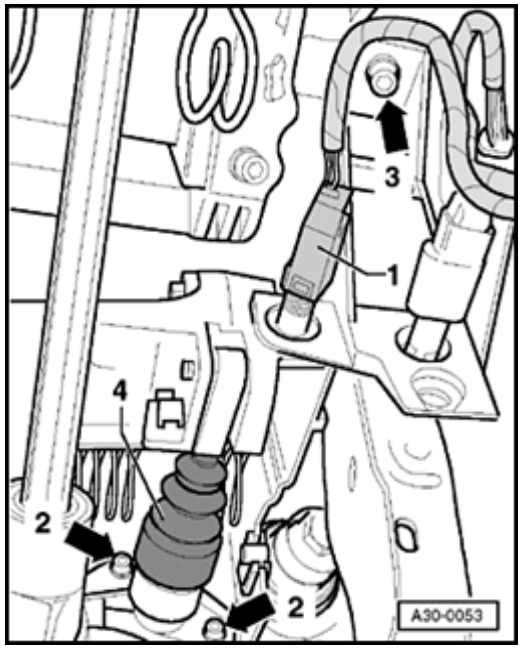
⇒ *Repair Manual, Body Interior, Repair Group 68*



- Remove clutch pedal from master cylinder. To do this, pry out bolt lock using screwdriver (arrow -1-), remove bolt (arrow -2-) and depress clutch pedal.

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30-20



Note:

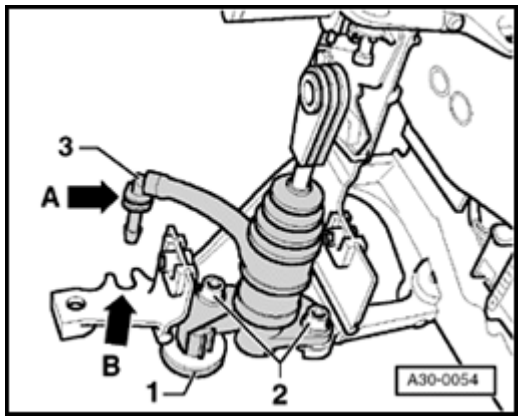
- *For the following procedures, make sure that the clutch pedal does not press out switch -1- from securing clip, since the thread of the switch would be damaged and the switch would have to be replaced.*
- *To ensure proper securing, the switch may only be installed once.*

- Remove bolts for master cylinder (arrow -2-) and for mounting bracket (arrow -3-).
- Pull complete pedal assembly somewhat toward seating compartment and remove clutch master cylinder -4-.

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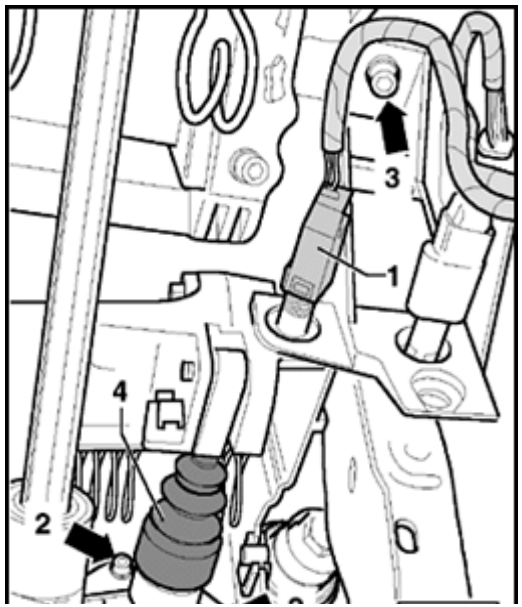
Installing

Installation is the reverse order of removal, while noting the following:



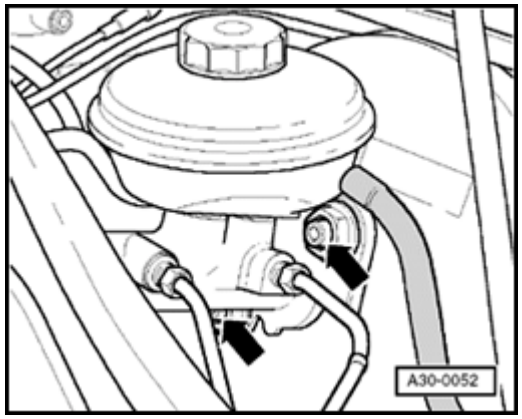
- Insert master cylinder so that the so that seal -1- with washer sits behind bearing mount and tighten bolts -2- to 20 Nm.
- Press connecting line -3- with guide -arrow A- into groove -arrow B- at mounting bracket.

A second technician is necessary for the next work step.

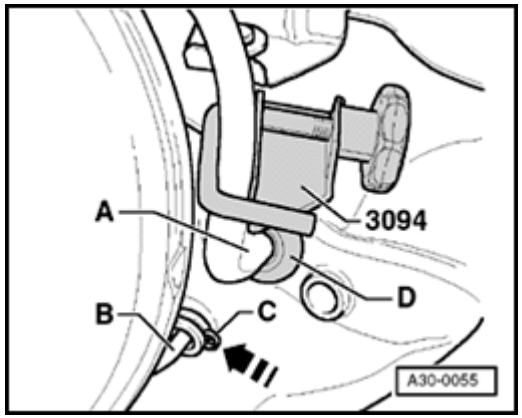


- Slide complete pedal assembly forward, toward transverse wall, insert bolt (arrow -3-) and tighten by hand. At the same time, second technician must insert tube from plenum chamber into master cylinder.

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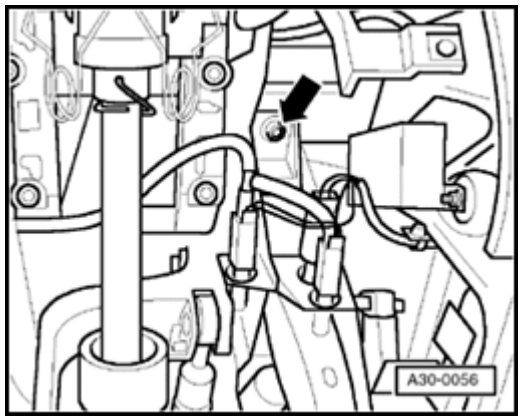


- Tighten bolts for brake booster (arrows) to 25 Nm.

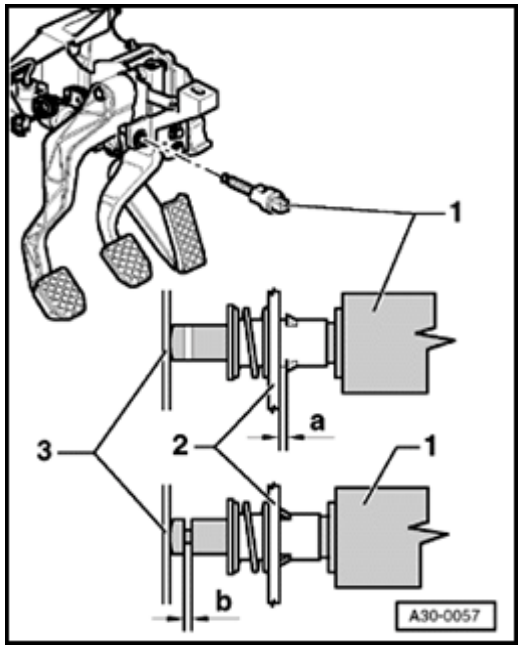


- Press securing clip -C- in to stop.
- Insert tube -B- into master cylinder until the tube engages audibly.
- Insert rubber grommet -D- into transverse wall above connecting tube/after-run hose -A-.
- Slide on after-run hose -A- to brake fluid reservoir to stop.
- Remove special tool 3094.

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- Tighten socket head bolt (arrow) for pedal assembly to 25 Nm.
- Connect master cylinder to clutch pedal. Engage bolt lock into clutch pedal.
- Bleed clutch system after installing master cylinder ⇒ Page 30-25 .



- Check adjustment of switch -1- above clutch pedal as follows:
  - Switch -1- must lie against clutch pedal -3- completely and must be completely activated.
  - Adjustment tolerance: gap measurement -a- between retaining clip and mounting bracket -2- or gap measurement -b- at switch -1- may be a maximum of 0.5 mm.
  - To adjust, hold clip and rotate switch -1-.

Note:

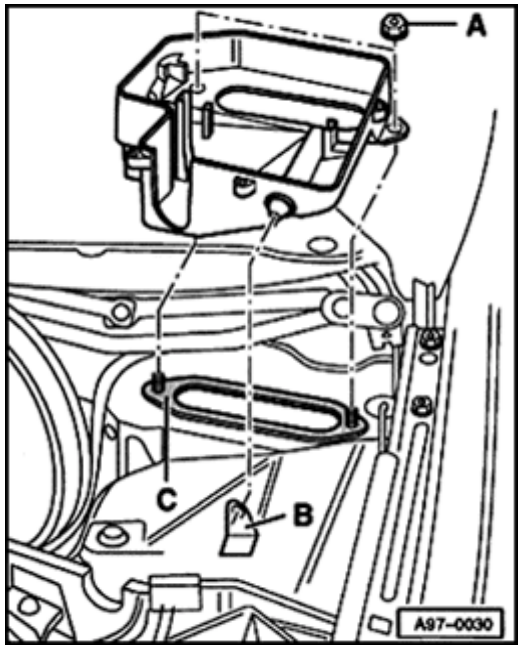
Connect clutch master cylinder with clutch pedal. Engage bolt lock in clutch pedal.

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30-24

- Remove driver's side storage compartment:

⇒ *Repair Manual, Body Interior, Repair Group 68*



- Always replace seal -C-.
- Make sure seal does not cover chassis opening and elevated edge of sheet metal.
- Insert E-Box in securing point -B- and tighten nuts -A- to 4 Nm.
- Press cover on by hand and tighten bolts -A- diagonally to 4 Nm (also see inscription on cover).
- Install engine wiring harness and connect harness connector in connector station.
- Install engine control module and if necessary, auxiliary relay carrier and auxiliary fuse holder.

⇒ *Repair Manual, Electrical Equipment, Repair Group 97*

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Clutch system, bleeding

Special tools, testers and auxiliary items

- Brake filling and bleeding appliance V.A.G 1238 B

or

- Brake filling and bleeding appliance V.A.G 1869

Note:

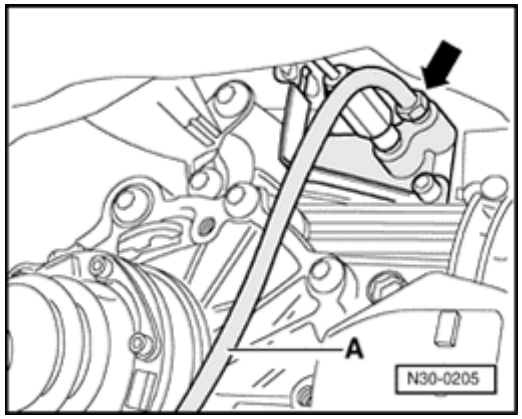
- *First open bleeder valve before switching on bleeding appliance.*
- *When performing the following steps, make sure that no brake fluid escapes onto the transmission.*
- *The clutch system must be bled after performing work on hydraulic clutch mechanism.*
- *Top-up brake fluid reservoir to "max." marking with brake fluid before bleeding clutch system.*

- Pull clutch pedal back to its normal position.

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- Connect brake filling and bleeding appliance V.A.G 1238 B or V.A.G 1869, but do not switch on at this stage.

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- Connect bleed hose -A- to slave cylinder (arrow) and open bleed valve.
- Connect bleeder hose to pressure hose of fluid collector bottle.
- Switch on bleeder appliance and allow about 100 cm3 of brake fluid to drain out.

  Working pressure: 2.5 bar

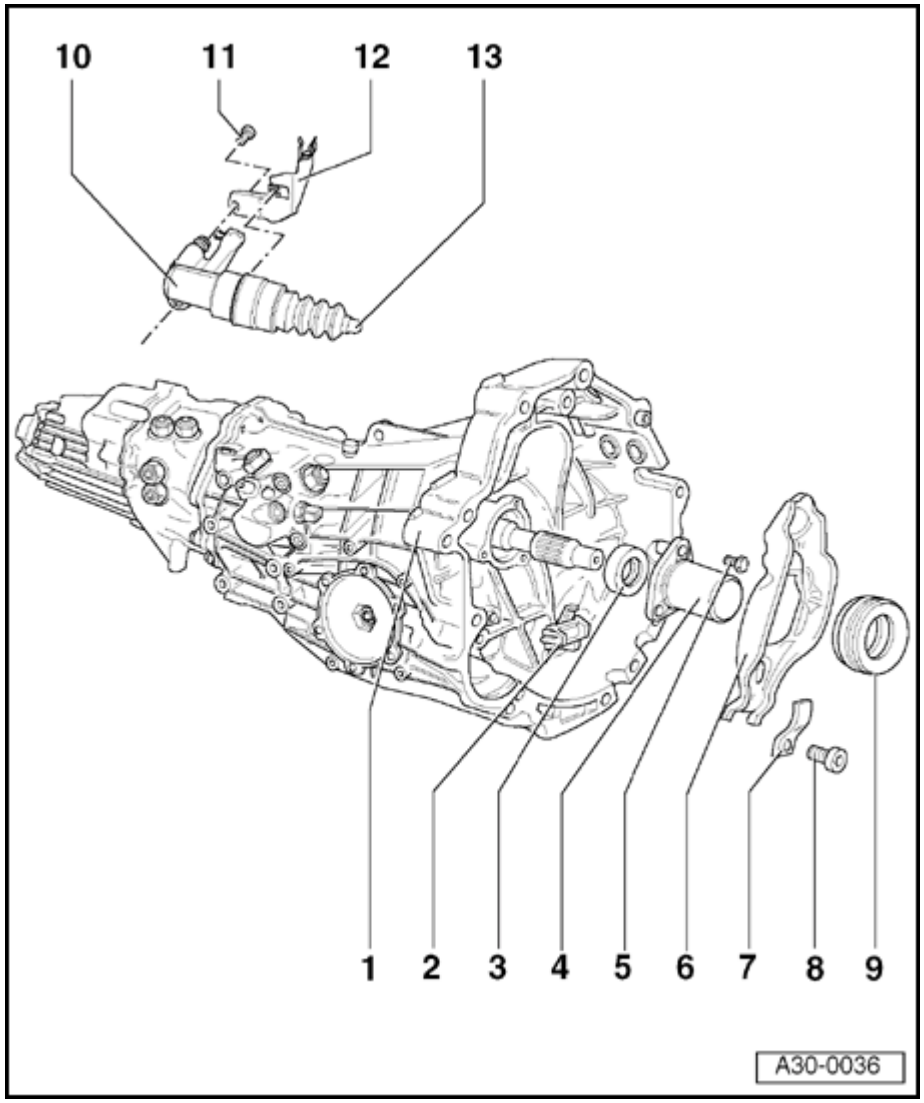
Note:

Ensure bleeder hose is correctly fitted during bleeding operation.

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

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30-27



Clutch release mechanism, servicing

1 - Transmission

2 - Intermediate piece

- Replace if damaged

3 - Shaft seal

- For input shaft
- Removing ⇒ Fig. 1
- Installing ⇒ Fig. 2
- Pressing-in depth (factory): 3.5 mm
- Pressing-in depth (repairs): 4.5 mm

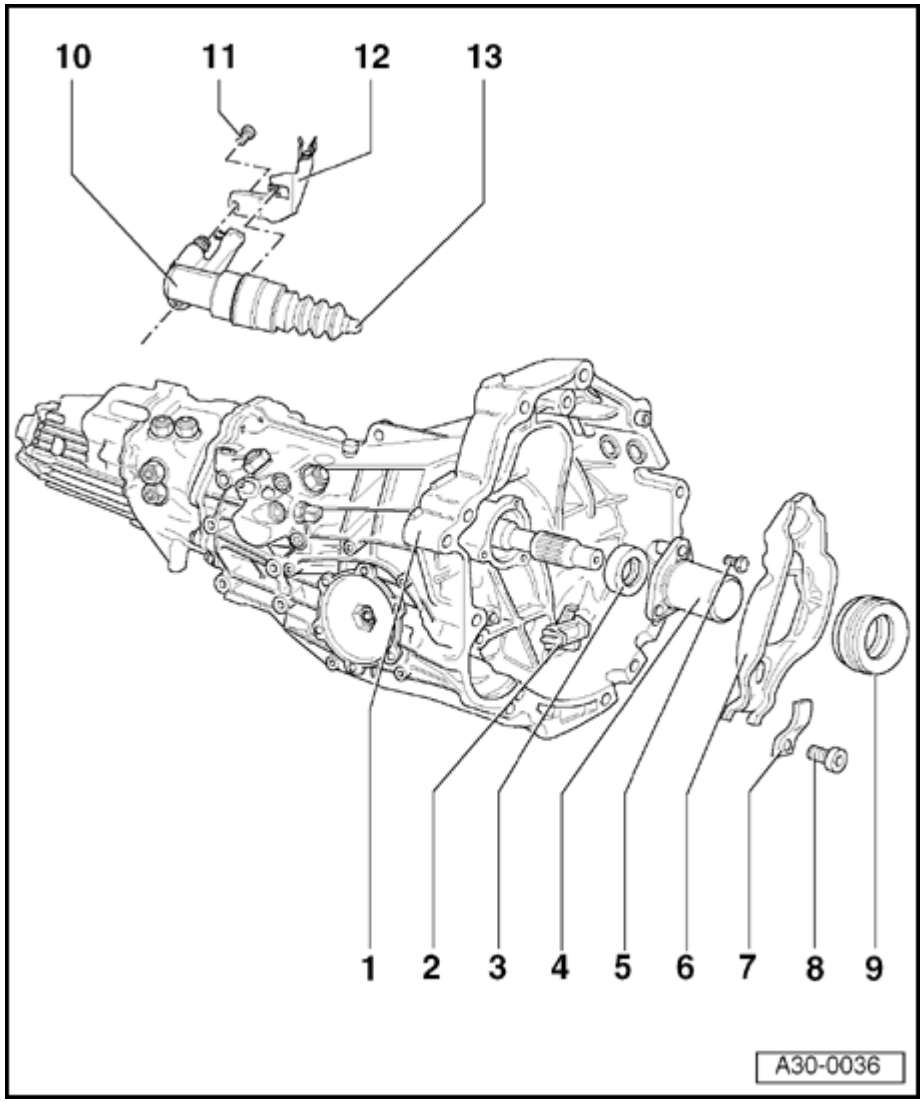
4 - Guide sleeve

5 - Bolt, 15 Nm

- Qty. 3

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30-28



6 - Clutch release lever

- Removing ⇒ Fig. 3
- Must engage in the lugs in intermediate piece when installed ⇒ Fig. 4
- Before installing, coat contact surface of clutch slave cylinder push rod with a thin layer of copper grease, e.g. Z381 351 TE

7 - Leaf spring

8 - Bolt, 25 Nm

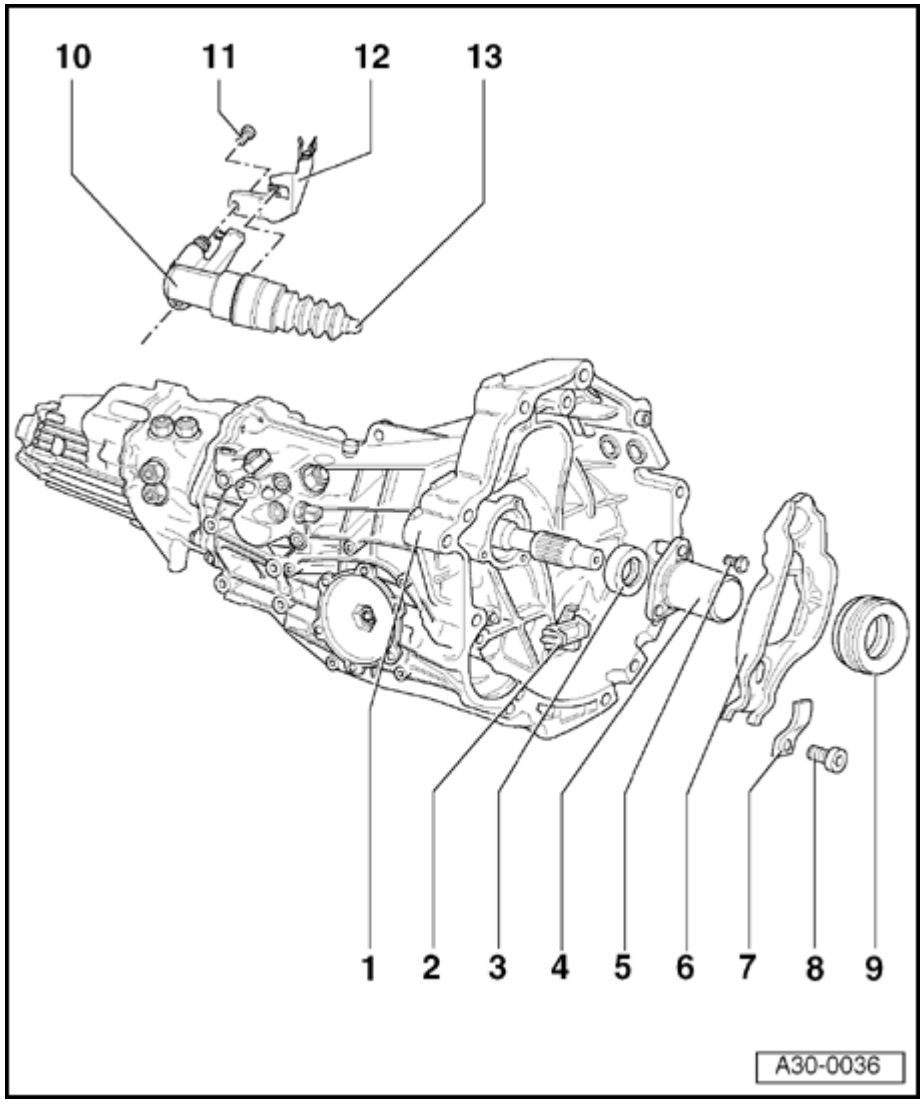
- Self-locking
- Always replace

9 - Release bearing

- Do not wash out, wipe clean only
- Replace noisy bearings
- Retainer lugs on release bearing must engage in release lever

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10 - Clutch slave cylinder

- Bleeding clutch system ⇒ Page 30-25
- Removing and installing ⇒ Page 30-32
- When installing, push on until the securing bolt can be fitted

11 - Bolt, 20 Nm

- Self-locking
- Always replace

12 - Bracket for hose/line assembly

- Engage in clutch slave cylinder

13 - Push rod

- Coat contact surface of push rod with copper grease, e.g. Z 381 351 TE

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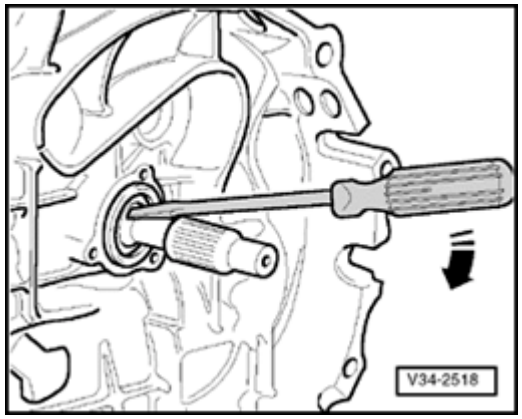


Fig. 1 Removing shaft seal for input shaft

- pry seal out carefully with a screwdriver.

Note:

Do not damage contact surface of shaft seal on input shaft.

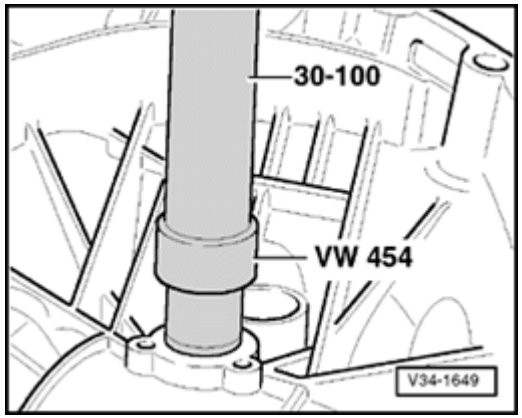


Fig. 2 Installing shaft seal for input shaft

- Pack space between sealing lip and dust lip of new seal for input shaft with multi-purpose grease.
- Fit a thin protective hose tightly over input shaft splines.
- Drive on seal for input shaft.
  - Pressing-in depth when fitted at factory: 3.5 mm
  - Pressing-in depth after repair work: 4.5 mm
- Remove protective hose.

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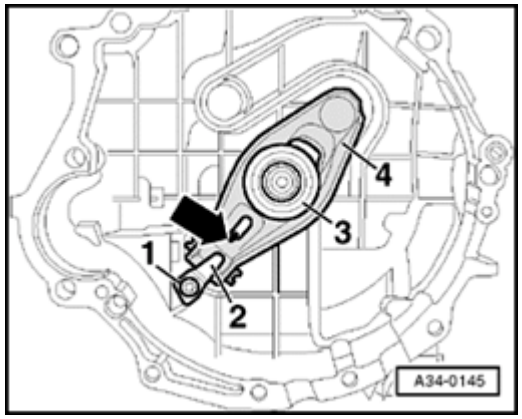


Fig. 3 Removing clutch release lever

- Loosen bolt -1-, remove leaf spring -2- and press back detent (arrow).
- Remove clutch release lever -4- together with release bearing -3-.
- Disengage release bearing retainer lugs from release lever.

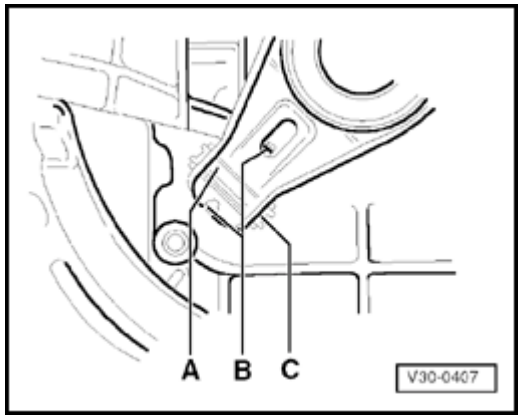


Fig. 4 Installing clutch release lever

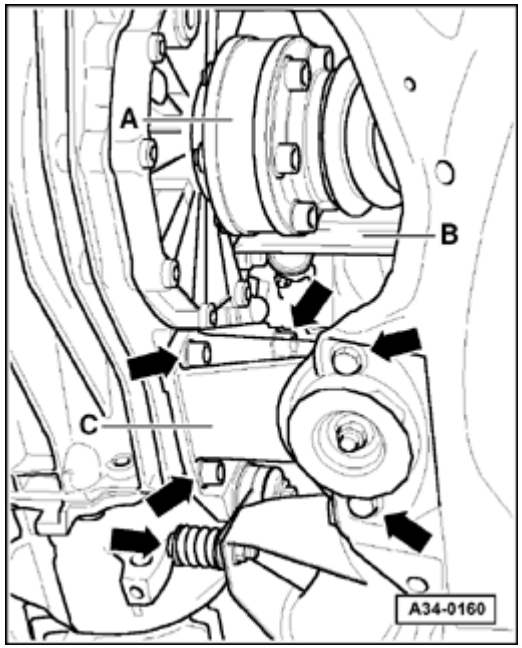
- Before installing clutch release lever, coat contact surface for slave cylinder push rod with with a thin layer of copper paste.
- Insert clutch release lever -A- into intermediate piece -C- and engage (detent -B- will come into view).
- Insert leaf spring (-item 7 -, Page ⇒ Page 30-28) and tighten retaining bolt (-item 8 -, Page ⇒ Page 30-28) to 25 Nm.

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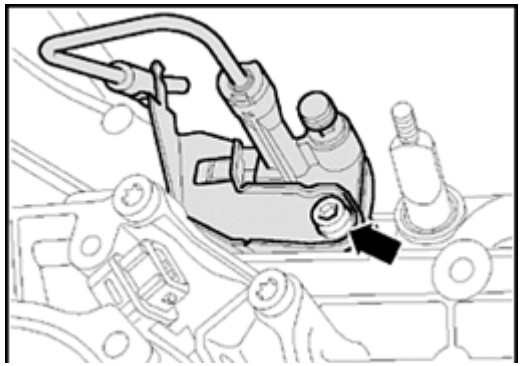
30-32

Clutch slave cylinder, removing and installing

Removing



- Unbolt left drive axle -A- from transmission and move clear to one side.
- Remove heat shield -B- from transmission.
- Unscrew bolts (arrows) and remove left transmission support -C- together with transmission mounting.

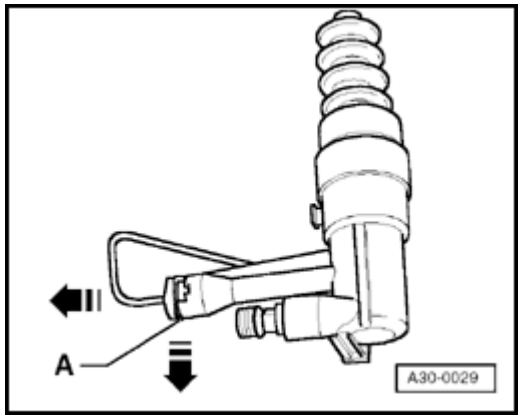


- Remove bolt (arrow) and take out slave cylinder from the rear.

Note:

Do not depress clutch pedal after removing slave cylinder.

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- To disconnect line, first pry out retaining clip -A- with a screwdriver until it disengages audibly. Line can then be pulled out.

Installing

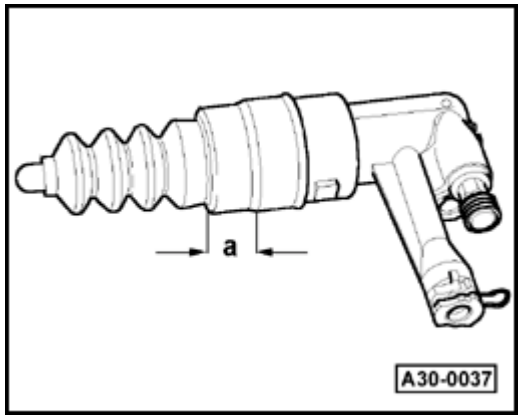
Installation is carried out in the reverse order, when doing this note the following:

Note:

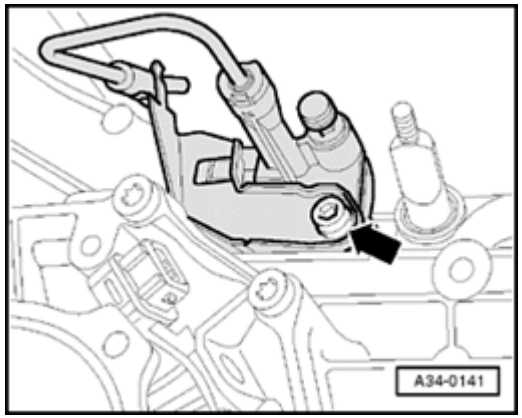
- *Do not allow brake fluid to come into contact with the transmission. If necessary, clean the transmission housing.*
- *If the clutch slave cylinder is inserted off-line there is a danger that the push rod will be guided past the clutch release lever.*
- *To facilitate installation, engage 6th gear (6-speed transmission) or 4th gear (5-speed transmission) before fitting the slave cylinder.*
- *Pre-tension the clutch slave cylinder far enough for the securing bolt to be easily inserted.*
- *Always replace securing bolt.*

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30-34

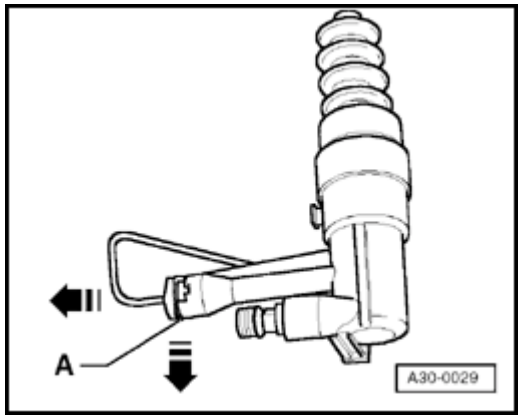


- Coat area -a- of collar with Lithium grease G 052 150 A2 before mounting the slave cylinder into the transmission housing.
- Lightly coat contact surface for plunger to clutch release lever using copper grease, e.g. Z 381 351 TE.



- Insert clutch slave cylinder into mounting hole in transmission housing, keeping it as far as possible in line with direction of operation of push rod, then tighten bolt (arrow).

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- To connect line to slave cylinder, press in retaining clip -A- as far as it will go.
- Push line into slave cylinder until it engages audibly.
- Install transmission support and transmission mounting.
- Bleed clutch system ⇒ Page 30-25

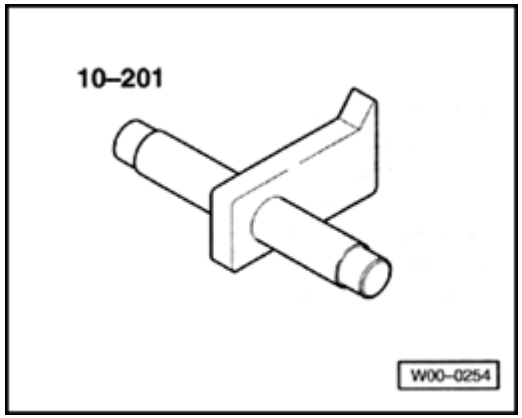
Tightening torques

Component		Nm
Clutch slave cylinder to transmission		20
Heat shield for drive axle		25
Drive axle to drive flange	M8	40
	M10	80
Transmission support to transmission		40
Transmission mounting to subframe		23

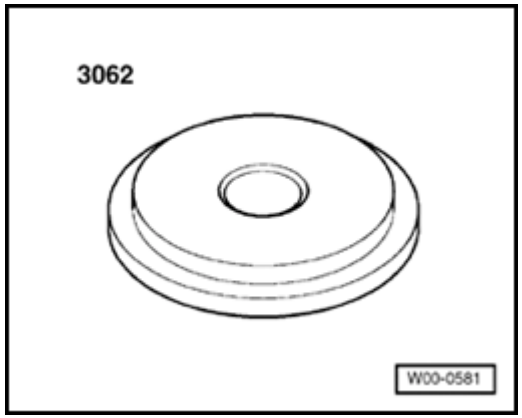
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Clutch, servicing

Special tools, testers and auxiliary items required



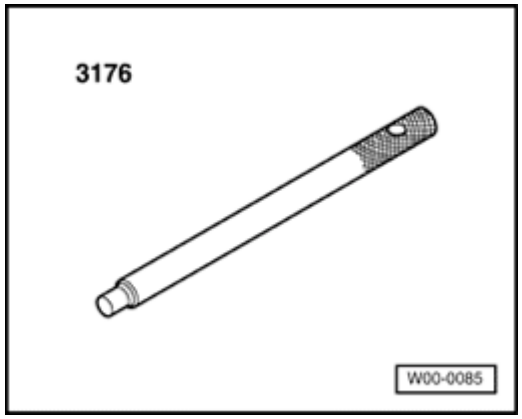
- Flywheel retainer 10-201



- Thrust pad 3062

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30-37



- Centering mandrel 3176
- Grease G 000 100

Notes:

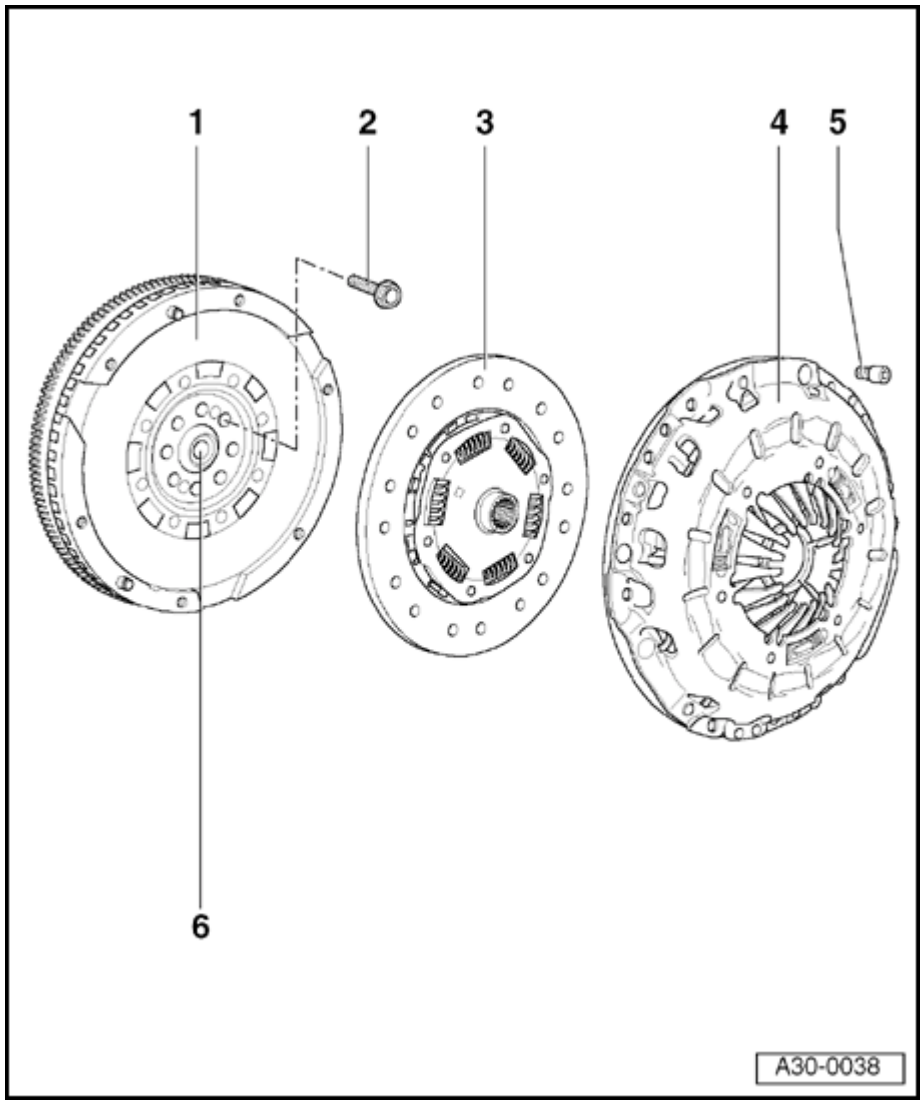
- *Observe general repair notes ⇒ Page 00-11 .*
- *For vehicles with V6 2.7 L-Biturbo engine, a SAC-clutch plate (self adjusting clutch plate) is installed, on which an adjustment ring must be reset except during replacement ⇒ Page 30-42 .*
- *Replace clutch plates and pressure plates with damaged or loose rivets.*
- *Select the correct clutch plate and pressure plate according to engine code:*

⇒ Parts catalog

- *Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease G 000 100 to the splines. Then move clutch plate to and fro on input shaft until hub moves freely on shaft. Excess grease must be removed.*
- *Pressure plates 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.*
- *If the clutch has burned out, thoroughly clean the bellhousing, flywheel and parts of the engine facing the transmission to reduce the smell of burned linings.*

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Clutch (SAC pressure plate) for vehicles with 6-cylinder 2.7 liter bi-turbo engine

Before working on the clutch, the transmission must be removed ⇒ Page 34-18 .

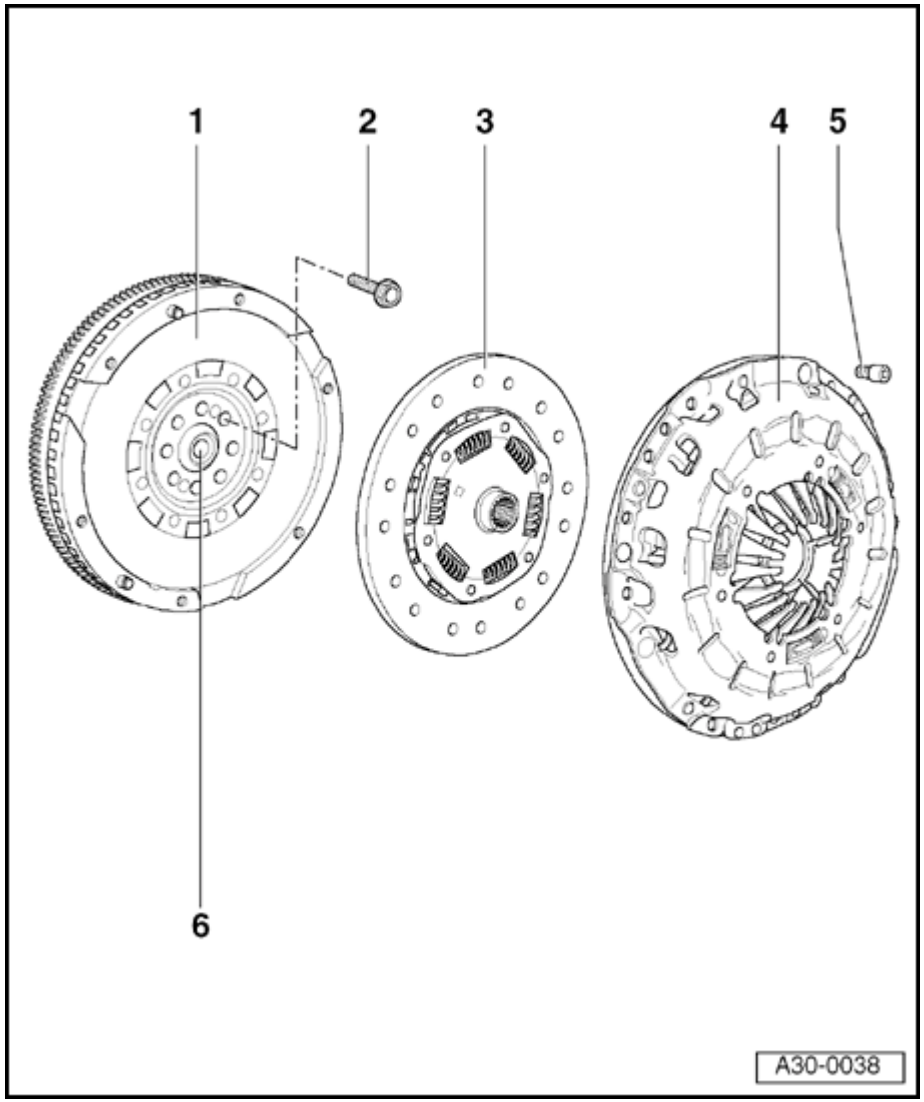
1 - Dual-mass flywheel

- Ensure centering pins are tightly seated
- Contact surface for clutch lining must be free of grooves, oil and grease
- Removing and installing

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 13*

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30-39



2 - Bolt

- Vehicles with dual-mass flywheel: tighten bolt to 60 Nm, then turn a further 180°
- Always replace

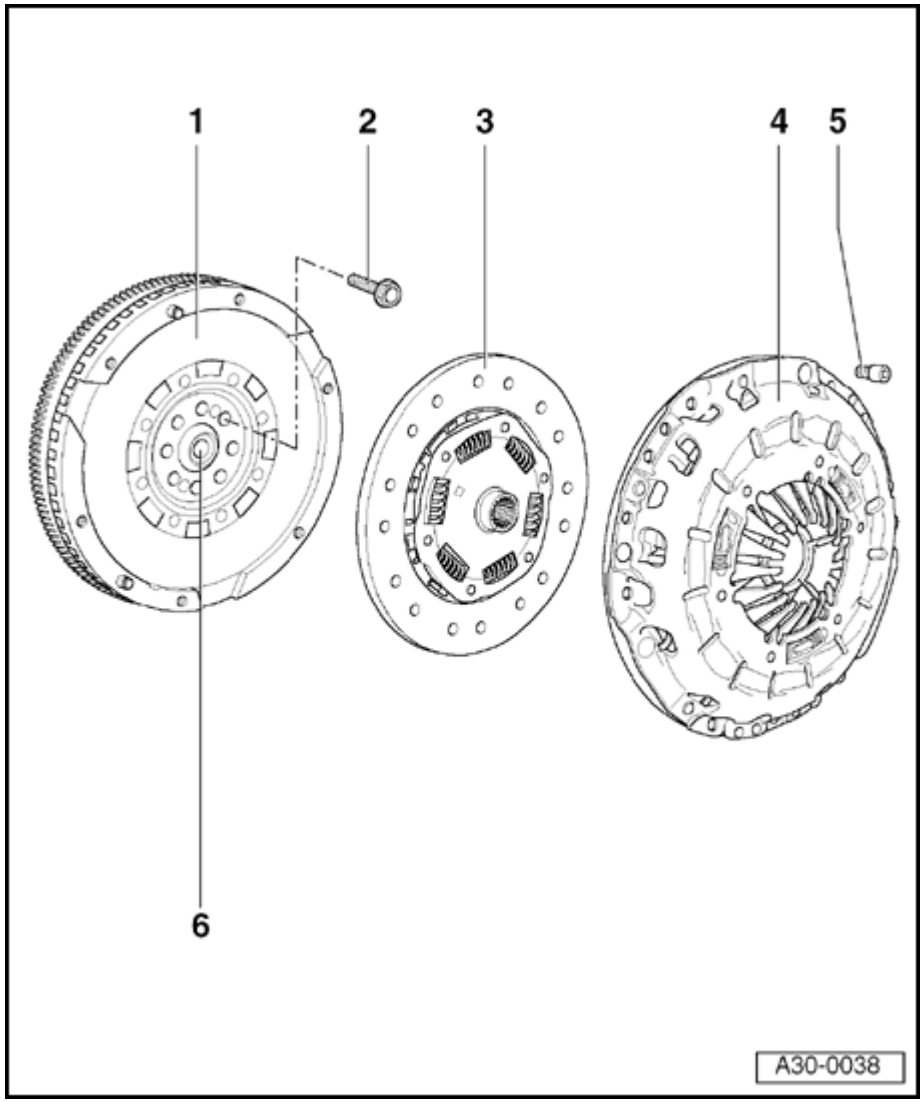
⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 13*

3 - Clutch plate

- Install with spring pack (coil springs) or the word "Getriebeseite" towards pressure plate and transmission
- Centering ⇒ Page 30-45
- Do not grease
- Clutch plate diameter ⇒ from Page 00-3

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30-40



4 - SAC pressure plate

- Removing and installing ⇒ Page 30-45
- Resetting adjuster ring ⇒ Page 30-42
- Checking ends of diaphragm spring ⇒ Fig. 1
- Checking spring connection and riveted fastenings

5 - Bolt, 22 Nm

- Tighten gradually in diagonal sequence and in several stages

6 - Needle roller bearing

- Removing and installing

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 13*

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30-41

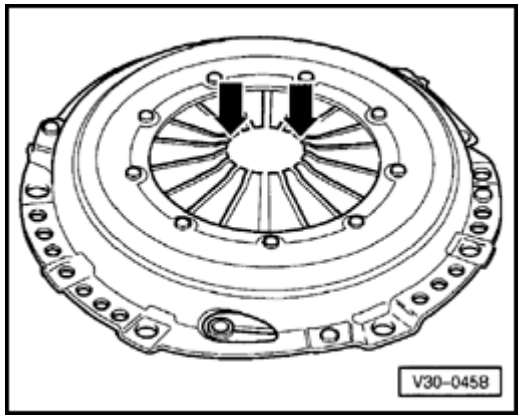


Fig. 1 Checking ends of diaphragm springs

- ♦ Wear up to half of the diaphragm spring thickness is permissible
- Check diaphragm springs and spring connection between pressure plate and cover for cracks, rivet connections and for secure fit.
- Replace clutches with damaged springs or with loose rivet connections (arrows).

Note:

In case of repair, always allocate clutch pressure plate and clutch disc to engine code according to to parts catalog.

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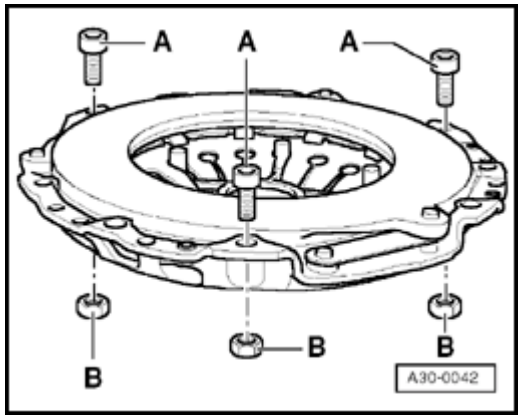
30-42

Adjuster ring in SAC clutch pressure plate, resetting

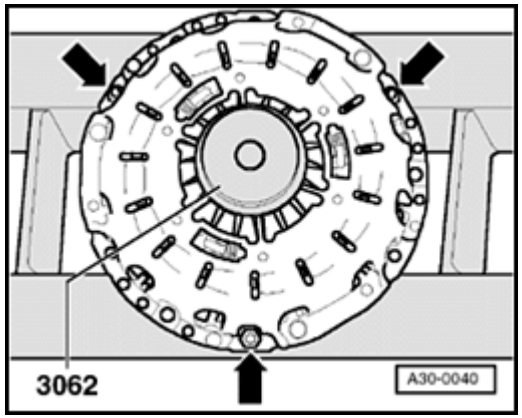
- "SAC" stands for Self-Adjusting-Clutch
- When fitting a new clutch plate together with a used SAC pressure plate, the adjuster ring in the pressure plate has to be reset by turning it back as far as it will go. If this is not done, the SAC pressure plate will operate with reduced clamping force, which will cause clutch slip and excessive wear (especially of the clutch plate). This adjustment is only required when fitting a new clutch plate together with a used SAC pressure plate, as above.
- If the clutch plate is not being replaced, it is not necessary to reset the adjuster ring.
- New SAC pressure plates are pre-set accordingly, and do not have to be reset.

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30-43



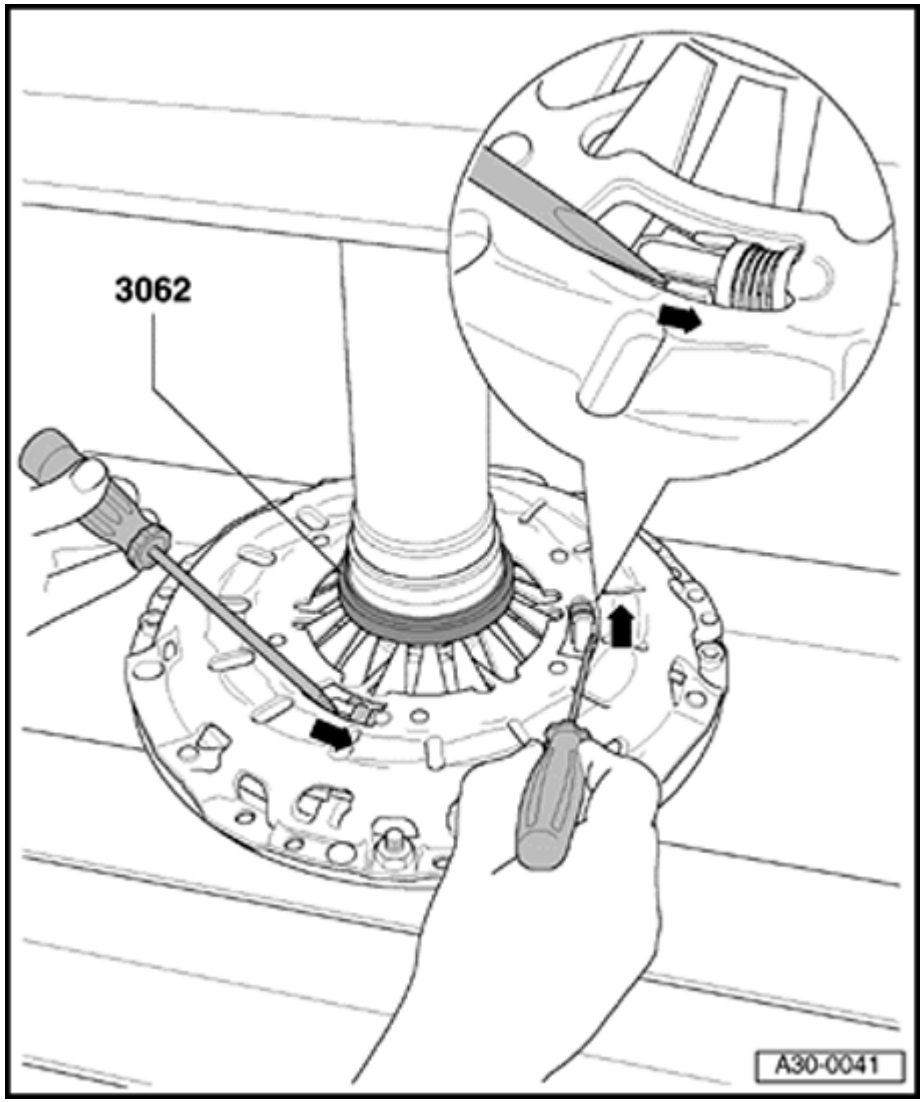
- Insert 3 securing bolts -A- into mounting holes on pressure plate, 120° from each other (1/3 turn), as shown in illustration.
- Thread 3 nuts -B- (M8) onto bolts -A- and tighten nuts slightly.



- Place SAC pressure plate onto press so that only the 3 bolt heads (arrows) make contact.
- Position special tool 3062 in center of pressure plate.

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30-44

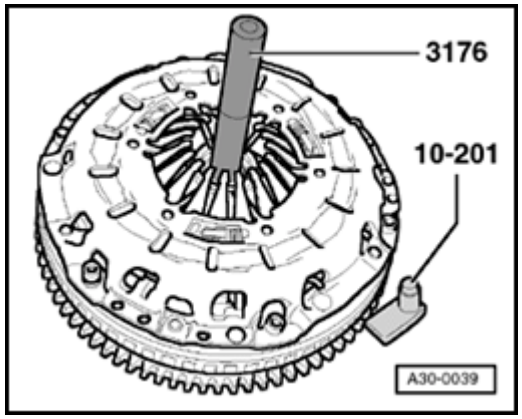


Do not use force when performing the following steps, otherwise the forks on the adjuster ring can break off.

- Apply two screwdrivers to forks on adjuster ring. Use press to compress pressure plate until it is just possible to move adjuster ring.
- Using two screwdrivers, turn back adjuster ring evenly in direction of arrows until it reaches stop.
- Hold adjuster ring against stop and reduce pressure exerted by press so that adjuster ring is held in this position.

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30-45



Removing and installing clutch with SAC pressure plate

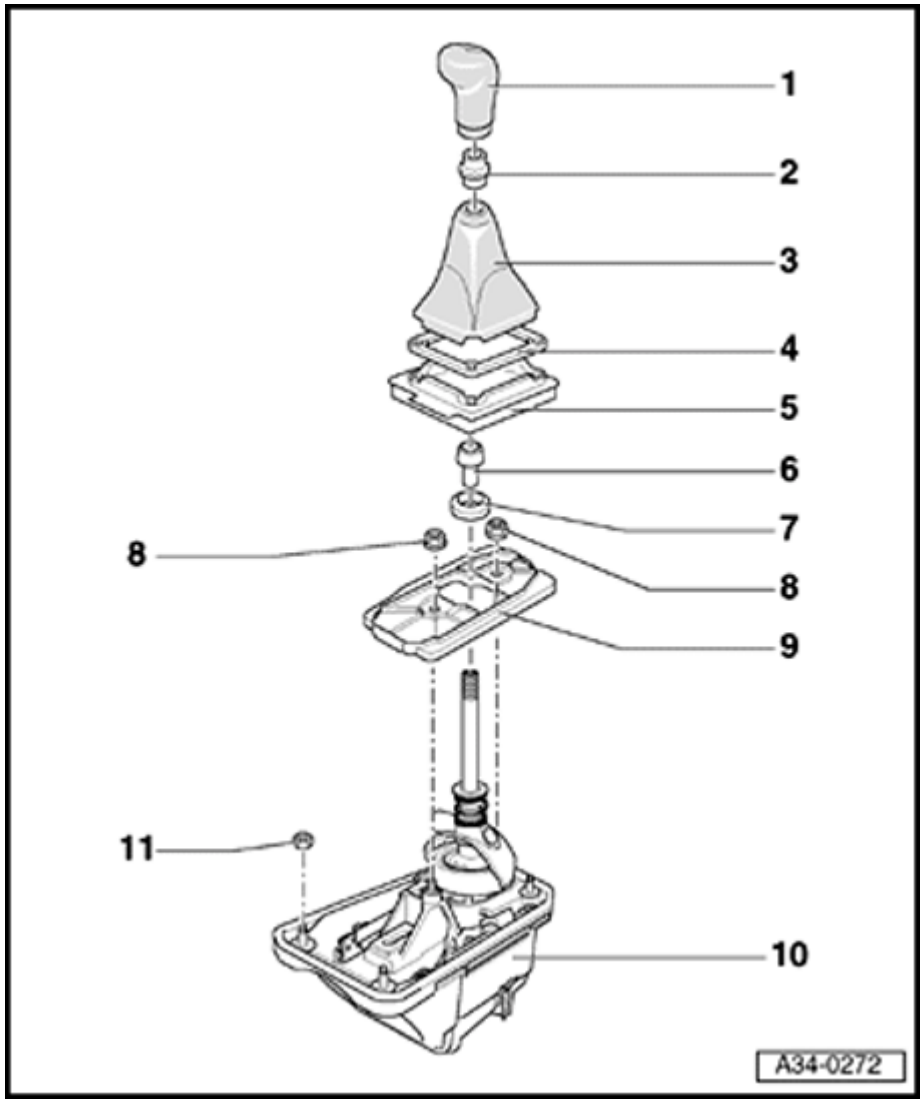
Note:

- *The adjuster ring in the SAC pressure plate has to be reset (⇒ Page 30-42) before assembly when replacing the clutch plate on its own.*
- *Clutch lining and contact surface of pressure plate must make full contact with flywheel before securing bolts are inserted.*
- *To avoid damaging centering holes in pressure plate and centering pins on flywheel, tighten securing bolts evenly and in several stages in diagonal sequence.*

- Position of clutch plate: spring pack (coil springs) or marking "Getriebeseite" towards pressure plate and transmission.
- Loosen and tighten bolts gradually in diagonal sequence and in several stages to 22 Nm.
- Reverse position of counter-hold tool 10-201 when removing.
- Use mandrel 3176 to center clutch plate.

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34-1



Shift control mechanism, servicing

Part I

Notes:

- *Grease bearings and sliding surfaces with polycarbamide grease, part nr. G 052 142 A2.*
- *Adjusting shift control mechanism* ⇒ *Page 34-12* .

1 - Shift knob

2 - Bushing

3 - Housing cover

- Carefully pry out latch in rear section of center console

4 - Top part of retaining frame

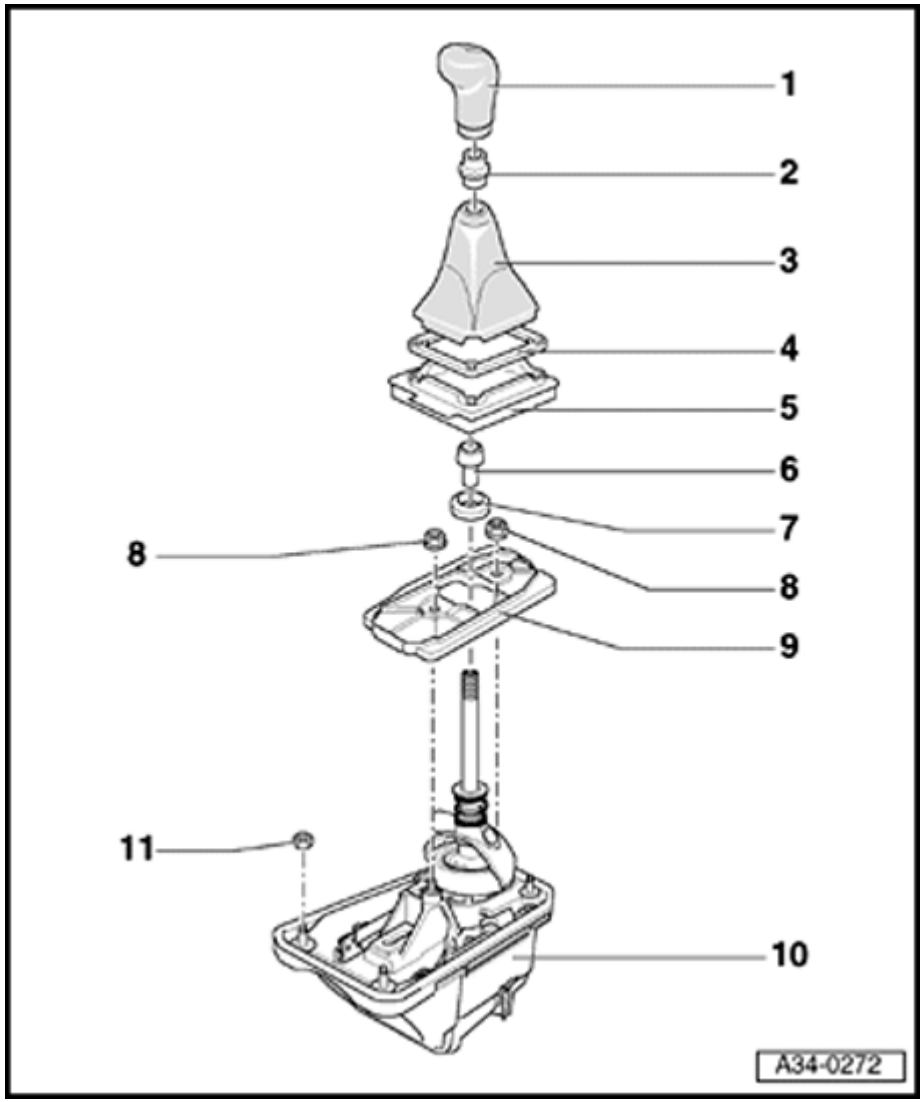
5 - Bottom part of retaining frame

6 - Bushing

7 - Sleeve

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34-2



8 - Nut, 8 Nm

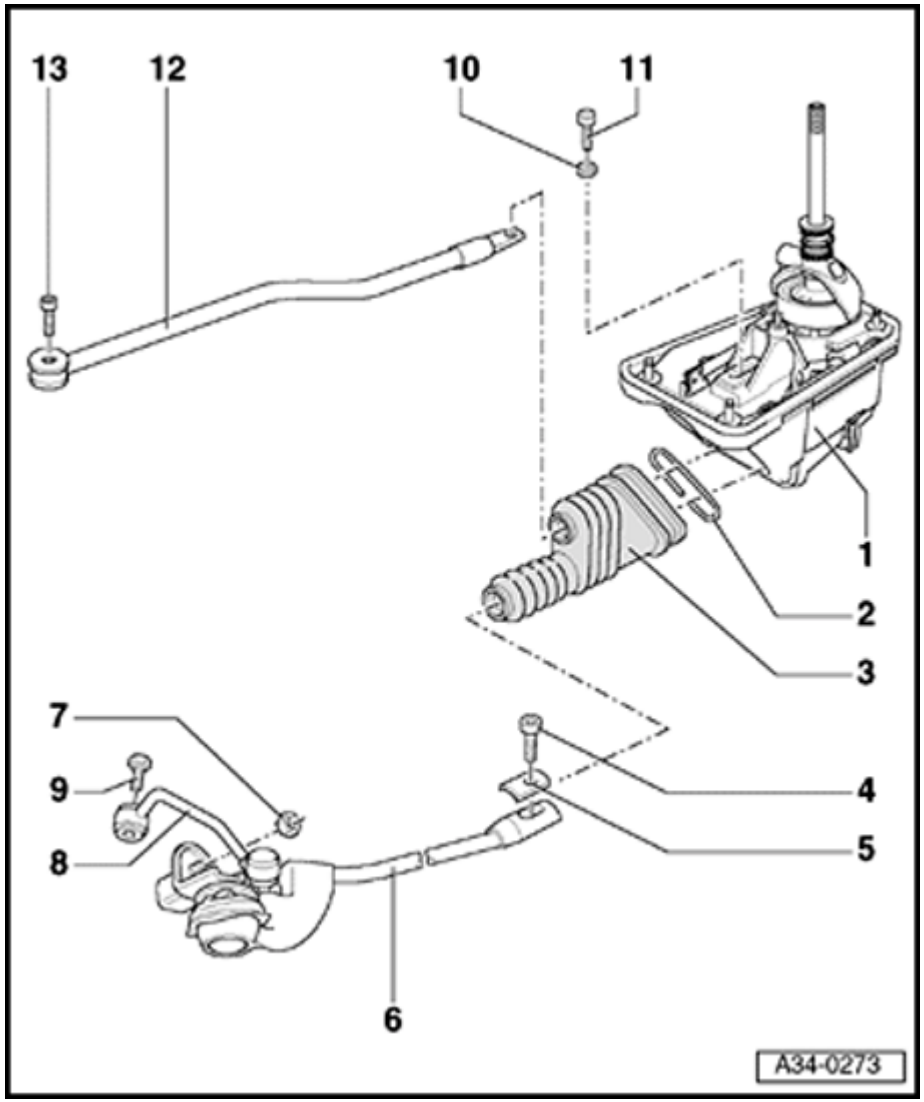
9 - Noise insulation cover

10 - Shift control mechanism with shift housing

11 - Nut, 10 Nm

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34-3



Part II

1 - Shift control mechanism with shift housing

2 - Tensioning ring

3 - Boot

- Carefully pull over shift rod during removal
- Set onto marks of shift rod and pivot rod when installing

4 - Socket head bolt, 25 Nm

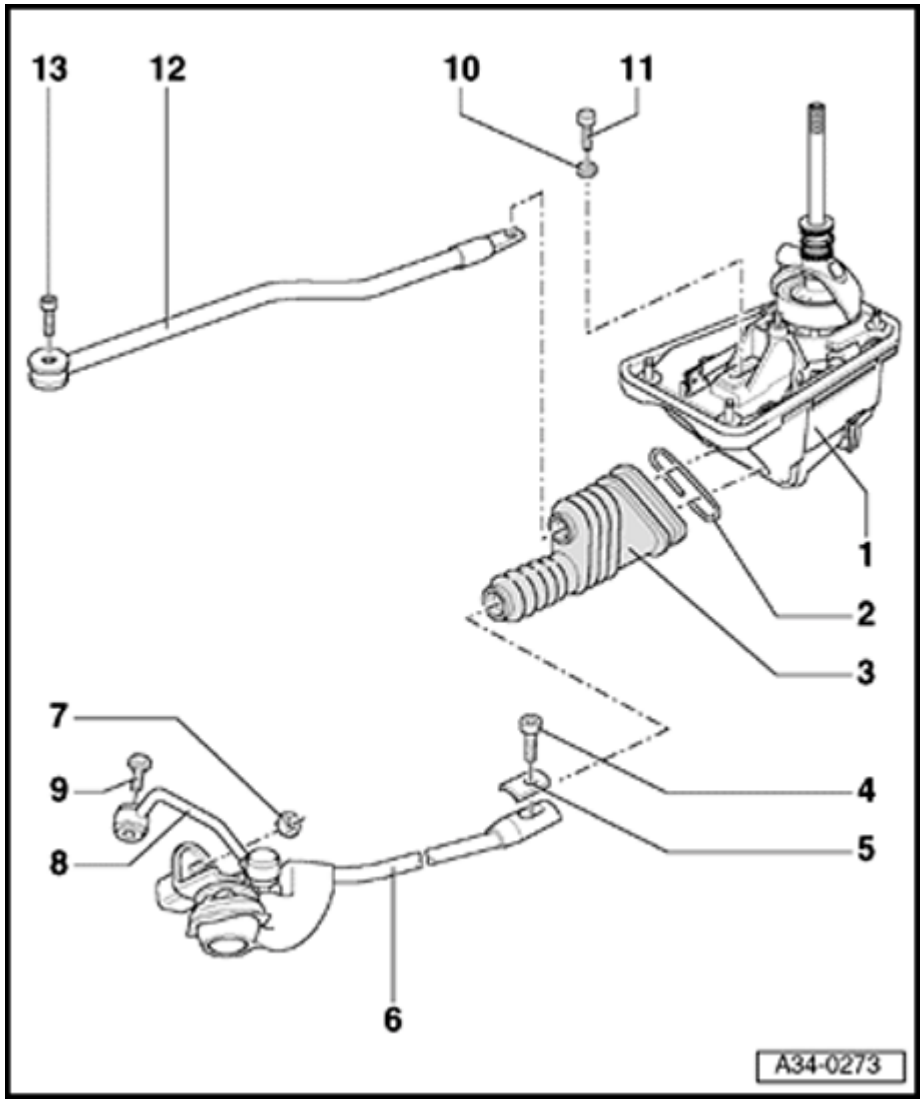
5 - Clamp

6 - Shift rod

- Do not disconnect connecting rod Fig. -8- from shift rod; observe note ⇒ Page 34-9

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34-4



7 - Nut, 25 Nm

8 - Connecting rod

- Do not disconnect from shift rod; observe note ⇒ Page 34-9

9 - Bolt, 25 Nm

10 - Washer

11 - Socket head bolt, 25 Nm

12 - Front shift rod

- With bearing bushing, bolt and washers

13 - Bolt, 40 Nm

- Part of front shift rod

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34-5

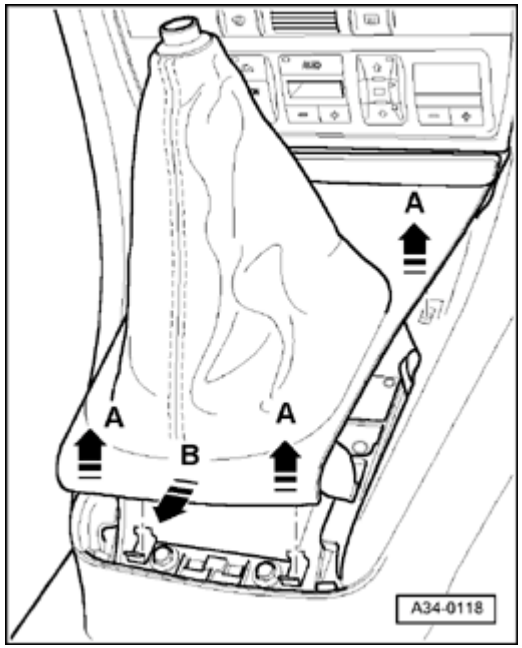
Selector mechanism, removing and installing

Removing

- Unscrew shift knob from shift lever.

Note:

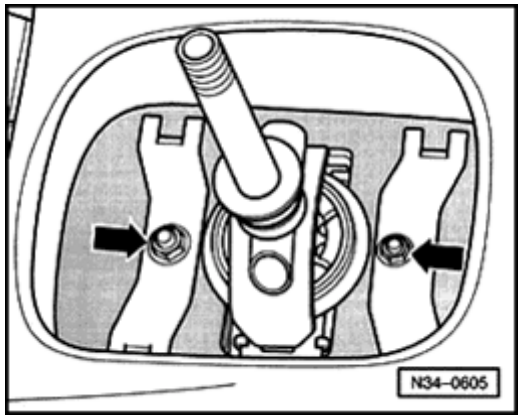
Shift cover is removed together with the cover for center console.



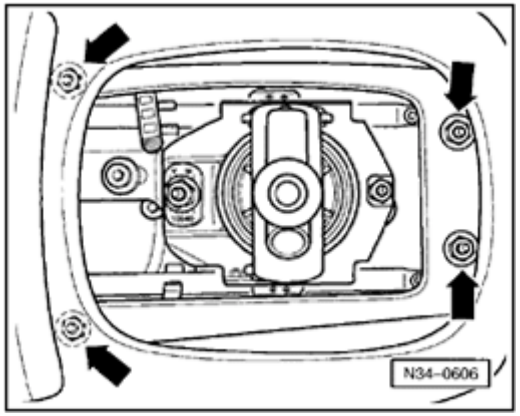
- Slightly lift off cover for center console upward (arrows -A-).
- Pull cover slightly toward back (arrow -B-), then lift complete cover upward.

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34-6

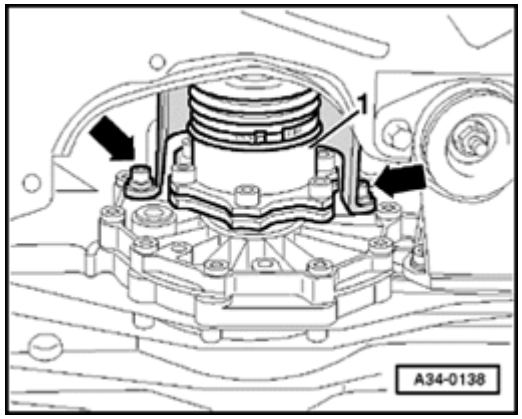


- Remove noise insulation cover for shift mechanism housing (arrows).



- Unscrew nuts securing shift mechanism housing (arrows).

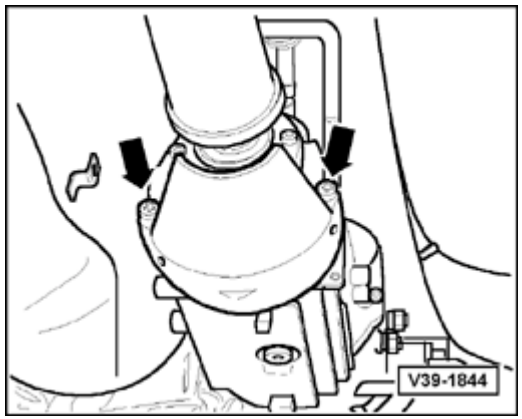
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- Remove heat shield for left-hand inner joint -1- from transmission (arrows).
- Disconnect left-hand drive axle -1-, lift toward front and tie up.
- Remove rear section of exhaust system (rearward of exhaust pipe clamp(s)):

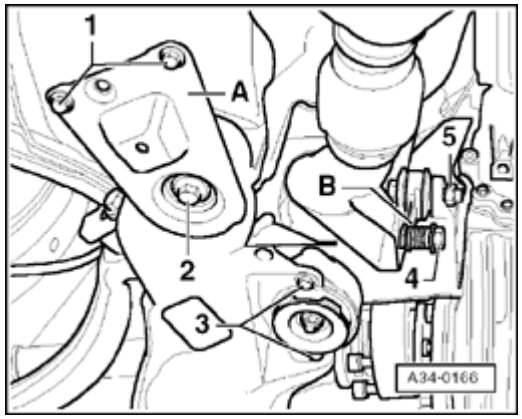
⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 26*

- Remove heat shield above driveshaft.

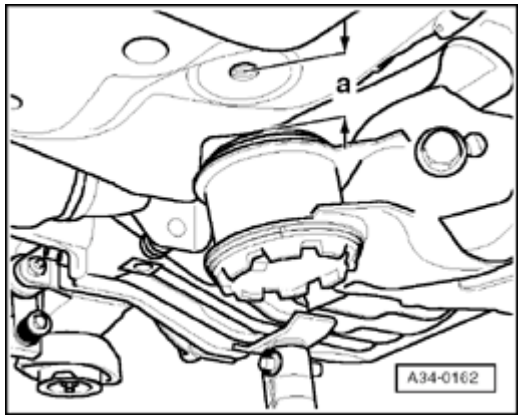


- Remove heat shield for driveshaft from cover for Torsen differential (arrows).
- Remove driveshaft ⇒ Page 39-68 .

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- Unscrew bolts -1- and -2- on left and right.

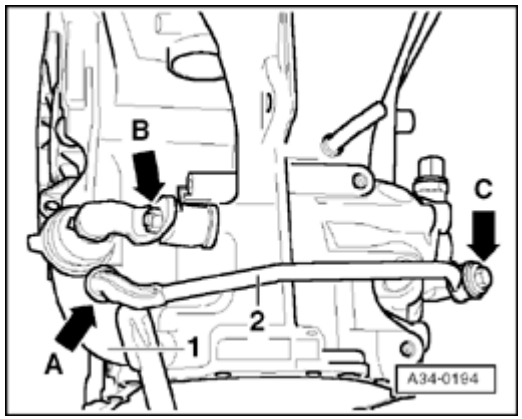


- Lower subframe at the rear.

◆ -a- = max. 50 mm

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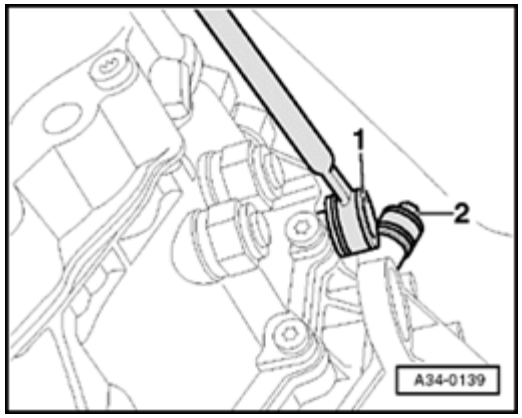
Important notice for the following procedures:



Under no circumstances may the ball head (arrow -A-) of connecting rod -2- be pulled off shift rod -1- during removal of shift linkage.

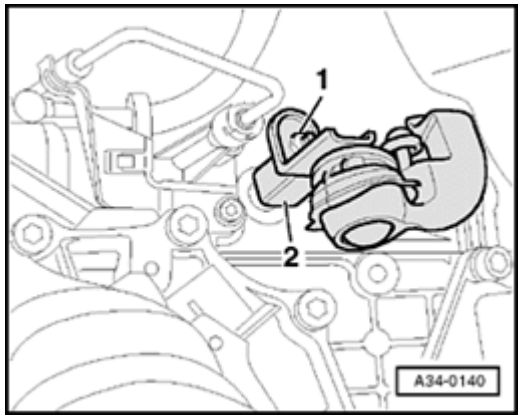
The ball head is destroyed when pulled off.

Nut (arrow -B-) and Bolt (arrow -C-)must be removed to remove shift rod.



- Unbolt connecting rod -2- on right-hand side of transmission.
- Remove hex socket head bolt from push rod -1-.

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- Unscrew nut -1- and pull selector rod lever -2- off transmission selector shaft.
- Swing gear shift housing with selector rod and push rod down and remove.

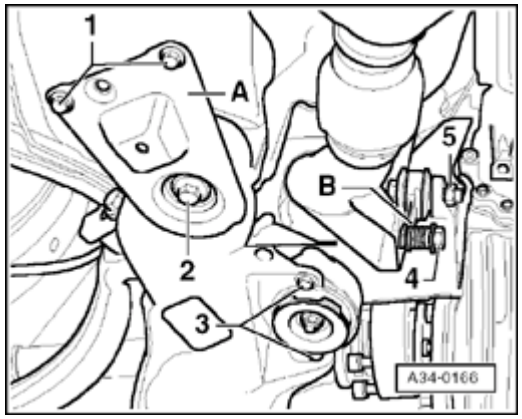
Installing

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

- Bolt on driveshaft ⇒ Page 39-71 .
- Adjust driveshaft ⇒ Page 39-75 .
- Adjust gear selector mechanism ⇒ Page 34-12 .
- Align exhaust system free of stress

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 26*

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Tightening torques

Component	Nm
Hex bolt -1-	75
Combi bolt -2-	110 + 90°
Gear shift housing to body	10
Selector rod to transmission	25
Connecting rod to transmission	25
Push rod to transmission	40
Drive axle to drive flange M8	40
M10	80
Heat shield for drive axle	25
Clamp for exhaust pipe	40

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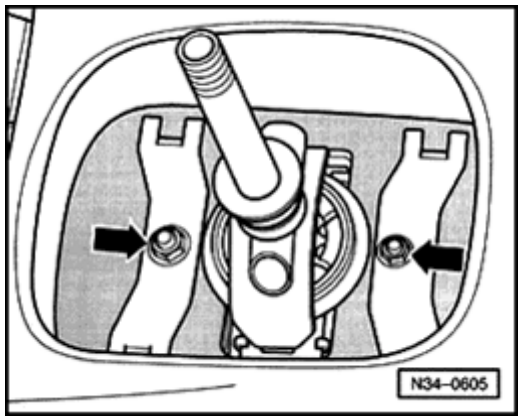
34-12

Gear selector mechanism, adjusting

Requirements

- Selector mechanism, operating and relay elements must be in proper condition.
- Selector mechanism must move freely.
- Transmission, clutch and clutch mechanism must be in proper condition.
- Transmission in neutral.

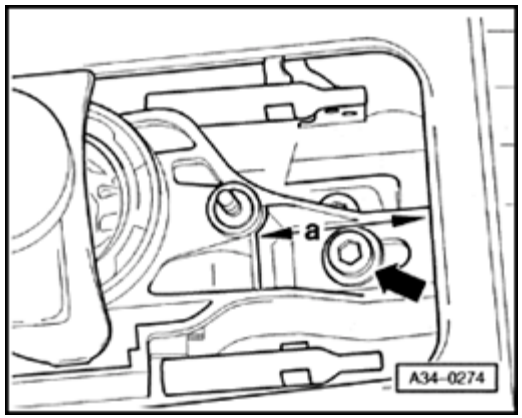
- Unscrew gear shift knob from gear shift.
- Remove cover (gaiter) for gear shift.



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

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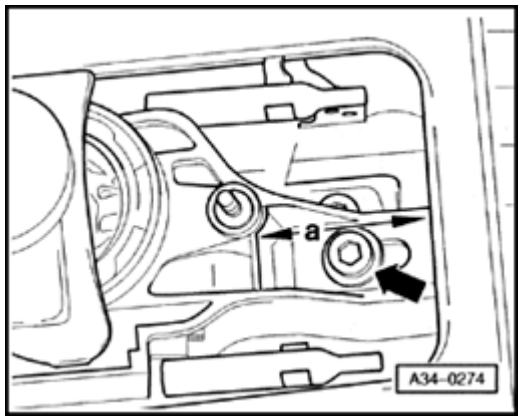
- Measure distance between body and rear push rod (in selector mechanism).



➢

- ♦ Specification: distance a = 43 mm

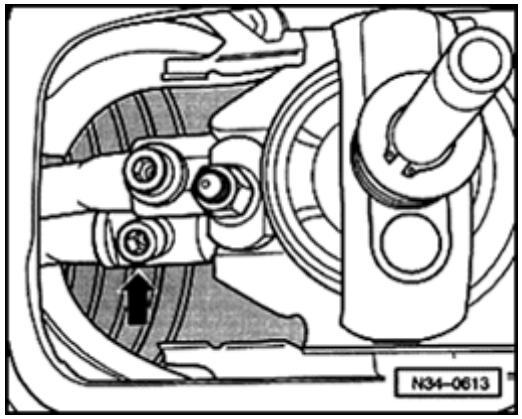
If that is not the case, obtain distance -a- as follows:



➢

- Loosen bolt (arrow) for pivot rod.
  - ♦ Rear pivot rod (in shift control mechanism) must move freely back and forth on sliding piece.
- Adjust measurement -a- by moving pivot rod rear (in shift control mechanism).
- Tighten bolt for pivot rod to 25 Nm.

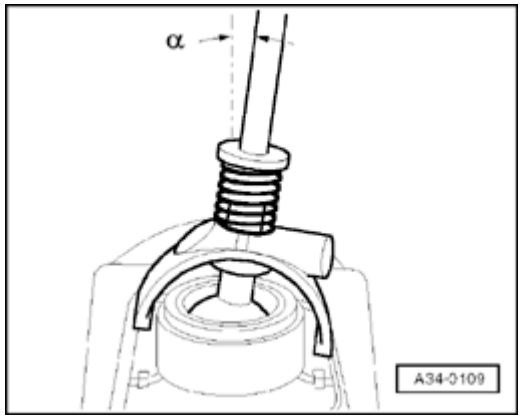
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- Loosen bolt for selector rod (arrow).

  Connection between selector rod and selector mechanism should move freely.

- Adjust gear shift as follows:



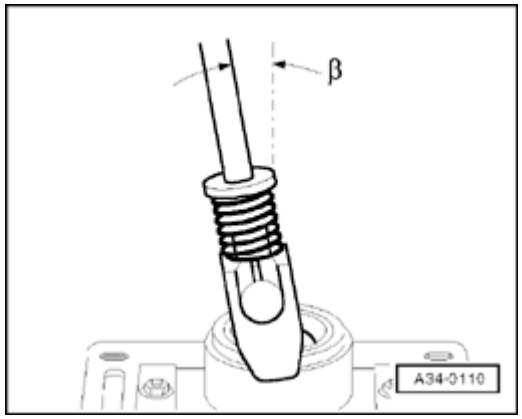
- Gear shift vertical, maximum inclination of 3° to the right (angle α)

Note:

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

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34-15



➢

- Gear shift inclined slightly backwards (approx. 7 °, angle b)

Note:

The illustration shows the gear shift from the right.

- Hold gear shift in this position.
- Tighten selector rod bolt to 25 Nm.

Note:

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

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Gear shift adjustment, checking

- The gear shift lever must rest in the 3rd/4th gear gate when transmission is in neutral.

- Check operation of 1st and 2nd gear stop.

- Engage 2nd gear and push gear shift to the left against the stop.

- Reduce pressure on gear shift until it moves back to pressure point.

  Spring-back measured at gear shift handle: 3-5 mm

- Check that all gears can be engaged.

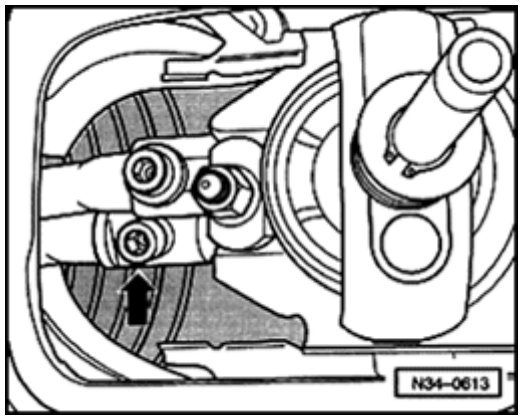
- Check operation of reverse gear lock.

  - It should only be possible to engage reverse gear after pressing the gear shift down to overcome the reverse gear lock.

  - It must be possible to move the gear shift, without pushing and without force, forwards from the reverse gear lock to the 3rd/4th gear plane

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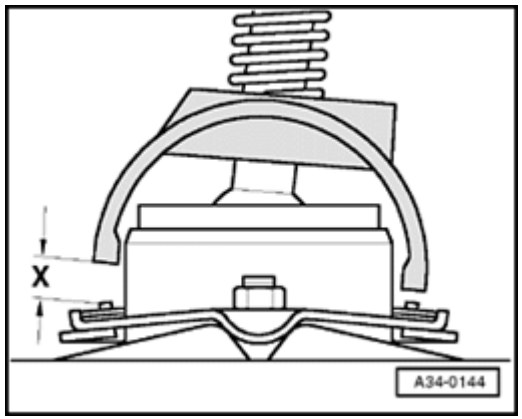
- If the gear shift setting is incorrect it can be adjusted as follows:



- Loosen bolt for selector rod (arrow).

Note:

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



- Move gear shift to the left or to the right until distance "x" is 8.5 mm.
- Hold gear shift in this position.
- Tighten selector rod bolt.

Tightening torques

Component	Nm
Selector rod to selector fork (in selector mechanism)	25

- Check gear shift setting again.
- Fit covers and gear shift knob.

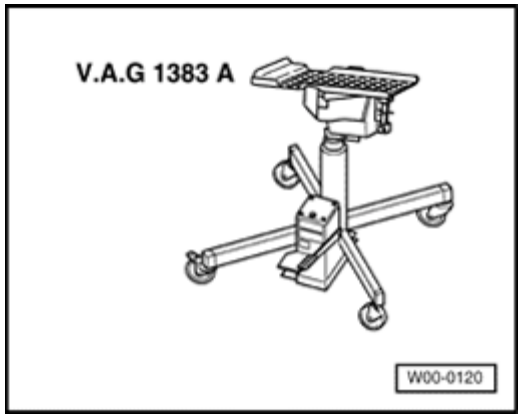
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34-18

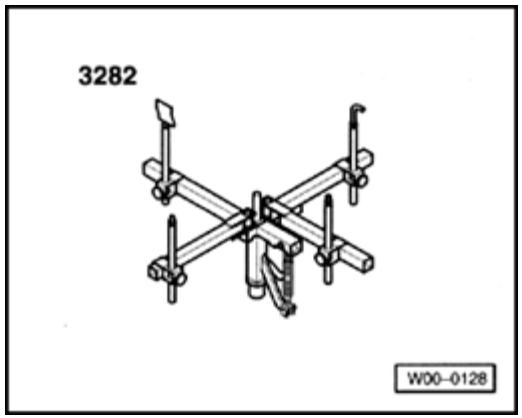
Transmission, removing and installing

Removing

Special tools, testers and auxiliary items required:



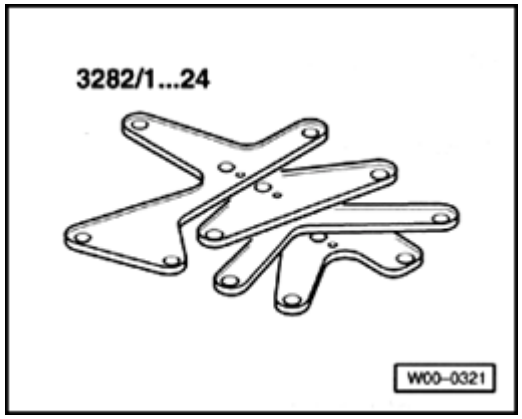
- Engine-/Transmission lifter V.A.G 1383 A



- Transmission support 3282

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34-19

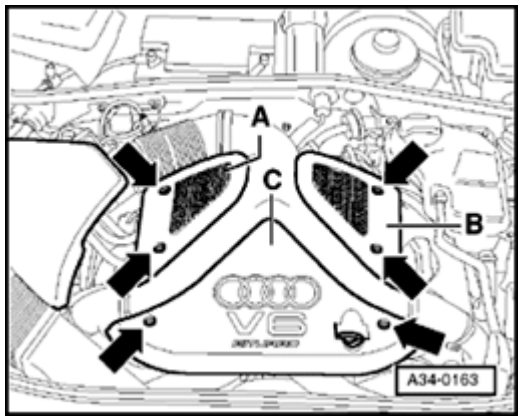


- 3282/12 Adjustment plate
- VAG1306 Drip tray

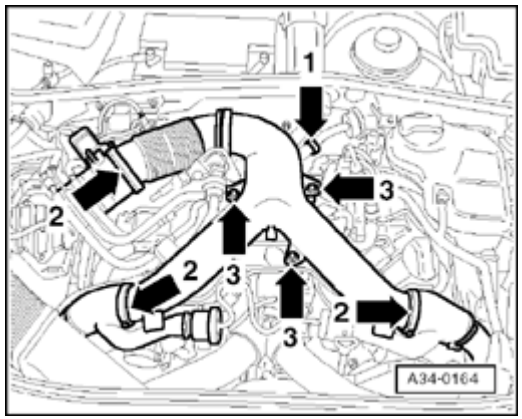
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- Obtain radio code on vehicles with coded radio.

- With ignition switched off disconnect battery Ground strap.



- Loosen bolts (arrows) and remove engine cover panels (arrows -A- through -C-).

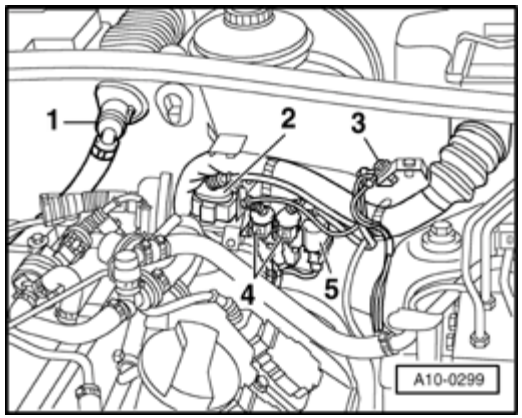


- Detach air intake duct. To do this, pull off retainer catch -1-, loosen clamps -2- and unscrew bolts -3-.

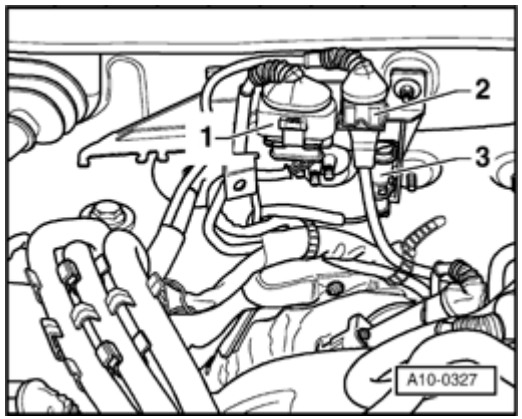
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34-21

- Remove coolant system expansion reservoir and lay to one side.

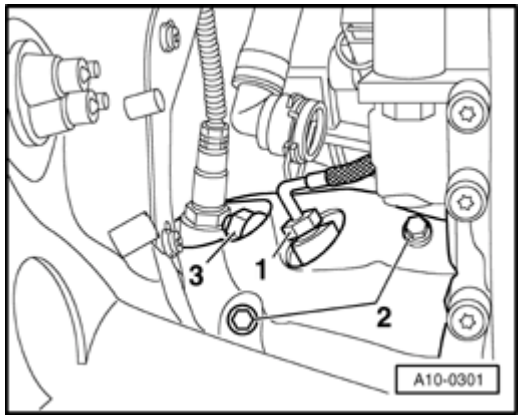


- Unplug connector for oxygen sensor on left (arrow -2-) and move wire for oxygen sensor clear.

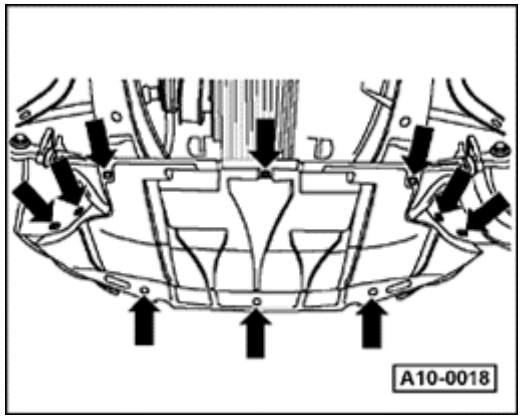


- Unplug connector for oxygen sensor on right -1- and move wire for oxygen sensor clear.

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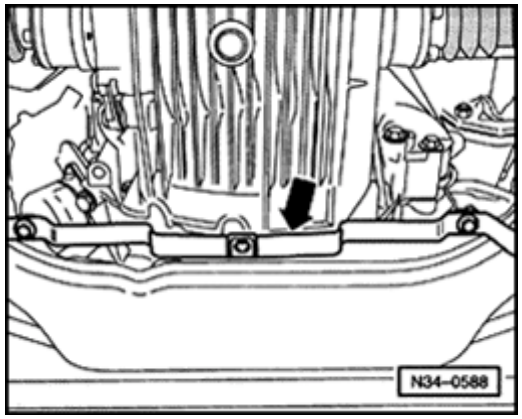
- Unscrew two bolts securing heat shield -2- on exhaust pipe (right and left).
- Unscrew nuts -3- on exhaust pipe (right and left).
- Unscrew engine/transmission securing bolts accessible from above.



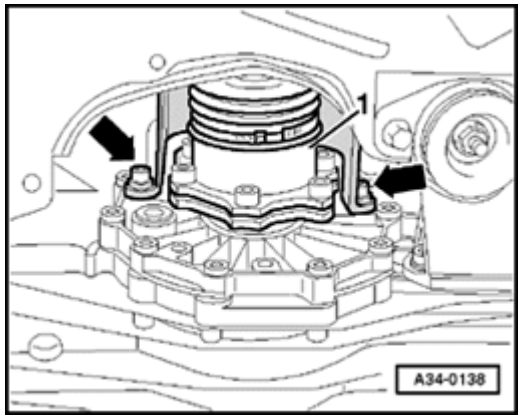
- Remove noise insulation (arrows).

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- Unbolt bracket for noise insulation (arrow).



- Unbolt heat shields from transmission above left and right drive axles (arrows).
- Unbolt left and right drive axles -1- from transmission, lift clear and tie in position.

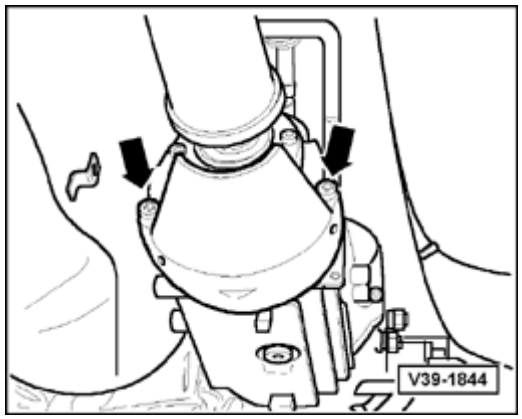
Note:

Take care not to damage protective coating on drive axles.

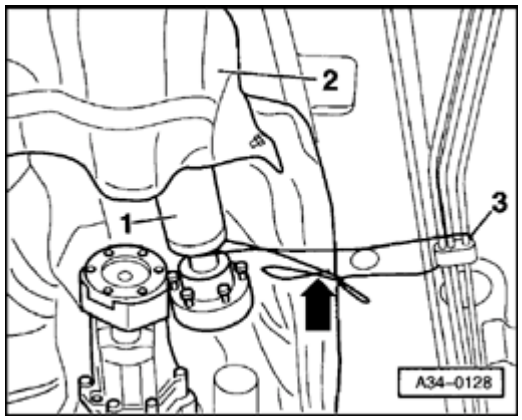
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- Loosen exhaust system clamps and push clamps towards rear.



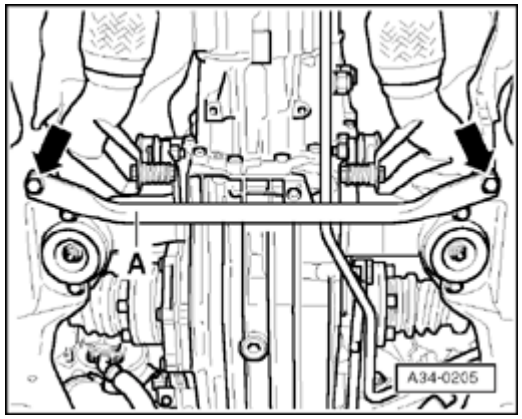
- Remove heat shield for driveshaft from cover for Torsen differential (arrows).



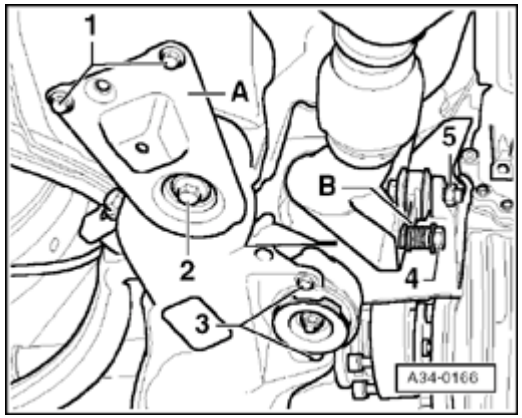
- Unbolt driveshaft -1- from transmission and rest it on heat shield -2-.
- Secure driveshaft to fuel pipe bracket -3- with wire (arrow).

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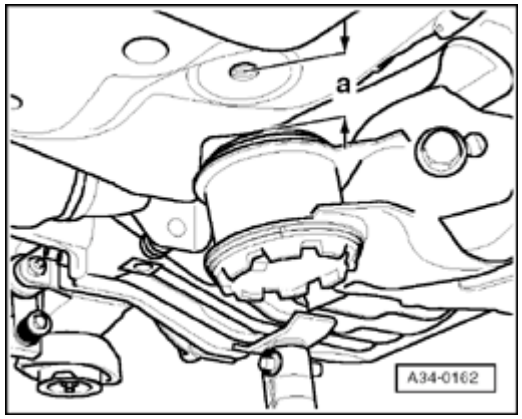
- Remove bolts (arrows) and remove transverse mount -A-.
- Completely remove brackets -B- at right and left exhaust pipe. To do this, bolts -2- and -3- must be removed.



- Unscrew and remove bolts -1- and -2- on right and left and remove support -A-.

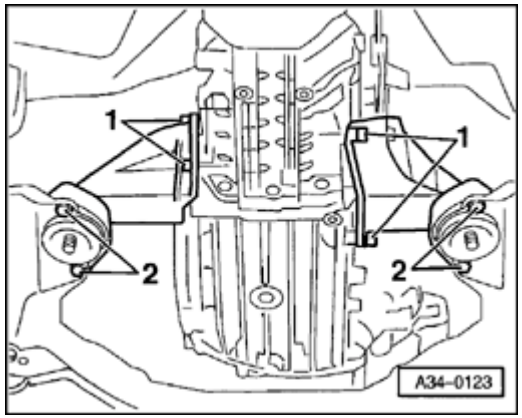
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- Lower subframe at rear and place spacer (e.g. wedge of wood) in gap.

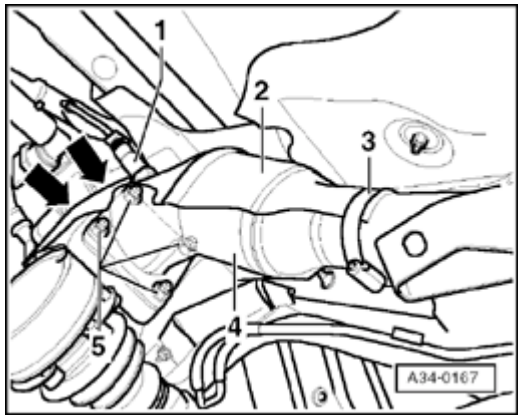
♦ -a- = max. 50 mm



- Unscrew bolts -1- and -2- and remove right and left transmission supports from transmission and subframe together with bonded rubber mountings.

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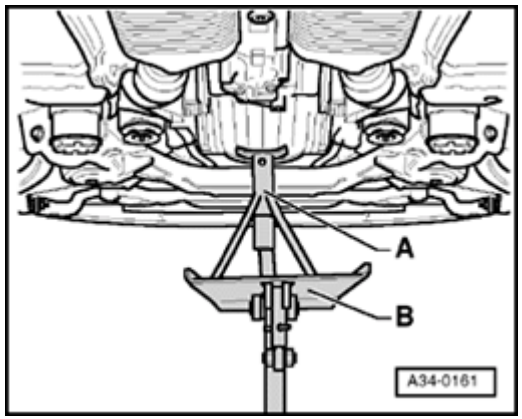
34-27



- Loosen clamp -3-, lift heat shield -2- slightly and unscrew remaining nuts -5-.
- Lift heat shield -2- and pull out front exhaust pipe together with catalytic converter -4-.
- Note that oxygen sensor -1- and oxygen sensor wire have to be guided through opening in heat shield -2-.

Note:

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



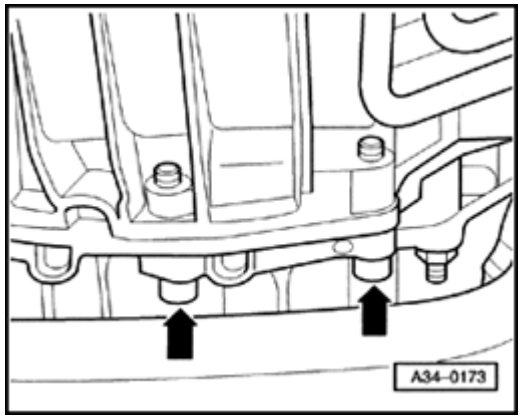
- Lift the transmission for access to the two lower bolts securing engine to transmission (⇒ A34-0173 below).

A - Axle stand

B - V.A.G 1383A

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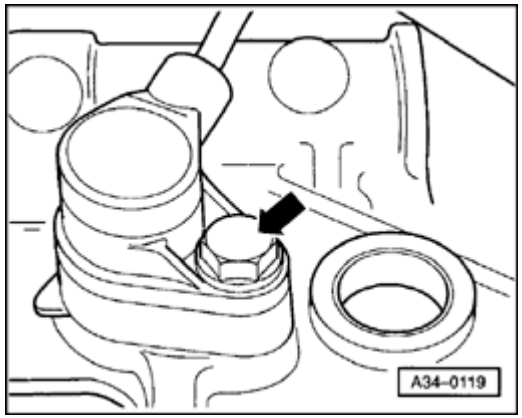


- Unscrew two bolts securing transmission to engine (arrows).

Note:

The two hex socket head bolts M 10 x 60 must be replaced by new hex bolts M 10 x 55 (Part No. N 104 684 01) so that the two bolts (arrows) can be tightened with a torque wrench after installing the transmission.

- Lower transmission again slowly.



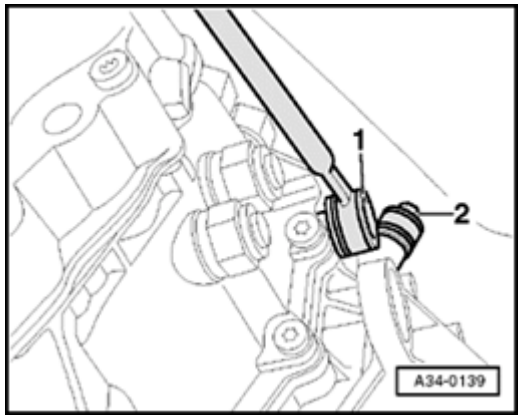
- Remove engine speed sender -G28 from left-hand side of transmission (arrow) and place to one side.
- Pull connector off sender for speedometer.
- Pull off connector on reversing light switch.
- Unbolt the starter and push it as far as it will go towards the front.

Note:

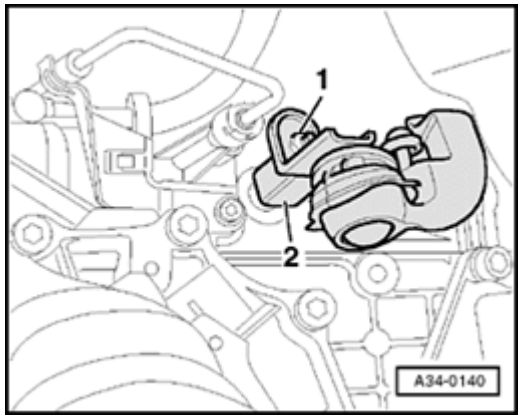
Do not disconnect cables at starter.

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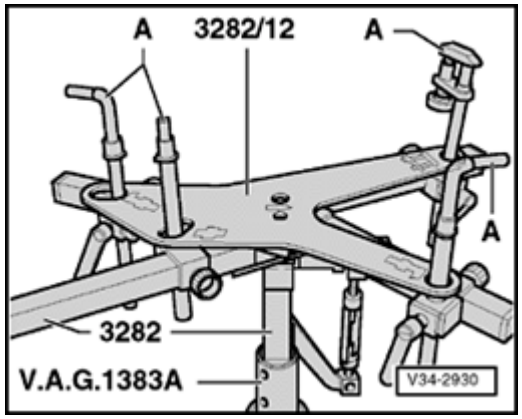
- Unbolt connecting rod -2- for selector rod on right-hand side of transmission.
- Remove hex socket head bolt from push rod -1-.



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

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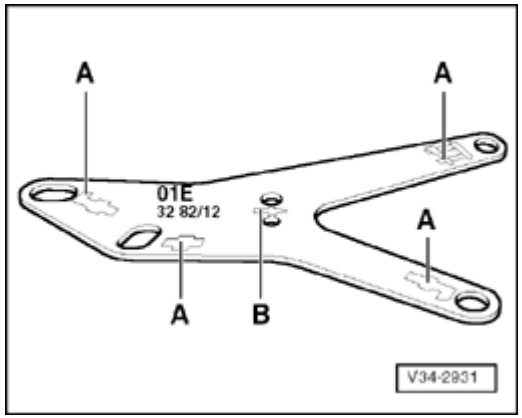
34-30



- Set up transmission support 3282 with adjustment plate 3282/12 for removal of manual transmission 01E (all-wheel drive) and place on transmission jack V.A.G 1383 A.

A - Attachments

Notes:

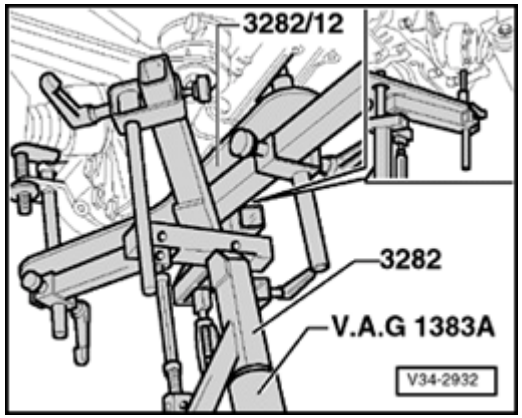


- *The positions for the attachments are indicated by symbols (-A-). Arrow -B- points in the direction of travel.*
- *Adjustment plate 3282/12 can only be installed in one position.*

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- Remove all but one of the engine/transmission securing bolts from below (one bolt is left in place to hold engine and transmission together).



- Run transmission jack V.A.G 1383 A with transmission support 3282 in under transmission and take up weight of transmission.
- Secure transmission to transmission support 3282.

Note:

If transmission support 3282 is not available, the transmission can be removed and installed using transmission jack V.A.G 1383 A.

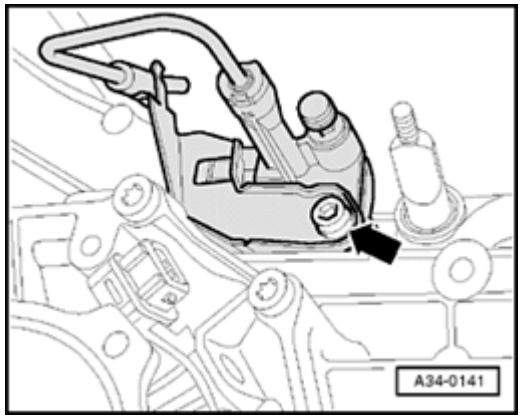
- Remove last remaining engine/transmission securing bolt.
- Press transmission off dowel sleeves and lower carefully with transmission jack V.A.G 1383 A just far enough for access to slave cylinder.

Note:

When lowering transmission ensure hydraulic line/hose to slave cylinder is not damaged.

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- Remove bolt (arrow) and take out slave cylinder from the rear. Do not open line/hose system.

Note:

Do not depress clutch pedal after removing slave cylinder.

- Lower transmission completely.

Note:

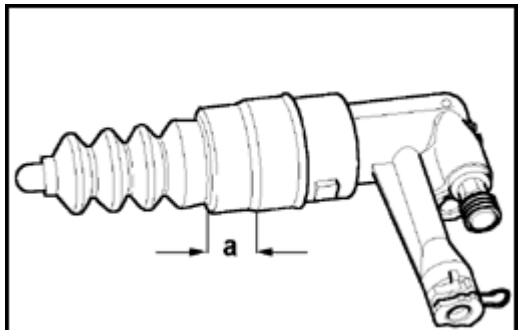
When lowering transmission ensure there is sufficient clearance to drive axles.

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Installing

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

- Always replace all seals and gaskets.
- Always replace all self-locking nuts.
- Check whether dowel sleeves for aligning transmission with engine are in engine flange. Insert if necessary ⇒ Page 34-36 .
- Clean input shaft splines and (in the case of used clutch plates) hub splines. Remove corrosion and apply only a very thin coating of grease G 000 100 to splines. Do not grease guide sleeve.
- Check clutch release bearing for wear and replace if necessary.

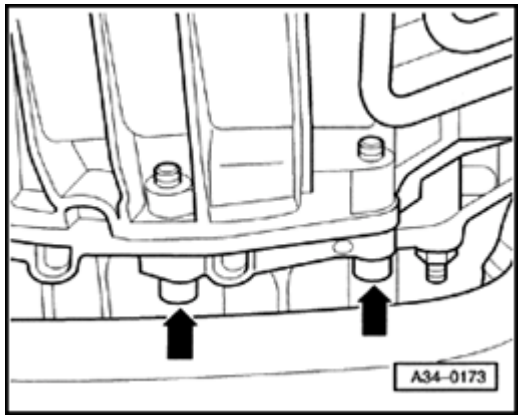


- Coat area -a- of collar with lithium grease G 052 150 A2 before mounting slave cylinder into transmission housing.
- Coat contact surface for clutch slave cylinder push rod with a thin layer of copper grease, e.g. Z381 351 TE.

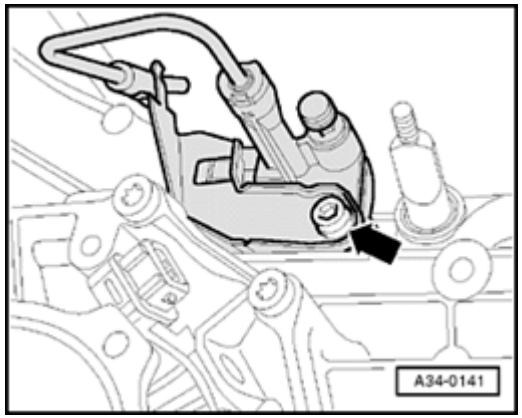
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34-34

- On vehicle with V6 bi-turbo engine, fit intermediate plate on dowel sleeves on engine flange.



- Two hex socket head bolts M 10 x 60 must be replaced by new hex bolts M 10 x 55 (Part No. N 104 684 01) so that two bolts (arrows) can be tightened with a torque wrench after installing transmission.
- Before installing transmission, tie electrical wiring off to one side so that it cannot be trapped between engine and transmission.



- Lift transmission until clutch slave cylinder with bracket for line/hose can be installed (arrow).
- Align exhaust system free of stress.

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 26*

- Before installing, use a tap to clean threads in drive flange for driveshaft on transmission to remove traces of locking compound.
- Replace gaskets on drive axles and on front of driveshaft ⇒ Page 39-65 .

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- Bolt on driveshaft ⇒ Page 39-71 .

- Check adjustment of selector rod and push rod; readjust if necessary ⇒ Page 34-12 .

- Check oil level in transmission ⇒ Page 34-39 .

- After connecting battery, enter anti-theft code for radio

⇒ *Radio operating instructions*

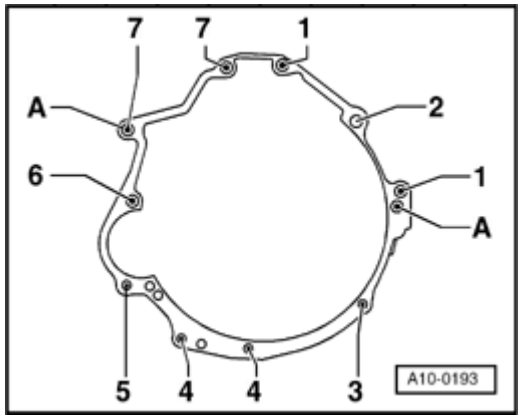
- Close windows fully using electric window switches.

- Operate all electric window switches again for at least one second in "close" direction to activate automatic one-touch function.

- Set clock to correct time.

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Vehicles with 6-cyl. bi-turbo engine

No.	Bolt	Qty.	Nm
1	M 12 x 90	2	65
2	M 12 x 100	1	65
3	M 10 x 60	1	45
4	M 10 x 60 1)	2	45
5	M 10 x 150	1	65
6	M 12 x 130	1	65
7	M 12 x 80	2	65

Dowel sleeves -A- for aligning.

1) The two hex socket head bolts M 10 x 60 must be replaced by new hex bolts M 10 x 55 (Part No. N 104 684 01) so that the two bolts -4- can be tightened with a torque wrench after installing the transmission.

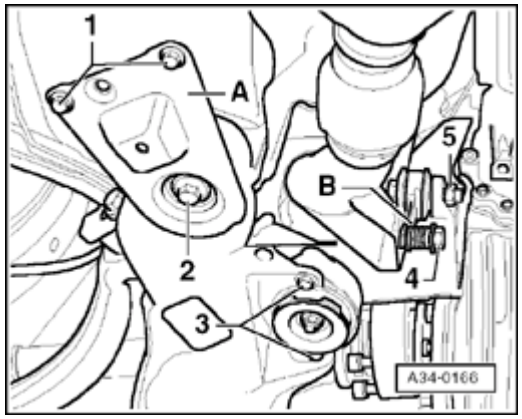
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Component		Nm
Clutch slave cylinder to transmission [1)]		20
Transmission support to transmission		40
Engine speed sender -G28-		10
Drive axle to drive flange	M8	40
	M10	80
Heat shields above drive axles to transmission		25
Push rod to transmission		40
Selector rod to transmission		23
Connecting rod for selector rod to transmission		23
Catalytic converter to mounting lugs		25
Front exhaust pipe to turbocharger		30
Heat shield to turbocharger/exhaust pipe		10
Clamp for exhaust pipe		40
Bracket for noise insulation to subframe		10
Driveshaft to transmission [1)]		55
Heat shield for driveshaft to Torsen differential cover		25

[1)] Always replace bolts

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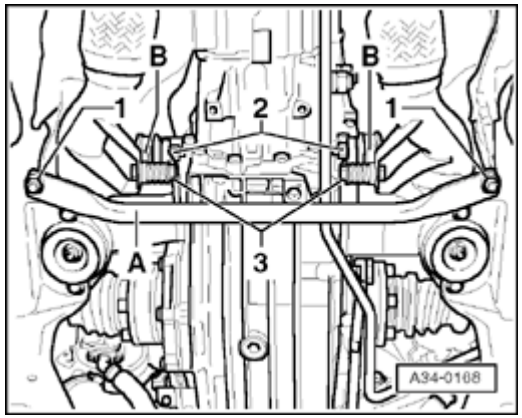
34-38



➢ Subframe to body

Support -A- to body -arrow 1-	75
Subframe to body 1) (arrow -2-)	115 + 90 °
Transmission mounting to subframe (arrow -3-)	25

1) Always replace bolts washers



➢ For 6-cylinder bi-turbo engine only

Cross-piece -A- to subframe 1)	40 + 90 °

1) Install bolts -1- from the bottom. Always replace nuts and bolts.

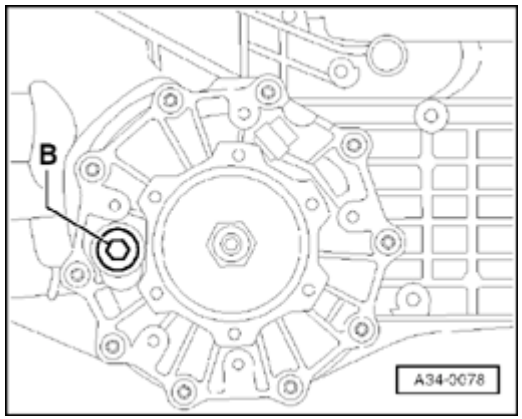
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Oil level in transmission, checking

Note:

- *When checking the oil level in the transmission, the vehicle should be standing on a perfectly horizontal surface. An inspection pit or a 4-post lifting platform is ideal.*
- *The prescribed oil level is to be adhered to exactly; the transmission reacts very sensitively to over-filling.*
- *If a transmission with transmission oil cooling (e.g. 2.7 ltr bi-turbo) has been removed, the vehicle must be driven a short distance on the road before checking the transmission oil level.*



- Remove oil filler plug -B- (in front of drive flange) to check transmission oil level.
- Check oil level with a suitable tool (such as a length of wire bent to shape).

Vehicles with V6 bi-turbo engine

- Specification: oil level 7 mm ± 1 mm below bottom lip of oil filler hole.

- Fill up with gear oil if necessary. Specification ⇒ Page 00-3 .

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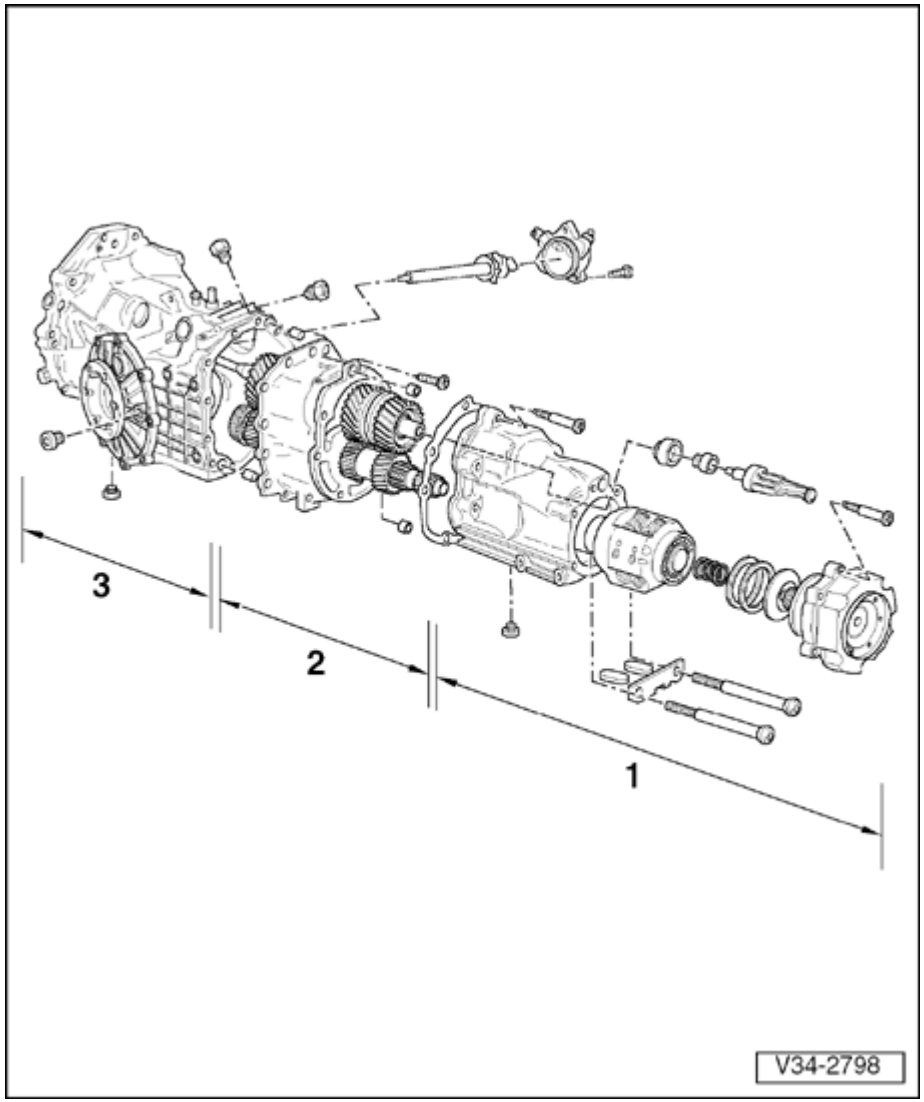
- Fit oil filler plug.

Tightening torque

Oil filler plug: 40 Nm

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Transmission, disassembling and assembling

Assembly sequence ⇒ Page 34-54 .

1 - Bearing housing, Torsen differential and end cover

- Removing and installing ⇒ Page 34-41

2 - Gear cluster and selector shaft

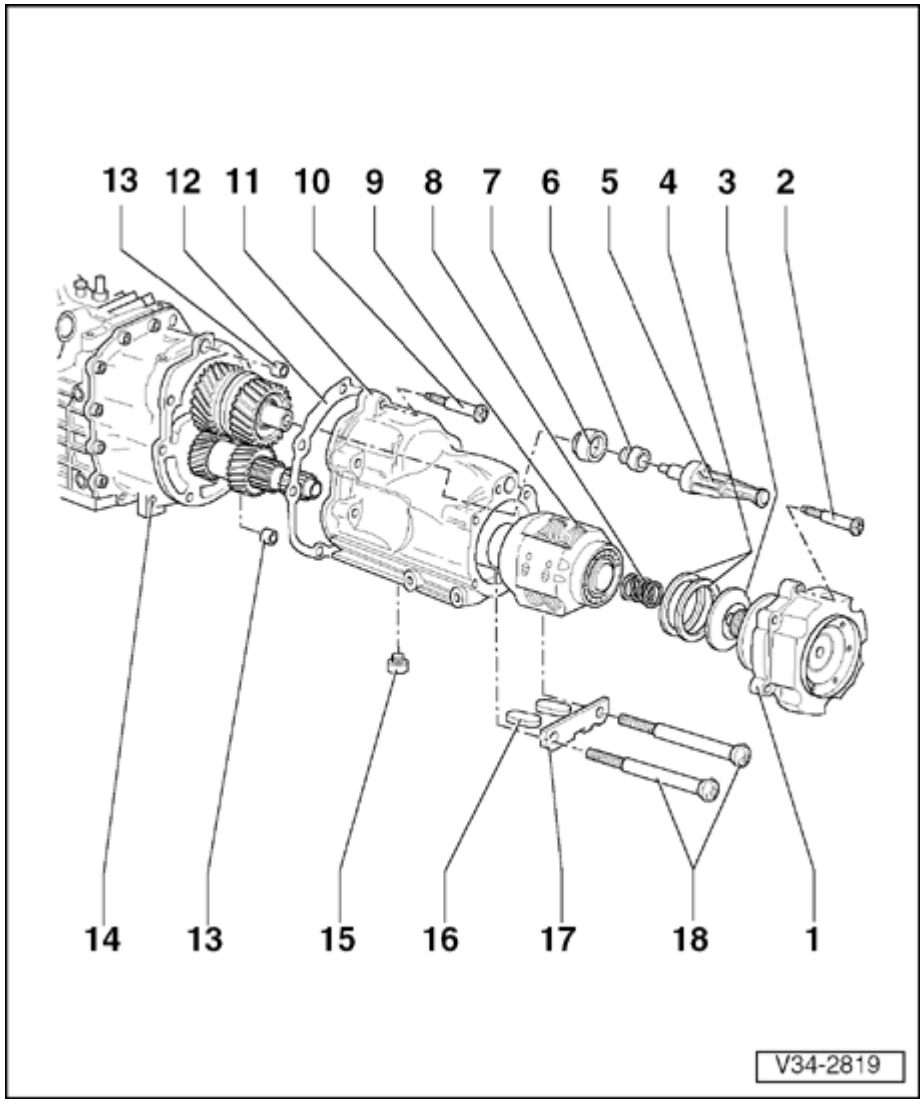
- Removing and installing ⇒ Page 34-44

3 - Differential

- Removing and installing ⇒ Page 39-15

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Bearing housing, Torsen differential and end cover, removing and installing

1 - Bearing housing

- Disassembling and assembling ⇒ Page 34-89

2 - Bolt, 25 Nm

- Qty. 6

3 - Dished spring

- Installation position: larger diameter (concave side) faces shims

4 - Shim

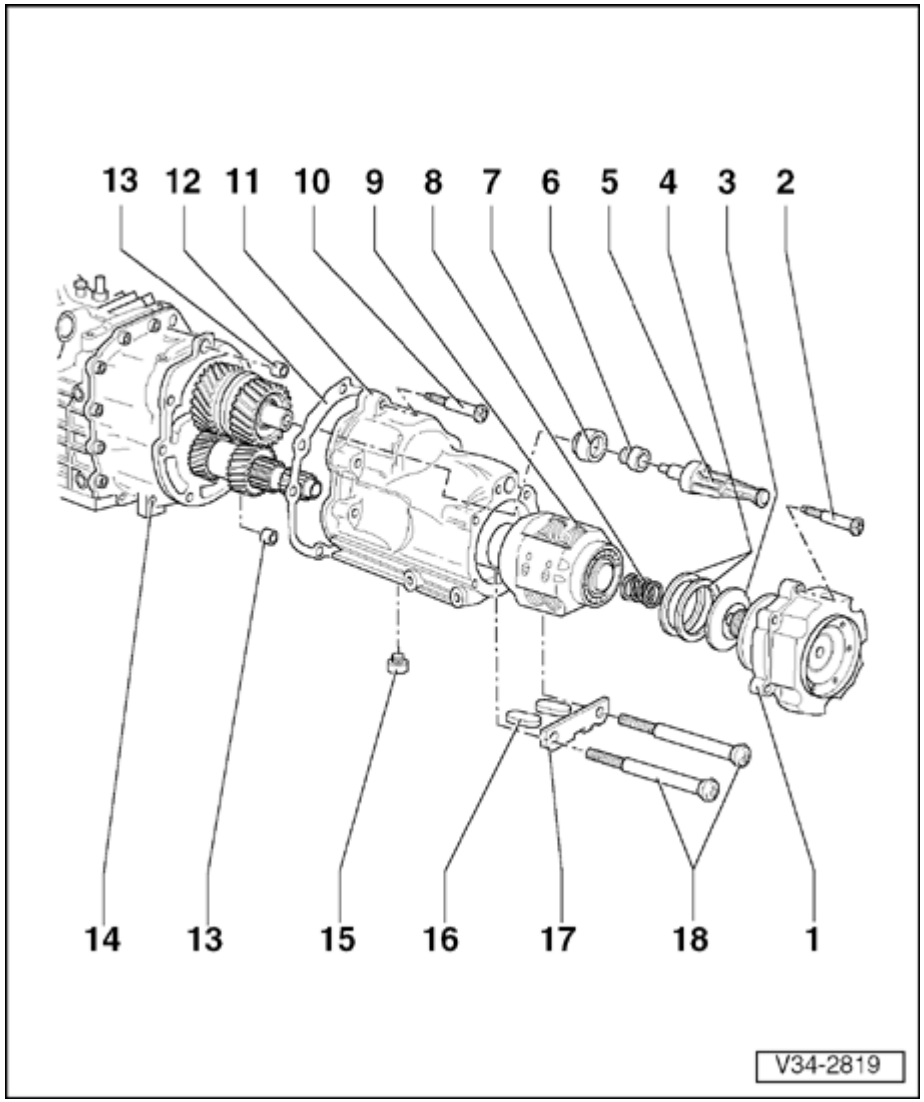
- Qty. 2 or 3
- Re-determining shims ⇒ Page 34-85

5 - Oil collector

- Disassembling and assembling ⇒ Page 34-83
- Removing ⇒ Page 34-58
- Installing ⇒ Page 34-84

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6 - Multi-point socket head bolt, 150 Nm

- Removing ⇒ Page 34-60
- Installing ⇒ Page 34-83

7 - 2nd inner race for tapered roller bearing for input shaft

- Removing ⇒ Page 34-61
- Installing ⇒ Page 34-82

8 - Spring

9 - Torsen differential

- Can be serviced only by manufacturer
- Servicing bearings for Torsen differential ⇒ Page 34-97

10 - Bolt, 25 Nm

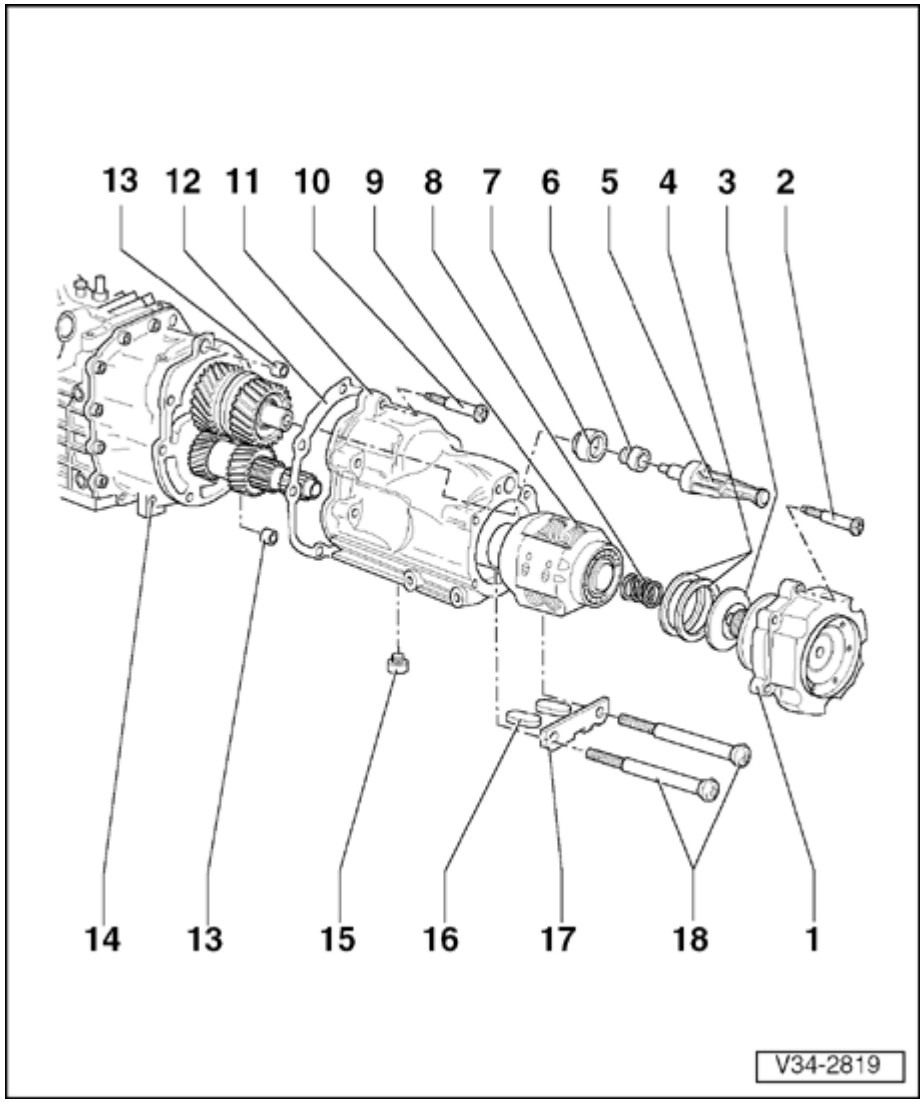
- Qty. 5

11 - End cover

- Servicing ⇒ Page 34-97

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12 - Gasket

- Replace

13 - Dowel sleeve

- Qty. 2

14 - Gear cluster

- Removing and installing ⇒ Page 34-18

15 - Oil drain plug - 40 Nm

16 - Magnet

- Qty. 2
- Clean

17 - Support plate

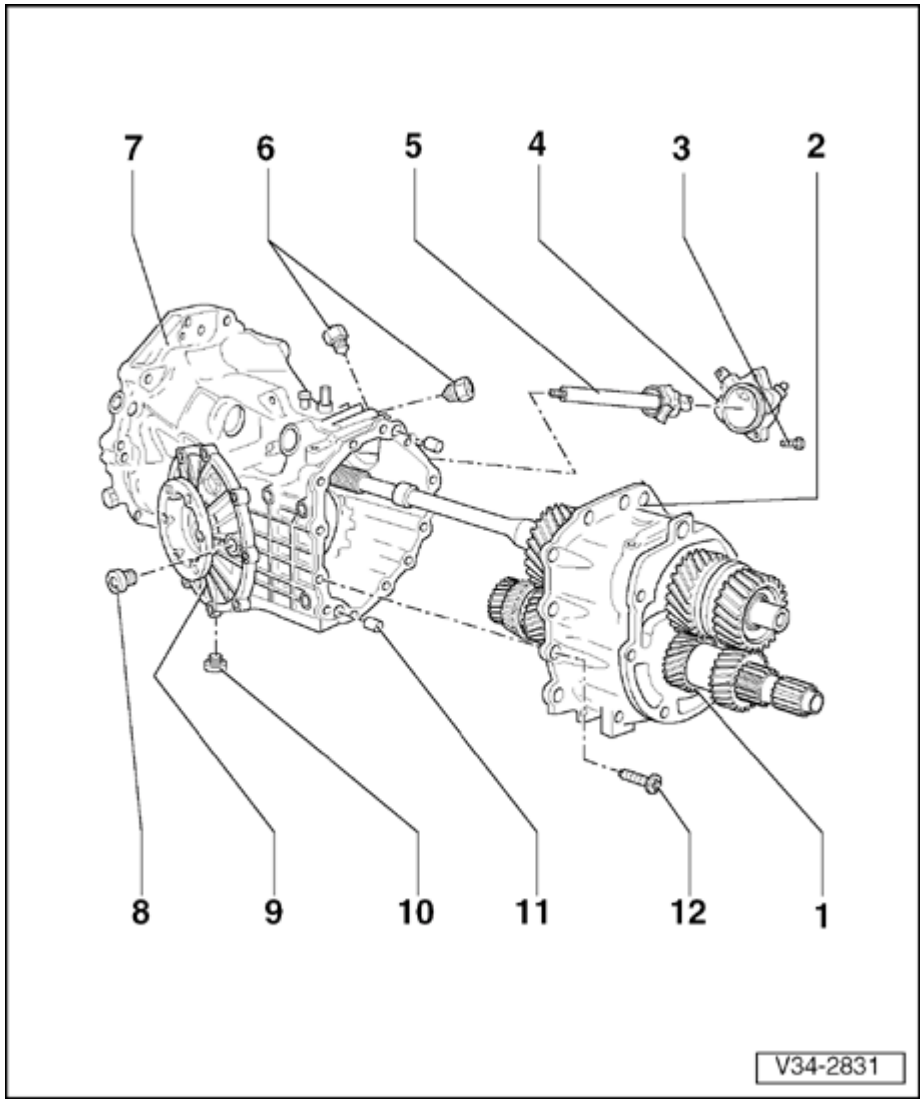
- Installation position: lugs face magnets

18 - Bolt, 25 Nm

- Qty. 2

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Gear cluster and selector shaft, removing and installing

1 - 5th and 6th gear

- Gear cluster remains flanged to transmission housing
- Removing and installing ⇒ Page 34-47

2 - Bearing plate complete

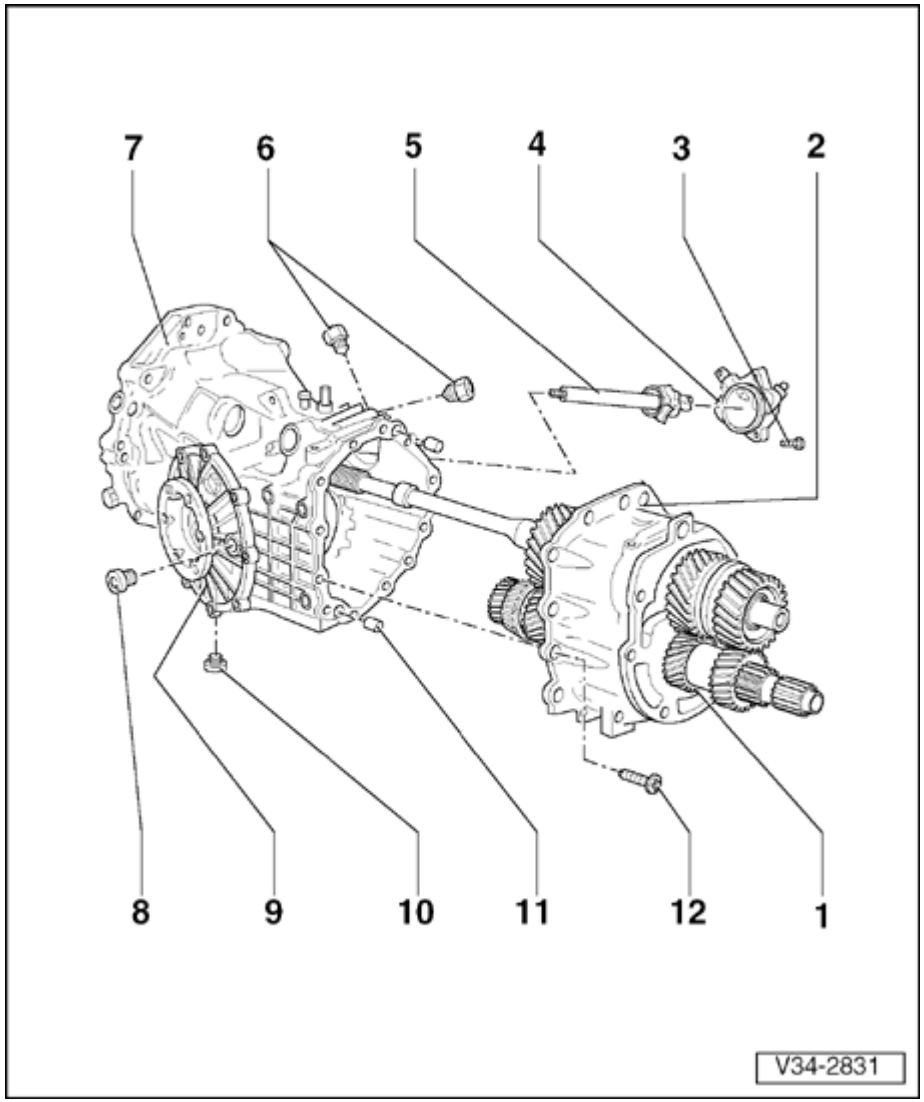
- Removing and installing input shaft, drive pinion, hollow shaft and internal selector mechanism ⇒ Page 34-51

3 - Bolt - 25 Nm

- Qty. 3
- Apply sealing paste AMV 188 000 02 when installing

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4 - Cover for selector shaft

- Removing ⇒ Page 34-59
- Installing ⇒ Page 34-85

5 - Selector shaft complete

- Removing ⇒ Page 34-59
- Installing ⇒ Page 34-85
- Disassembling and assembling ⇒ Page 34-144

6 - Locking bolt

- For aluminium bolt: 50 Nm
- For steel bolt: 70 Nm
- Mark installation positions of aluminium bolts and steel bolts; do not interchange

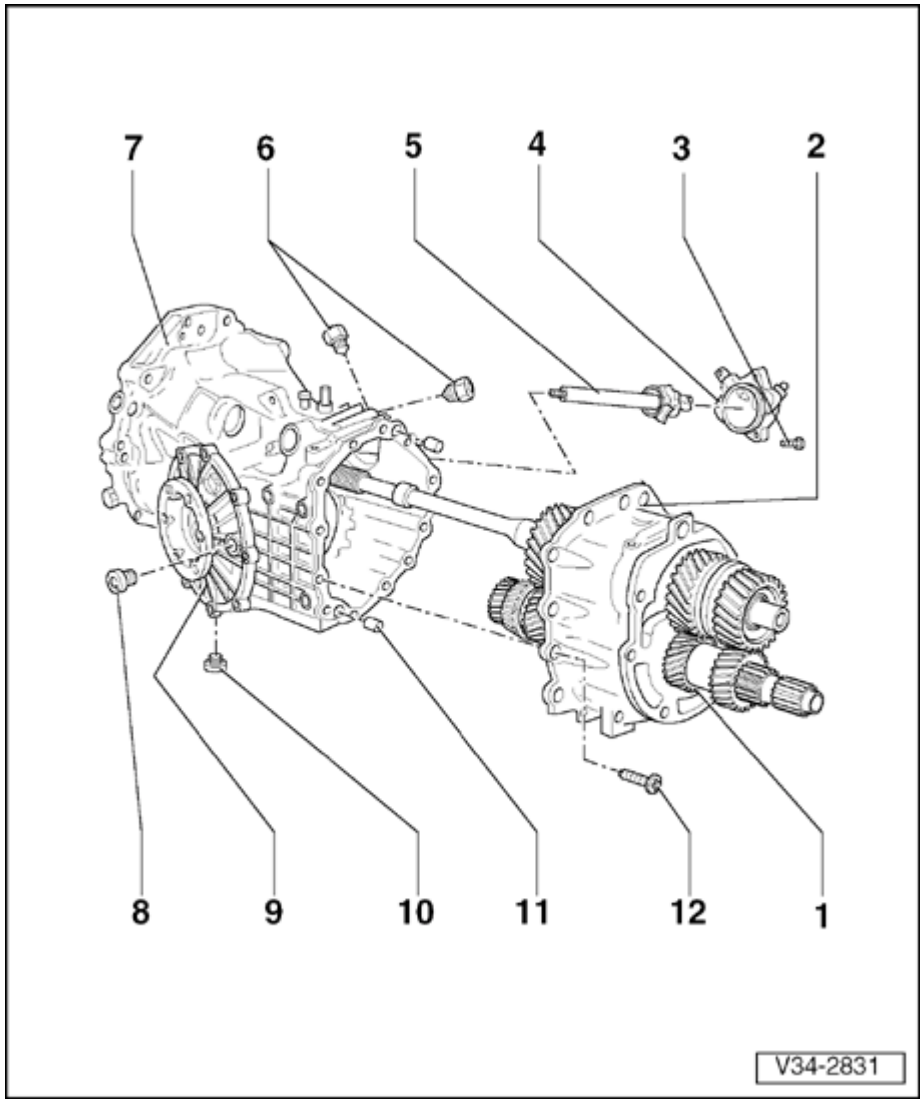
7 - Transmission housing

- Servicing ⇒ Page 34-127

8 - Oil filler plug, 40 Nm

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9 - Differential

- Removing and installing ⇒ Page 39-15

10 - Oil drain plug, 40 Nm

11 - Dowel sleeves

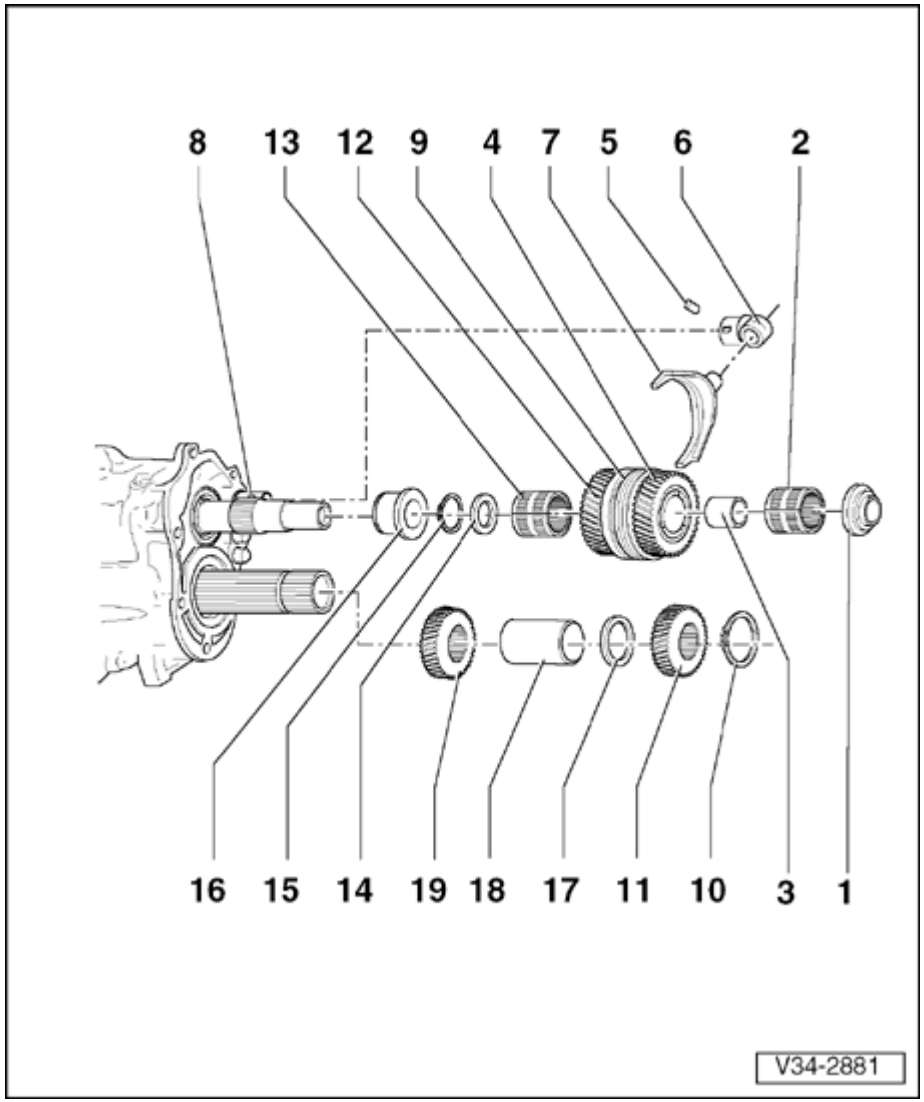
- Qty. 2

12 - Bolt, 25 Nm

- Qty. 12

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5th and 6th gear, removing and installing

1 - 1st inner race for tapered roller bearing for input shaft

- Pulling off ⇒ Page 34-61
- Installing ⇒ Page 34-81

2 - Needle bearing for 5th gear

3 - Inner race for 5th speed sliding gear

- Pulling off ⇒ Page 34-64
- Driving on ⇒ Page 34-81

4 - 5th speed sliding gear

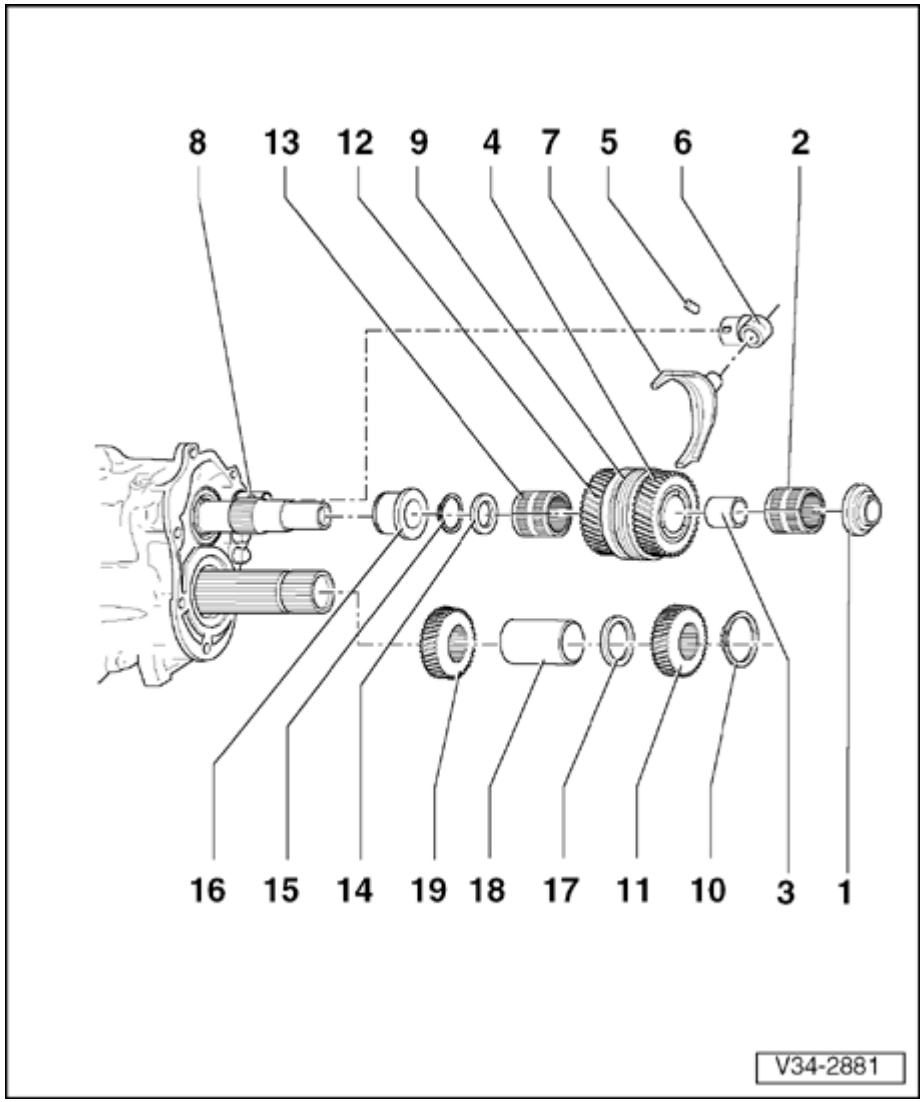
- Pulling off ⇒ Page 34-61
- Installing ⇒ Page 34-81

5 - Roll pin

- Pressing out ⇒ Page 34-62
- Pressing in ⇒ Page 34-77

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6 - Follower

- Only replace complete with selector rod for 5th and 6th gear - 8 -
- Pulling off ⇒ Page 34-63
- Fitting ⇒ Page 34-77

7 - Selector fork for 5th and 6th gear

- Can be replaced individually

8 - Selector rod for 5th and 6th gear

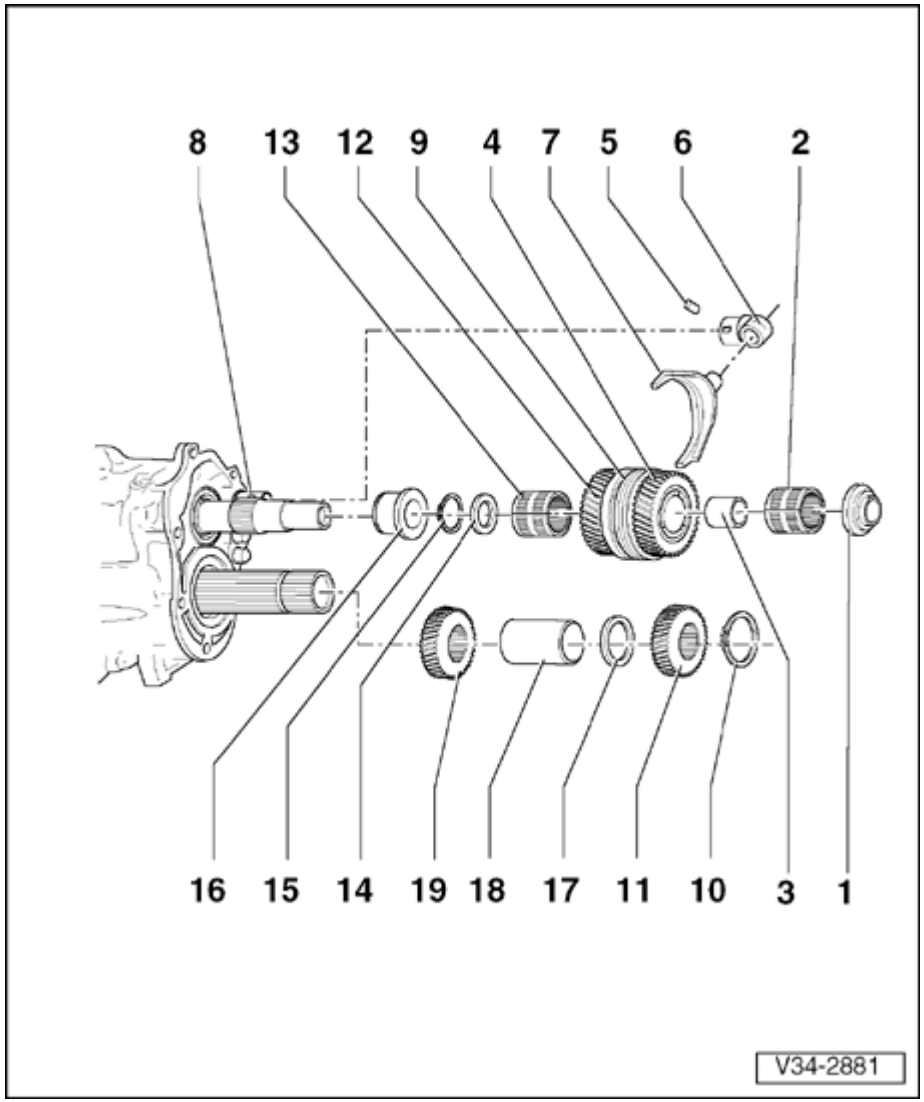
- Only replace complete with follower - 6 -
- Removing ⇒ Page 34-62
- Installing ⇒ Page 34-72

9 - Locking collar, synchro-ring, synchro-hub for 5th and 6th gear

- Removing ⇒ Page 34-63
- Installing ⇒ Page 34-76

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34-49



10 - Circlip

- Re-determining ⇒ Page 34-80

11 - 5th speed gear

- Pulling off ⇒ Page 34-62
- Pressing on ⇒ Page 34-79

12 - 6th speed sliding gear

- Pull off together with synchro-hub and inner race for 5th gear ⇒ Page 34-64

13 - Needle bearing for 6th gear

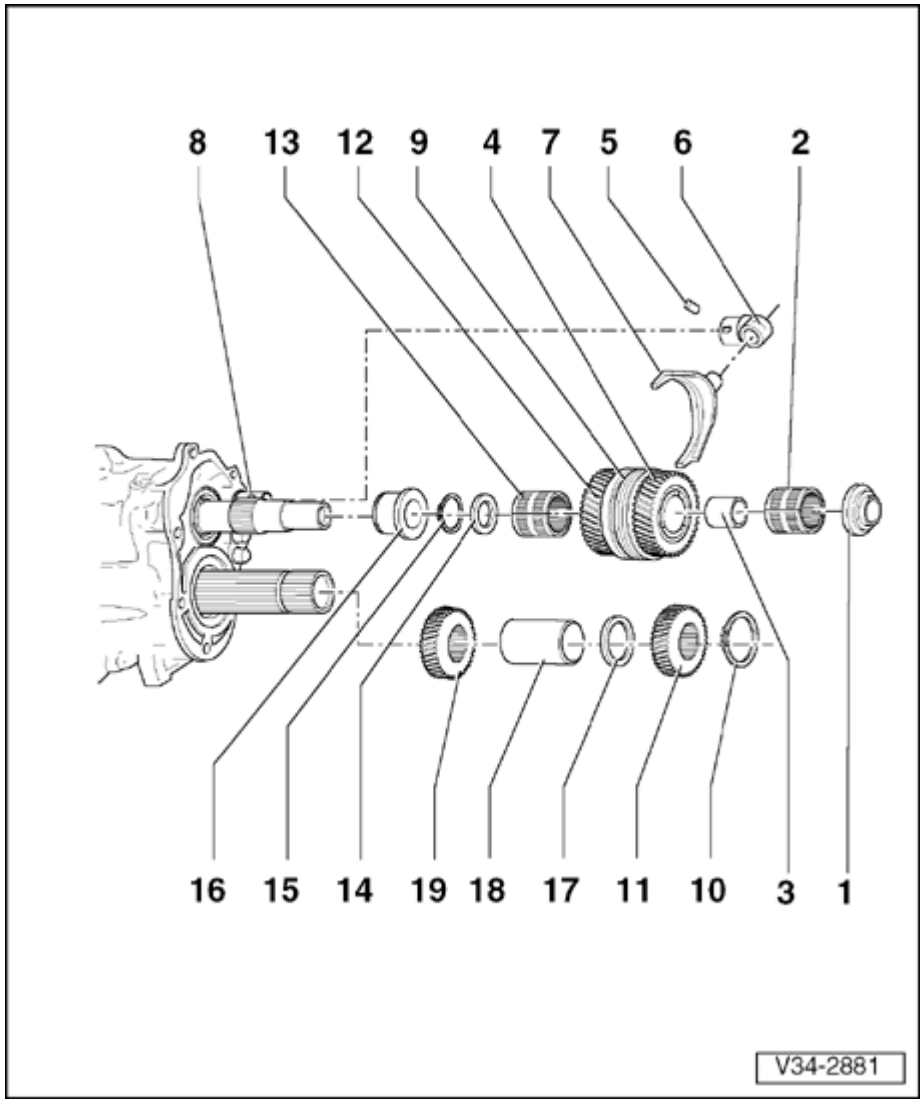
14 - Thrust washer for needle bearing for 6th gear

- Installation position: grooves face circlip, smooth face contact surface towards needle bearing

15 - Circlip

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34-50



16 - Inner race for cylinder roller bearing

- Take off by hand ⇒ Page 34-65

17 - Shim

- Re-determine thickness ⇒ Page 34-78

18 - Spacer sleeve

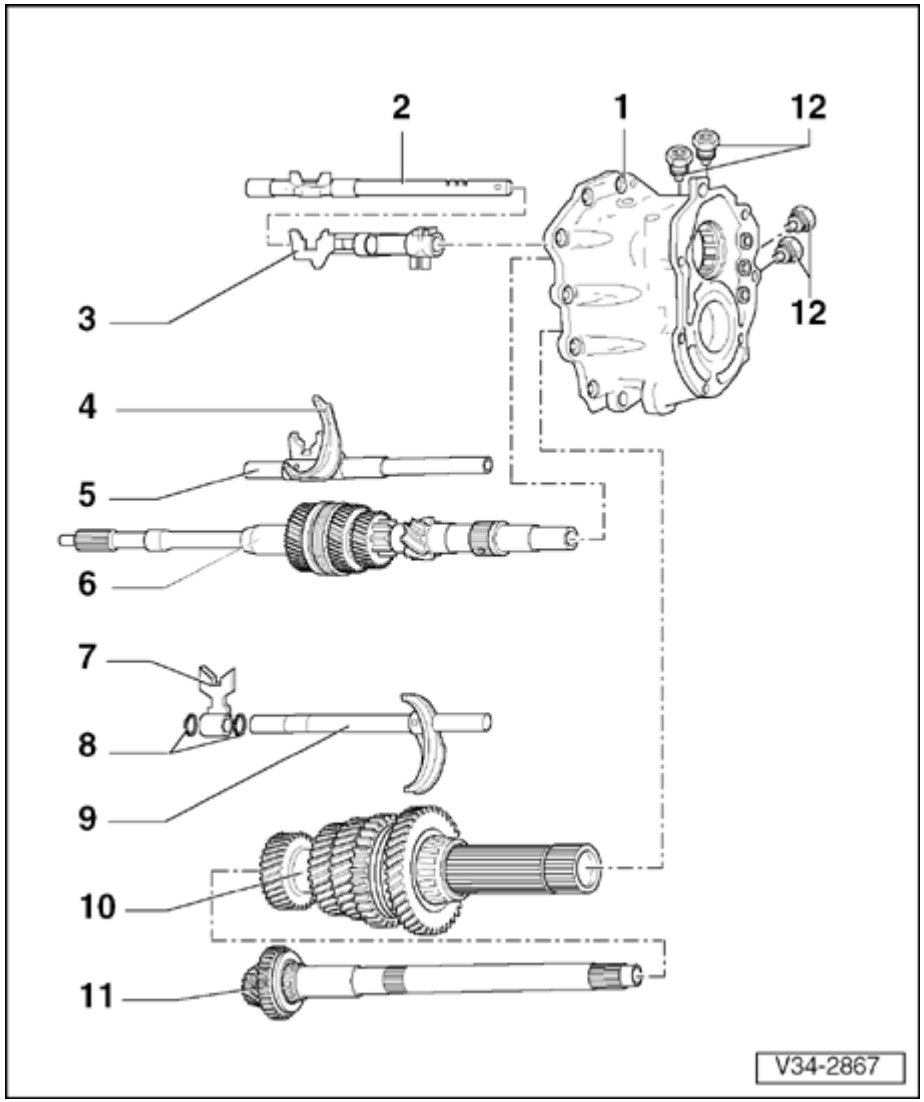
- Length 39.6 mm

19 - 6th speed gear

- To press off, remove bearing plate ⇒ Page 34-65
- Pressing off ⇒ Page 34-68
- Pressing on ⇒ Page 34-69

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Input shaft, drive pinion, hollow shaft and internal selector mechanism from bearing plate, removing and installing

1 - Bearing plate

- Servicing ⇒ Page 34-112

2 - Selector rod for 5th and 6th gear

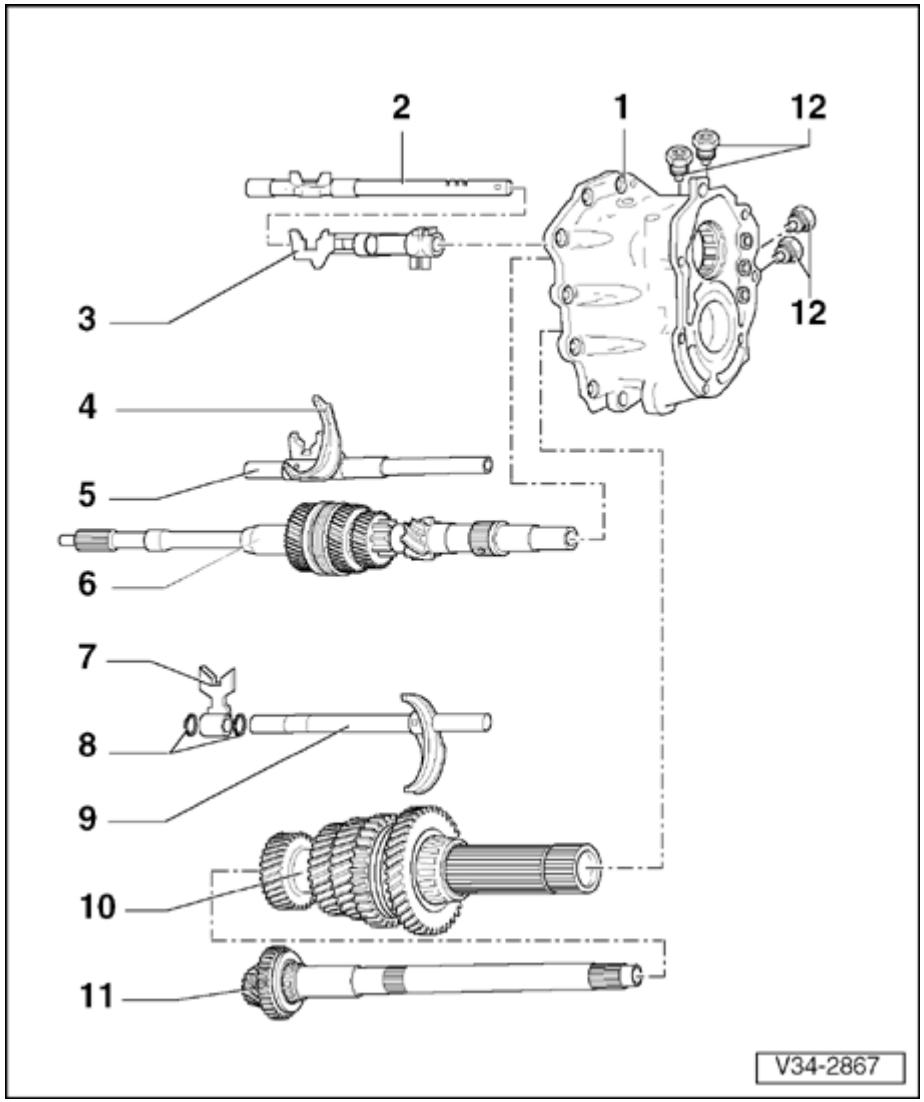
- Only replace complete with follower for 5th and 6th gear ⇒ Page 34-48

3 - Follower for reverse gear

- Pulling out ball sleeve ⇒ *Fig. 3* , Page ⇒ Page 34-118
- Driving in ball sleeve ⇒ *Fig. 4* , Page ⇒ Page 34-119

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34-52



4 - Selector fork for 3rd and 4th gear

- Can be replaced individually
- Installation position: rib towards follower

5 - Selector rod for 3rd and 4th gear

- Only replace complete with follower for 3rd and 4th gear

6 - Input shaft

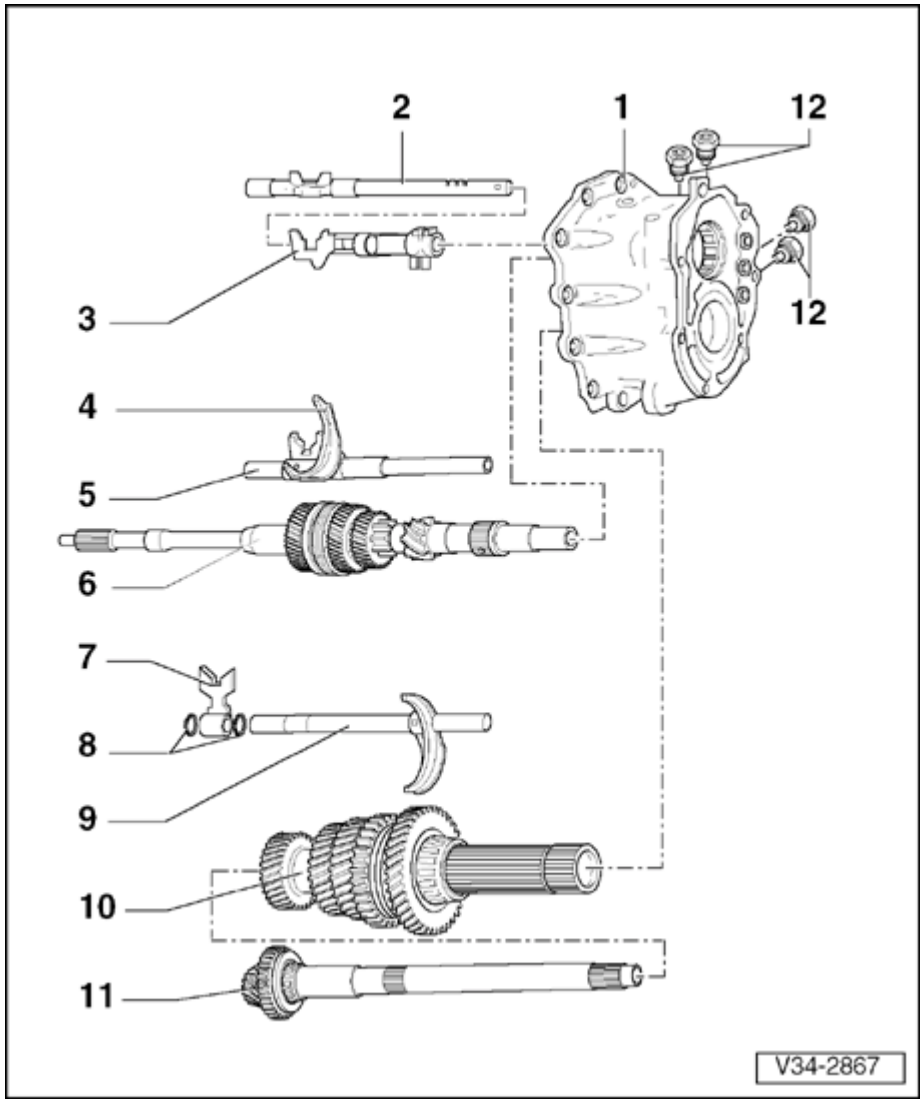
- Disassembling and assembling ⇒ Page 35-1

7 - Follower for 1st and 2nd gear

- Can be replaced individually

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34-53



8 - Circlip

- Qty. 2

9 - Selector rod for 1st and 2nd gear

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

10 - Hollow shaft

- Disassembling and assembling ⇒ Page 35-13

11 - Drive pinion

- Disassembling and assembling ⇒ Page 35-13

12 - Locking bolts

- Qty. 4
- For aluminium bolt: 50 Nm
- For steel bolt: 70 Nm
- Mark installation positions of aluminium bolts and steel bolts; do not interchange

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Bearing housing, Torsen differential, end cover, internal selector mechanism, input shaft, drive pinion and hollow shaft, removing and installing (assembly sequence)

Special tools, testers and auxiliary items required:

- Engine and transmission support VW 540
- Drip tray V.A.G 1306
- Multi-purpose tool 771/1 with attachments 771/15, 771/37 and stud M8/ M10
- Two-arm puller e.g. Kukko 20/10 with 200 mm long hooks
- Mandrel 2064
- Clamping sleeve 3116
- Thrust piece 3118

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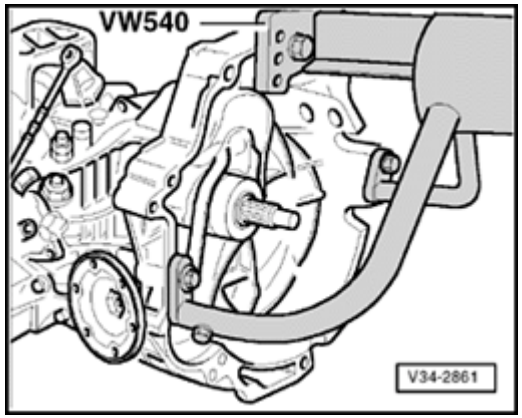
- Drift 3121
- Internal puller 3275
- Pressing tool 3276

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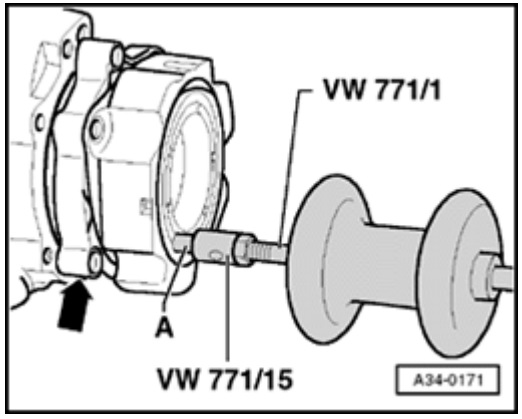
- Thrust plate VW 402
- Press tool VW 407
- Press tool VW 412
- Tube VW 415a
- Thrust plate VW 447h
- Thrust pad VW 454
- Extractor lever VW 681
- Extension piece 30-23
- Drift sleeve 30-100
- Support bridge 30-211A
- Press tool 40-21
- Depth gauge

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Removing



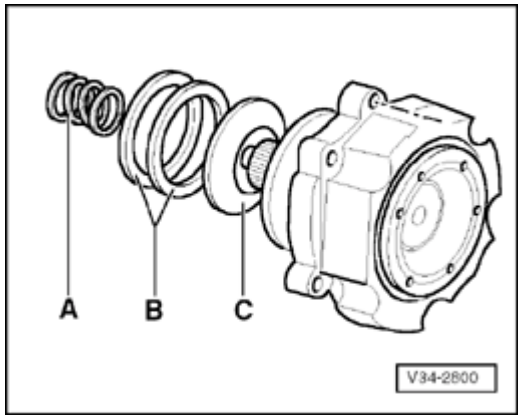
- Secure transmission on engine and transmission support VW 540.
- Place drip tray V.A.G 1306 underneath and drain transmission oil (2 oil drain plugs).
- Remove release bearing, clutch release lever and guide sleeve ⇒ Page 30-27 .



- Remove bearing housing (arrow) and pull off.

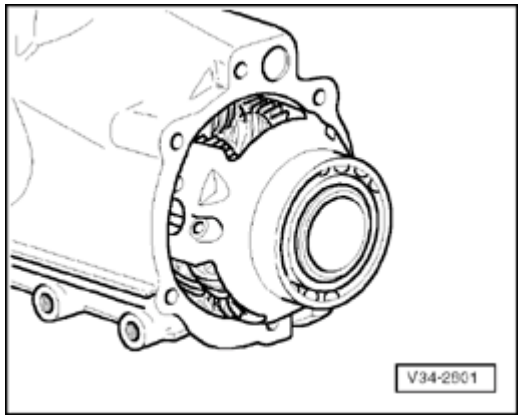
A - M8/M10 stud

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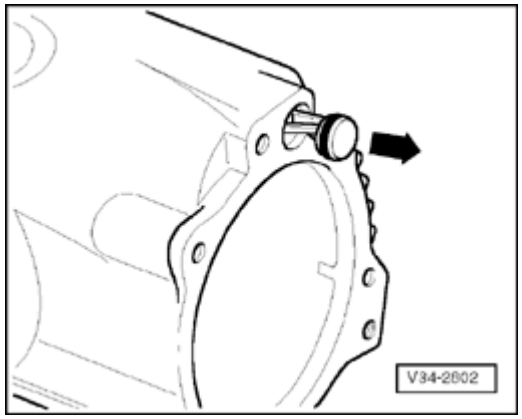
➢ When pulling off, bearing housing is pressed slightly off end cover by spring -A-.

- Note position of spring plate -C- when removing bearing housing.
  - ♦ Outer diameter (concave side) towards shims
- Remove shims -B-, note thickness re-determine if necessary ⇒ Page 34-85 .

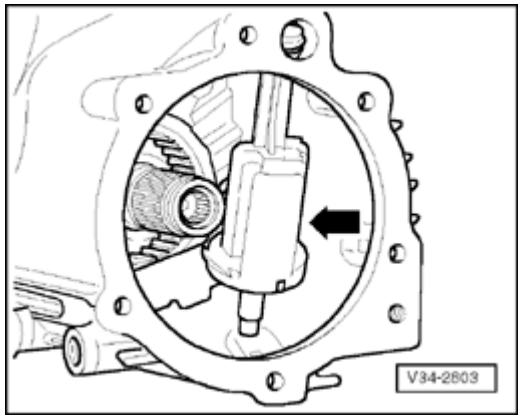


➢ - Pull Torsen differential out of end cover.

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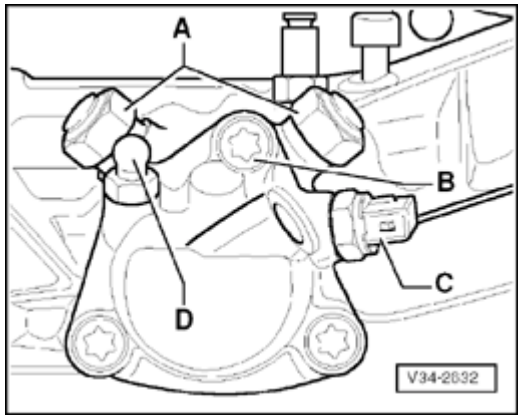


- Pull oil collector out of end cover (arrow) until it moves freely.

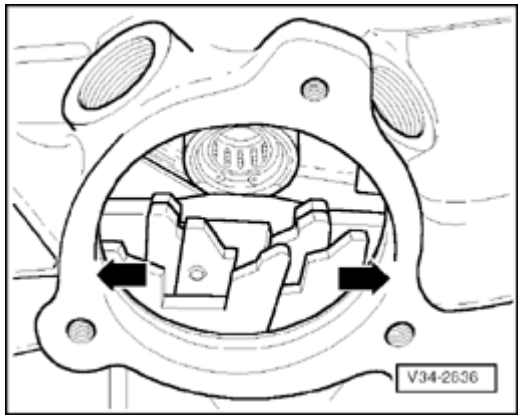


- Swing oil collector (arrow) down and guide out through hole in end cover.
- Remove oil collector.

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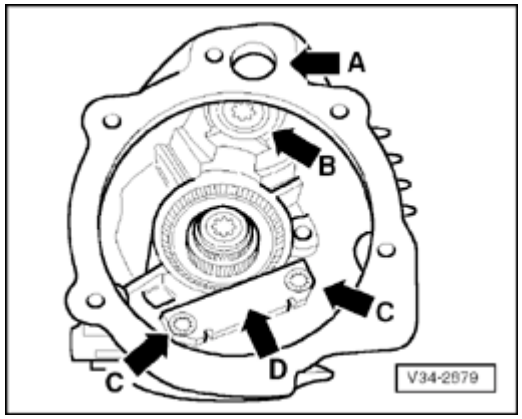


- Remove locking bolts -A- for selector shaft from transmission housing.
- Mark installation positions of aluminium bolts and steel bolts; do not interchange.
- Remove 3 bolts -B- for cover for selector shaft, take off cover.
- Pull out selector shaft.

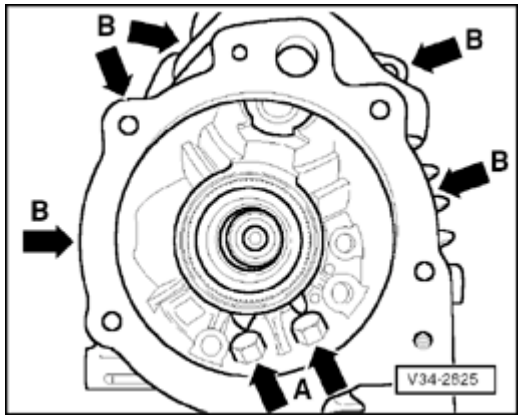


- Lock input shaft by engaging 2 gears (e.g. reverse and 2nd gear) do this by moving 2 selector plates (arrows).

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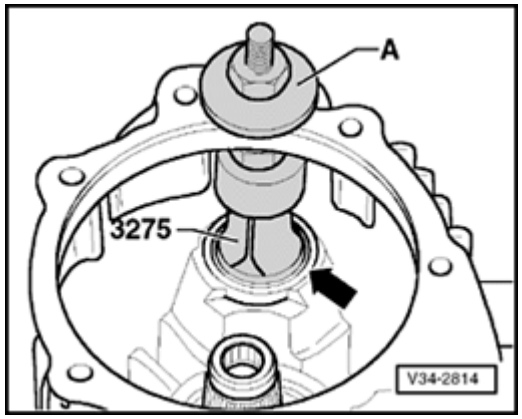


- Loosen and unscrew multi-point socket head bolt (arrow -B-) in input shaft through hole (arrow -A-) in end cover.
- Remove 2 securing bolts (arrow -C-) for end cover for transmission at supporting plate for needle bearings -arrow D-.
- Take out supporting plate.



- Remove 2 magnets (arrows -A-) and clean.
- Loosen 5 bolts (arrows -B-) for securing end cover for transmission and remove.

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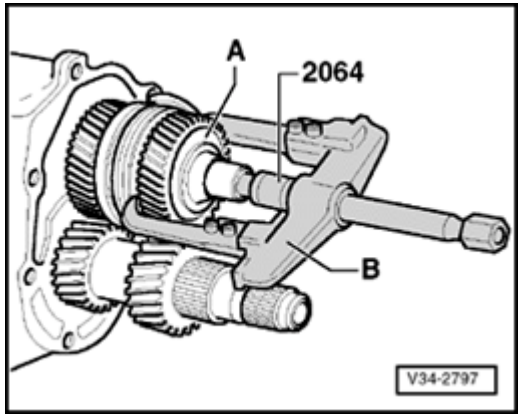
- Pull 2nd inner race for ball bearing for input shaft from input shaft.

A - Washer

Note:

The internal extractor 3275 grips the circumferential groove of the inner race (arrow) during the pulling operation.

- Take off end cover together with end cover/bearing plate gasket.
- Pull dowel sleeves out of bearing plate.

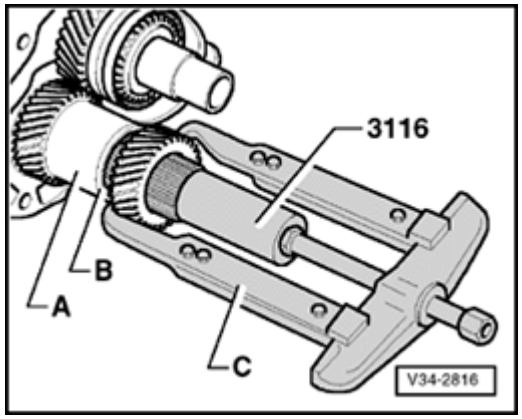


- Pull off 5th speed sliding gear with spring together with 1st inner race - A- for ball bearing for input shaft.

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

- Take off 5th gear synchro-ring.
- Take off circlip for 5th speed gear.

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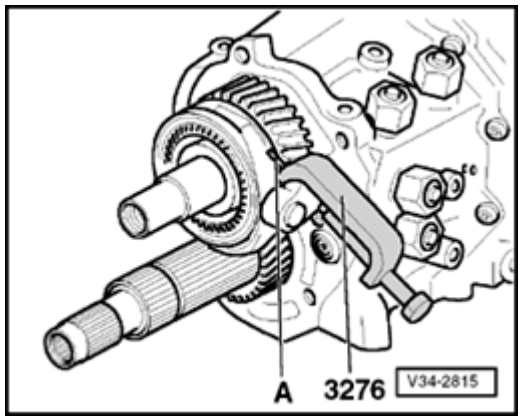
- Pull off 5th speed gear, to do this, block hollow shaft by engaging 2 gears ⇒ Page 34-59 .

Note:

Use only hex bolt of tensioning sleeve 3116, length 50 mm.

C - Two arm puller, e.g. Kukko 20/10 with 200 mm long puller arms

- Remove shim -B- for 5th speed gear, note thickness and re-determine if necessary ⇒ Page 34-78 .
- Take off spacer sleeve -A-.



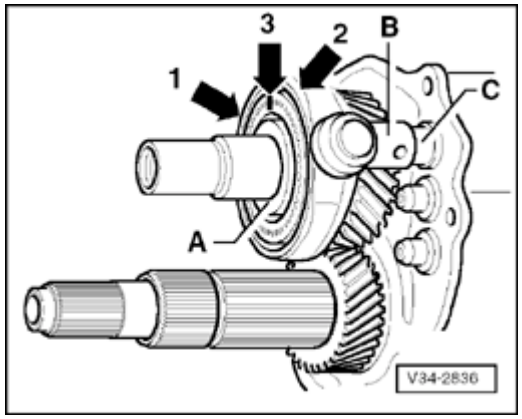
- Press out roll pin -A- for selector fork for 5th and 6th gear.

Note:

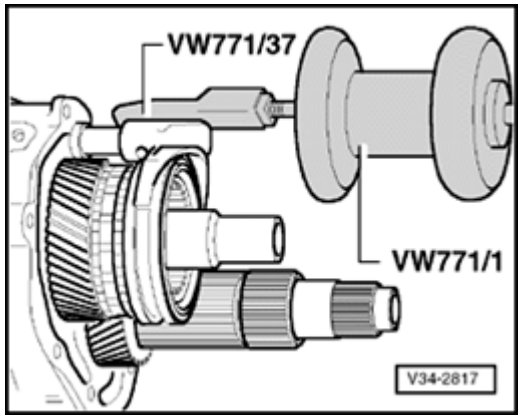
Do not drive out roll pin, otherwise selector rod bearing will be damaged.

- Pull selector rod on follower together with selector fork for 5th and 6th gear and locking collar as far as possible away from bearing plate (until stop is felt).

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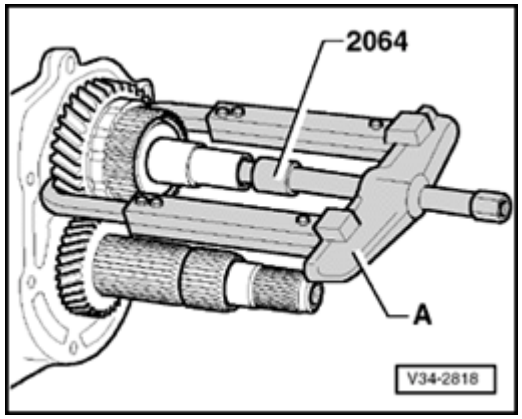
- Mark installation position (arrow -3-) of locking collar for 5th and 6th gear (arrow -1-) and synchro-hub -A- (paired).



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

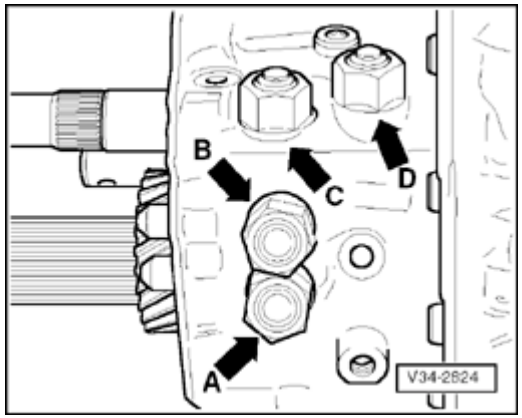
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34-64



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

A - Two arm puller, e.g. Kukko 20/10 with 200 mm long hooks



- Unscrew selector rod locking bolts.

A - 1st and 2nd gear

B - 3rd and 4th gear

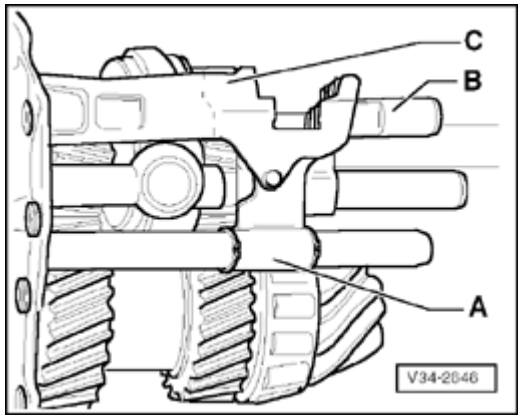
C - 5th and 6th gear

D - Reverse gear

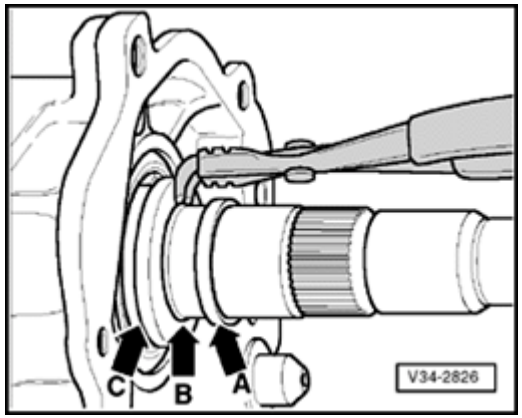
- Mark fitting locations of aluminium and steel bolts. (Bolts must not be interchanged when installing.)
- Drive out dowel sleeves on bearing plate and remove bearing plate from transmission housing.
- Secure drive pinion relative to hollow shaft e.g. hose tie, to prevent it falling out.

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- Separate bearing plate with input shaft, with drive pinion and hollow shaft and with inner selector mechanism from transmission housing.

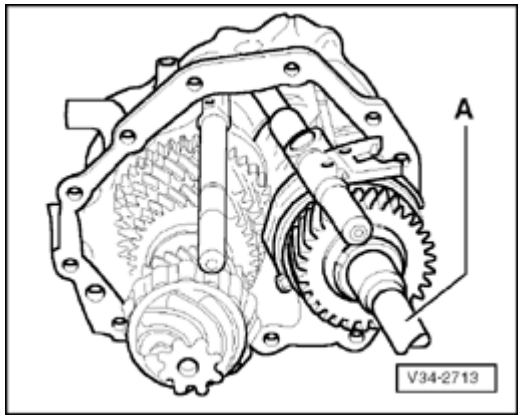


- Remove circlip from selector rod for 1st and 2nd gear and take off follower -A-.
- Pull out selector rod -B- for 5th and 6th gear.
- Remove follower -C- for reverse gear.

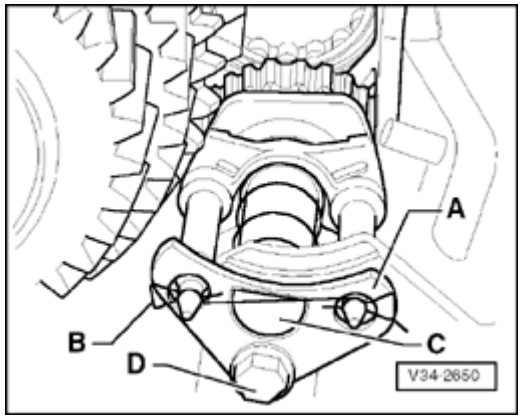


- Pull thrust washer (arrow -A-) for needle bearing for 6th gear off shaft.
- Use right-angled circlip pliers to remove circlip (arrow -B-) for inner race for cylinder roller bearing.
- Take out inner race (arrow -C-) for cylinder roller bearing (not a press fit).

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



- Unscrew hex bolt -D-, take off spring clasp -B- and retaining plate -A-, pull out shaft -C- for reverse idler gear.
- Take out spring, synchro-ring and reverse idler gear.
- Take off relay lever for reverse gear.

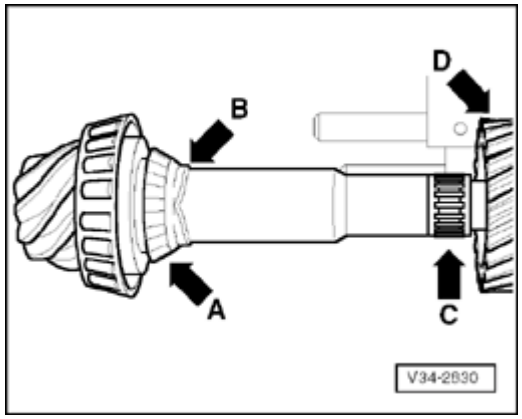
Removing and installing reverse gear ⇒ Page 34-114 .

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Note:

- *Drive pinion and hollow shaft can be removed complete if the 6th speed gear can be easily pried off.*
- *If it is necessary to press off the 6th speed gear, the drive pinion must be pulled out of the hollow shaft.*

- Remove drive pinion circlip.

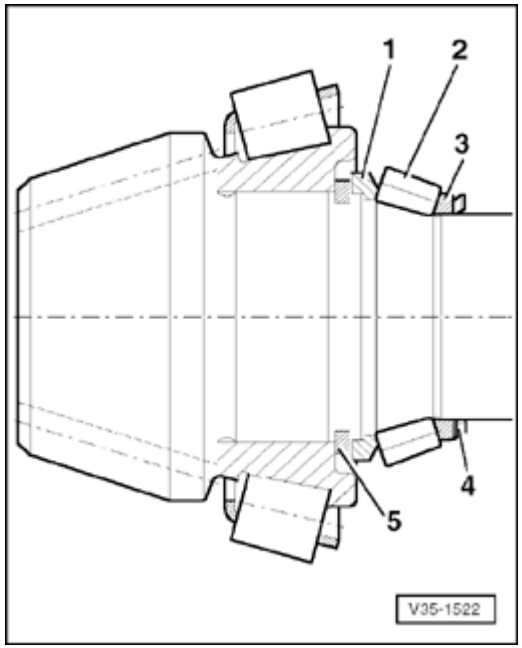


- Pull drive pinion out of hollow shaft -D-, when doing this catch tapered rollers -A- (Qty. 23).
- Take off corrugated spring -B- and needle ring -C-.

Note:

Carefully protect bearings from dirt, clean if necessary.

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- Check bearing to ensure it is complete:

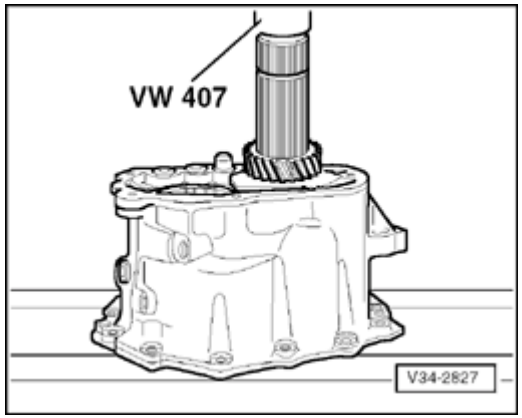
1 - Flange ring (tapered contact surface to tapered rollers)

2 - Tapered rollers (Qty. 23) with larger diameter facing towards drive pinion head

3 - Support ring (tapered contact surface to tapered rollers)

4 - Corrugated spring

5 - Circlip for tapered roller bearing for drive pinion



- Press off 6th speed gear.

Note:

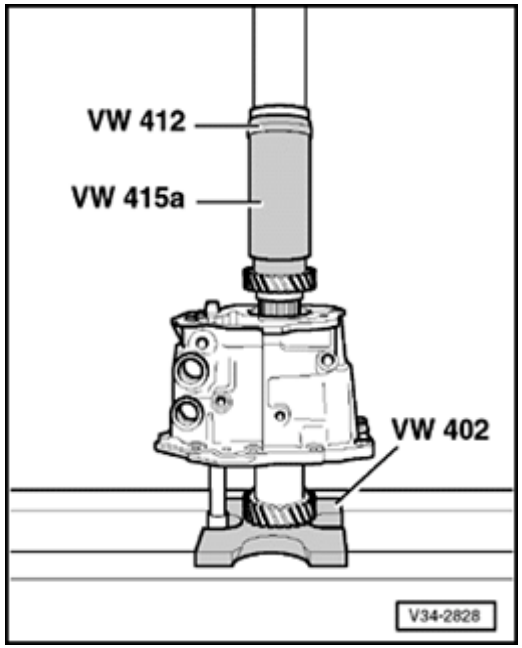
Because of the type of fit, it may be possible to press gear off easily.

- Take hollow shaft or drive pinion and hollow shaft with selector rod and selector fork for 1st and 2nd gear out of bearing plate.

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Installing

- Fit hollow shaft with selector fork and selector rod for 1st and 2nd gear (without follower) into bearing plate.

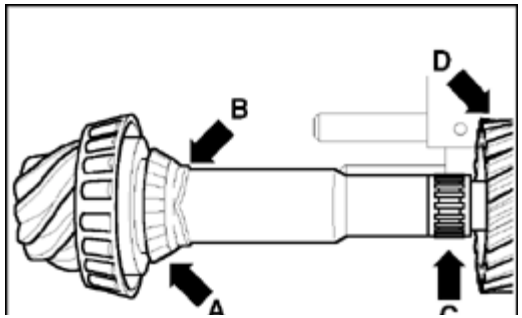


- Heat 6th gear to approx. 120 ° C and fit on.

  Installation position: shoulder towards tapered roller bearing

- Press onto stop; ensure there is no play.
- Grease drive pinion/hollow shaft tapered roller bearing with multi-purpose grease before inserting.

  Allocation ⇒ Page 34-68



A - Flange ring, tapered rollers (Qty. 23), and support ring

B - Corrugated spring

C - Needle ring

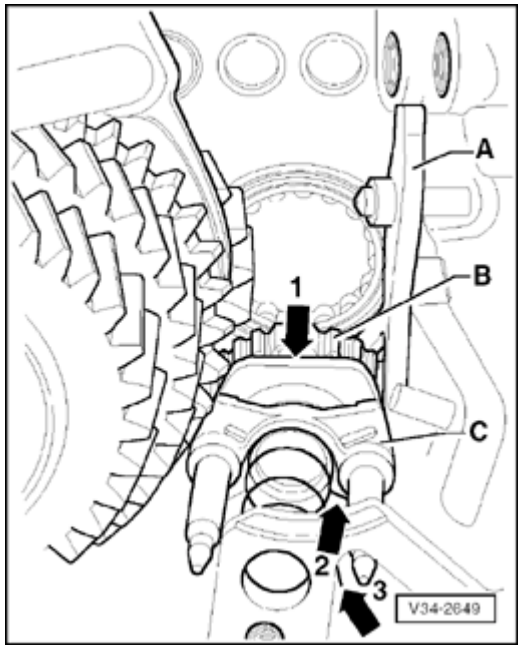
D - Hollow shaft

- Oil needle bearing well.

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- Insert drive pinion into hollow shaft and secure with hose clip to prevent it slipping out.

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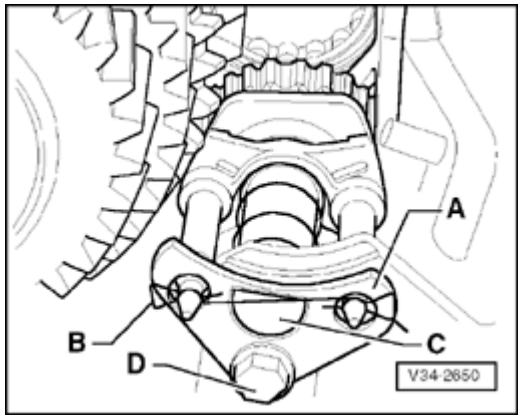
- Fit relay lever -A- for reverse gear onto bolt for relay lever. Watch position of pin when doing this (limits relay lever travel to synchro-ring).
- Insert sliding gear -B- and engage relay lever with groove on sliding gear.
- Insert synchro-ring -C-.

  Installation position: position flat on circumference of synchro-ring towards input shaft (not as yet fitted) (arrow -1-)

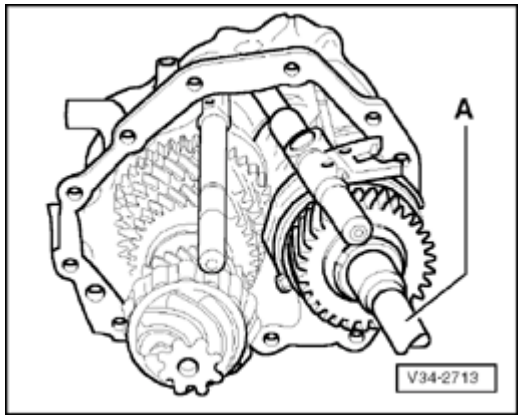
- Insert spring.

  Installation position: hook single angled end into recess on synchro-ring (arrow -2-). Turn double angled end anti-clockwise and hook into opening in bearing plate (arrow -3-)

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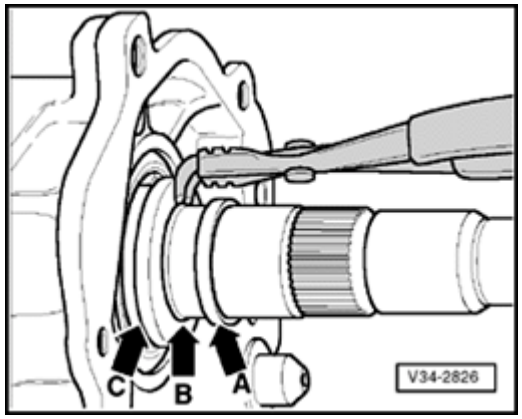


- Insert shaft -C-.
- Fit retaining plate -A-.
  - Installation position: chamfers of holes for locking pins of the synchro-ring face bearing plate
- Insert spring clasp -B- into locking pins of the synchro-ring.
- Replace self-locking nut -D- and tighten to 25 Nm.

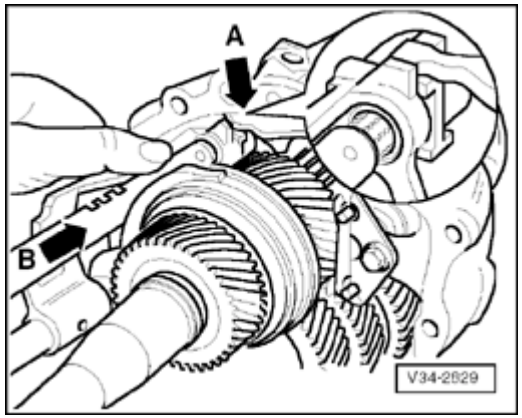


- Slide input shaft -A- with selector rod and selector fork for 3rd and 4th gear at an angle into bearing plate.
  - Selector fork installation position: rib towards follower ⇒ Page 34-52

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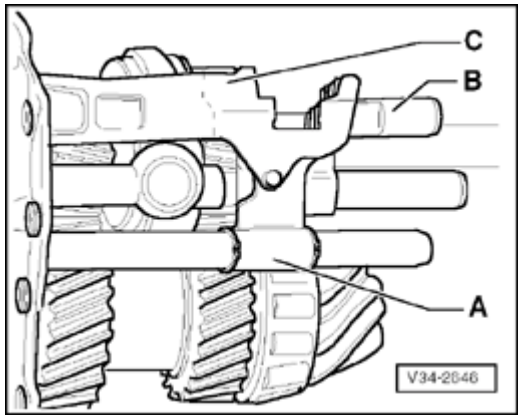


- Slide inner race (arrow -C-) for cylinder roller bearing onto main shaft at flange for end cover (clearance fit).
- Fit circlip (arrow -B-) using right-angled circlip pliers.

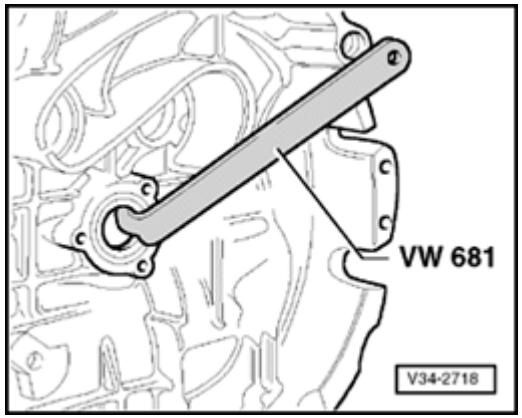


- Engage recess in follower for reverse gear with the free end of relay lever (arrow -A-).
- Slide selector rod for 5th and 6th through follower for reverse gear in direction of (arrow -B-).

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- Slide follower -A- for 1st and 2nd gear onto selector rod and secure with circlips.
- Oil all bearings of input shaft and drive pinion/hollow shaft in transmission housing and bearing flange as well as selector rods with gear oil.



- Pry used seal for input shaft carefully out of transmission housing with VW 681.
- Coat sealing surfaces between bearing plate and transmission housing with sealing paste AMV 188 000 02 or AMV 188 001 02 sealing paste.
- Insert complete bearing plate into transmission housing.

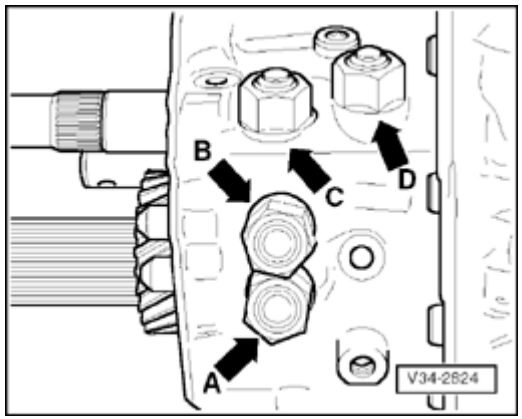
Note:

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

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- Drive in 2 dowel sleeves for bearing flange/transmission housing.

- Tighten 12 bolts using diagonal sequence to 25 Nm.



- Screw in locking bolts for selector rods.

A - 1st and 2nd gear

B - 3rd and 4th gear

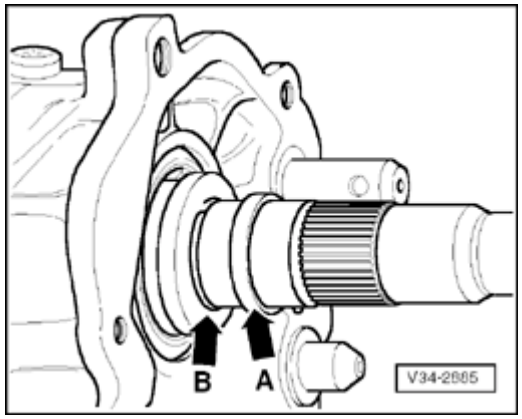
C - 5th and 6th gear

D - Reverse gear

Note:

- *Aluminium and steel bolts must not be interchanged when installing.*
- *Tightening torques: for aluminium locking bolts = 50 Nm, and for steel locking bolts = 70 Nm*

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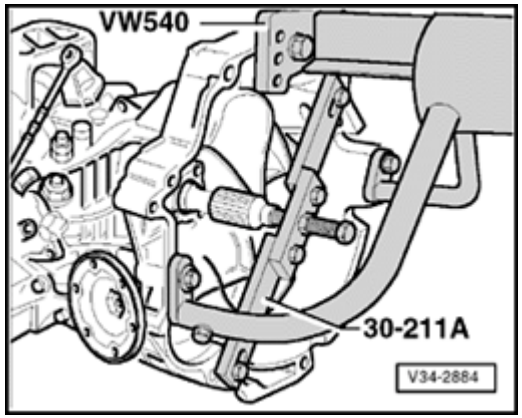


- Fit thrust washer (arrow -A-) for needle bearing for 6th speed gear.

  Installation position: shoulder towards circlip (arrow -B-), smooth contact surface to shaft end

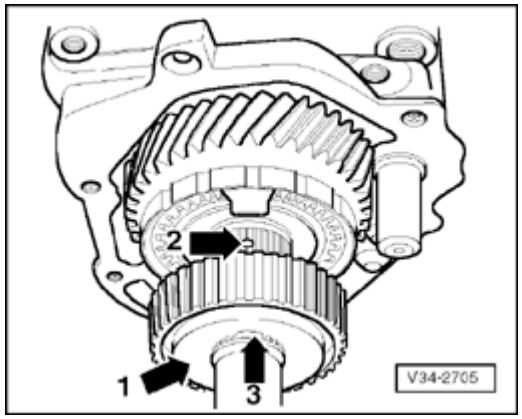
- Oil needle bearing for 6th speed sliding gear with gear oil and fit.
- Slide on 6th speed sliding gear with spring and synchro-ring.

  Synchro-ring installation position: the lugs of the synchro-ring engage into the recesses below in the sliding gear



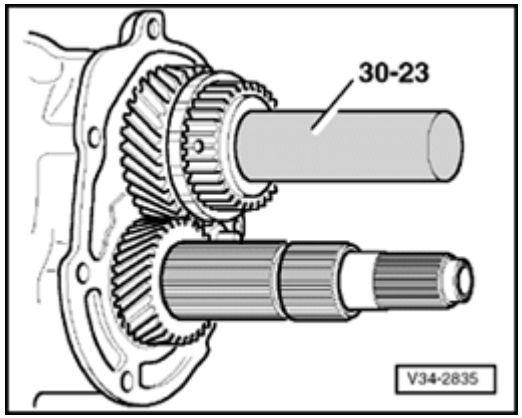
- Support input shaft with support bridge 30-211 A.

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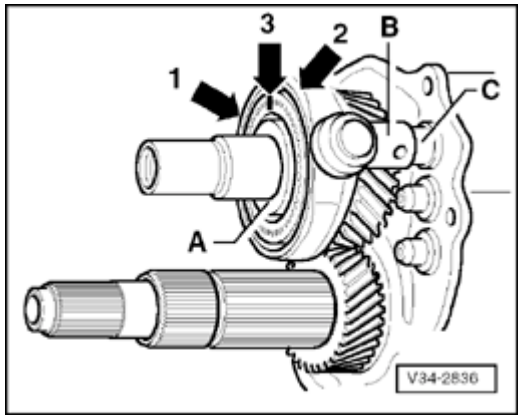
Installation position of synchro-hub for 5th and 6th gear:

- Side with projecting face (arrow -1-) faces shaft end
- 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 6th speed sliding gear for axial play.

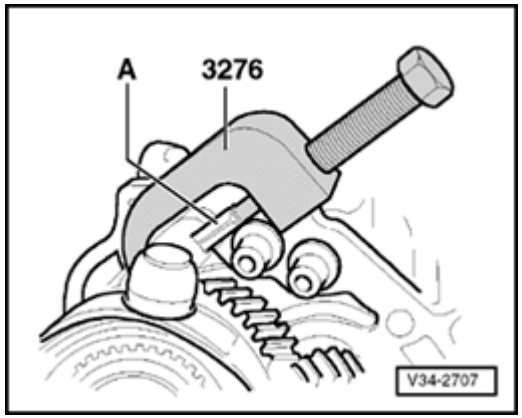
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- Line up markings (arrow -3-) on paired synchro-hub -A- and locking collar for 5th and 6th gear (arrow -1-).
- Fit locking collar (arrow -1-) with selector fork (arrow -2-) onto synchro-hub -A- as well as follower for 5th and 6th gear -B- onto selector rod -C- at the same time.

Note:

- *Selector fork rib (arrow -2-) must face towards shaft end.*
- *When sliding follower onto selector rod for 5th and 6th gear remember holes for roll pin.*

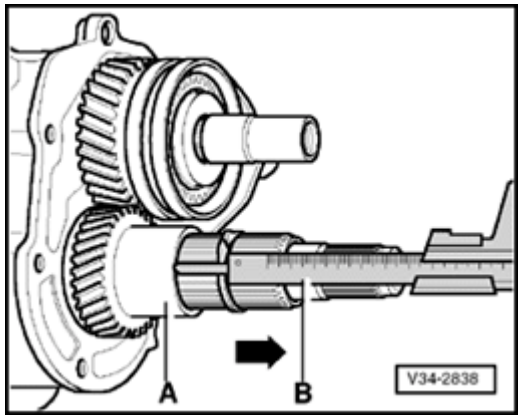


- Press in roll pin -A- flush.

Note:

Do not drive in roll pin, otherwise selector rod mounting will be damaged.

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Re-determining shim for 5th speed gear:

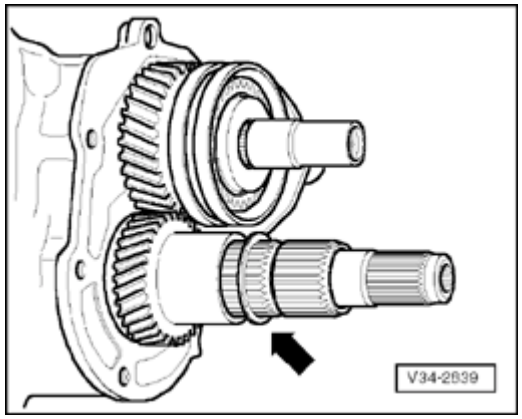
- Fit spacer sleeve -A- (length 39.6 mm) onto hollow shaft.
- When fitting circlip, push in direction of arrow onto stop.
- Measure distance between sleeve and fitted circlip with depth gauge -B-.
- Determine shim from table.

⇒ *Parts catalog*

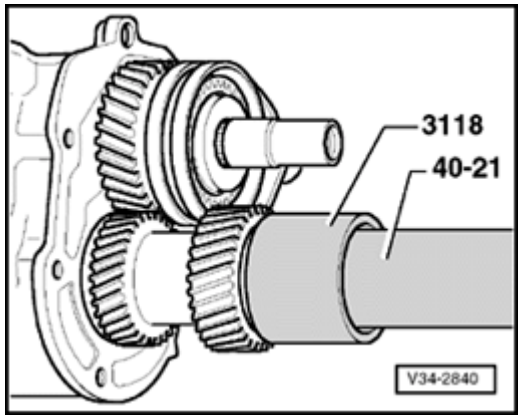
The following shims are available:

Measured range (mm)	Shim thickness (mm)
31.01-31.11	1.05
31.11-31.21	1.15
31.21-31.31	1.25
31.31-31.41	1.35

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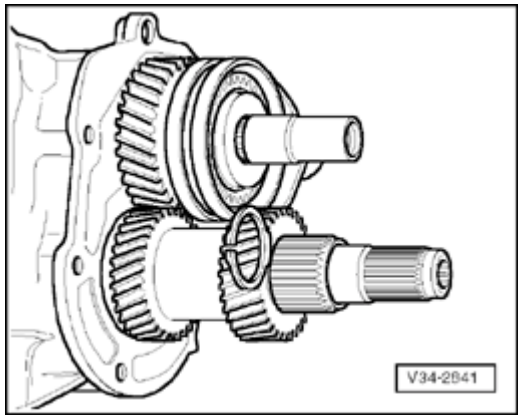


- Fit shim selected (arrow) onto hollow shaft.



- Heat 5th speed gear to approx. 120 ° C, fit and drive onto stop free of play.
  - ♦ Installation position: shoulder toward spacer sleeve

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➢ Re-determining circlip for 5th speed gear:

- Determine thickest circlip that can still just be fitted.
- Determine circlip from table.

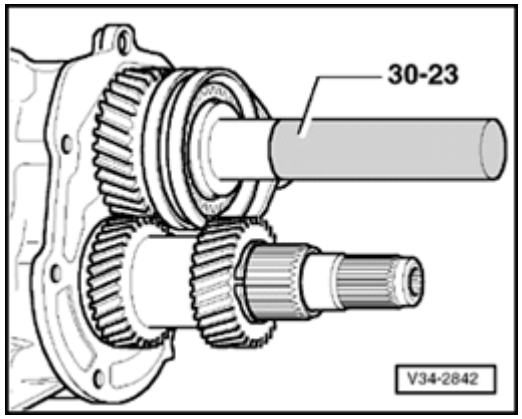
⇒ *Parts catalog*

The following circlips are available:

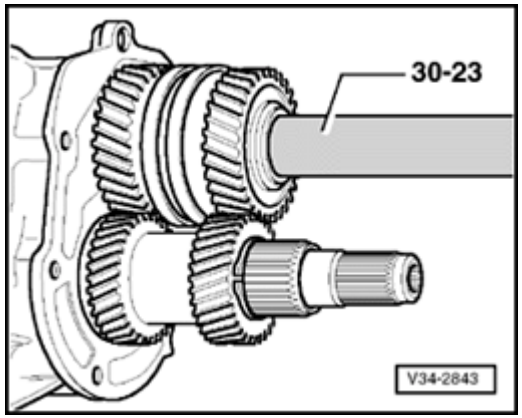
Circlip thickness (mm)		
2.32	2.40	2.48
2.34	2.42	2.50
2.36	2.44	
2.38	2.46	

- Fit circlip.

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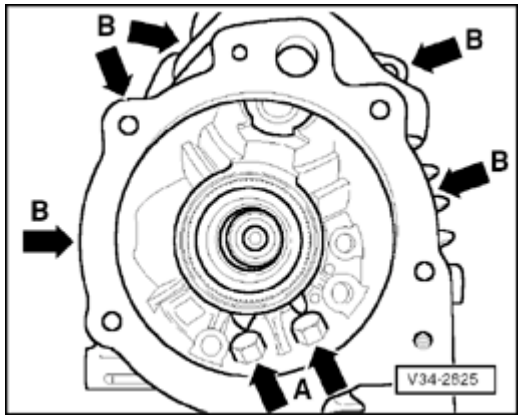
- Drive on inner race for 5th speed sliding gear free of axial play.
- Oil needle bearing with gear oil and fit.
- Place synchro-ring for 5th gear in locking collar.
- Slide on 5th speed sliding gear with spring.



- Heat 1st inner race for ball bearing for input shaft to approx. 100 ° C, fit onto input shaft and drive onto stop; ensure there is no play.
- Check 5th speed sliding gear for axial clearance.

  Permissible axial clearance: 0.15-0.35 mm
- Insert dowel sleeves into bearing plate.
- Fit new gasket for end cover.

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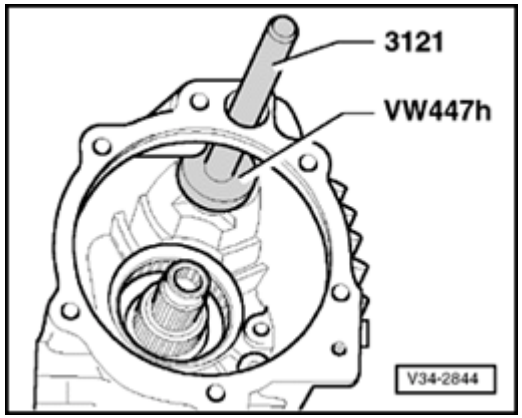


- Fit end cover and insert securing bolts (arrows -B-).

Note:

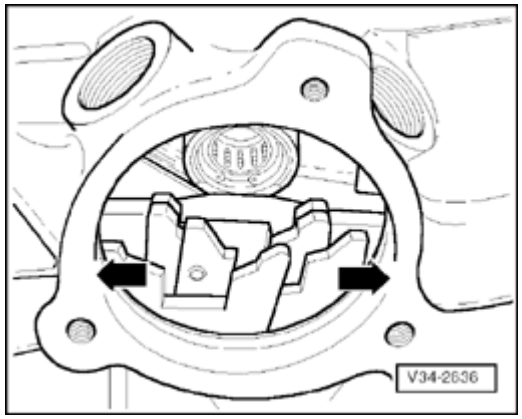
Do not tighten bolts.

- Clean two magnets (arrows -A-) and insert.
- Fit support plate and tighten hand tight.
  - ♦ Installation position: Lugs towards magnets
- Tighten bolts for end cover using diagonal sequence.

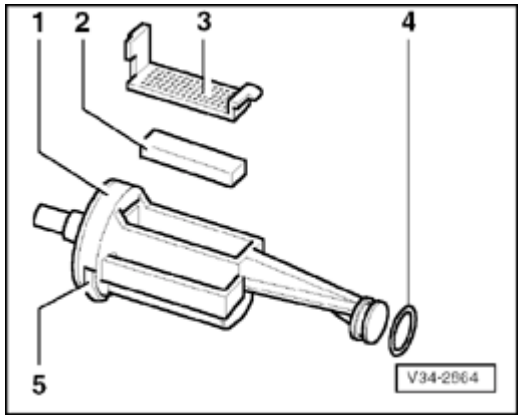


- Oil 2nd inner race and with ball contact surface facing towards input shaft ball bearing, drive onto input shaft through hole in end cover.
- Remove support bridge 30-211 A.

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- Lock input shaft by engaging 2 gears (e.g. reverse and 2nd gear), do this by moving two selector plates (arrows).
- Tighten multi-point socket head bolt to 150 Nm.



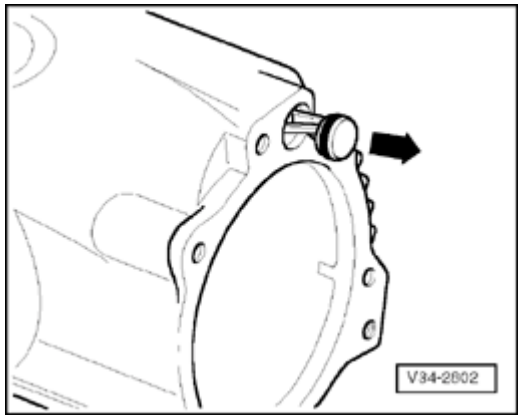
- Unclip cover -3- for oil collector from oil collector -1- at longer end with a screwdriver and remove magnet -2-.

4 - O-ring

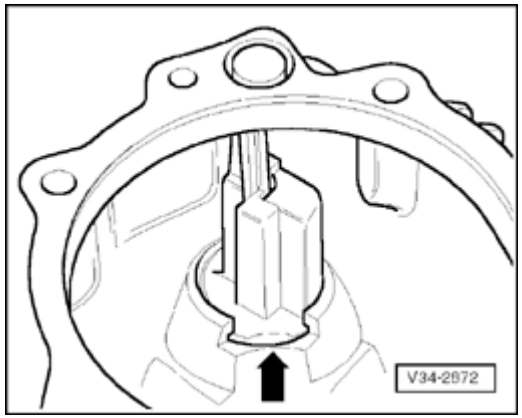
5 - Positioning segment

- Clean oil collector.
- Assemble oil collector.

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- Guide oil collector from interior of end cover with support arm leading through hole of end cover (arrow), until O-ring can be fitted from outside onto oil collector.
- Lightly oil new O-ring and fit.
- Insert oil tube of oil collector into input shaft.

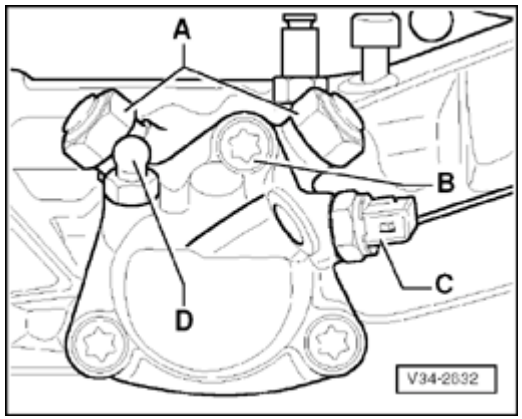


- Turn oil collector until the positioning segment is located in the machined recess of the end cover (arrow).
- Press in oil collector onto stop.
- Slide assembly sleeve, Part No. 01E 311 120, onto selector shaft.
- Check neutral position of followers.

  Selector gates must align.

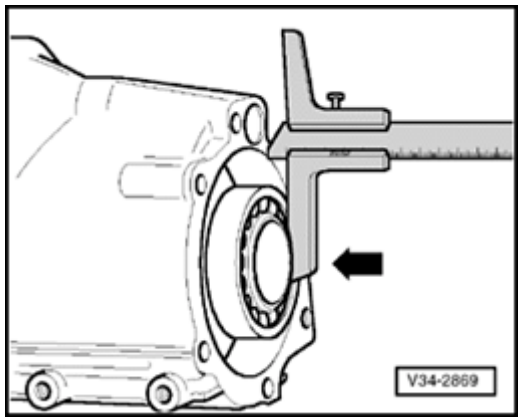
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- Install complete selector shaft.



- Screw locking bolts -A- for selector shaft into transmission housing.
- Aluminium and steel bolts must not be interchanged when installing.

  Tightening torques: for aluminium locking bolts = 50 Nm, and for steel locking bolts = 70 Nm.
- Lightly oil new O-ring for cover for selector shaft and fit.
- Fit cover for selector shaft.
- Apply sealing paste AMV 188 000 02 to bolts -B- (Qty. 3) before installing and tighten.
- Slide Torsen differential onto splines of hollow shaft.



- Press Torsen differential in direction of arrow, and measure distance between top edge of bolted end cover and front edge of outer race of ball bearing for Torsen differential.
- Determine required shim(s) from following table.

⇒ *Parts catalog*

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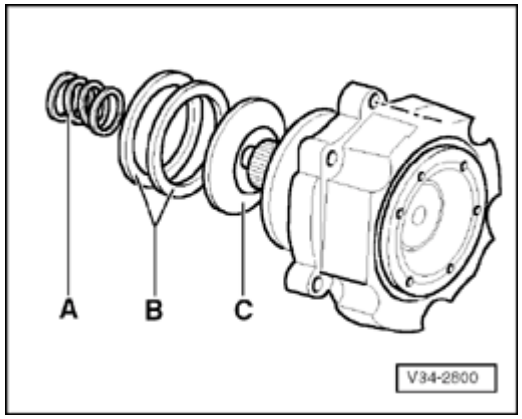
The following shims are available:

Measured range mm	Qty.	Shim thickness (mm)
7.05-7.30	1	1.65
	1	1.45
	1	1.20
7.30-7.55	1	1.65
	1	1.45
	1	0.95
7.55-7.80	1	1.65
	1	1.45
	1	0.70
7.80-8.05	1	1.65
	1	1.45
	1	0.45
8.05-8.25	2	1.65
8.25-8.50	1	1.65
	1	1.45

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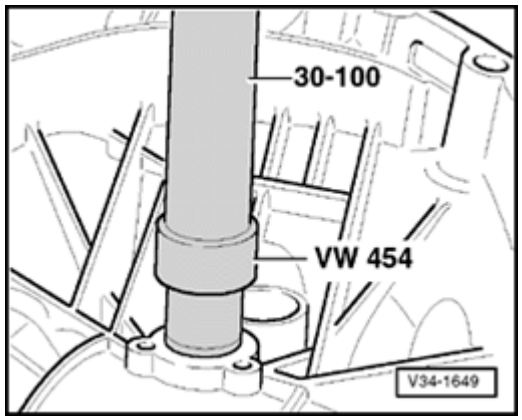
8.50-8.75	1 1	1.65 1.20
8.75-9.00	1 1	1.65 0.95
9.00-9.25	1 1	1.65 0.70
9.25-9.50	1 1	1.65 0.45

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- Insert spring plate -C- into bearing housing.

  Installation position: larger diameter (concave side) towards the shims.
- Fit shims -B- as determined in table.
- Fit spring -A- to end of drive flange.
- Lightly oil new O-ring for bearing housing and fit.
- Oil small needle bearing in drive pinion.
- Insert complete bearing housing and pull home evenly.
- Tighten bearing housing using diagonal sequence.
- Fill new seal for drive axle between sealing lip and dust lip with sealing grease G52 128 A1.
- Pull a thin protective hose tightly onto splines of input shaft.



- Drive on seal for input shaft.
  - Pressing-in depth (factory): 3.5 mm
  - Pressing in depth (repairs): 4.5 mm

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- Remove protective hose.

- Install release bearing, clutch release lever and guide sleeve ⇒ from Page 30-27 .

- Check that transmission can be shifted through all gears.

- Fit connecting rod.

- Check oil level in transmission ⇒ Page 34-39 .

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Bearing housing, disassembling and assembling

Special tools, testers and auxiliary items required:

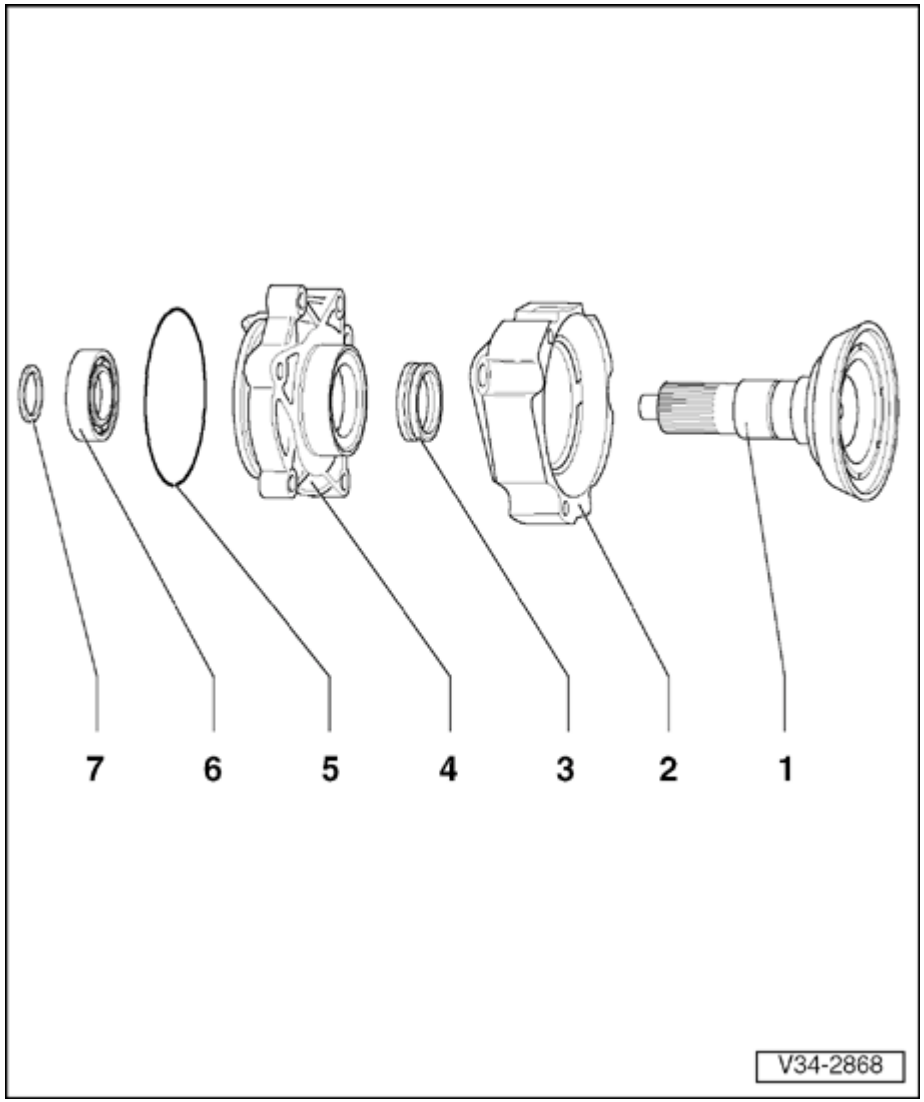
- Adapter VW 295a
- Thrust plate VW 401
- Thrust plate VW 402
- Press tool VW 407
- Press tool VW 412
- Tube VW 415a
- Tube VW 416b
- Press tool VW 433
- Thrust pad VW 454
- Support rails VW 457

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- Extractor lever VW 681
- Punch 2005
- Thrust pad 2007
- Shim, Part No. 016 311 391 B

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1 - Drive flange

- Pressing out ⇒ Fig. 1
- Pressing in ⇒ Fig. 2

2 - Balance weight

- Pressing off ⇒ Fig. 3
- Pressing on ⇒ Fig. 4

3 - Seal

- Pulling out ⇒ Fig. 5
- Preparing for installation ⇒ Fig. 6
- Driving in ⇒ Fig. 7

4 - Bearing housing

5 - O-ring

- Always replace
- Lightly oil before installing

6 - Ball bearing for drive flange

- Pressing off ⇒ Fig. 8
- Pressing in ⇒ Fig. 9

7 - Circlip

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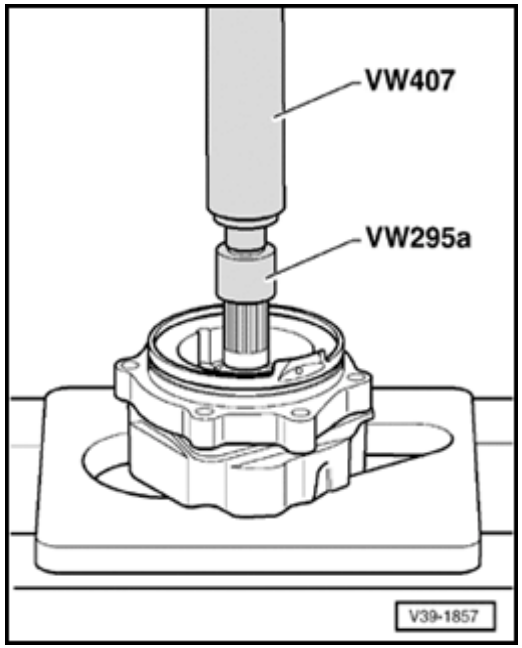


Fig. 1 Pressing out drive flange

- Before pressing out drive flange remove circlip.

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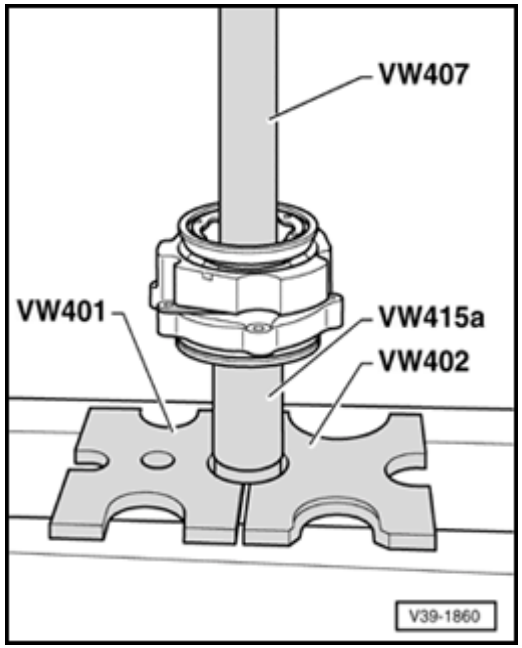


Fig. 2 Pressing in drive flange

- Before pressing in drive flange, press on balance weight ⇒ Fig. 4 .
- Fit circlip.

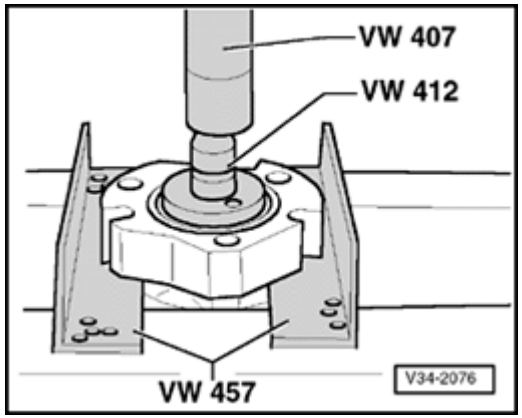


Fig. 3 Pressing off balance weight

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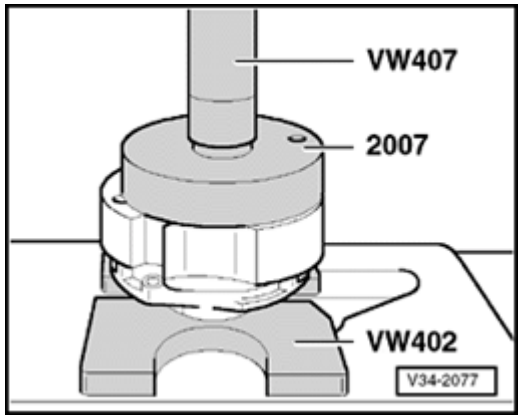


Fig. 4 Pressing on balance weight

Note:

Note position of holes.

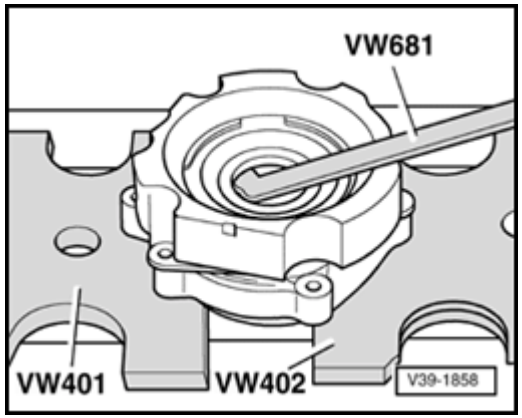


Fig. 5 Pulling out seal

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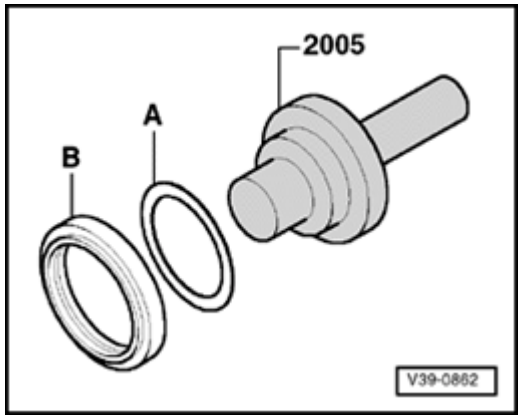


Fig. 6 Preparing seal for installation

A - Shim Part No. 016 311 391 B (1.7 mm thick)

B - Seal

- Fill space between sealing and dust lips with sealing grease G52 128 A1.
- Fit shim and seal onto tool one after the other.

  Installation position: open side of seal towards bearing housing

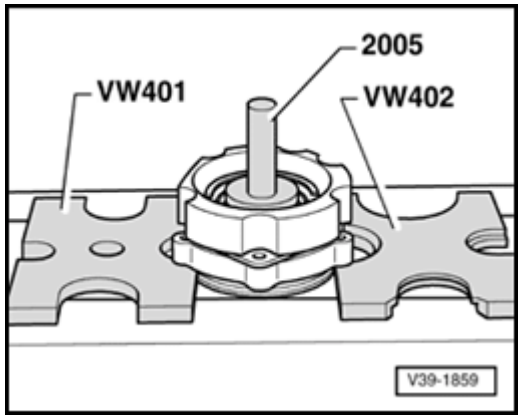


Fig. 7 Driving in seal

- Remove shim.

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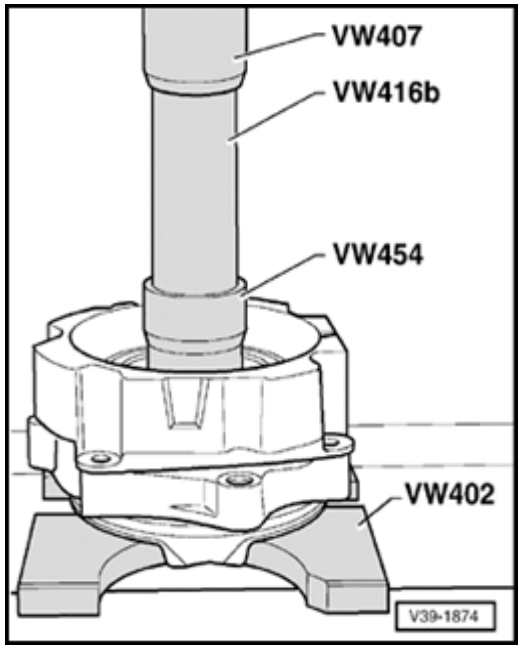


Fig. 8 Pressing out ball bearing for drive flange

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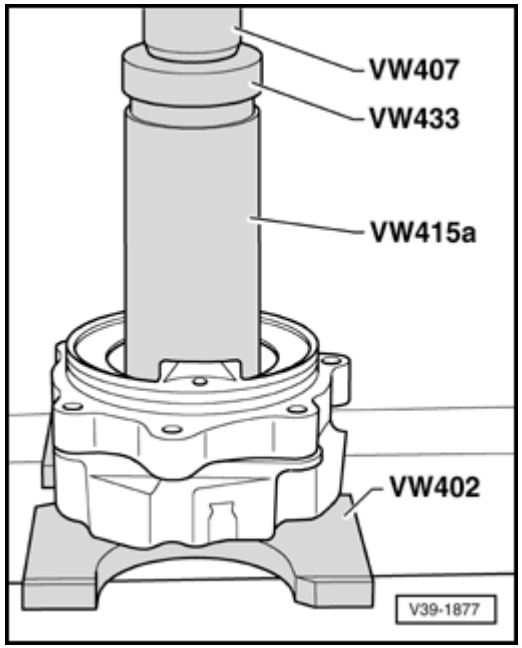


Fig. 9 Pressing in ball bearing for drive flange

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Bearings for Torsen differential, servicing

Special tools, testers and auxiliary items required:

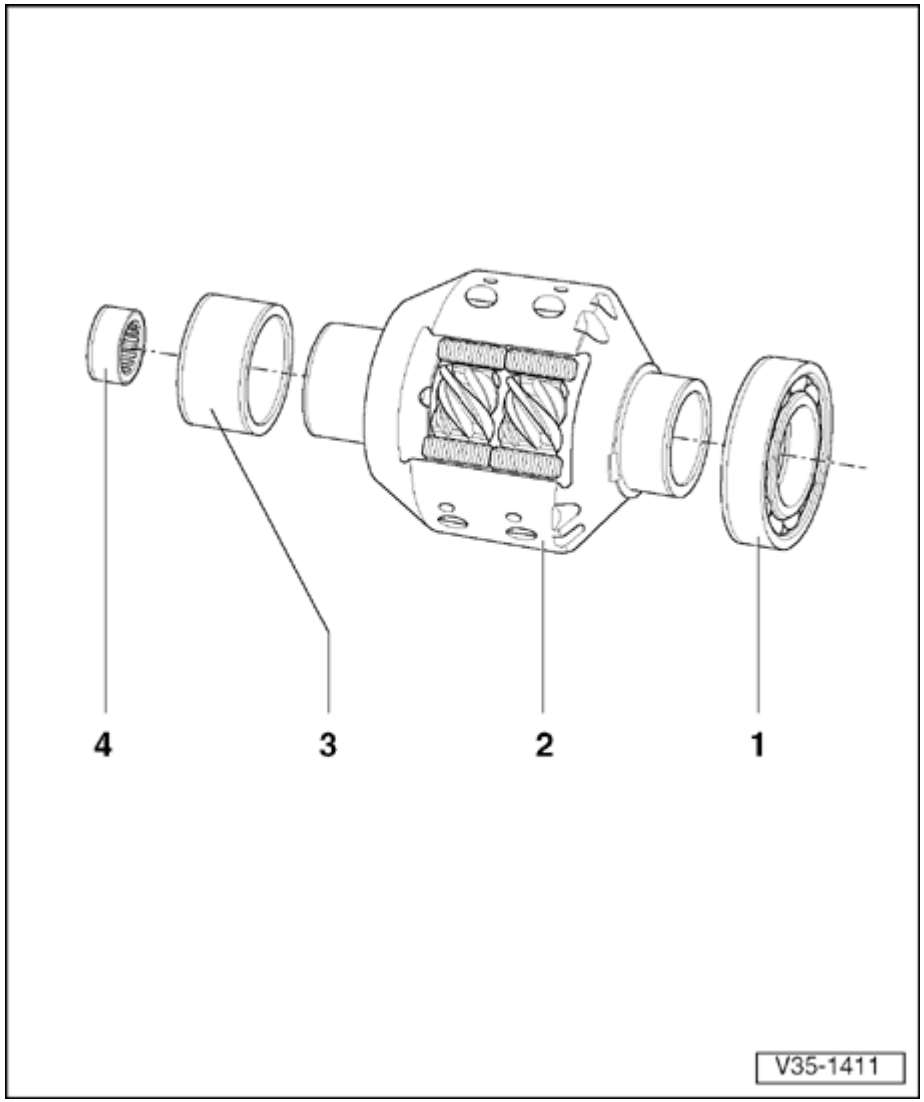
- Thrust plate VW 401
- Thrust plate VW 402
- Press tool VW 407
- Press tool VW 412
- Press tool VW 432
- Thrust plate VW 447h
- Clamping sleeve 3116
- Thrust piece 3118
- Separating device 22-115 mm, e.g. Kukko 17/2
- Internal puller 30-37 mm, e.g. Kukko 21/5

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- Counter support e.g. Kukko 22/1

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1 - Ball bearing for Torsen differential

- Pressing off ⇒ Fig. 1
- Pressing on ⇒ Fig. 2

2 - Torsen differential

- Can only be serviced by manufacturer

3 - Inner race for needle bearing for Torsen differential

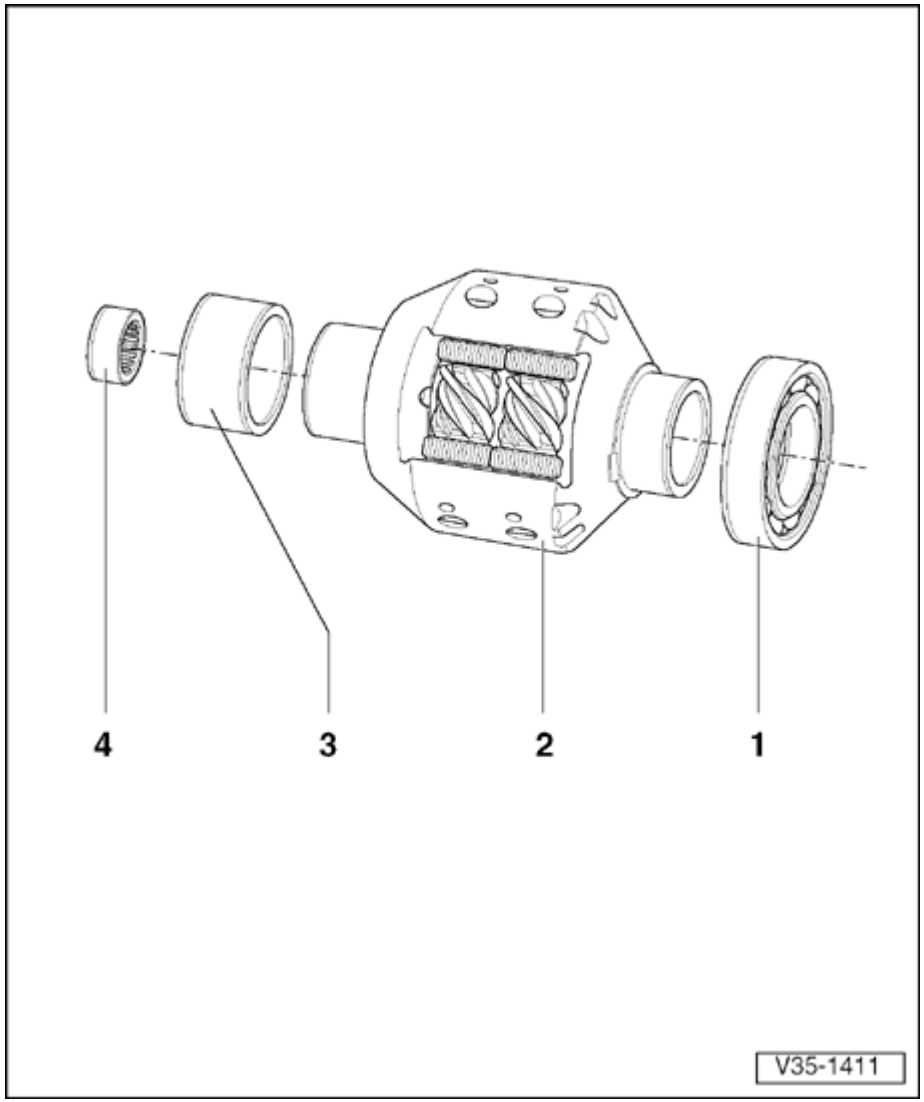
- Pulling off ⇒ Fig. 3
- Pressing on ⇒ Fig. 4

4 - Needle bearing for drive pinion/Torsen differential

- Pulling out ⇒ Fig. 5
- Pressing in ⇒ Fig. 6

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Note:

The shims for the Torsen differential must be re-determined after replacing the following parts ⇒ Page 34-85 :

- *End cover*
- *Inner race for needle bearing*
- *Torsen differential*
- *Ball bearing for Torsen differential*

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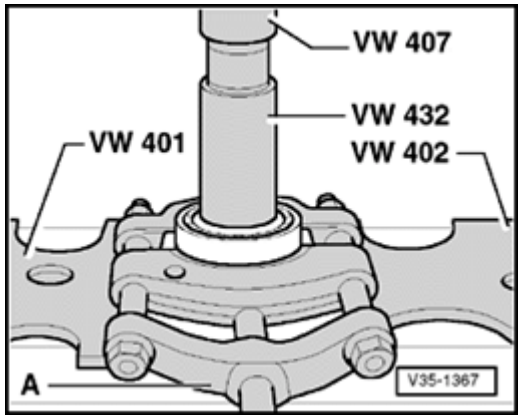


Fig. 1 Pressing off ball bearing for Torsen differential

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

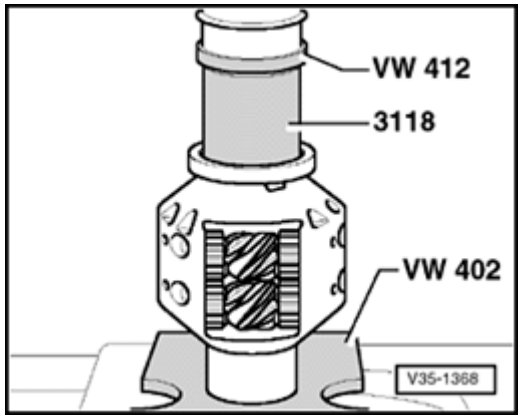


Fig. 2 Pressing on ball bearing for Torsen differential

- Press piece 3118 with shoulder towards press tool VW 412

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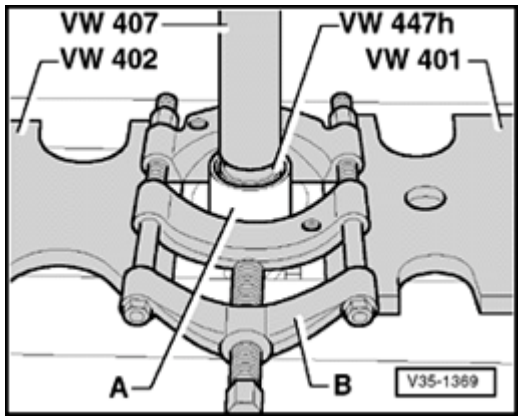


Fig. 3 Pulling off inner race for needle bearing for Torsen differential

A - Inner race

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

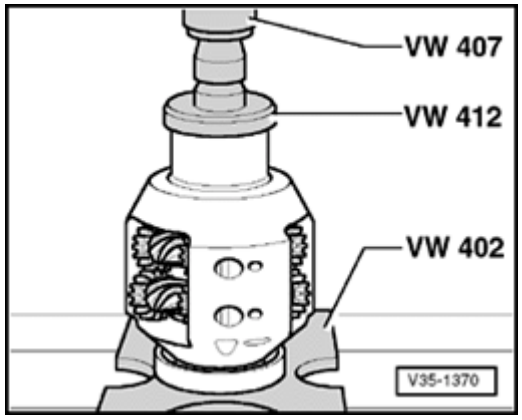


Fig. 4 Pressing on inner race for needle bearing for Torsen differential

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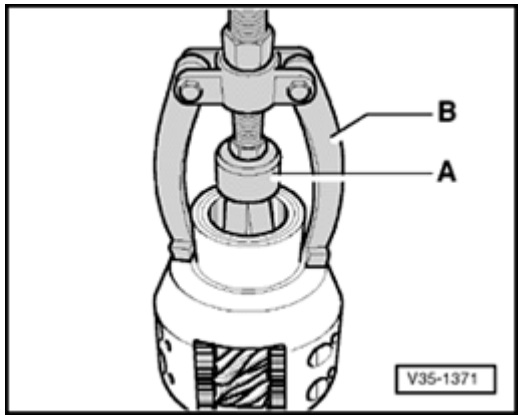


Fig. 5 Pulling out needle bearing for drive pinion/Torsen differential

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

B - Counter support, e.g. Kukko 22/1

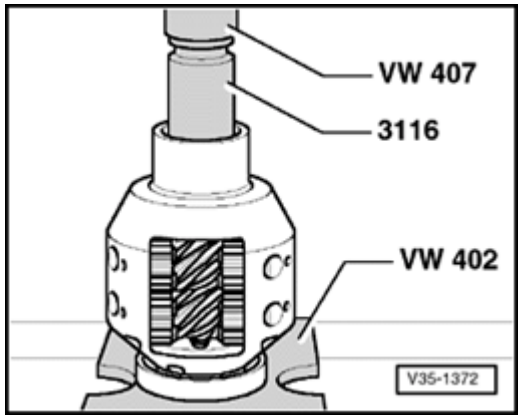


Fig. 6 Pressing in needle bearing for drive pinion/Torsen differential

- Press in needle bearing flush.

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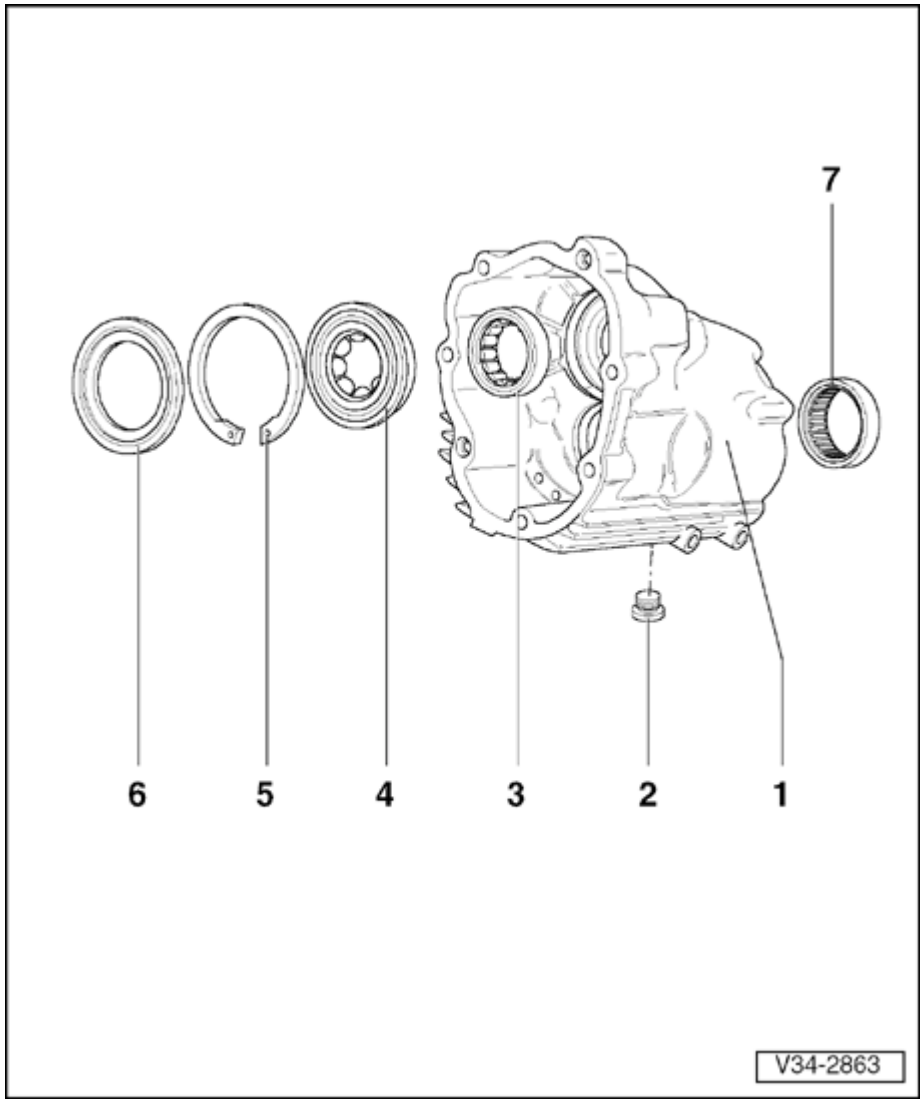
End cover, servicing

Special tools, testers and auxiliary items required:

- Thrust plate VW 401
- Press tool VW 407
- Press tool VW 412
- Tube VW 415a
- Spacer sleeve VW 472/2
- Thrust ring 2006A
- Internal puller 37-46 mm (e.g. Kukko 21/6)
- Internal puller 46-58 mm (e.g. Kukko 21/7)
- Counter support (e.g. Kukko 22/2)

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1 - End cover

- If replaced:
  - Re-determine thickness of circlip - 5 -.
  - Re-determine shims for Torsen differential ⇒ Page 34-85 .

2 - Oil drain plug, 40 Nm

3 - Cylinder roller bearing for input shaft

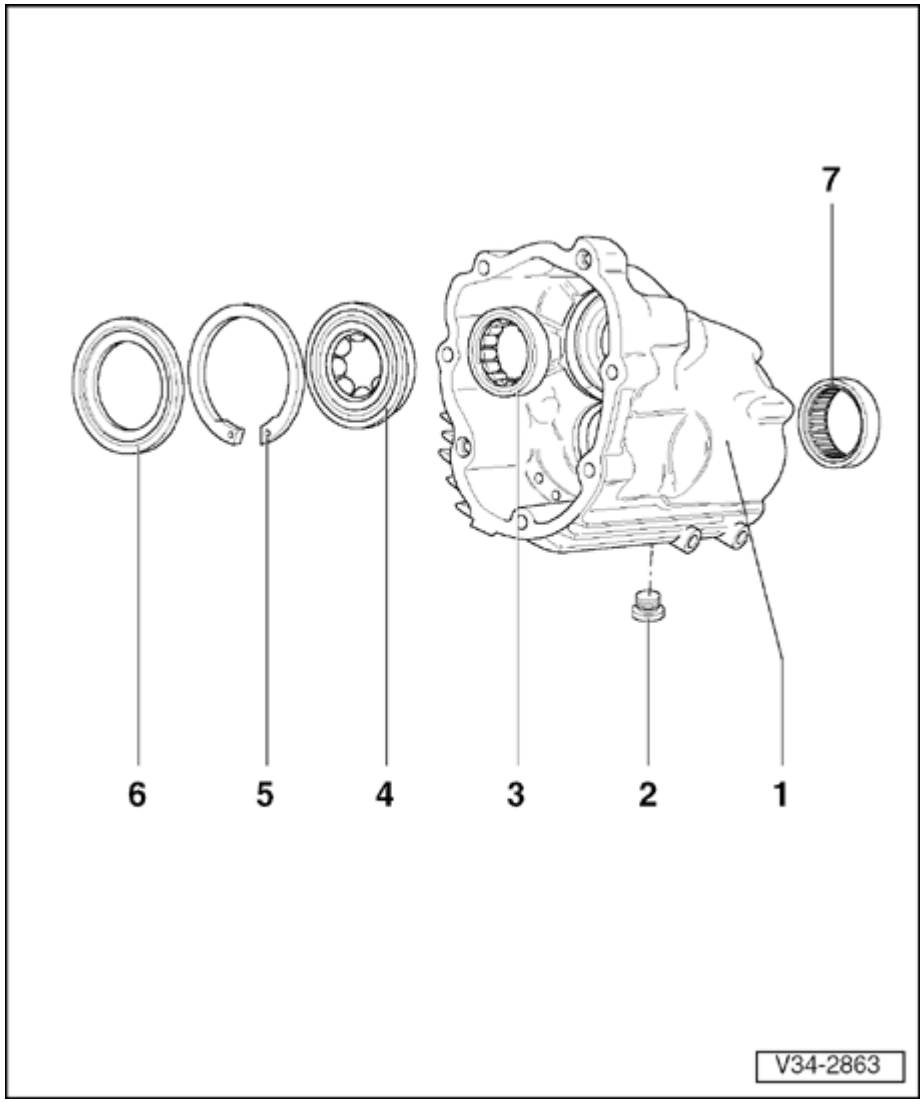
- Pulling out ⇒ Fig. 1
- Pressing in flush ⇒ Fig. 2

4 - Ball bearing for input shaft

- Removing ⇒ Fig. 3
- Installing ⇒ Fig. 4
- If replaced, re-determine thickness of circlip - 5 -

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5 - Circlip

- Re-determine thickness ⇒ Page 34-108
- Installing ⇒ Fig. 4

6 - Baffle plate

- Replace
- Removing ⇒ Fig. 3
- Installing and peening in position when replacing ball bearing for input shaft ⇒ Fig. 5
- Installing and peening in position when replacing end cover ⇒ Fig. 6

7 - Needle bearing for Torsen differential

- Pulling out ⇒ Fig. 7
- Driving in ⇒ Fig. 8

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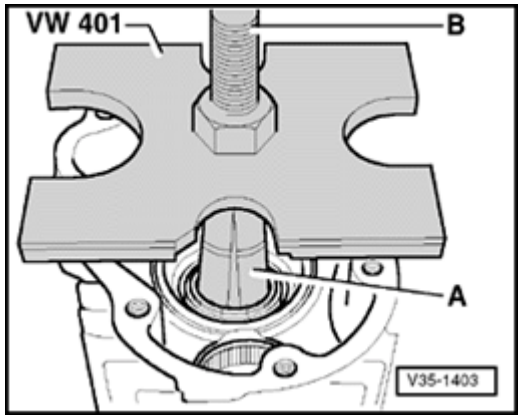


Fig. 1 Pulling cylinder roller bearing for input shaft out of end cover

A - Internal puller 37-46 mm, e.g. Kukko 21/6

B - Spindle from counter support Kukko 22/2

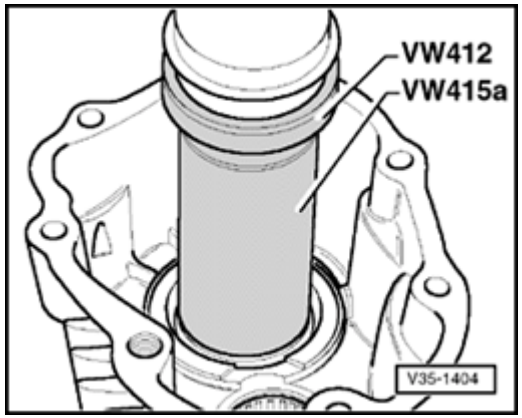


Fig. 2 Pressing cylinder roller bearing for input shaft flush into end cover

- Tube VW 415a with shoulder towards press tool VW 412

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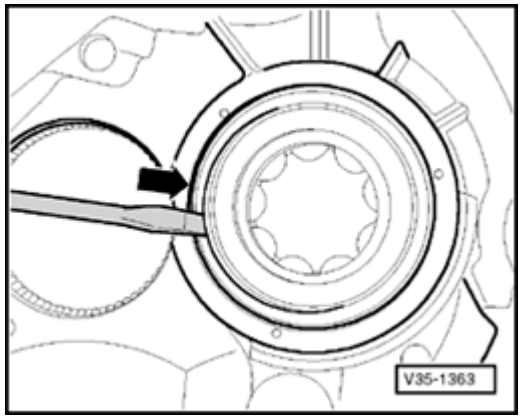


Fig. 3 Removing ball bearing for input shaft from end cover

- Position screwdriver as illustrated, drive into baffle plate (arrow) and pry out.
- Remove circlip.
- Take out bearing, remove peening indentations if necessary.

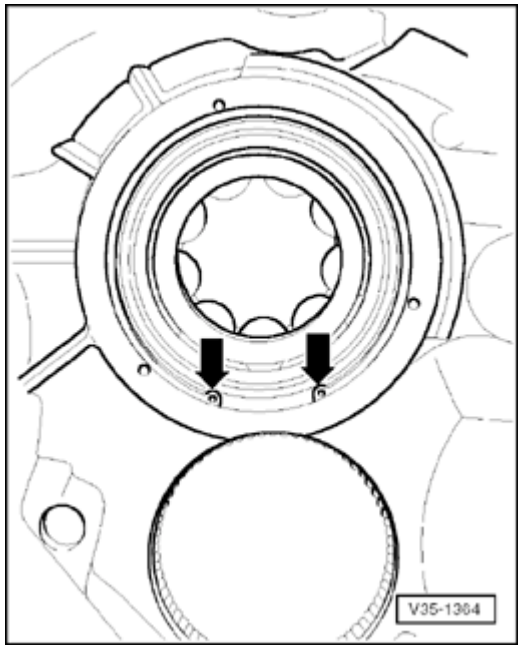


Fig. 4 Installing ball bearing for input shaft in end cover

Installation position of circlip:

- Ends of circlip (arrows), point towards needle bearing

Note:

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

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- Determine circlip for input shaft ball bearing:
  - Press ball bearing outer race onto stop.
  - Determine thickest circlip that can still just be fitted.

  Axial play: max. 0.08 mm
  - Determine circlip from table. Part numbers

⇒ *Parts catalog*

The following circlips are available:

Circlip thickness (mm)	
2.55	2.65
2.60	2.70

- Fit circlip.

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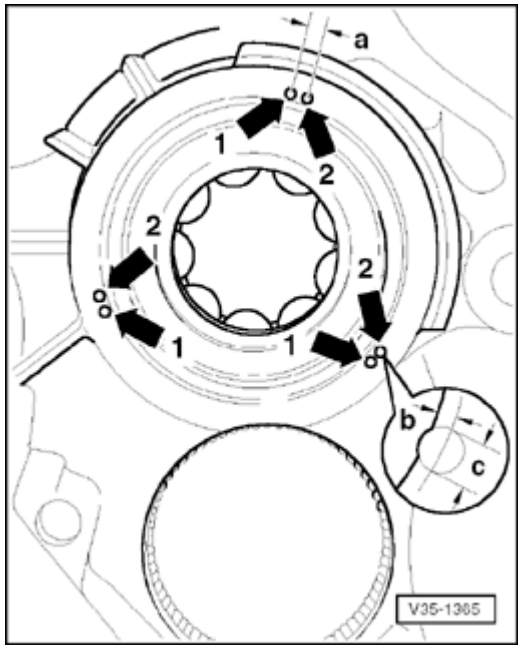


Fig. 5 Peening baffle plate in position when replacing ball bearing for input shaft

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

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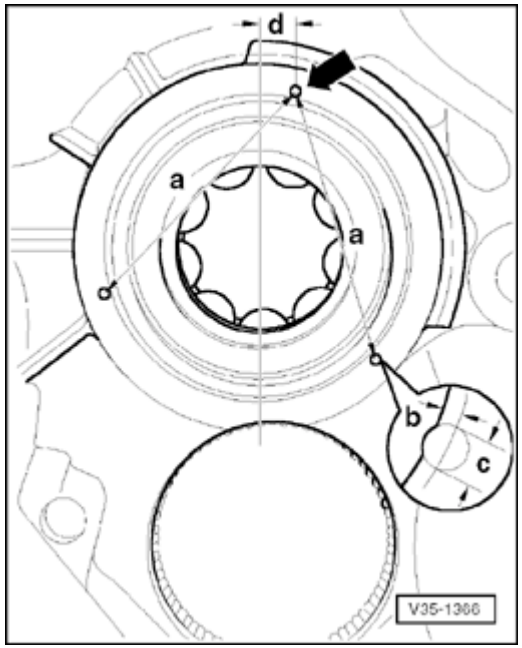


Fig. 6 Peening baffle plate in position when replacing end cover

- 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 distance -d- from center line of two shafts.
  - Dimension d = 10 mm
- Observe position and diameter of peening positions.
  - Dimension b = 2 mm
  - Dimension c = 3 mm
- Peen in second and third peening points in same manner at distance -a-.
  - Dimension a = 70 mm

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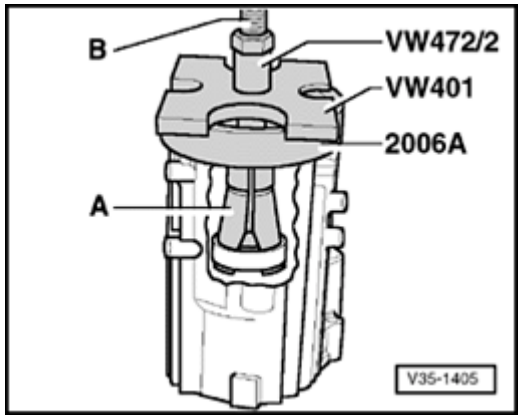


Fig. 7 Pulling needle bearing for Torsen differential out from end cover

A - Internal puller 46-58 mm, e.g. Kukko 21/7

B - Spindle from counter support Kukko 22/2

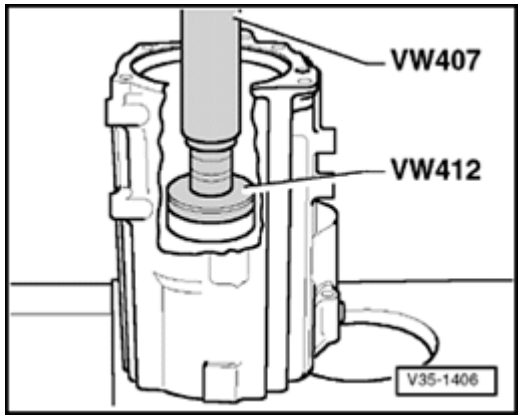


Fig. 8 Driving needle bearing for Torsen differential flush into end cover

- Fit press plate VW 412 onto bearing with shoulder facing up.

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Transmission housing, servicing

Special tools, testers and auxiliary items required:

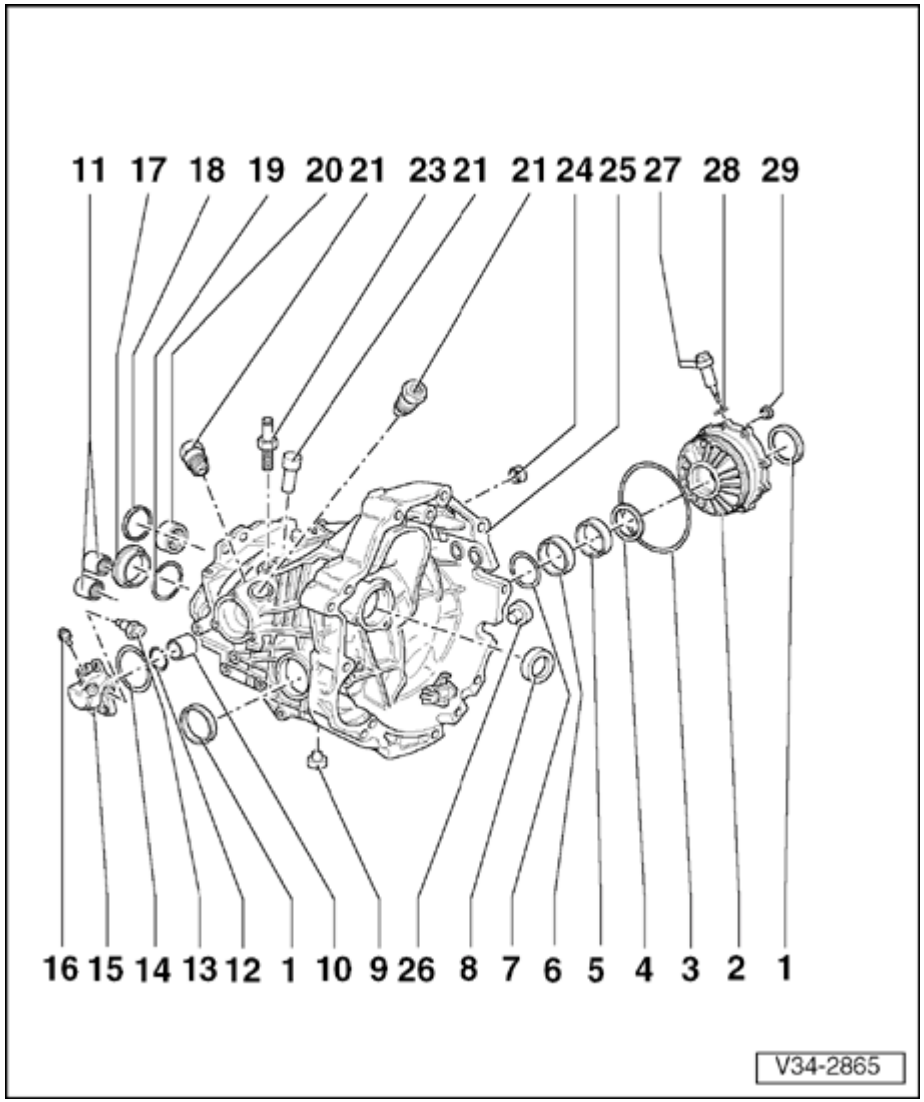
- Multi-purpose tool 771/1 with attachment 771/15
- Mandrel 2062
- Press tool VW 408 A
- Tube VW 423
- Thrust pad VW 454
- Extractor lever VW 681
- Guide pin 10-15
- Drift sleeve 30-100
- Mandrel 30-505
- Installing tool 40-503

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- Internal puller 14.5-18.5 mm e.g. Kukko 21/2
- Internal puller 30-37 mm e.g. Kukko 21/5
- Depth gauge
- Assembly sleeve, Part No. 01E 311 120

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Note:

- *Refer to general repair instructions ⇒ Page 00-11 .*
- *Adjustments are required when replacing components marked 1) ⇒ Page 39-37 , adjustment overview.*

1 - Seal

- For drive flange
- Pulling out ⇒ Fig. 1
- Driving in ⇒ Fig. 2
- Fill space between sealing lips with sealing grease G52 128 A1.
- Replacing with transmission installed ⇒ Page 39-1

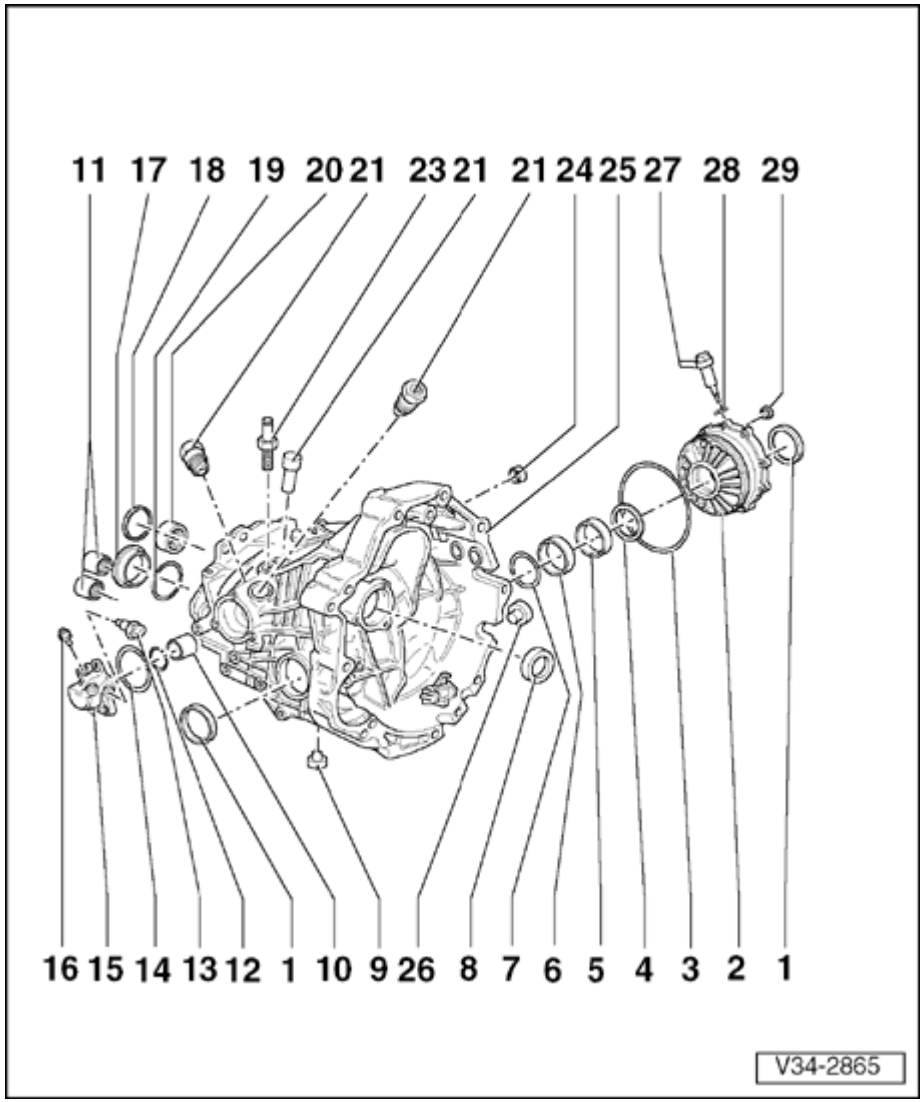
2 - Final drive cover 1)

3 - O-ring

- For cover for final drive
- Always replace

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4 - Shim "S1"

- Note thickness
- Adjustment overview ⇒ Page 39-37

5 - Outer race for large tapered roller bearing
1)

- For differential
- Driving out and driving in ⇒ Page 39-32

6 - Outer race for small tapered roller bearing
1)

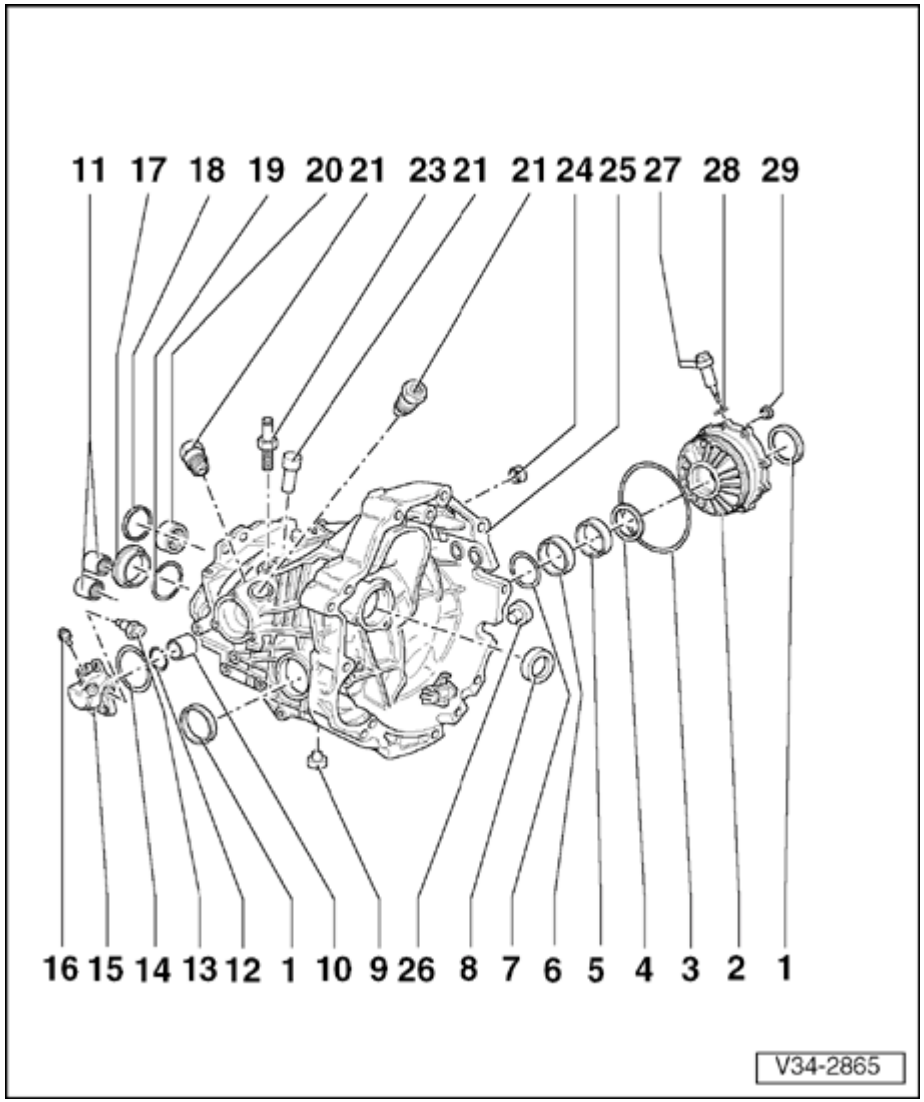
- For differential
- Driving out and driving in ⇒ Page 39-31

7 - Shim "S2"

- Note thickness
- Adjustment overview ⇒ Page 39-37

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8 - Seal

- For input shaft
- Prying out ⇒ Fig. 3
- Driving in ⇒ Fig. 5
- Always replace when removing input shaft
- Replacing when transmission is not disassembled ⇒ Fig. 4 and ⇒ Fig. 5

9 - Oil drain plug, 40 Nm

10 - Ball sleeve

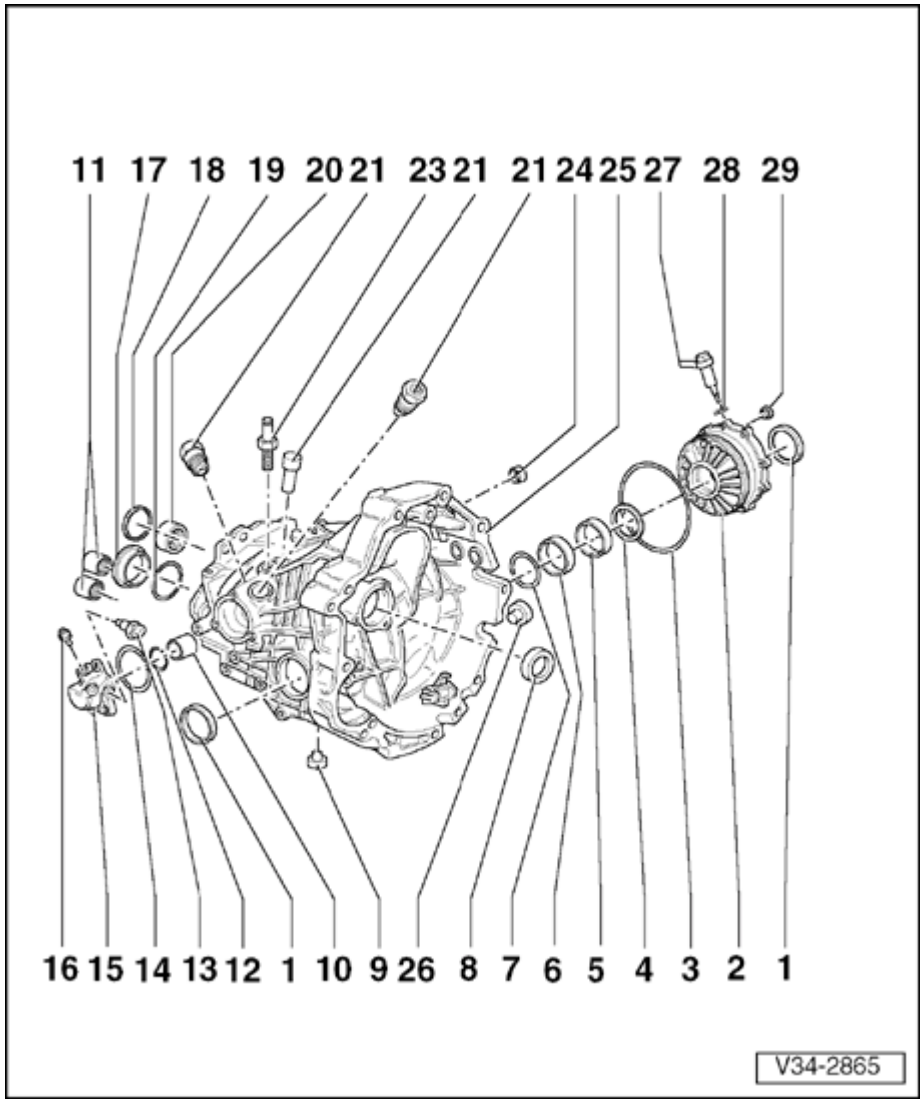
- For selector shaft
- Replace
- Pulling out ⇒ Fig. 6
- Driving in ⇒ Fig. 7

11 - Ball sleeves

- For selector shafts
- Replace
- Pulling out, as - 10 - ⇒ Fig. 6
- Driving in, as - 10 - ⇒ Fig. 7

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12 - Circlip

- Installation position: eyes facing up

13 - Switch for back-up lights, 20 Nm

14 - O-ring

- For cover for selector shaft
- Always replace

15 - Cover for selector shaft

- Removing ⇒ Page 34-59
- Installing ⇒ Page 34-85

16 - Ball stud, 20 Nm

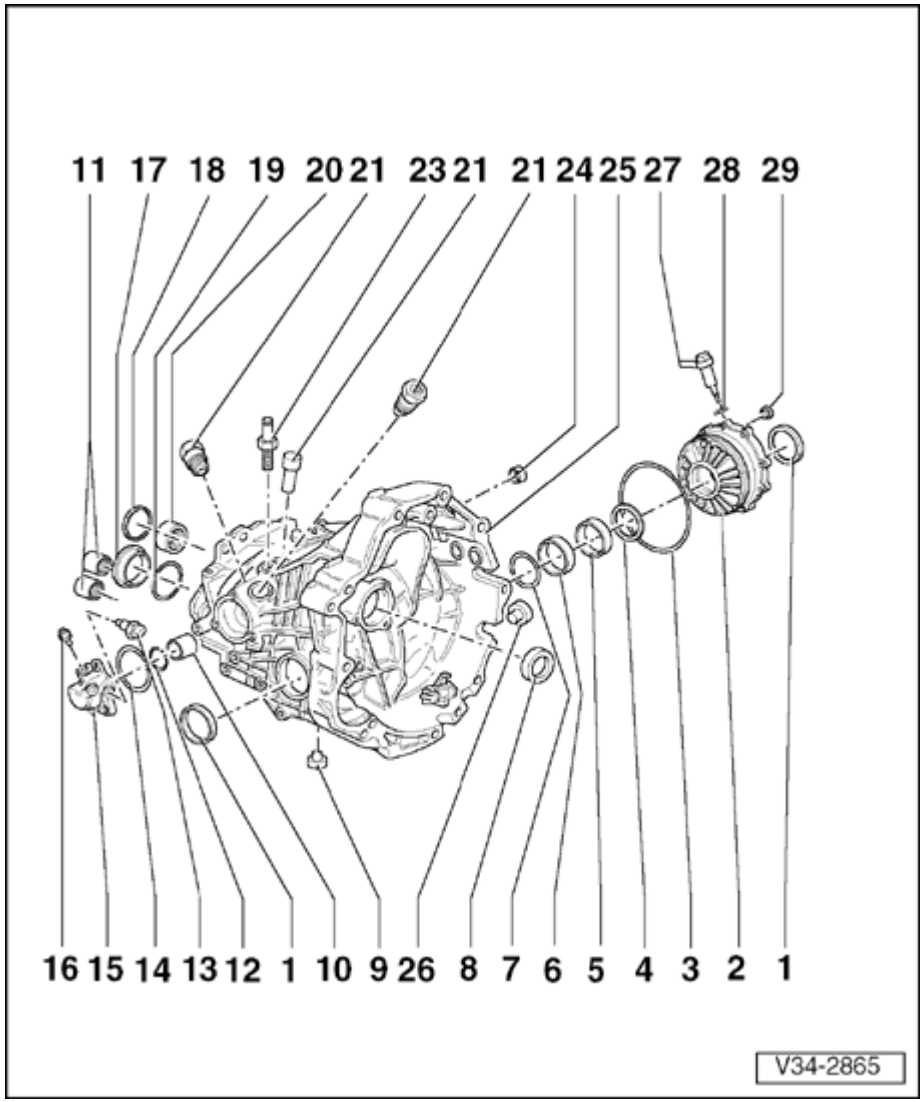
- For connecting rod

17 - Outer race for large tapered roller bearing 1)

- For drive pinion
- Pulling out ⇒ *Fig. 1* , ⇒ Page 35-22
- Pressing in ⇒ *Fig. 2* , ⇒ Page 35-22 and ⇒ *Fig. 3* , ⇒ Page 35-23

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18 - Circlip

- Removing ⇒ Fig. 16

19 - Shim "S3"

- Note thickness
- Adjustment overview ⇒ Page 39-37

20 - Needle bearing

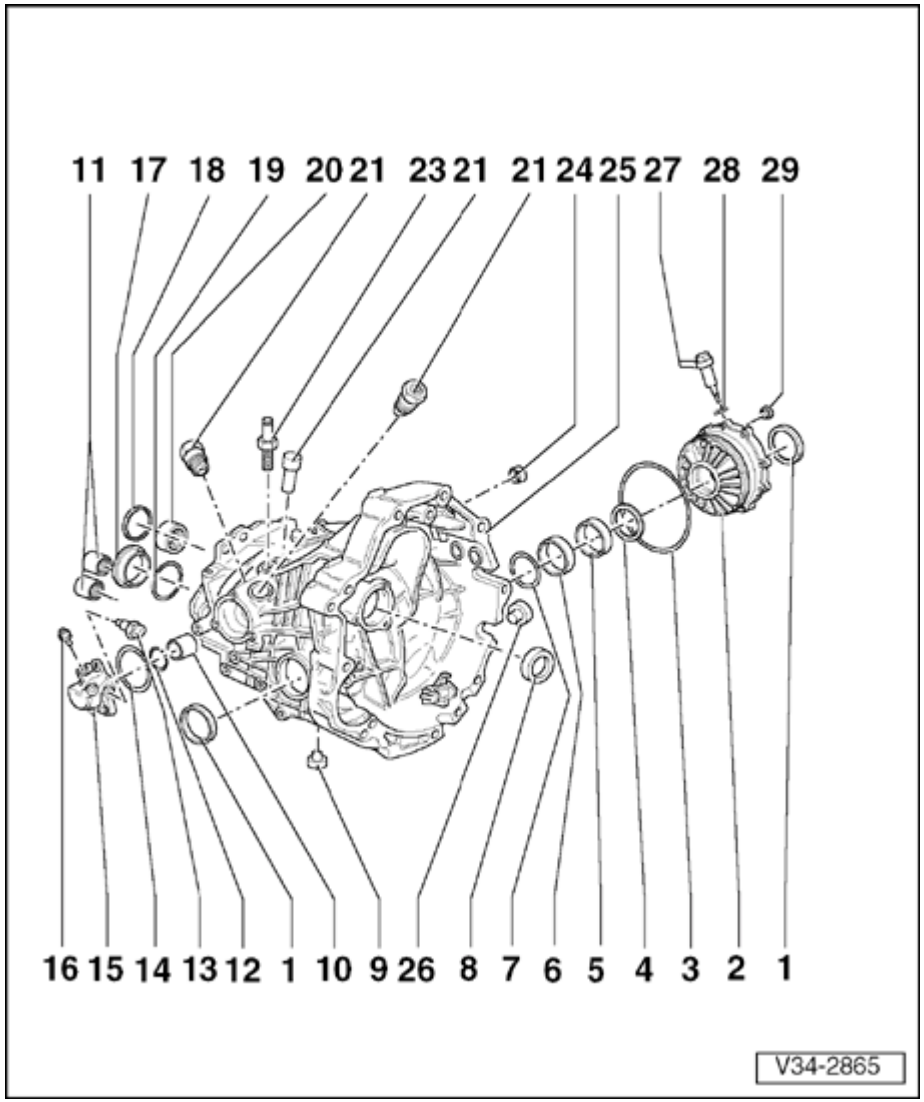
- For input shaft
- Pulling out ⇒ Fig. 13
- Driving in ⇒ Fig. 14
- Measuring insertion depth ⇒ Fig. 15

21 - Locking bolt

- For selector shaft
- Removing ⇒ Page 34-59
- Installing ⇒ Page 34-85
- Tightening torques: For aluminium bolt = 50 Nm, and for steel bolt = 70 Nm

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22 - Breather

- Clip cap on
- For transmission with sleeve insertion depth of sleeve ⇒ Fig. 11
- For transmission with with additional breather hose ⇒ Fig. 12

23 - Trunnion bolt, 40 Nm

- For push rod

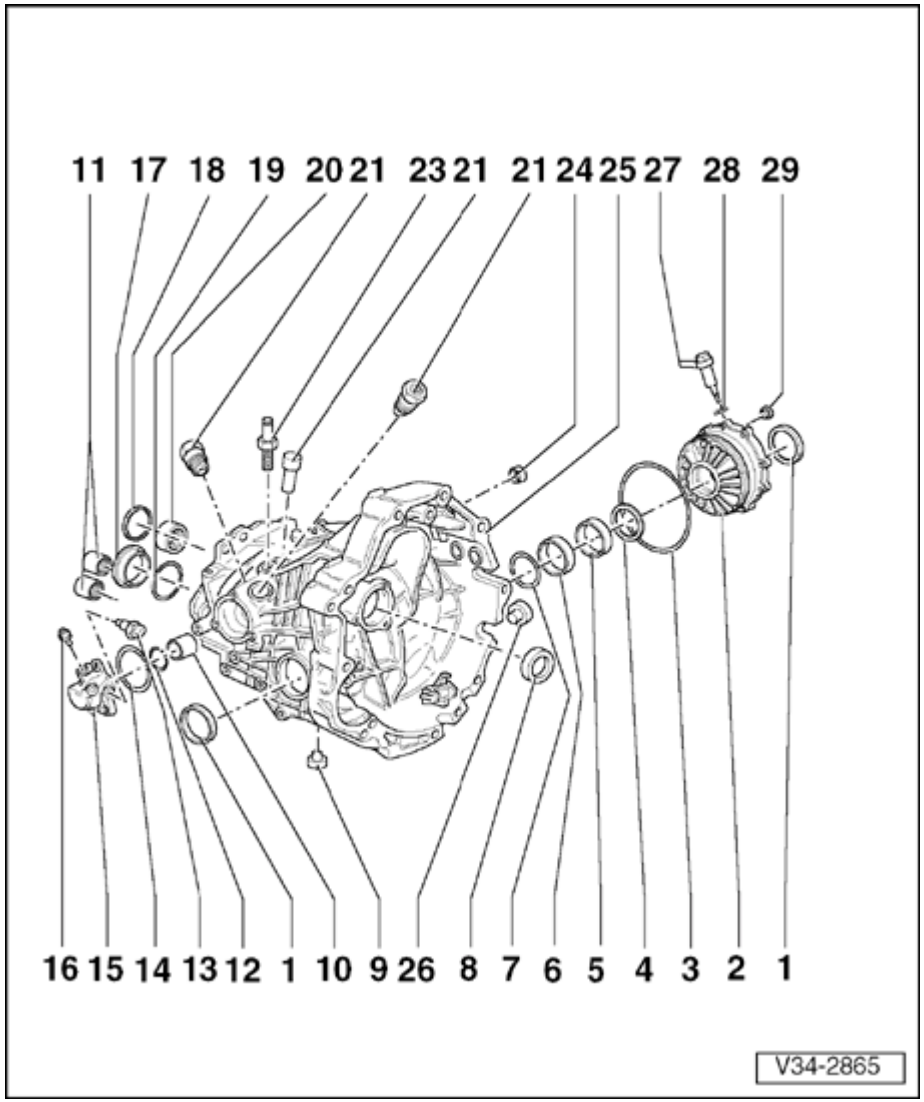
24 - Seal for selector shaft

- Can be replaced when transmission is removed but not disassembled
- Always replace
- Pulling out ⇒ Fig. 8
- Driving in ⇒ Fig. 9
- Always use assembly sleeve for installing ⇒ Fig. 10

25 - Transmission housing [1)]

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26 - Magnet

- Clean
- When replacing transmission housing drive in with e.g. press tool VW 408 A

27 - Sender for speedometer -G22-

- Replacing ⇒ Page 39-4

28 - O-ring

- Always replace

29 - Oil filler plug, 40 Nm

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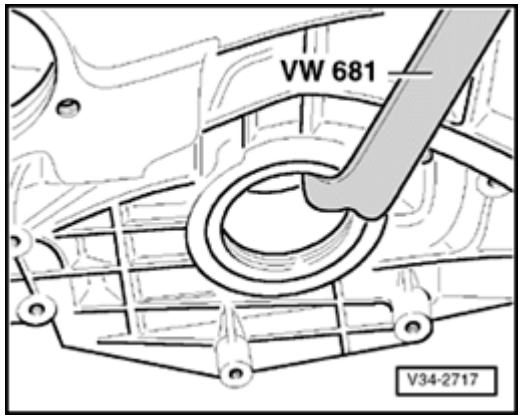


Fig. 1 Pulling out seal for drive flange

Note:

- *Illustrated, removing oil seal on right-hand side.*
- *Procedure for removing oil seal on left and right-hand sides is identical.*

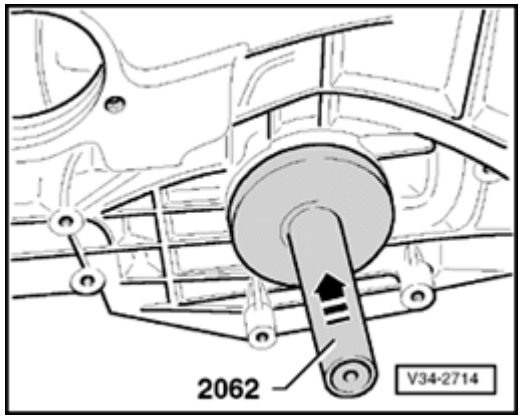


Fig. 2 Driving in seal for drive flange

- Fill space between sealing lip and dust lip with sealing grease G52 128 A1.
- Pressing-in depth (factory): 5.5 mm
- Pressing-in depth when re-installing a used drive flange (repairs): 6.5 mm

Note:

- *Illustrated, installing oil seal on right-hand side.*
- *Procedure for installing oil seal on left and right-hand sides is identical.*

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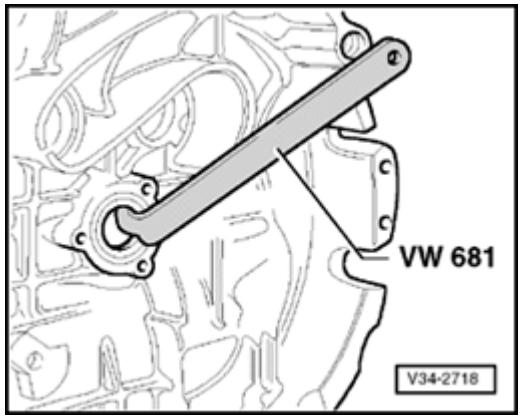


Fig. 3 Prying out seal for input shaft when transmission is dismantled

- Pry out seal carefully with VW 681.

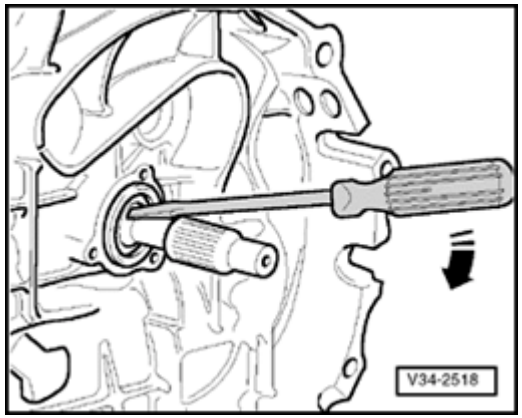


Fig. 4 Removing seal for input shaft when transmission is not dismantled

- Pry out seal carefully with a screwdriver.

Note:

Do not damage bearing surface on input shaft for shaft seal.

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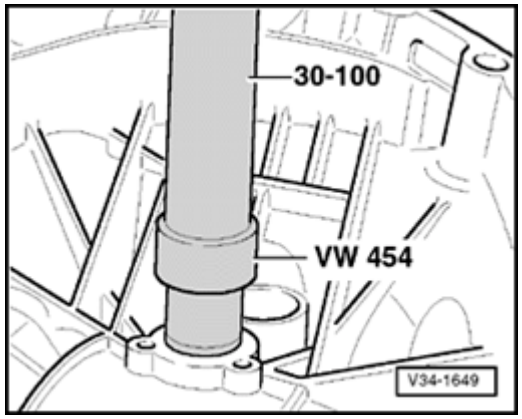


Fig. 5 Driving in seal for input shaft

- Fill space between sealing lip and dust lip of new seal for input shaft with sealing grease G52 128 A1.
- Fit a thin protective hose tightly over splines of input shaft.
- Drive in seal for input shaft.
  - ♦ Pressing-in depth (factory): 3.5 mm
  - ♦ Pressing-in depth when re-installing a used input shaft (repairs): 4.5 mm
- Remove protective hose.

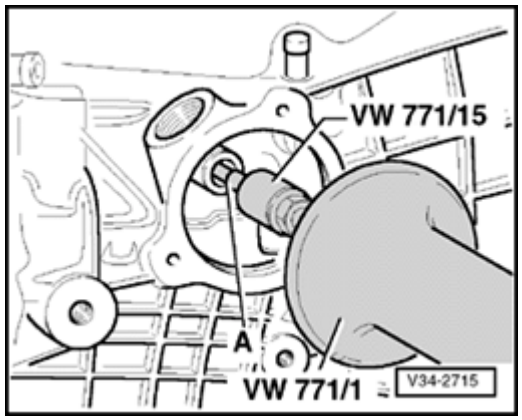


Fig. 6 Pulling out ball sleeve

- Remove circlip.

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

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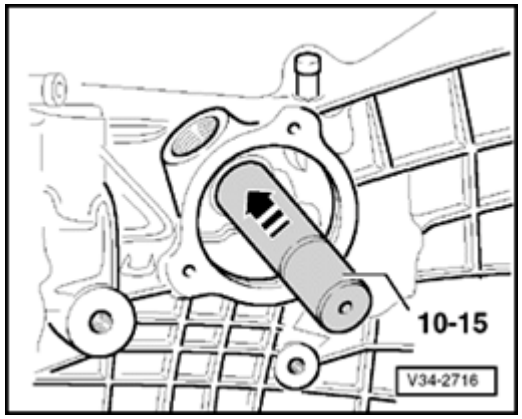


Fig. 7 Driving in ball sleeve

- Drive in onto stop.

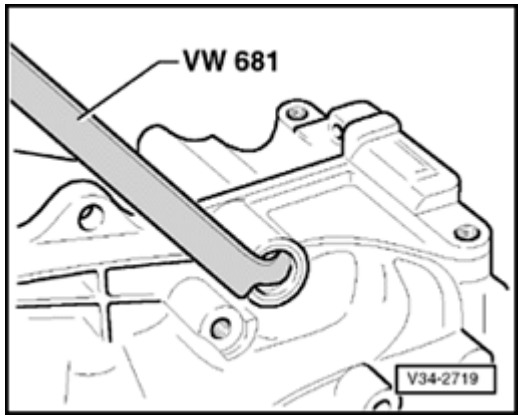


Fig. 8 Pulling out seal for selector shaft

Note:

With transmission removed but not disassembled, carefully pry out seal without damaging the shaft with a screwdriver.

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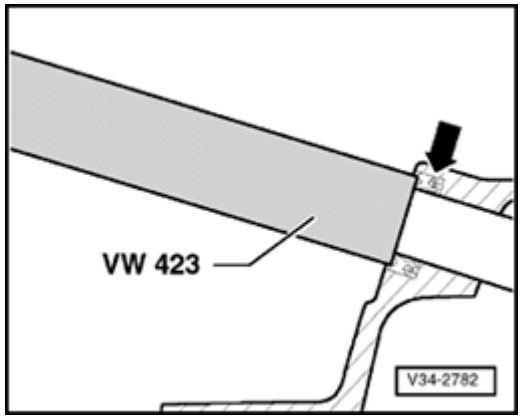


Fig. 9 Driving in seal for selector shaft

- Selector shaft installed or removed

- Fill space between sealing lip and dust lip with sealing grease G52 128 A1.
- Pull assembly sleeve onto selector shaft ⇒ Fig. 10 .
- Drive seal into housing onto stop.

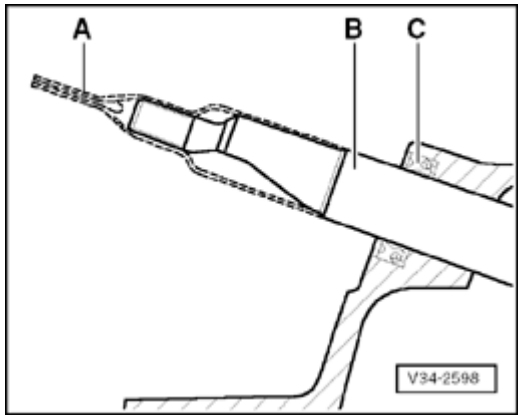


Fig. 10 Installing seal and selector shaft with assembly sleeve

- To avoid damaging seal -C- always use assembly sleeve -A-, Part No. 01E 311 120, to install seal or selector shaft.

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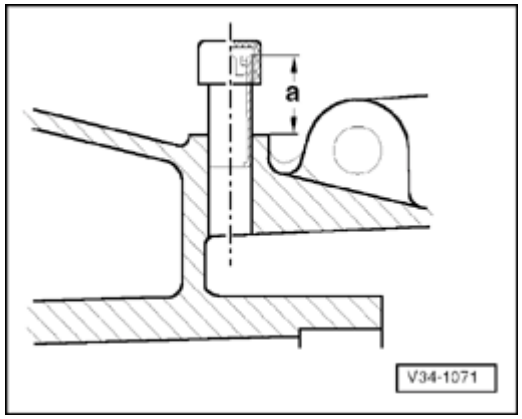


Fig. 11 Insertion depth of breather sleeve for transmissions without breather hose

- Dimension a = 21 mm

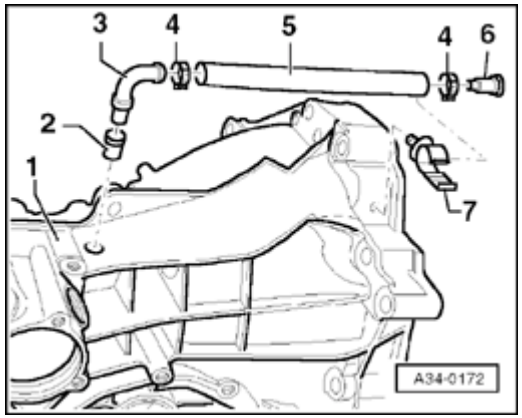


Fig. 12 Breather for transmission with breather hose

1 - Transmission

2 - Sleeve: drive in onto stop

3 - Pipe: drive in onto stop

4 - Clamp

5 - Hose

6 - Breather pipe

7 - Retaining clip

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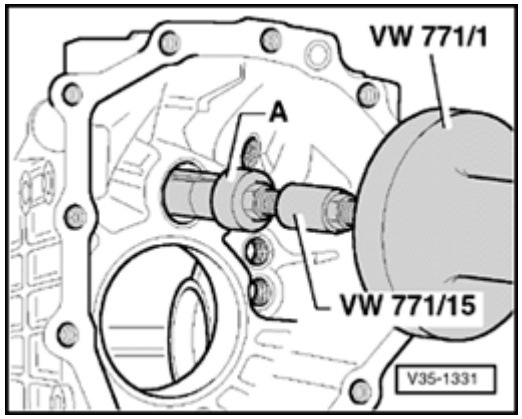


Fig. 13 Pulling needle bearing out of transmission housing

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

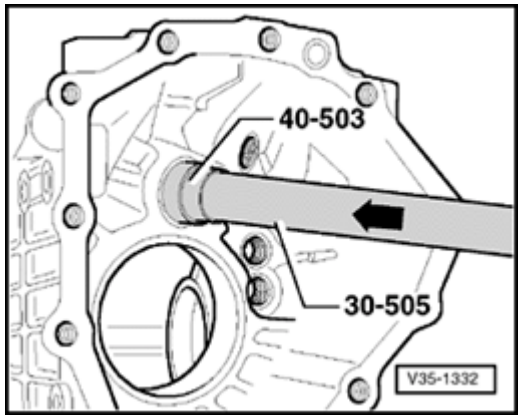


Fig. 14 Driving needle bearing into transmission housing

- Installation position: inscription on bearing faces tool
- Insertion depth ⇒ Fig. 15

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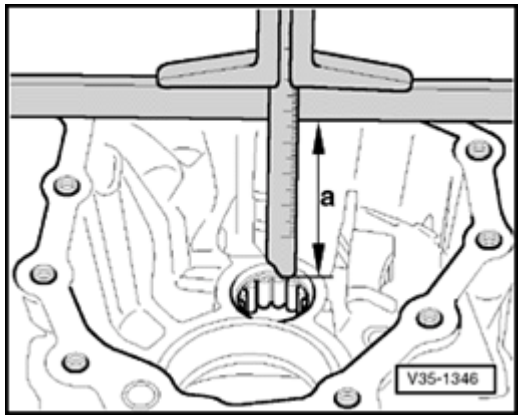


Fig. 15 Insertion depth of needle bearing

Dimension a = 105 mm

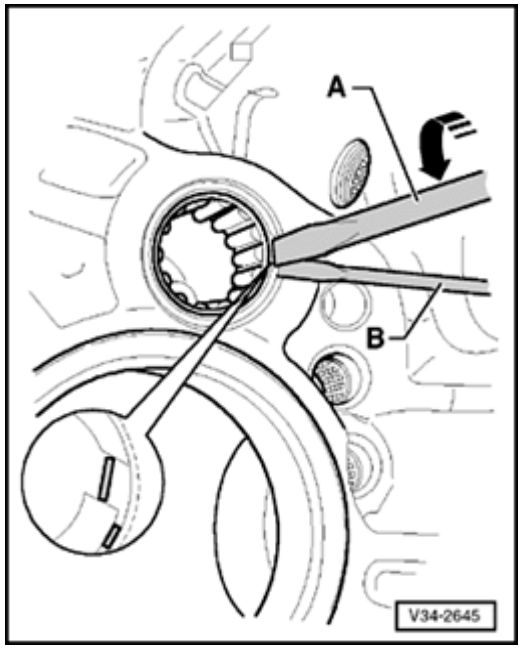


Fig. 16 Removing circlip

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

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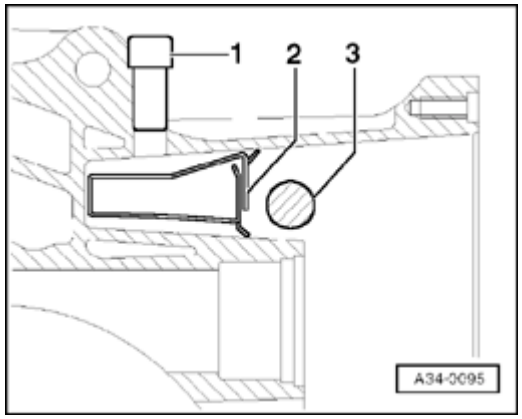


Fig. 17 Installation position of oil baffle plate for transmission DSY

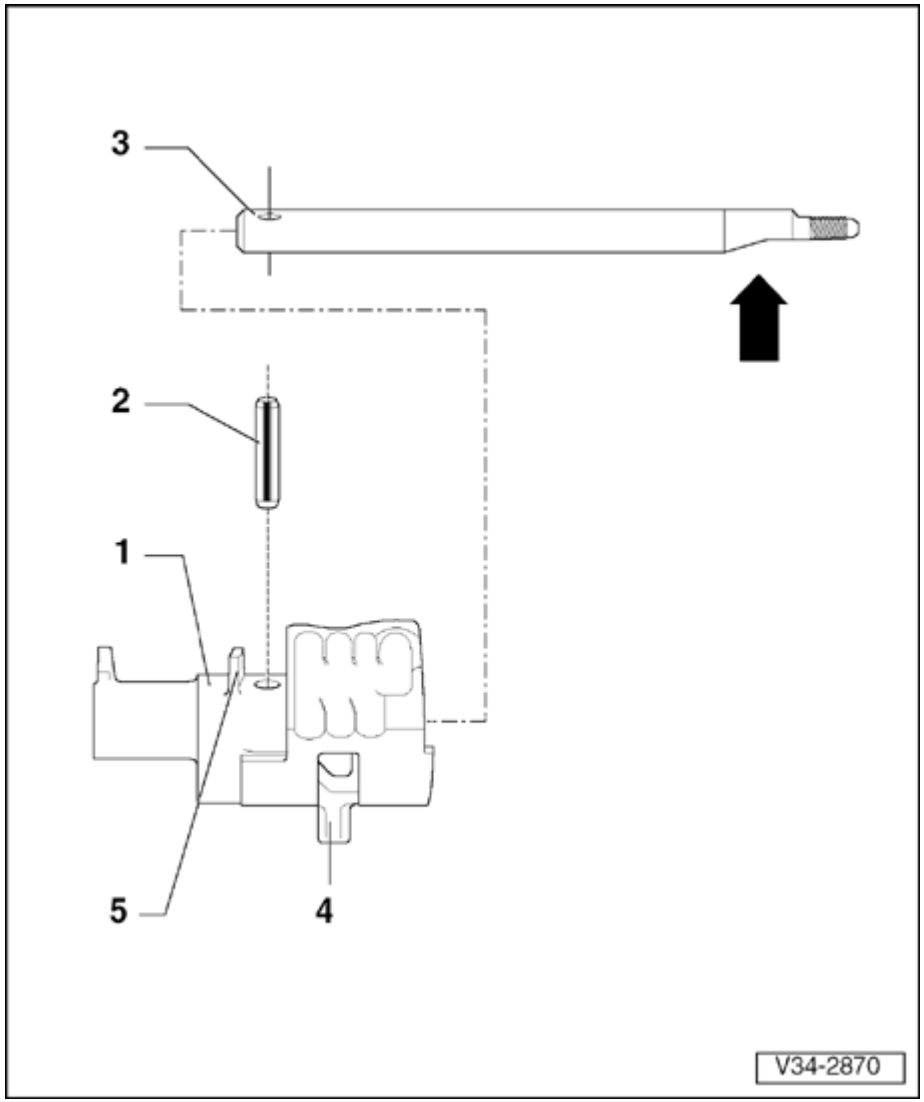
1 - Breather

2 - Oil baffle plate

3 - Selector shaft

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Selector shaft (complete), disassembling and assembling

1 - Selector cylinder

2 - Roll pin

- Drive out and drive in flush ⇒ Fig. 1

3 - Selector shaft

- Driving out ⇒ Fig. 2
- Driving in ⇒ Fig. 3
- Installation position: flat (arrow) and selector finger - 4 - face in same direction

4 - Selector finger

- Observe installation position to - 3 -

5 - Cam for reversing light switch

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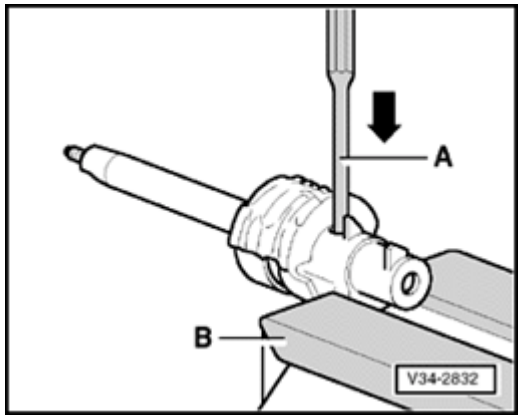


Fig. 1 Driving out and driving in roll pin flush

A - Drift

B - Vice clamps

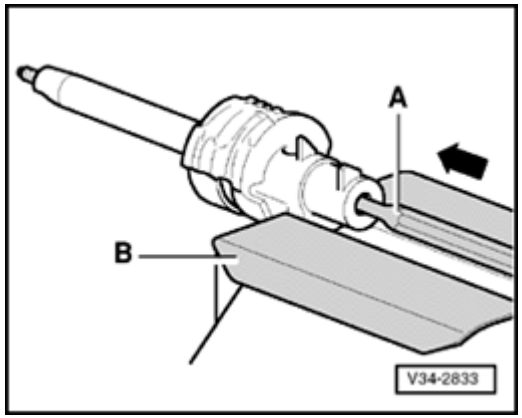


Fig. 2 Driving out selector shaft

A - Drift

B - Vice clamps

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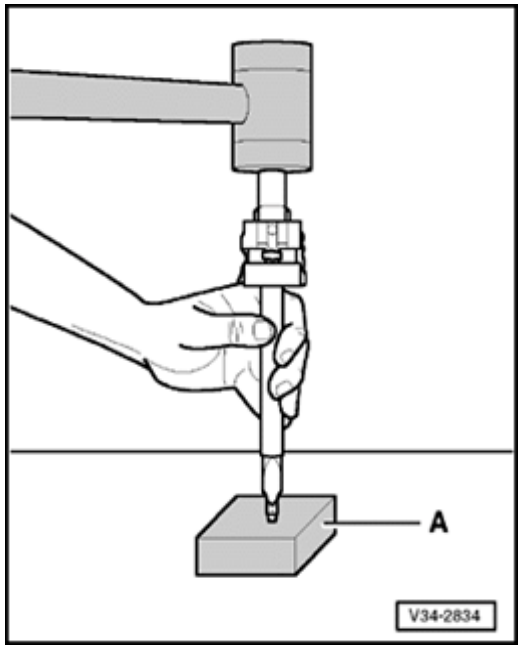


Fig. 3 Driving in selector shaft

A - Wooden block

Note:

- *Bring holes into alignment.*
- *Flat on selector shaft and selector finger point in same direction.*

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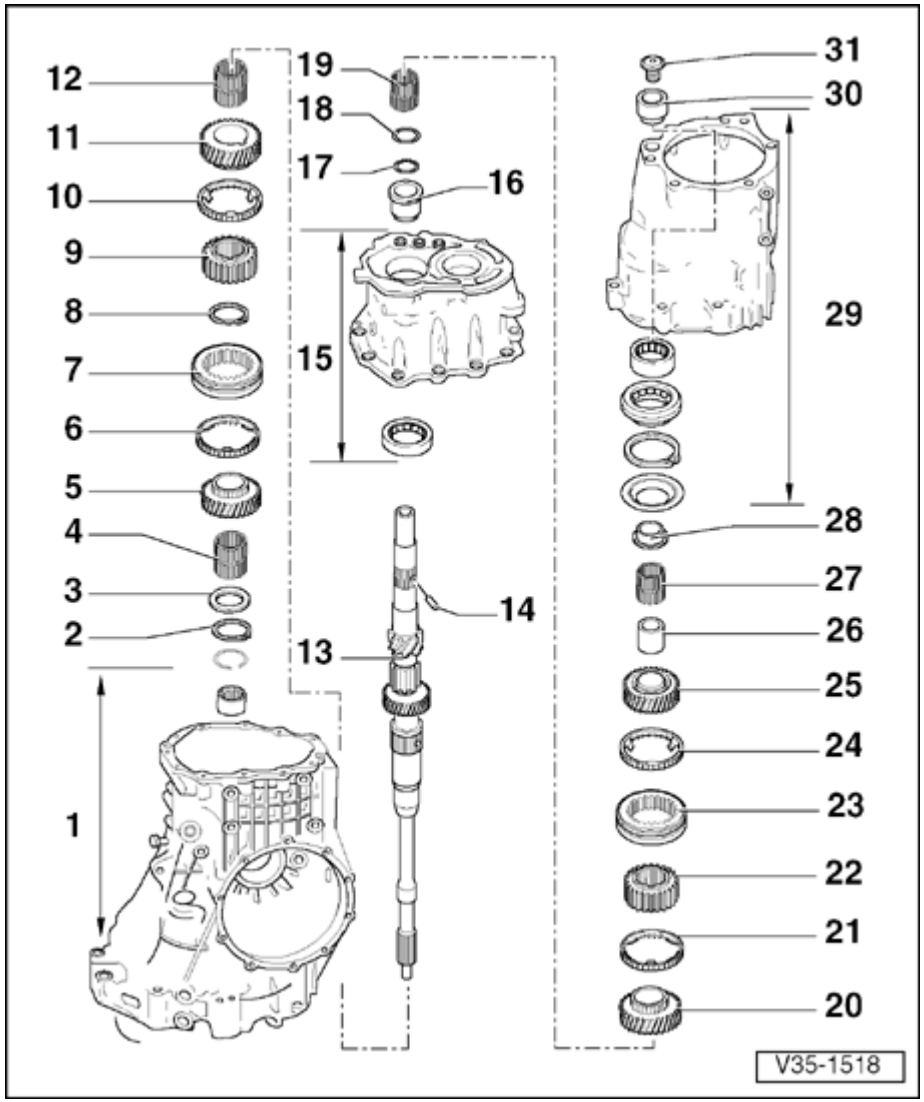
Input shaft, disassembling and assembling

Special tools, testers and auxiliary items required:

- Thrust plate VW 401
- Press tool VW 412
- Tube VW 519
- Feeler gauge

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35-2



Note:

When installing new gears ⇒ Page 00-3 , Technical data

1 - Gearbox housing

- Servicing ⇒ Page 34-127

2 - Circlip

3 - Thrust washer

4 - Needle bearing for 4th gear

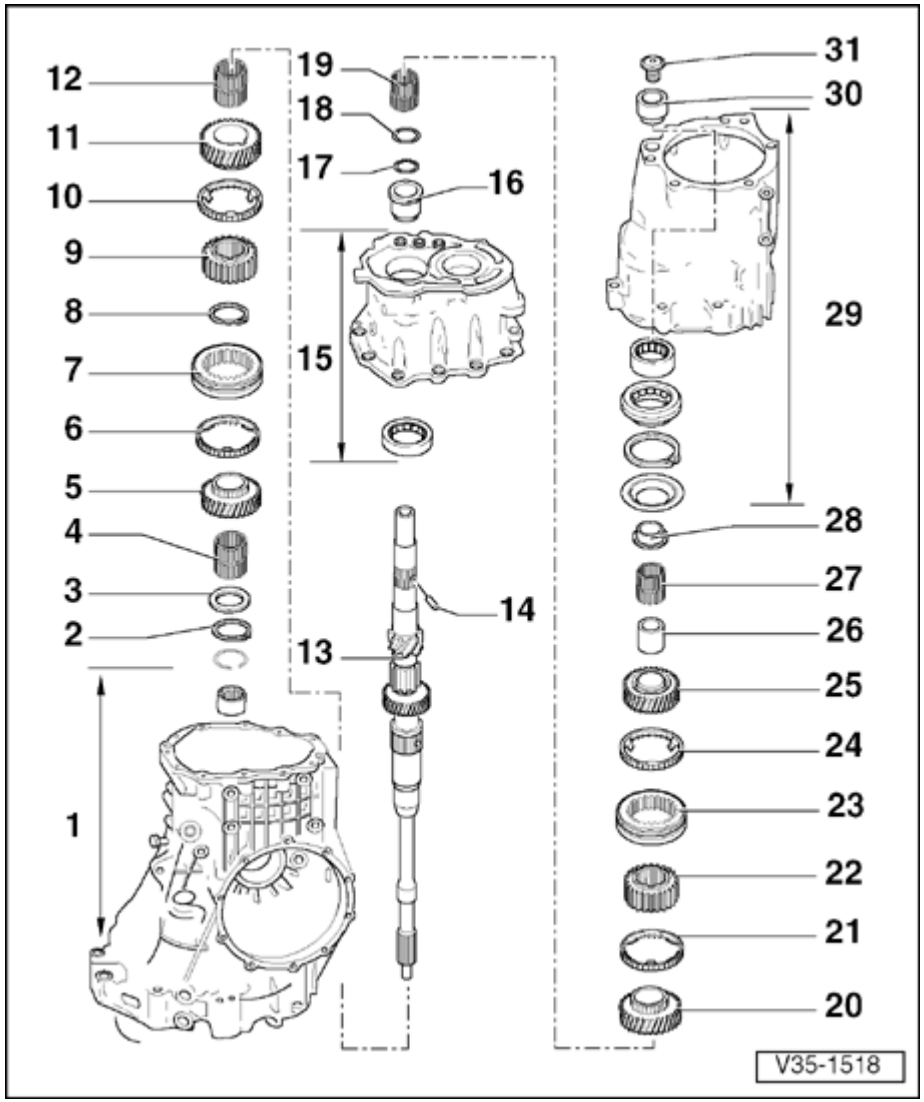
- Mark before removing
- Do not interchange with needle bearing for 3rd gear
- Oil with gear oil before installing

5 - 4th speed sliding gear

- Before installing, insert spring ⇒ Fig. 1
- After installing, check axial clearance with a feeler gauge (0.15-0.35 mm)

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6 - Synchro-ring for 4th gear

- Check for wear ⇒ Fig. 2

7 - Locking collar

- Paired with synchro-hub
- Mark before removing ⇒ Page 34-63

8 - Circlip

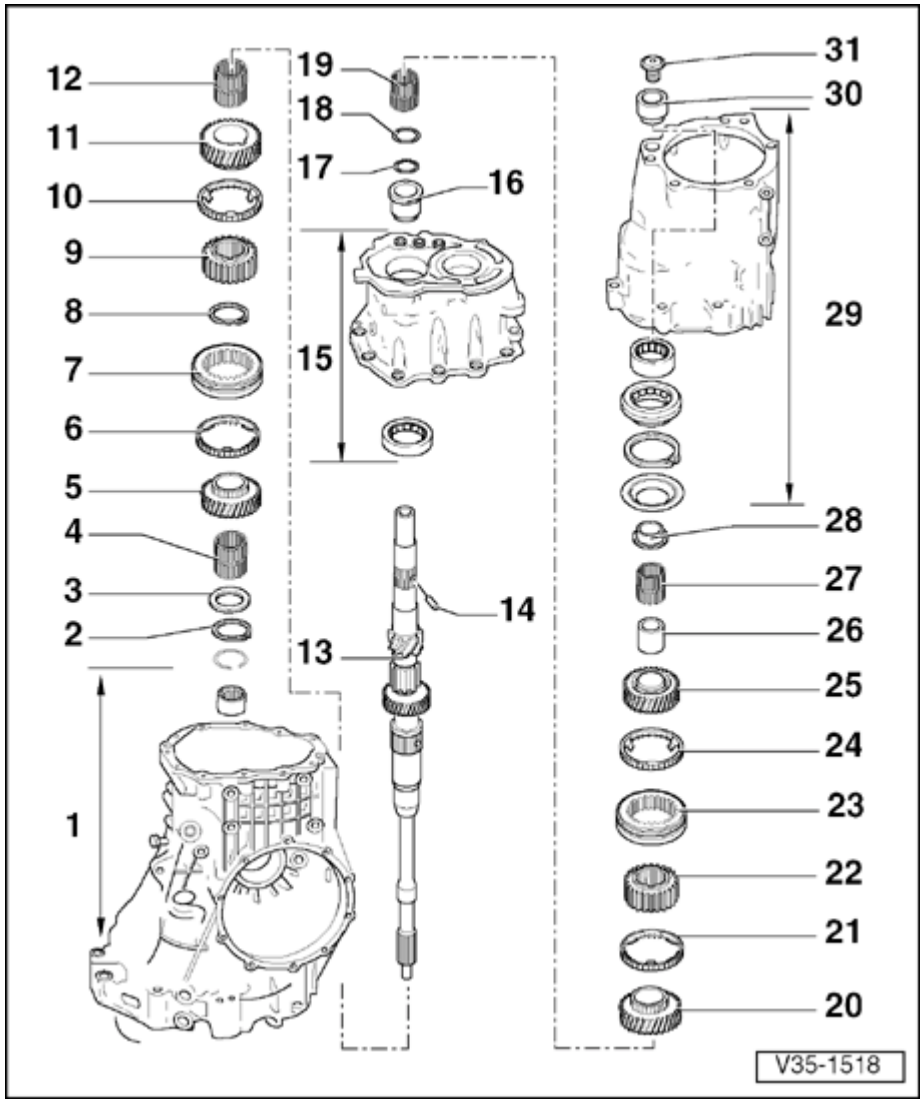
- Re-determine thickness when replacing synchro-hub ⇒ Fig. 3
- Installation position: ends align with groove of synchro-hub

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

- Pressing off ⇒ Fig. 4
- Installation position ⇒ Fig. 5
- Pressing on ⇒ Fig. 6

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10 - Synchro-ring for 3rd gear

- Coated with molybdenum
- Check for wear ⇒ Fig. 2

11 - 3rd speed sliding gear

- Before installing, insert spring ⇒ Fig. 1
- After pressing on -item 9 -, check axial clearance with a feeler gauge (0.15-0.35 mm)

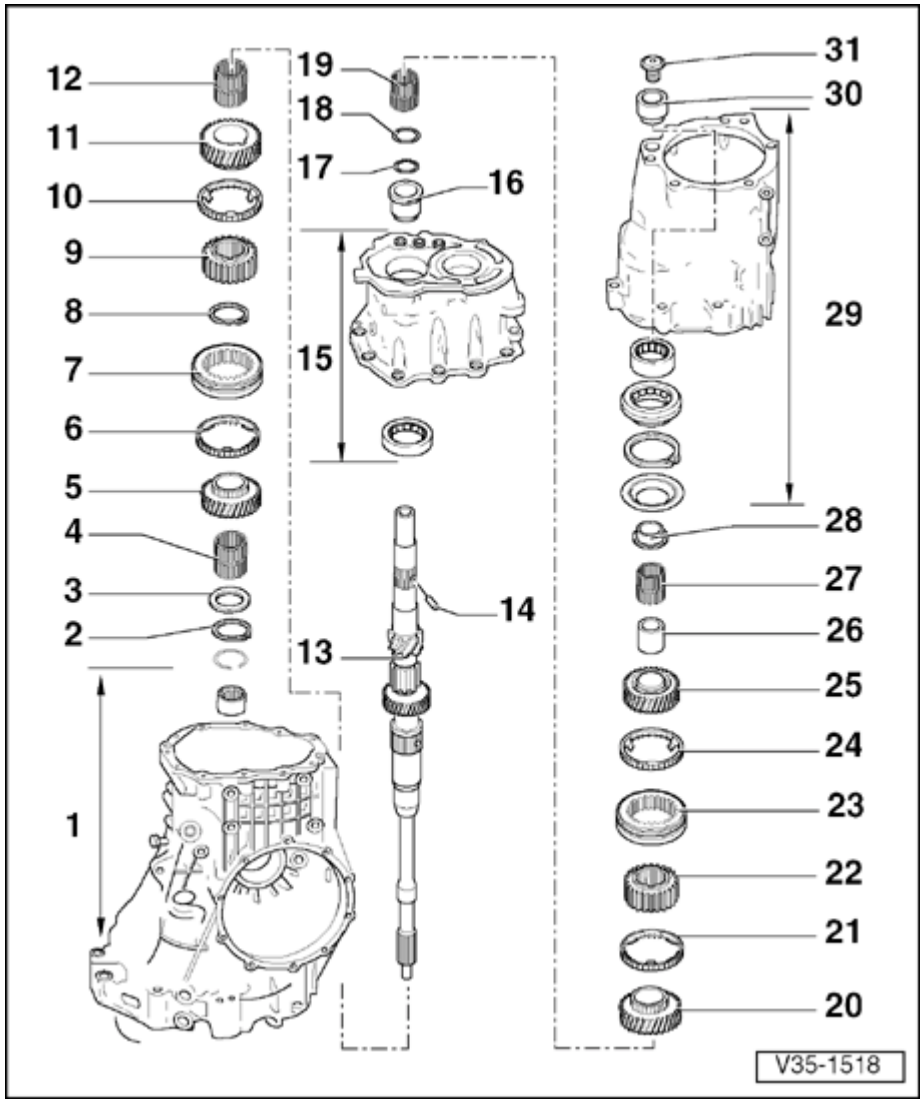
12 - Needle bearing for 3rd gear

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

13 - Input shaft

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14 - Spring pin

- Drive in when replacing input shaft ⇒ Fig. 7

15 - Bearing plate

- Servicing ⇒ Page 34-112

16 - Inner race for cylinder roller bearing

- Take off and fit by hand

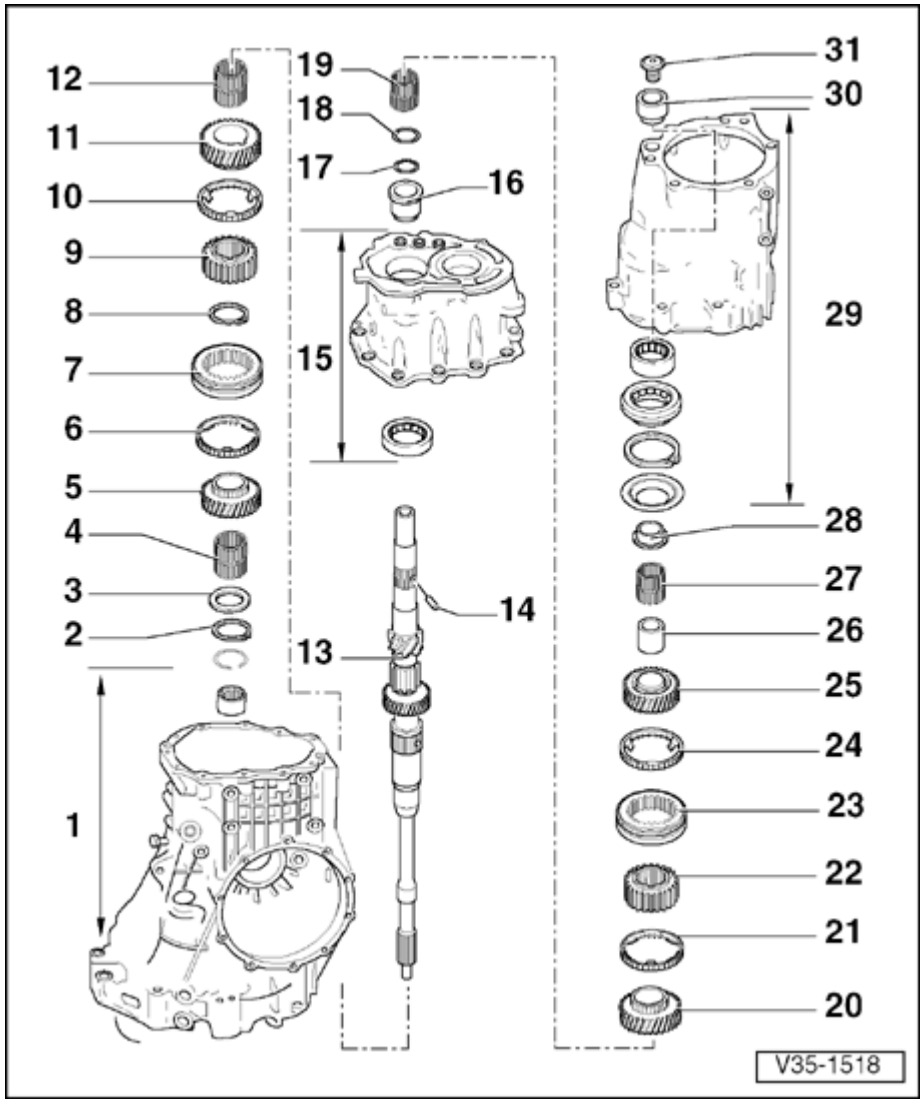
17 - Circlip

18 - Thrust washer for needle bearing for 6th gear

- Installation position: shoulder towards circlip, smooth contact surface towards needle bearing ⇒ Page 34-75

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19 - Needle bearing for 6th gear

- Oil with gear oil before installing

20 - 6th speed sliding gear

- Before installing, insert spring ⇒ Fig. 1
- After installing, check axial clearance with a feeler gauge (0.15-0.35 mm)

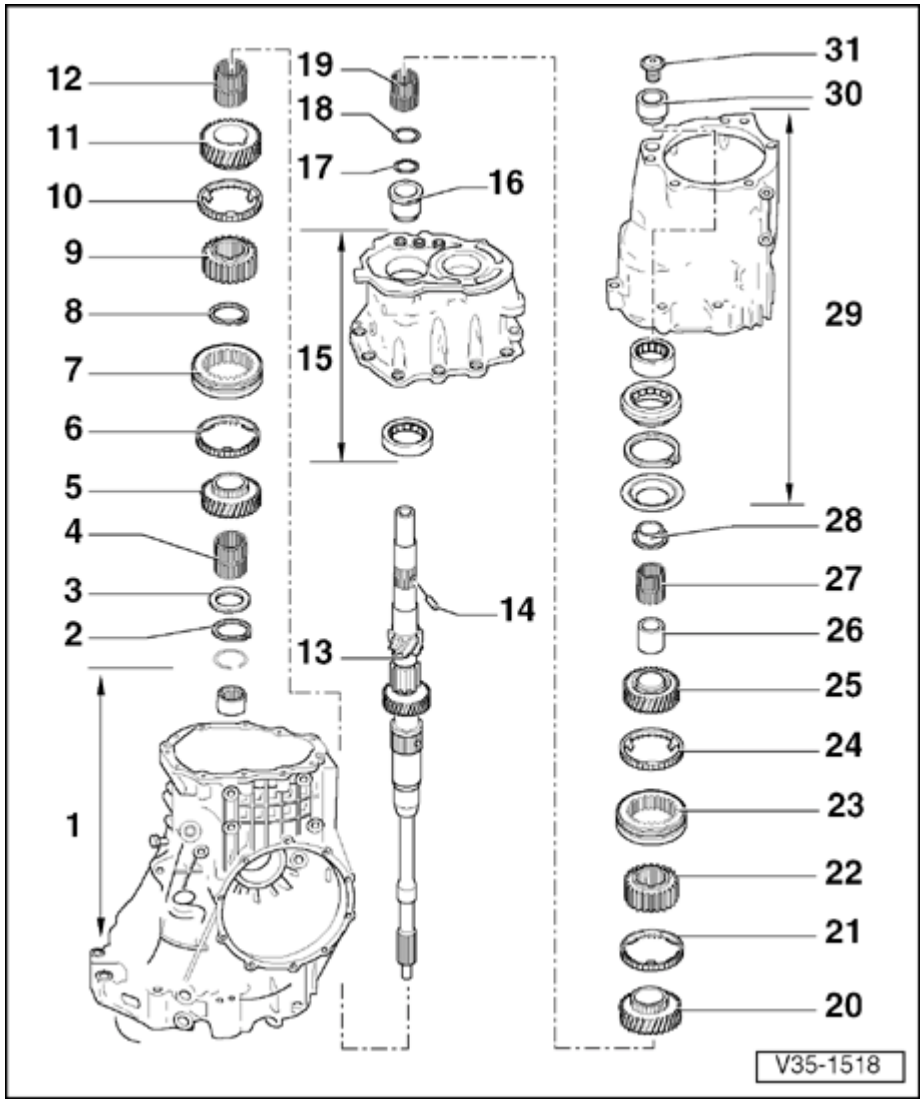
21 - Synchro-ring for 6th gear

- Check for wear ⇒ Fig. 2

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

- Pulling off ⇒ Page 34-64
- Driving on ⇒ Page 34-76
- Installation position: projecting hub towards 5th speed sliding gear

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23 - Locking collar

- Paired with synchro-hub
- Mark before removing ⇒ Page 34-63

24 - Synchro-ring for 5th gear

- Checking for wear ⇒ Fig. 2

25 - 5th speed sliding gear

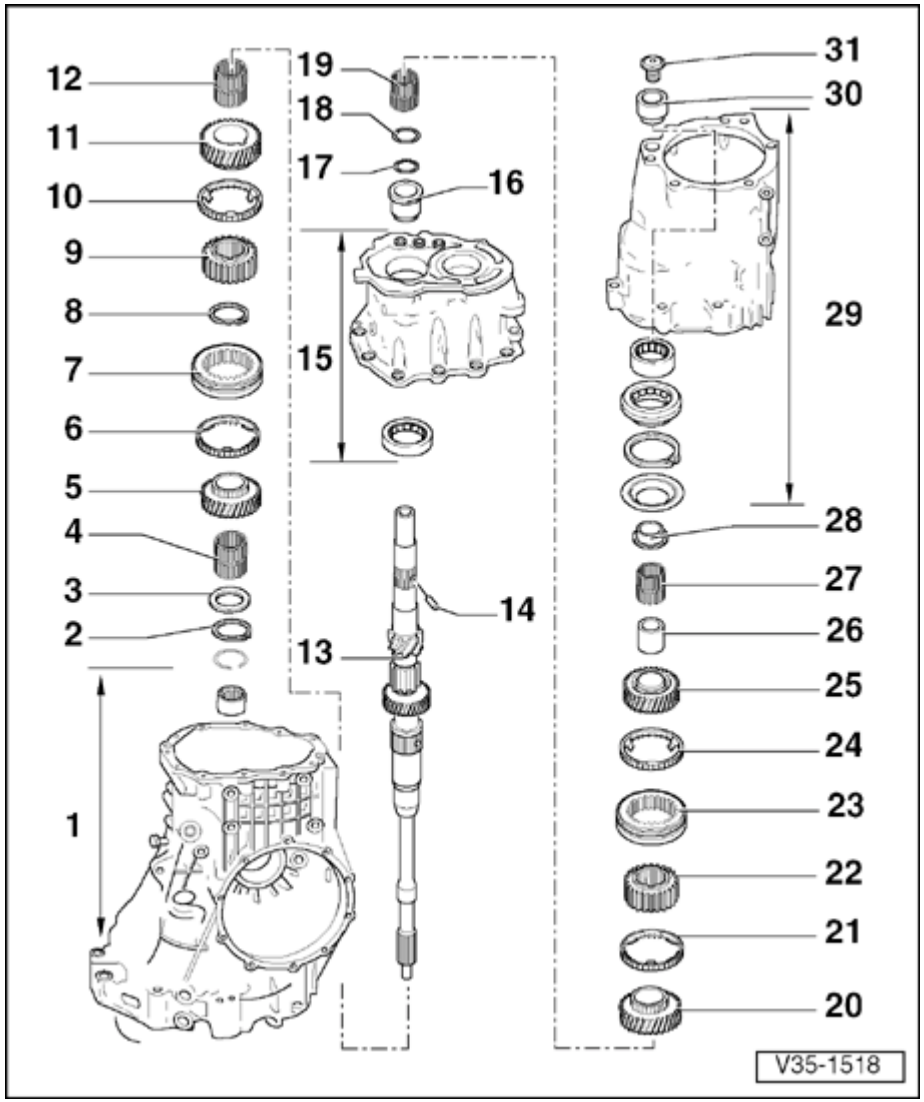
- Before installing, insert spring ⇒ Fig. 1
- After installing, check axial clearance ⇒ Page 34-81

26 - Inner race for 5th speed sliding gear

- Pulling off ⇒ Page 34-64
- Driving on ⇒ Page 34-81

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27 - Needle bearing for 5th gear

- Oil with gear oil before installing

28 - 1st inner race for tapered roller bearing for input shaft

- Pulling off ⇒ Page 34-61
- Driving on ⇒ Page 34-81

29 - End cover

- Servicing ⇒ Page 34-103

30 - 2nd inner race for tapered roller bearing for input shaft

- Pulling off ⇒ Page 34-61
- Driving on ⇒ Page 34-82

31 - Multi-point socket head bolt, 150 Nm

- Loosening and tightening ⇒ Page 34-60

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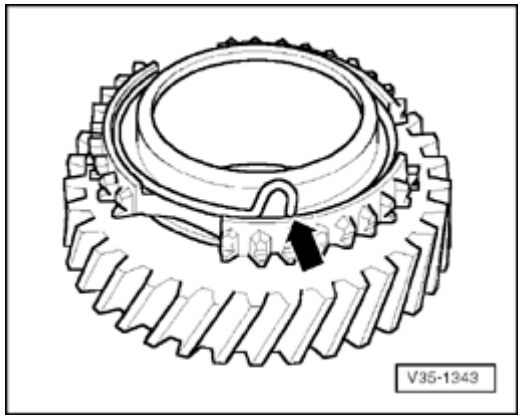


Fig. 1 Inserting spring in sliding gear

- Insert spring (arrow) in sliding gear, hook angled end into hole.

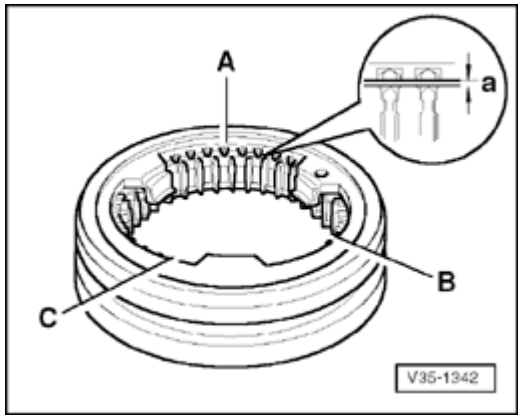


Fig. 2 Checking synchro-ring for wear

- Press synchro-ring into locking collar and measure gap "a" with a feeler gauge at positions -A-, -B- and -C-.
- Add together results and divide by three.
  - ♦ The figure calculated must not be less than 0.5 mm

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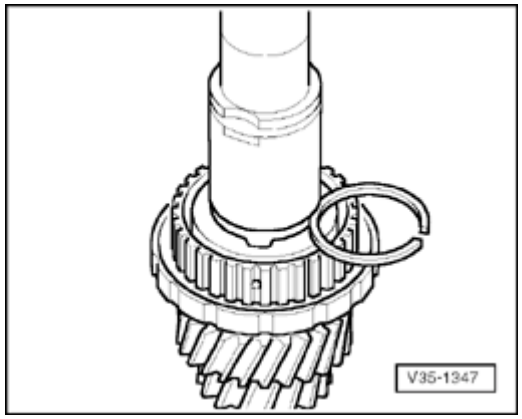


Fig. 3 Re-determining thickness of circlip

- Press synchro-hub onto stop.

Note:

Note installation position when pressing on ⇒ Fig. 5 .

- Determine thickest circlip that can still just be fitted.

Note:

The opening of the circlip must align with the groove in the synchro-hub.

- Determine circlip from table.

⇒ *Parts catalog*

Circlips available

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

- Fit circlip.

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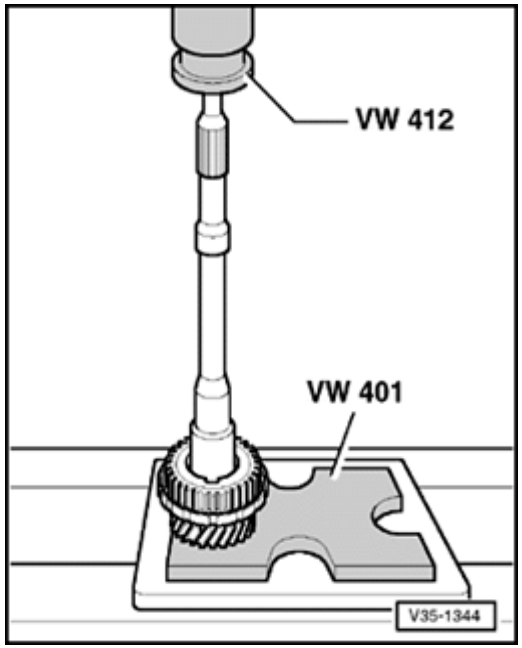


Fig. 4 Pressing off synchro-hub for 3rd and 4th gear

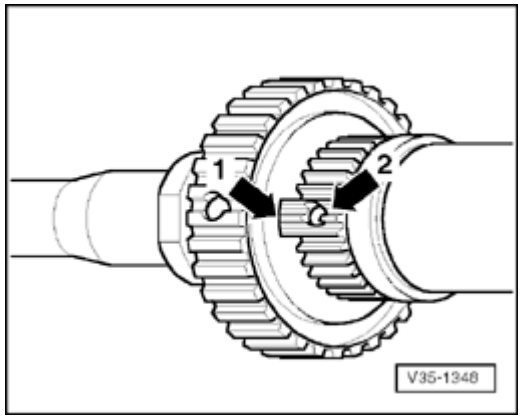


Fig. 5 Synchro-hub installation position

- Oil groove in synchro hub (arrow -1-) must align with oil drilling -arrow 2- in input shaft

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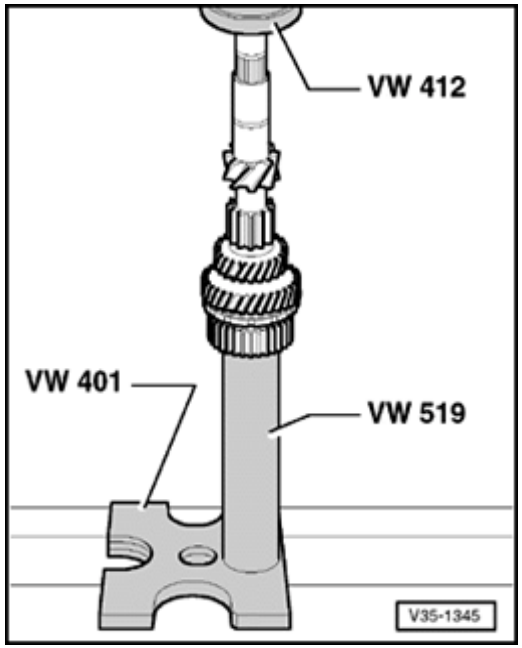


Fig. 6 Pressing on synchro-hub for 3rd and 4th gear

- Heat synchro-hub to approx. 100 ° C, fit and press home.
- Fit circlip.

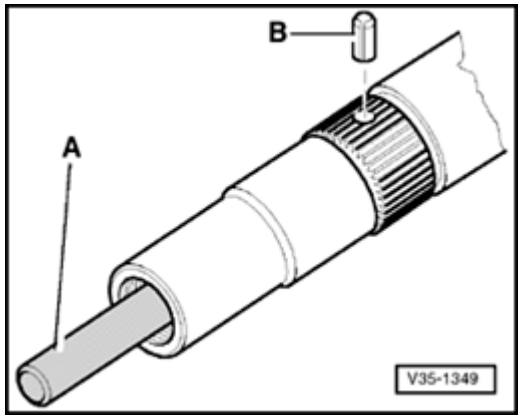


Fig. 7 Driving spring pin into input shaft

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

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Drive pinion and hollow shaft, disassembling and assembling

Special tools, testers and auxiliary items required:

- Multi-purpose tool 771/1 with attachment 771/15
- Installing sleeve 2003/3
- Punch 3013
- Thrust pad 3062
- Thrust piece 3118
- Drift 3138
- Drift VW 295
- Thrust plate VW 401
- Thrust plate VW 402

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- Press tool VW 407
- Press tool VW 411

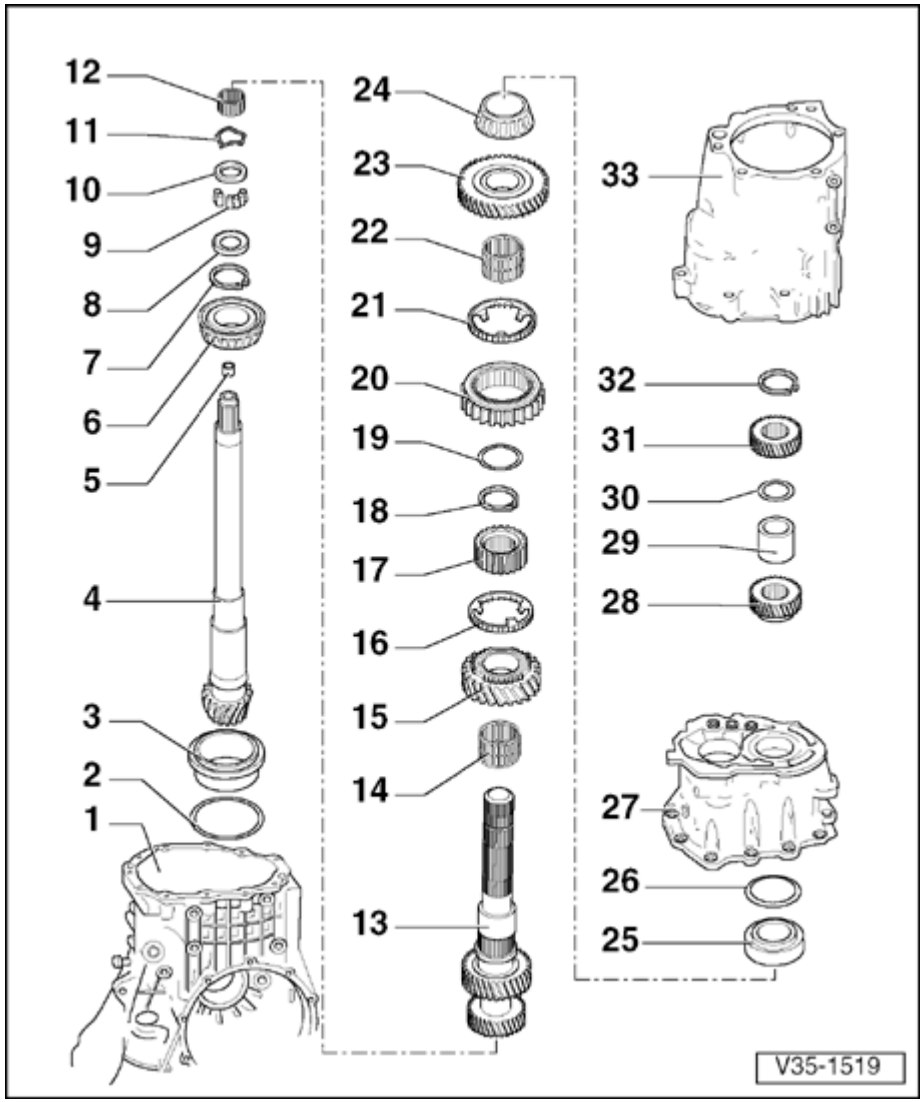
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- Press tool VW 412
- Tube VW 415a
- Support rails VW 457
- Separating device 22-115 mm (e.g. Kukko 17/2)
- Internal puller 12-14.5 mm (e.g. Kukko 22/1)
- Hot air blower V.A.G 1416

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Note:

- *When installing new gears or final drive set ⇒ Page 00-3 , Technical data*
- *Adjustments are required when replacing components marked 1) ⇒ Page 39-37 , Adjustment overview*

1 - Gearbox housing

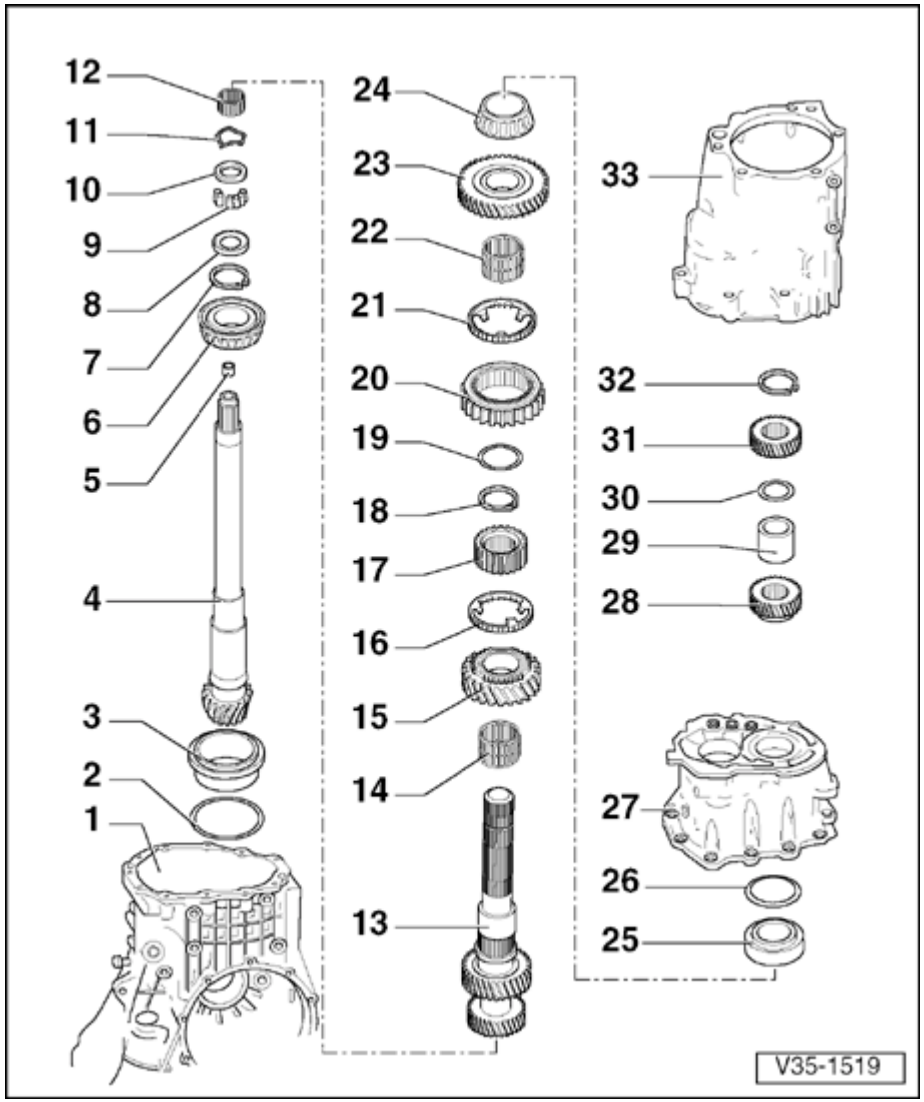
- Servicing ⇒ Page 34-127

2 - Shim "S3"

- Adjustment overview ⇒ Page 39-37

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3 - Outer race for large tapered roller bearing 1)

- Pulling out ⇒ Fig. 1
- Pressing in ⇒ Fig. 2 and ⇒ Fig. 3

4 - Drive pinion 1)

- Paired with ring gear (final drive set)

5 - Needle bearing for flange shaft/drive pinion

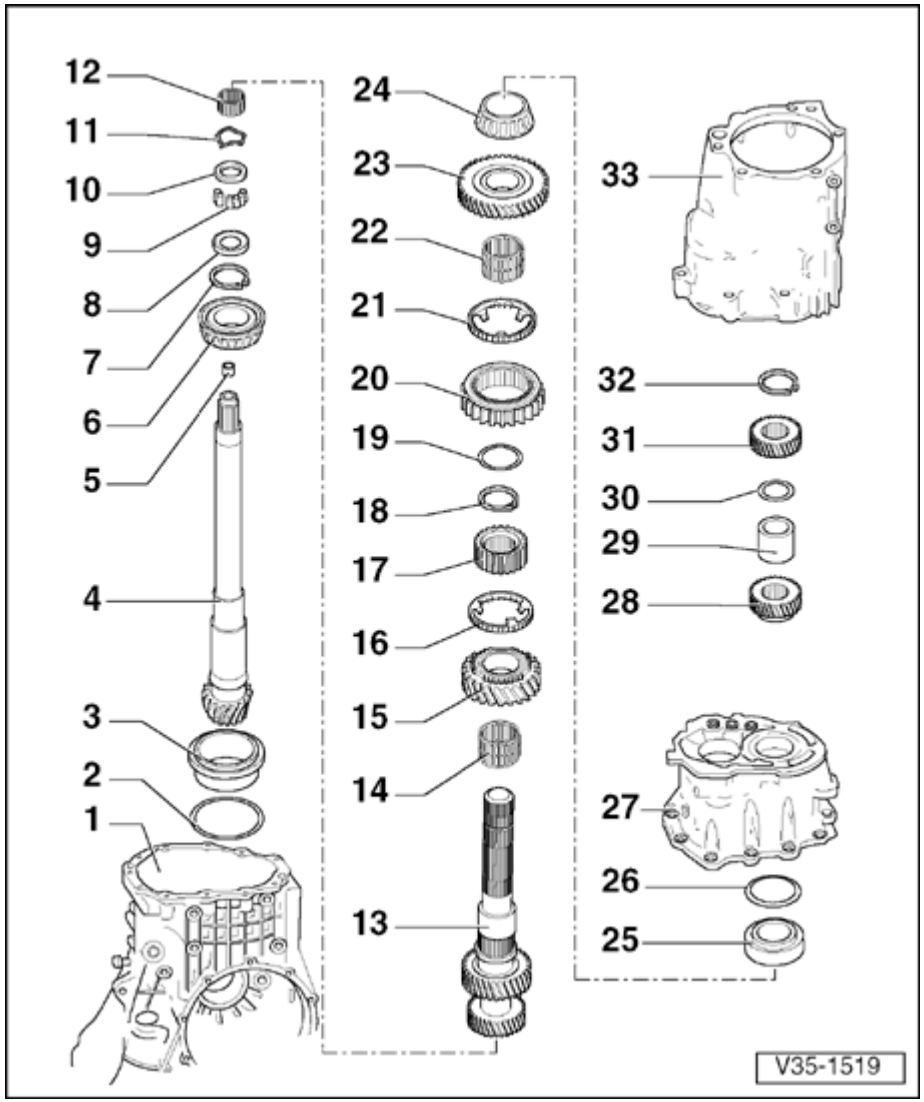
- Pulling out ⇒ Fig. 4
- Driving in ⇒ Fig. 5

6 - Inner race for large tapered roller bearing 1)

- Pressing off ⇒ Fig. 6
- Pressing on ⇒ Fig. 7
- Low-friction bearing; do not oil when measuring friction torque

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7 - Circlip

- Re-determining ⇒ Fig. 8

8 - Flange ring

- Installation position ⇒ Page 34-68

9 - Tapered rollers

- Qty. 23
- Installation position ⇒ Page 34-68

10 - Support ring

- Installation position ⇒ Page 34-68

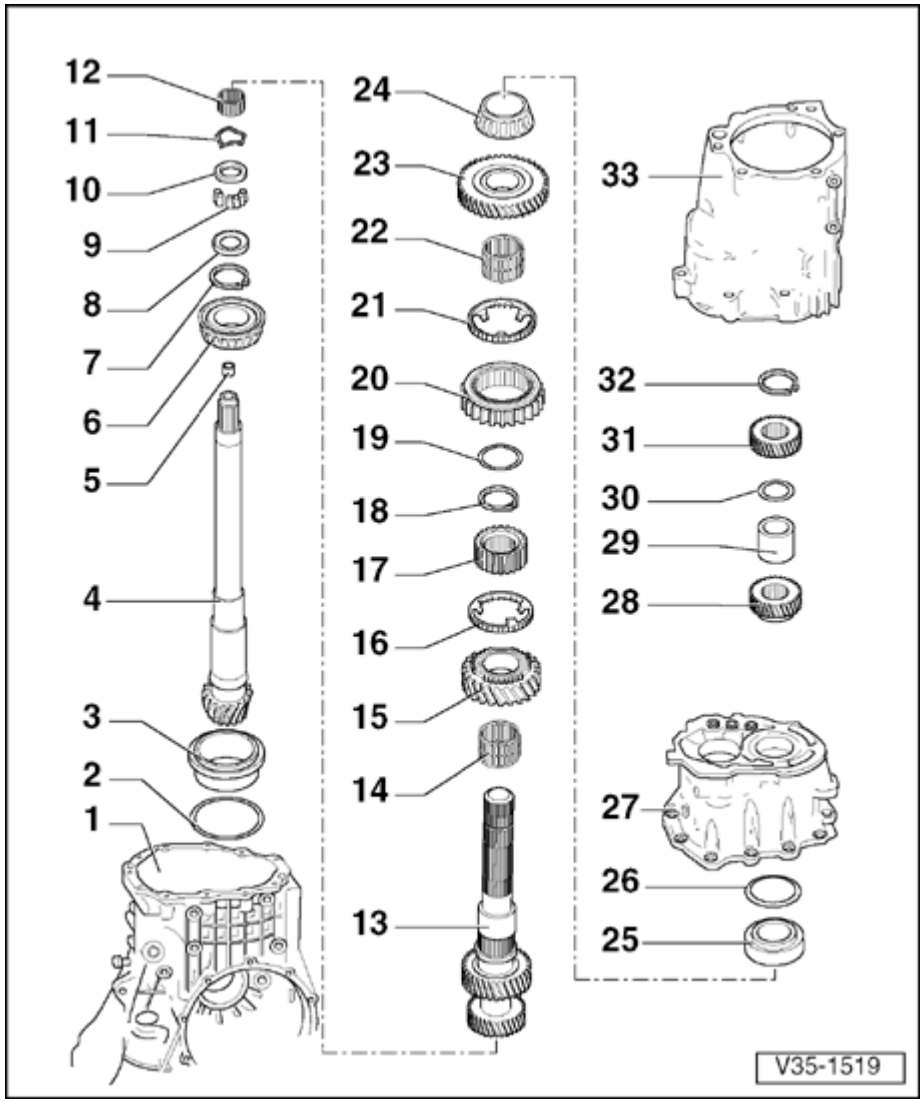
11 - Corrugated spring

12 - Needle bearing for drive pinion/hollow shaft

- Oil before installing

13 - Hollow shaft with 3rd and 4th speed gears 1)

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14 - Needle bearing for 2nd speed sliding gear

- Split
- Oil with gear oil before installing

15 - 2nd speed sliding gear

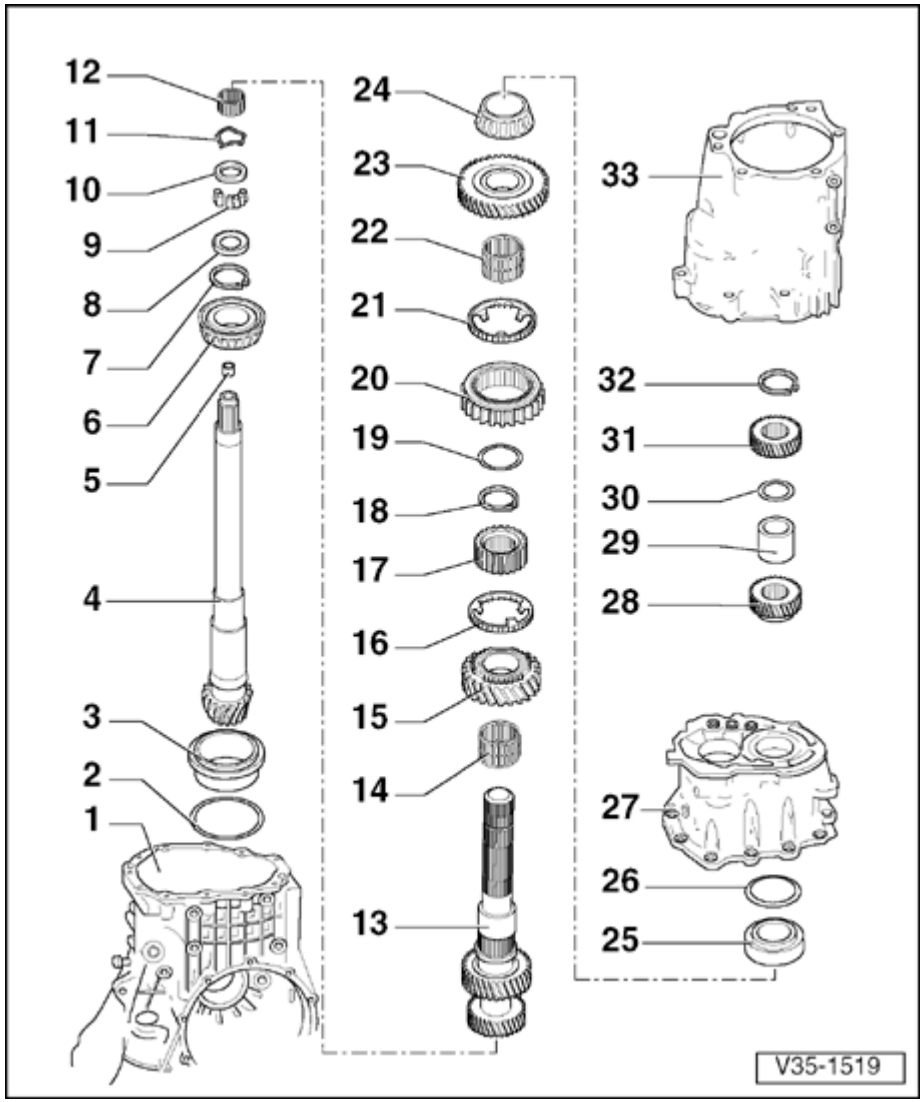
- Pressing off ⇒ Fig. 12
- Before installing, fit spring and slide needle bearing onto hollow shaft
- After installing, check axial clearance with a feeler gauge (0.15-0.35 mm)

16 - Synchro-ring for 2nd gear

- Coated with Molybdenum
- Checking for wear ⇒ Fig. 2 , ⇒ Page 35-9

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

- Pressing off ⇒ Fig. 12
- Pressing on ⇒ Fig. 13
- Installation position: flush hub towards 2nd speed sliding gear

18 - Circlip

- Removing and installing ⇒ Fig. 11
- Re-determining ⇒ Fig. 8

19 - Washer

- Removing and installing ⇒ Fig. 11

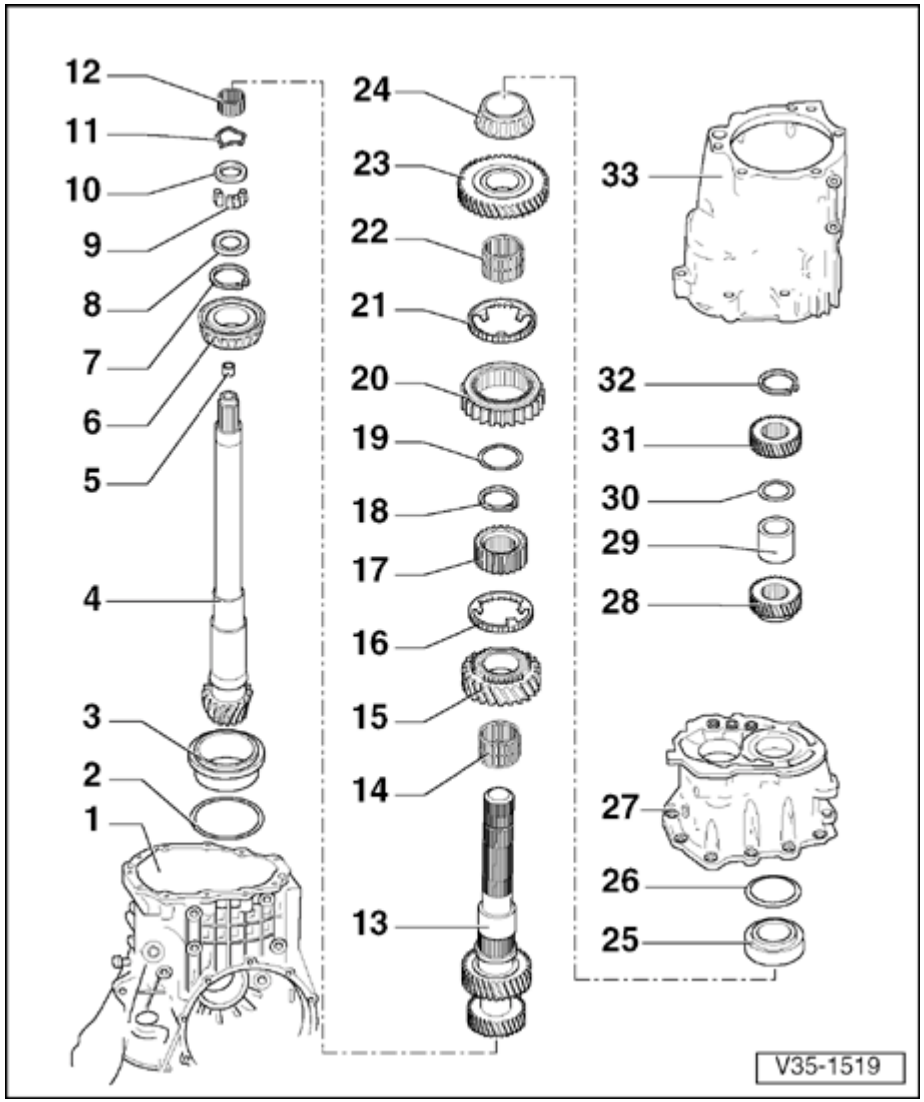
20 - Locking collar for 1st and 2nd gear

- Installation position: splines for reverse gear towards synchro-ring for 2nd gear

21 - Synchro-ring for 1st gear

- Checking for wear ⇒ *Fig. 2* , ⇒ Page 35-9

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22 - Needle bearing for 1st speed sliding gear

- Oil with gear oil before installing

23 - 1st speed sliding gear

- Before installing, insert spring ⇒ *Fig. 1* , ⇒ Page 35-9
- After pressing on -item 24 -, check axial clearance

24 - Inner race for small tapered roller bearing 1)

- Pressing off ⇒ Fig. 9
- Pressing on ⇒ Fig. 10
- Low friction bearing; do not oil when measuring friction torque

25 - Outer race for small tapered roller bearing 1)

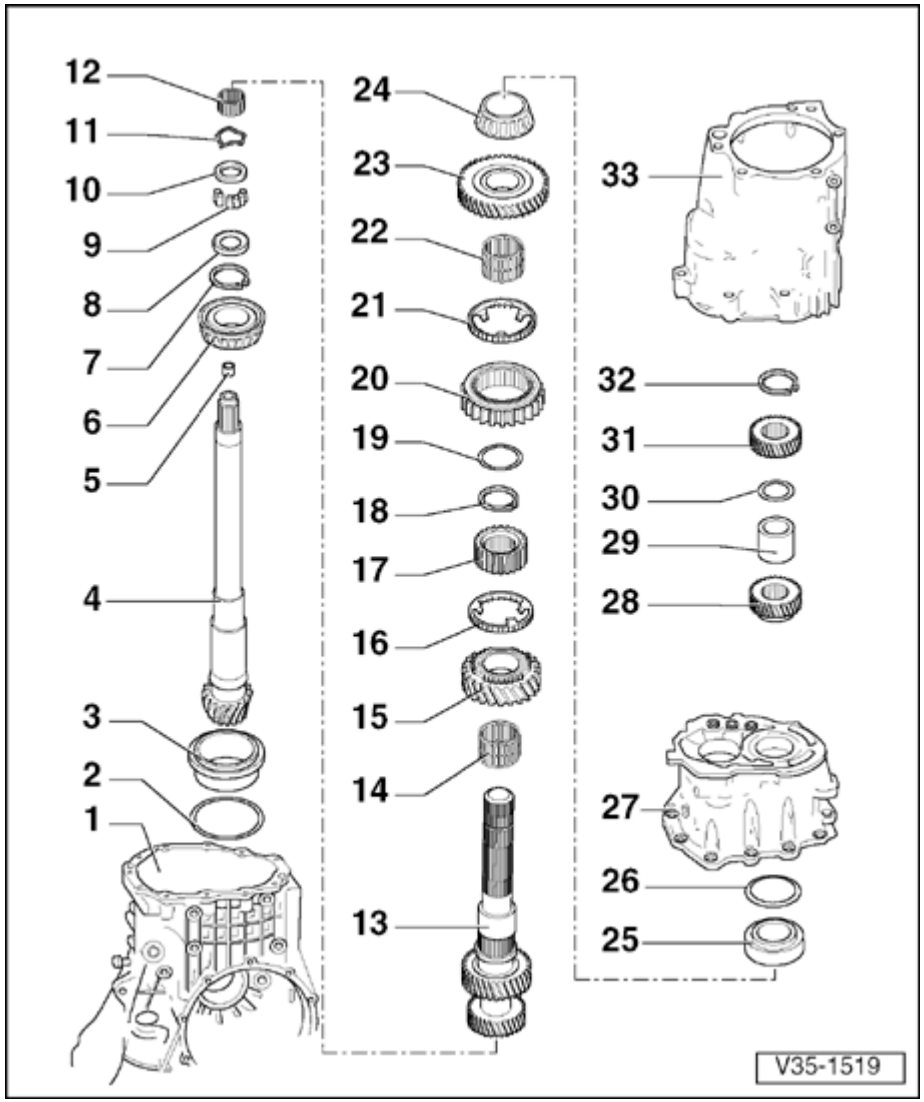
- Driving out ⇒ Fig. 15
- Pressing in ⇒ Fig. 16

26 - Shim "S4"

- Adjustment overview ⇒ Page 39-37

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27 - Bearing plate [1)]

- Servicing ⇒ Page 34-112

28 - 6th gear wheel

- Pressing off ⇒ Page 34-68
- Pressing on ⇒ Page 34-69
- Installation position: shoulder towards inner race for small tapered roller bearing

29 - Spacer sleeve

30 - Shim

- Re-determining ⇒ Page 34-78

31 - 5th gear wheel

- Pulling off ⇒ Page 34-62
- Driving on ⇒ Page 34-79

32 - Circlip for 5th gear wheel

- Re-determining ⇒ Page 34-80

33 - End cover

- Servicing ⇒ Page 34-103

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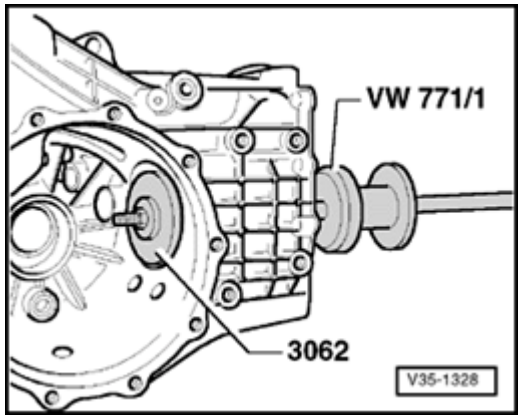


Fig. 1 Pulling out outer race for large tapered roller bearing

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

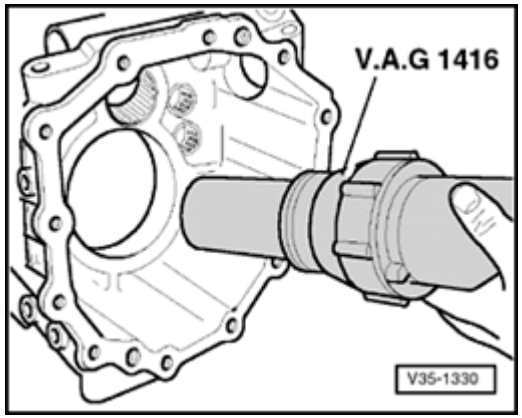


Fig. 2 Heating gearbox housing to insert the outer race for large tapered roller bearing

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

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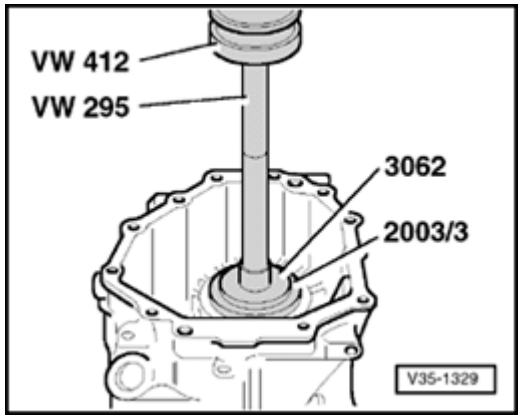


Fig. 3 Inserting outer race for large tapered roller bearing in gearbox housing and pressing home

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

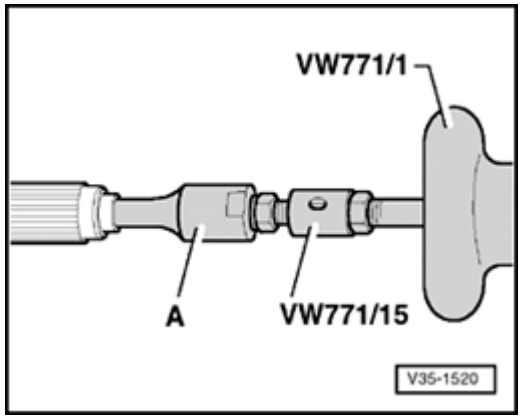


Fig. 4 Pulling out needle bearing for flange shaft/drive pinion

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

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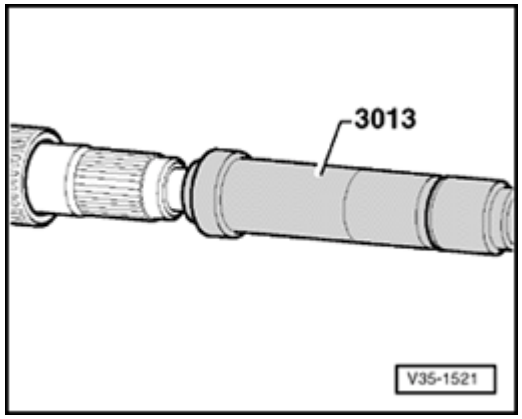


Fig. 5 Driving needle bearing for flange shaft/ drive pinion in flush

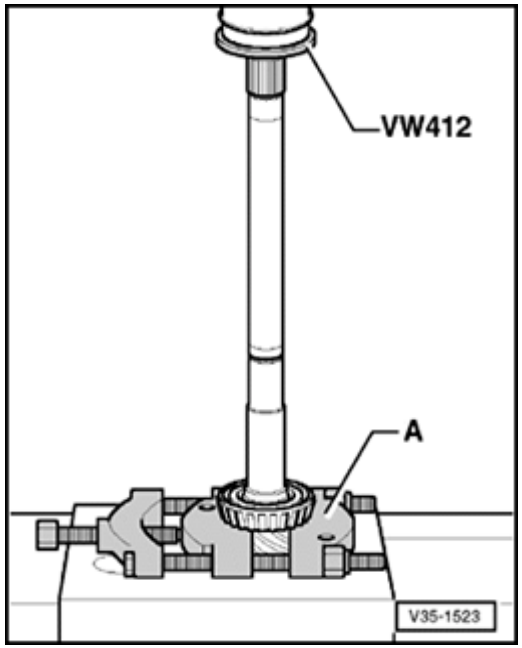


Fig. 6 Pressing off inner race for large tapered roller bearing

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

- Bearing is destroyed when pressing off

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35-25

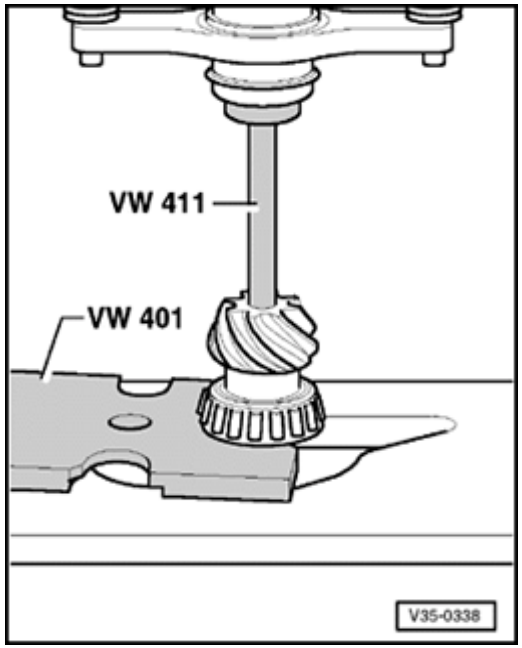


Fig. 7 Pressing on inner race for large tapered roller bearing

- Heat inner race to approx. 100 ° C and fit.
- Press home ensuring there is no axial play.

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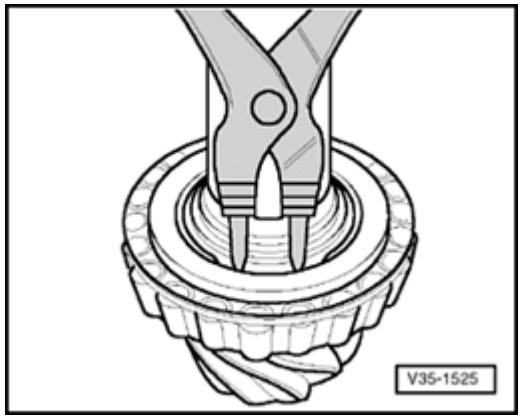


Fig. 8 Determining circlip for large tapered roller bearing for drive pinion

- Determine thickest circlip that can still just be fitted.
- Determine circlip from table.

⇒ *Parts catalog*

The following circlips are available:

Circlip thickness (mm)		
2.34	2.40	2.46
2.36	2.42	2.48
2.38	2.44	

- Fit circlip.

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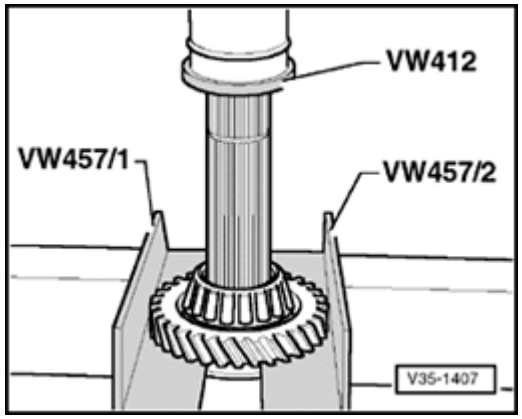


Fig. 9 Pressing off inner race of small tapered roller bearing for drive pinion together with 1st speed sliding gear

Note:

Do not press off together with 1st and 2nd gear synchro-hub and 2nd speed sliding gear.

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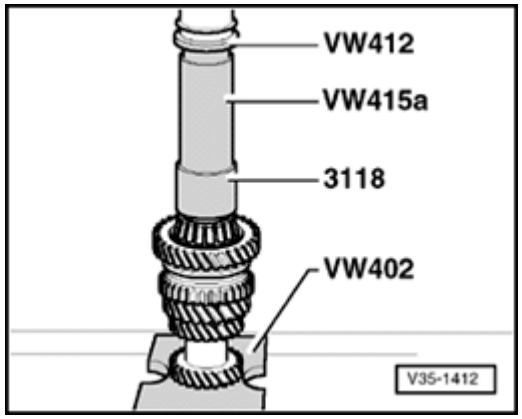


Fig. 10 Pressing on inner race for small tapered roller bearing for drive pinion together with 1st speed sliding gear

- Install circlip, shim for 1st speed sliding gear, synchro-ring for 1st speed, and 1st speed sliding gear with spring and needle bearing.
- Heat inner race to approx. 100 ° C and fit.
- Press home ensuring there is no axial play.

Note:

- *With shoulder of thrust piece 3118 facing downwards, press only onto bearing inner race.*
- *Position stepped shoulder of tube VW 415 A facing up towards press tool VW 412.*
- *After pressing on, check axial clearance of 1st speed sliding gear.*

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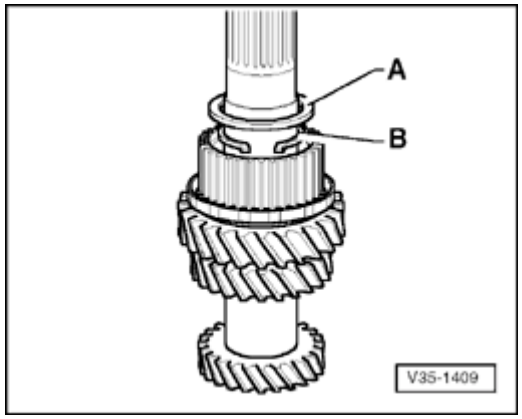


Fig. 11 Removing and installing circlip for synchro-hub and shim for 1st speed sliding gear

- Removing: take off shim -A- then circlip -B-.
- Installing: fit circlip -B- then shim -A-.

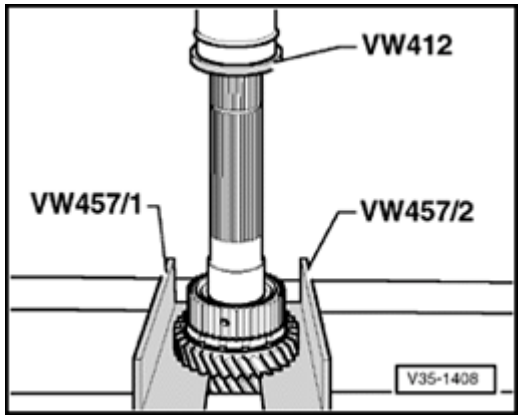


Fig. 12 Pressing off 2nd speed sliding gear with synchro-hub for 1st and 2nd gear

- Take off locking collar for 1st and 2nd gear and synchro-ring for 1st gear.
- Remove shim and circlip for synchro-hub.
- Press off 2nd speed sliding gear together with synchro-hub for 1st and 2nd gear.

Note:

Do not press off together with 1st speed sliding gear and inner race for small tapered roller bearing.

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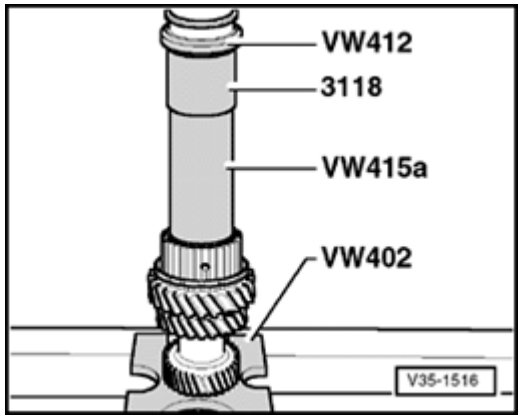


Fig. 13 Fitting 2nd speed sliding gear, pressing on synchro-hub for 1st and 2nd gear

- Install needle bearing (split), sliding gear with spring and synchro-ring for 2nd gear.
- Oil needle bearing.
- Heat synchro-hub to approx. 100 ° C and fit.
- Press home ensuring there is no axial play.

Note:

- *Position tube VW 415 a with shoulder towards synchro-hub.*
- *Position thrust pad 3118 with stepped shoulder towards press tool VW 412.*

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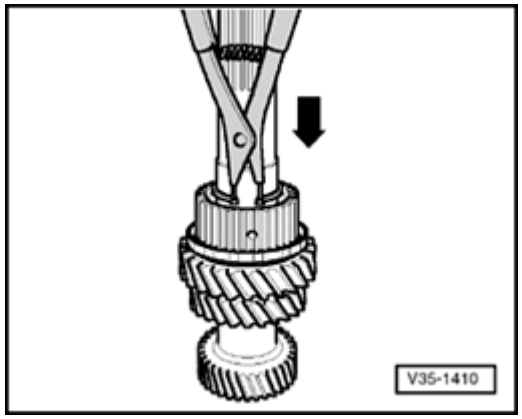


Fig. 14 Determining thickness of circlip for synchro-hub for 1st and 2nd gear

- Determine thickest circlip that can still just be fitted.
- Determine circlip from table.

⇒ *Parts catalog*

The following circlips are available:

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	

- Fit circlip in direction of arrow onto synchro-hub.

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35-32

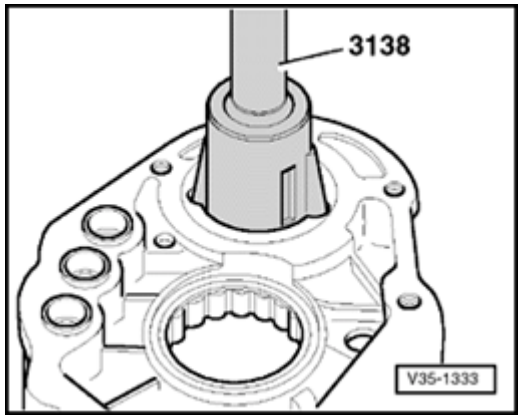


Fig. 15 Driving out outer race for small tapered roller bearing

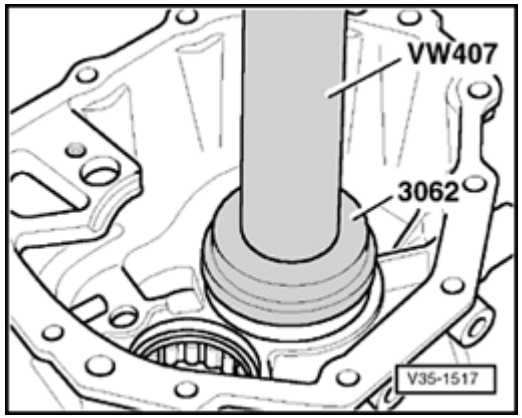


Fig. 16 Pressing in outer race for small tapered roller bearing

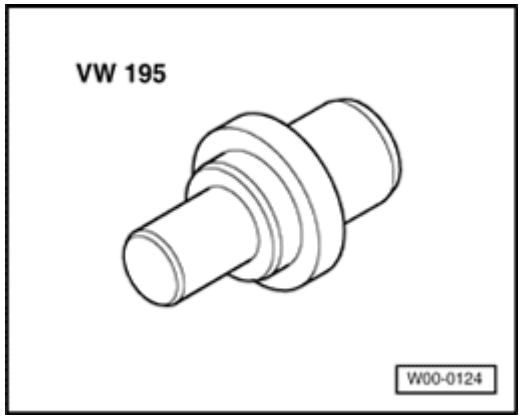
- Insert shim "S4" into bearing flange behind bearing seat.
- Position stepped shoulder of thrust pad 3062 towards press tool VW 407.
- Press outer race for small tapered roller bearing onto stop.

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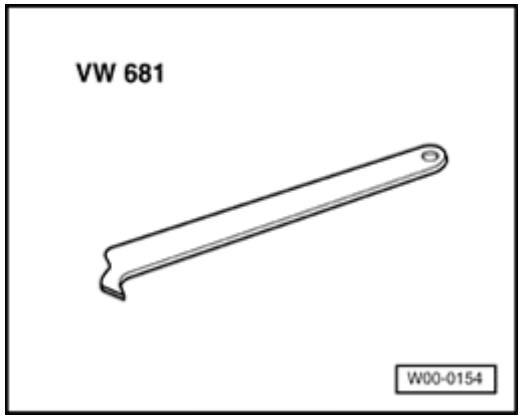
39-1

Drive flange seal, replacing

Special tools, testers and auxiliary items required:



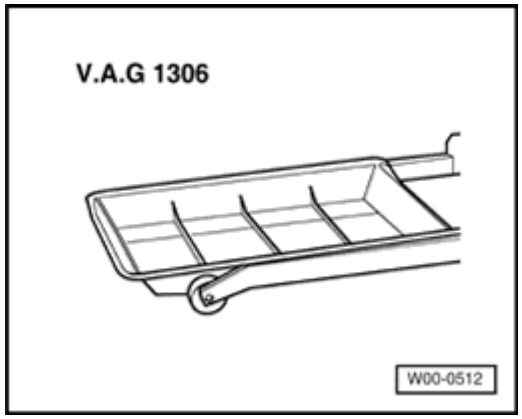
- Arbor VW 195



- Extractor lever VW 681

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39-2



- Drip tray V.A.G 1306

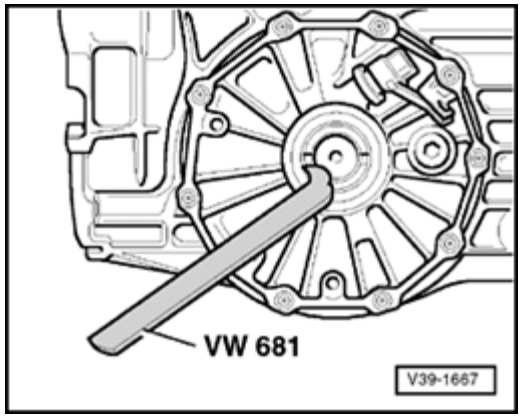
Removing

- Transmission installed

Note:

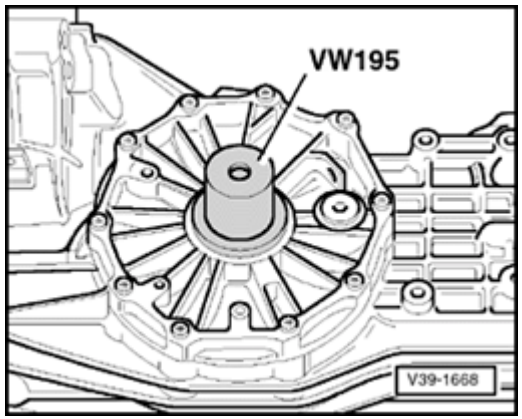
- *Illustrated, removing and installing oil seal on left-hand side.*
- *Procedure for removing oil seal on left and right-hand sides is identical.*

- Remove heat shield.
- Disconnect drive axle.
- Place a drip tray underneath.
- Remove drive flange, secure with a drift to prevent it turning.



- Pull seal out with lever VW 681.

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Installing

- Fill space between sealing and dust lips with sealing grease G52 128 A1.
- Lightly oil outer circumference of seal.
- Drive in seal for drive flange.
  - Pressing-in depth (factory): 5.5 mm
  - Pressing-in depth when re-installing a used drive flange (repairs): 6.5 mm
- Install drive flange and drive axle.

Tightening torques

Component	Nm
Drive flange to transmission	10 + 90° 1)
Drive axle to drive flange M10	80
Heat shield for drive axle	25

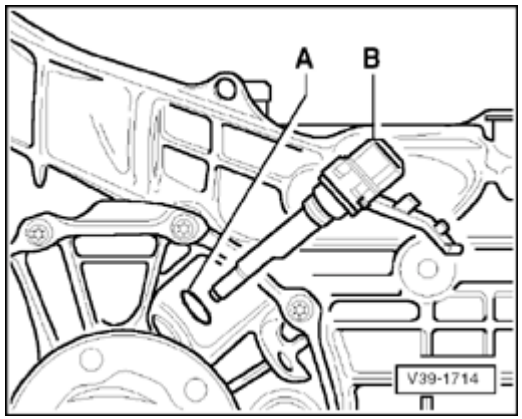
1) 90° equals to a quarter turn

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Speedometer sender -G22- and drive wheel for speedometer sender, removing and installing

- Transmission installed

Removing and installing speedometer sender -G22-

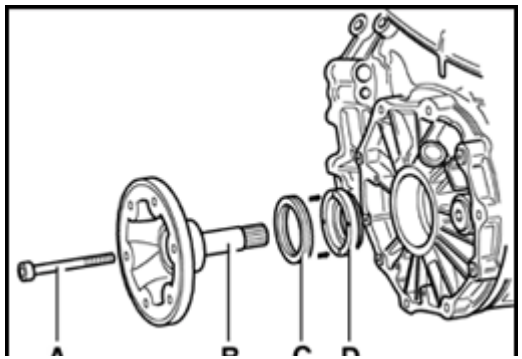


- Pull connector off sender -B-.
- Press sender retainer down, turn and pull out sender.
- Replace O-ring -A-.

Removing and installing drive wheel for speedometer sender -G22-

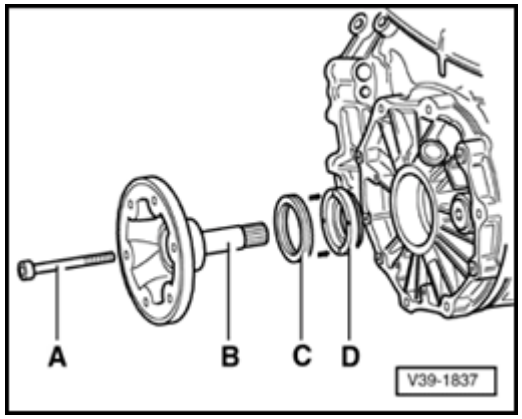
Removing:

- Detach drive axle from left drive flange -B-.



- Unscrew bolt -A-. Secure drive flange with a drift to prevent it turning.
- Remove drive flange and seal -C-.

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- Using a screwdriver, pry out drive wheel for speedometer sender -D- on alternate sides at the follower lugs (arrows).

Installing:

- Install drive wheel for speedometer sender so that follower lugs (arrows) face toward seal.

Note:

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.

Follower lugs engage in differential housing grooves.

- Replace seal for drive flange and install drive flange ⇒ Page 39-1 .
- Top up oil in transmission and check oil level ⇒ Page 34-39 .

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Seal and grooved ball bearing for flange for driveshaft on transmission, replacing

Special tools, testers and auxiliary items required:

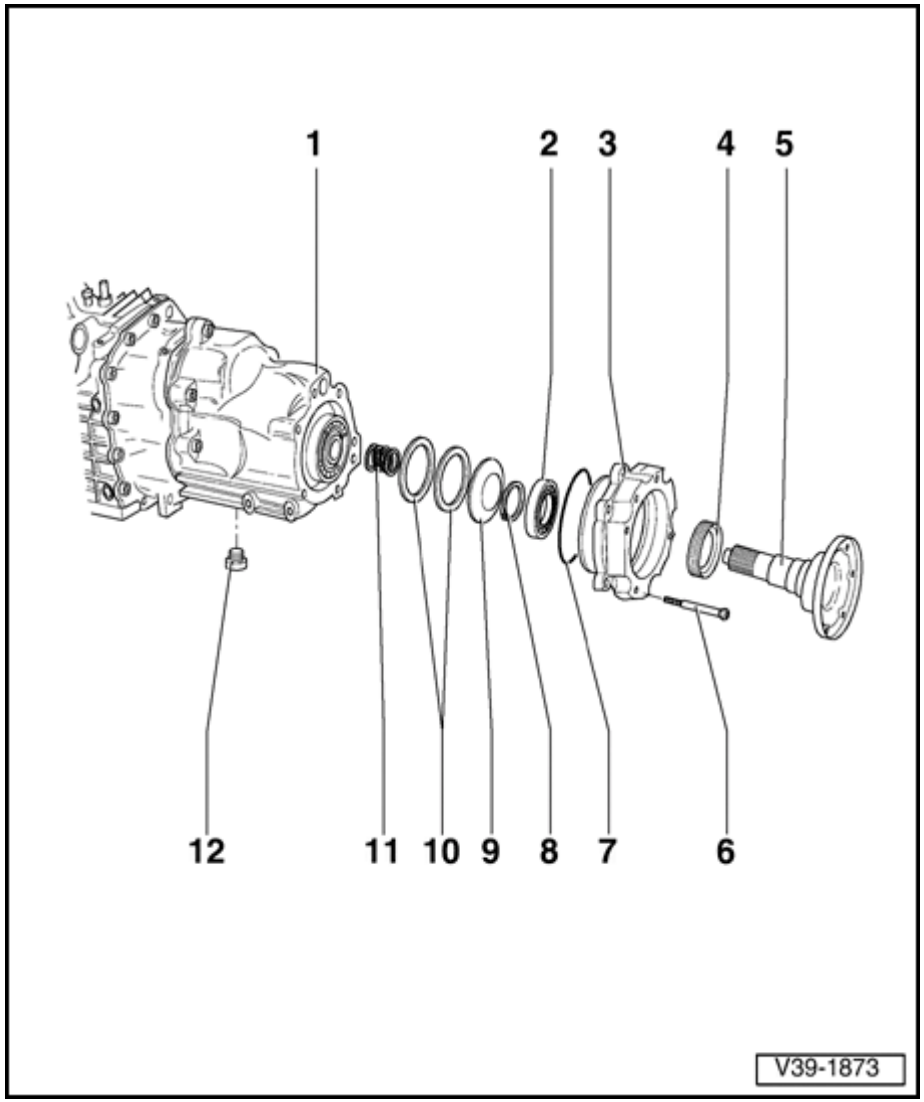
- Drip tray V.A.G 1306
- Adapter VW 295a
- Thrust plate VW 401
- Thrust plate VW 402
- Press tool VW 407
- Tube VW 415a
- Tube VW 416b
- Press tool VW 433
- Thrust pad VW 454
- Extractor lever VW 681

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- Multi-purpose tool 771/1 with attachment 771/15 and stud M8/M10
- Punch 2005
- Shim, Part No. 016 311 391 B

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1 - Transmission

2 - Grooved ball bearing

3 - Bearing housing on balance weight

4 - Seal

- Driving in ⇒ Page 39-13

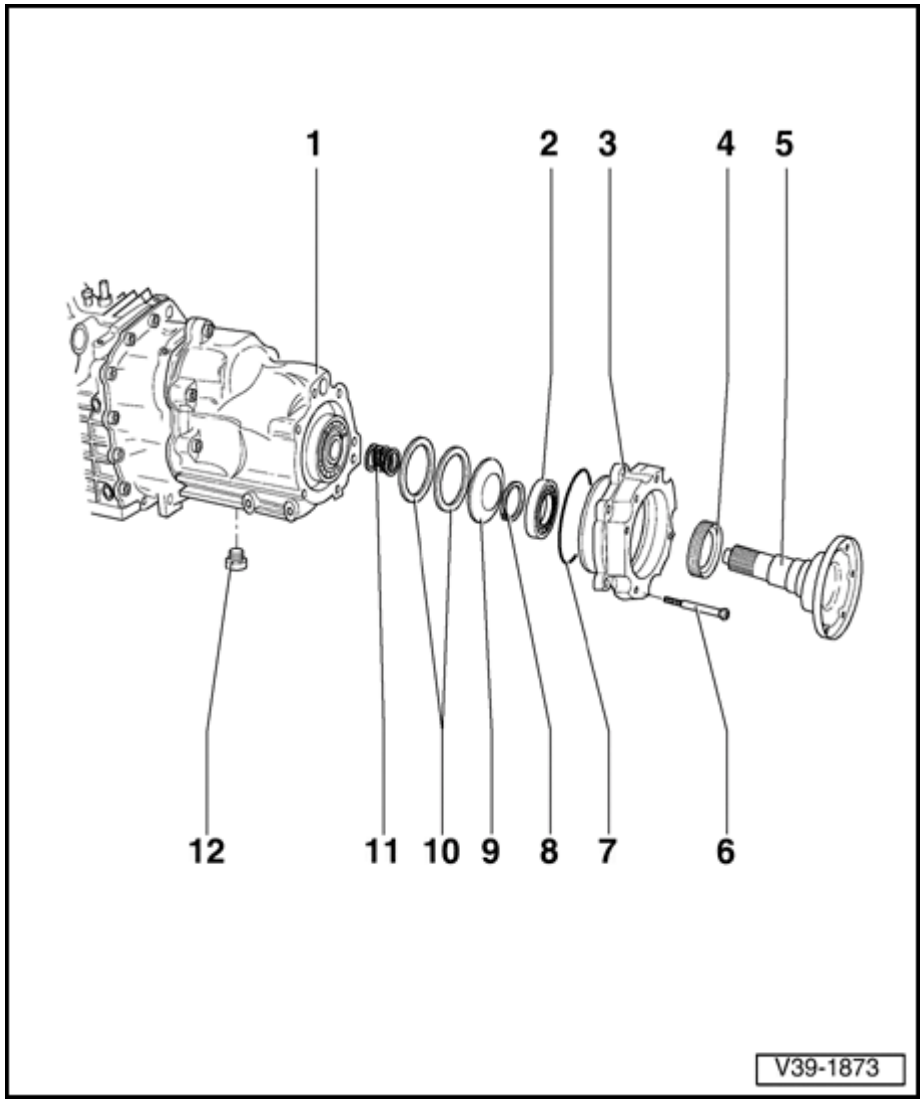
5 - Drive flange

6 - Bolt, 25 Nm

- Qty. 6

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39-8



7 - O-ring

- Always replace

8 - Circlip

9 - Spring plate

- Mark installation position when removing: larger diameter (concave side) toward shims - 10

10 - Shims

11 - Spring

12 - Oil drain plug, 40 Nm

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Removing

- Transmission installed

- Disconnect driveshaft at the front ⇒ Page 39-68 , lift clear and tie-up on selector linkage.

- Place a drip tray underneath.

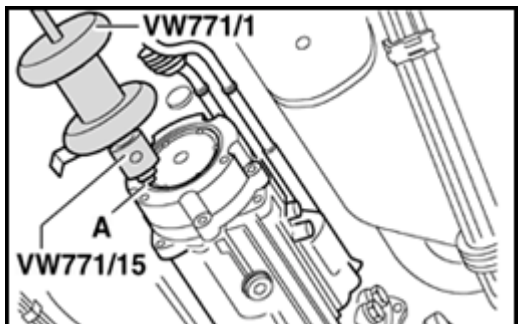
- Unscrew rear oil drain plug (on end cover) and drain transmission oil.

- Unscrew securing bolts for bearing housing.

Note:

Generally, the bearing housing is pressed out via the spiral spring when loosening bolts from cover.

If the bearing housing is not pressed off:



- Pull drive flange together with bearing housing and balance weight off end cover.

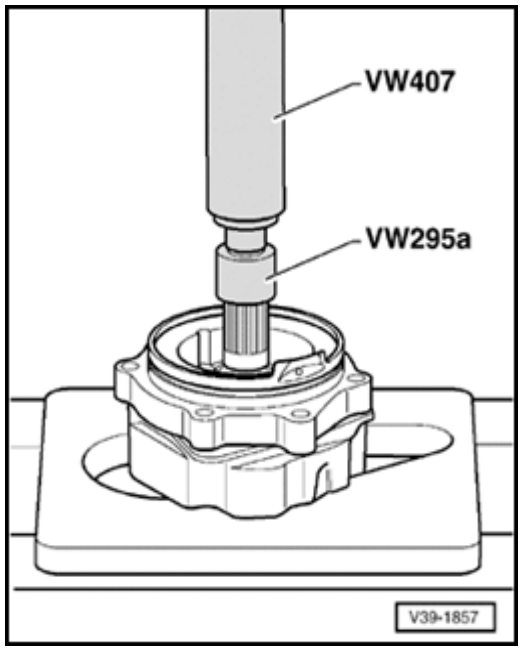
A - M8/M10 stud

- Take off bearing housing.

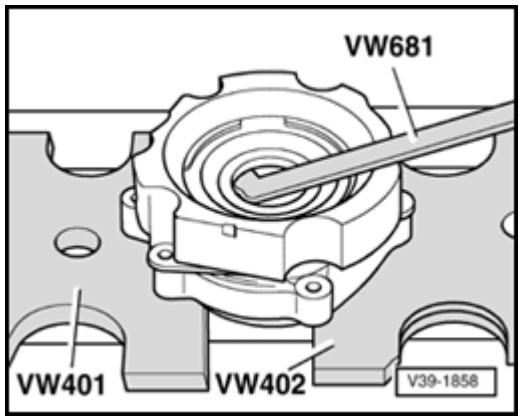
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39-10

- Take circlip off drive flange.

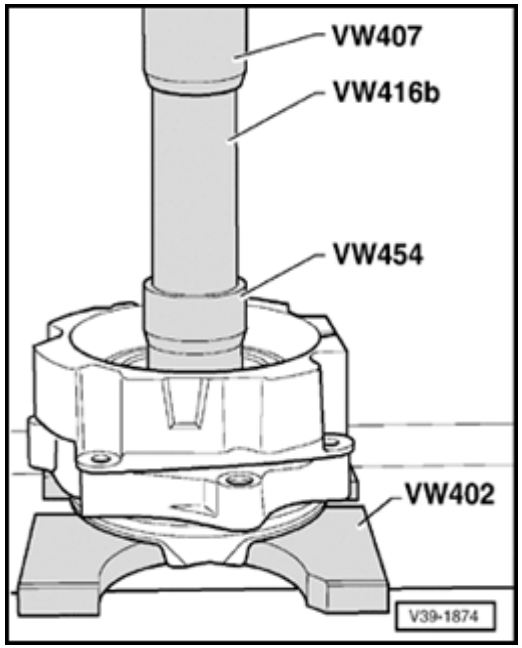


- Press out drive flange.



- Pull out seal for drive flange.
- Thoroughly clean seal seat.

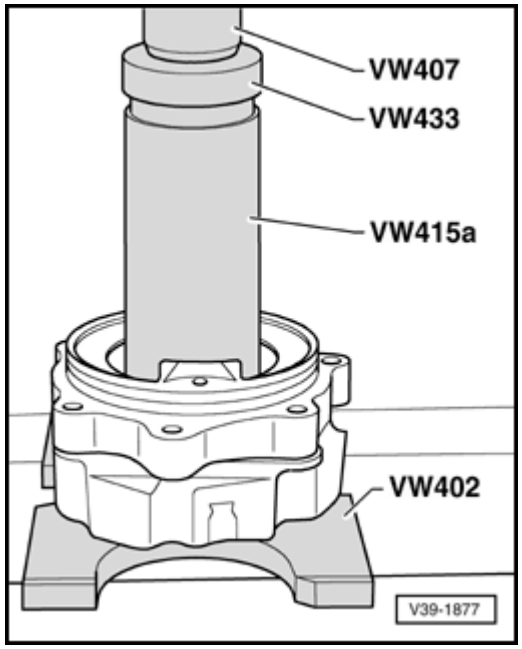
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- Press out grooved ball bearing.

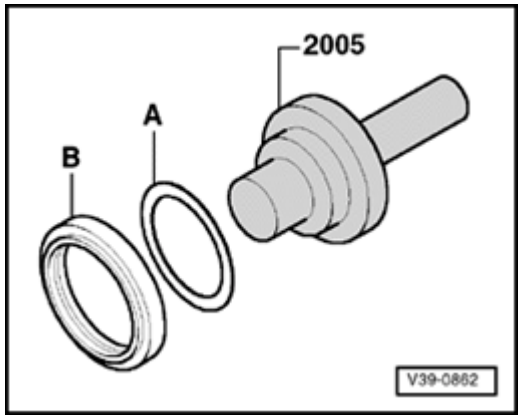
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Installing



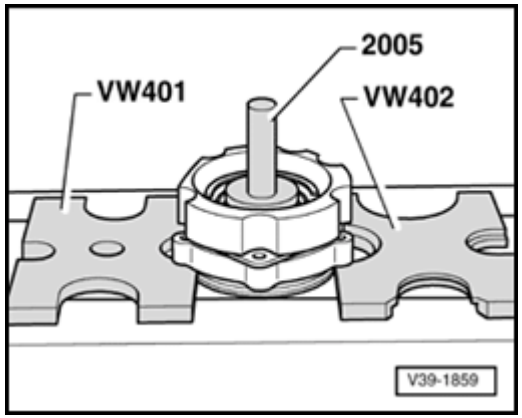
- Press grooved ball bearing in bearing housing.

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- Lightly oil outer circumference of seal -B-.
- Fill space between sealing lips and dust lips with sealing grease G52 128 A1.
- Fit seal with shim -A-, Part No. 016 311 391 B (1.7 mm thick) onto punch 2005.

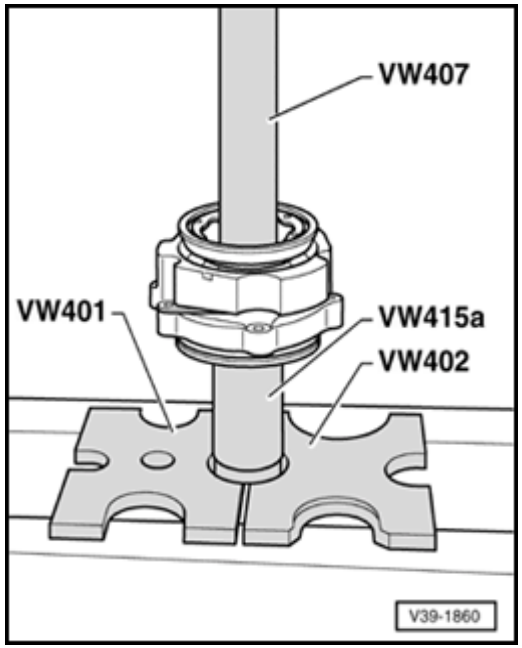
  Installation position: open side of seal toward transmission.



- Drive in seal for drive flange.
- Remove shim after driving in.

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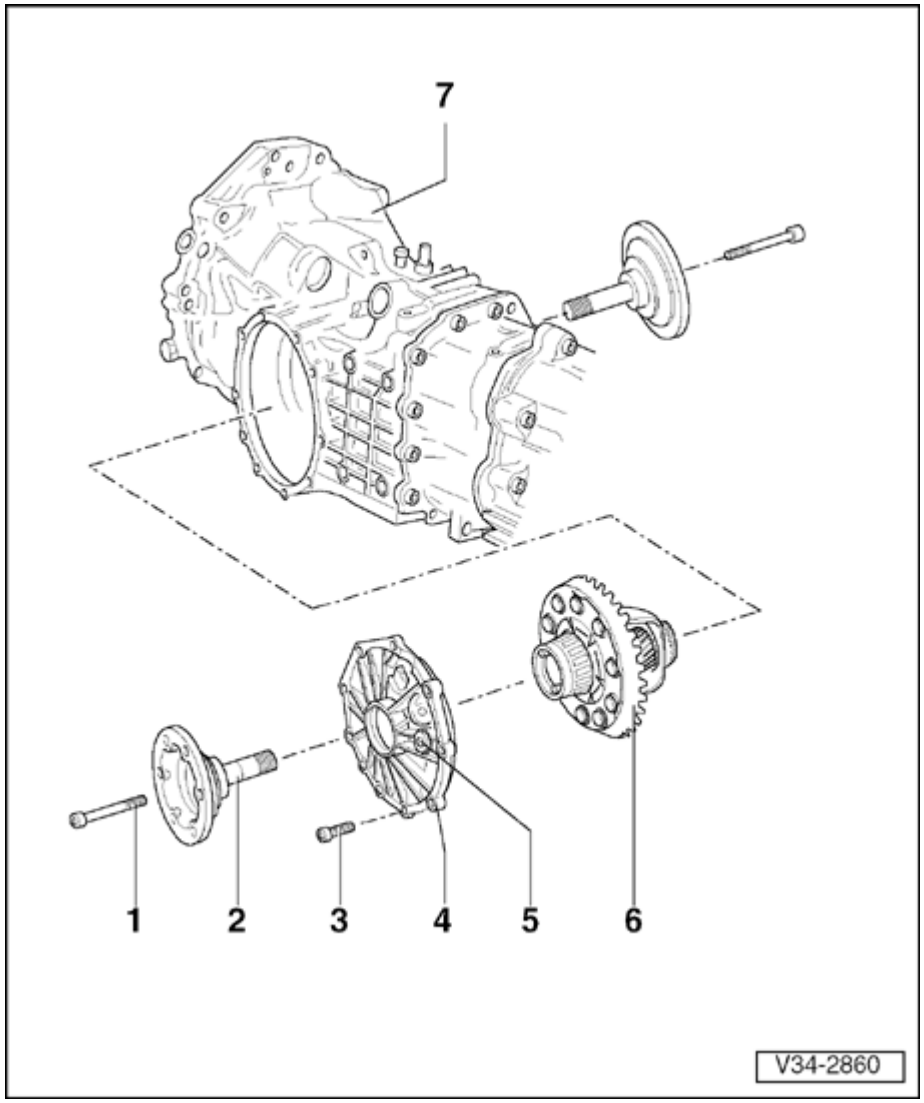


- Press in drive flange.
- Fit circlip onto drive flange.
- Lightly oil O-ring and fit into bearing housing groove.
- Insert spring plate and shims into bearing housing.

  Installation position: ⇒ Page 39-8
- Slide coil spring onto drive flange.
- Tighten securing bolts for bearing housing in diagonal sequence and in stages to 25 Nm.
- Bolt on driveshaft ⇒ Page 39-71 .
- Top up oil in transmission and check oil level ⇒ Page 34-39 .

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Differential, removing and installing

Note:

Removing and installing is also possible with transmission installed in vehicle.

1 - Bolt, 10 Nm + 1/4 turn (90 °) further

2 - Drive flange

- When removing, secure with a drift to prevent it turning

3 - Bolt, 25 Nm

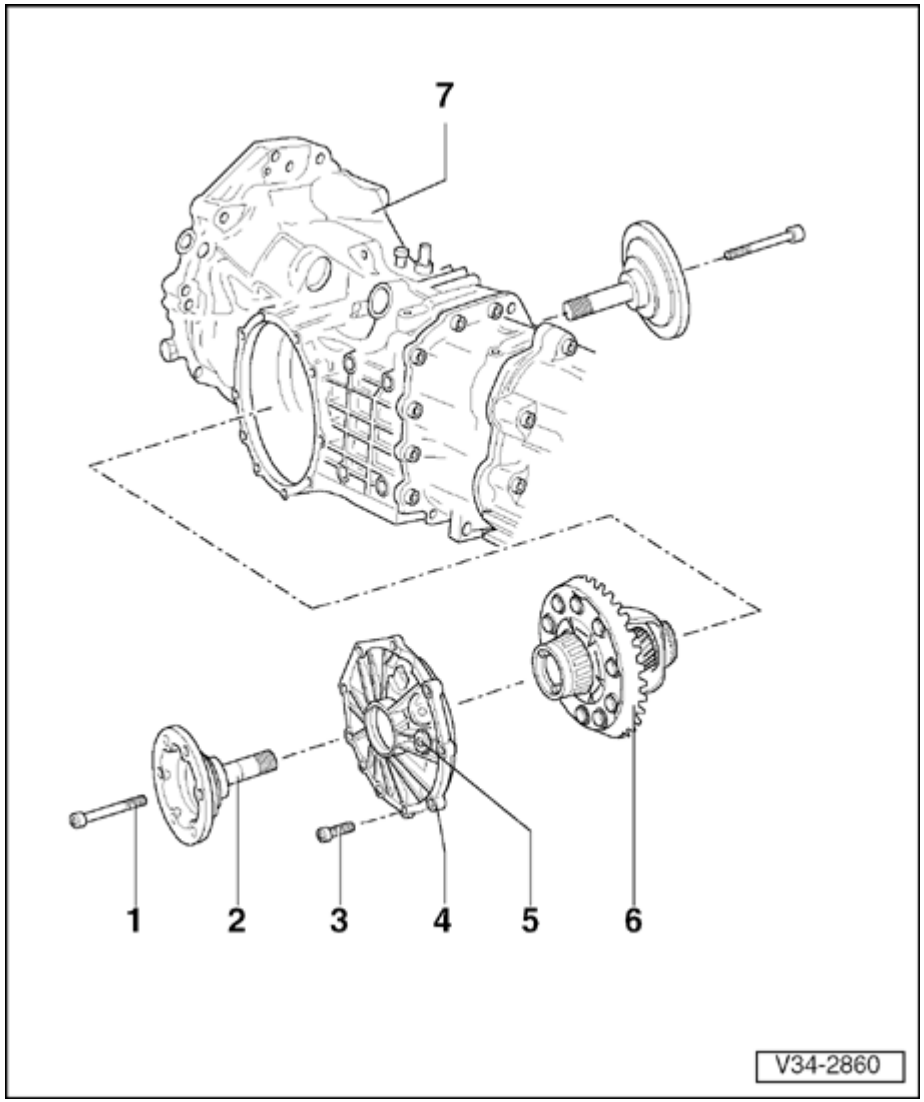
- Qty. 10

4 - Cover for final drive

- Removing and installing drive wheel for speedometer sender -G22 ⇒ Page 39-4
- If replaced: adjust ring gear ⇒ Page 39-52

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5 - Oil filler plug, 40 Nm

- Checking oil level in transmission ⇒ Page 34-39

6 - Differential

- Disassembling and assembling ⇒ Page 39-17
- If replaced: adjust ring gear ⇒ Page 39-52

7 - Transmission housing

- Servicing ⇒ Page 34-127

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Differential, disassembling and assembling

Special tools, testers and auxiliary items required:

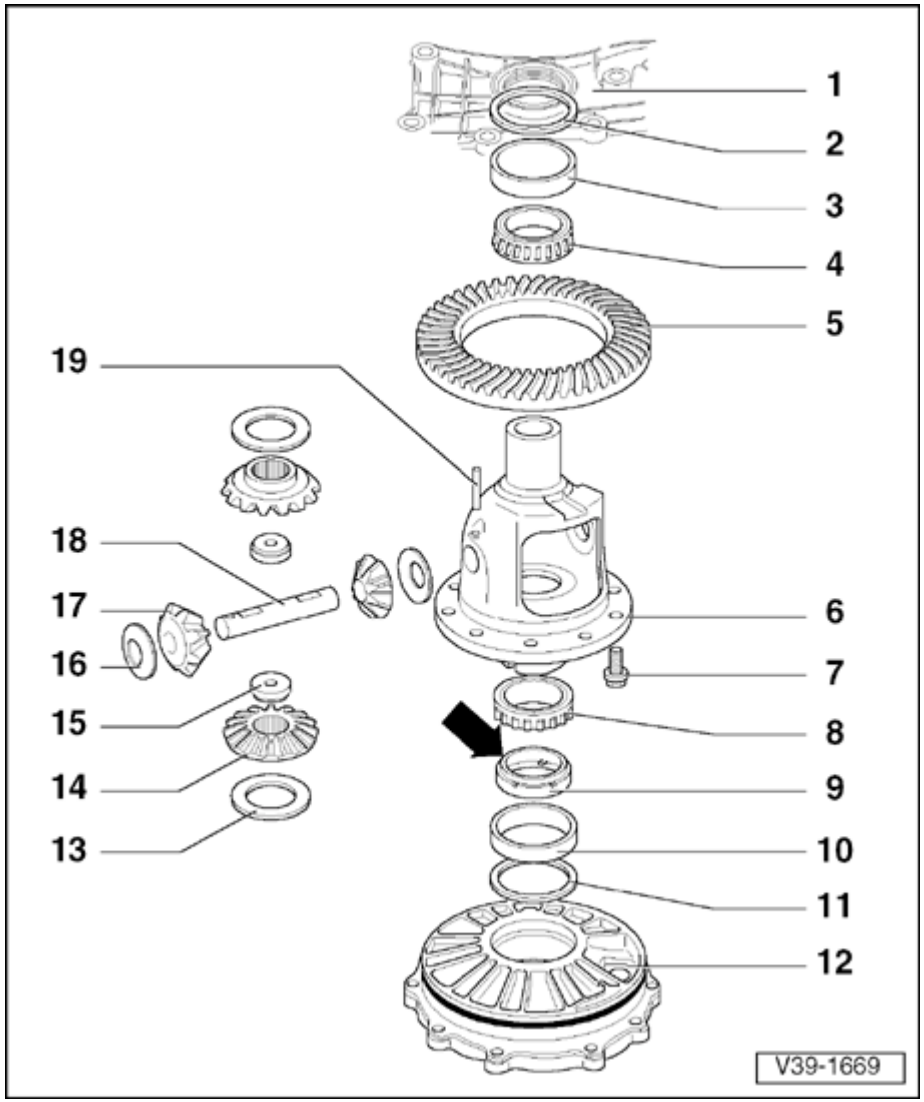
- Drift VW 295
- Thrust plate VW 401
- Thrust plate VW 402
- Press tool VW 412
- Installing tool VW 459/2
- Thrust plate 30-205
- Mandrel 30-505
- Press tool 40-21
- Thrust plate 40-105
- Thrust pad 3062

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- Drift 3138
- Tapered roller bearing puller V.A.G 1582
- Grip V.A.G 1582/3
- Grip V.A.G 1582/6

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39-18



Notes:

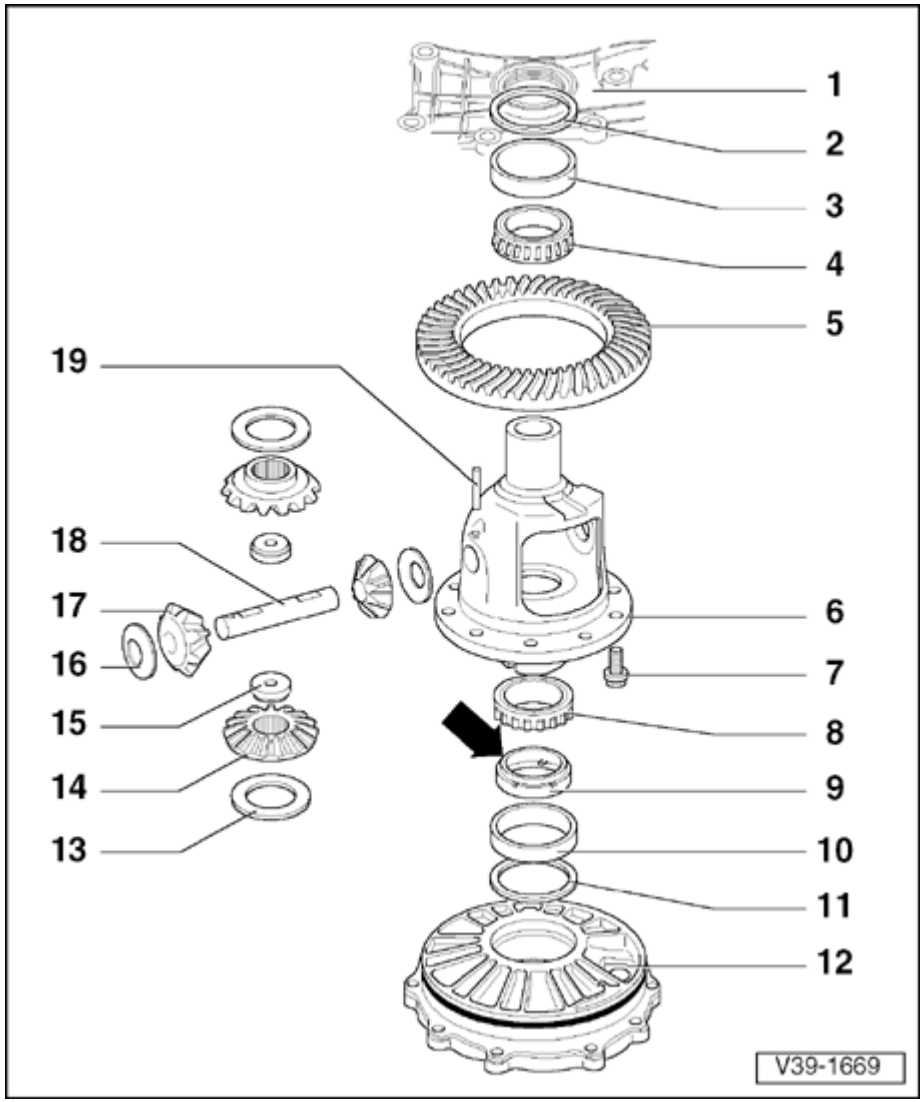
- *Removing and installing differential* ⇒ *Page 39-15* .
- *Adjustments are required when replacing components marked 1)* ⇒ *Page 39-37* , *adjustment overview*

1 - Transmission housing 1)

2 - Shim "S2"

- Note thickness
- Adjustment overview ⇒ Page 39-37

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3 - Outer race for small tapered roller bearing 1)

- Driving out ⇒ Fig. 9
- Driving in ⇒ Fig. 10

4 - Inner race for small tapered roller bearing 1)

- Pulling out ⇒ Fig. 1
- Pressing in ⇒ Fig. 3
- Low friction bearing; do not oil when measuring frictional torque

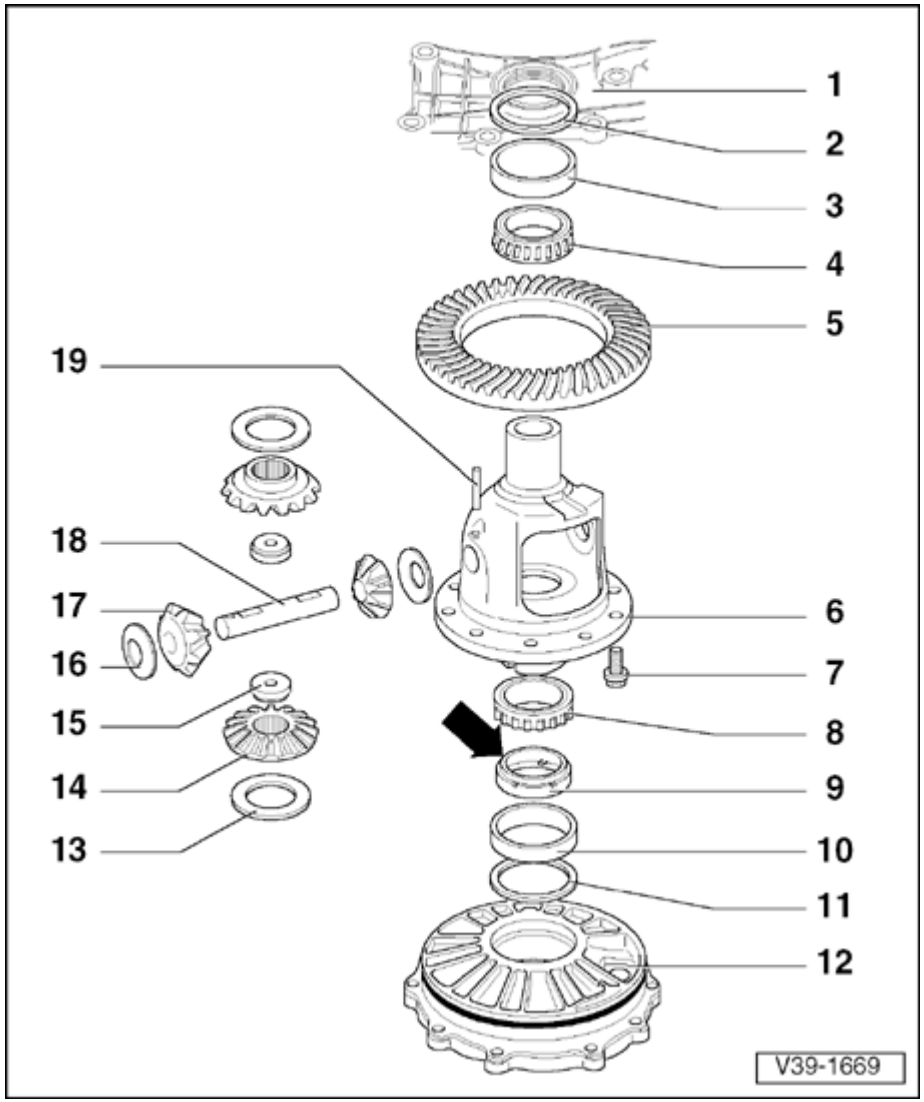
5 - Ring gear 1)

- Paired with drive pinion (final drive set)
- Removing ⇒ Fig. 5
- Installing ⇒ Fig. 6

6 - Differential housing 1)

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39-20



7 - Ring gear bolt, 60 Nm + 45° further

- Always replace
- Use only genuine bolts

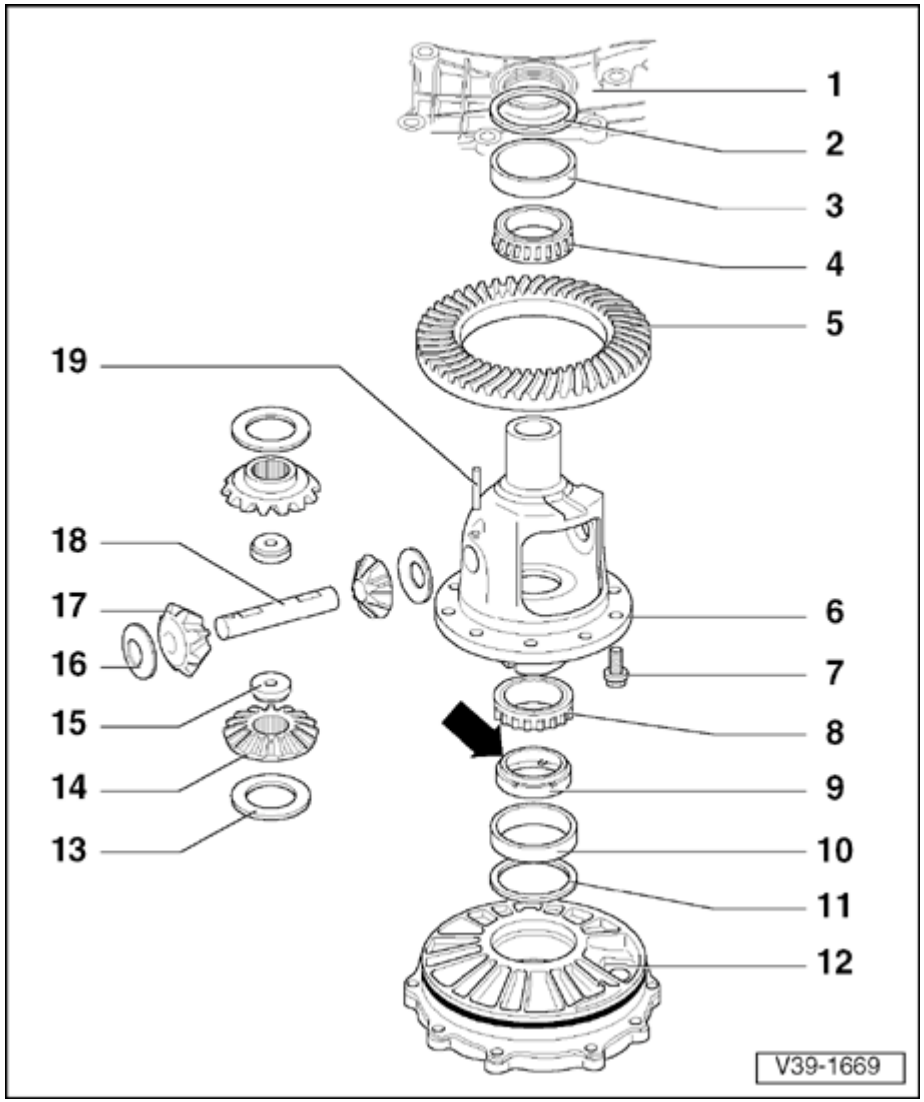
8 - Inner race for large tapered roller bearing 1)

- Pulling off ⇒ Fig. 2
- Pressing on ⇒ Fig. 4
- Low friction bearing; do not oil when measuring frictional torque

9 - Drive wheel

- For speedometer sender
- Removing and installing ⇒ Page 39-4
- 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) toward differential

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10 - Outer race for large tapered roller bearing 1)

- Driving out ⇒ Fig. 11
- Driving in ⇒ Fig. 12

11 - Shim "S1"

- Note thickness
- Adjustment overview ⇒ Page 39-37

12 - Cover for final drive 1)

- With O-ring
- Replace O-ring
- Oil O-ring before installing

13 - Shims

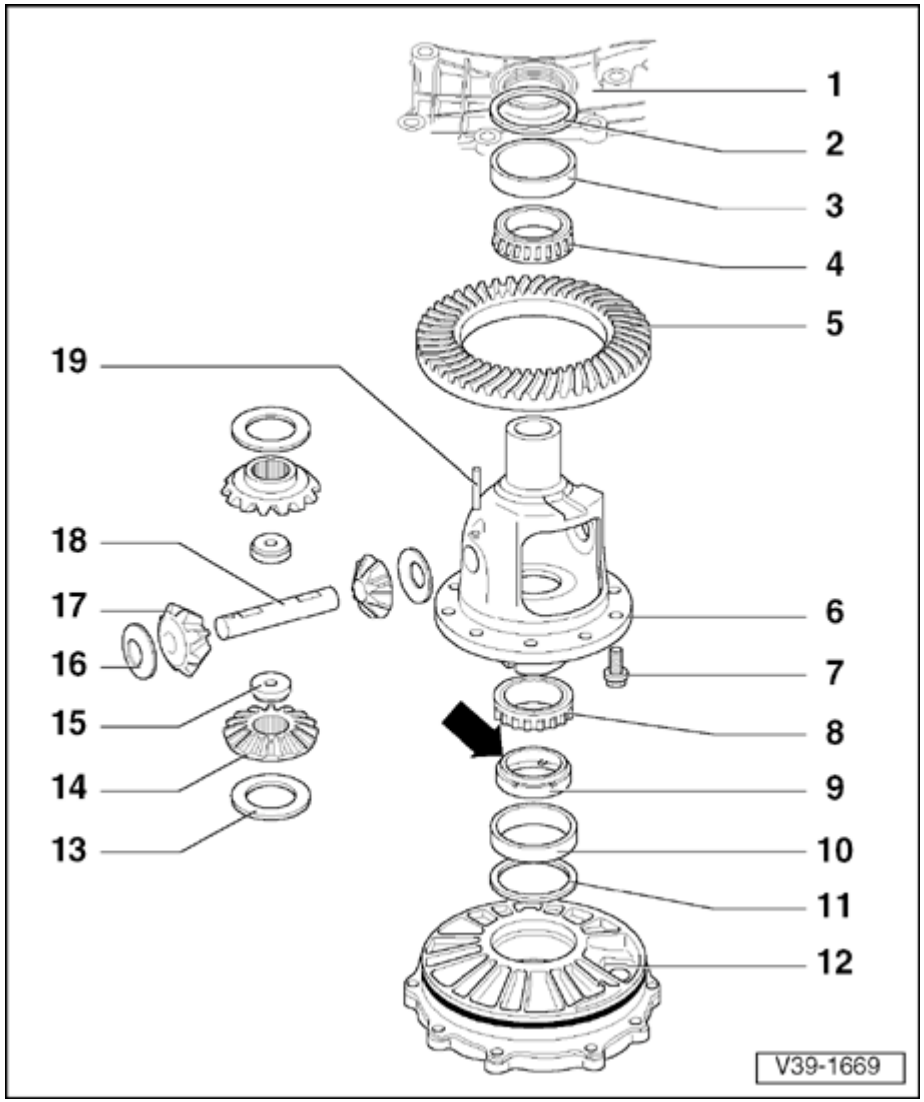
- Re-determining thickness ⇒ Fig. 8

14 - Sun wheels

- Adjusting ⇒ Fig. 8

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15 - Threaded piece

16 - Thrust washer

- Check for cracks and chipping

17 - Planet wheels

- Installing ⇒ Fig. 7

18 - Shaft for planet wheels

- Drive out with drift after removing spring pin
- Before driving in, align thrust washers

19 - Spring pin

- Drive in flush

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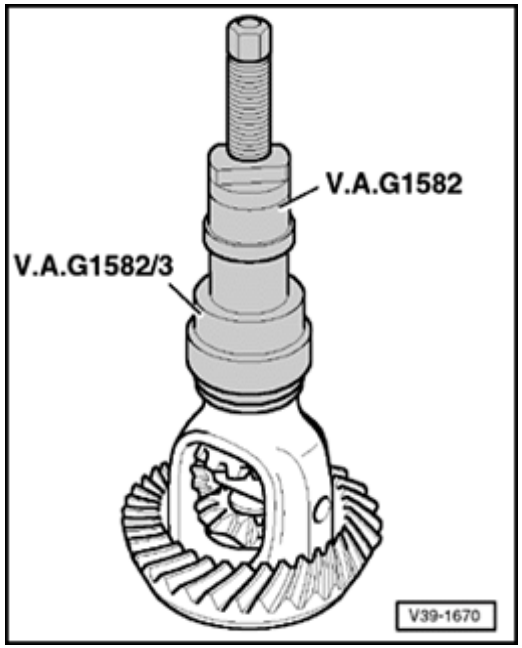


Fig. 1 Pulling inner race for small tapered roller bearing out of housing

- Fit thrust plate 40-105 before fitting puller.

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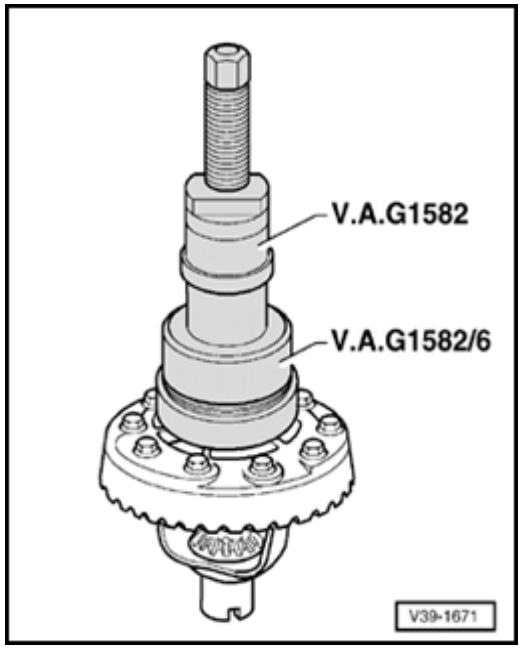


Fig. 2 Pulling inner race for large tapered roller bearing off housing

- Fit thrust plate 40-105 before fitting puller.

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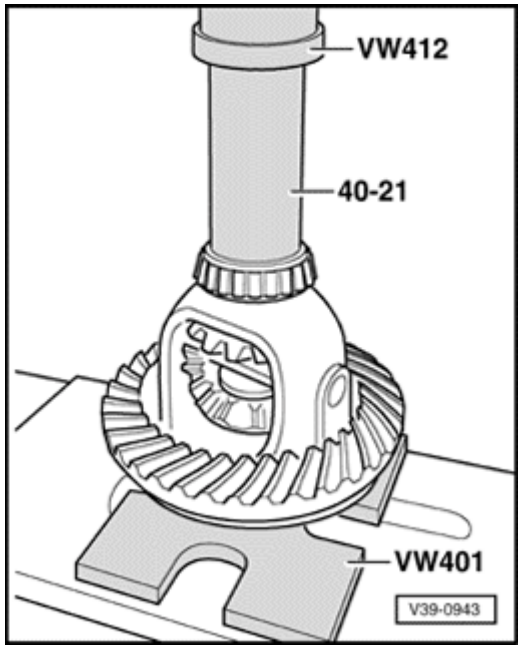


Fig. 3 Pressing on inner race for small tapered roller bearing

- Heat bearing to approx. 10 ° C, fit in position and press home.

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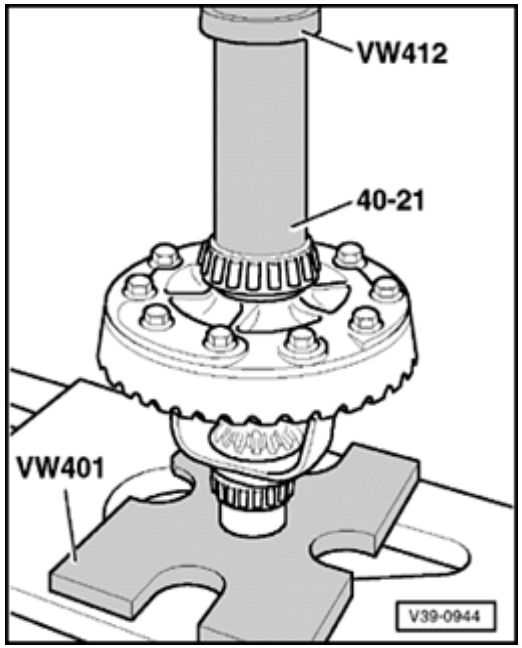


Fig. 4 Pressing on inner race for large tapered roller bearing

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

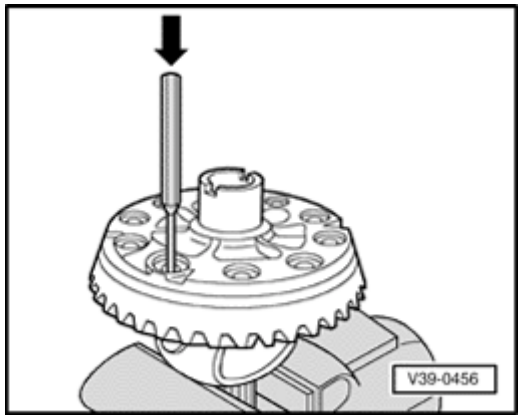


Fig. 5 Driving ring gear off housing

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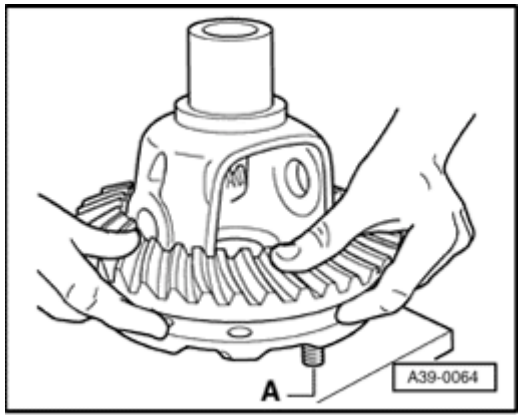


Fig. 6 Installing ring gear

- Use 2 centering pins -A- (local manufacture) as a guide.

CAUTION!

Wear protective gloves.

- Heat ring gear to approx. 100 ° C and install.
- Allow ring gear to cool off slightly before inserting bolts. Then tighten to specified torque.

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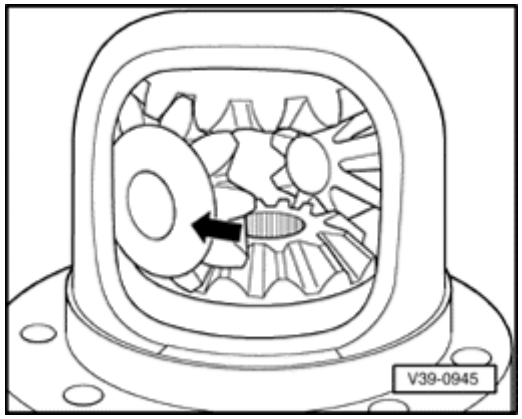


Fig. 7 Installing planet wheels and sun wheels

- Carefully pry out drive wheel for speedometer sender with a screwdriver.
- Insert thrust washers for planet wheels with a small amount of grease.
- Insert sun wheels with selected shims ⇒ Fig. 8 .
- Insert planet wheels spaced 180° apart and rotate into position (arrow).
- Insert threaded pieces.

  Installation position: stepped shoulder toward sun wheels
- Locate thrust washers and planet wheels so that they align with holes.
- Drive planet pinion shaft into final position and secure.

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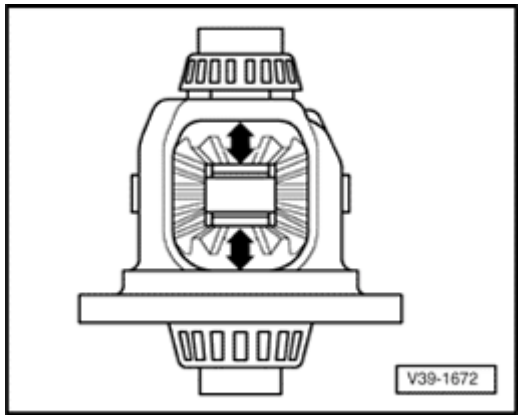


Fig. 8 Adjusting planet wheels and sun wheels

- Insert sun wheels with thinnest shims (0.5 mm).
- Insert planet wheels with thrust washers and press in shaft.

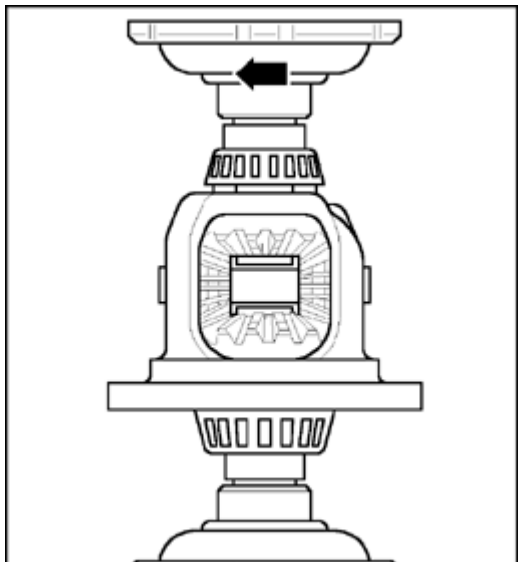
Note:

Do not now interchange bevel gears and thrust washers!

- Press planet wheels outward and check play of sun wheels by hand (arrows).
- Adjust play by inserting an appropriate shim ⇒ Page 39-30 .

  Specification: max. 0.10 mm

Note:



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

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- Determine shim from table.

⇒ *Parts catalog*

The following shims are available:

Shim thickness (mm)		
0.50	0.70	0.90
0.60	0.80	1.00

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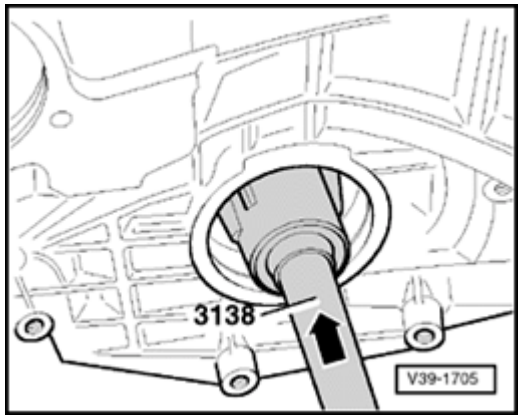


Fig. 9 Driving outer race for small tapered roller bearing out of transmission housing

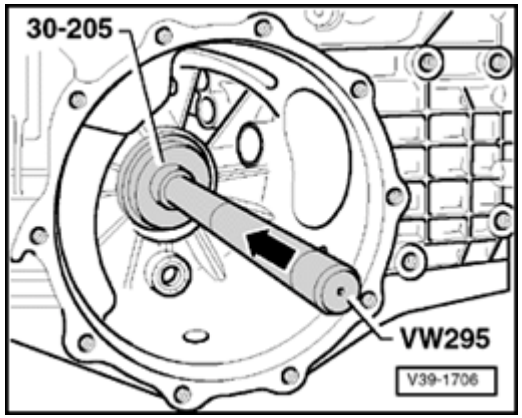


Fig. 10 Driving outer race for small tapered roller bearing into transmission housing

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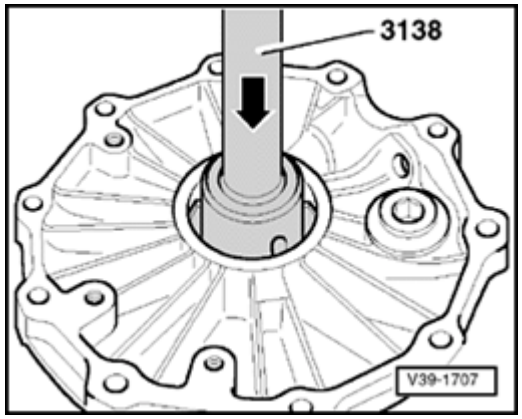


Fig. 11 Driving outer race for large tapered roller bearing out of cover

Use suitable base, e.g. VW 470 with recess toward cover.

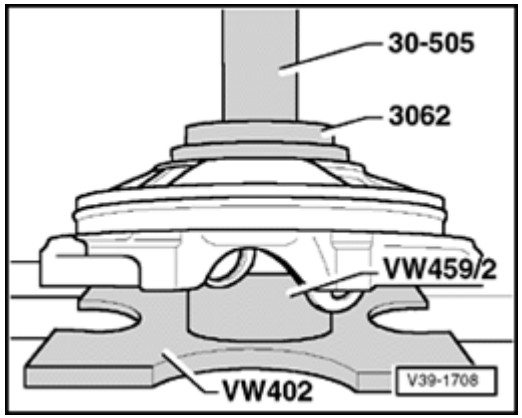


Fig. 12 Driving outer race for large tapered roller bearing into cover

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Drive pinion and ring gear, adjusting

Note:

- *Careful adjustment of the drive pinion and ring gear is important for the service life and smooth running of the final drive. For this reason, the drive pinion and ring gear are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions of rotation. The position of quietest running is found by moving the drive pinion in an axial direction and at the same time lifting the ring gear out of the zero-play mesh position by the amount necessary to maintain the backlash within the specified tolerance.*

- *The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.*

- *The deviation (tolerance) "r," which is related to the master gauge "Ro," is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the ring gear. The final drive set (drive pinion and ring gear) may only be replaced together as a matched pair.*

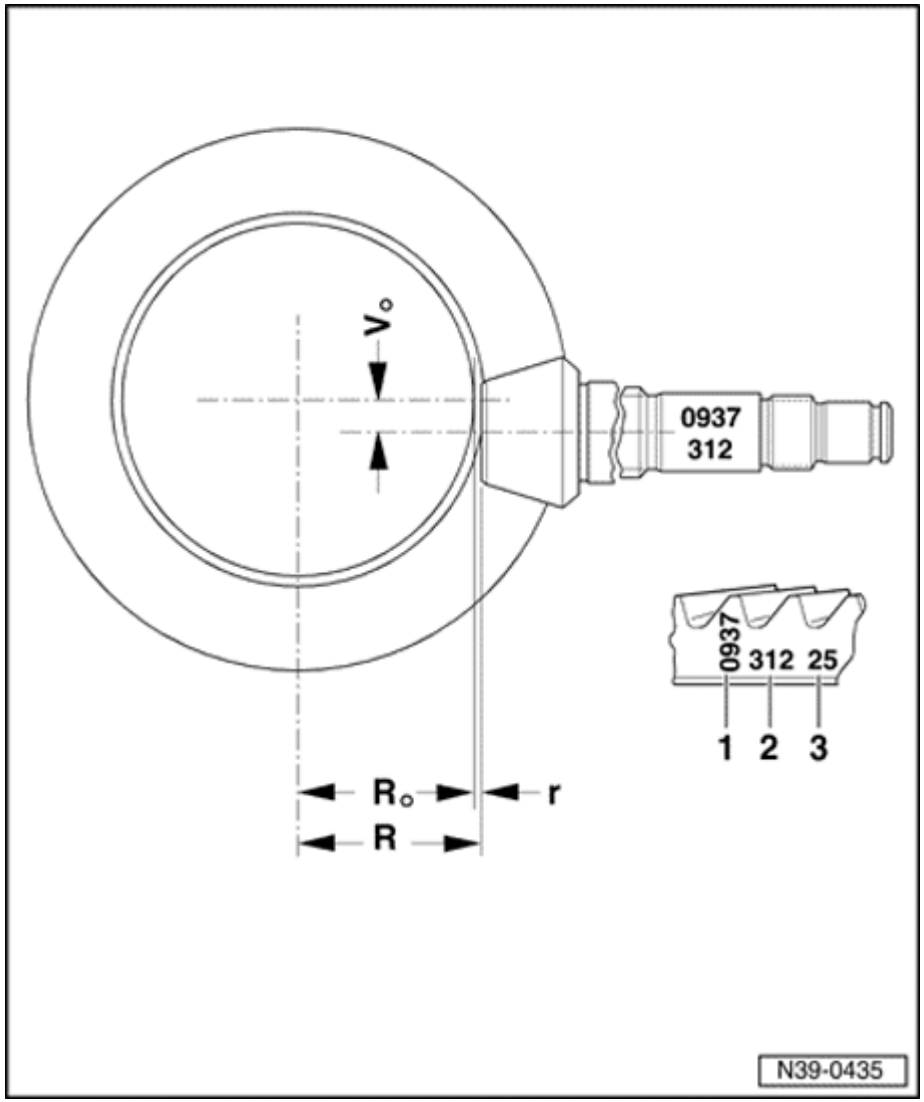
- *Observe the general repair instructions for*

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tapered roller bearings and shims.

- *The frictional torque measurement is only used as a final check to make sure that the adjustment is correct.*

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Gear sets, adjusting and marking

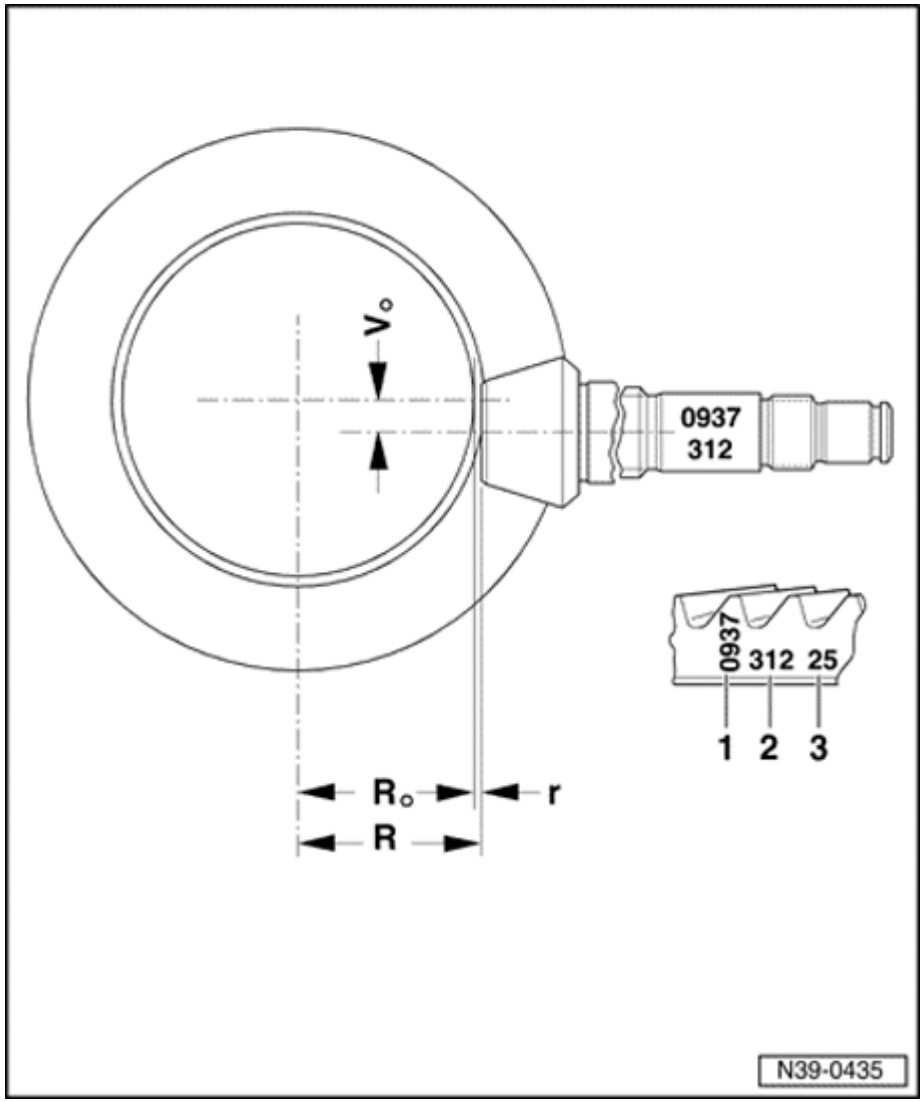
1 - Identification "0937" signifies Oerlikon gear set with a ratio of 37:9.

2 - Pairing number (312) of final drive set.

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

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

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R - Actual distance between ring gear axis and face of drive pinion at point with quietest running for this gear set R = Ro + r

Vo - Hypoid offset

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Final drive set readjusting, recommended sequence

The following sequence of work is recommended to save time when the drive pinion and ring gear have to be adjusted:

1.) Determine total shim thickness "S_{total}" for "S1" +"S2" (sets preload for tapered roller bearings for differential) ⇒ from Page 39-54 .

2.) Determine total shim thickness "S_{total}" for "S3" + "S4" (sets preload for tapered roller bearings for drive pinion) ⇒ from Page 39-41 .

3.) Distribute total shim thickness "S_{total}" for "S3" + "S4" so that the distance from center of ring gear to face of drive pinion is the same as distance "R" which was determined during production ⇒ from Page 39-47 .

4.) Distribute total shim thickness "S_{total}" for "S1" + "S2" so that the specified backlash between ring gear and drive pinion is maintained ⇒ from Page 39-61 .

Note:

Overview of components and shims ⇒ Page 39-38 .

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Adjustment overview

Note:

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

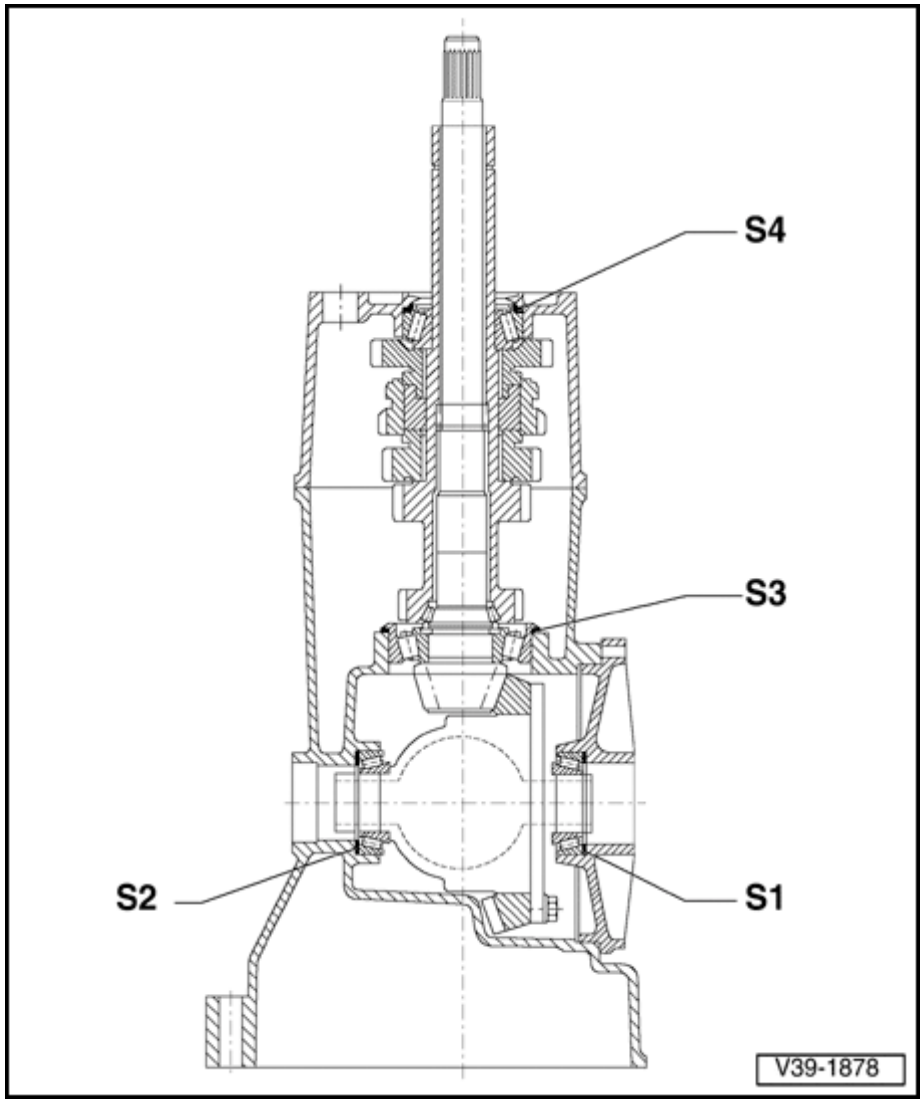
Parts replaced: ▼	**adjustment required:**			
	Ring gear "S1"+"S2" 1) ⇒ Page 39-52	Drive pinion "S3"+"S4" 1) via deviation "r" ⇒ Page 39-39	Drive pinion "S4" 1) ⇒ Page 34-121	Backlash Check ⇒ Page ⇒ Page 39-59
Transmission housing	X	X		X
Bearing plate			X	X
Differential housing	X			X
Tapered roller bearing for drive pinion		X		X
Tapered roller bearing for differential	X			X
Final drive set 2)	**X**	X		X
Hollow shaft			X	X
Cover for differential	X			X

1) Shims; installation position ⇒ Page 39-38 .

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2) Drive pinion and ring gear; only replace together.

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Shims, position

Note:

Adjustment overview when replacing individual components of transmission ⇒ *Page 39-37* .

S1 - Adjustment shim for ring gear in cover for differential

S2 - Adjustment shim for ring gear in transmission housing

S3 - Adjustment shim for drive pinion in transmission housing

S4 - Adjustment shim for drive pinion in bearing plate

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Drive pinion, adjusting

(Adjusting drive pinion and hollow shaft)

Repairs after which the drive pinion must be adjusted ⇒ Page 39-37 , table

Special tools, testers and auxiliary items

- Universal mandrel VW 385/1
- Centering disc VW 385/2
- Centering disc VW 385/3
- Measuring plunger VW 385/14
- Measuring plate VW 385/17
- Master gauge VW 385/30
- Universal dial gauge bracket VW 387
- Press tool VW 407
- Multi-purpose tool VW 771/15

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- Thrust pad 3062
- Pin 3114/2

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- Clamping sleeve 3116
- Bolt 3116/1
- Torque gauge 0-600 Ncm
- Dial gauge
- Dial gauge extension 6.5 mm
- Dial gauge extension 30 mm

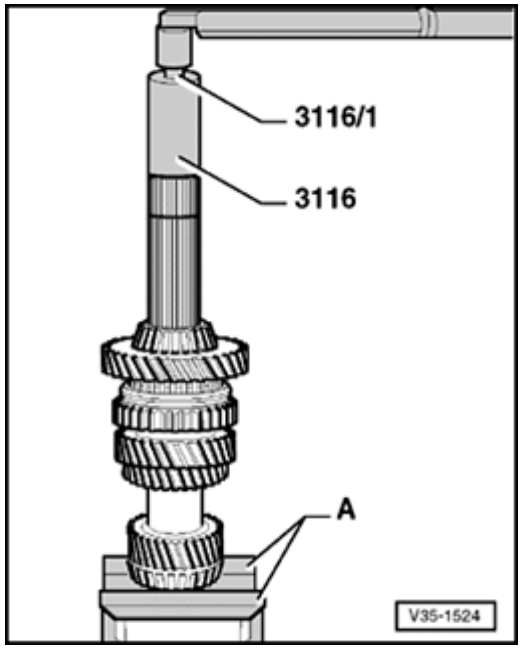
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Determining total shim thickness "S_{total}" for shims "S3" + "S4"

(Setting preload of tapered roller bearing for drive pinion with hollow shaft)

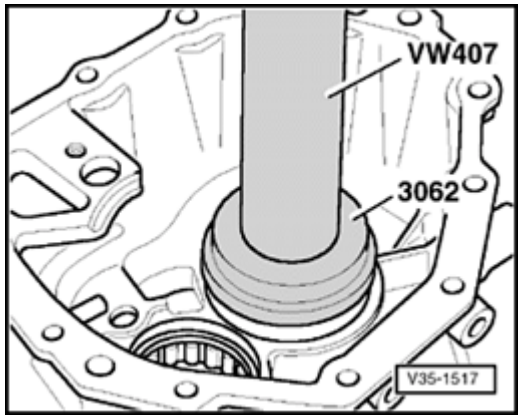
- Differential removed



- Clamp drive pinion in a vice using clamps -A-.
- Insert tapered rollers with grease, assemble drive pinion and hollow shaft.
- Turn hollow shaft against drive pinion five turns in both directions so that tapered roller bearings settle.
- Preload drive pinion/hollow shaft to 10 Nm, hold hollow shaft when doing this.
- Insert outer race for tapered roller bearing for drive pinion into transmission housing without shims ⇒ *Fig. 2* , ⇒ Page 35-22 and ⇒ *Fig. 3* , ⇒ Page 35-23 .

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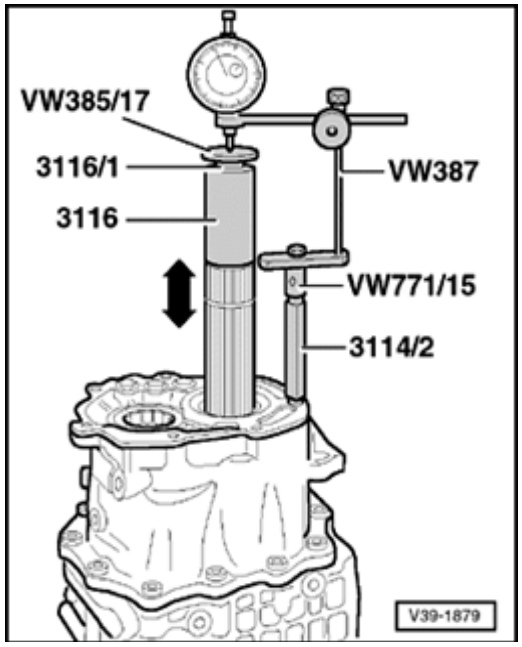


- Insert outer race for tapered roller bearing for drive pinion with shim "S4*" (1.0 mm thick) into bearing plate.

Note:

For measurement purposes a shim "S4" of 1.0 mm is initially inserted which is designated "S4" After determining measurement "e" "S4*" will be replaced by the correct shim "S4."*

- Insert completely assembled drive pinion in transmission housing.
- Fit bearing plate with dowel sleeves and tighten to 25 Nm.
- Turn drive pinion with hollow shaft five turns in both directions so that tapered roller bearings settle.



- Assemble measuring equipment, use a 30 mm dial gauge extension.
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.

Note:

The tip of the dial gauge must be positioned on center of drive pinion.

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- Lift drive pinion, without turning, and read off play on dial gauge.

  Measurement in example: 0.90 mm

Note:

If the measurement has to be repeated, the drive pinion with hollow shaft must be turned 5 turns in each direction to settle the tapered roller bearings. Set dial gauge again to "0" with 2 mm preload.

Formula:

"S_{total}" = "S4*" + measurement + bearing preload

Example:

	Inserted shim "S4*"	1.00 mm
+	Measured value (example)	0.90 mm
+	Bearing preload (constant)	0.15 mm
=	Total shim thickness "S_{total}" for "S3" + "S4"	2.05 mm

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Determining thickness of shim "S3*"

Formula:

"S3*" = "S_{total}" - "S4*"

Example:

	Total shim thickness "S_{total}" for "S3" + "S4"	2.05 mm
-	Inserted shim "S4*"	1.00 mm
=	Thickness of shim "S3*"	1.05 mm

Remove outer race for tapered roller bearing, insert shim "S3*" into transmission housing and install outer race again

⇒ *Fig. 2* , ⇒ Page 35-22 and

⇒ *Fig. 3* , ⇒ Page 35-23 .

- Insert completely assembled drive pinion into transmission housing again.

- Fit bearing plate with dowel sleeves and tighten securing bolts to 25 Nm.

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- Turn drive pinion with hollow shaft five turns in both directions to settle the tapered roller bearing.

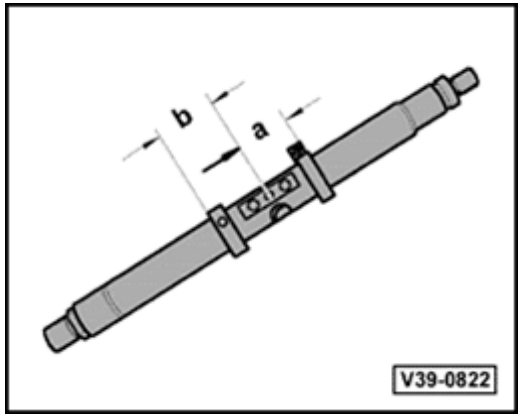
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39-45

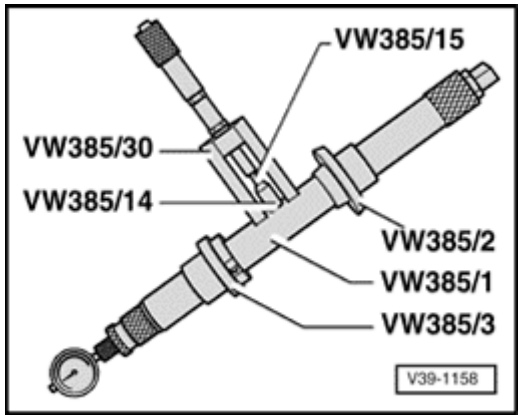
Determining measurement "e"

Note:

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



- Set adjustment rings of universal mandrel VW 385/1 to the following measurements:
  - Dimension a = 65 mm
  - Dimension b = 55 mm



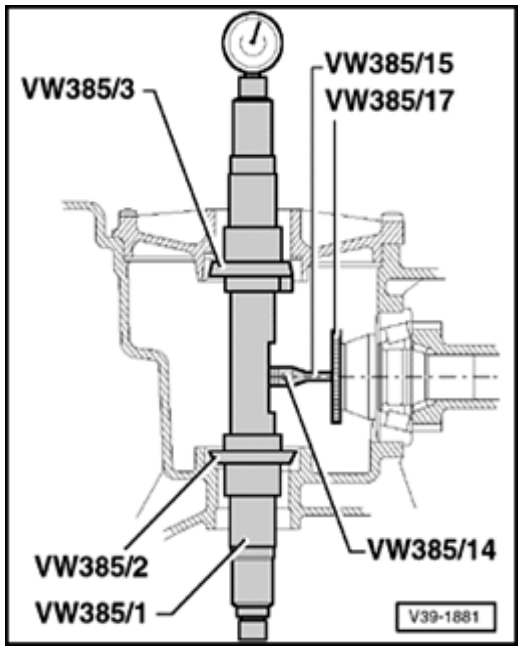
- Assemble universal mandrel VW 385/1 as illustrated:
  - Dial gauge extension VW 385/15, 9.3 mm long
  - Master gauge VW 385/30
- Set master gauge VW 385/30 to Ro = 59.65 mm and fit onto mandrel.
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.

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Note:

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



Arrangement of measuring equipment when determining dimension "e"

- Place end measuring plate VW 385/17 onto drive pinion head.

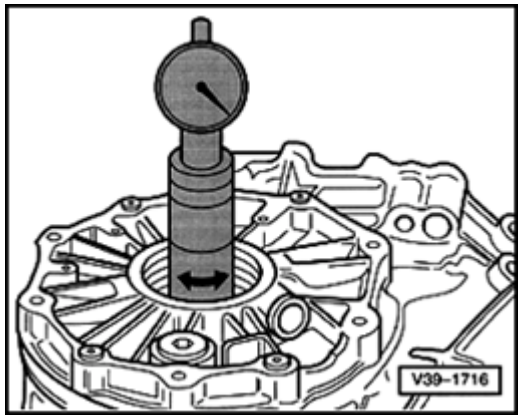
Note:

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

- Take master gauge off mandrel.
- Insert mandrel into transmission housing.
  - ♦ The centering disc 385/3 faces toward cover for final drive
- Fit cover for final drive and tighten 4 bolts to 25 Nm.
- Using adjustable ring, pull 2nd centering disc VW 385/2 out as far as possible so that mandrel can still just be turned by hand.

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- Turn mandrel until dial gauge plunger tip touches end measuring plate on drive pinion head, then measure maximum deflection (return point).
  - Measurement in following example: "e" = 0.16 mm (in red scale)

Determining thickness of shim "S3"

Formula:

"S3" = "S3*" + "r" + "e"

("e" in black scale)

or

"S3" = "S3*" + "r" - "e"

("e" in red scale)

Note:

- *The deviation "r" related to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and inscribed on outer circumference of ring gear.*
- *If measurements are obtained on red scale then subtract value "e."*
- *If measurements are obtained on black scale then add value "e."*

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Example:

	Inserted shim "S3*"	1.05 mm
+	Deviation "r"	0.38 mm
-	Determined "e" (in red scale)	
		0.16 mm
=	Thickness of shim "S3"	1.27 mm

- Determine shim(s) from table.

⇒ *Parts catalog*

The following shims are available for "S3"

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

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

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Determining thickness of shim "S4"

Formula:

"S4" = "S_{total}" - "S3"

Example:

	Total shim thickness "S_{total}"	
	for "S3" + "S4"	2.05 mm
-	Thickness of shim "S3"	1.27 mm
=	Thickness of shim "S4"	0.78 mm

- Determine shim(s) from table.

⇒ *Parts catalog*

The following shims are available for "S4"

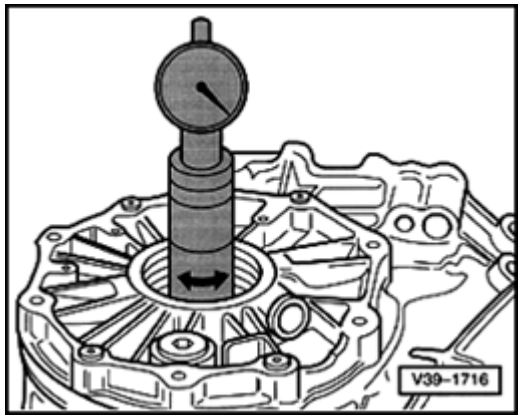
Shim thickness (mm) 1)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

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

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Performing check measurement

Checking dimension "r"

- Install drive pinion with determined shims "S3" and "S4" and turn 5 turns in both directions.

- Insert universal mandrel, ⇒ Page 39-45 , "determining measurement 'e'" and perform check measurement.
- Read off dial gauge anti-clockwise (red scale).
  - If the shims have been correctly selected, the deviation "r" (marked on outer circumference of ring gear) must be shown - within a tolerance of ± 0.04 mm

Note:

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

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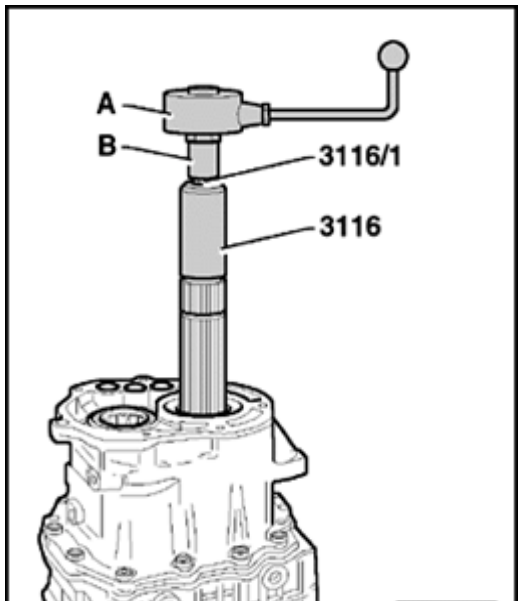
39-51

Measuring friction torque (check)

Note:

- *Drive pinion/hollow shaft tapered roller bearings are low friction bearings. Therefore the frictional torque has only a limited use as a check. Correct adjustment is only possible by determining the total shim thickness "S_{total}."*

- *Do not additionally oil new tapered roller bearing to perform the frictional torque measurement. These bearings have already been treated with a special oil by the manufacturer.*



- Fit torque gauge 0-600 Ncm -A- onto drive pinion.

B - Socket

- Insert tensioning sleeve 3116.

Frictional torque specification:

New bearings	Used bearings
80-150 Ncm	30-60 Ncm

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Ring gear, adjusting

(Adjusting differential)

Repairs after which the ring gear must be adjusted ⇒ Page 39-37 .

Special tools, testers and auxiliary items

- Drift VW 295
- Dial gauge extension VW 382/10
- Measuring plate VW 385/17
- Universal dial gauge bracket VW 387
- Measuring lever VW 388
- Press plate VW 402
- Installing tool VW 459/2
- Ring gear adjusting device VW 521/4
- Attachment for adjusting device VW 521/8

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- Thrust pad 3062
- Thrust plate 30-205
- Mandrel 30-505
- Torque gauge 0-600 Ncm
- Dial gauge
- Dial gauge extension

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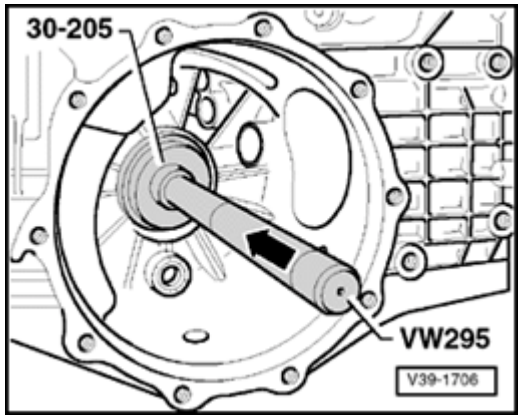
Determining total shim thickness "S_{total}" for shims "S1" + "S2"

(Setting preload of tapered roller bearing for differential)

- Drive pinion removed

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

- Remove shims ⇒ Page 39-18 .



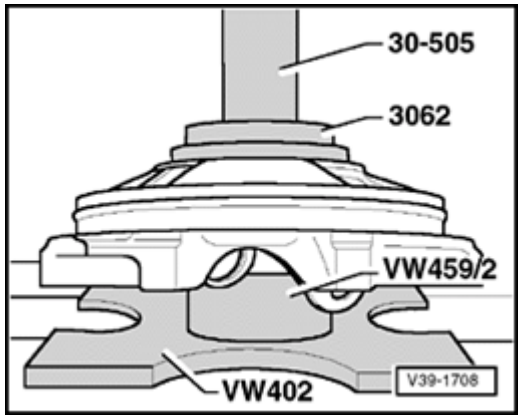
- Drive outer race for tapered roller bearing with shim "S2" into transmission housing. For measurement purposes an "S2*" shim 1.20 mm thick (2 shims of 0.60 mm) is used.

Note:

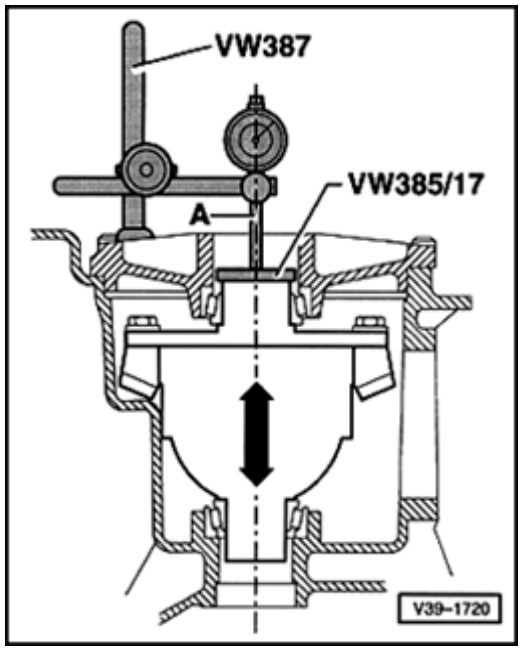
For measurement purposes a shim "S2" of 1.20 mm is initially inserted which is designated "S2" in the following. After determining backlash, "S2*" will be replaced by the correct shim "S2."*

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- Press outer race for tapered roller bearing without shim "S1" into cover for differential.
- Insert differential without drive wheel for speedometer sender -G22 into transmission housing. Ring gear is positioned on left-hand side (same side as cover for final drive).
- Install cover for differential with 4 bolts (25 Nm).
- Position transmission so that cover for differential faces up.
- Turn differential 5 turns in both directions so that tapered roller bearings settle.



- Assemble measuring equipment, use a 30 mm dial gauge extension.
- Set dial gauge (3 mm measuring range) -A- to "0" with 2 mm preload.

Note:

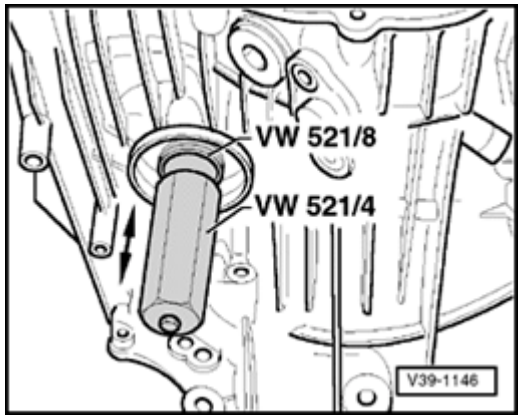
The tip of the dial gauge must be positioned on center of differential.

- Lift differential, without turning, and read off play on dial gauge.

• Measurement in following example: 0.62 mm.

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Note:

- *Secure special tools VW 521/4 and VW 521/8 on right of differential (transmission side) to lift differential.*
- *If the measurement has to be repeated, the differential must again be turned 5 turns in each direction to settle the tapered roller bearing.*

Formula:

"S_{total}" = "S2*" + measurement + bearing preload

Example:

	Inserted shim(s) "S2*"	1.20 mm
+	Measured value	0.62 mm
+	Bearing preload (constant)	0.25 mm
=	Total shim thickness "S_{total}"	
	for "S1" + "S2"	2.07 mm

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Determining thickness of shim "S1*"

Note:

- *The preliminary adjustment shim "S1*" will be replaced with the final shim "S1" after determining the backlash.*

- *The total shim thickness "S_{total}" remains unchanged.*

Formula:

"S1*" = "S_{total}" - "S2*"

Example:

	Total shim thickness "S_{total}"	
	for "S1" + "S2"	2.07 mm
-	Inserted shim(s) "S2*"	1.20 mm
=	Thickness of shim "S1*"	0.87 mm

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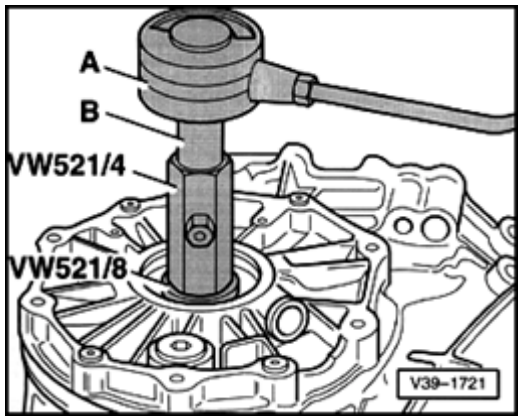
Measuring friction torque (check)

Note:

- *Differential tapered roller bearings are low friction bearings. Therefore the friction torque only has a limited use as a check. Correct adjustment is only possible by determining the total shim thickness "S_{total}."*

- *Do not additionally oil new tapered roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.*

- Drive pinion removed



- Fit torque gauge 0-600 Ncm -A- onto differential.

B - Socket

- Read off frictional torque.

Frictional torque specifications:

New bearings	Used bearings
200-350 Ncm	30-50 Ncm

Note:

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If the final drive set (drive pinion and ring gear) is being adjusted, perform the adjustment of the drive pinion now and check the adjustment ⇒ *Page 39-39* .

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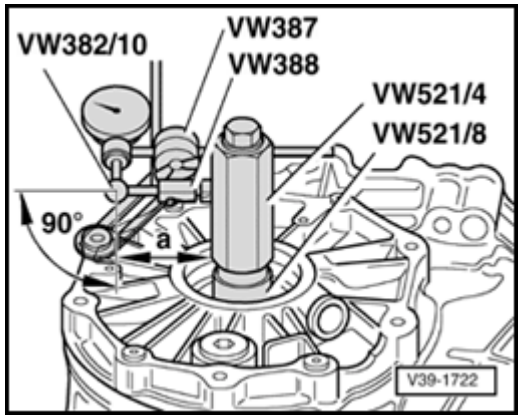
Measuring backlash

(Position of ring gear in transmission housing)

- Drive pinion with shims "S3" and "S4" installed

- Install differential.

- Turn differential 5 turns in each direction to settle tapered roller bearings.



- Secure dial gauge retainer VW 387 onto housing.
- Insert adjustment device VW 521/4 and VW 521/8 for ring gear.
- Fit dial gauge with dial gauge extension VW 382/10 (6 mm flat).
- Set measuring lever VW 388 to dimension a = 79 mm.
- Determine play between the teeth flanks as follows:
  - Turn ring gear until it makes contact with a tooth flank (end of backlash travel).
  - Set dial gauge to "0" with 2 mm preload.
  - Turn ring gear back until lying against an opposite tooth flank (backlash).

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- Read off backlash and note value.

- Turn ring gear through 90° and repeat measurements a further 3 times.

Note:

If the individual measurements differ by more than 0.06 mm from each other, the installation of the ring gear or the final drive set itself is not correct. Check installation, replace final drive set if necessary.

Determining average backlash

- Add the four measurements together and divide by four.

Example:

	1st measurement	0.49 mm
+	2nd measurement	0.48 mm
+	3rd measurement	0.50 mm
+	4th measurement	0.49 mm
=	Sum of measured values	1.96 mm

- Result: The average backlash is 1.96 ÷ 4 = 0.49 mm

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Determining thickness of shim"S2"

Formula:

"S2" = "S2*" - backlash + lift

Example:

	Inserted shim "S2*"	1.20 mm
-	Average backlash	0.49 mm
+	Lift (constant)	0.15 mm
=	Thickness of shim "S2"	0.86 mm

- Determine shim(s) from table.

⇒ *Parts catalog*

The following shims are available for "S2"

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

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

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Determining thickness of shim "S1"

Formula:

"S1" = "S_{total}" - "S2"

Example:

	Total shim thickness "S_{total}" for "S1" + "S2"	2.07 mm
-	Thickness of shim "S2"	0.86 mm
=	Thickness of shim "S1"	1.21 mm

- Determine shim(s) from table.

⇒ *Parts catalog*

The following shims are available for "S1"

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

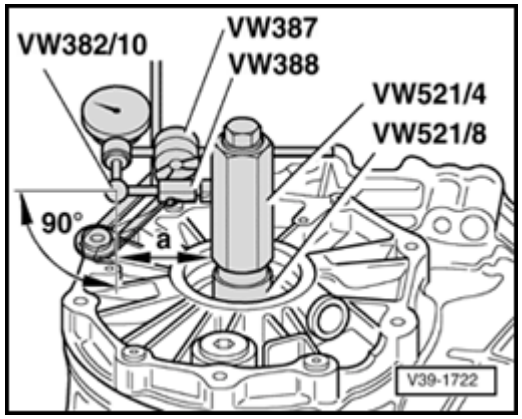
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0.60	0.80	

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

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Performing check measurement

- 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.

  Specifications: 0.12-0.22 mm

Note:

- *If the backlash lies outside the tolerances, the adjustments must be repeated. But the total shim thickness "S_{total}" must remain the same.*
- *The individual measurements must not differ by more than 0.06 mm from each other.*

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Driveshaft, servicing

Note:

- *Observe general repair instructions ⇒ Page 00-11 .*
- *Do not bend the driveshaft more than 25° at the central joint, otherwise the universal joint will be damaged.*
- *Only store and transport driveshaft extended.*
- *No repair work can be carried out on the driveshaft with the exception of removing, installing and adjusting.*
- *If the driveshaft is only detached at the transmission or from rear final drive then the driveshaft is to be tied-up or supported at the constant velocity joint.*
- *Before removing, mark the position of the rear driveshaft joint in relation to the flange on the rear final drive. Reinstall in the same position, otherwise this can cause excessive imbalance, bearing damage and droning noise.*
- *If complaints are received (noises, vibrations), it*

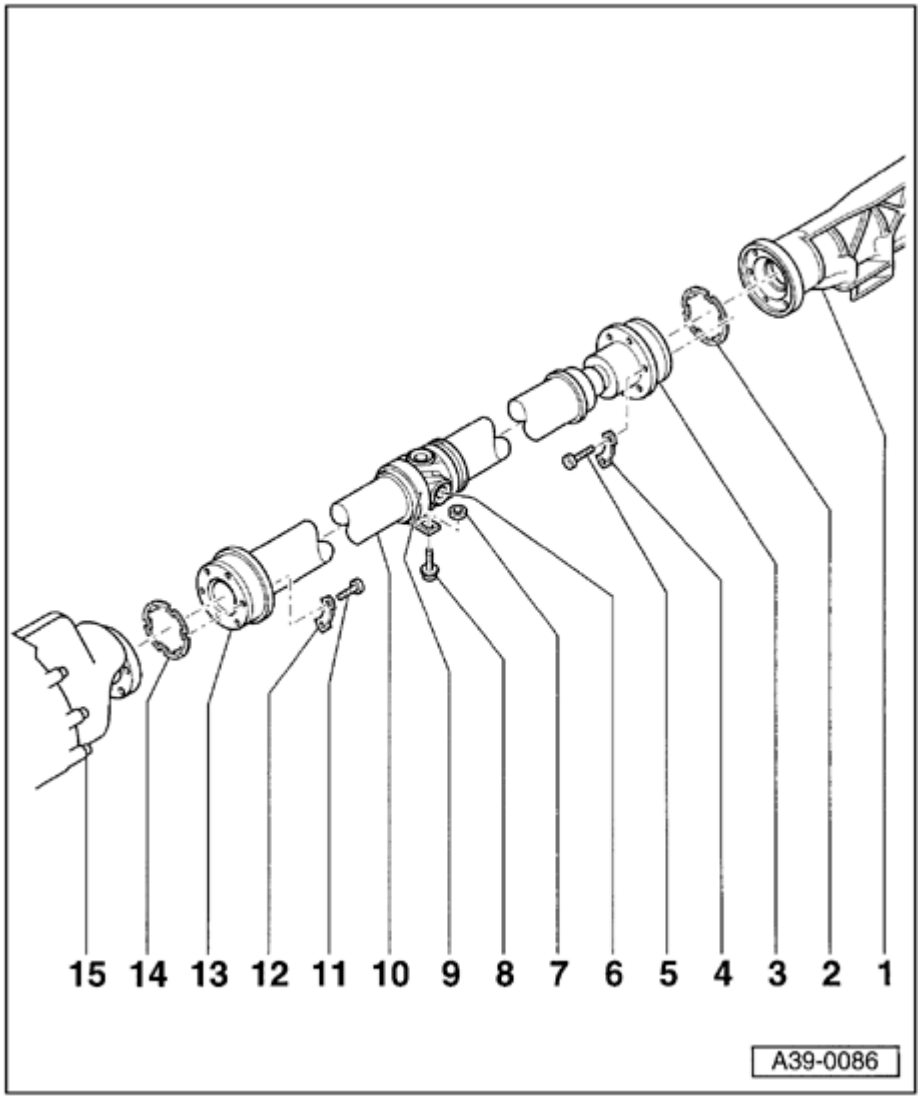
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is essential to check whether correct adjustment of the driveshaft rectifies the fault before replacing the driveshaft.

- *After removing the driveshaft from the rear final drive, the additional balance disc (thick washer) that may be located between the lock plate and the bolt head must not be reinstalled.*

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1 - Rear final drive

2 - Gasket

- Always replace
- Pull off backing foil, and stick self-adhesive side of gasket to drive flange.
- Remove grease from drive flange

3 - Constant velocity joint

- Maximum permissible angle of deflection 8°

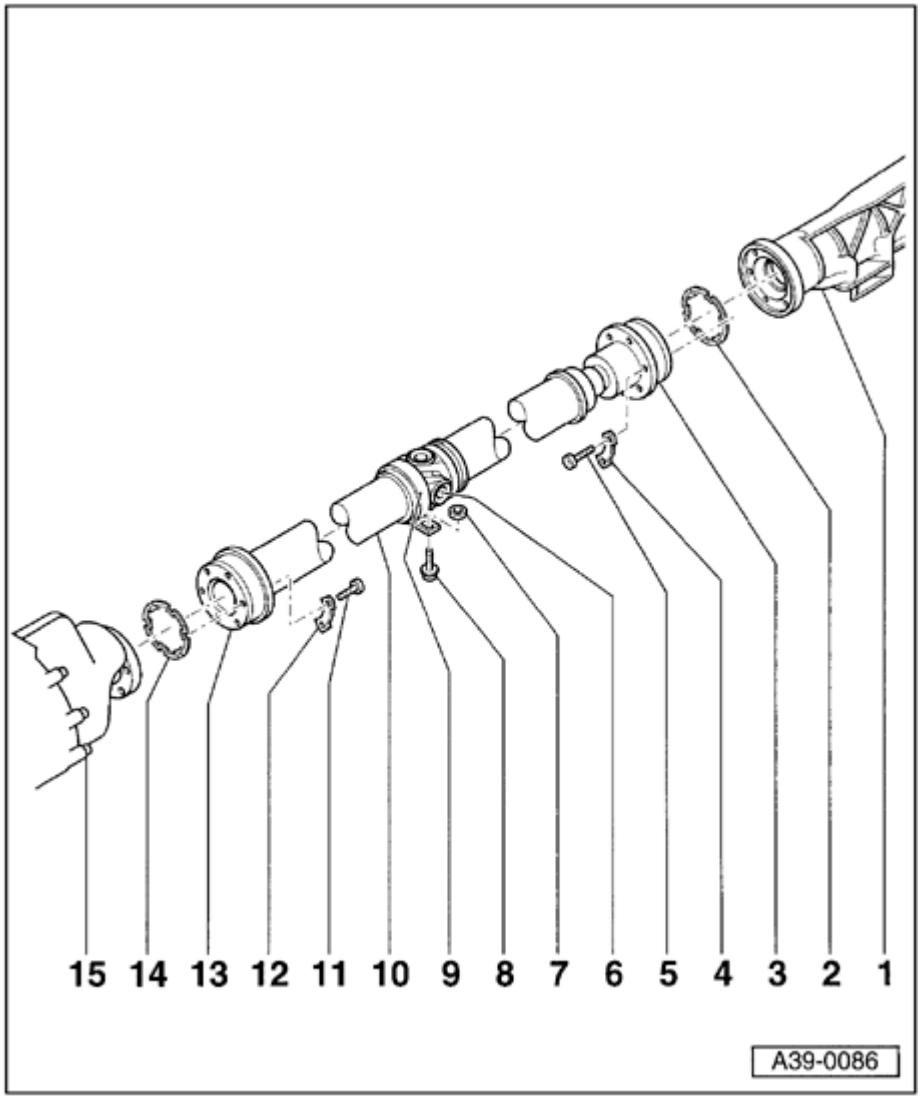
4 - Lock plate

5 - Hex socket head bolt, 55 Nm

- Self-locking
- Always replace
- Threads for bolts in drive flanges must always be cleaned (e.g. with a thread tap)

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6 - Universal joint

- Maximum permissible angle of deflection 25°

7 - Shim

- Determining thickness ⇒ Page 39-76

8 - Hex bolt, 23 Nm

9 - Driveshaft center mounting

10 - Driveshaft

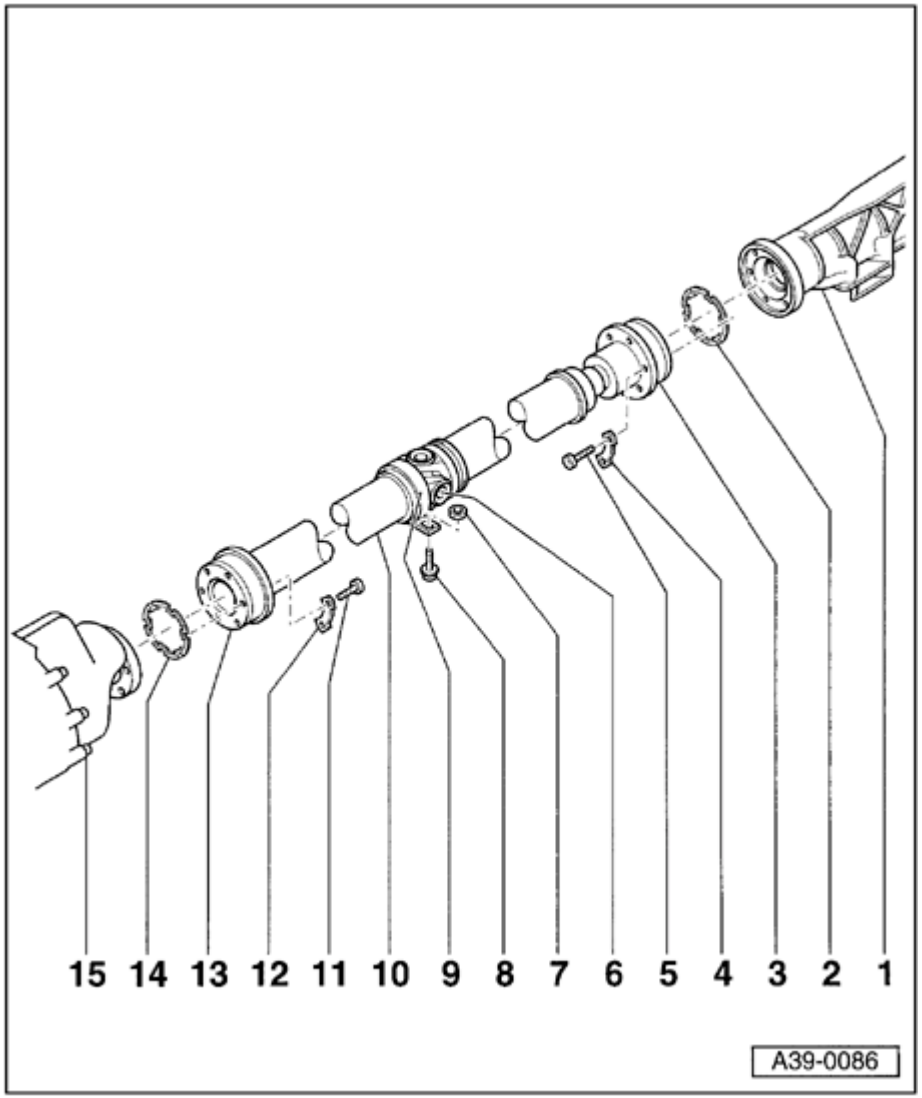
- Adjusting ⇒ Page 39-75

11 - Hex socket head bolt, 55 Nm

- Self-locking
- Always replace
- Threads for bolts in drive flanges must always be cleaned (e.g. with a thread tap)

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12 - Lock plate

13 - Constant velocity joint

- Maximum permissible angle of deflection 8°

14 - Gasket

- Always replace
- Pull off backing foil, and stick self-adhesive side of gasket to drive flange.
- Remove grease from drive flange

15 - Transmission

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Driveshaft, removing and installing

Special tools, testers and auxiliary items

- Assembly appliance 3405

- Observe notes ⇒ Page 39-64 .

Removing

- If fitted, remove cross piece below exhaust system.

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

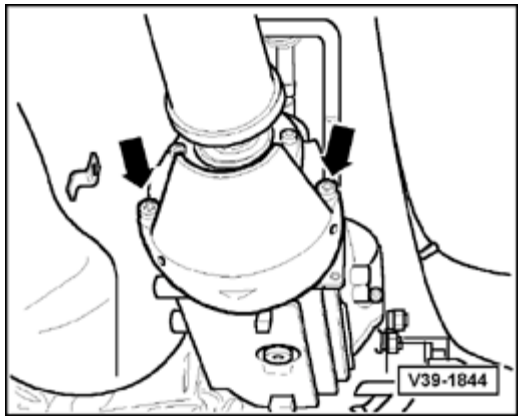
⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 26*

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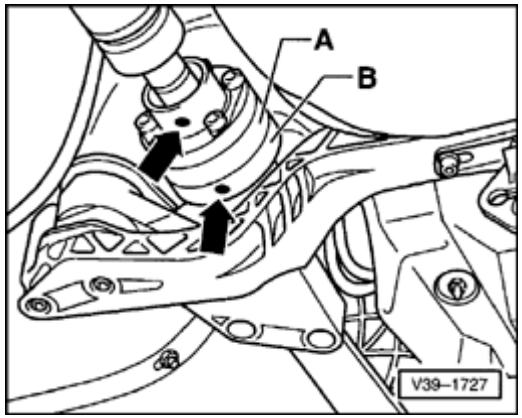
39-69

Removing

- Remove heat shields above driveshaft.



- Remove heat shield for driveshaft from cover for Torsen differential (arrows).



- Check whether there is a factory marking (paint spots (arrows)) on the driveshaft flange and the flange on the rear final drive. If not, mark the position of the driveshaft flange -A- in relation to the rear final drive (arrow -B-) with paint.

Note:

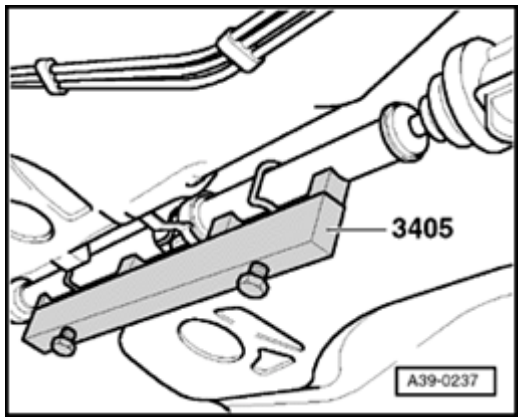
Only mark if the same driveshaft is to be reinstalled.

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- Loosen securing bolts on both driveshaft flanges.

- Unscrew three upper securing bolts on each driveshaft constant velocity joint.

- Loosen securing bolts of center driveshaft mounting slightly.



- Attach assembly appliance 3405 and tighten the plastic nuts.

Note:

Never fit assembly appliance onto balance plates.

- Remove securing bolts of flange to transmission and to rear final drive as well as securing bolts of center driveshaft mounting.
- Slide driveshaft together toward rear final drive. Constant velocity joints move along their axis.
- Guide out driveshaft with assembly appliance past transmission flange.

Note:

Only transport and store driveshaft when extended.

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39-71

Installing

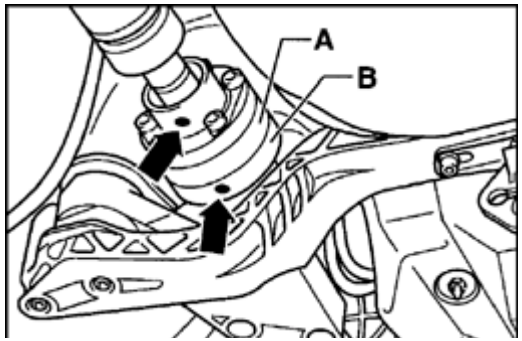
Installation is carried out in the reverse order, when doing this note the following:

Note:

- *It is essential that the locking fluid remaining in the threads in the drive flanges on the transmission and rear final drive is cleaned out after removing the driveshaft. Otherwise there is a danger that the new bolts will seize when they are screwed in and then shear if they have to removed later.*

- *The threaded holes can be cleaned with a thread tap.*

- *Replace the gaskets on the drive flanges (remove backing foil and stick gaskets onto drive flange; make sure that the surfaces are free of grease).*



- *To prevent imbalance, the flanges on the driveshaft -A- and on the rear final drive -B- must be installed so that the factory markings (or the markings made on removal) are in alignment (arrows).*

- *If a new driveshaft is being installed and the factory paint marking on the rear final drive flange is no longer visible, the radial run-out at the flange for the driveshaft must be measured ⇒ Page 39-73 , and the paint marking on the driveshaft must be aligned with the marking on*

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the flange.

- *After removing the driveshaft from the rear final drive, the additional balance disk (thick washer) that may be located between the lock plate and the bolt head must not be reinstalled. Always replace all flange bolts after disassembling.*
- *Replace driveshaft bolts (self-locking).*

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- Adjust driveshaft after installing ⇒ Page 39-75 .

- Align exhaust system free of stress.

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 26; Removing and installing parts of exhaust system*

Tightening torques

Component	Nm
Driveshaft to transmission (output flange)	55
Driveshaft to final drive (input flange)	55
Driveshaft center mounting to body	23
Heat shield for driveshaft to transmission	23
Cross member to body	25
Nuts for clamp	40

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Radial run-out at driveshaft flange and marking, measuring

Special tools, testers and auxiliary items

- Universal dial gauge bracket VW 387
- Lifting tackle 2024 A
- Dial gauge
- M10 x 85 bolt

Note:

- *The radial run-out must always be measured when the drive flange housing is removed. Remove old paint marking and make new marking.*
- *If a new driveshaft is being installed and the marking on the drive flange of the rear final drive is no longer visible, the point of maximum radial run-out must be measured with a dial gauge and marked with paint.*
- *The paint marking on the driveshaft is then brought into alignment with this paint marking*

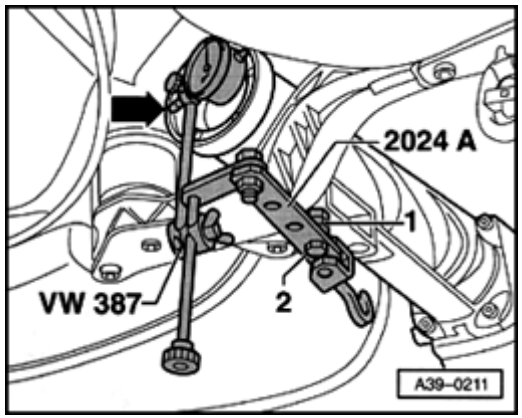
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⇒ *Page 39-71* .

- *The radial run-out can be measured when the rear final drive is installed, but the driveshaft must be disconnected at the rear final drive. Observe notes* ⇒ *Page 39-64* .

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- Remove bolt on front left of rear final drive support.

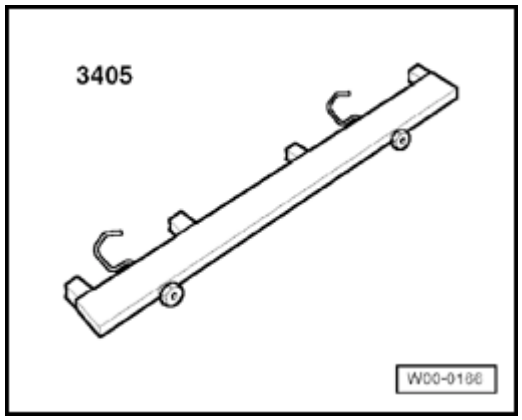
- Remove bar from lifting appliance 2024 A and secure it to free hole with an M10 x 85 mm bolt -2-. Use approx. 5 M12 nuts -1- as spacers.
- Secure dial gauge bracket VW 387 to the bar when it is secured in position.
- Position dial gauge on ground circumference in driveshaft flange (arrow) and set to zero with a preload of 1 mm.
- Turn differential via both rear wheels (left and right drive flanges) until flange on rear final drive completes one rotation.
- Make a paint marking at point of greatest radial run-out on outside of flange (= greatest distance from axis of rotation).
- Remove old marks on driveshaft flange.
- Install driveshaft ⇒ Page 39-71 .

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39-75

Driveshaft, adjusting

Special tools, testers and auxiliary items



- Assembly appliance 3405

- Observe notes ⇒ Page 39-64 .

Adjustments should be carried out with care, because a badly adjusted driveshaft is often the cause of vibration and droning.

- If fitted, remove cross-piece below exhaust system.
- Remove rear section of exhaust system (rearward of exhaust pipe clamp(s)):

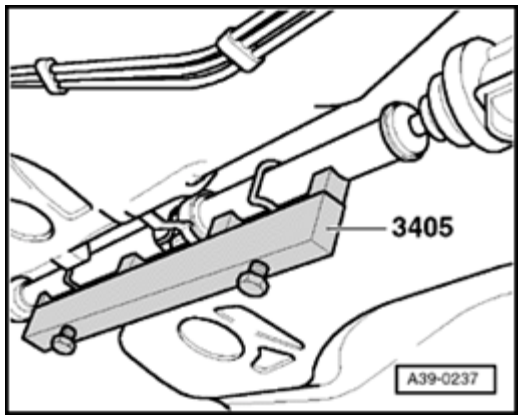
⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 26*

- Remove heat shields above driveshaft.

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- Loosen securing bolts of center driveshaft mounting slightly.

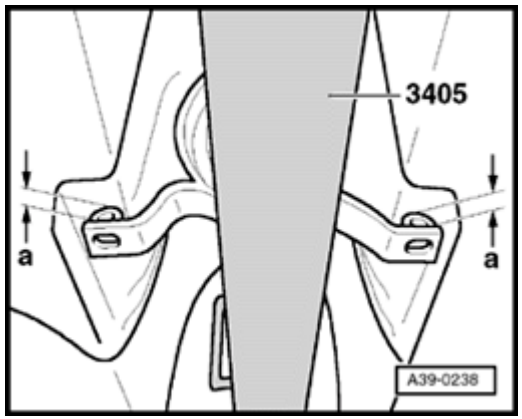


- Attach assembly appliance 3405 and tighten the plastic nuts.

Note:

Never fit assembly appliance onto balance plates.

- Remove securing bolts and shims from center mounting.



- Align center driveshaft mounting so that distance -a- is the same on left and right.
- Measure -a- on both sides.
- Select shims from table.

⇒ *Parts catalog*

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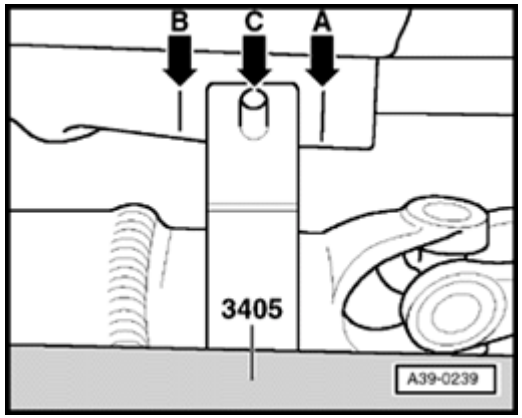
39-77

The following shims are available:

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

- Install the correct shims on both sides.

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Aligning driveshaft longitudinally

- Using assembly appliance, push driveshaft toward rear as far as it will go.
- Mark position of center mounting on body (arrow -A-).
- Using assembly appliance, push driveshaft toward front as far as it will go.
- Mark position of center mounting on body (arrow -B-).
- Align driveshaft -arrow C-.
  - The center mounting must be positioned centrally between the markings -A- and -B-
- Install securing bolts of driveshaft center mounting and previously determined shims and tighten.
- Remove assembly appliance.
- Install heat shield above driveshaft.

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The remaining installation steps are carried out in the reverse order of removal. Note the following points:

- Align exhaust system free of stress.

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 26*

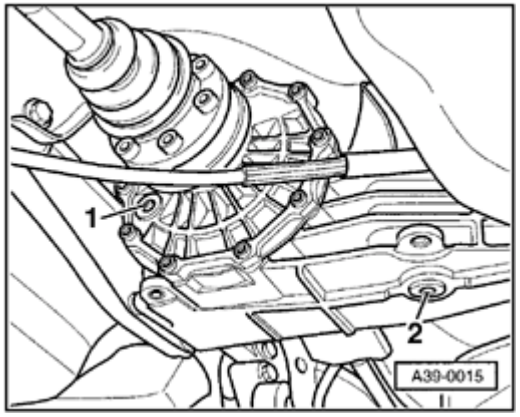
Tightening torques

Component	Nm
Driveshaft center mounting to body	23
Cross member to body	25
Nuts for clamps	40

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Oil level in rear final drive, checking



- Remove oil filler plug -1- to check final drive oil level.

  Specification: oil level up to lower edge of filler hole.
- Top-up gear oil if necessary.

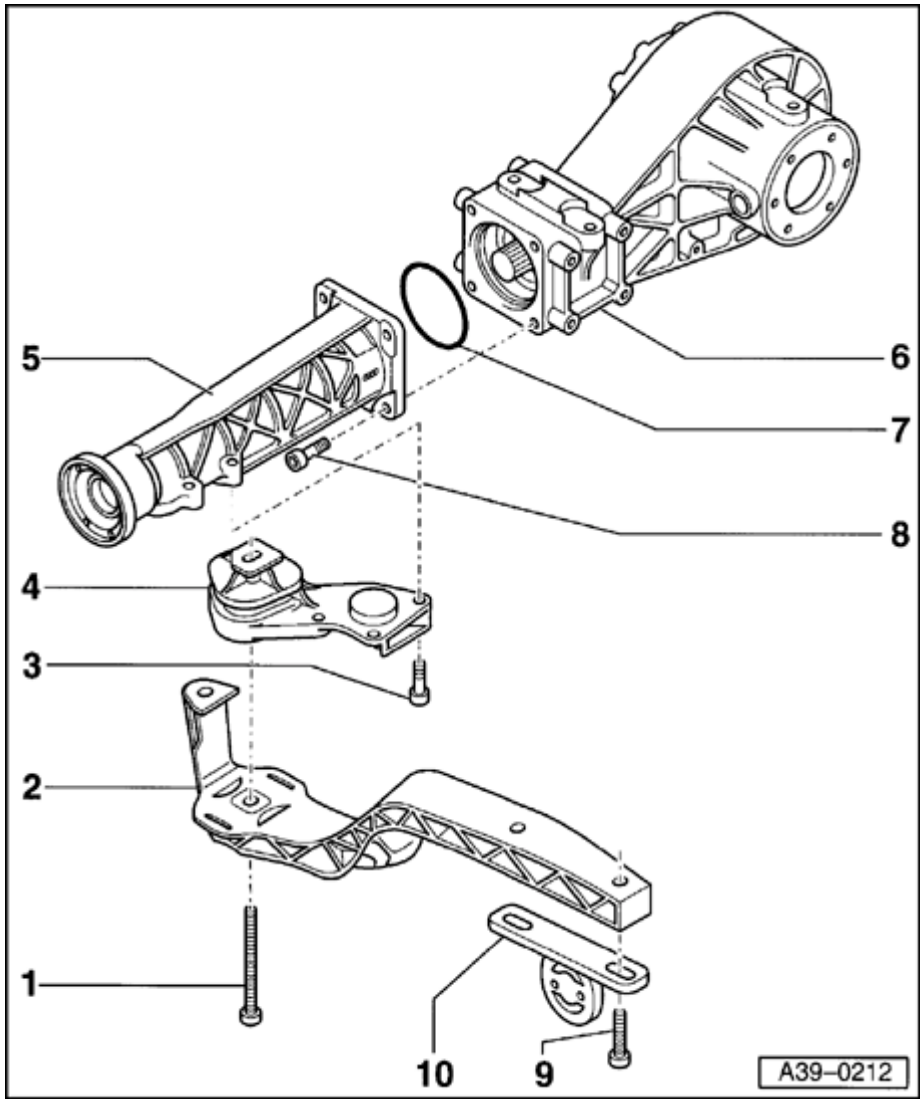
  Specification ⇒ Page 00-6 .
- Fit oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	35

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Drive flange housing, removing and installing

Assembly overview

1 - Bolt, 40 Nm

2 - Front cross member

3 - Bolt, 40 Nm

4 - Final drive support

5 - Drive flange housing

6 - Rear final drive housing

7 - O-ring

8 - Bolt, 35 Nm

9 - Bolt, 23 Nm

10 - Bracket

- For exhaust system

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Removing

- Rear final drive installed

Special tools, testers and auxiliary items

- Multipurpose tool VW 771 and 771/15
- Drip tray V.A.G 1306
- Universal support V.A.G 1359/2
- Engine/transmission jack V.A.G 1383 A

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

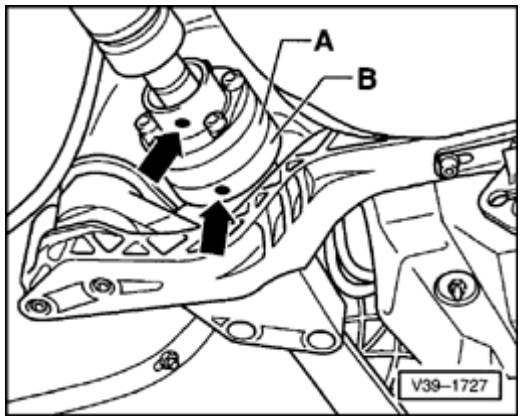
- Remove rear section of exhaust system (rearward of exhaust pipe clamp(s)):

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 26*

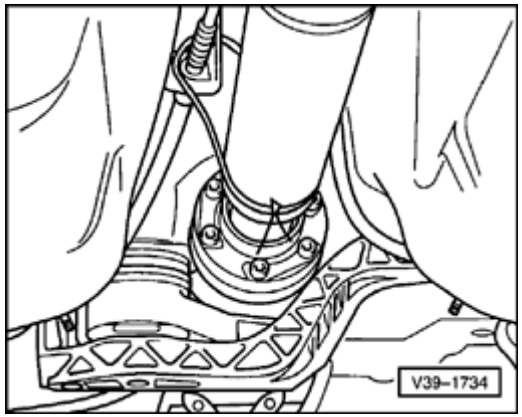
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- Remove heat shield above driveshaft.

- Remove heat shield next to rear final drive.



- Check whether there is a factory marking (paint spot) on driveshaft. If not, mark position of driveshaft flange -A- in relation to rear final drive (arrow -B-) with paint.
- Unscrew bolts from driveshaft flange.



- Secure driveshaft to parking brake cable bracket with wire.

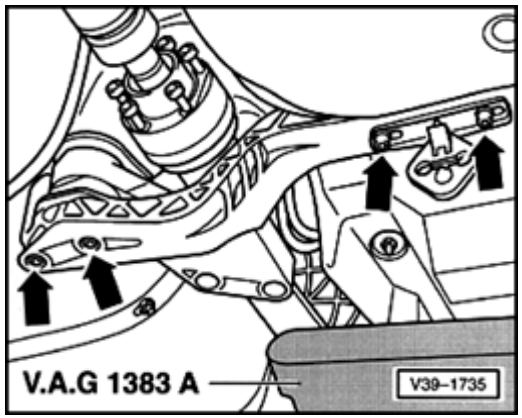
Note:

If it is not possible to push the driveshaft up and off the flange, lower the final drive before tying up the driveshaft. When lowering the final drive, prevent the driveshaft from dropping down, and do not bend the center joint further than the maximum angle permitted ⇒ Page 39-64 , Notes.

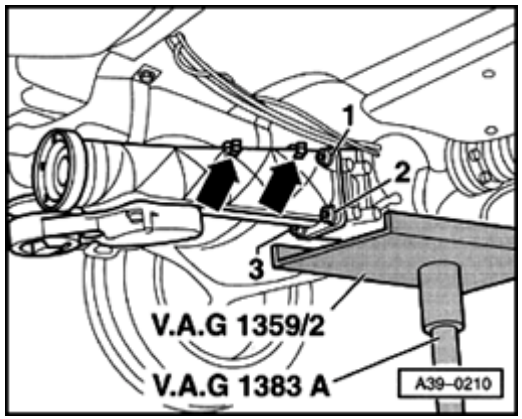
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- Support final drive with transmission jack V.A.G 1383 A.



- Unscrew bolts (arrows) on front cross member for rear final drive.
- Detach front cross member.
- Lower final drive about 10 cm.



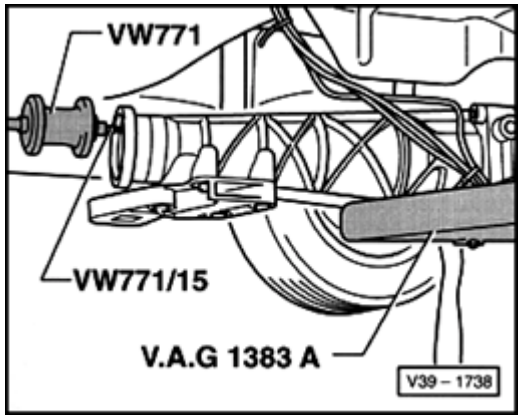
- Unscrew 4 bolts for drive flange housing (see -1-, -2- and -3- in illustration).

Note:

Fourth bolt not shown in illustration.

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- Pull off drive flange with drive flange housing.

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Installing

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

Note:

- *After removing the driveshaft, it is important to clean any remaining locking compound out of the threads in the drive flanges on the transmission and rear final drive. If this is neglected, the new bolts can seize when they are screwed in and shear off later if they have to be removed.*
- *The threaded holes can be cleaned with a thread tap.*
- *Replace gasket between driveshaft and drive flange (pull off backing foil and stick gasket onto drive flange). Surface must be free of grease.*
- *Replace driveshaft bolts (self-locking).*

- If there is a factory marking on the driveshaft, measure the radial run-out at the flange for the driveshaft (⇒ Page 39-73) and align the paint marking on the driveshaft with new marking on the flange.

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- Align exhaust system free of stress.

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 26*

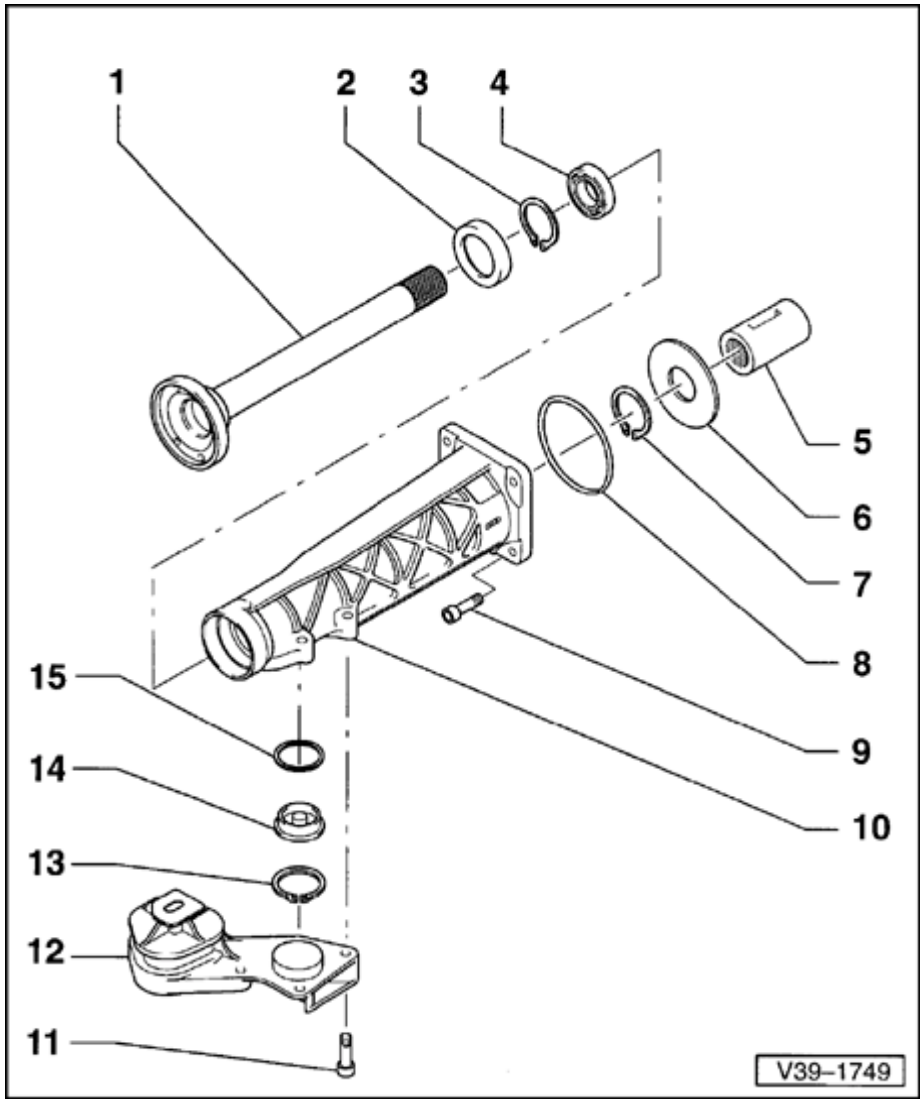
- Top up gear oil in rear final drive and check oil level ⇒ Page 39-80 .

Tightening torques

Component	Nm
Drive flange housing to rear final drive	35
Driveshaft to final drive (input flange)	55
Front cross member for rear final drive to body	40
Front cross member for rear final drive and exhaust bracket to body	23
Oil filler plug	35
Nuts for clamp	40

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Drive flange housing, disassembling and assembling

Assembly overview

Note:

Removing and installing drive flange housing ⇒ *Page 39-81* .

1 - Drive flange

- Removing ⇒ Page 39-93
- When installing drive flange, circlip - 7 - should be inserted at the same time through hole in housing ⇒ Page 39-97

2 - Seal

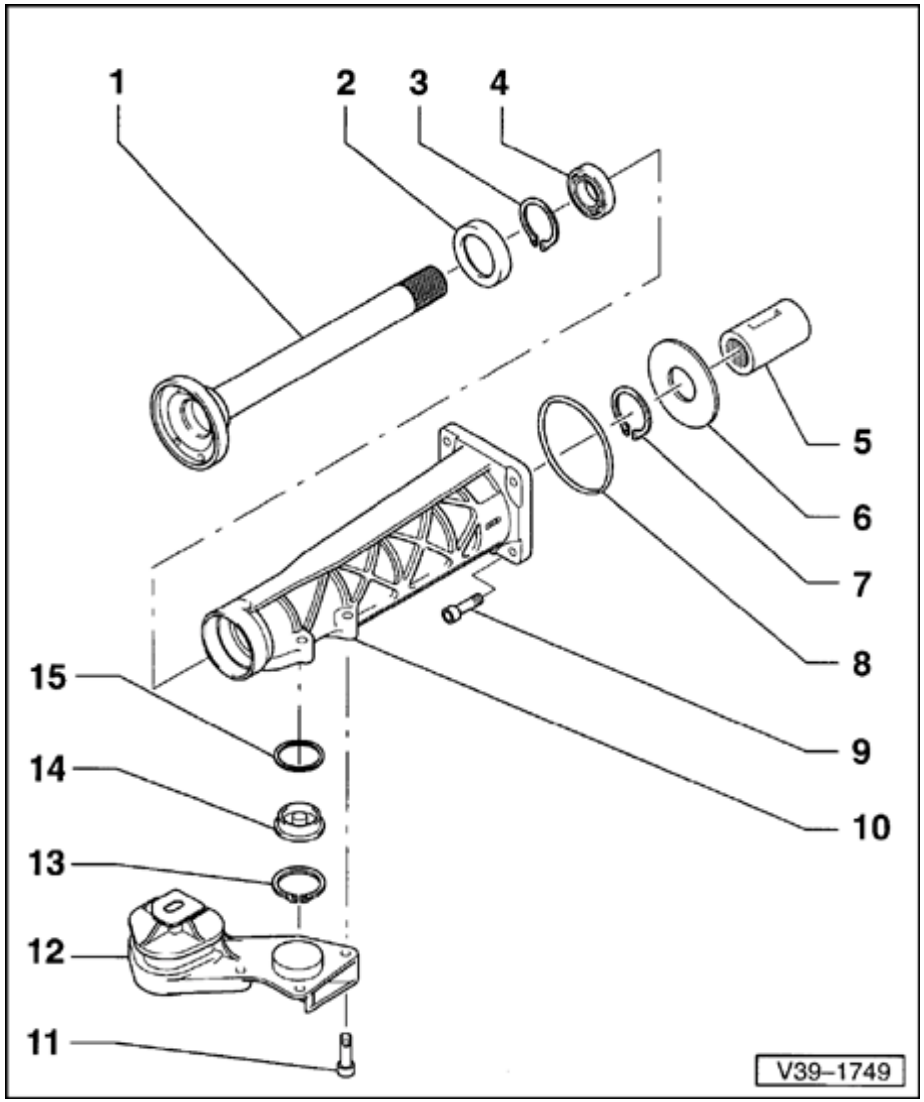
- Prising off ⇒ Page 39-94
- Driving in ⇒ Page 39-96

3 - Circlip

- Removing ⇒ Page 39-94

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4 - Grooved ball bearing for drive flange

- Pulling out ⇒ Page 39-95
- Pressing in ⇒ Page 39-96

5 - Sleeve

- Pulling off ⇒ Page 39-92
- Pressing on ⇒ Page 39-97

6 - Baffle plate

- Only press out if damaged
- Installing ⇒ Page 39-95

7 - Circlip

- To remove drive flange, open out circlip ⇒ Page 39-93

8 - O-ring

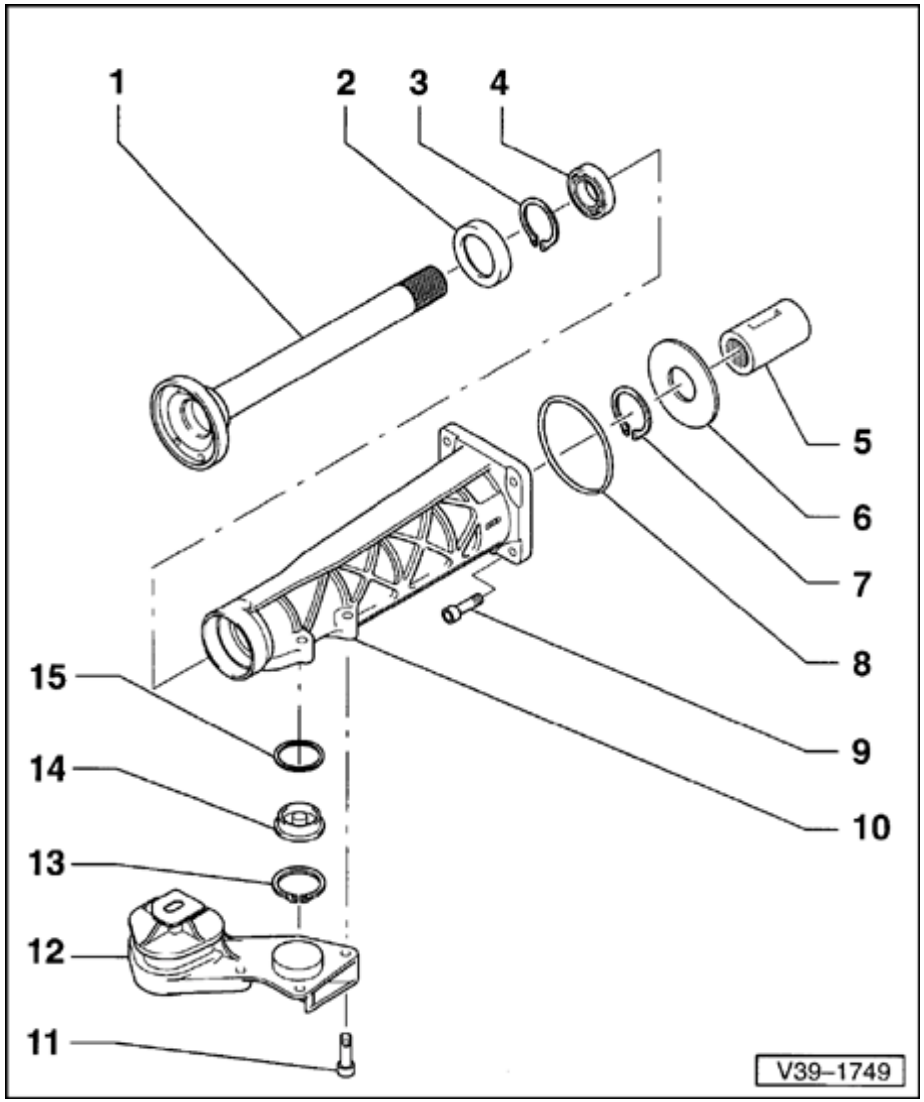
- Always replace

9 - Bolt, 35 Nm

- Secures drive flange housing to rear final drive housing

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10 - Drive flange housing

11 - Bolt, 40 Nm

- Secures final drive support to drive flange housing

12 - Final drive support

13 - Circlip

- Removing ⇒ Page 39-92

14 - Cover cap

- Removing ⇒ Page 39-92

15 - O-ring

- Always replace

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Drive flange housing, disassembling and assembling

Special tools, testers and auxiliary items

- Press plate VW 402
- Press tool VW 409
- Press tool VW 412
- Press tool VW 433
- Multipurpose tool VW 771 and 771/15
- Mandrel 2051
- Drift 2062
- Tappet compressor 2078
- Internal puller Kukko 21/5

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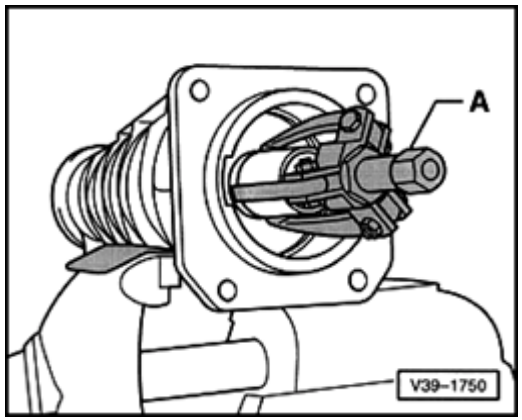
39-92

Note:

Removing and installing drive flange housing ⇒ Page 39-81 .

Disassembling

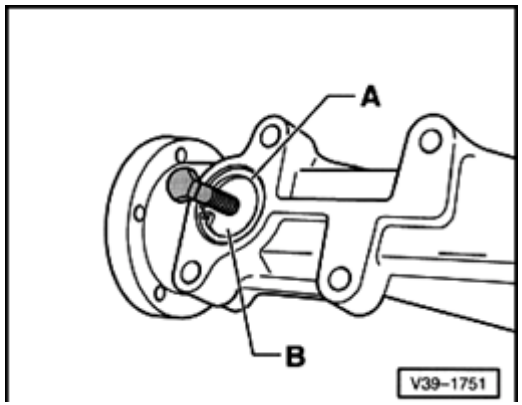
- Clamp drive flange housing in vice (use soft jaws).



- Pull off sleeve.

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

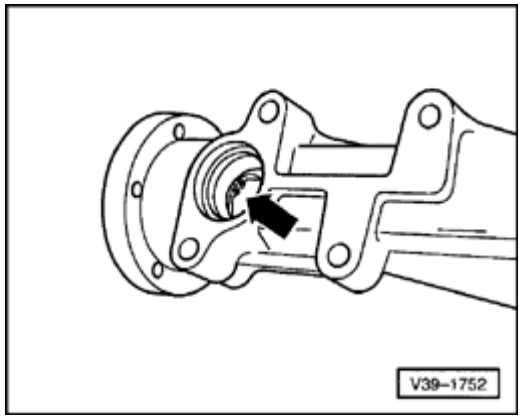
- Detach final drive support.



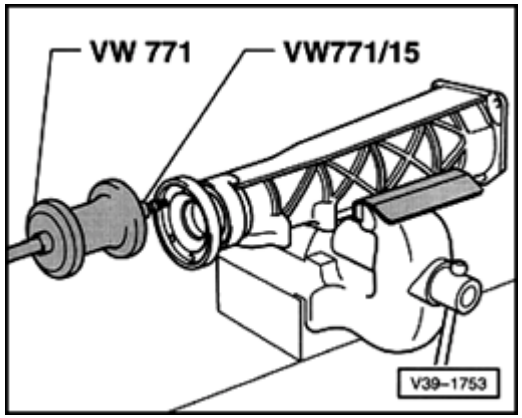
- Remove circlip -A-.
- Screw M8 bolt into thread in cover cap -B- and pull out cover cap.

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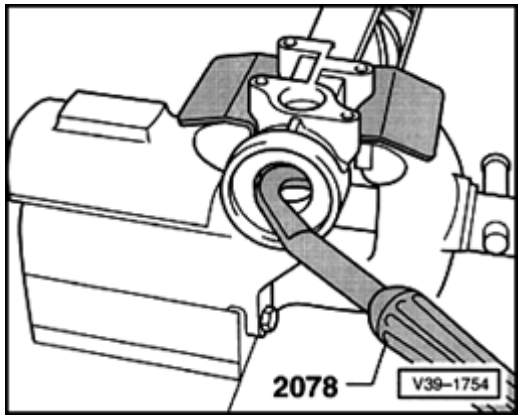
- Open out circlip (arrow) on drive flange and push circlip toward splines.



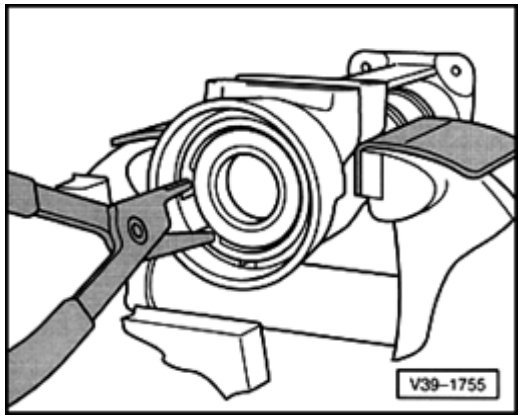
- Remove drive flange.
- Take circlip out of drive flange housing.

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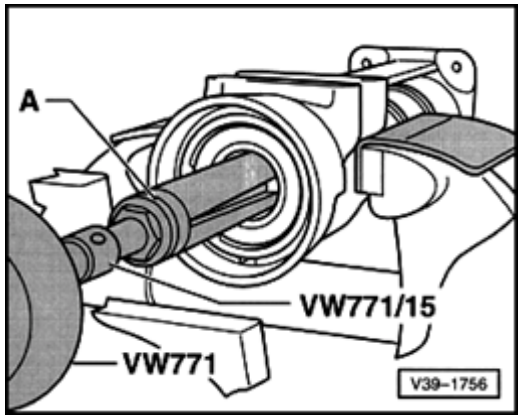
- Pry out seal.



- Remove circlip.

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- Pull out grooved ball bearing for drive flange.

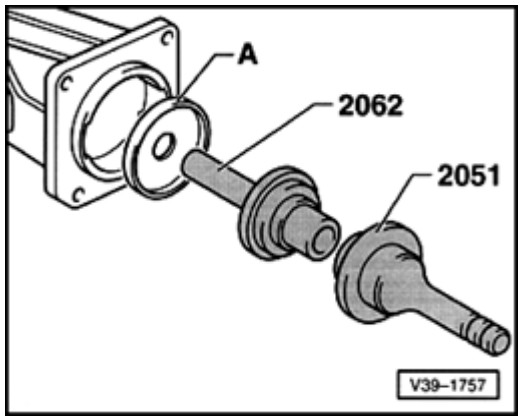
A - Internal puller 30-37 mm, e.g. Kukko 21/5

Note:

The bearing will be damaged when it is removed.

Only if baffle plate is damaged:

- If baffle plate is damaged, press it out with drive flange.

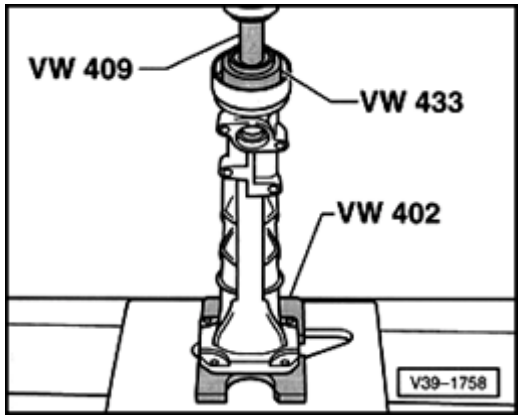


- To install, drive in baffle plate -A- onto stop.

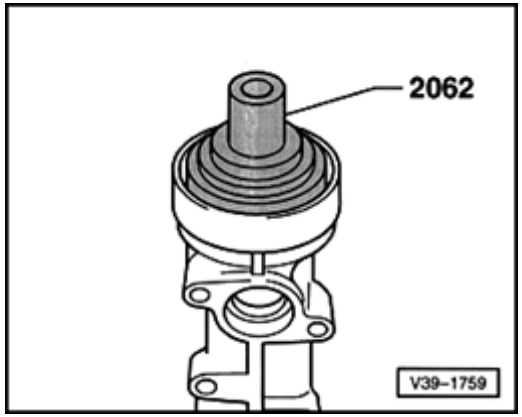
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Assembling



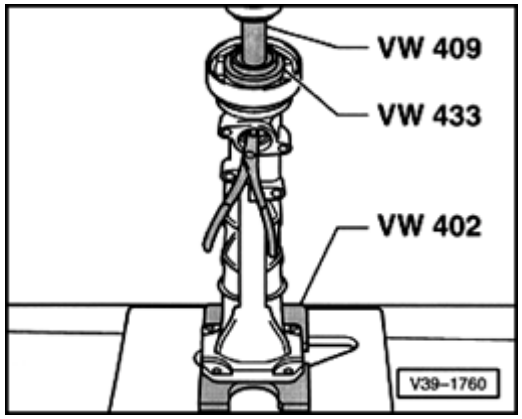
- Press grooved ball bearing into drive flange housing.
- Fit outer circlip.
- Pack space between sealing lip and dust lip of seal with sealing grease G52 128 A1.



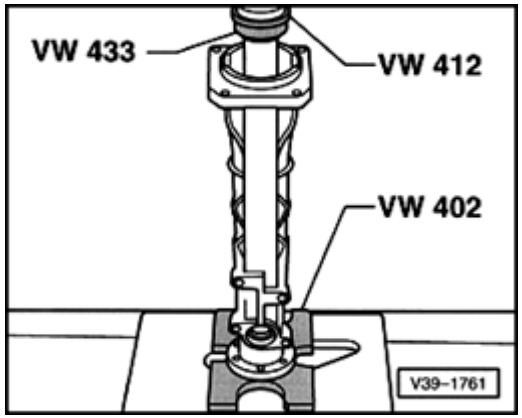
- Drive in seal onto stop.

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- Insert inner circlip in drive flange housing and hold in position with pliers; press in drive flange.
- Fit circlip in groove.



- Press sleeve onto drive flange as far as stop.
- Install cover cap with seal.
- Fit circlip.
- Install final drive support.
- Fit O-ring on drive flange housing.

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Drive flange oil seals, replacing

- Rear final drive installed

- Observe general repair instructions ⇒ Page 00-11 .

Note:

The exhaust system only needs to be removed if the left oil seal is replaced.

Special tools, testers and auxiliary items

- Drift 2062
- Drip tray V.A.G 1306
- Universal support V.A.G 1359/2
- Engine/transmission jack V.A.G 1383 A

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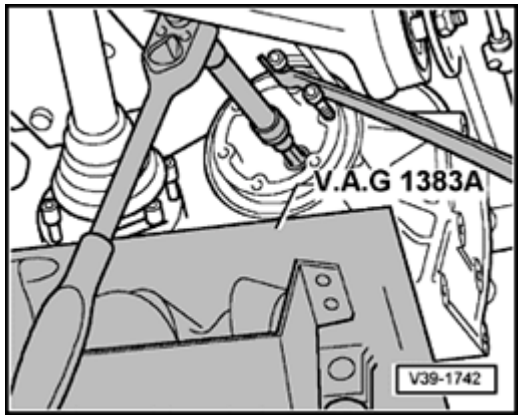
Removing

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

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 26*

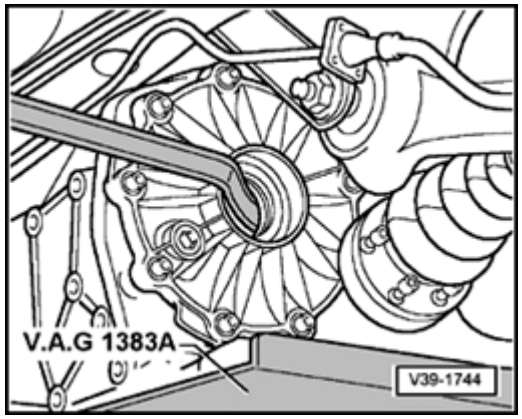
- Detach left and right-hand drive axles from rear final drive, and lay to one side:

⇒ *Repair Manual, Suspension, Wheels, Steering, Repair Group 42.*



- Remove drive flange. To loosen securing bolt, screw two bolts into drive flange and hold with bar to prevent it from turning.
- Place drip tray V.A.G 1306 underneath and drain transmission oil.
- Pull out drive flange using the bolts already screwed in.

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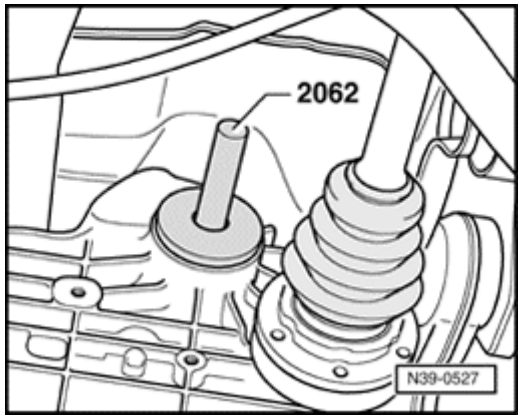


- Pry out drive flange oil seal with a suitable lever.

Installing

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

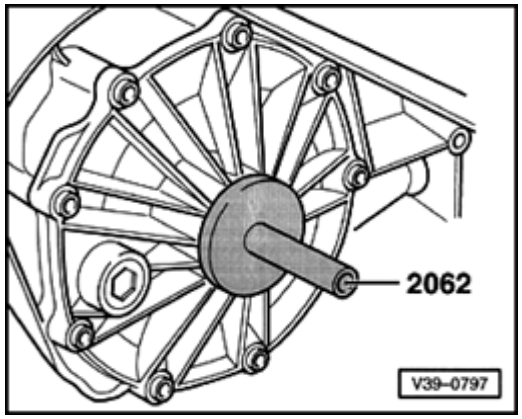
- Clean seat for oil seal.
- Moisten outer circumference of seal with gear oil.
- Fill space between sealing lip and dust lip with sealing grease G52 128 A1.



- Drive in oil seal for left drive flange onto stop with mandrel 2062, taking care to keep the seal straight.

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- Drive in oil seal for right drive flange onto stop with mandrel 2062, ensuring that seal is kept straight.
- Bolt on driveshaft.

⇒ *Repair Manual, Suspension, Wheels, Steering, Repair Group 42.*

- Align exhaust system free of stress.

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 26*

- Top up gear oil in rear final drive and check oil level ⇒ Page 39-80 .

Tightening torque

Component		Nm
Drive flange to final drive		25
Drive axle to flange shaft	M8	40
	M10	77

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Rear final drive, removing and installing

Special tools, testers and auxiliary items

- Universal support V.A.G 1359/2
- Engine/transmission jack V.A.G 1383 A

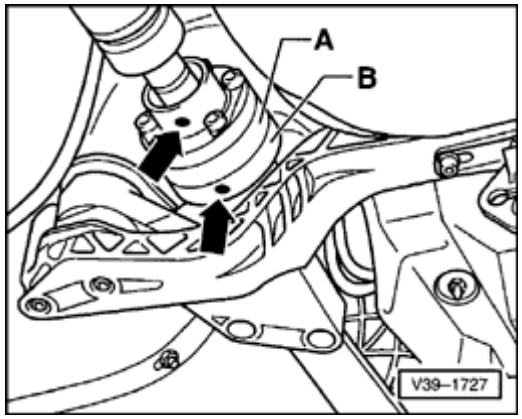
Removing

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

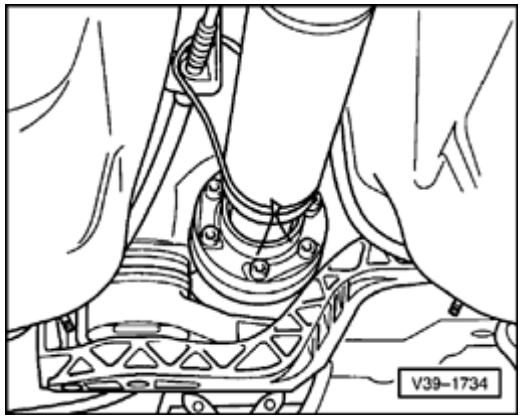
⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 26*

- Remove heat shield above driveshaft.

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- Check whether there is a factory marking (paint spot) on the driveshaft. If not, mark the position of the driveshaft flange -A- in relation to the rear final drive (arrow -B-) with paint.
- Unscrew bolts from driveshaft flange.



- Secure driveshaft to parking brake cable bracket with wire.

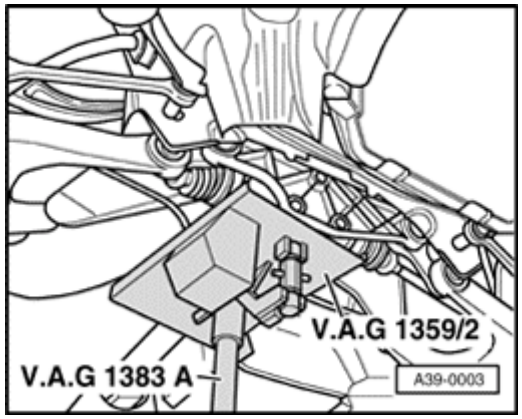
Note:

If it is not possible to push the driveshaft up and off the flange, lower the final drive before tying up the driveshaft. When lowering the final drive, prevent the driveshaft from dropping down, and do not bend the center joint further than the maximum angle permitted ⇒ *Page 39-64* , *Notes.*

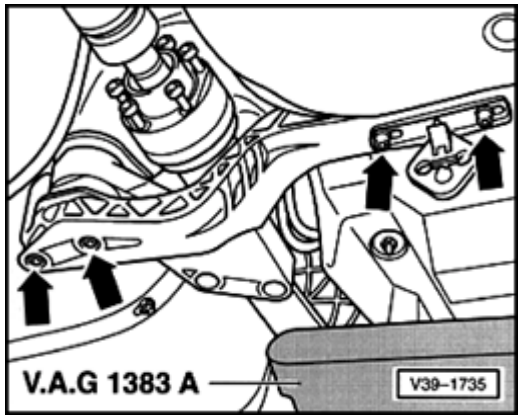
- Disconnect left and right-hand drive axles from rear final drive.

⇒ *Repair Manual, Suspension, Wheels, Steering, Repair Group 42.*

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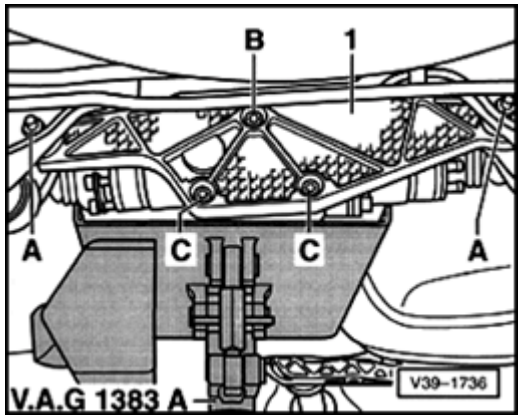
- Support final drive with transmission jack V.A.G 1383 A and universal support V.A.G 1359/2.
- Secure final drive with a strap.



- Unscrew bolts (arrows) on front cross member for rear final drive.
- Disconnect front cross member.

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- Unscrew securing bolts -B- and -C- of rear cross member on rear final drive.
- Lower final drive on transmission jack.

Note:

The cross member -1- need not be removed.

Installing

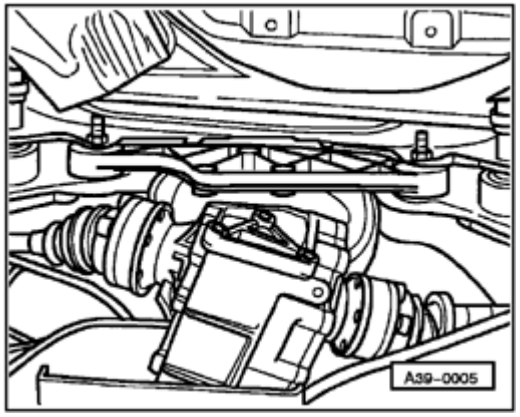
Installation is carried out in the reverse order, when doing this observe the following:

Note:

- *Always replace self-locking nuts.*
- *It is essential to clean out the locking fluid remaining in the threads in the drive flange on the rear final drive after removing the driveshaft. Otherwise there is a danger that the new bolts will seize when they are screwed in and then shear if they have to be removed later.*
- *The threaded holes can be cleaned with a thread tap.*
- *Replace gasket between driveshaft and drive flange (pull off backing foil and stick gasket onto drive flange). Surface must be free of grease.*
- *Replace driveshaft bolts (self-locking).*

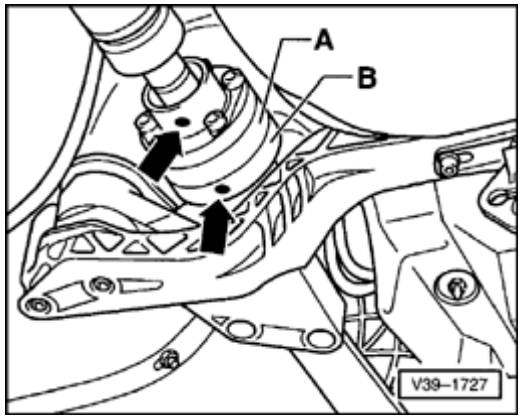
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- Raise final drive with transmission jack until both drive axles can be connected.
- Lightly tighten securing bolts for drive axles.
- Lift final drive and bolt to cross member and final drive support.
- Bolt on driveshaft ⇒ Page 39-71 .

Note:



- *To prevent imbalance, the flanges on the driveshaft -A- and on the rear final drive -B- must be installed so that the paint markings are in alignment (arrows).*
- *After removing the driveshaft from the rear final drive, the additional balance disk (thick washer) that may be located between the lock plate and the bolt head must not be reinstalled. Always replace all flange bolts after disassembling.*
- *Replace driveshaft bolts (self-locking).*

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- Check gear oil in rear final drive ⇒ Page 39-80 .

- Align exhaust system free of stress.

⇒ *Repair Manual, 2.7 Liter V6 5V BiTurbo Engine Mechanical, Engine Code(s): APB, Repair Group 26*

Tightening torques

Component	Nm
Driveshaft to final drive (drive flange)	55
Front cross member for rear final drive to body	40
Front cross member for rear final drive and exhaust bracket to body	23
Rear cross member for rear final drive to subframe	50
Rear cross member to rear final drive	55

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Driveshaft to drive flange	M8	40
	M10	77

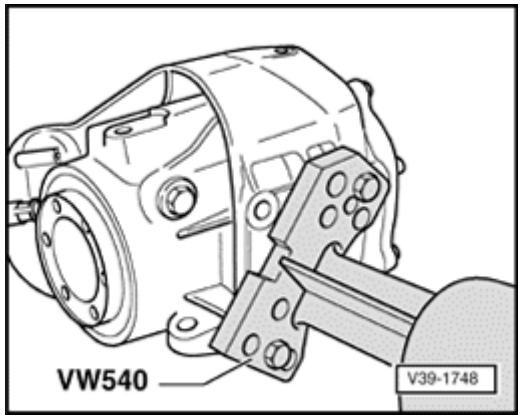
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Rear final drive, securing to repair stand

Special tools, testers and auxiliary items

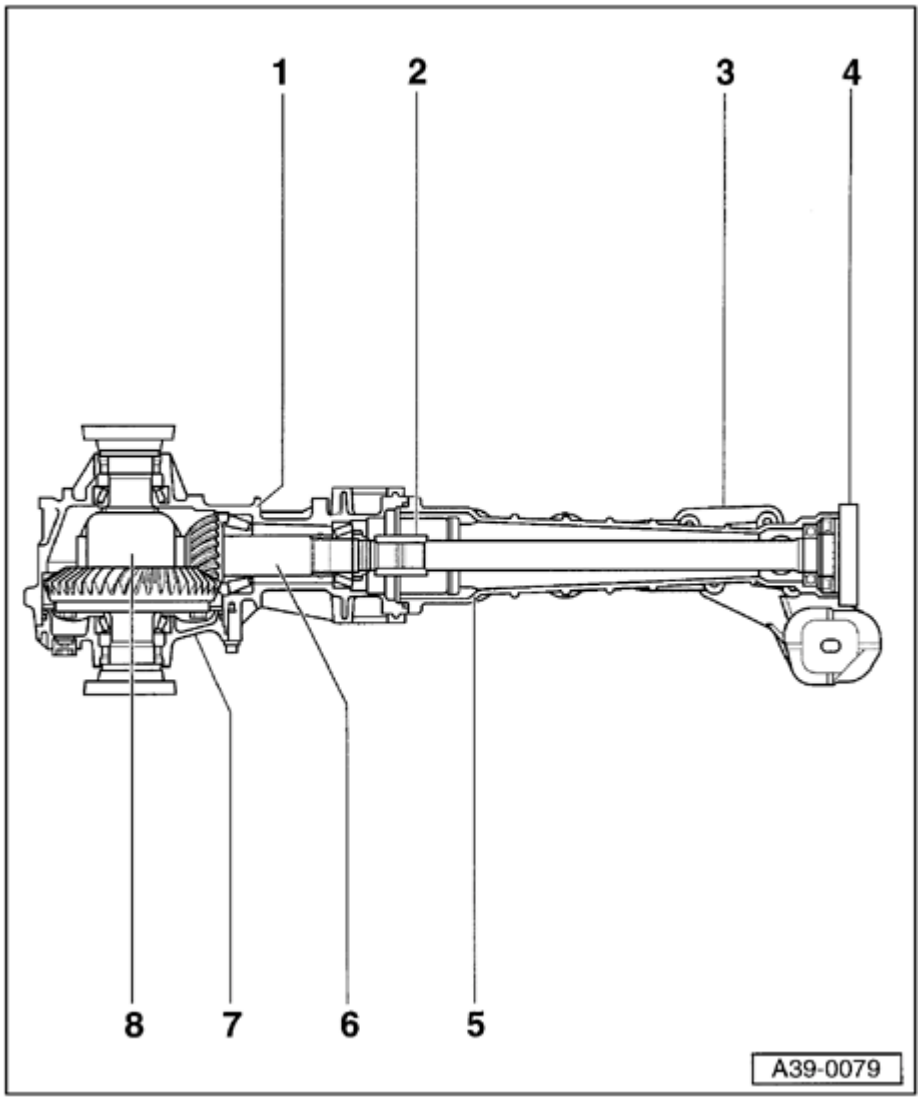
- Engine/transmission support VW 540



- Secure complete rear final drive to a repair stand with engine and transmission support VW 540.

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Rear final drive, disassembling and assembling

Rear final drive, overview

Note:

- *Removing drive flange housing from rear final drive with final drive installed* ⇒ *Page 39-81* .
- *Removing drive flange housing from rear final drive with final drive removed* ⇒ *Page 39-111* .

1 - Final drive housing

2 - Sleeve

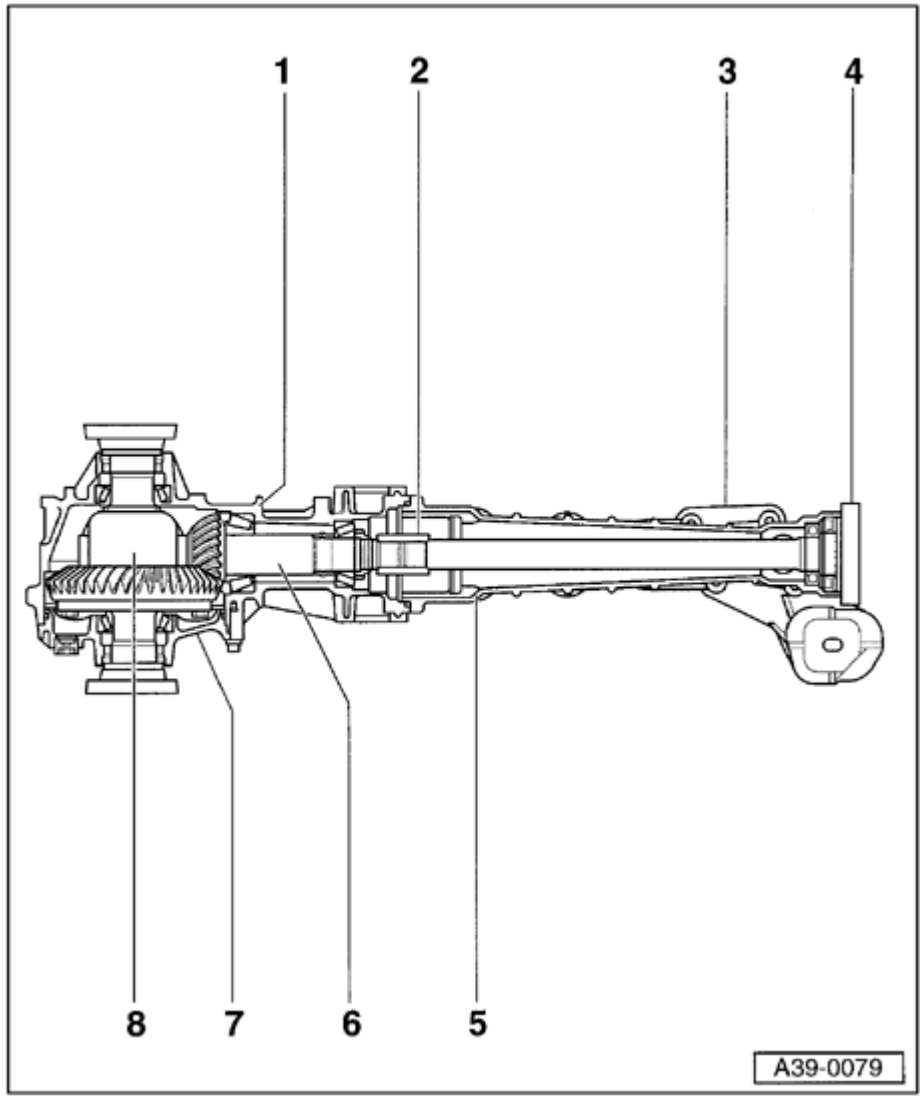
3 - Final drive support

4 - Flange for driveshaft

- Removing ⇒ Page 39-93

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5 - Drive flange housing

- Removing and installing ⇒ Page 39-81

6 - Drive pinion

- Paired with ring gear
- Removing and installing drive pinion ⇒ Page 39-134

7 - Cover for final drive

8 - Differential

- Must be removed before disassembling drive pinion
- Removing and installing ⇒ Page 39-112
- Disassembling and assembling ⇒ Page 39-120

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Removing drive flange housing from rear final drive

- Rear final drive removed

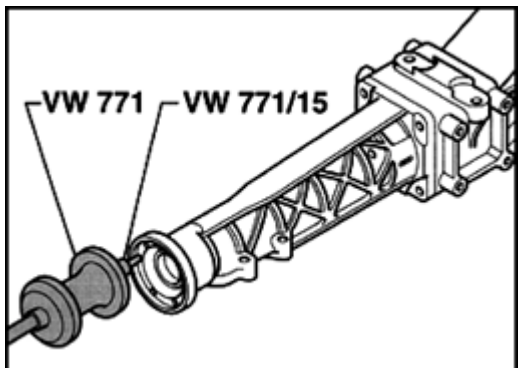
Special tools, testers and auxiliary items

- Multipurpose tool VW 771 and 771/15
- Drip tray V.A.G 1306

- Secure rear final drive to repair stand ⇒ Page 39-108 .

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

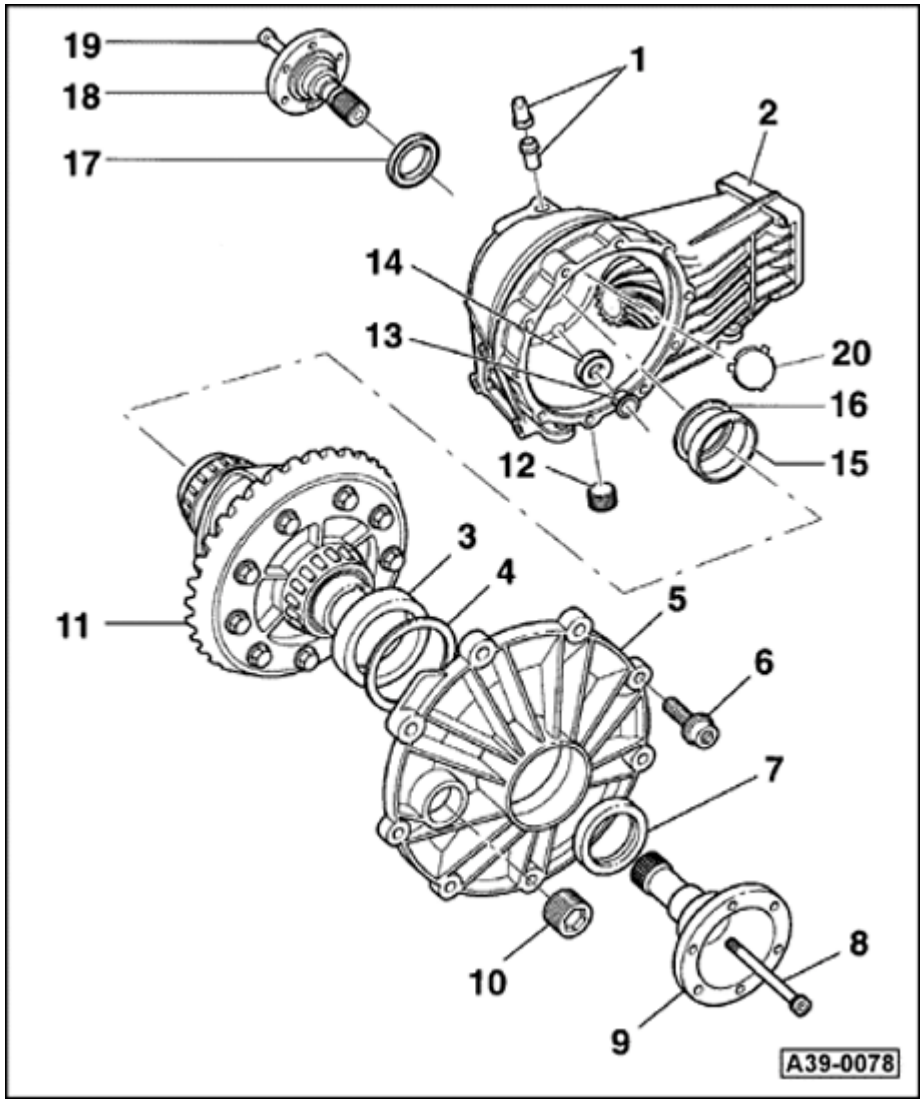
- Remove bolts securing the drive flange housing to rear final drive housing.



- Pull off drive flange housing with drive flange ; when doing this, support drive flange housing.

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Differential, removing and installing

Note:

- *General repair instructions* ⇒ *Page 00-11* .
- *Secure final drive on a repair stand* ⇒ *Page 39-108* .
- *Adjustments are required when replacing components marked 1)* ⇒ *Page 39-150* , *Adjustment overview*

1 - Breather sleeve

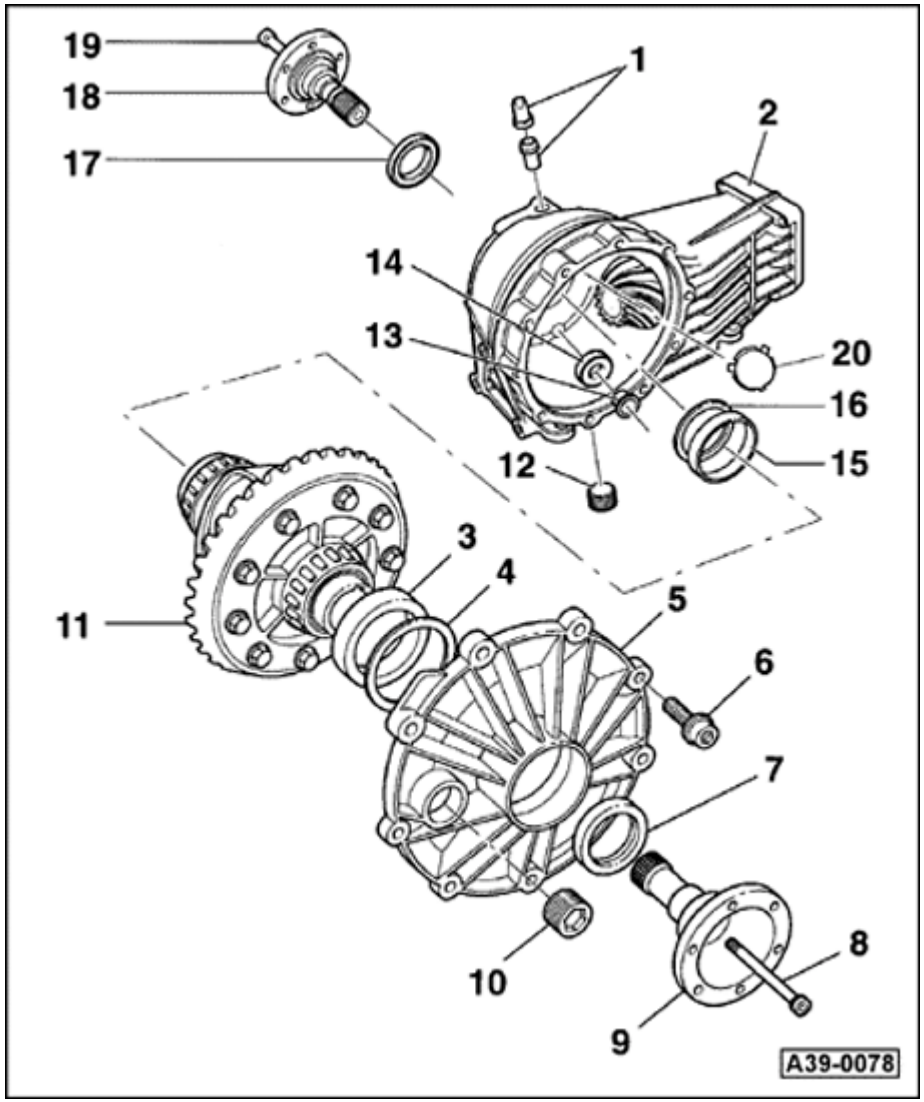
- With rubber valve
- Installation position ⇒ Fig. 3

2 - Final drive housing 1)

- With drive pinion
- Removing and installing drive pinion ⇒ Page 39-134

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3 - Outer race for large tapered roller bearing 1)

- Driving out ⇒ *Fig. 7* , ⇒ Page 39-129
- Driving in ⇒ *Fig. 8* , ⇒ Page 39-130

4 - Shim "S1"

- Note thickness
- Adjustment overview ⇒ Page 39-150

5 - Cover for final drive 1)

- With seal
- Replace O-ring
- Lubricate O-ring with oil when installing

6 - Torx bolt, 25 Nm

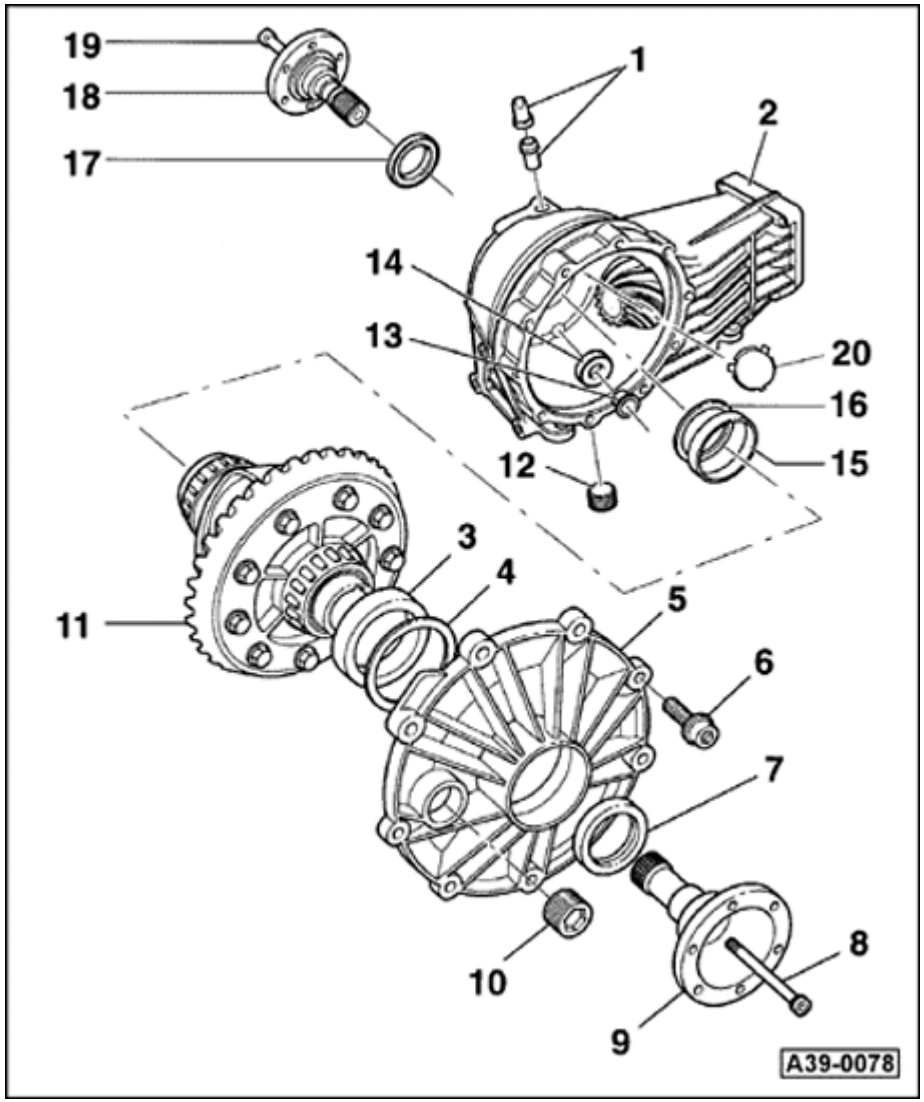
7 - Seal, right

- Replacing ⇒ Page 39-98

8 - Hex socket head bolt, 25 Nm

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9 - Drive flange, right

- Removing and installing ⇒ Fig. 1

10 - Oil filler plug, 35 Nm

11 - Differential with ring gear 1)

- Disassembling and assembling ⇒ Page 39-120

12 - Oil drain plug, 35 Nm

13 - Bushing

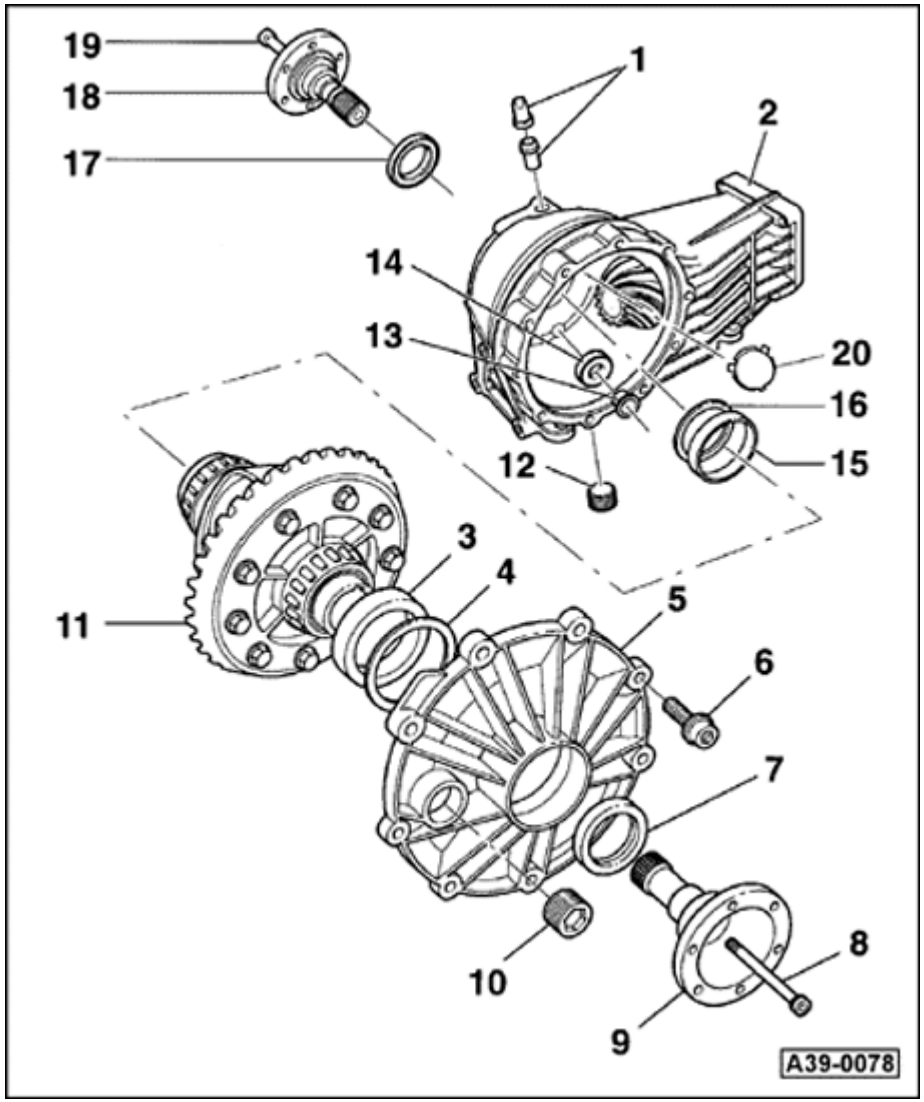
- Holds magnet in position
- Knock in onto stop

14 - Magnet

15 - Outer race for small tapered roller bearing 1)

- Knocking out ⇒ *Fig. 1* , ⇒ Page 39-126
- Pressing in ⇒ *Fig. 2* , ⇒ Page 39-126

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16 - Shim "S2"

- Note thickness
- Adjustment overview ⇒ Page 39-150

17 - Seal, left

- Replacing ⇒ Page 39-98

18 - Drive flange, left

- Removing and installing ⇒ Fig. 1

19 - Hex socket head bolt, 25 Nm

20 - Cover

- Installing ⇒ Fig. 2

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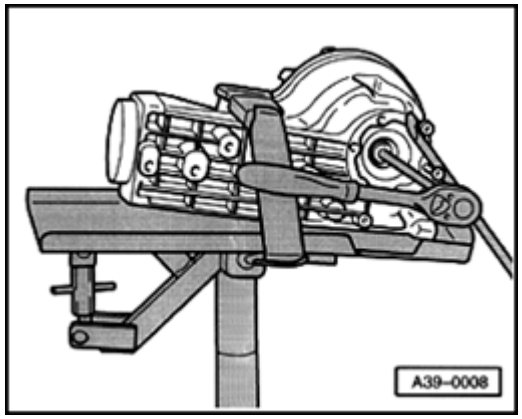


Fig. 1 Removing and installing drive flange

- To loosen securing bolt, screw two bolts into drive flange and counter-hold with a lever.
- Pull out drive flange using bolts already screwed in.

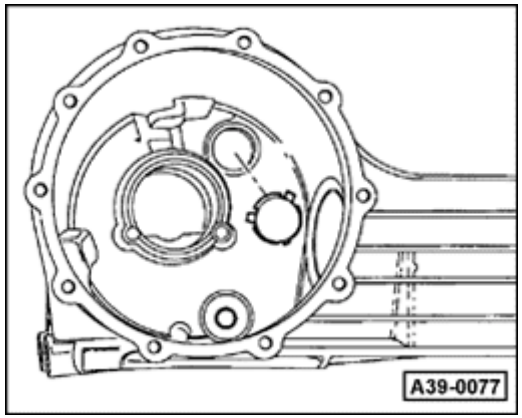


Fig. 2 Pressing cover onto stop

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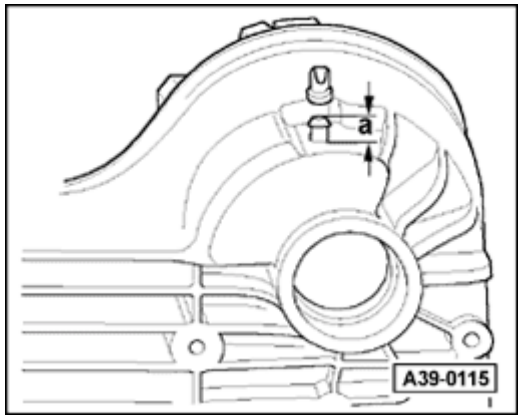


Fig. 3 Position of breather sleeve

The breather sleeve should project 13 mm (distance "a") out of the housing after pressing in.

The slot in the rubber valve should be in line with the direction of travel.

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Removing and installing differential

- Rear final drive removed

Special tools, testers and auxiliary items

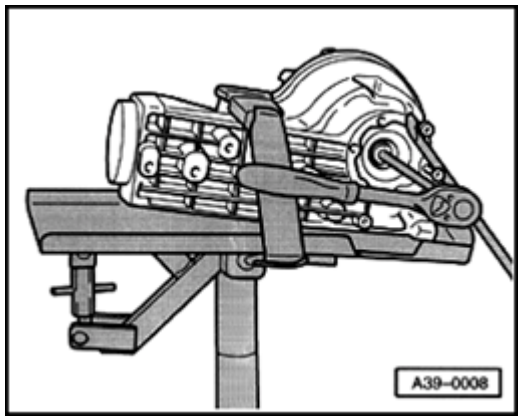
- Drip tray V.A.G 1306

Removing

- Secure complete rear final drive on a repair stand ⇒ Page 39-108 .

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

- Fill space between sealing lip and dust lip with sealing grease G52 128 A1.



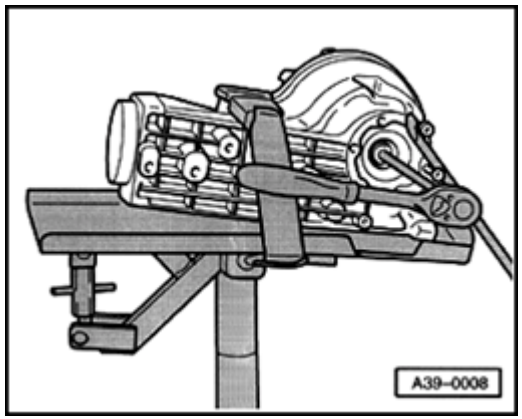
- Remove left and right-hand drive flanges.
- To loosen securing bolt, screw two bolts into drive flange and counter-hold with a lever.
- Mark drive flanges (for left and right sides).
- Pull out drive flange using the bolts already screwed in.
- Unscrew securing bolts from cover for final drive.
- Take cover for final drive off axle housing and remove differential.

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Installing

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

- Insert differential.
- Replace O-ring for cover for final drive and oil when installing.
- Fit cover for final drive on final drive housing and tighten in diagonal sequence to 25 Nm.
- Replace drive flange oil seals ⇒ Page 39-98 .
- Fill space between sealing and dust lips with sealing grease G52 128 A1.



- Install drive flanges and tighten to 25 Nm.
- Top-up gear oil in rear final drive and check oil level ⇒ Page 39-80 .

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Differential, disassembling and assembling

Special tools, testers and auxiliary items

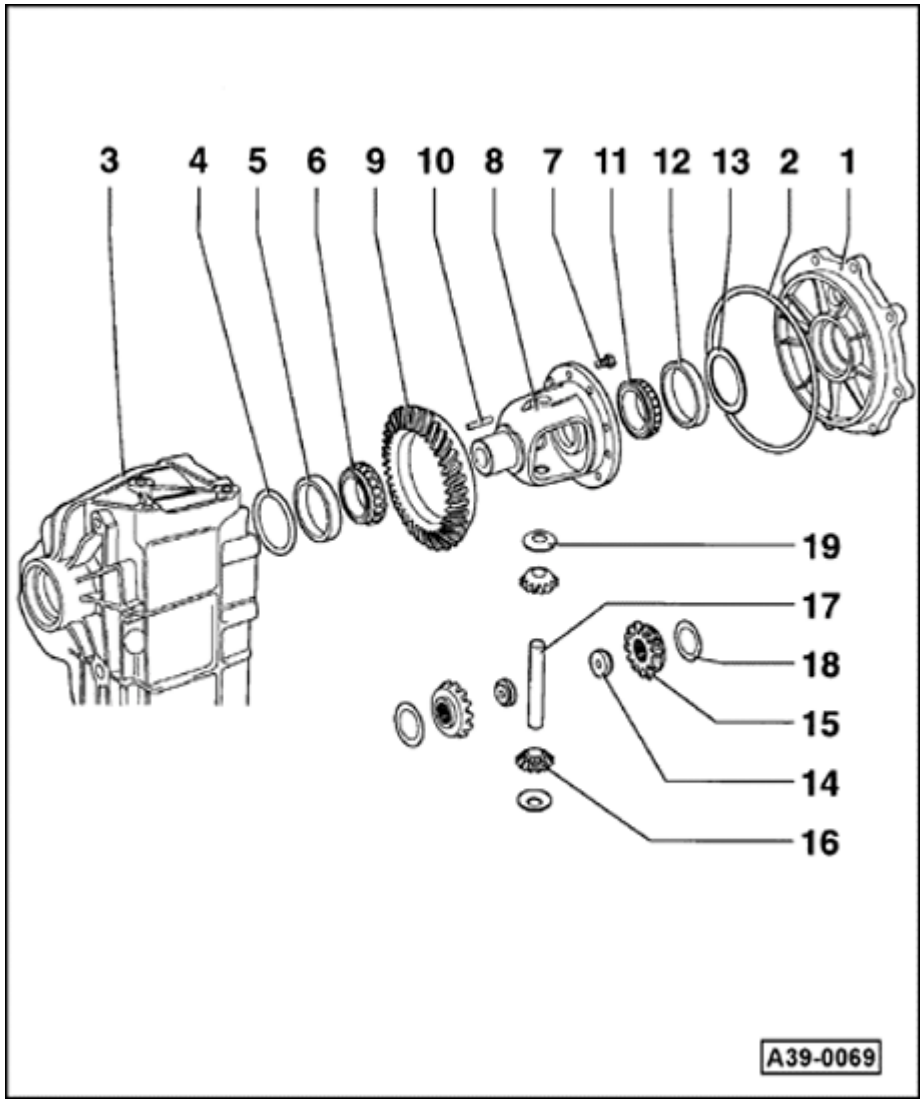
- Drift VW 295
- Press plate VW 401
- Press plate VW 402
- Press tool VW 407
- Press tool VW 408 A
- Press tool VW 412
- Press tool VW 442
- Press tool 40-21
- Thrust plate 40-105
- Thrust pad 2050

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- Drift 3138
- Tapered roller bearing puller V.A.G 1582 and V.A.G 1582/6
- Two-arm puller Kukko 44/2

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Note:

- *General repair instructions ⇒ Page 00-11 .*
- *Replace both tapered roller bearings of the differential together. Use same make if possible.*
- *Adjustments are required when replacing components marked 1) ⇒ Page 39-150 , Adjustment overview*

1 - Cover for final drive 1)

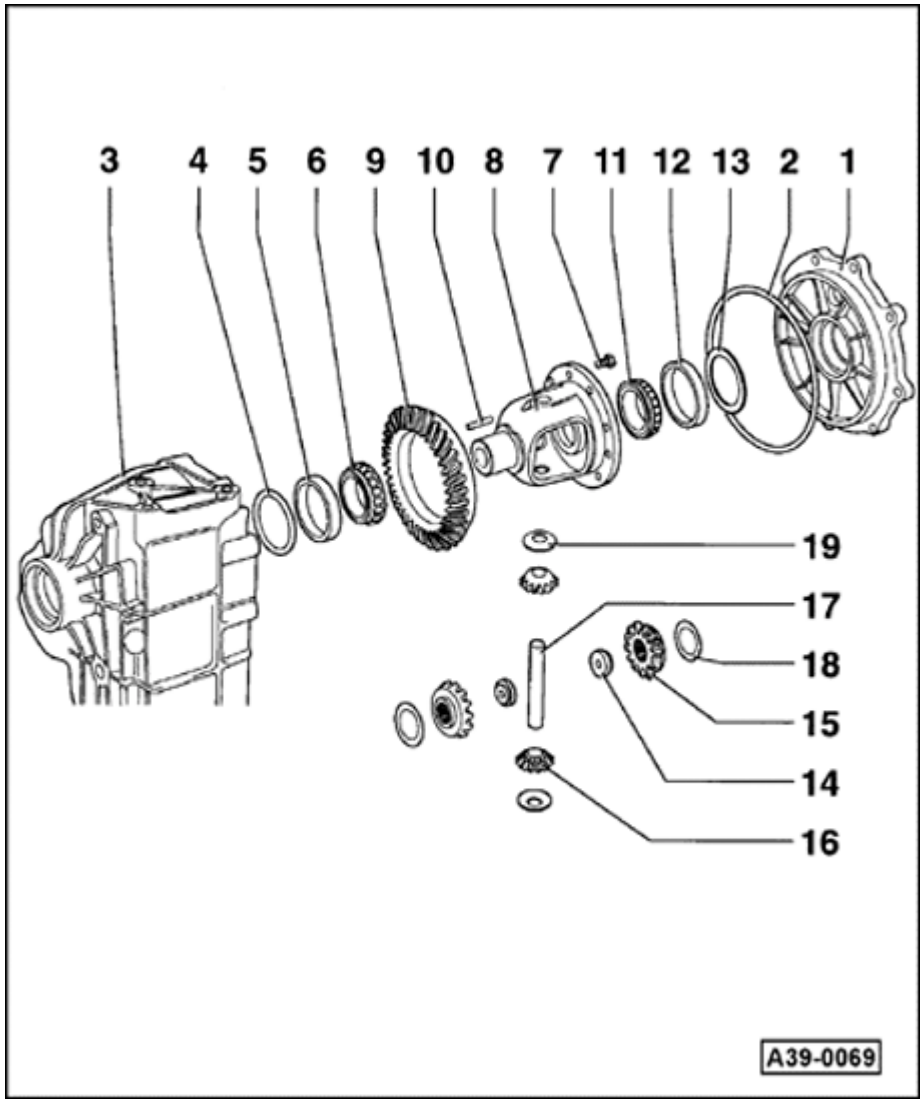
2 - O-ring

- Always replace
- Insert with oil

3 - Final drive housing 1)

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4 - Shim "S2"

- Note thickness
- Adjustment overview ⇒ Page 39-150

5 - Outer race for small tapered roller bearing 1)

- Knocking out ⇒ Fig. 1
- Pressing in ⇒ Fig. 2

6 - Inner race for small tapered roller bearing 1)

- Pulling out ⇒ Fig. 3
- Pressing in ⇒ Fig. 4

7 - Bolt, 60 Nm + turn 45° further

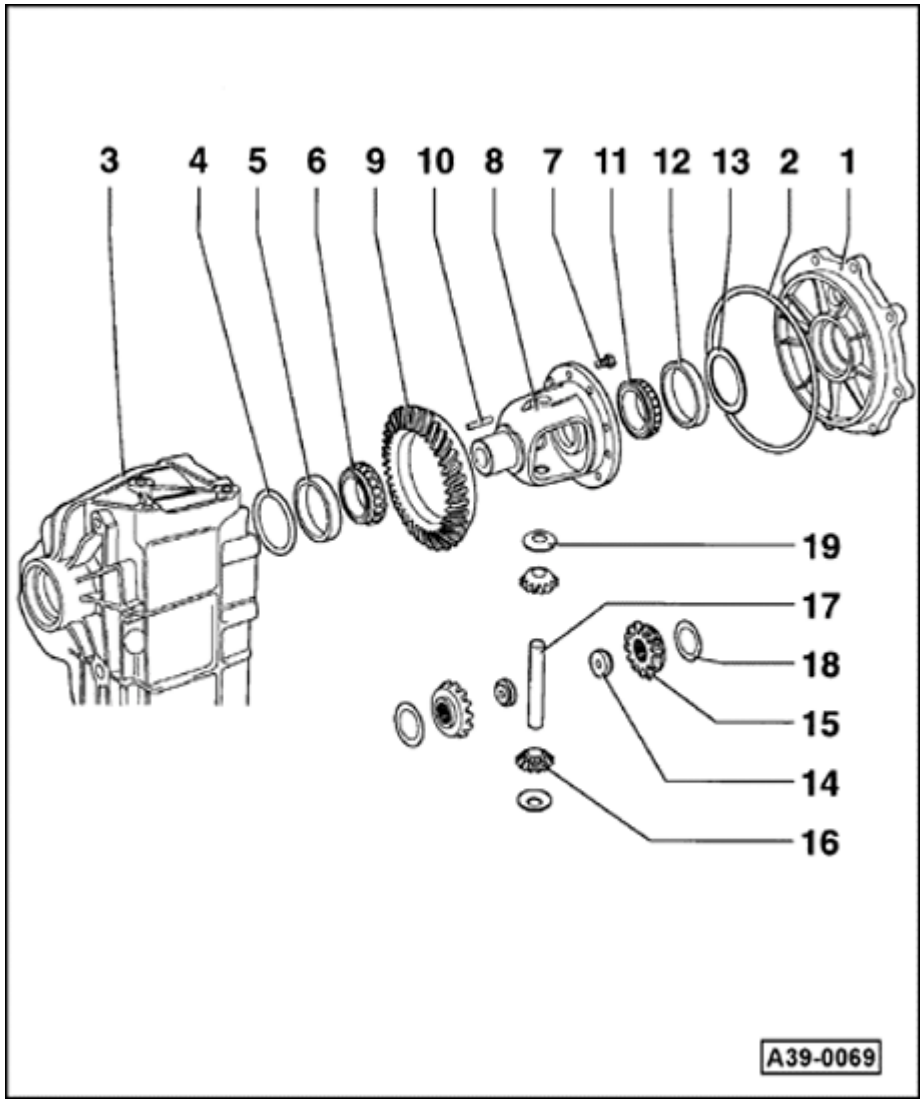
- Always replace
- Allocation

⇒ *Parts catalog*

- Lightly tighten bolts then tighten diagonally to correct torque

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8 - Differential housing [1)]

9 - Ring gear [1)]

- Paired with drive pinion (final drive set)
- Select correct version according to code letters

⇒ *Parts catalog*

- Drive off housing with a punch ⇒ Fig. 9
- Installing on differential housing ⇒ Fig. 10

10 - Spring pin

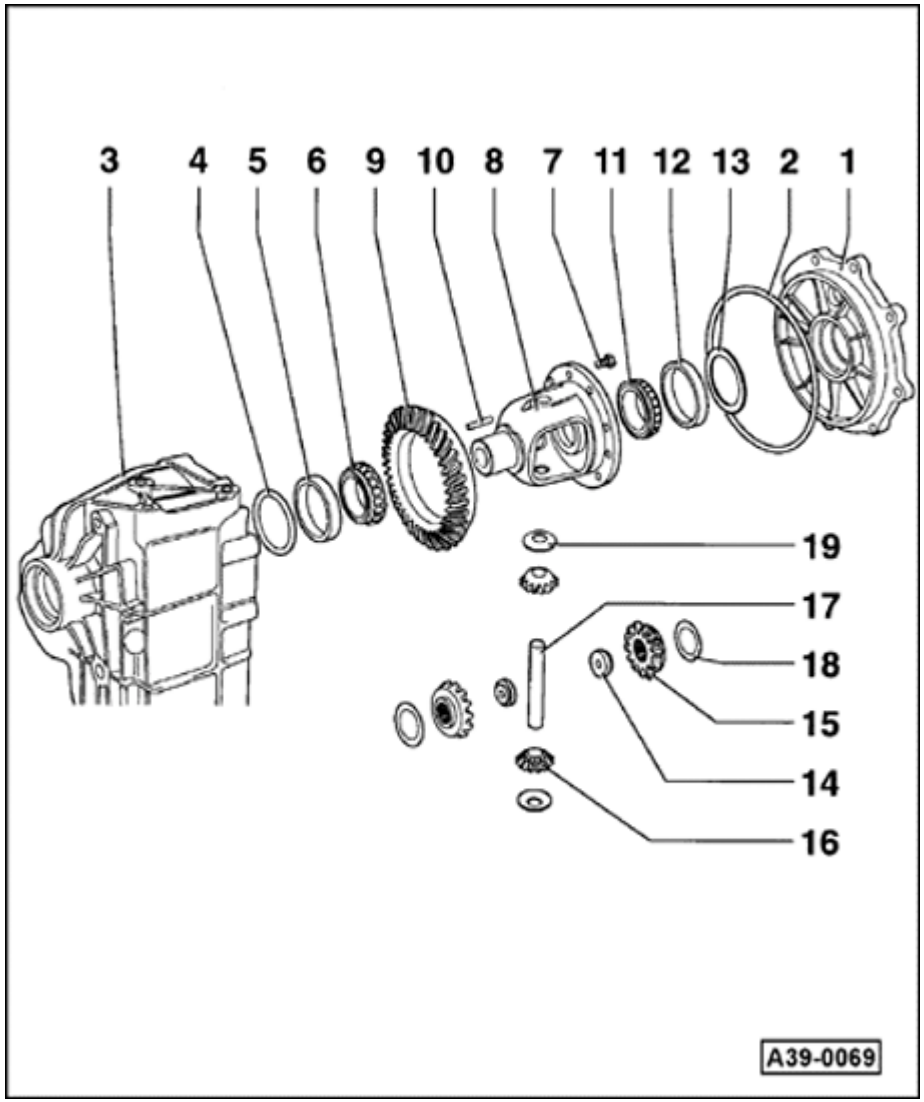
- For securing planet pinion axis shaft
- Drive in flush

11 - Inner race for large tapered roller bearing [1)]

- Pulling off ⇒ Fig. 5
- Pressing on ⇒ Fig. 6

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12 - Outer race for large tapered roller bearing
1)

- Driving out ⇒ Fig. 7
- Pressing in ⇒ Fig. 8

13 - Shim "S1"

- Note thickness
- Adjustment overview ⇒ Page 39-150

14 - Threaded piece

15 - Sun wheel

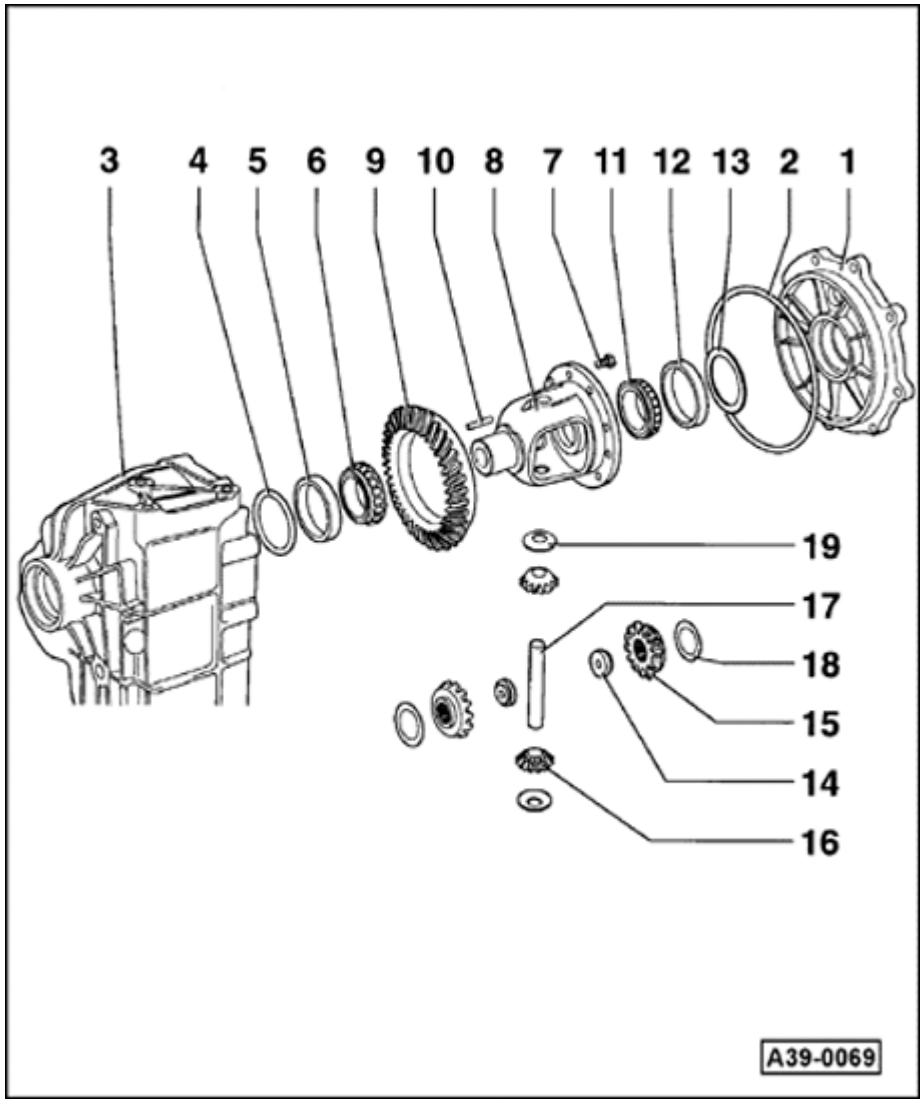
- Installing ⇒ Fig. 11
- Adjusting ⇒ Fig. 12

16 - Planet pinion

- Installing ⇒ Fig. 11

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17 - Planet pinion axis shaft

- Knock out with drift
- Drive in carefully so that the thrust washers are not damaged
- Secure with spring pin - 10 -

18 - Shim

- Re-determining thickness ⇒ Fig. 12

19 - Thrust washer

- Check for cracks

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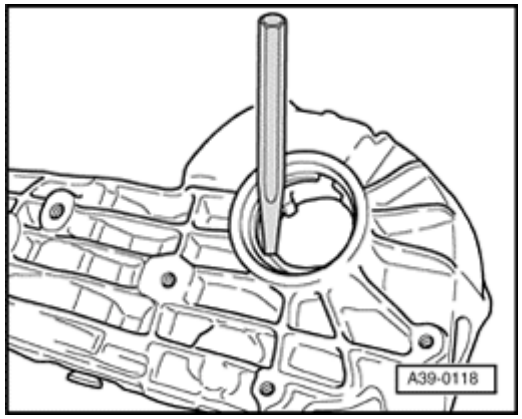


Fig. 1 Knocking outer race of small tapered roller bearing out of housing

- After removing check shims for damage.

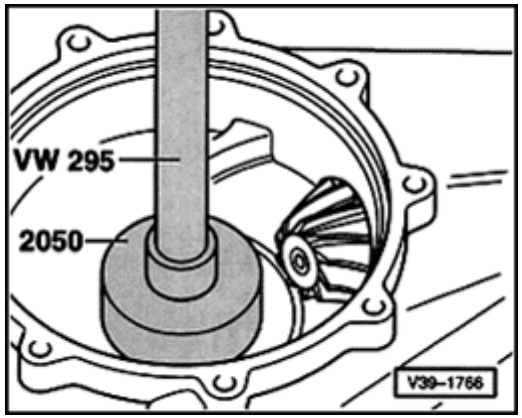


Fig. 2 Pressing outer race of small tapered roller bearing into housing (press against stop)

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

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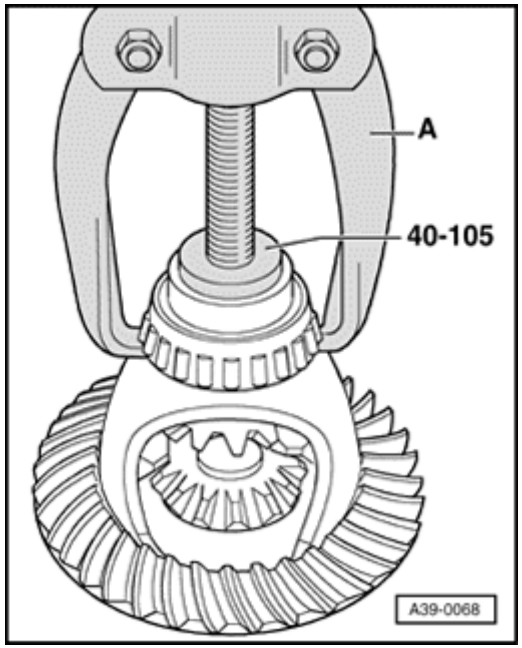


Fig. 3 Pulling off inner race for small tapered roller bearing

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

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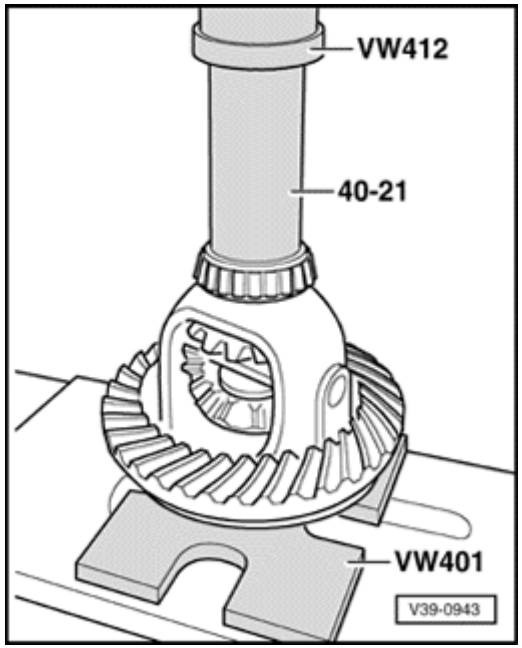


Fig. 4 Pressing on inner race for small tapered roller bearing

CAUTION!

Wear protective gloves.

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

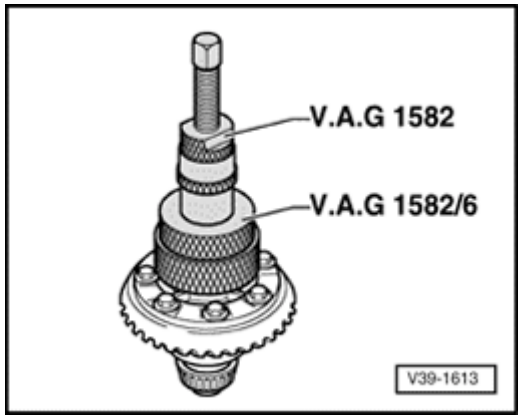


Fig. 5 Pulling off inner race for large tapered roller bearing

- Before fitting extractor position press piece 40-105 on differential housing.

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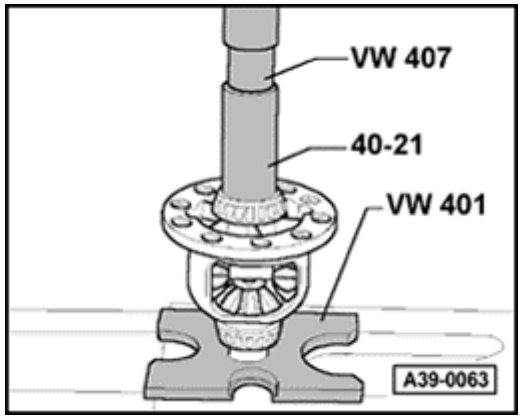


Fig. 6 Pressing on inner race for large tapered roller bearing

CAUTION!

Wear protective gloves.

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

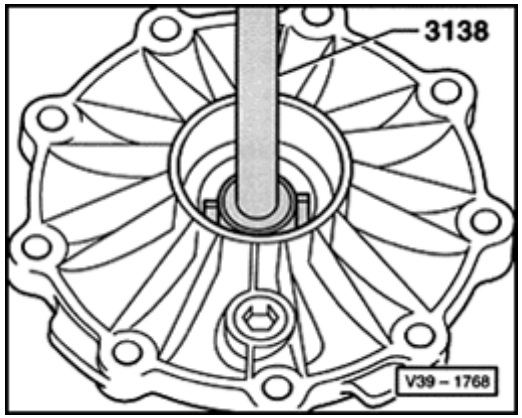


Fig. 7 Driving outer race for large tapered roller bearing out of cover

- After removing check shims for damage.

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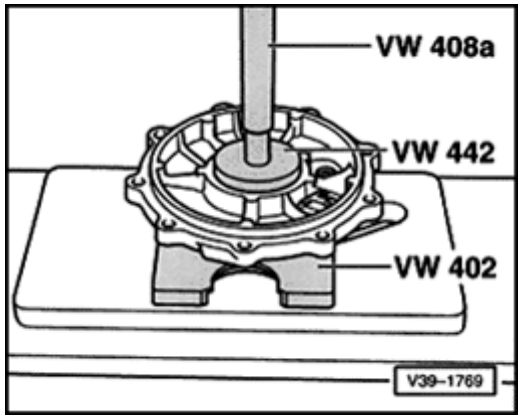


Fig. 8 Pressing outer race for large tapered roller bearing into cover

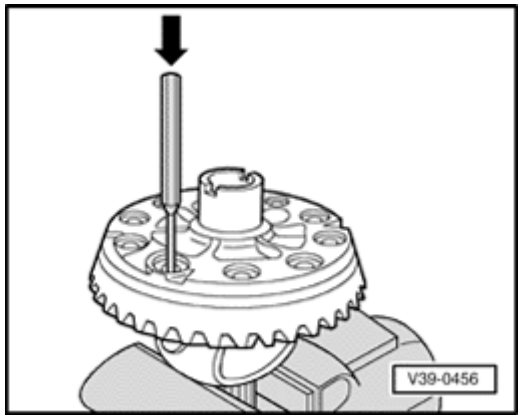


Fig. 9 Driving ring gear off housing

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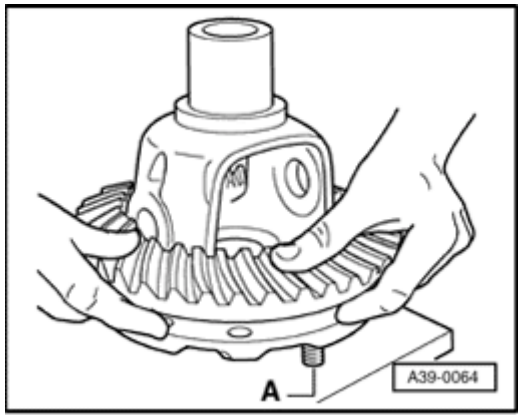


Fig. 10 Installing ring gear

CAUTION!

Wear protective gloves.

- When fitting ring gear guide centralizing pins -A- (local manufacture).
- Heat ring gear to approx. 100 ° C and install.

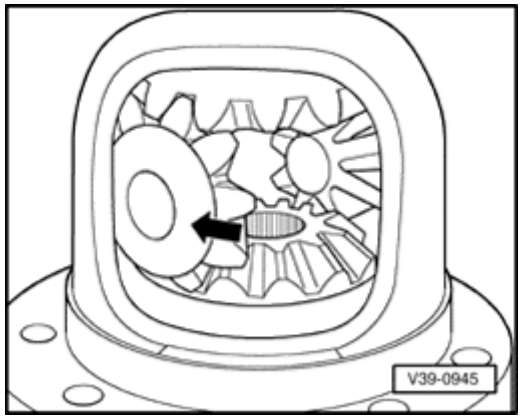


Fig. 11 Installing sun wheels and planet pinions

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

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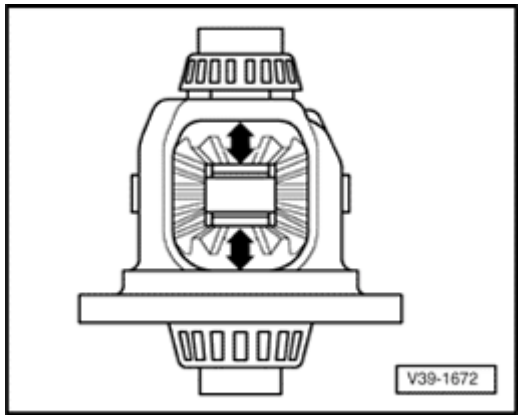


Fig. 12 Adjusting differential bevel gears

- Insert sun wheels with thinnest shims (0.5 mm).
- Insert planet pinions with thrust washers spaced 180° apart.

Note:

Do not now interchange bevel gears and thrust washers.

- Drive in planet pinion axis shaft.
- Press planet pinions outward.
- Press sun wheels in direction indicated (arrows), and check the amount of play.
- Determine thickest shims for sun wheels (on each side) which can still just be inserted.

  The same thickness of shim should be used on both sides.
- Identify shims according to table.

⇒ *Parts catalog*

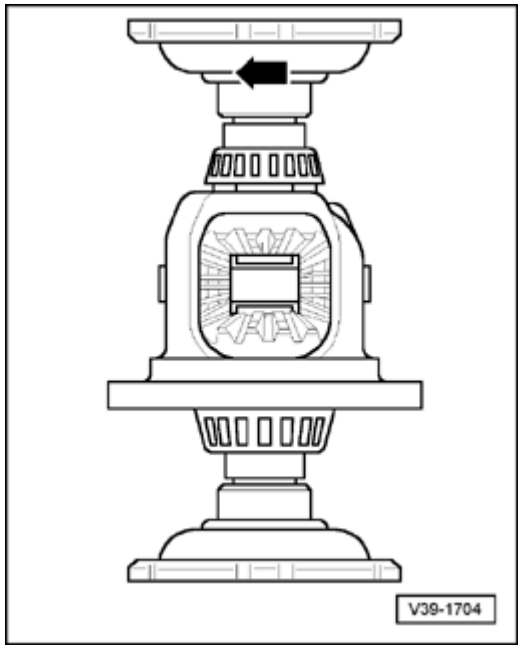
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The following shims are available:

Shim thickness (mm)		
0.50	0.70	0.90
0.60	0.80	1.00

Note:

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



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Drive pinion, removing, installing, disassembling and assembling

Special tools, testers and auxiliary items

- Press plate VW 401
- Press plate VW 402
- Press tool VW 407
- Press tool VW 408 A
- Press tool VW 412
- Support rails VW 457
- Mandrel VW 460/2
- Tube VW 519
- Engine and transmission support VW 540
- Thrust plate 30-205

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- Installing ring 2003/3
- Pinion assembly appliance 2052/2
- Thrust plate 3005

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- Thrust pad 3062
- Drift 3138
- Fitting appliance 3253 with 3253/3 and 3253/4
- Retainer 3304
- Engine/transmission jack V.A.G 1383 A
- Universal support V.A.G 1359/2
- Separating tool Kukko 17/2
- Two-arm puller Kukko 21/7
- Counter-support Kukko 22/2
- Torque gauge 0-600 Ncm
- Socket attachment (long), 32 mm A/F

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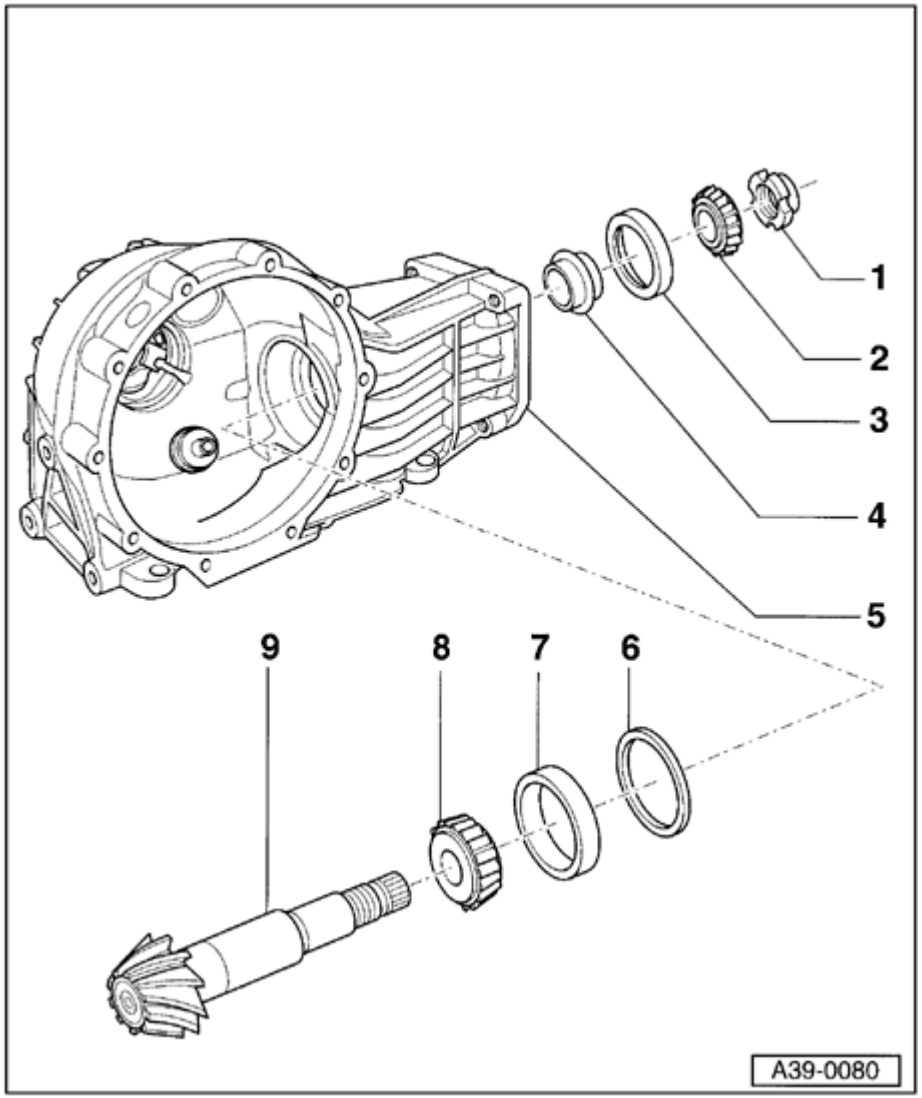
39-136

Note:

- *General repair instructions ⇒ Page 00-11 .*
- *Removing drive flange housing from rear final drive with final drive installed ⇒ Page 39-82 .*
- *Removing drive flange housing from rear final drive with final drive removed ⇒ Page 39-111 .*
- *Replace both tapered roller bearings together. Use same make if possible.*
- *Do not additionally oil new tapered roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.*
- *Removing differential ⇒ Page 39-112 .*
- *Adjustments are required when replacing components marked with a 1) ⇒ Page 39-150 , Adjustment overview*

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1 - Nut

- Always replace
- Removing ⇒ Fig. 1 and ⇒ Fig. 2
- Installing ⇒ Fig. 11
- Measuring friction torque ⇒ Fig. 12
- Securing ⇒ Fig. 13

2 - Inner race for small tapered roller bearing 1)

- Pressing out drive pinion ⇒ Fig. 3
- Installing ⇒ Fig. 10

3 - Outer race for small tapered roller bearing 1)

- Pulling out ⇒ Fig. 4
- Pressing in ⇒ Fig. 9

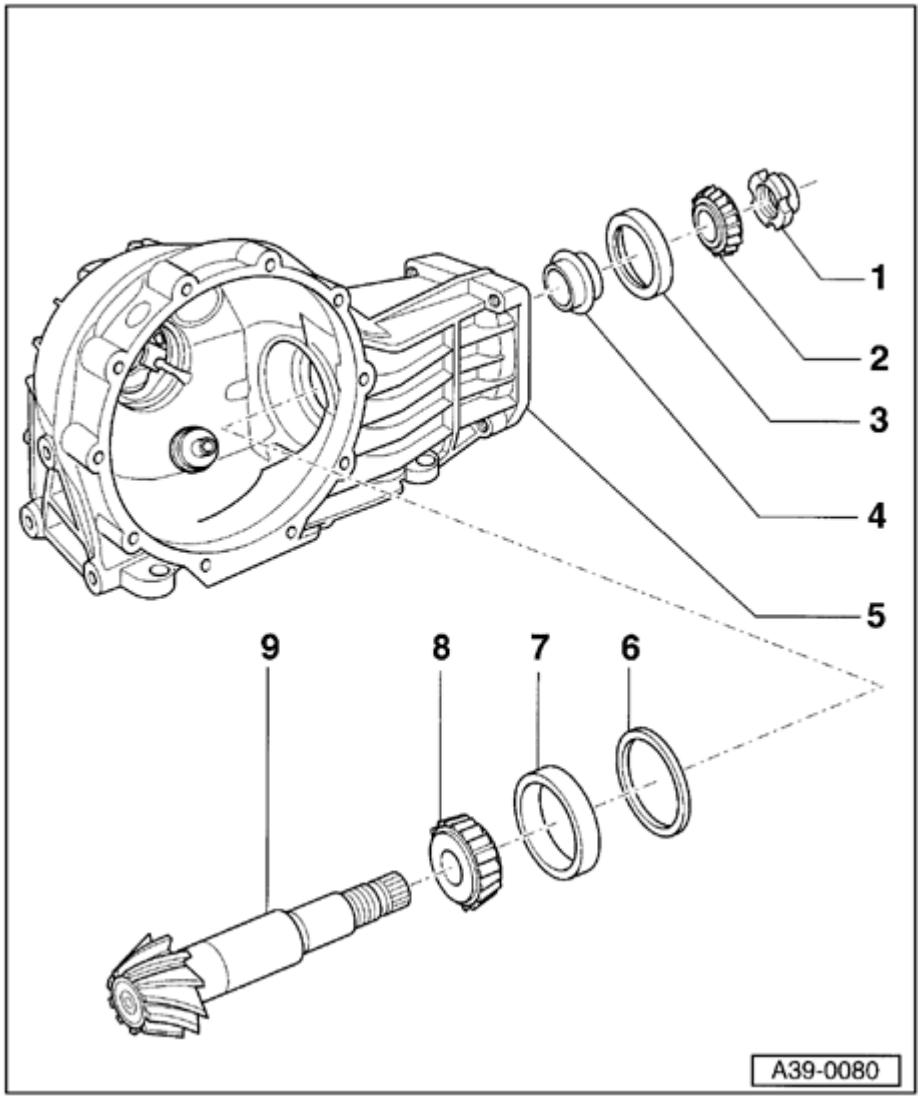
4 - Spacer sleeve 1)

- Always replace

5 - Final drive housing 1)

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6 - Shim "S3"

- Note thickness
- Adjustment overview ⇒ Page 39-150

7 - Outer race for large tapered roller bearing 1)

- Driving out ⇒ Fig. 5
- Pulling in ⇒ Fig. 8

8 - Inner race for large tapered roller bearing 1)

- Pulling off ⇒ Fig. 6
- Pressing on ⇒ Fig. 7

9 - Drive pinion 1)

- Is mated with ring gear, always replace together as a set

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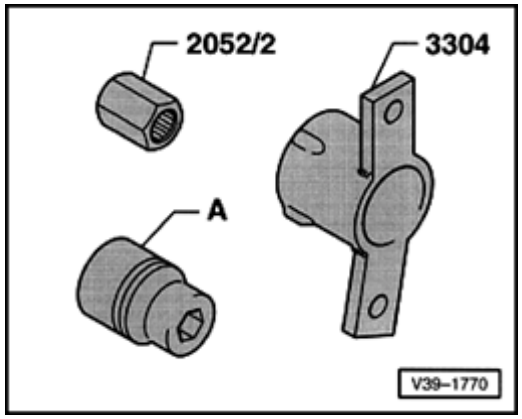


Fig. 1 Tools for loosening and tightening drive pinion nut

A - Socket (32 mm)

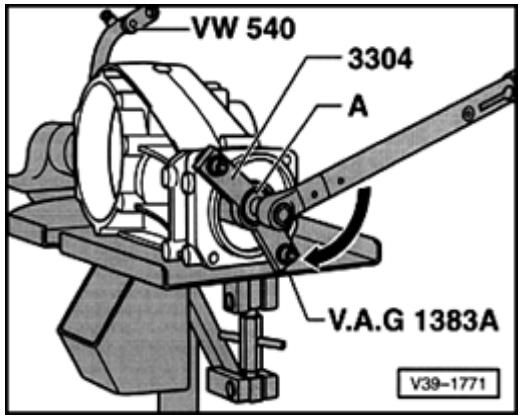


Fig. 2 Removing nut for drive pinion

- Secure retainer 3304 with two M8 x 30 hex bolts.
- Support final drive when loosening nut (e.g. using universal support V.A.G 1359/2 in combination with transmission jack V.A.G 1383 A).

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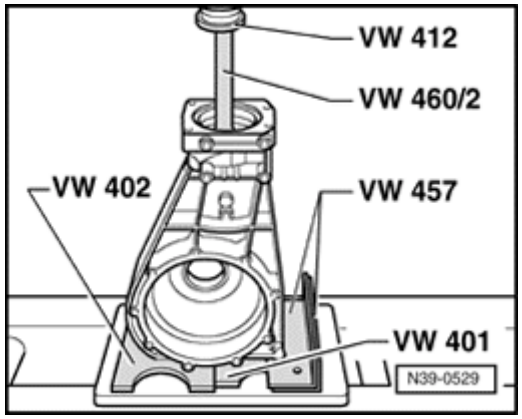


Fig. 3 Pressing drive pinion out of inner race for small tapered roller bearing

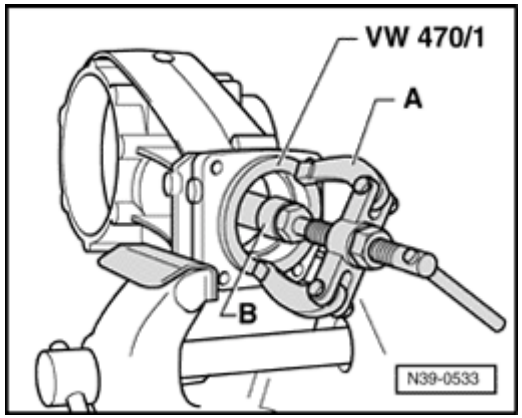


Fig. 4 Pulling out outer race for small tapered roller bearing

A - Counter support e.g. Kukko 22/2

B - Internal puller 46-58 mm, e.g. Kukko 21/7

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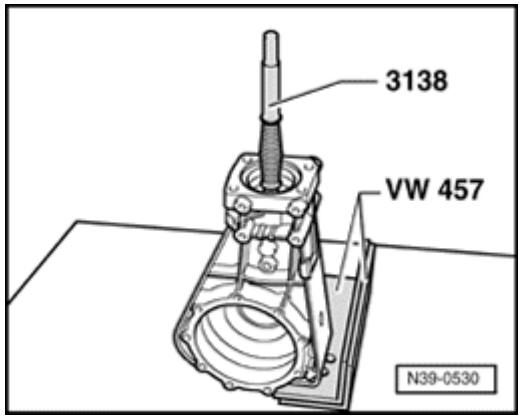


Fig. 5 Driving out outer race for large tapered roller bearing

- After removing check shims for damage.

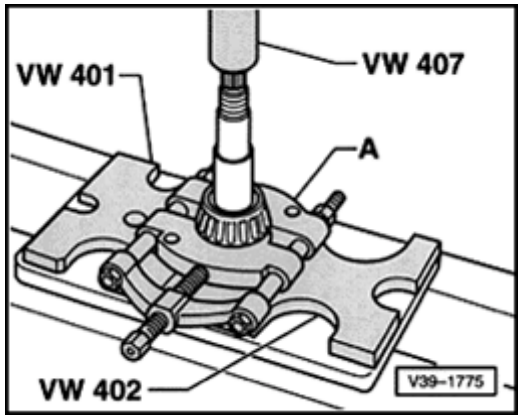


Fig. 6 Pressing inner race for large tapered roller bearing off drive pinion

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

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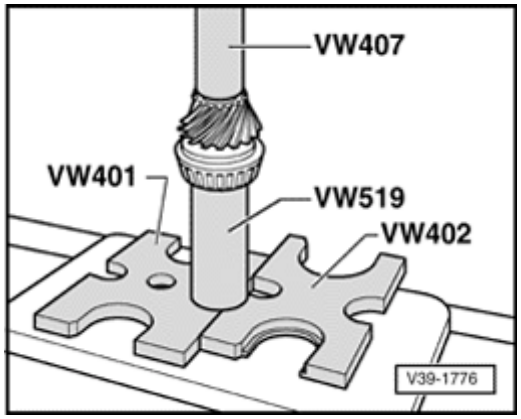


Fig. 7 Pressing inner race for large tapered roller bearing onto drive pinion

CAUTION!

Wear protective gloves.

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

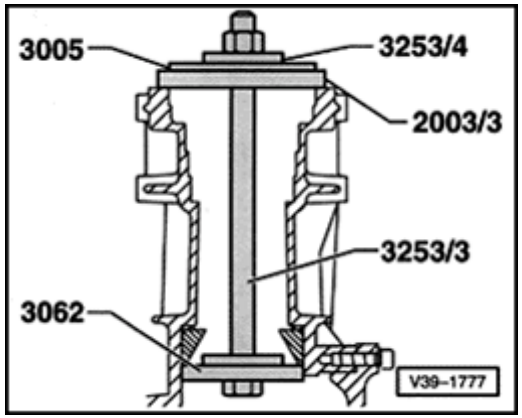


Fig. 8 Pulling in outer race for large tapered roller bearing

- Insert predetermined shim "S3" for drive pinion ⇒ Page 39-154 .

Note:

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

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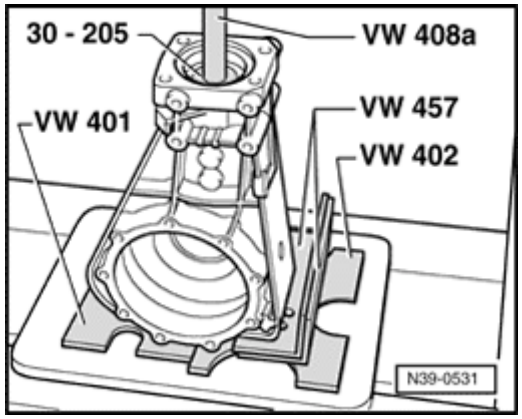


Fig. 9 Pressing in outer race for small tapered roller bearing

- Lubricate outer race with oil and fit using press tool VW 408 A and thrust plate 30-205.

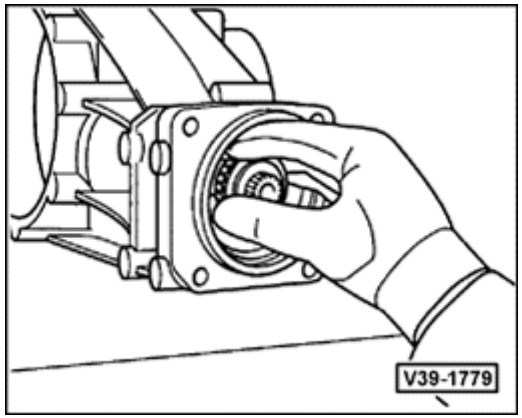


Fig. 10 Pressing on small tapered roller bearing inner race

CAUTION!

Wear protective gloves.

- Insert drive pinion with new spacer sleeve.
- Heat inner race for small tapered roller bearing to approx. 100 ° C and fit onto drive pinion.
- Press up drive pinion and insert bearing with thrust plate 40-21 onto stop.

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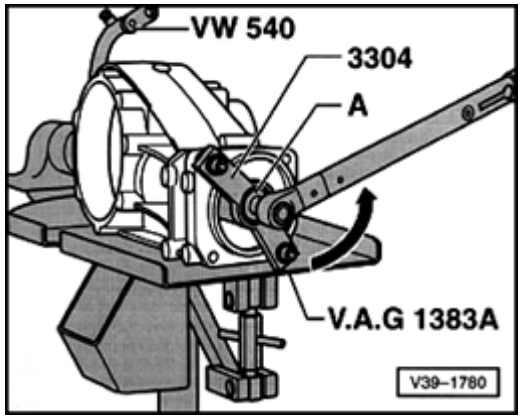


Fig. 11 Tightening nut for drive pinion and measuring friction torque

- Secure retainer 3304 with two M8 x 30 hexagon bolts.
- Support final drive when tightening nut (e.g. using universal support V.A.G 1359/2 in conjunction with transmission jack V.A.G 1383 A).
- Fit a new drive pinion nut.
- Tighten drive pinion nut just far enough so that no play can be felt at drive pinion.
- Gradually increase tightening torque, checking friction torque at regular intervals, until specified friction torque is obtained ⇒ Fig. 12 .

Note:

If the specified friction torque is exceeded, the spacer sleeve must be replaced and the adjustment repeated. A spacer sleeve which has been compressed too much cannot be reused.

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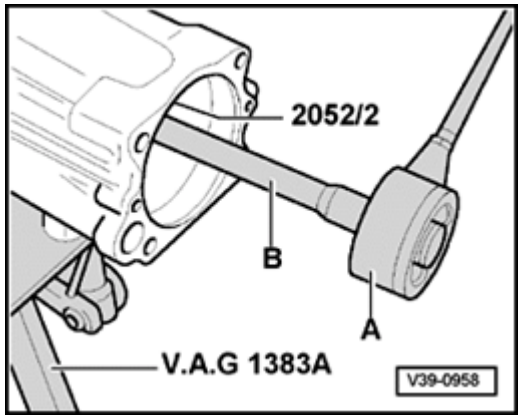


Fig. 12 Measuring friction torque

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

B - Extension with 32 mm socket

- The following friction torques should be set:

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

1) run at least 50 km (30 miles)

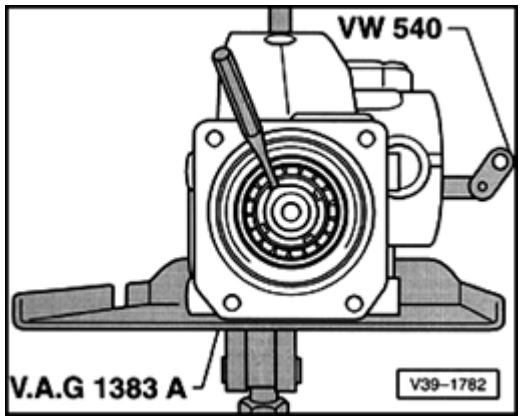


Fig. 13 Securing drive pinion nut

- Peen drive pinion nut with punch.

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Drive pinion and ring gear, adjusting

Note:

- *Careful adjustment of the drive pinion and ring gear is important for the service life and smooth running of the final drive. For this reason, the drive pinion and ring gear are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions of rotation. The position of quietest running is found by moving the drive pinion in an axial direction and at the same time lifting the ring gear out of the zero-play mesh position by the amount necessary to maintain the backlash within the specified tolerance.*

- *The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.*

- *The deviation (tolerance) "r," which is related to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the ring gear. The final drive set (drive pinion and ring gear) may only be replaced together as a matched pair.*

- *Observe the general repair instructions for*

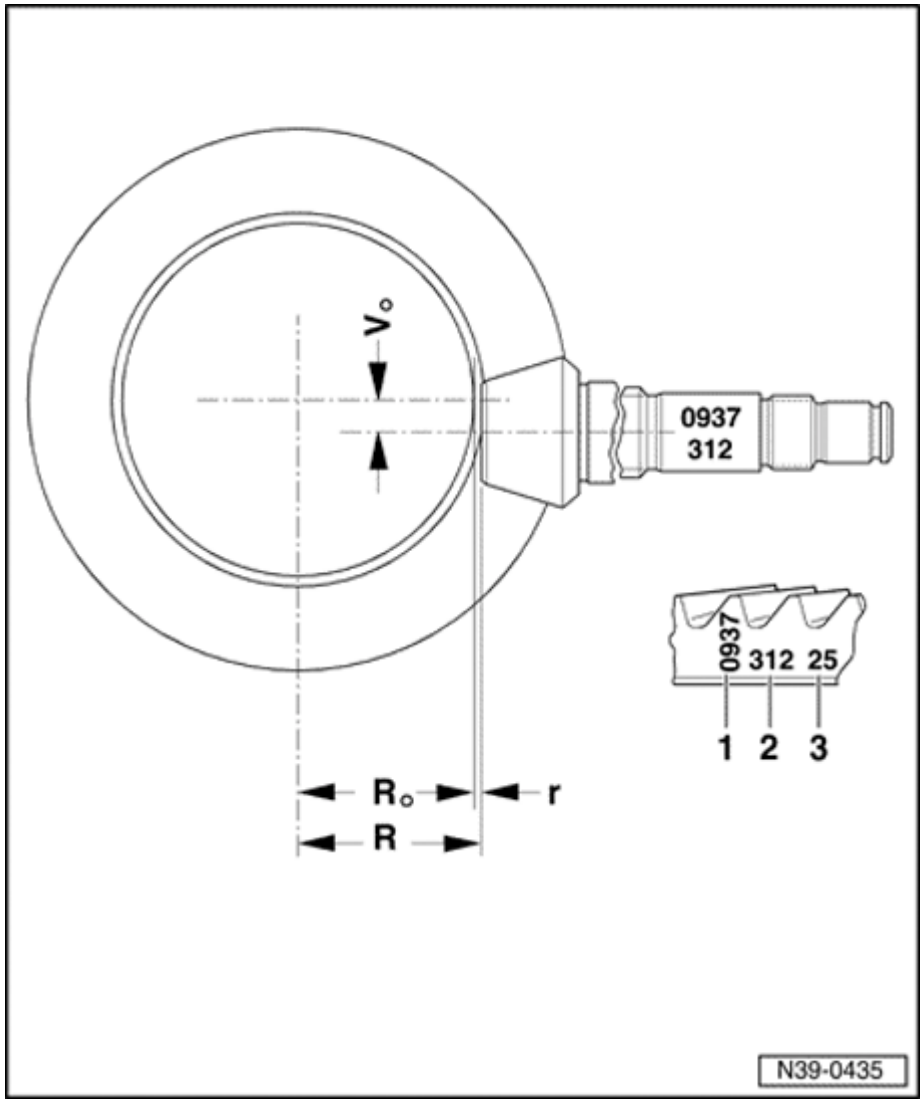
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tapered roller bearings and shims.

- *Maximum care and cleanliness are essential for achieving good results when performing repairs and taking measurements.*

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Gear sets, adjusting and marking

1 - Identification "0937" signifies Oerlikon gear set with a ratio of 37:9.

2 - Gear set pairing number (312).

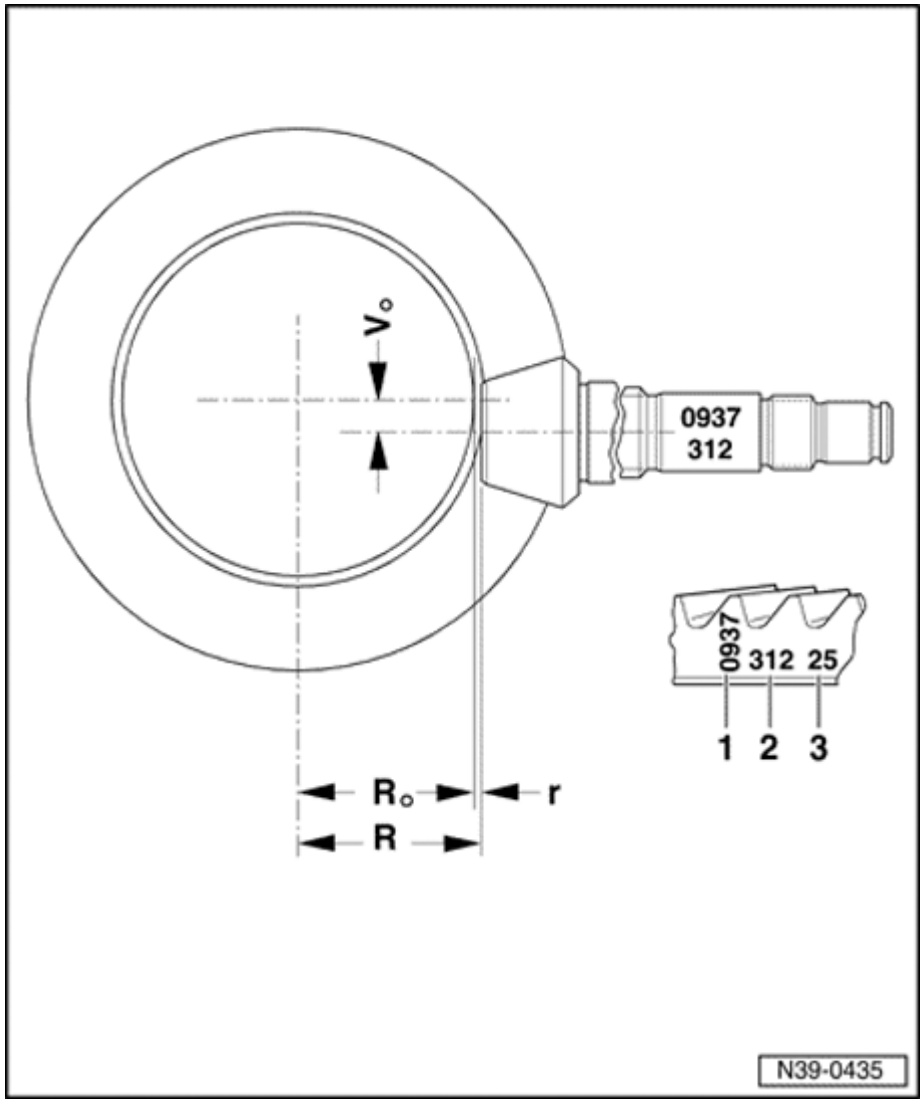
3 - Deviation (tolerance) "r" is based on the test machine master gauge used in the production. The deviation "r" is always given in 1/100 mm. Example: "25" signifies r = 0.25 mm

Ro - Length of master gauge used for test machine "Ro."

Ro - Ring gear = 57.50 mm

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R - Actual distance between center axis of ring gear and face of drive pinion at point with quietest running for this gear set. R = Ro + r

Vo - Hypoid offset

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Readjusting final drive set, recommended sequence

The following work sequence is recommended to save time when the drive pinion and ring gear have to be adjusted:

1.) Determine total shim thickness "S_{total}" for "S1" + "S2" for the specified preload for tapered roller bearings for differential.

2.) Determine total shim thickness "S3" to reproduce the installation position for the drive pinion determined on the test machine in production.

3.) Distribute total shim thickness "S_{total}" for "S1" + "S2" so that the specified backlash exists between ring gear and drive pinion.

Note:

Overview of components and shims ⇒ *Page 39-151* .

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Adjustment overview

Note:

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

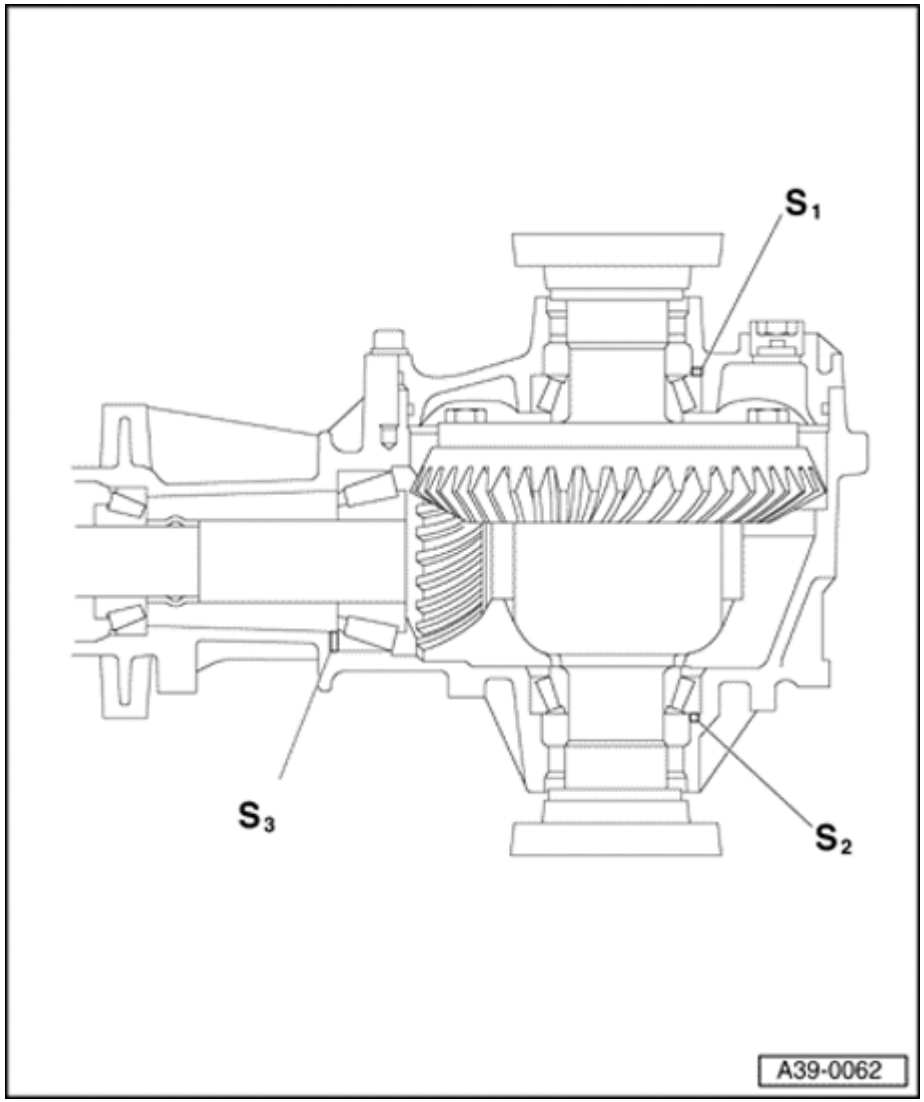
	adjustment required:		
Part replaced: ▼	Ring gear "S1"+"S2" 1) ⇒ Page 39-163	Drive pinion "S3" 1) via deviation "r" ⇒ Page 39-154	Check backlash ⇒ Page 39-169
Final drive housing	X	X	X
Differential housing	X		X
Tapered roller bearing for drive pinion		X	X
Tapered roller bearing for differential	X		X
Final drive set 2)	X	X	X
Cover for final drive	X		X

1) Shims; installation position ⇒ Page 39-151 .

2) Drive pinion and ring gear; only replace together.

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Shims, position

Note:

Adjustment overview when replacing individual components of final drive ⇒ *Page 39-150* .

S1 - Adjustment shim for ring gear in cover for final drive

S2 - Adjustment shim for ring gear in final drive housing

S3 - Adjustment shim for drive pinion in final drive housing

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Special tools, testers and auxiliary items

- Dial gauge extension VW 382/10
- Universal mandrel VW 385/1
- Centralizing disc VW 385/2
- Centralizing disc VW 385/3
- Measuring plunger VW 385/14
- Dial gauge extension VW 385/15
- Measuring plate VW 385/17
- Master gauge VW 385/30
- End dimension plate VW 385/33
- Universal dial gauge bracket VW 387
- Measuring lever VW 388
- Press plate VW 401

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- Press plate VW 402
- Press tool VW 408 A
- Support rails VW 457

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- Ring gear adjusting appliance VW 521/4
- Ring gear adjusting appliance VW 521/8
- Engine and transmission support VW 540
- Thrust plate 30-205
- Installing ring 2003/3
- Pinion assembly appliance 2052/2
- Thrust plate 3005
- Retainer 3028
- Thrust pad 3062
- Fitting appliance 3253 with 3253/3 and 3253/4
- Retainer 3304
- Engine/transmission jack V.A.G 1383 A

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- Universal support V.A.G 1359/2
- Dial gauge extension 30 mm
- Dial gauge
- Torque gauge 0-600 Ncm

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Drive pinion, adjusting

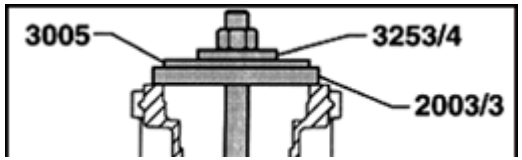
Note:

- *Before adjusting drive pinion, adjust ring gear (determine total shim thickness "S_{total}" for shims "S1" + "S2")* ⇒ *Page 39-163* .
- *The drive pinion only has to be readjusted if the final drive set (ring gear and drive pinion), the tapered roller bearings for the drive pinion or the final drive housing are replaced. Adjustment overview* ⇒ *Page 39-150* .
- *Do not additionally oil new tapered roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.*

Determine thickness of shim "S3"

(Setting preload of tapered roller bearings for drive pinion)

- Mount final drive onto engine and transmission support ⇒ Page 39-108 .



- Pull outer race of large tapered roller bearing into housing (without shim).

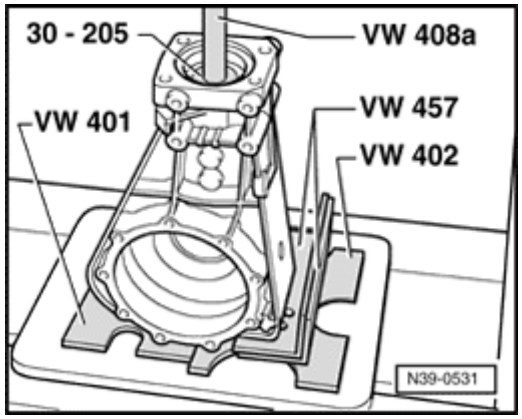
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Note:

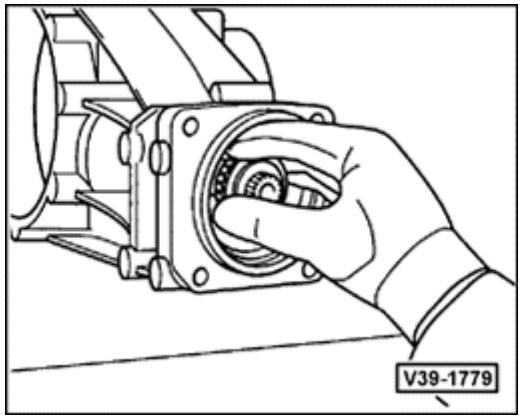
Inscription "Oben" with thrust washer 3253/4 faces the nut of the puller.

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- Pull outer race for small tapered roller bearing into housing.
- Lubricate outer race with oil and fit using press tool VW 408 A and thrust plate 30-205.



- Insert drive pinion without spacer sleeve.

CAUTION!

Wear protective gloves.

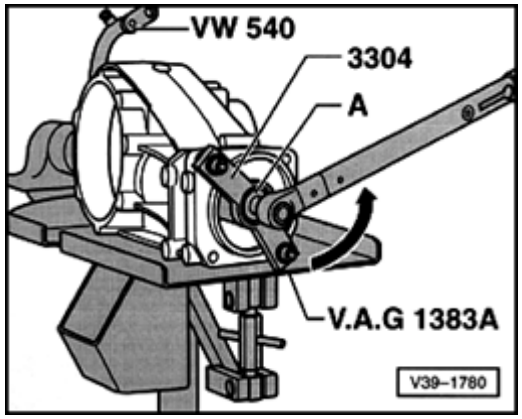
- Heat inner race for tapered roller bearing to approx. 100 ° C and fit onto drive pinion.

Note:

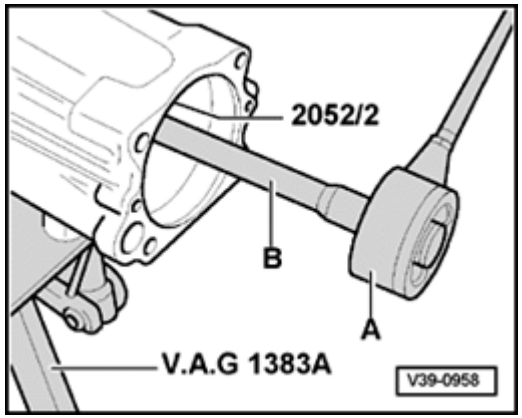
- *Do not additionally oil new tapered roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.*
- *Only install spacer sleeve for final friction torque measurement (after determining shim "S3").*

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- Secure retainer 3304 with two M8 x 30 hex bolts.
- Support final drive when tightening nut (e.g. using universal support V.A.G 1359/2 in conjunction with transmission jack V.A.G 1383 A).
- Fit a new drive pinion nut.
- Tighten drive pinion nut just far enough so that no play can be felt at drive pinion.
- Gradually increase tightening torque, checking friction torque at regular intervals, unti specified friction torque is obtained.



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

B - Extension with 32 mm socket

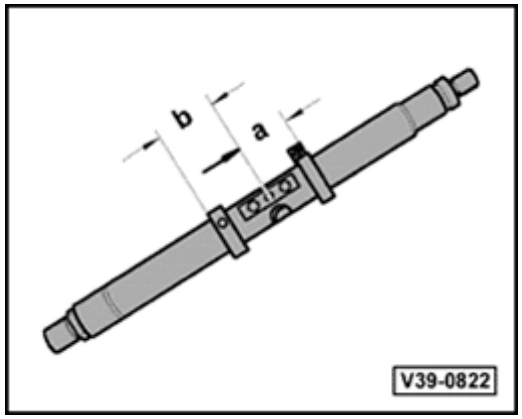
The following friction torques should be set:

New bearings	**Used bearings** [1)]
200-250 Ncm	30-60 Ncm

[1)] run at least 50 km (30 miles)

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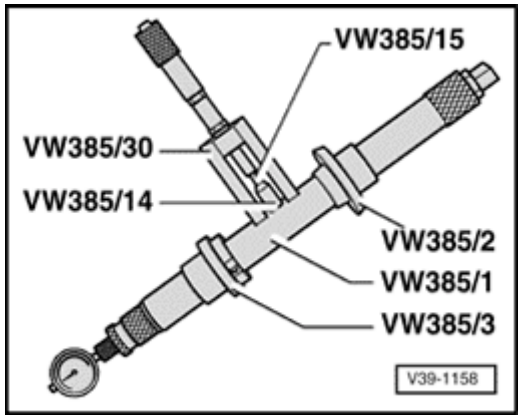
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- Set adjustment ring of universal mandrel VW 385/1.

  Distance a = 60 mm
- Set sliding adjustment ring.

  Dimension b = 55 mm



- Assemble universal mandrel as illustrated:

  Dial gauge extension VW 385/15 = 9 mm long
- Set universal master gauge VW 385/30.

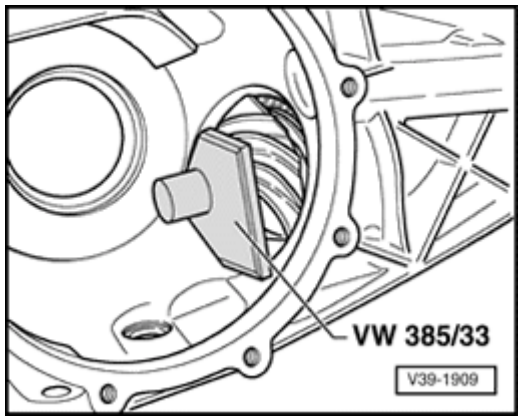
  Ro = 57.50 mm
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.

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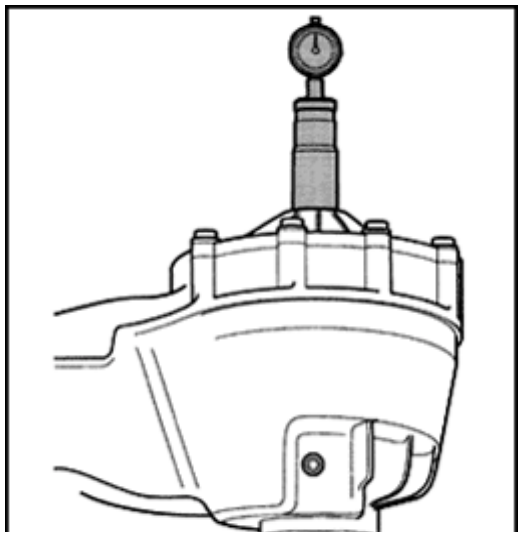
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Note:

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



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



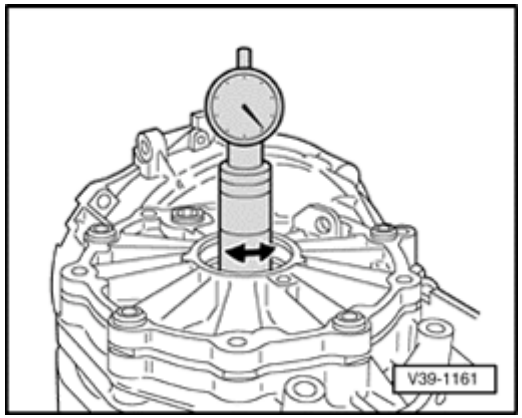
- Remove master gauge and insert measuring mandrel in the housing.

  The centering disc VW 385/3 faces toward cover for final drive

- Fit cover for final drive and tighten 4 bolts.
- Using adjustable ring, move 2nd centering disc out as far as possible so that mandrel can still just be turned by hand.

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Determining measurement "e"

- Turn mandrel until dial gauge point touches end measuring plate on drive pinion head, then measure maximum deflection (return point). Measured value is dimension "e" (in red scale).
  - Measurement in following example: "e" = 1.60 mm

Note:

Dimension "e" is required to determine thickness of shim "S3."

- After removing universal mandrel, check once again whether dial gauge reads "0" with 2 mm preload when master gauge VW 385/30 is in place, otherwise repeat measurement.

Determining shim thickness "S3"

Formula:

"S3" = "e" - "r"

e = Measured value

r = Deviation (tolerance): marked on ring gear in 1/100 mm

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Example:

	Determined value "e"	1.60 mm
-	Deviation "r"	0.42 mm
=	Thickness of shim "S3"	1.18 mm

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

⇒ *Parts catalog*

The following shims are available for "S3"

Shim thickness (mm) 1)		
0.95	1.20	1.45
1.00	1.25	1.50
1.05	1.30	1.55
1.10	1.35	
1.15	1.40	

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

- Remove universal mandrel.

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- Remove drive pinion and outer race of large tapered roller bearing and install together with measured shims "S3" and spacer sleeve ⇒ from Page 39-139 .

Install inner race of small tapered roller bearing and tighten nut for drive pinion until specified friction torque is obtained

⇒ *Fig. 11* , ⇒ Page 39-144 .

Note:

- *Do not additionally oil new tapered roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.*

- *Increase tightening torque slowly and check friction torque at regular intervals, if the specified friction torque is exceeded, the spacer sleeve must be replaced and the adjustment repeated. A spacer sleeve which has been compressed too much cannot be reused.*

- Set to following friction torques:

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

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1) run at least 50 km (30 miles)

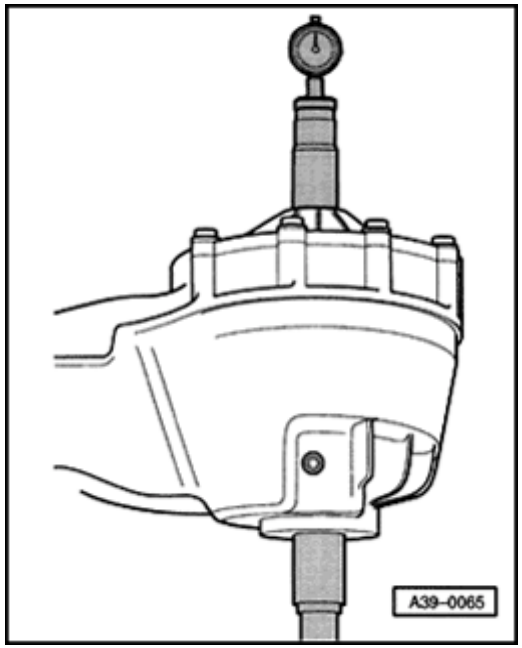
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Performing check measurement

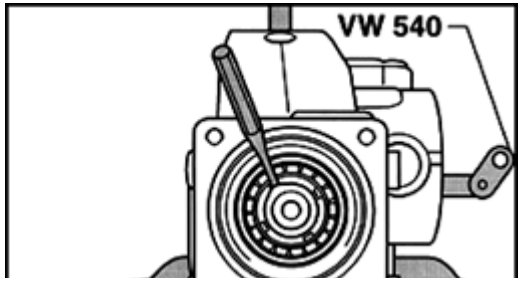
Checking dimension "r"

- Turn drive pinion at least 5 turns in both directions.



- Insert universal mandrel and perform check measurement.

  If the shims have been correctly selected, the dial gauge should now show the value of "r" as marked on the ring gear, reading anti-clockwise in the red scale, within a tolerance of ± 0.04 mm.



- Peen drive pinion nut with a punch.

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Ring gear, adjusting

(Adjusting differential)

Repairs after which the ring gear has to be adjusted ⇒ Page 39-150 , Adjustment overview

Note:

- *Differential tapered roller bearings are low friction bearings. Therefore the friction torque only has a limited use as a check. Correct adjustment is only possible by determining the total shim thickness "S_{total}."*

- *Do not additionally oil new tapered roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.*

Determining total shim thickness "S_{total}" for shims "S1" + "S2"

(Setting preload of tapered roller bearing for differential)

- Drive pinion removed or ring gear dismantled from differential housing

- Pull out drive flange oil seal with lever.

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- Remove differential tapered roller bearing outer races and take out shims ⇒ Page 39-120 .

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Press outer race of left tapered roller bearing for differential (housing side) with shim "S2" into housing

⇒ *Fig. 2* , ⇒ Page 39-126 . To perform measurement use a shim "S2*" with a thickness of 1.00 mm (one 0.80 mm shim and one 0.20 mm shim).

Note:

For measurement purposes a shim "S2" of 1.0 mm is initially inserted which will be designated "S2" in the following. After determining the backlash "S2*" will be replaced by the correct "S2.."*

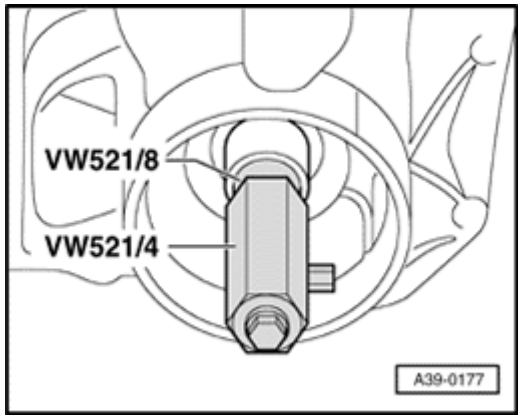
-	Press in outer race of right tapered roller bearing for differential (final drive cover side) without shims	⇒ *Fig. 8* , ⇒ Page 39-120 (install as far as

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the stop).

- Insert differential into housing. Ring gear is positioned on right side (cover side).

- Fit cover and tighten bolts to 25 Nm.



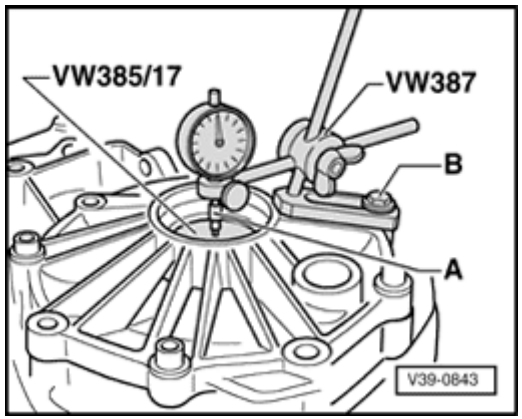
- Install special tools VW 521/4 and 521/8 onto housing side in differential housing.
- Turn cover side of differential housing upward.

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- Turn differential 5 turns in both directions to settle tapered roller bearing.

- Place measuring plate VW 385/17 onto differential.



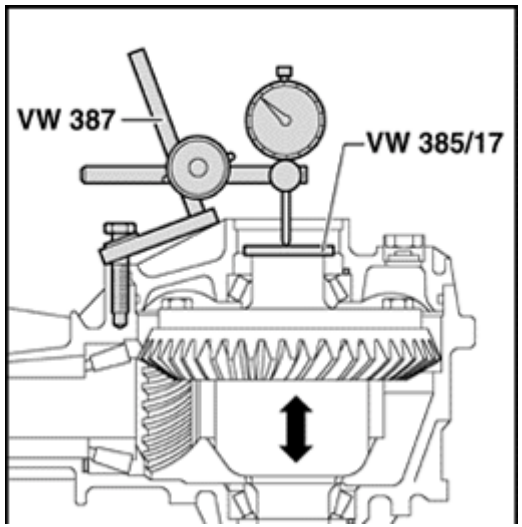
- Fit measuring tools.

A - Dial gauge extension approx. 30 mm long

B - Hex bolt M8 x 45

- Place D.T.I. extension on center of measuring plate VW 385/17.

- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.



- Lift differential without turning; read play on dial gauge and note.

  Measurement in following example: 0.50 mm

Note:

If the measurement has to be repeated, the differential must again be turned 5 turns in each direction to settle the tapered roller bearing.

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Formula:

"S_{total}" = "S2*" + measurement + bearing preload

Example:

	Inserted shim(s) "S2*"	1.00 mm
+	Measured value	0.50 mm
+	Bearing preload (constant)	0.30 mm
=	Total shim thickness "S_{total}" for shims "S1" + "S2"	1.80 mm

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Determining thickness of shim "S1*"

Note:

- *The preliminary adjustment shim "S1*" will be replaced with the final shim "S1" after determining the backlash.*
- *The total shim thickness "S_{total}" remains unchanged.*

Formula:

"S1*" = "S_{total}" - "S2*"

Example:

	Total shim thickness "S_{total}" for shims "S1" + "S2"	1.80 mm
-	Inserted shim(s) "S2*"	1.00 mm
=	Thickness of shim "S1*"	0.80 mm

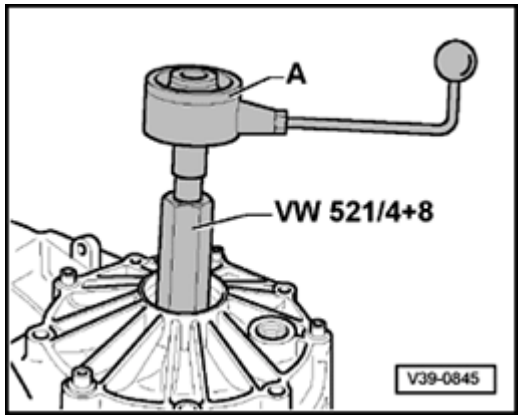
- Determine shim(s) as accurately as possible from table ⇒ Page 39-172 .

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Measuring friction torque (check)

- Drive pinion removed
- Differential fitted with shims "S1*" and "S2*"



- Fit torque gauge 0-600 Ncm -A- onto differential.
- Read friction torque.

Friction torque specifications:

New bearings	Used bearings 1)
150-300 Ncm	30-60 Ncm

1) run at least 50 km (30 miles)

Note:

- *Differential tapered roller bearings are low friction bearings. Therefore the friction torque only has a limited use as a check. Correct adjustment is only possible by determining the total shim thickness "S_{total}."*
- *Do not additionally oil new tapered roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.*
- *If the final drive set (drive pinion and ring gear) is being re-adjusted, the adjustment of the drive pinion should be performed now, and the*

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adjustment checked ⇒ *Page 39-154* .

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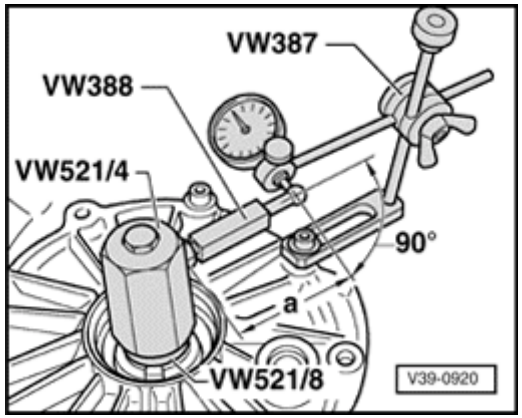
Adjusting backlash

(Positioning ring gear in final drive housing)

- Drive pinion with shim "S3" installed
- Differential with shims "S1*" + "S2*" installed

- Insert differential in final drive housing, install cover and tighten all bolts to 25 Nm.

- Turn differential 5 turns in both directions to settle tapered roller bearings.



- Assemble measuring equipment.

  Use dial gauge extension VW 382/10 (6 mm flat).

- Set measuring lever VW 388 to dimension "a" = 60 mm.
- Determine play between teeth flanks as follows:
  - Turn ring gear until it makes contact with a tooth flank (end of backlash travel).
  - Set dial gauge to "0" with 1 mm preload.

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- Turn ring gear back until lying against an opposite tooth flank (backlash).

- Read backlash and note value.

- Turn ring gear through 90° and repeat measurements a further 3 times.

Note:

If the individual measurements differ by more than 0.06 mm from each other, the installation of the ring gear or the final drive set itself is not correct. Check installation, replace final drive set if necessary.

Determining average backlash

Example:

	1st measurement	0.28 mm
+	2nd measurement	0.30 mm
+	3rd measurement	0.30 mm
+	4th measurement	0.28 mm
=	Sum of measured values	1.16 mm

- Result: The average backlash is 1.16 ÷ 4 = 0.29 mm

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Determining thickness of shim "S2"

Formula:

"S2" = "S2*" - backlash + lift

Example:

	Inserted shim "S2*"	1.00 mm
-	Average backlash	0.29 mm
+	Lift (constant)	0.15 mm
=	Thickness of shim "S2"	0.86 mm

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

⇒ *Parts catalog*

The following shims are available for "S2"

Shim thickness (mm) 1)		
0.15	0.50	1.50
0.20	0.80	
0.25	1.00	

1) Using the shim tolerance variations it is

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possible to find the exact shim thickness required, insert two shims if necessary.

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Determining thickness of shim "S1"

Formula:

"S1" = "S_{total}" - "S2"

Example:

	Total shim thickness "S_{total}" for "S1" + "S2"	1.80 mm
-	Thickness of shim "S2"	0.86 mm
=	Thickness of shim "S1"	0.94 mm

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

⇒ *Parts catalog*

The following shims are available for "S1"

Shim thickness (mm) 1)		
0.15	0.50	0.90
0.20	0.60	1.00
0.30	0.70	1.20

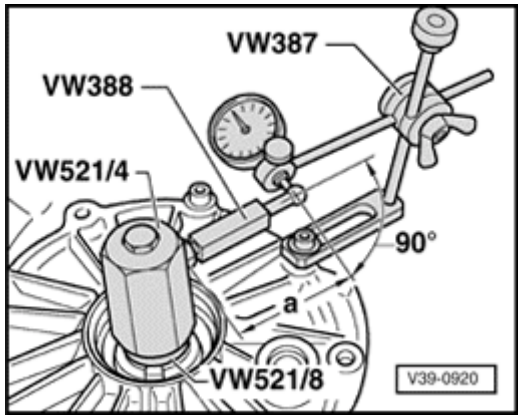
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0.40	0.80	

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

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Performing check measurement

- Drive pinion with shim "S3" installed
- Differential with shims "S1" + "S2" installed

- Turn differential 5 turns in both directions so that tapered roller bearings settle.
- Measure backlash four times on circumference.
  - Specifications: 0.12-0.22 mm

Note:

- *If the backlash lies outside the tolerances, the adjustments must be repeated, but the total shim thickness "S_{total}" must remain unchanged.*
- *The individual measurements must not differ by more than 0.06 mm from each other.*

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