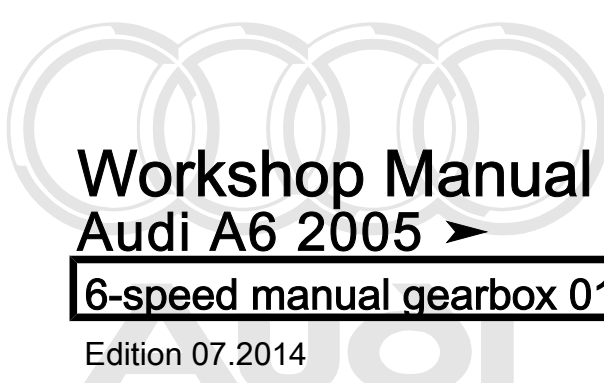




Workshop Manual Audi A6 2005 ➤

6-speed manual gearbox 01X, front-wheel drive

Edition 07.2014

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List of Workshop Manual Repair Groups

Repair Group

- 00 - Technical data
- 30 - Clutch
- 34 - Controls, housing
- 35 - Gears, shafts
- 39 - Final drive - differential



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

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00 – Technical data

1 Gearbox identification

(ARL003909; Edition 07.2014)

The 6-speed manual gearbox 01X, front-wheel drive is installed in the Audi A6 2005 ▶ in combination with various engine versions. For allocation ⇒ [page 1](#) .

Location on gearbox

- ◆ Code letters and date of manufacture -arrow 1- or -arrow 3-
- ◆ Manual gearbox 01X -arrow 2-

Code letters and date of manufacture of gearbox -arrow 1-

Example:	GJU	14	06	3
	Code letters	Day	Month	Year of manufacture (2003)

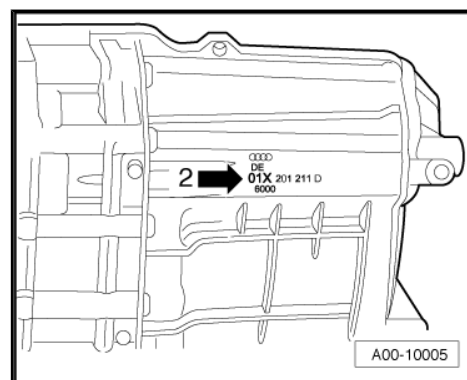
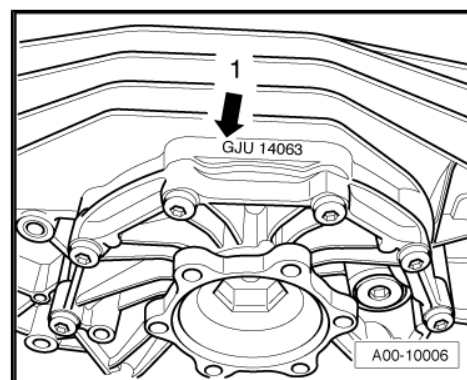
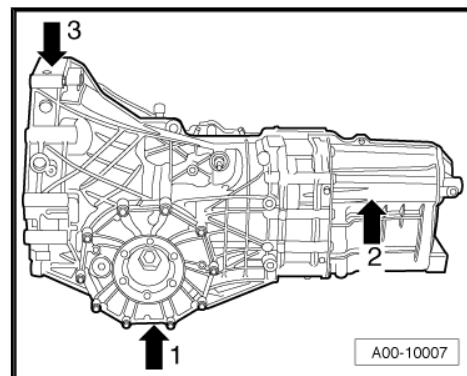
Additional data are manufacture-related.



Note

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

Manual gearbox 01X -arrow 2-



1.1 Code letters, allocation, transmission ratios, capacities

The following data can be found in the ⇒ [Electronic parts catalogue](#) .

- ◆ Gear oil specification
- ◆ Correct type of flange shafts
- ◆ Correct type of clutch plate and pressure plate



Manual gearbox		6-speed 01X (front-wheel drive)		
Code letters		GVC	GYF	GYX
Manufactured	from	04.04	04.04	07.04
	to	10.08	10.08	10.08
Allocation	Model	A6 2005 ►	A6 2005 ►	A6 2005 ►
	Engine	2.0 ltr. - 125 kW TFSI 2.8 ltr. - 154 kW FSI 3.2 ltr. - 188 kW FSI	2.4 ltr. - 130 kW MPI	2.0 ltr. 103 kW TDI-PD (unit injector)
Ratio $Z_2 : Z_1 = i$	Final drive	30 : 8 = 3.750	33 : 8 = 4.125	30 : 8 = 3.750
	1st gear	33 : 9 = 3.667	33 : 9 = 3.667	33 : 9 = 3.667
	2nd gear	39 : 19 = 2.053	39 : 19 = 2.053	39 : 19 = 2.053
	3rd gear	37 : 26 = 1.432	37 : 27 = 1.370	37 : 27 = 1.370
	4th gear	32 : 31 = 1.032	32 : 31 = 1.032	32 : 31 = 1.032
	5th gear	28 : 35 = 0.800	29 : 35 = 0.829	28 : 35 = 0.800
	6th gear	25 : 38 = 0.658	26 : 37 = 0.703	25 : 39 = 0.641
	Reverse gear	34 : 10 = 3.400	34 : 10 = 3.400	34 : 10 = 3.400
Overall ratio i_{OV} in top gear		2.467	2.899	2.404
Capacity		3.0 ltr.		

Manual gearbox		6-speed 01X (front-wheel drive)		
Code letters		GVD	HCK	JEM
Manufactured	from	10.08	11.08	01.06
	to			03.09
Allocation	Model	A6 2005 ►	A6 2005 ►	A6 2005 ►
	Engine	2.8 ltr. - 140 kW FSI	2.0 ltr. - 125 kW TDI CR	2.0 ltr. - 100 kW TDI CR
Ratio $Z_2 : Z_1 = i$	Final drive	30 : 8 = 3.750	30 : 8 = 3.750	32 : 9 = 3.556
	1st gear	33 : 9 = 3.667	33 : 9 = 3.667	33 : 9 = 3.667
	2nd gear	39 : 19 = 2.053	39 : 19 = 2.053	39 : 19 = 2.053
	3rd gear	37 : 27 = 1.370	36 : 28 = 1.286	37 : 27 = 1.370
	4th gear	32 : 31 = 1.032	31 : 33 = 0.939	32 : 31 = 1.032
	5th gear	28 : 35 = 0.800	26 : 37 = 0.703	28 : 35 = 0.800
	6th gear	25 : 38 = 0.658	23 : 40 = 0.575	25 : 38 = 0.658
	Reverse gear	34 : 10 = 3.400	34 : 10 = 3.400	34 : 10 = 3.400
Overall ratio i_{OV} in top gear		2.467	2.156	2.339
Capacity		3.0 ltr.		

Manual gearbox		6-speed 01X (front-wheel drive)		
Code letters		JWS	LDW	
Manufactured	from	10.08	09.08	
	to			
Allocation	Model	A6 2005 ►	A6 2005 ►	
	Engine	2.0 ltr. - 100 kW TDI CR	2.0 ltr. - 125 kW TFSI	
Ratio $Z_2 : Z_1 = i$	Final drive	32 : 9 = 3.556	30 : 8 = 3.750	
	1st gear	33 : 9 = 3.667	33 : 9 = 3.667	
	2nd gear	39 : 19 = 2.053	39 : 19 = 2.053	
	3rd gear	36 : 28 = 1.286	37 : 27 = 1.370	

Manual gearbox		6-speed 01X (front-wheel drive)		
	4th gear	31 : 33 = 0.939	32 : 31 = 1.032	
	5th gear	26 : 37 = 0.703	29 : 34 = 0.853	
	6th gear	23 : 40 = 0.575	27 : 37 = 0.730	
	Reverse gear	34 : 10 = 3.400	34 : 10 = 3.400	
Overall ratio $i_{ov.}$ in top gear		2.045	2.736	
Capacity		3.0 ltr.		



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2 Transmission layout

Identification



Note

-Arrows- point in direction of travel.

1 - Engine

2 - Clutch

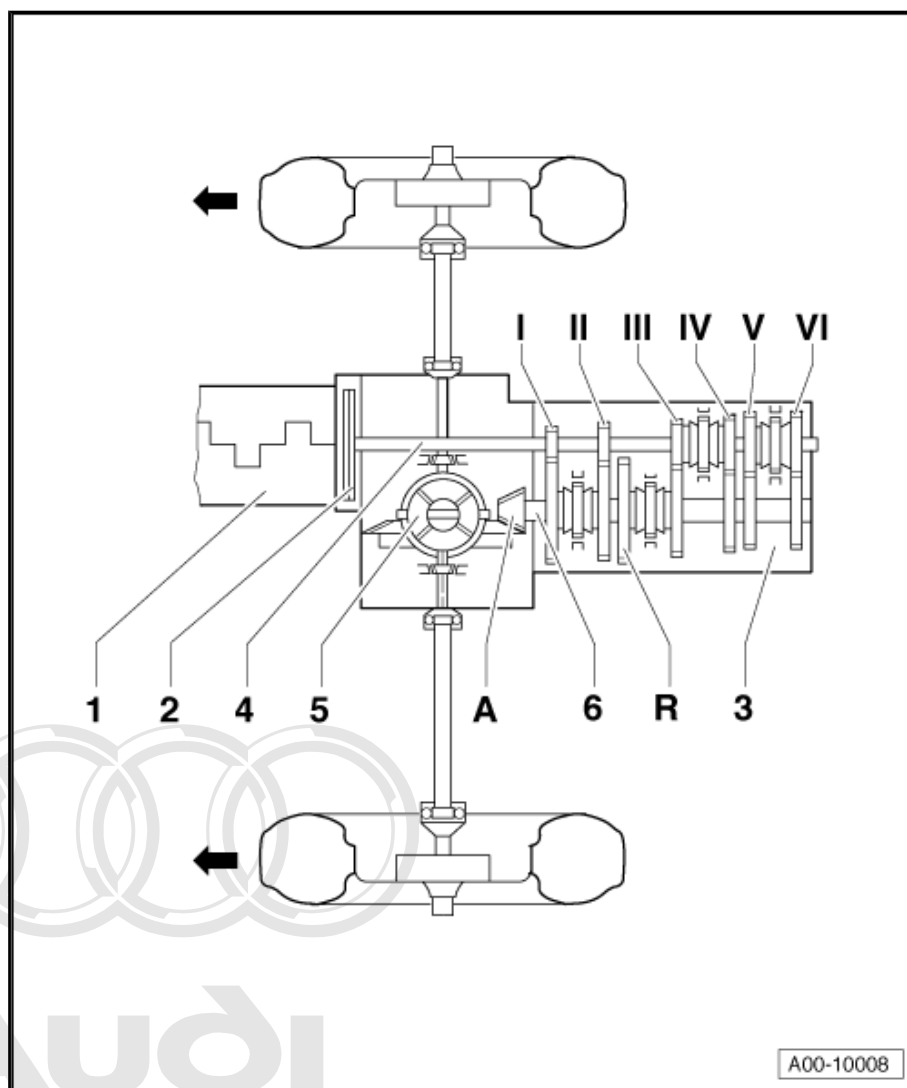
3 - Manual gearbox

- General layout of gear-box ⇒ [page 102](#)

4 - Input shaft (main shaft)

5 - Differential

6 - Pinion shaft (output shaft)



A00-10008

Ratio

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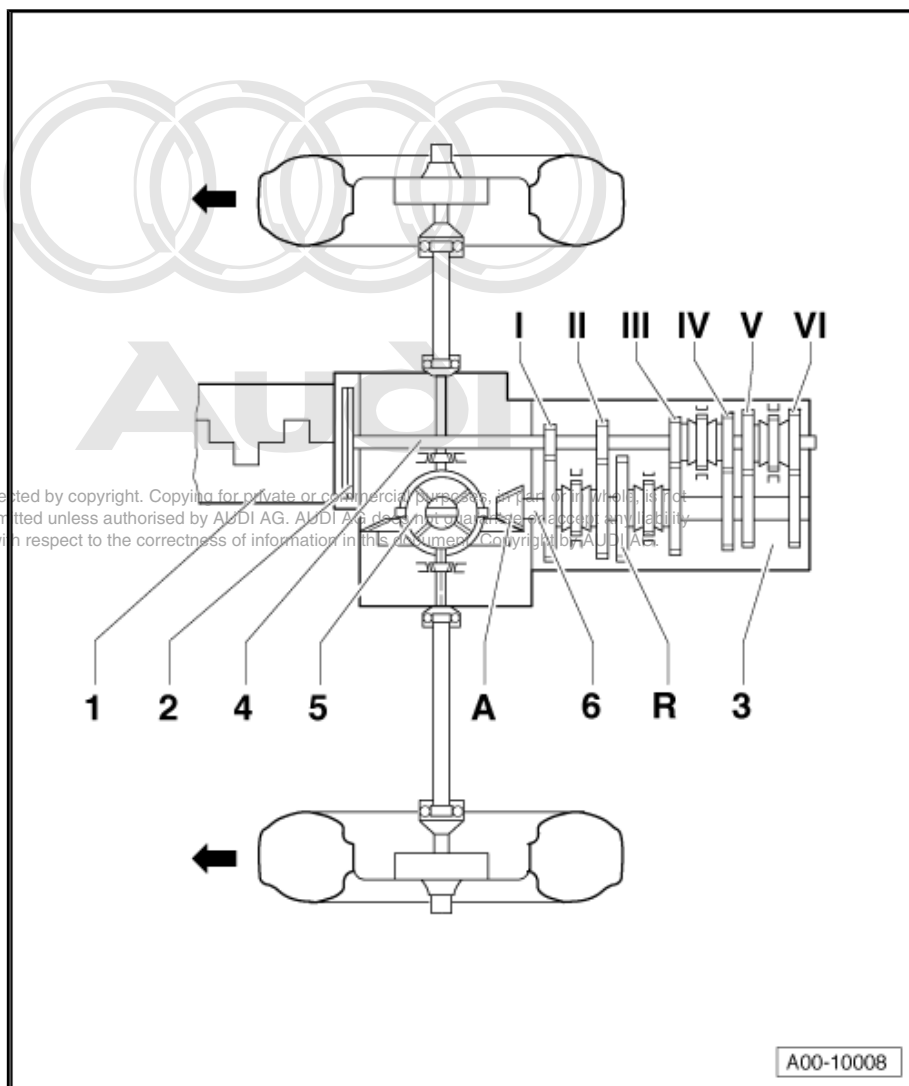


Note

-Arrows- point in direction of travel.

- I - 1st gear
- II - 2nd gear
- III - 3rd gear
- IV - 4th gear
- V - 5th gear
- VI - 6th gear
- R - Reverse gear
- A - Final drive

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3 Calculating ratio "i"

Transmission ratio

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

Ratios

i_G = Gear ratio

i_A = Axle ratio

i_{ov} = Overall ratio

Formula

$ZG_2 : ZG_1$

$ZA_2 : ZA_1$

$i_G \times i_A$

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Example:

	6th gear	Final drive
Driving gear	$ZG_1 = 38$	$ZA_1 = 8$
Driven gear	$ZG_2 = 25$	$ZA_2 = 30$

Calculations:

$i_G = 25 : 38 = 0.658$

$i_A = 30 : 8 = 3.750$

$i_{ov} = 0.658 \times 3.750 = 2.467$

4 General repair instructions

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

A number of generally applicable instructions for the various repair procedures are summarised here under the heading "Components" ⇒ [page 7](#). They apply to the work described in this Manual.

4.1 Special tools

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

4.2 Components

Gearbox

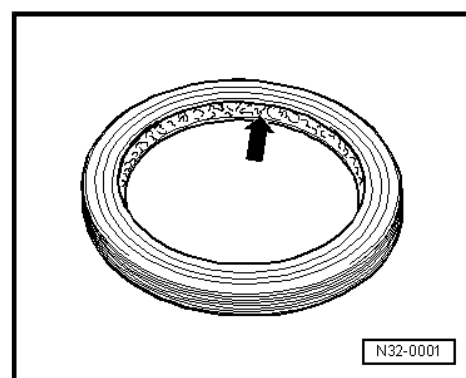
- ◆ Allocate bolts and other components according to gearbox code letters, refer to ⇒ [Electronic parts catalogue](#) ⇒ [page 1](#).
- ◆ When installing a new gearbox, check the oil level and fill up with oil if necessary ⇒ [page 98](#).
- ◆ Capacities and specifications ⇒ [page 1](#).
- ◆ Thoroughly clean all joints and connections and the surrounding areas before dismantling.
- ◆ When installing gearbox ensure dowel sleeves are correctly seated.

Sealants

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

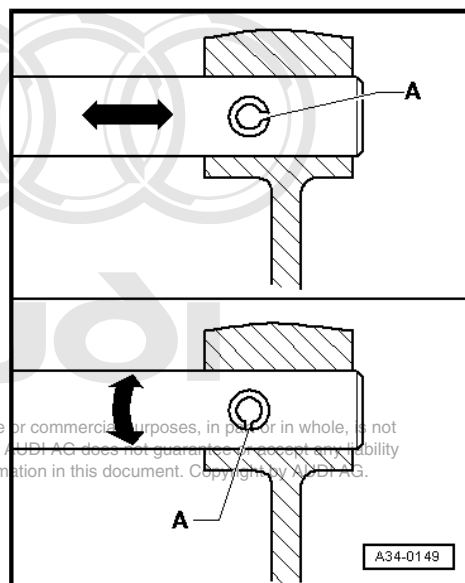
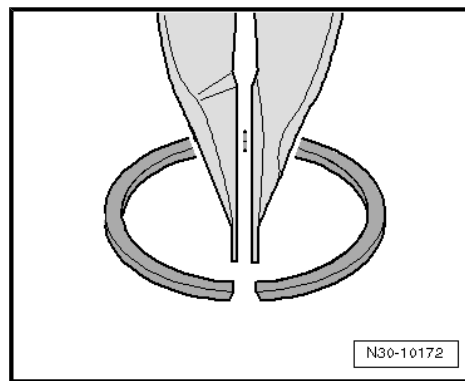
O-rings, oil seals and gaskets

- ◆ Always renew O-rings, oil seals and gaskets after removal.
- ◆ After removing gaskets and oil seals, always inspect the contact surface on the housing or shaft for burrs resulting from removal or for other signs of damage.
- ◆ Thoroughly clean housing joint surfaces before assembling.
- ◆ Before installing oil seals, lightly oil the outer circumference of the seal and fill the space between the sealing lips -arrow- about half full with grease - G 052 128 A1-.
- ◆ The open side of the oil seal should face the side containing the fluid.
- ◆ When installing a new oil seal, position the seal such that the sealing lip does not contact the shaft in the same place as the old seal (make use of installation depth tolerances).
- ◆ Lightly lubricate O-rings before installation to prevent them from being trapped and damaged during assembly.
- ◆ After renewing gaskets and oil seals, check and, if necessary, top up oil level in gearbox ⇒ [page 98](#).



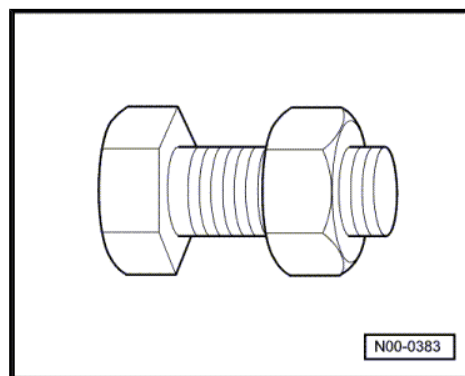
Locking elements

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



Nuts, bolts

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

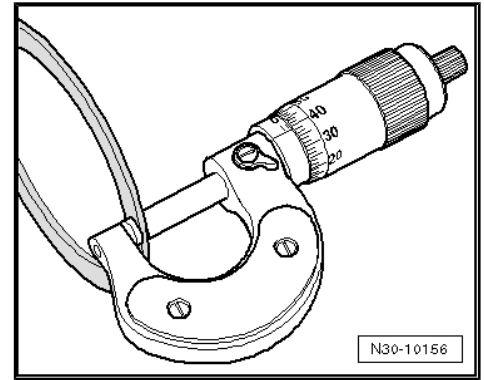


Shims

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

Bearings

- ◆ Install needle bearings, ball sleeves and roller bearings so the lettering (side with thicker metal) faces towards the installing tool.
- ◆ Lubricate all bearings in gearbox with gear oil when installing.
- ◆ Use inductive heater - VAS 6414- to heat inner races of tapered roller bearings to approx. 100°C before installing. Press home onto stop when installing so there is no axial clearance.
- ◆ Do not interchange the outer or inner races of bearings of the same size (the bearings are paired).
- ◆ If required, renew the tapered roller bearings on one shaft together and use new bearings from a single manufacturer.
- ◆ Grease needle bearing for gearbox input shaft in rear side of flywheel.

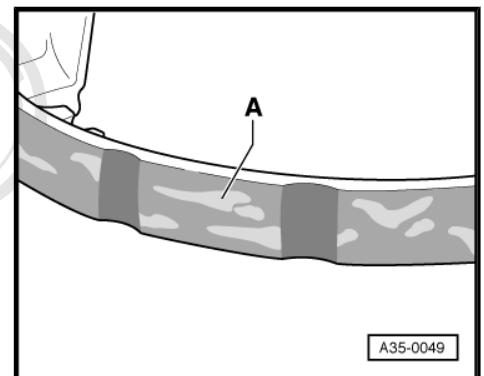


Synchro-rings

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

Checking synchro-rings with molybdenum coating

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



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Checking synchro-rings for 1st and 2nd gear

Check the coated contact surfaces -arrows 2- on intermediate ring -B- for damage (flattened sections or particles of carbon coating broken away).

Check inner contact surface -arrow 1- on synchro-ring -A- and outer contact surface -arrow 4- on inner ring -C- for grooves or scoring.

Check for damage to coating on inner rings -C- with coated contact surface -arrow 3- (particles of carbon coating broken away).

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

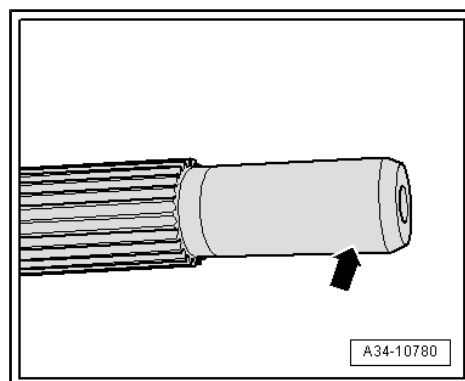
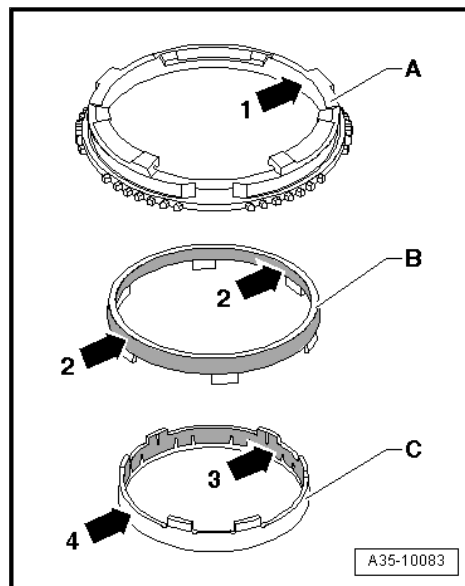
- ◆ Before installing, heat inner races of needle bearings for selector gears to approx. 100° C using inductive heater - VAS 6414- .
- ◆ Use inductive heater - VAS 6414- to heat gear wheels and synchro-hubs to approx. 100°C before installing. Press home onto stop when installing so there is no axial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

Selector gears

- ◆ After installing, check 1st to 6th speed selector gears for minimal axial play and freedom of movement.

Input shaft

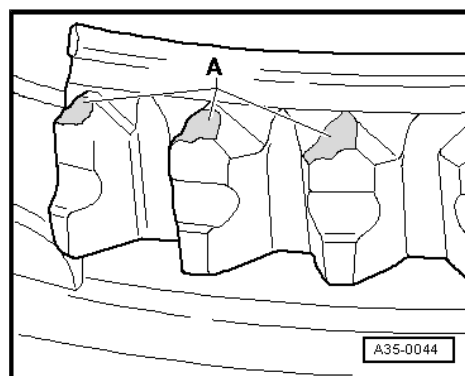
- ◆ Check the input shaft for scoring around the bearing in the crankshaft/flywheel -arrow-. Renew the needle bearing in the crankshaft if necessary ⇒ Rep. gr. 13 .



Abnormal wear on selector gears and locking collars

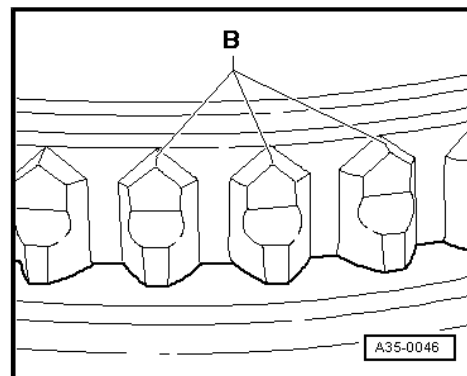
- ◆ Abnormal wear on synchro-ring or selector gear:

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



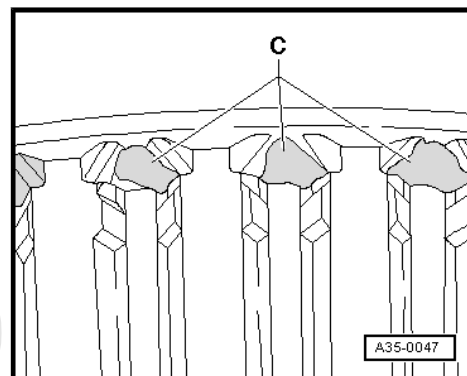
- ◆ In comparison: intact synchro-ring or selector gear:

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



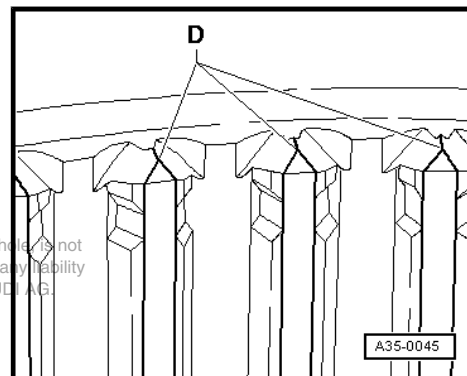
- ◆ Abnormal wear on locking collar:

C - Worn chamfer on internal splines of locking collar.



- ◆ In comparison: intact locking collar:

D - Intact chamfer on internal splines of locking collar.



Clutch mechanism

- ◆ When removing gearbox, remove clutch slave cylinder without disconnecting pipes.
- ◆ Do not depress the clutch pedal after removing the clutch slave cylinder if the hydraulic pipe is still connected. Otherwise the piston will be pressed out of the clutch slave cylinder. As a result the clutch slave cylinder will be destroyed.
- ◆ If the clutch pedal does not return to its initial position after releasing it (clutch pedal in rest position), you must bleed the clutch system (further measures ⇒ ["1.7 Notes on removing and installing clutch master cylinder and slave cylinder", page 20](#)).
- ◆ The clutch system should be bled at the same intervals as the brake system ⇒ Maintenance ; Booklet 45 .
- ◆ Note assembly instructions for SAC pressure plate ⇒ [page 41](#) .
- ◆ On vehicles with SAC pressure plate an adjuster ring has to be reset when only the clutch plate is renewed ⇒ [page 43](#) .
- ◆ If the clutch has burnt out, thoroughly clean the gearbox housing in area of clutch and parts of the engine facing the gearbox in order to prevent odours.
- ◆ Only blow out dual-mass flywheel with compressed air.
- ◆ Clutch pressure plates have an anti-corrosion coating and are greased. With the exception of the friction surface for the clutch plate, the clutch pressure plate must not be cleaned. Otherwise, the service life of the clutch will be considerably reduced.
- ◆ The friction surface of the clutch pressure plate and the dual-mass flywheel must be cleaned (degreased) thoroughly.

30 – Clutch

1 Servicing clutch mechanism



Caution

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



Note

- ◆ Grease all bearings and contact surfaces.
- ◆ *Select correct type of grease from ⇒ Electronic parts catalogue*
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- ◆ *Before working on pedal cluster, remove storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68.*
- ◆ *Make sure that no brake fluid escapes into the footwell, the plenum chamber or onto the gearbox below. If this does happen, clean the affected area thoroughly.*
- ◆ *When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.*

⇒ [“1.1 Exploded view - pedal cluster \(LHD vehicles\)”, page 13](#)

⇒ [“1.2 Removing and installing over-centre spring”, page 14](#)

⇒ [“1.3 Removing and installing clutch pedal switch for engine start F194”, page 15](#)

⇒ [“1.4 Removing and installing clutch position sender G476”, page 16](#)

⇒ [“1.5 Exploded view - pedal cluster \(RHD vehicles\)”, page 17](#)

⇒ [“1.6 Exploded view - hydraulic system”, page 19](#)

⇒ [“1.7 Notes on removing and installing clutch master cylinder and slave cylinder”, page 20](#)

⇒ [“1.8 Function check for clutch master cylinder and slave cylinder”, page 20](#)

⇒ [“1.9 Removing and installing clutch master cylinder”, page 22](#)

⇒ [“1.10 Bleeding clutch system”, page 24](#)

1.1 Exploded view - pedal cluster (LHD vehicles)



Note

- ◆ Before working on pedal cluster, remove storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68.
- ◆ Apply grease - G 000 450 02- to all bearings and contact surfaces.
- ◆ Make sure that no brake fluid escapes into the footwell, the plenum chamber or onto the gearbox below. If this does happen, clean the affected area thoroughly.
- ◆ The travel of the brake pedal must not be restricted with additional floor mats or the like.
- ◆ When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.

1 - Mounting bracket

- Removing and installing
⇒ [page 22](#)

2 - Pivot pin for clutch and brake pedal

3 - Retaining clip

4 - Hexagon socket head bolt

- 25 Nm

5 - Brake pedal

- Maintenance-free bearing, do not grease

6 - Bearing shell

7 - Retaining clip

8 - Over-centre spring

- Black side points towards clutch pedal
- Removing and installing
⇒ [page 14](#)
- Different versions available; for correct version refer to ⇒ Electronic parts catalogue

9 - Bearing

10 - Clutch pedal stop

- Different versions available; for correct version refer to ⇒ Electronic parts catalogue

11 - Bolt

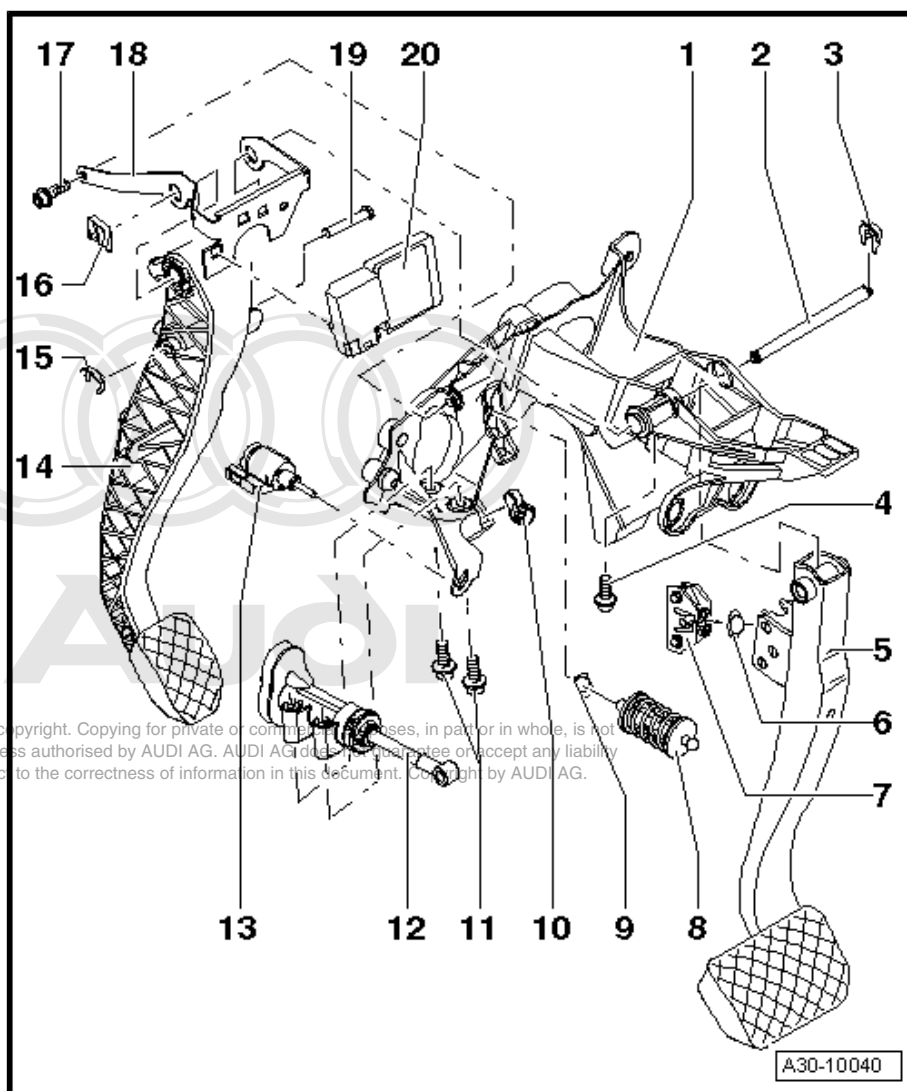
- 8 Nm + 90°
- For clutch master cylinder

12 - Clutch master cylinder

- Removing and installing ⇒ [page 22](#)

13 - Clutch pedal switch for engine start - F194-

- May only be installed once; must always be renewed if removed
- Different versions; for details refer to ⇒ [page 15](#)



- ☐ Depress clutch pedal by hand all the way when removing or installing switch.
- ☐ Removing and installing ⇒ [page 15](#)
- ☐ Engine can only be started when clutch is fully depressed (clutch pedal switch for engine start activated).

14 - Clutch pedal

- ☐ Removing and installing ⇒ [page 22](#)

15 - Retaining clip

16 - Retaining clip

17 - Bolt

- ☐ 10 Nm

18 - Bracket

19 - Pivot pin

20 - Clutch position sender - G476-

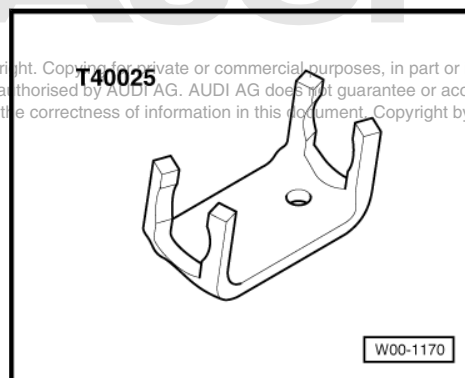
- ☐ Removing and installing ⇒ [page 16](#)

1.2 Removing and installing over-centre spring

Special tools and workshop equipment required

- ◆ Assembly clip - T40025-

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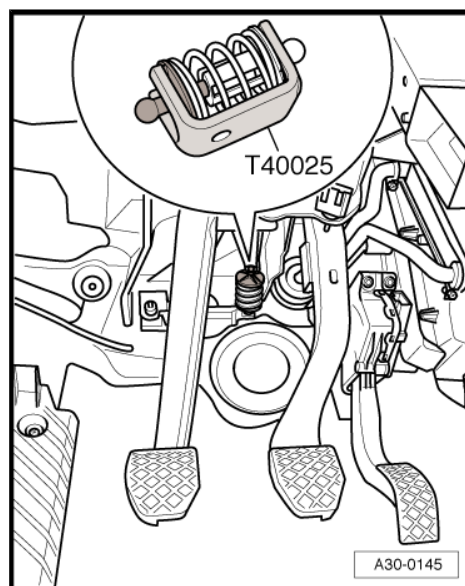
Removing

- Remove storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .
- Compress over-centre spring with clutch pedal, at the same time pressing on assembly clip - T40025- .
- Move clutch pedal to rest position and take out over-centre spring together with assembly clip - T40025- downwards.

Installing

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

- Pull clutch pedal into the passenger compartment.
- Installation position of over-centre spring: black side of over-centre spring faces clutch pedal.
- Install over-centre spring with assembly clip - T40025- , operate clutch pedal and remove assembly clamp.
- Install storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .



1.3 Removing and installing clutch pedal switch for engine start - F194-



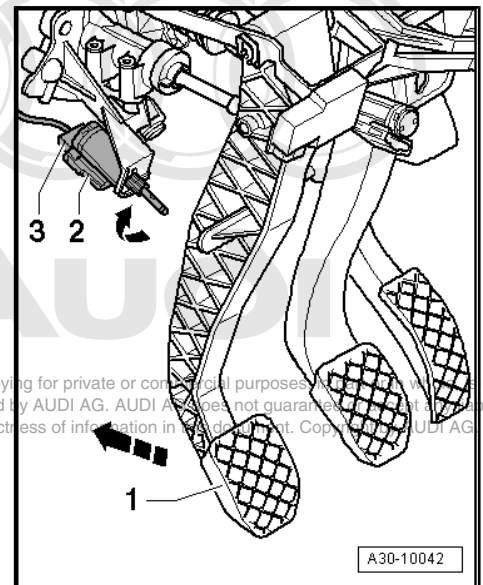
Clutch pedal switch for engine start - F194- may only be fitted once so as to ensure a firm fit.

Removing

- Remove storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .
- Detach electrical connector -3- on clutch pedal switch for engine start - F194- .
- Press clutch pedal -1- all the way down and hold it in this position.
- At the same time, release clutch pedal switch for engine start - F194- -2- by turning it 45° in the direction indicated -arrow- and pull it out of the guide.

Installing

⇒ **"1.3.1 Installing clutch pedal switch for engine start F194 ", page 15**

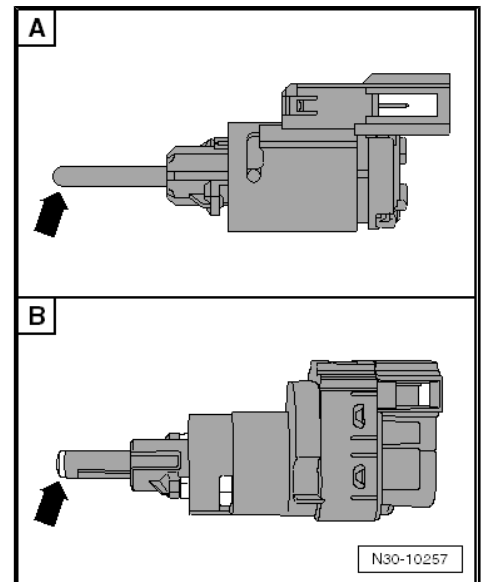


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1.3.1 Installing clutch pedal switch for engine start - F194-

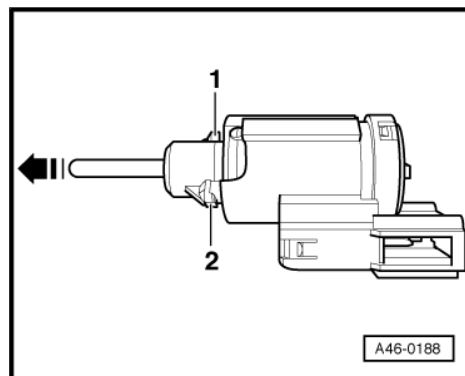
Different versions of clutch pedal switch for engine start - F194-

Clutch pedal switch	
-A- = Without light-coloured cap on plunger head -arrow- Part number -1J0 927 189 F-	• Plunger must be pulled out fully prior to installation.
-B- = With light-coloured cap on plunger head -arrow- Part number -6Q0 927 189-	• Plunger must not be pulled out.



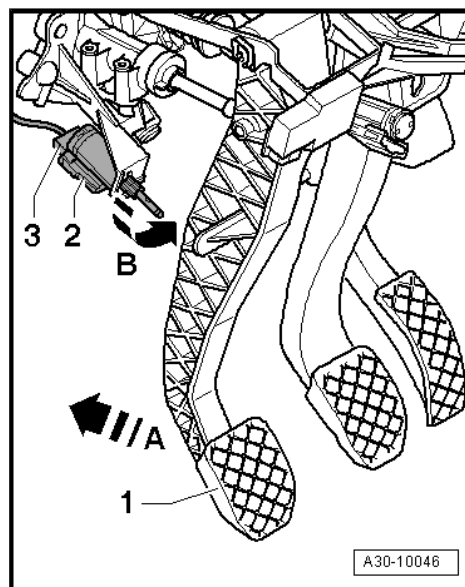
Clutch pedal switch for engine start with part number -1J0 927 189 F-

- Pull out plunger -arrow- all the way before installing clutch pedal switch .



All versions of clutch pedal switch for engine start (continued)

- When installing clutch pedal switch for engine start , press clutch pedal -1- all the way down -arrow A-. Hold clutch pedal in this position.
- Guide clutch pedal switch for engine start - F194- -2- through mounting hole.
- Press plunger of clutch pedal switch against clutch pedal and at the same time turn clutch pedal switch as far as stop in direction of -arrow B- (approx. 45°).
- Let go of clutch pedal.
- Attach electrical connector -3- on clutch pedal switch for engine start - F194- .
- Install storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .



1.4 Removing and installing clutch position sender - G476-



Note

The clutch position sender - G476- can be checked in "Guided Fault Finding" using ⇒ Vehicle diagnostic tester.

Removing

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

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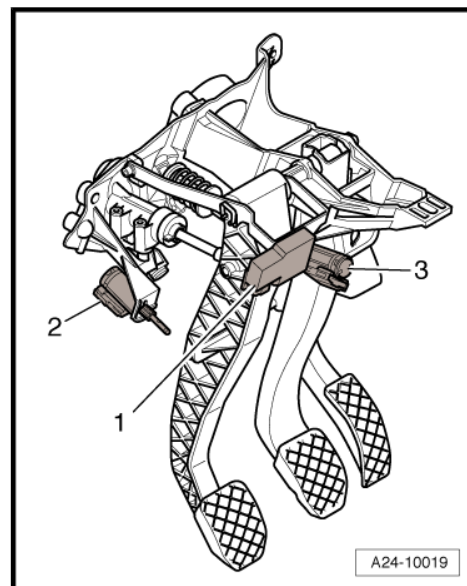
- Unplug connector at clutch position sender - G476- -1-.



Note

-Item 2- and -item 3- can be disregarded.

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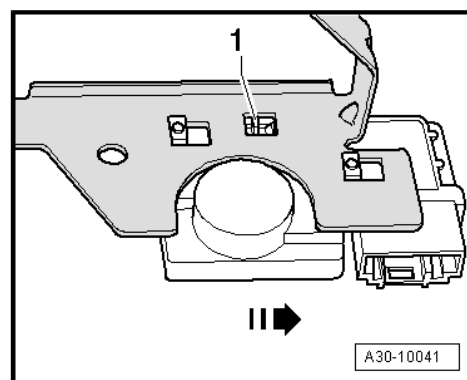


- Press retainer tab -1- inwards and push clutch position sender - G476- in direction of -arrow- onto limit stop.

Installing

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

- The retainer tab -1- should engage with a clicking sound.
- Install storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .



1.5 Exploded view - pedal cluster (RHD vehicles)



Note

- ◆ The travel of the brake pedal must not be restricted with additional floor mats or the like.
- ◆ Apply grease - G 000 450 02- to all bearings and contact surfaces.
- ◆ Make sure that no brake fluid escapes into the footwell, the plenum chamber or onto the gearbox below. If this does happen, clean the affected area thoroughly.

1 - Retaining clip
2 - Pivot pin for clutch pedal
3 - Pivot pin for brake pedal
4 - Bolt

- 25 Nm

5 - Brake pedal

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

6 - Bracket

- For clutch pedal switch
⇒ [Item 8 \(page 18\)](#)

7 - Bolt

- 10 Nm

8 - Clutch pedal switch for engine start - F194-

- Different versions; for differences refer to
⇒ [page 15](#)
- May only be installed once; must always be renewed if removed
- Depress clutch pedal by hand all the way when removing or installing switch.
- Removing and installing
⇒ [page 15](#)
- Engine can only be started when clutch is fully depressed (clutch pedal switch for engine start activated).

9 - Bolt

- 8 Nm + 90°
- For clutch master cylinder

10 - Retaining clip
11 - Clutch pedal
12 - Pin
13 - Retaining clip
14 - Bolt

- 25 Nm

15 - Mounting bracket for pedal cluster

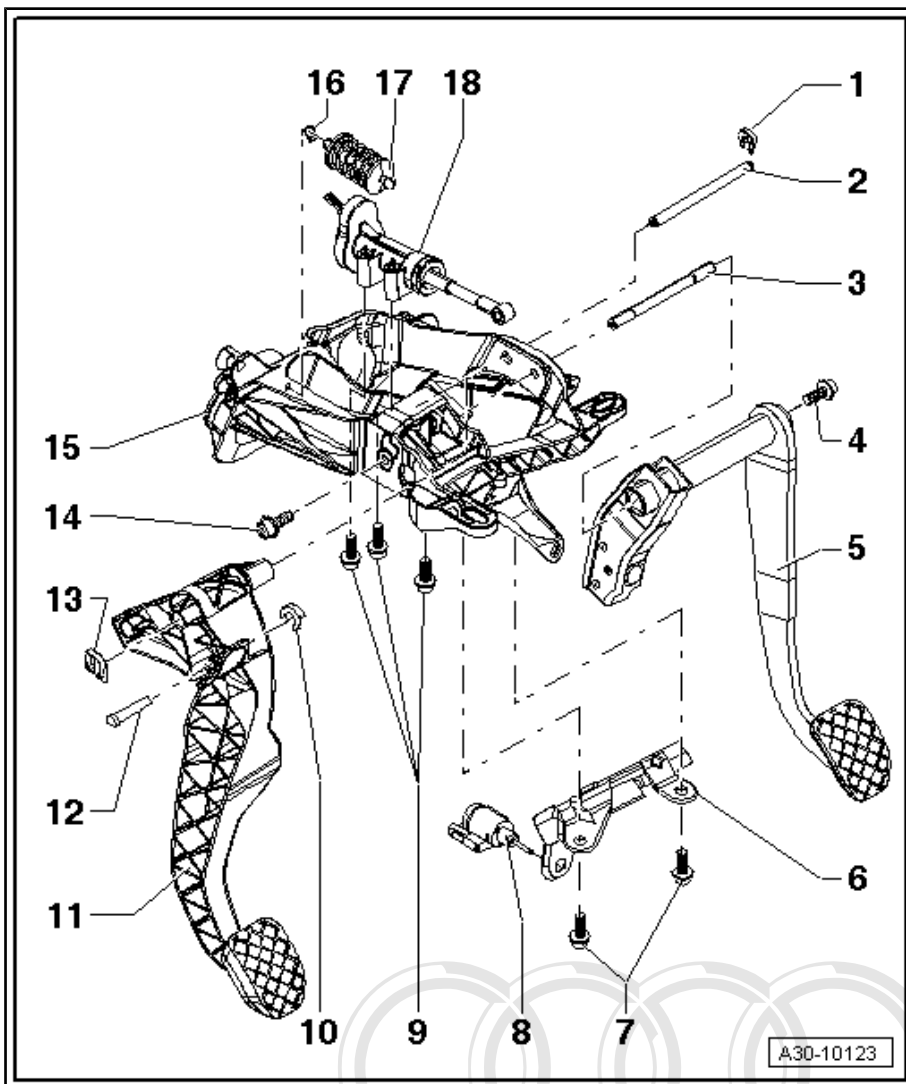
- Removing and installing ⇒ Brake system; Rep. gr. 46

16 - Bearing

- For over-centre spring

17 - Over-centre spring

- When installing please note: white spring mounting goes to pedal bracket, black spring mounting goes to clutch pedal

18 - Clutch master cylinder


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1.6 Exploded view - hydraulic system



Note

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

1 - Bleeder screw

- ☐ Tighten to 4.5 Nm
- ☐ Follow correct procedure when bleeding
⇒ [page 24](#)
- ☐ If bleeder screw has broken off, it can be removed with 3 mm Allen key

2 - Dust cap

3 - Retaining clip

4 - Grommet

5 - Pipe/hose assembly

- ☐ Between clutch master cylinder and clutch slave cylinder
- ☐ Removing and installing
⇒ [page 20](#)

6 - Securing bolt

- ☐ For brake fluid reservoir

7 - Brake fluid reservoir

8 - Screw plug

- ☐ To extract brake fluid

9 - Supply hose

- ☐ For clutch master cylinder

10 - Clutch master cylinder

- ☐ Removing and installing
⇒ [page 22](#)
- ☐ Removing and installing pipe/hose assembly
⇒ [page 20](#)

- ☐ Do not remove clip -arrow A- for pipe/hose assembly or seal -arrow B-.

11 - Pivot pin

12 - Retaining clip

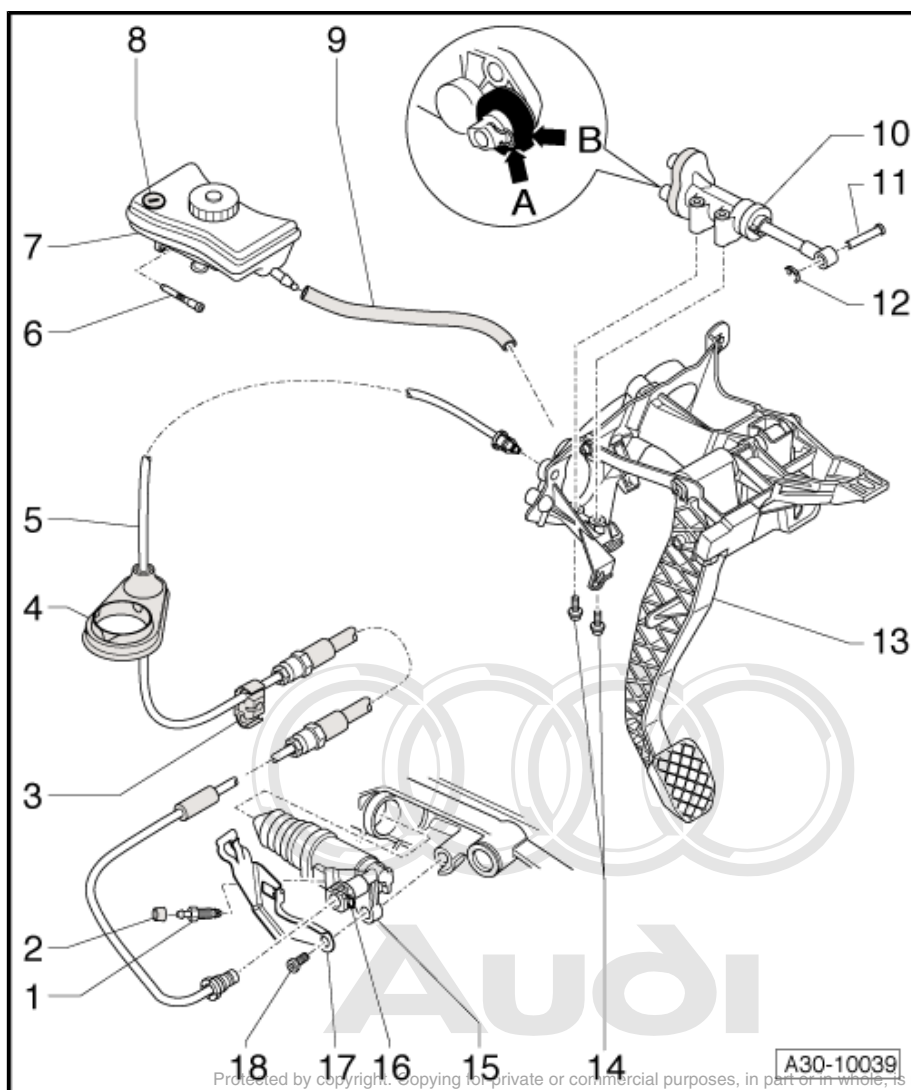
13 - Clutch pedal with mounting bracket

14 - Bolt

- ☐ 8 Nm + 90°
- ☐ For clutch master cylinder

15 - Clutch slave cylinder

- ☐ Removing and installing ⇒ [page 30](#)



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A30-10039

- ☐ Removing and installing pipe/hose assembly ⇒ [page 20](#)
- ☐ Do not operate clutch pedal after slave cylinder has been removed
- ☐ After working on hydraulic clutch mechanism, bleed clutch system ⇒ [page 24](#)

16 - Clip

- ☐ For pipe/hose assembly
- ☐ Must not be removed

17 - Bracket

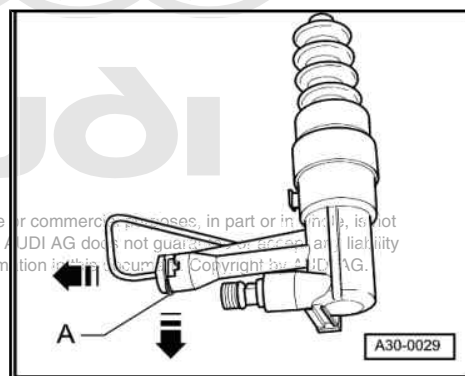
- ☐ For pipe/hose assembly
- ☐ Attached to gearbox together with slave cylinder

18 - Hexagon socket head bolt

- ☐ 25 Nm
- ☐ Self-locking
- ☐ Renew

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

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



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

- ◆ Before renewing the clutch master cylinder or slave cylinder on the assumption that it is defective, you must first carry out the appropriate function check
⇒ ["1.8 Function check for clutch master cylinder and slave cylinder", page 20](#).
- ◆ If the slave cylinder is removed from gearbox with the pipe/hose assembly still attached, make sure you do not press the clutch pedal. Otherwise, the piston will be pressed out of the slave cylinder and be destroyed.
- ◆ After installing the slave cylinder, carefully press the clutch pedal. If you feel an unusually strong point of resistance when depressing the clutch pedal, you must not press it down further. The plunger of the slave cylinder is likely to have been guided past the clutch release lever. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

1.8 Function check for clutch master cylinder and slave cylinder

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

Noises when operating the clutch:

- ◆ First check the over-centre spring / clutch pedal switch for noise.

- ◆ If you hear a noise, remove over-centre spring and repeat check.
- ◆ Renew relevant component.

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

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

Check the complete hydraulic system for leaks.

- ◆ Check brake fluid level in brake fluid reservoir.
- ◆ Check clutch master cylinder and slave cylinder as well as the pipe/hose assembly including connections for external leaks (visual inspection).
- ◆ If you identify any leaks you must renew the leaking component.
- ◆ Bleed clutch system ⇒ [page 24](#) .

High pedal force:

- ◆ Clutch plate is worn (except for SAC)
- ◆ Mechanically defective pressure plate/ clutch plate
⇒ [page 35](#)

Pedal forces:

Conventional clutch:

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

SAC clutch:

- approx. 140 N for complete service life of the clutch

Clutch does not disengage or does not disengage fully:

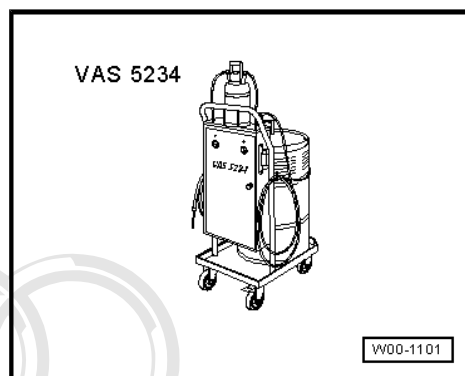
- ◆ Air in hydraulic system: bleed clutch system ⇒ [page 24](#) and check hydraulic system for external and internal leaks.
- ◆ Clutch plate does not move smoothly on input shaft splines (due to corrosion or dirt, etc.).
- ◆ Needle bearing in flywheel (centring bearing for input shaft) defective, renew needle bearing ⇒ Engine, mechanics; Rep. gr. 13 .
- ◆ Foreign body in clutch system
- ◆ Mechanically defective pressure plate/clutch plate
⇒ [page 35](#) .

- ◆ Wrong components used or components forgotten when carrying out repair work (e.g. intermediate plate).

1.9 Removing and installing clutch master cylinder

Special tools and workshop equipment required

- ◆ Brake filling and bleeding equipment - VAS 5234-



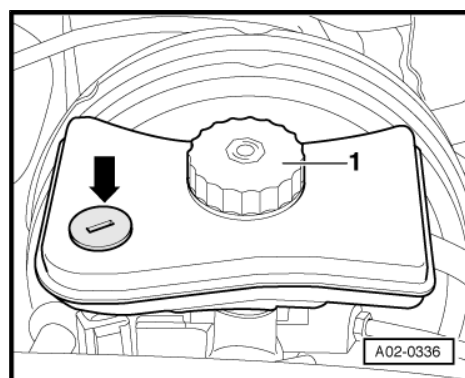
Removing



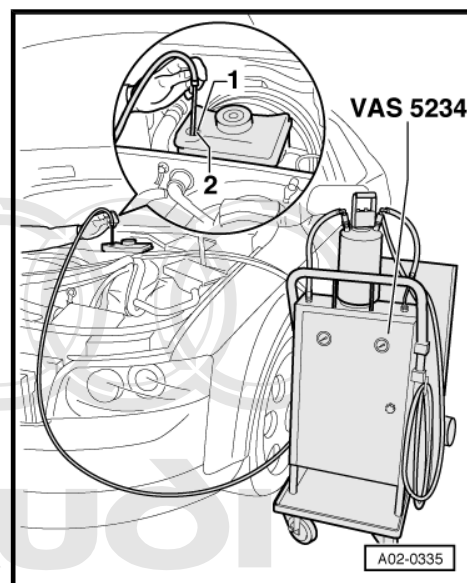
Note

- ◆ *If you suspect a defective clutch master cylinder, perform function test prior to renewing*
⇒ *"1.7 Notes on removing and installing clutch master cylinder and slave cylinder", page 20.*
- ◆ *When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.*

- Remove windscreen wiper motor ⇒ Electrical system; Rep. gr. 92 .
- Unscrew screw plug -arrow- in brake fluid reservoir.

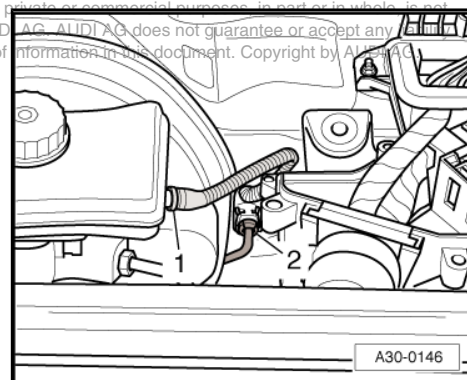


- Connect extraction hose of brake filling and bleeding equipment - VAS 5234- to tube -1- of brake fluid reservoir and extract brake fluid.
- Repeat procedure at tube -2- of brake fluid reservoir.
- Fit screw plug back in brake fluid reservoir.



- Place cloth under connection point.
- Detach hose -1- from brake fluid reservoir and seal opening.
- Release retaining clip -2- using a screwdriver and pull out to limit stop.
- Detach pipe/hose assembly from clutch master cylinder.
- Remove storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .
- Remove over-centre spring ⇒ [page 14](#) .

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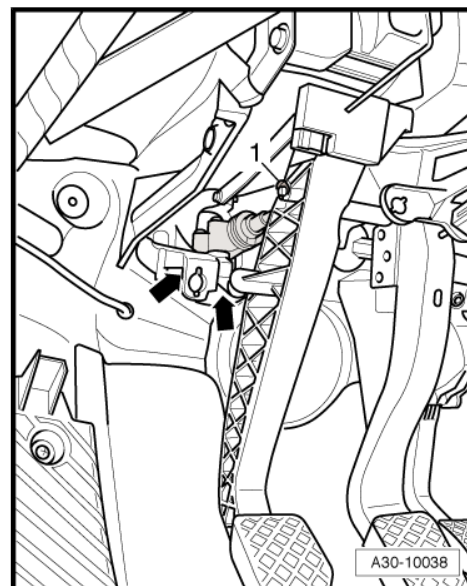


- Detach retaining clip -1- from pin.
- Press pin out of clutch pedal
- Unscrew bolts -arrows- and remove clutch master cylinder.

Installing

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

- Press in retaining clip on clutch master cylinder until limit stop.
- Push pipe/hose assembly onto connection on clutch master cylinder so that retainer clip snaps into place.
- Pull pipe/hose assembly to check that it is securely seated.
- Install over-centre spring ⇒ [page 14](#) .
- Install storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .
- Install windscreen wiper motor and mount wiper arms ⇒ Electrical system; Rep. gr. 92 .
- Bleed clutch system ⇒ [page 24](#) .



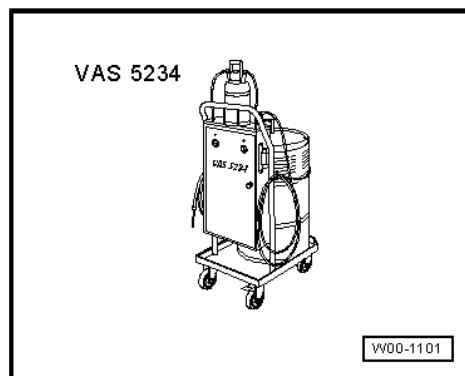
Tightening torque

Component	Nm
Clutch master cylinder to pedal bracket	20

1.10 Bleeding clutch system

Special tools and workshop equipment required

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



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

Procedure

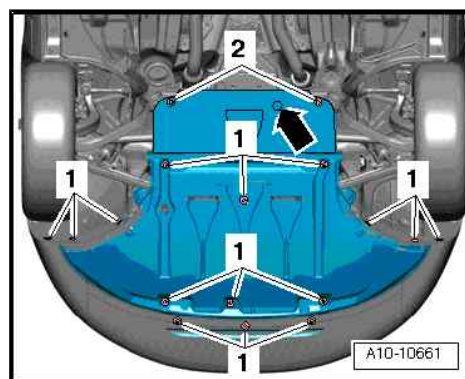
Note

- ◆ *The clutch system must be bled after performing work on the hydraulic clutch mechanism.*
- ◆ *Before bleeding the clutch system, pull back the clutch pedal to the normal position and top up brake fluid to "Max" marking on brake fluid reservoir.*
- ◆ *Do not allow brake fluid to come into contact with the gearbox. If necessary, clean the gearbox housing.*
- ◆ *Open the bleeder screw before switching on the bleeding appliance.*
- ◆ *The clutch system should be bled at the same intervals as the brake system ⇒ Maintenance ; Booklet 45 .*

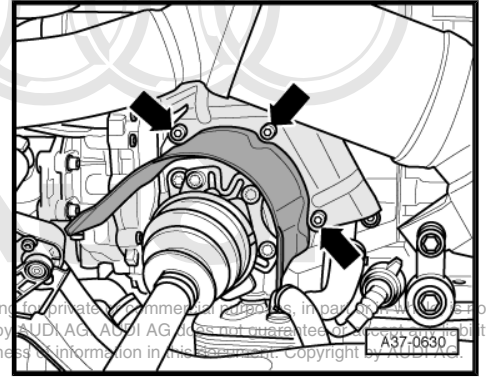
- Connect brake filling and bleeding equipment - V.A.G 1869- or -VAS 5234- , but do not switch on at this stage ⇒ Brake system; Rep. gr. 47 ; Bleeding brake system .
- Release fasteners marked -1-, -2- and -arrow- (if fitted) and remove noise insulation panels.
- Remove front left wheel.

Note

Secure brake disc with one wheel bolt.



- Unbolt heat shield -arrows- for drive shaft (left-side).



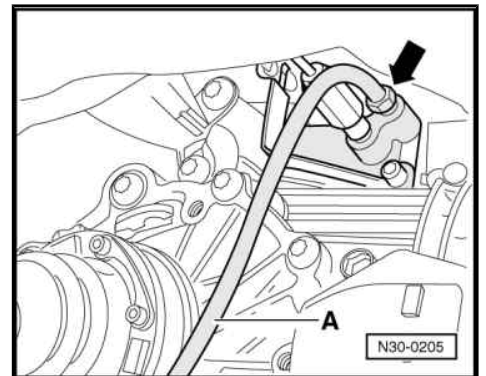
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- Connect bleeder hose -A- to slave cylinder -arrow- and open bleeder screw.
- Connect bleeder hose to pressure hose of fluid collector bottle.
- Switch on bleeding appliance and allow about 100 cm³ of brake fluid to drain out.
- Operating pressure 2.0 bar



Note

Ensure bleeder hose is correctly fitted during bleeding operation.



- Close bleeder screw.
- Depress clutch pedal several times after bleeding process is completed.
- Repeat bleeding procedure if necessary.
- Disconnect bleeder hose and fit protective cap.
- Bolt heat shield for drive shaft onto gearbox.
- Install noise insulation below gearbox.

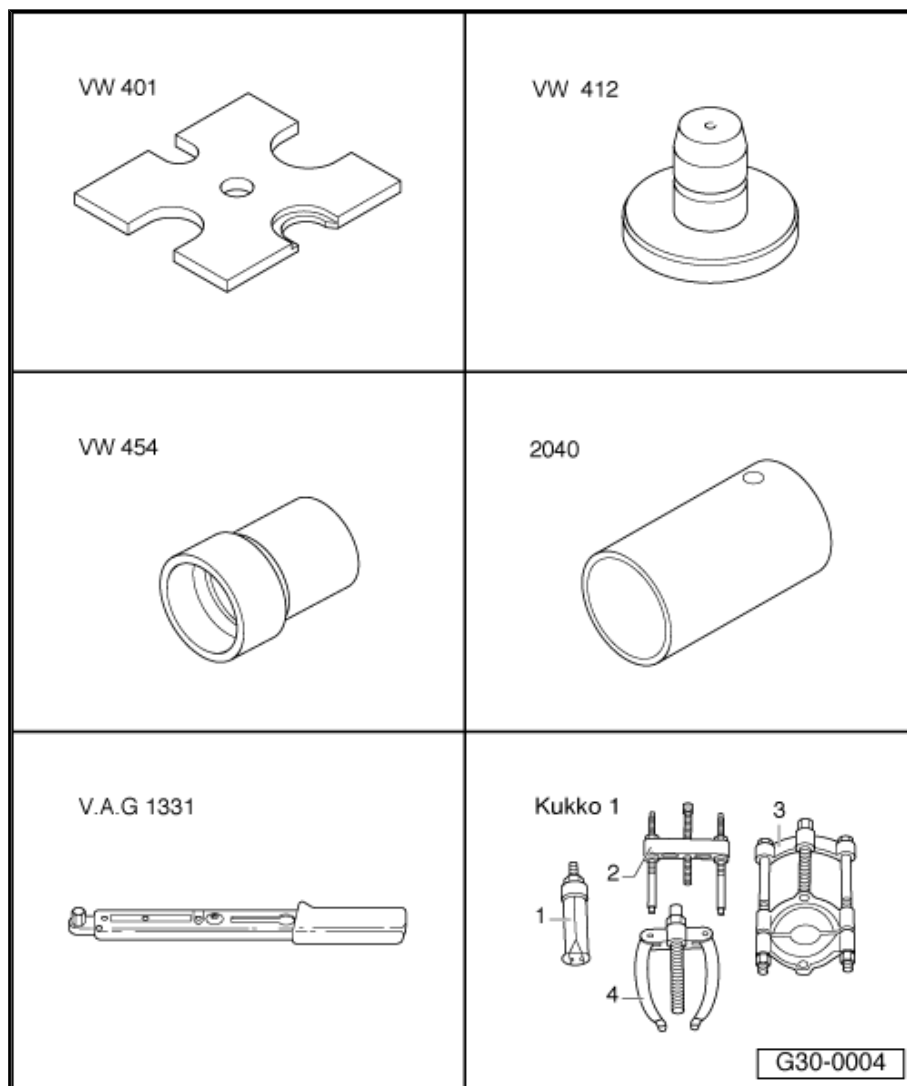
Tightening torques

Component	Nm
Bleeder screw	4.5
Heat shield for drive shaft to gearbox	23

2 Servicing clutch release mechanism

Special tools and workshop equipment required

- ◆ Thrust plate - VW 401-
- ◆ Press tool - VW 412-
- ◆ Press tool - VW 454-
- ◆ Tube - 2040-
- ◆ Torque wrench - V.A.G 1331-
- ◆ -1- Internal puller - Kukko 21/4-
- ◆ -4- Counter-support - Kukko 22/1-
- ◆ Locking fluid - AMV 185 101 A1-
- ◆ Sealing grease - G 052 128 A1-
- ◆ Copper grease (commercially available)
- ◆ Adhesive - AMV 195 KD1 01-
- ◆ Grease for clutch plate splines - G 000 100-



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1 - Release bearing

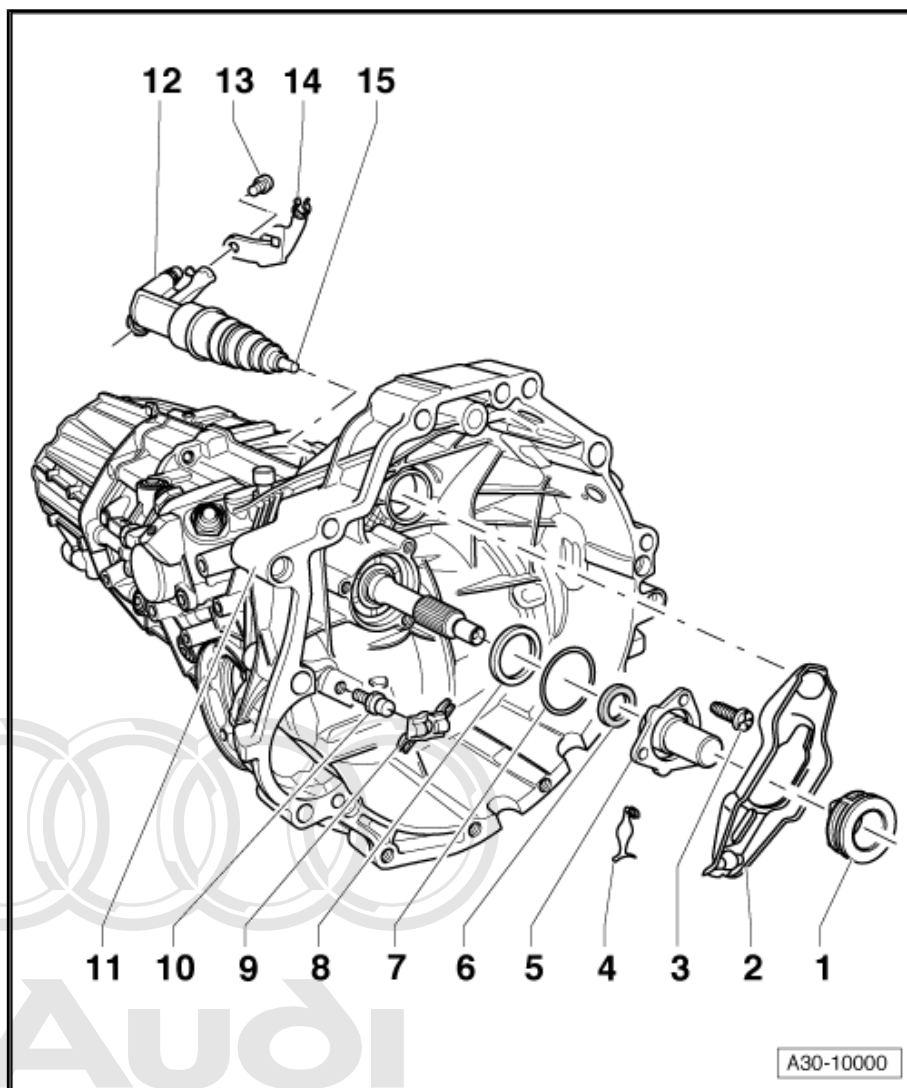
- ☐ Different versions
- ☐ Do not wash out; wipe clean only
- ☐ Renew bearing if noisy
- ☐ Surface on which release bearing moves on guide sleeve must be free of grease
- ☐ Grease bearing surface for clutch release lever thoroughly with lubricating paste - G 000 150-
⇒ [page 29](#) .
- ☐ Checking release bearing ⇒ [page 29](#)
- ☐ Retainer lugs on release bearing must engage in release lever

Release bearing with mechanically attached plastic ring

- Checking release bearing with mechanically attached plastic ring ⇒ [page 29](#)
- Renew if groove worn on plastic ring is too deep
⇒ [page 29](#)

Release bearing with glued plastic ring

- Servicing release bearing with glued plastic ring
⇒ [page 29](#)
- Renew if groove worn on plastic ring is too deep (deeper than 0.8 mm)



2 - Clutch release lever

- ☐ Before installing, lubricate area which makes contact with plunger of slave cylinder with copper grease (commercially available).

3 - TORX bolt

- ☐ 35 Nm
- ☐ 3x
- ☐ Apply locking fluid - AMV 185 101 A1- when fitting

4 - Retaining spring

- ☐ Secure to clutch release lever

5 - Guide sleeve

- ☐ Installation position: Oil drain hole points downwards
- ☐ Before removing and installing, cover input shaft splines with a shrink-fit hose to protect oil seal

6 - Oil seal

- ☐ For input shaft
- ☐ Pull out of guide sleeve ⇒ [Item 5 \(page 27\)](#) ⇒ [page 28](#) .
- ☐ Press into guide sleeve ⇒ [Item 5 \(page 27\)](#) ⇒ [page 29](#) .
- ☐ Pack space between sealing lip and dust lip half full with sealing grease - G 052 128 A1-

7 - O-ring

- ☐ Always renew

8 - Dished spring

- ☐ Inner diameter (convex side) faces guide sleeve ⇒ [Item 5 \(page 27\)](#)

9 - Intermediate piece

- ☐ Installation position: insert locating element between ribs of housing

10 - Ball-head pin

- ☐ Lubricate with grease for clutch plate splines - G 000 100-

11 - Gearbox**12 - Clutch slave cylinder**

- ☐ Removing and installing ⇒ [page 30](#)
- ☐ Do not operate clutch pedal after slave cylinder has been removed
- ☐ Grease lightly before installing ⇒ [page 32](#)
- ☐ Follow correct procedure when bleeding ⇒ [page 24](#)
- ☐ Tighten bleeder screw to 4.5 Nm
- ☐ When installing push in until the securing bolt can be fitted

13 - Hexagon socket head bolt

- ☐ 23 Nm
- ☐ Self-locking
- ☐ Renew

14 - Bracket

- ☐ For pipe/hose assembly
- ☐ Bolt to gearbox with clutch slave cylinder
- ☐ Not fitted on all versions

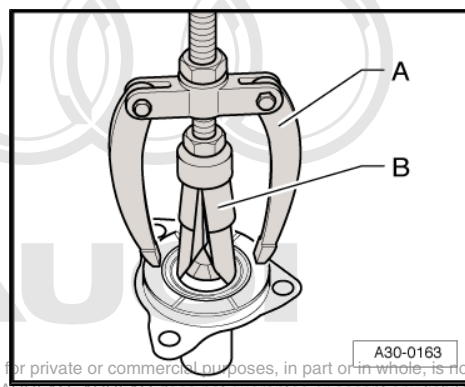
15 - Plunger

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

Pulling oil seal out of guide sleeve

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

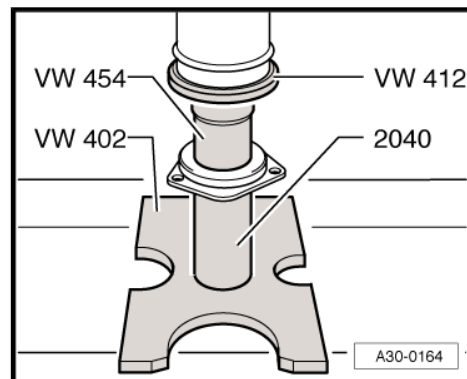
B - Internal puller 23.5 ... 30 mm , e.g. -Kukko 21/4-



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Pressing oil seal into guide sleeve (press in onto stop)

- The open side of the oil seal faces towards press tool - VW 454- .
- Pack space between sealing lip and dust lip half-full with sealing grease - G 052 128 A1- .



2.1 Checking release bearing

Checking and servicing release bearing with glued plastic ring

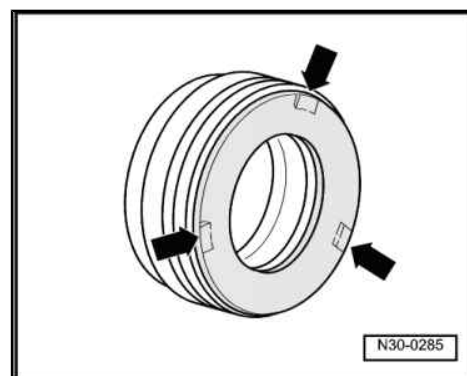
Identification: inner side of plastic ring has three lugs -arrows-.

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

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

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

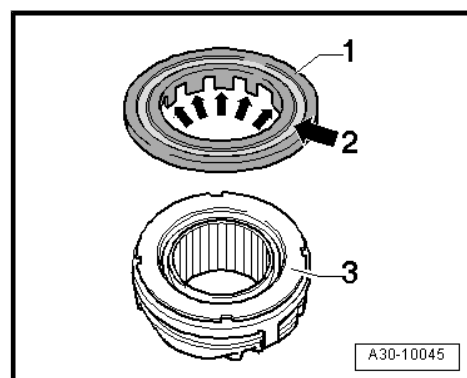
- ♦ The release bearing must be renewed if the groove worn on the plastic ring is deeper than 0.8 mm.



Checking release bearing with mechanically attached plastic ring

Identification: retaining tabs around plastic ring -arrows-.

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



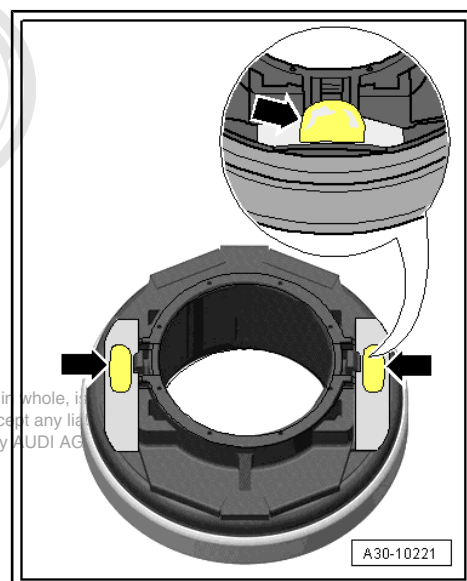
Greasing release bearing



Caution

Grating/creaking noises can occur when clutch is operated.

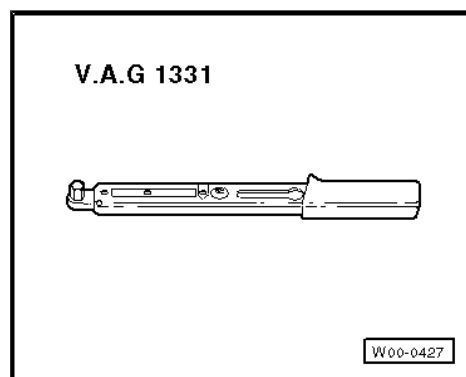
- *Lack of grease at the bearings -arrows- on the release bearing assembly can cause creaking/grating noises when the clutch is operated.*
- *Grease bearings -arrows- on release bearing assembly thoroughly with lubricating paste - G 000 150- . A thin coating of grease is not sufficient.*
- *Remove grease in bearing surface for guide sleeve: bearing of release bearing on guide sleeve must be free of grease.*



2.2 Removing and installing clutch slave cylinder

Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-



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

Removing



Note

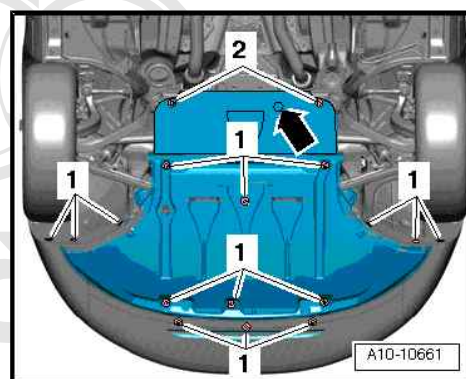
- ◆ If you suspect a defective clutch slave cylinder, perform function test prior to renewing
⇒ ["1.7 Notes on removing and installing clutch master cylinder and slave cylinder", page 20](#).
- ◆ Do not allow brake fluid to come into contact with the gearbox. If necessary, clean the gearbox housing.



Caution

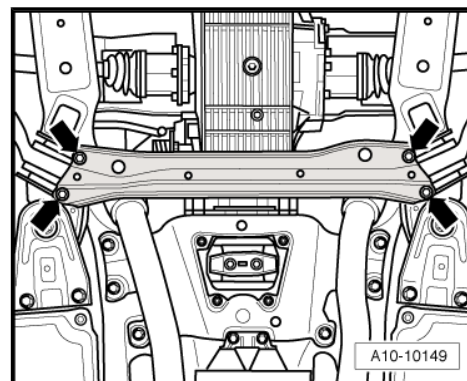
Make sure you do not press the clutch pedal if the clutch slave cylinder is removed from the gearbox with the pipe/hose assembly still attached. Otherwise, the piston will be pressed out of the slave cylinder and be destroyed.

- Release fasteners marked -1-, -2- and -arrow- (if fitted) and remove noise insulation panels.

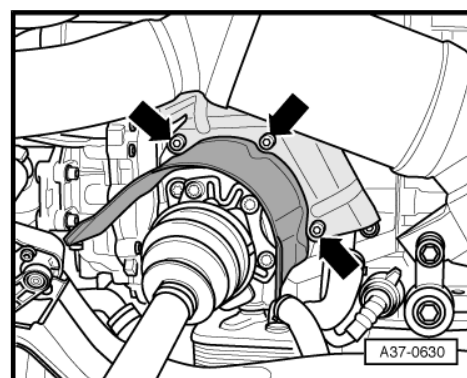


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- Unscrew cross member from subframe -arrows-.



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

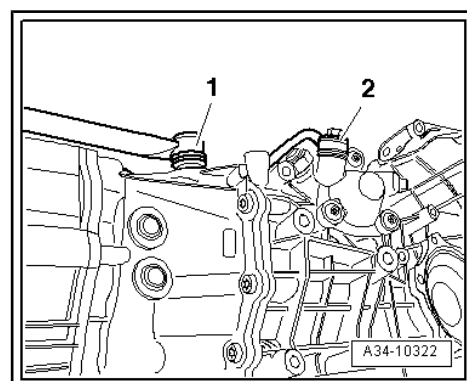


- Unscrew connecting rod -2- for selector rod.

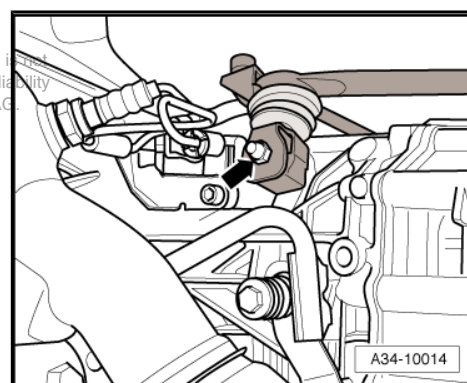


Note

-Item 1- can be disregarded.



- Unscrew nut -arrow- and detach gearbox selector lever from selector shaft.



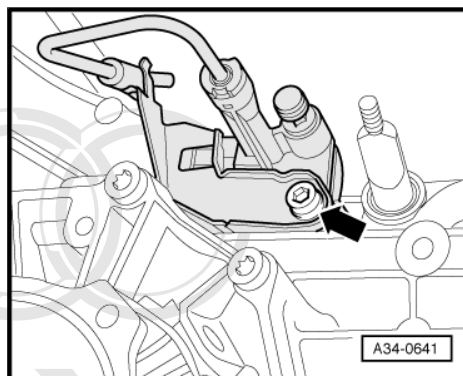
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- Remove bolt -arrow- and take out clutch slave cylinder from the rear.



Caution

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



- Release retaining clip -A- using a screwdriver and pull out as far as stop.
- Detach pipe/hose assembly from clutch slave cylinder and seal opening.

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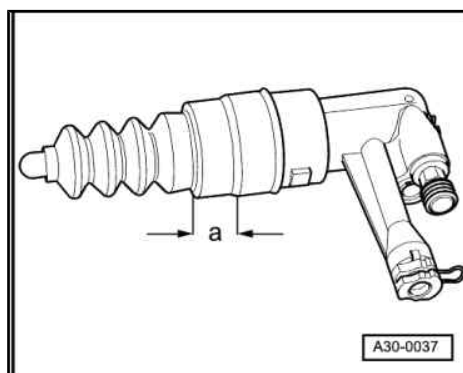
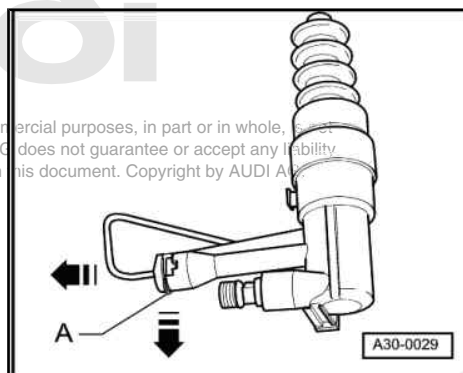
Installing

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

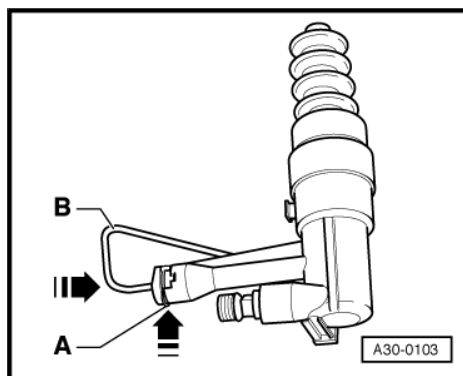


Note

- ◆ Renew securing bolt.
- ◆ When installing, press in slave cylinder so that securing bolt can be fitted easily.
- Before inserting clutch slave cylinder in gearbox housing, lubricate area -a- of rubber sleeve with lithium grease - G 052 150 A2- .



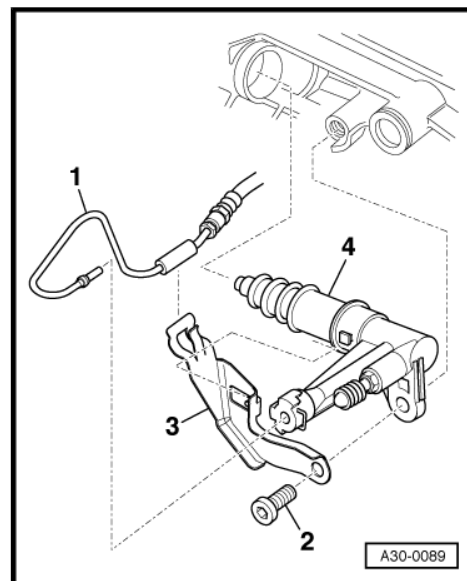
- Using copper grease (commercially available), lightly lubricate surface where plunger and clutch release lever make contact.
- Press retaining clip -A- in clutch slave cylinder onto limit stop.
- Push pipe/hose assembly -B- onto connection on clutch slave cylinder so that retaining clip snaps into place.
- Pull pipe/hose assembly to check that it is securely seated.



- Engage bracket for hose/pipe assembly -3- at slave cylinder -4-.

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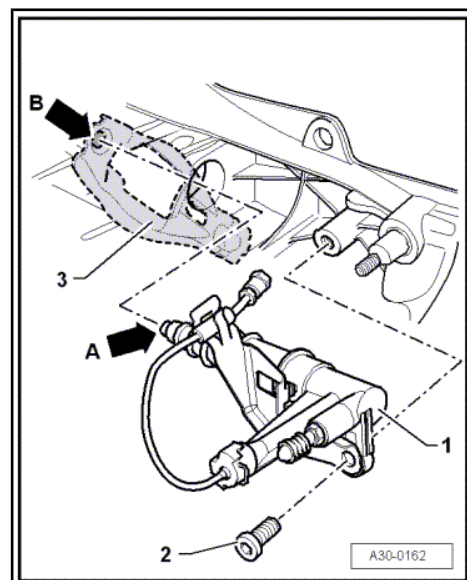


- Guide slave cylinder -1- into mounting hole in gearbox housing, keeping it as far as possible in line with the operating direction of the plunger -arrow A-.
- At the same time insert in recess -arrow B- on clutch release lever -3-.
- Secure slave cylinder -1- with new bolt -2-. Tightening torque [⇒ Item 13 \(page 28\)](#)



Note

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



Caution

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

The remaining installation steps are carried out in the reverse sequence; note the following points:

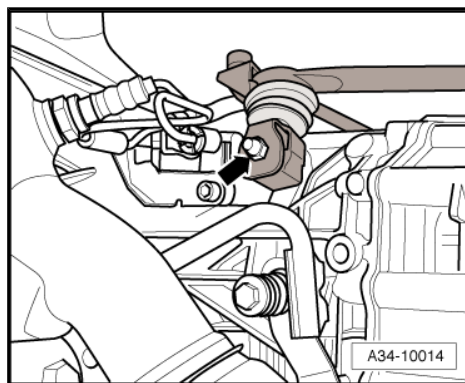
- If the pipe-hose assembly was disconnected at the slave cylinder, the clutch system has to be bled after installing slave cylinder [⇒ page 24](#).



- Install gearbox selector lever and tighten nut -arrow-.

Tightening torques

Component	Nm
Gearbox selector lever to selector shaft	23
Connecting rod to gearbox	23
Heat shield for drive shaft to gearbox	23



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3 Servicing clutch

- ◆ ⇒ [“3.1 Exploded view - servicing conventional clutch”, page 35](#)
- ◆ ⇒ [“3.2 Removing and installing conventional clutch”, page 38](#)
- ◆ ⇒ [“3.3 Exploded view - servicing clutch with SAC pressure plate \(LuK version\)”, page 39](#)
- ◆ ⇒ [“3.4 Removing and installing clutch with SAC pressure plate”, page 41](#)
- ◆ ⇒ [“3.5 Resetting adjuster ring in SAC clutch pressure plate”, page 43](#)

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Note

- ◆ Refer to general repair instructions ⇒ [page 7](#).
- ◆ Observe the notes on removing and installing the clutch master cylinder and slave cylinder ⇒ [page 20](#).
- ◆ “SAC” stands for “Self-Adjusting Clutch”.
- ◆ On vehicles with SAC pressure plate (self-adjusting clutch) an adjuster ring has to be reset when only the clutch plate is renewed ⇒ [page 43](#).
- ◆ To avoid damaging SAC pressure plate when removing and installing, observe assembly instructions for SAC pressure plate ⇒ [page 41](#).
- ◆ Check that SAC pressure plate is not distorted ⇒ [page 41](#).
- ◆ Renew clutch plate and pressure plate if riveted fastening is damaged or loose.
- ◆ Select the correct clutch plate and pressure plate according to engine code ⇒ Electronic parts catalogue.
- ◆ To avoid damaging dual-mass flywheel during removal, please observe instructions for removal ⇒ [page 41](#).
- ◆ Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease for clutch plate splines - G 000 100- to the splines. Then move clutch plate backwards and forwards on input shaft until hub moves freely on shaft. It is important to remove excess grease.
- ◆ Pressure plates have an anti-corrosion coating and are greased. Only the contact surface may be cleaned, otherwise the service life of the clutch will be considerably reduced.
- ◆ The friction surface of the pressure plate and the dual-mass flywheel must be cleaned (degreased) thoroughly.
- ◆ Only blow out dual-mass flywheel with compressed air.
- ◆ If the clutch has burnt out, thoroughly clean the gearbox housing in area of clutch and parts of the engine facing the gearbox in order to prevent odours.

3.1 Exploded view - servicing conventional clutch

- Observe notes ⇒ [“3 Servicing clutch”, page 35](#).

- The gearbox has to be removed before working on the clutch
⇒ [page 35](#) .

1 - Flywheel/dual mass fly-wheel

- ❑ Ensure that dowel pins fit tightly
- ❑ Contact surface for clutch lining must be free of grooves, oil and grease
- ❑ Removing and installing ⇒ Rep. gr. 13
- ❑ Do not use a pneumatic wrench or impact wrench to remove dual-mass flywheel
⇒ [page 38](#)

2 - Bolt

- ❑ For flywheel
- ❑ Tightening torque for bolt length 22.5 mm: 60 Nm + 90° further
- ❑ Tightening torque for bolt length 43 mm: 60 Nm + 180° further
- ❑ Renewing ⇒ Rep. gr. 13

3 - Clutch plate

- ❑ Installation position: Clutch lining must make full contact with flywheel
- ❑ The marking "Getriebeseite" (gear-box side), if provided, faces towards pressure plate/gearbox
- ❑ Coil springs (damper assembly) point towards pressure plate and gearbox
- ❑ Centralising ⇒ [page 39](#)
- ❑ Lightly grease splines ⇒ [page 35](#)
- ❑ For diameter of clutch plate, refer to ⇒ Electronic parts catalogue

4 - Pressure plate

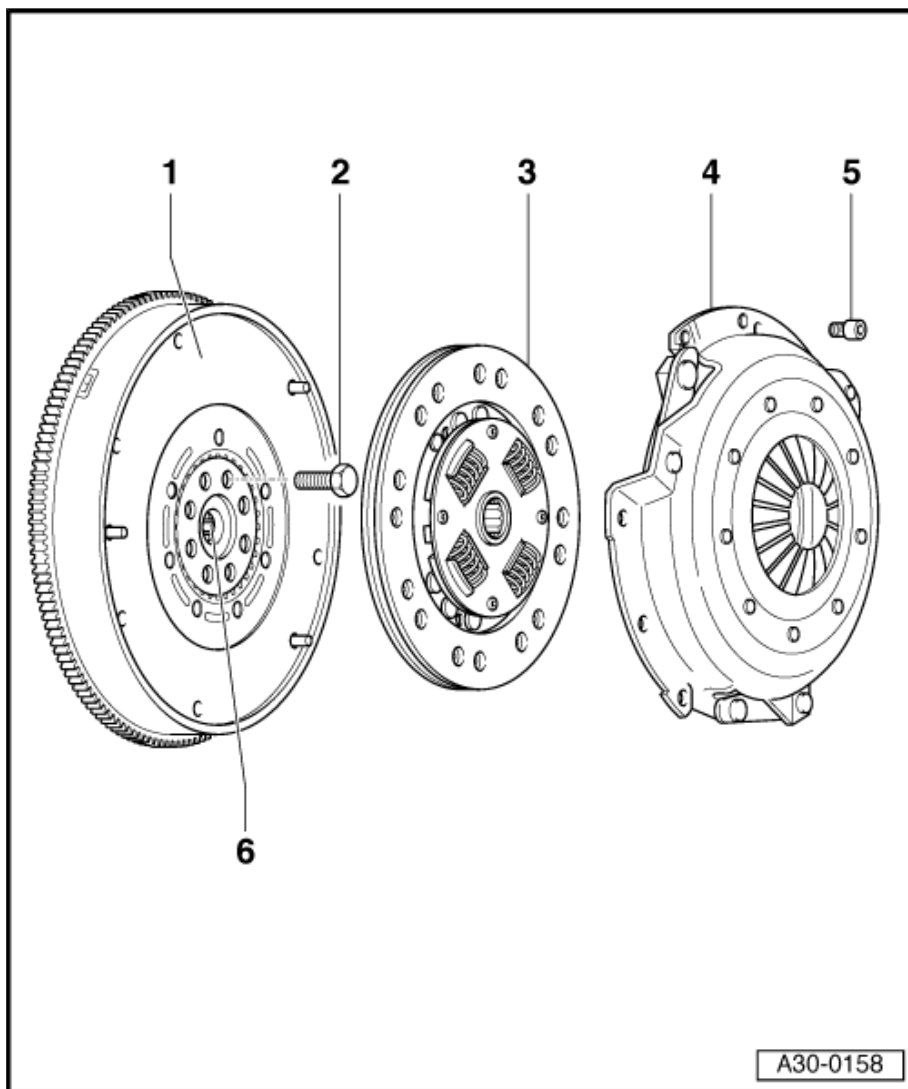
- ❑ Removing and installing ⇒ [page 38](#)
- ❑ Checking ends of diaphragm spring ⇒ [page 37](#)
- ❑ Checking springs and riveting ⇒ [page 37](#)
- ❑ Checking wire ring ⇒ [page 37](#)
- ❑ Contact surface for clutch lining must be free of grooves, oil and grease

5 - Bolt

- ❑ 22 Nm
- ❑ Loosening and tightening ⇒ [page 38](#)

6 - Needle bearing

- ❑ Removing and installing ⇒ Rep. gr. 13



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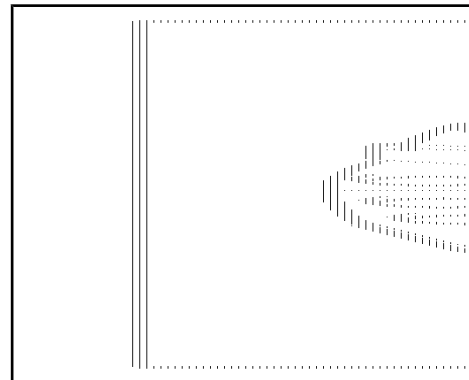
Checking ends of diaphragm spring

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



Note

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



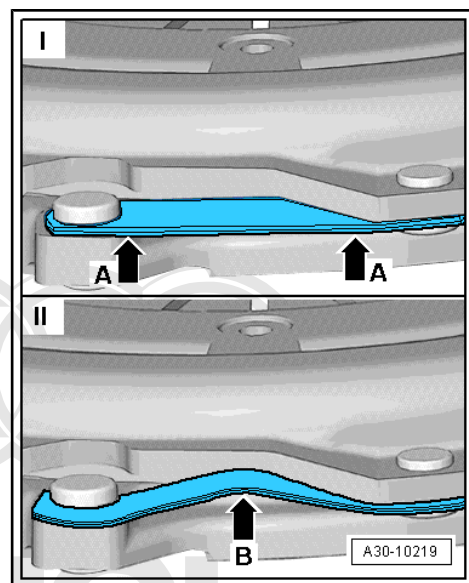
Checking springs and riveting

I - Springs OK

- Slight kinking on the outside -arrows A- is normal on production parts.

II - Springs damaged

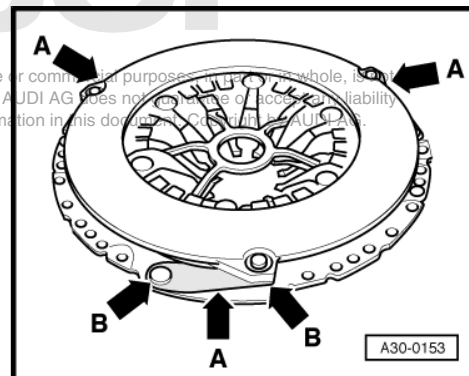
- Renew pressure plate if springs are broken or badly bent -arrow B-.



- Check that riveting -arrows B- is secure at all springs -arrows A-.

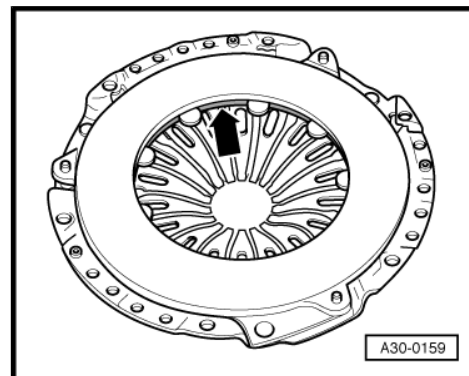
- Renew pressure plate if rivets -arrows B- are loose

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Checking wire ring

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



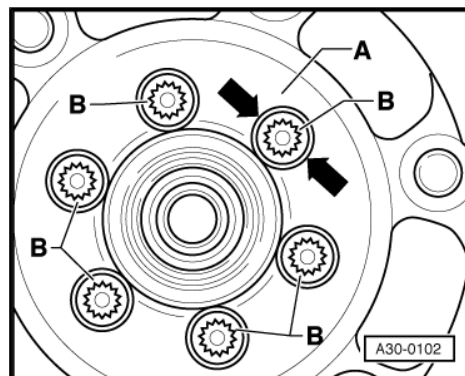
Removing dual-mass flywheel



Caution

Do not use an impact wrench or pneumatic wrench to remove bolts -B-: this would severely damage the dual-mass flywheel. Bolts -B- must always be removed by hand.

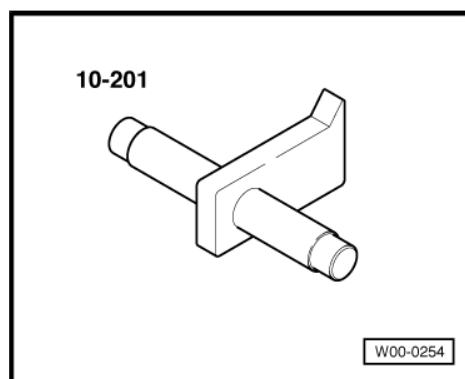
- Rotate dual-mass flywheel -A- so that the bolts are aligned centrally behind the holes -arrows-.
- When removing the bolts, make sure that none of the bolt heads contacts the dual-mass flywheel, as this would damage the flywheel when the bolts are unscrewed further.
- Removing and installing dual-mass flywheel ⇒ Rep. gr. 13 .



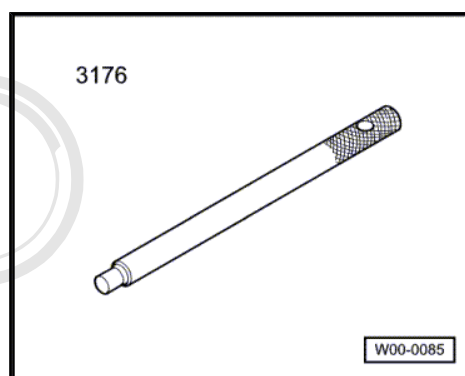
3.2 Removing and installing conventional clutch

Special tools and workshop equipment required

- ◆ Counterhold tool - 10-201-



- ◆ Centring mandrel - 3176-



- ◆ Grease for clutch plate splines - G 000 100-

Removing

- Apply counterhold tool - 10-201- or -3067- in order to loosen bolts.

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

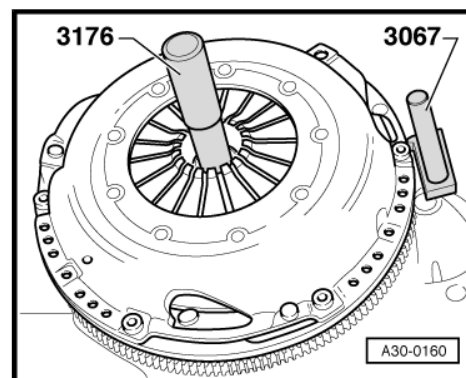
- Loosen all bolts consecutively in clockwise direction and in steps of 90° (1/4 turn) until the pressure plate is released.

Installing

- Apply counterhold tool - 3067- or -10-201- in order to tighten bolts.
- Installation position of clutch plate: coil springs (damper assembly) or marking "Getriebeseite" point towards pressure plate and gearbox.
- Use centring mandrel - 3176- to centralise clutch plate.

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

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



3.3 Exploded view - servicing clutch with SAC pressure plate (LuK version)

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1 - Dual-mass flywheel

- ☐ Ensure that dowel pins fit tightly
- ☐ Contact surface for clutch lining must be free of grooves, oil and grease
- ☐ Observe instructions for removal ⇒ [page 41](#)
- ☐ Removing and installing ⇒ Rep. gr. 13

2 - Needle bearing

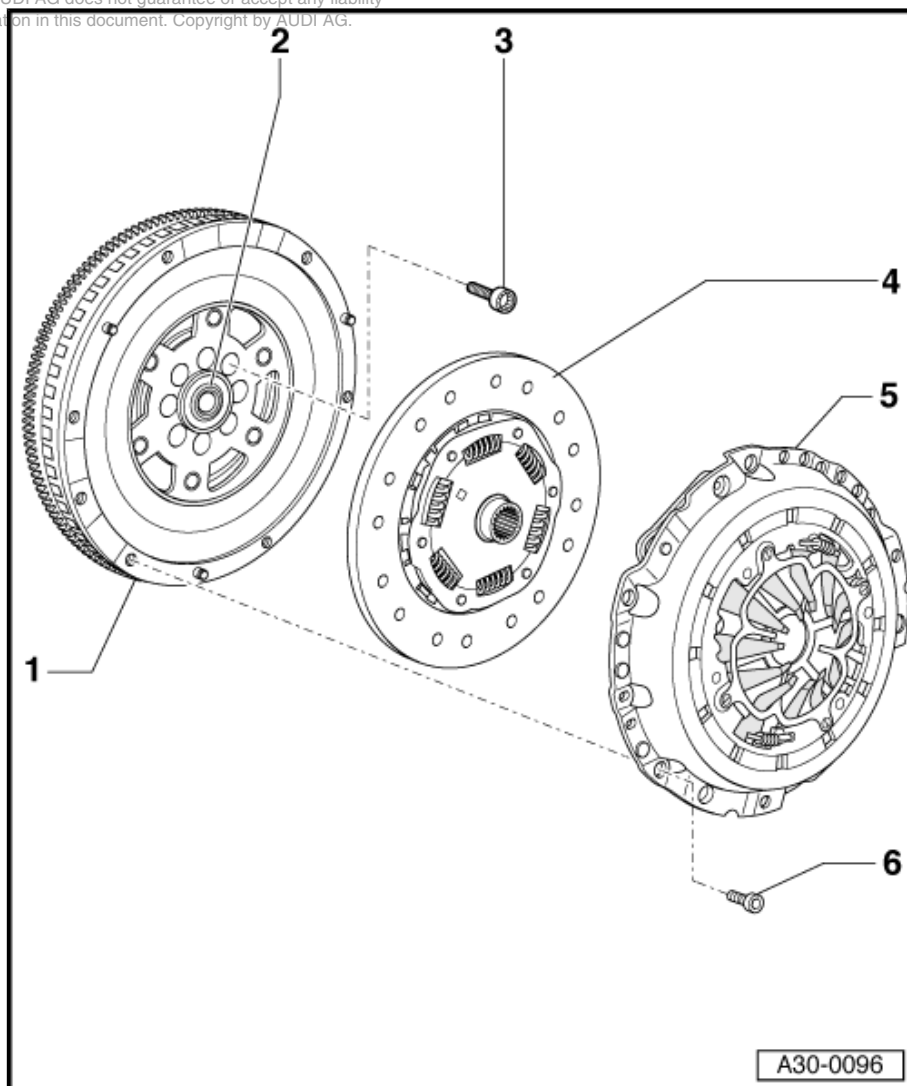
- ☐ Removing and installing ⇒ Rep. gr. 13

3 - Bolt

- ☐ For flywheel
- ☐ Renew
- ☐ Tightening torque for bolt length 22.5 mm: 60 Nm + 90° further
- ☐ Tightening torque for bolt length 43 mm: 60 Nm + 180° further
- ☐ Observe instructions for removal ⇒ [page 41](#)

4 - Clutch plate

- ☐ For correct version, refer to ⇒ Electronic parts catalogue
- ☐ Installation position: Clutch lining must make full contact with flywheel
- ☐ The marking



“Getriebeseite” (gear-box side), if provided, faces towards pressure plate/gearbox

- ☐ Coil springs (damper assembly) point towards pressure plate and gearbox
- ☐ Centralising ⇒ [page 42](#)
- ☐ Lightly grease splines ⇒ [page 35](#)

5 - SAC pressure plate

- ☐ For correct version, refer to ⇒ Electronic parts catalogue
- ☐ Observe assembly instructions ⇒ [page 41](#) when removing and installing
- ☐ Resetting adjuster ring ⇒ [page 43](#)
- ☐ Checking ends of diaphragm spring ⇒ [page 40](#)
- ☐ Checking pressure plate for distortion ⇒ [page 41](#)
- ☐ Checking springs and riveting ⇒ [page 40](#)
- ☐ Contact surface for clutch lining must be free of grooves, oil and grease

6 - Bolt

- ☐ 22 Nm
- ☐ Observe instructions for installation ⇒ [page 41](#)

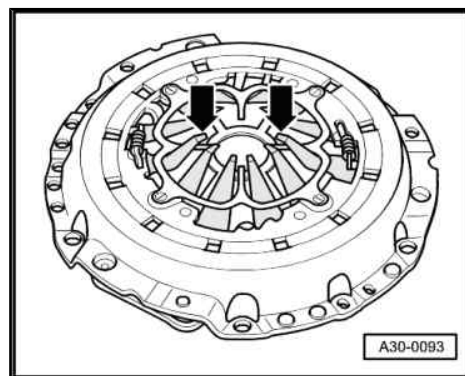
Checking ends of diaphragm spring

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



Note

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



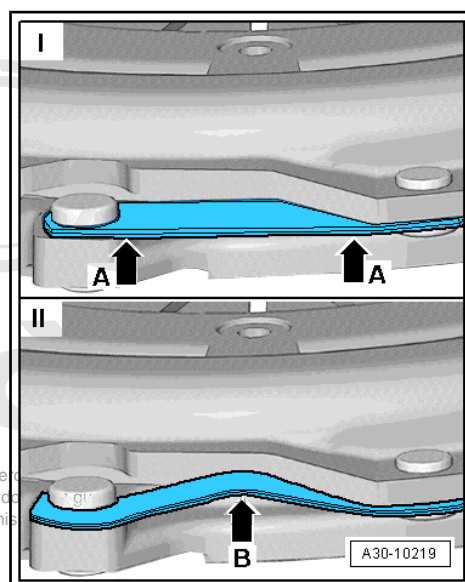
Checking springs and riveting

I - Springs OK

- Slight kinking on the outside -arrows A- is normal on production parts.

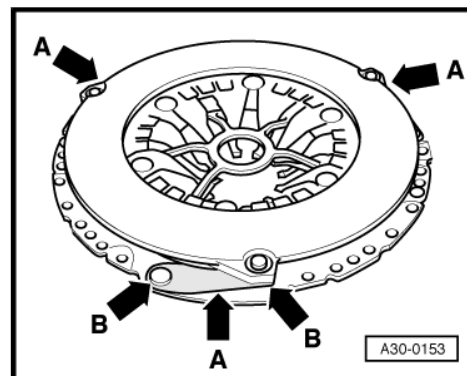
II - Springs damaged

- Renew pressure plate if springs are broken or badly bent -arrow B-.



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- Check that riveting -arrows B- is secure at all springs -arrows A-.
- Renew pressure plate if rivets -arrows B- are loose.

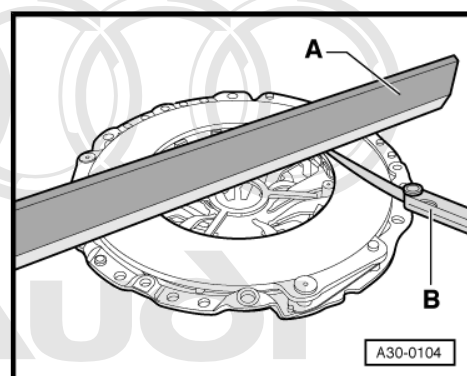


Checking SAC pressure plate for distortion, cracks and burning

A - Straightedge

B - Feeler gauge

- Pressure plate distortion up to 0.8 mm is permissible.



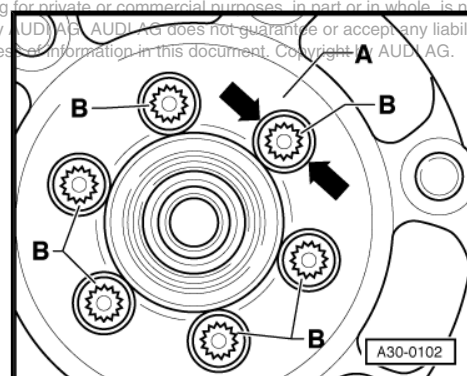
Removing dual-mass flywheel



Caution

Do not use an impact wrench or pneumatic wrench to remove bolts -B-: this would severely damage the dual-mass flywheel. Bolts -B- must always be removed by hand.

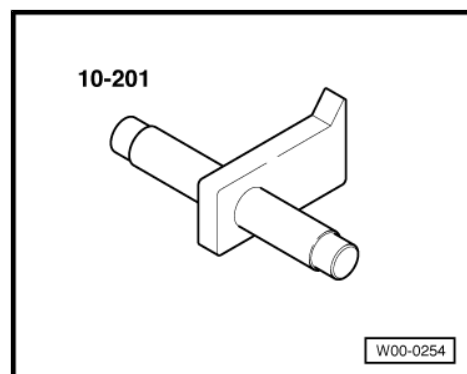
- Rotate dual-mass flywheel -A- so that the bolts are aligned centrally behind the holes -arrows-.
- When unscrewing bolts -B-, make sure the bolt heads do not contact the dual-mass flywheel -arrows- because this would damage the flywheel when the bolts are turned further.
- Removing and installing dual-mass flywheel ⇒ Rep. gr. 13 .



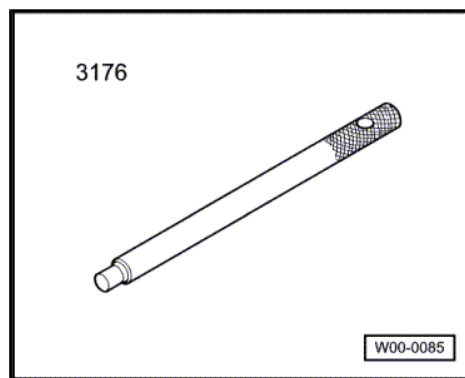
3.4 Removing and installing clutch with SAC pressure plate

Special tools and workshop equipment required

- ◆ Counterhold tool - 10-201-



◆ Centring mandrel - 3176-



◆ Grease for clutch plate splines - G 000 100-

Removing

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

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

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

Installing



Note

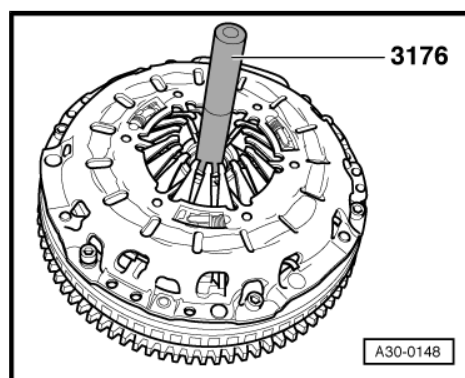
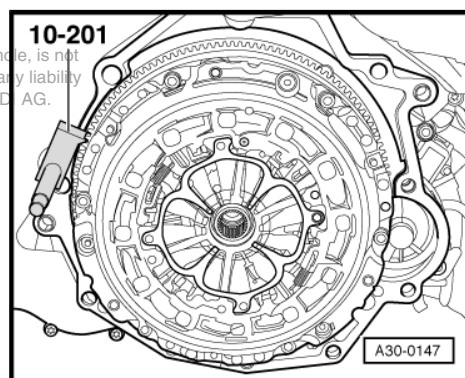
- ◆ Before you re-install the SAC pressure plate check that it is not distorted ⇒ [page 41](#).
- ◆ When only the clutch plate is renewed, the adjuster ring in the SAC pressure plate has to be reset before assembly ⇒ [page 43](#).

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

- Use centring mandrel - 3176- to centralise clutch plate.
- Re-position counterhold tool - 10-201- to tighten bolts.

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

- Position pressure plate on centring pins.
- Screw in all 6 bolts evenly by hand until bolt heads make contact with pressure plate.
- Tighten all six bolts consecutively in clockwise direction and in steps of 90° (1/4 turn) until the housing makes contact with flywheel.
- Tighten all 6 bolts to final torque (22 Nm) consecutively in clockwise direction.



3.5 Resetting adjuster ring in SAC clutch pressure plate

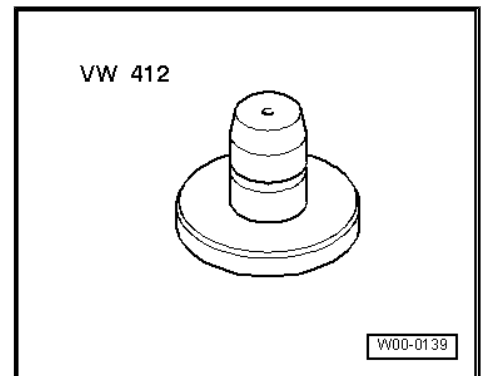


Note

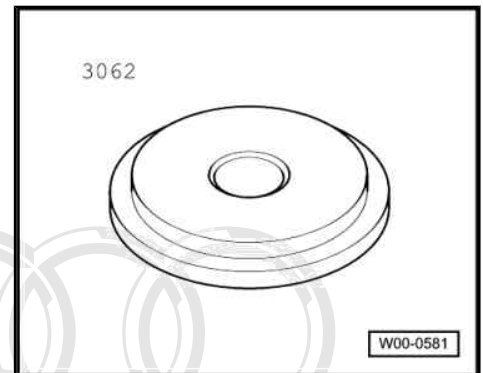
- ◆ *When fitting a new clutch plate in conjunction with a used SAC pressure plate, the adjuster ring in the pressure plate has to be reset by turning it back as far as it will go. If you do not reset the adjuster ring in the pressure plate, the SAC pressure plate will operate with reduced clamping force, which will cause excessive wear, especially of the clutch plate (clutch will then slip).*
- ◆ *If the clutch plate is not renewed, it is not necessary to reset the adjuster ring.*
- ◆ *New SAC pressure plates are pre-set accordingly, and do not have to be reset.*

Special tools and workshop equipment required

- ◆ Press tool - VW 412-

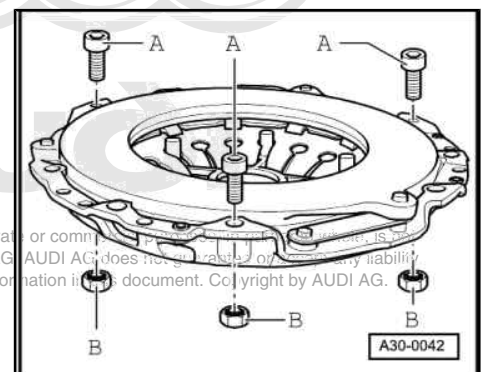


- ◆ Thrust pad - 3062-



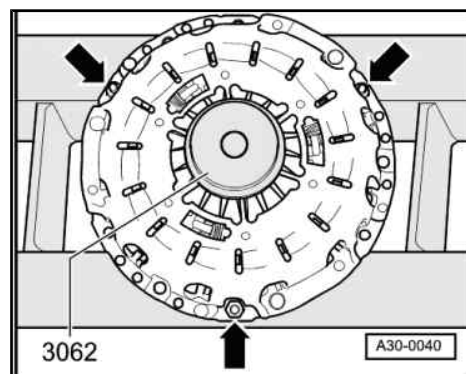
Procedure

- Insert 3 bolts for securing pressure plate -A- into the mounting holes on the pressure plate located at 120° (1/3 turn) intervals, as shown in the illustration.
- Screw three M8 nuts -B- onto bolts -A- and tighten nuts.



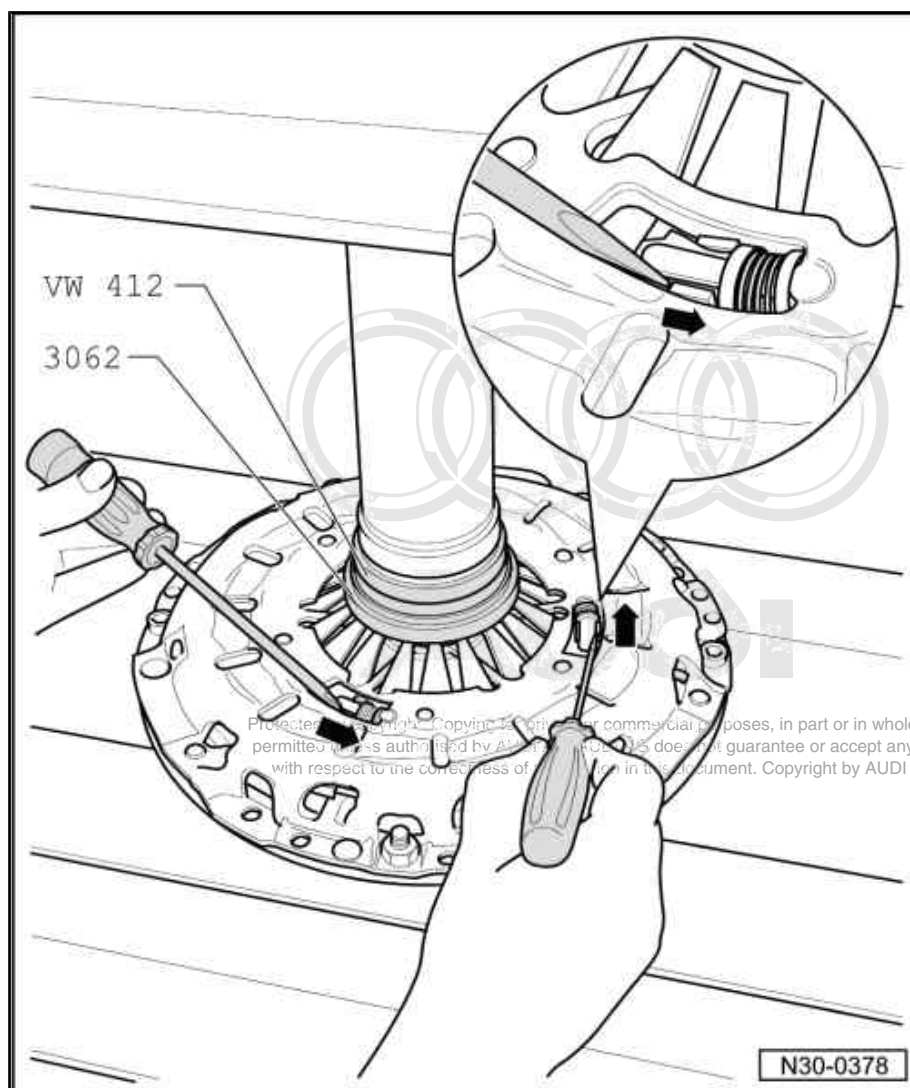
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- Place the SAC pressure plate onto the press so that only the 3 bolt heads -arrows- make contact.
- Position thrust pad - 3062- in the centre of the pressure plate.



Caution

Do not use force when performing the following steps, as this could cause the forks on the adjuster ring to break off.



- Apply two screwdrivers to the forks on the adjuster ring. Use the press to apply pressure to the pressure plate until it is just possible to move the adjuster ring.

- Using the two screwdrivers, turn back the adjuster ring evenly in -direction of arrows- until it reaches the stop.
- Hold the adjuster ring against the stop and relieve the pressure applied by the press so that the adjuster ring is held in this position.



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34 – Controls, housing

1 Servicing selector mechanism

- ◆ ⇒ [“1.1 Installation position of selector mechanism”, page 46](#)
- ◆ ⇒ [“1.2 Exploded view - selector mechanism”, page 47](#) Part I + Part II
- ◆ ⇒ [“1.3 Removing and installing gear knob with gear lever boot”, page 49](#)
- ◆ ⇒ [“1.4 Removing and installing selector mechanism”, page 50](#)
- ◆ ⇒ [“1.5 Adjusting selector mechanism”, page 54](#)

1.1 Installation position of selector mechanism

-Arrow A- gear selection movement

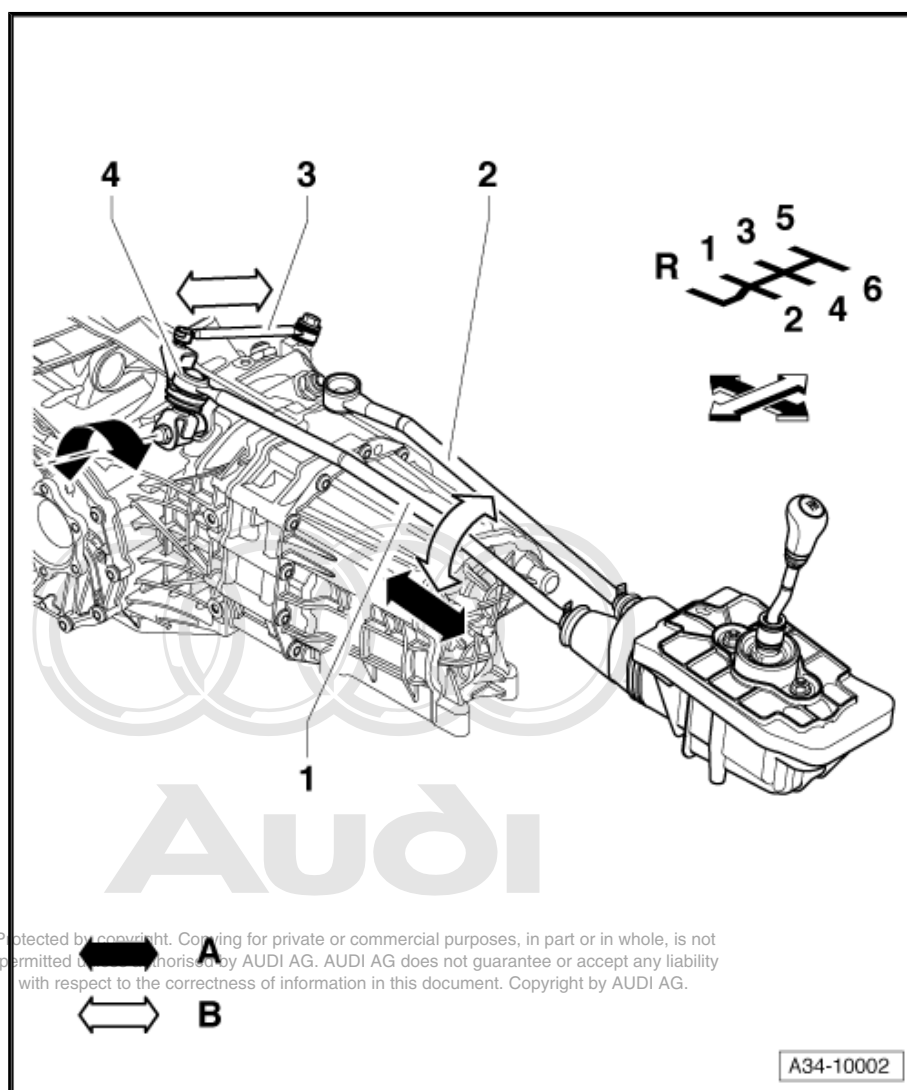
-Arrow B- gate selection movement

1 - Selector rod

2 - Push rod

3 - Connecting rod

4 - Gearbox selector lever



1.2 Exploded view - selector mechanism

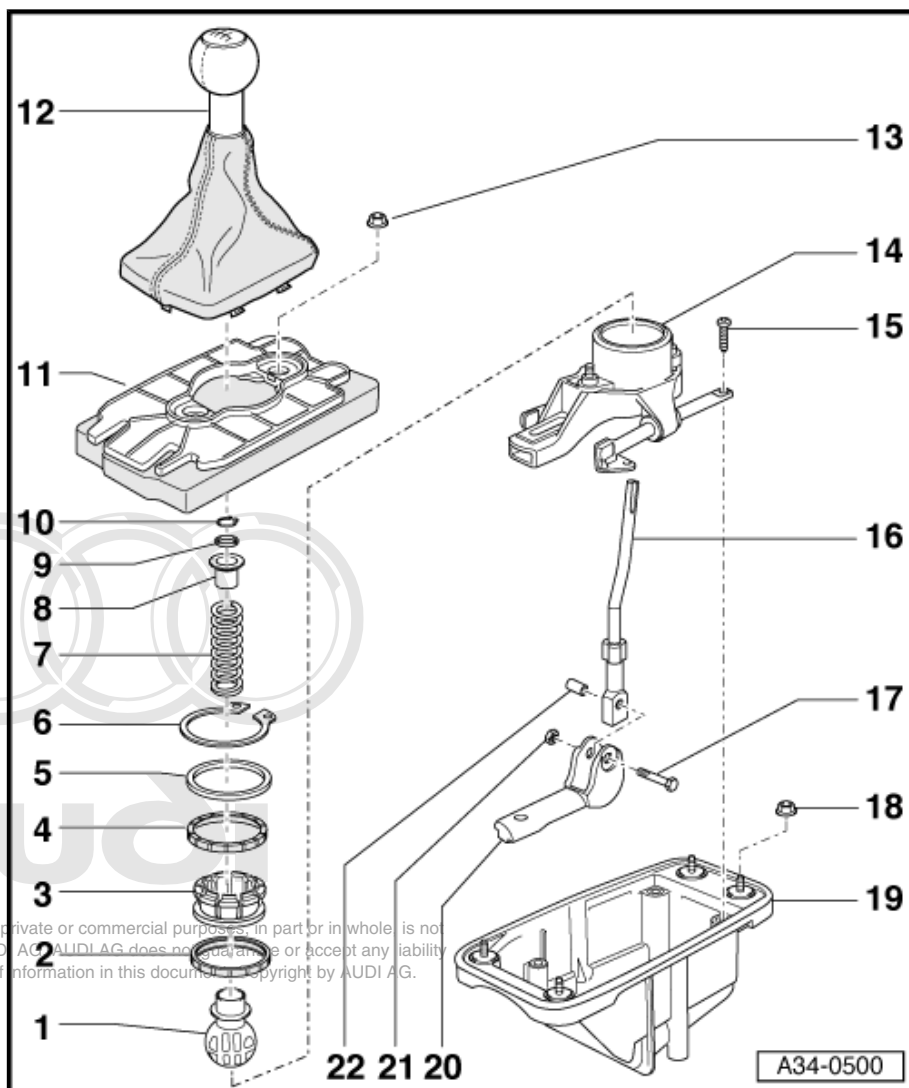
Part I



Note

Lubricate all bearings and moving surfaces with grease - G 000 450 02- .

- 1 - Ball
- 2 - Rubber ring
- 3 - Ball guide
- 4 - Rubber ring
- 5 - Washer
 - ☐ Lip points towards ball guide
⇒ [Item 3 \(page 47\)](#)
- 6 - Circlip
 - ☐ Take out before removing ball
- 7 - Spring
- 8 - Spacer bush
- 9 - Washer
- 10 - Circlip
- 11 - Noise insulation
 - ☐ -Arrow- marked on noise insulation points in direction of travel
- 12 - Gear knob
 - ☐ With boot
 - ☐ Removing and installing
⇒ [page 49](#)
- 13 - Nut
 - ☐ 8 Nm
- 14 - Gear lever bearing
- 15 - Bolt
 - ☐ 6 Nm
 - ☐ Secures gear lever bearing to selector housing
- 16 - Gear lever
 - ☐ Bend points towards rear
- 17 - Bolt
- 18 - Nut
 - ☐ 8 Nm
- 19 - Selector housing
- 20 - Joint
 - ☐ For gear lever/selector rod
- 21 - Nut
 - ☐ 10 Nm



20 - Hexagon socket head bolt

- 23 Nm

21 - Clamp

22 - Selector rod

23 - Joint

- For gear lever/selector rod

24 - Cap nut, 23 Nm

25 - Gearbox selector lever

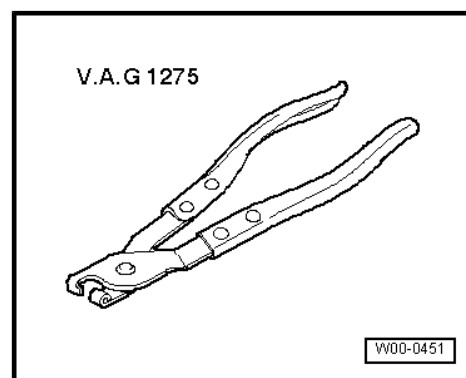
1.3 Removing and installing gear knob with gear lever boot

Special tools and workshop equipment required

- ◆ Hose clip pliers - V.A.G 1275-



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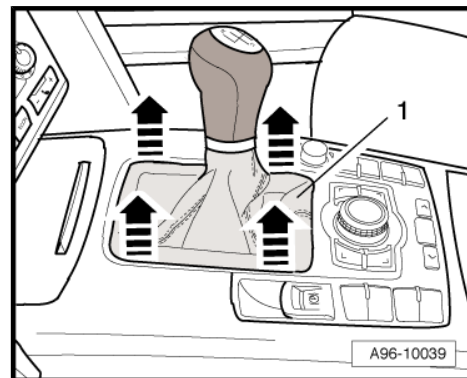
Removing



Note

The gear knob is removed together with the gear lever boot.

- Unclip retaining frame for gear lever boot from front section of centre console and lift it off -arrows-.

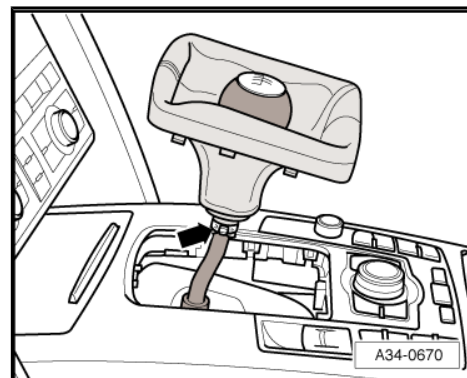


- Pull gear lever boot up and over gear knob.
- Open clip -arrow- and pull off gear knob together with gear lever boot.

Installing

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

- Secure gear knob to gear lever with clip -arrow- using hose clip pliers - V.A.G 1275- .

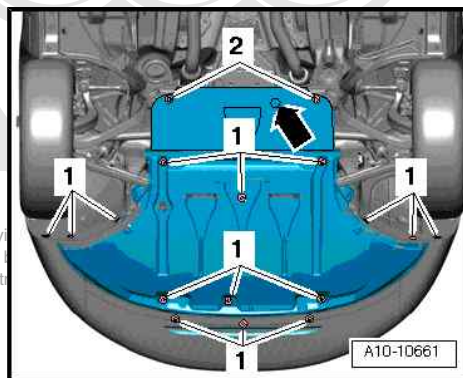


1.4 Removing and installing selector mechanism

Removing

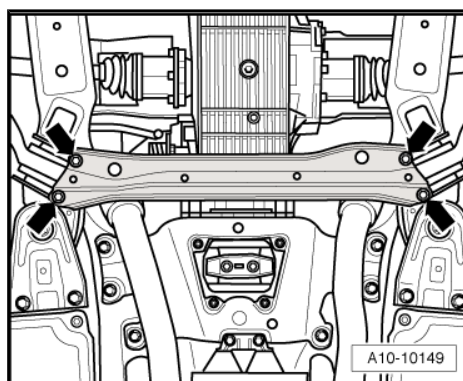
- Release fasteners marked -1-, -2- and -arrow- (if fitted) and remove noise insulation panels.

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Vehicles with 6-cylinder engine:

- Unscrew cross member from subframe -arrows-.

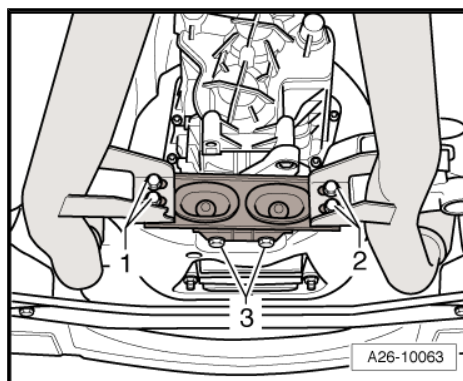


- Unscrew bolts -1- and -2- at rear bracket for front exhaust pipe.

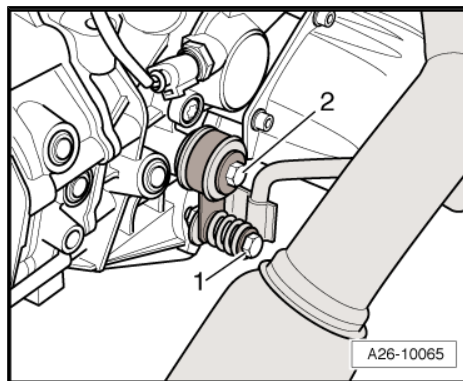


Note

-Item 3- can be disregarded.



- Unscrew bolts -1- and -2- and remove front exhaust pipe bracket (right-side).

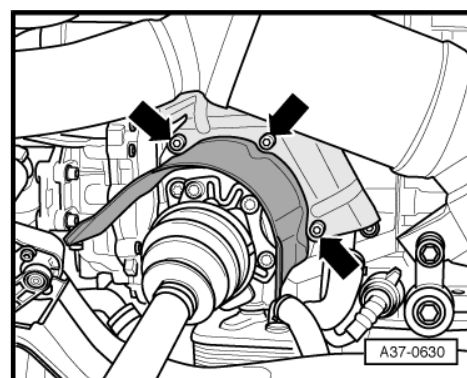
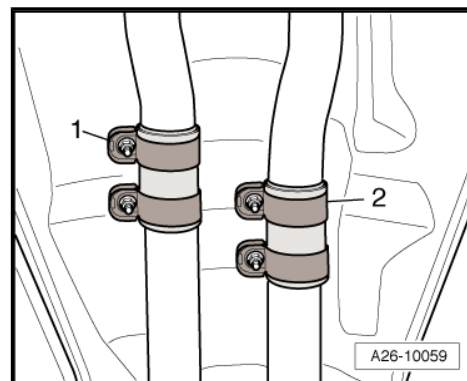




Note

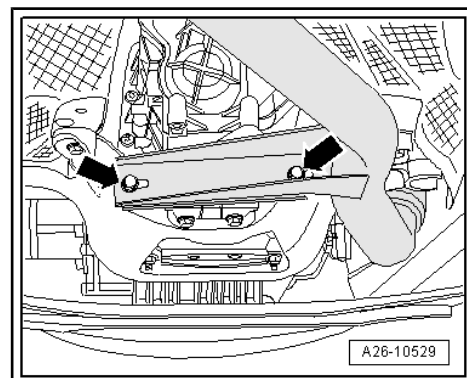
The flexible pipe connection (de-coupling element) on the front exhaust pipe must not be bent more than 10° – otherwise it can be damaged.

- Loosen clamps -1- and -2-.
- Tie up front exhaust pipes (left and right) to body.
- Unbolt heat shields -arrows- for drive shafts (left and right).



Vehicles with 4-cylinder 2.0 ltr. TFSI engine:

- Remove bolts -arrows- on rear bracket for front exhaust pipe.



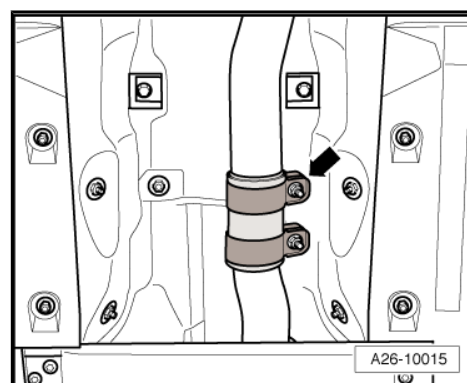
All vehicles with 4-cylinder engine:



Note

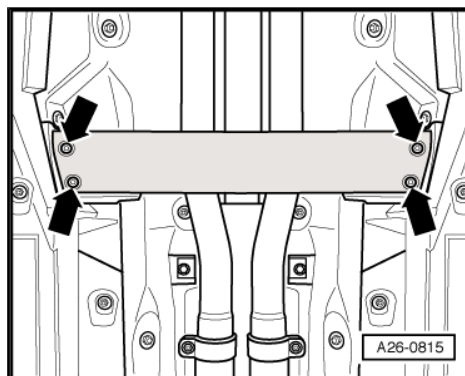
The flexible pipe connection (de-coupling element) on the front exhaust pipe must not be bent more than 10° – otherwise it can be damaged.

- Separate the exhaust system at the clamp -arrow- and slide the clamp to rear.
- Tie up the exhaust pipe (right-side) to body.

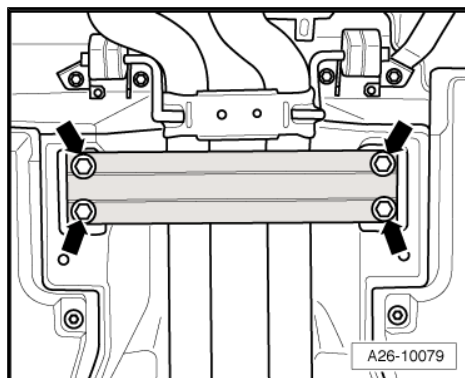


Continued for all vehicles:

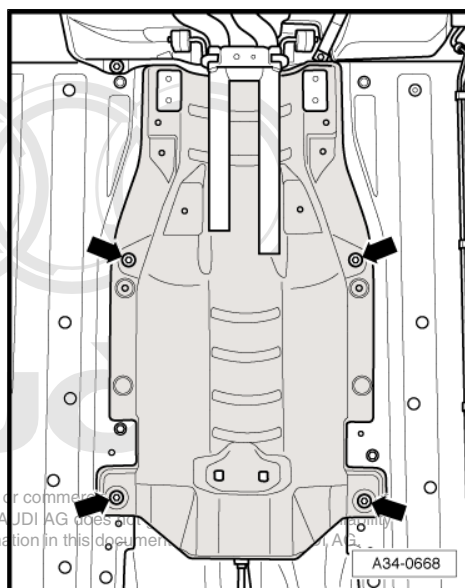
- Unscrew front cross member -arrows-.



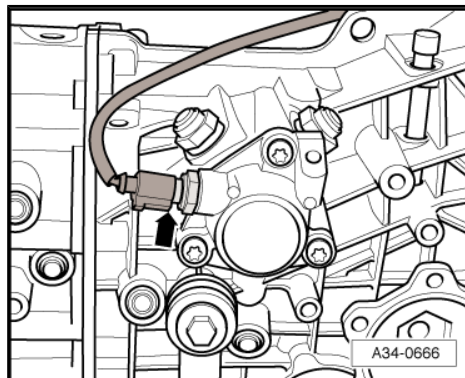
- Unscrew rear cross member -arrows-.



- Release inner side of covers on vehicle underbody (left and right).
- Remove heat shield for selector mechanism -arrows-.

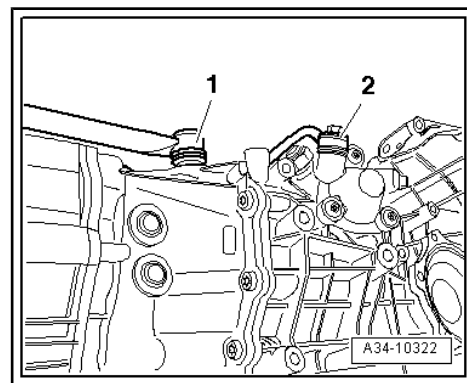


- Unplug electrical connector -arrow- for reversing light switch -F4-.

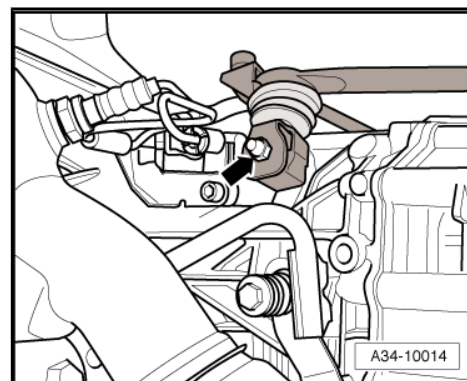


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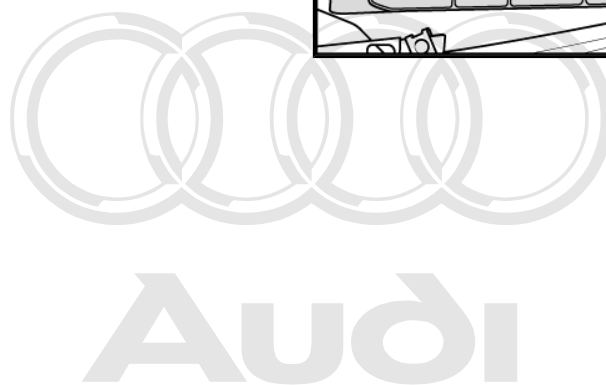
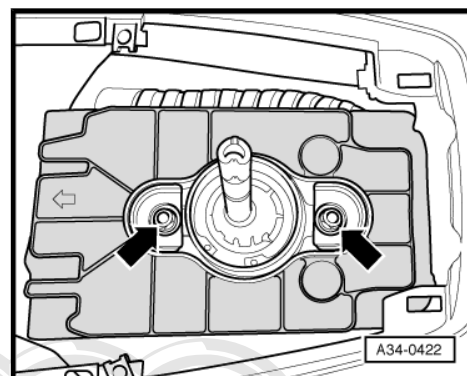
- Unscrew connecting rod -2- for selector rod.
- Unscrew push rod -1-, using an 8 mm hexagon key when unscrewing bolt.



- Unscrew nut -arrow- and detach gearbox selector lever from selector shaft.
- Remove gear knob together with gear lever boot ⇒ [page 49](#) .
- Remove rear and front sections of centre console ⇒ General body repairs, interior; Rep. gr. 68 .



- Lift out noise insulation.
- Unscrew noise insulation for selector housing -arrows-.



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Note

A second mechanic is required to support the selector mechanism from below when unscrewing the securing nuts.

- Remove nuts -arrows-.
- Take out selector mechanism from below.

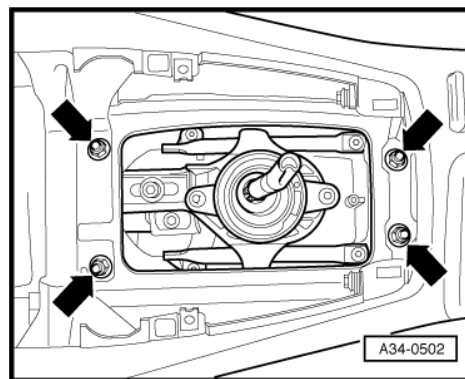
Installing

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

- Fit cross member on subframe and install front and rear cross members ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Install exhaust system and perform stress-free alignment ⇒ Rep. gr. 26 .
- Adjust selector mechanism ⇒ [page 54](#) .
- Install front and rear section of centre console ⇒ General body repairs, interior; Rep. gr. 68 .

Tightening torques

Component	Nm
Gearbox selector lever to selector shaft	23
Push rod to gearbox	40
Connecting rod to gearbox	23
Heat shield for drive shaft to gearbox	23
Selector mechanism to body	8
Noise insulation to selector mechanism	8



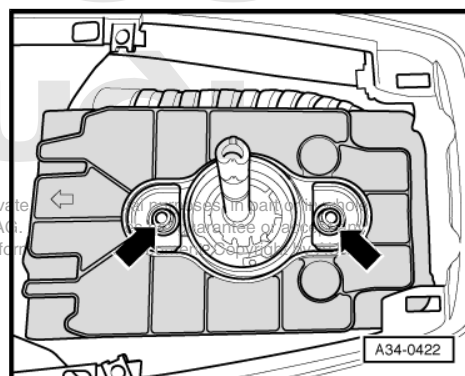
1.5 Adjusting selector mechanism

The following are prerequisites for correct gear lever alignment:

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

Procedure

- Remove rear and front sections of centre console ⇒ General body repairs, interior; Rep. gr. 68 .
- Lift up noise insulation.
- Unscrew noise insulation for selector housing -arrows-.



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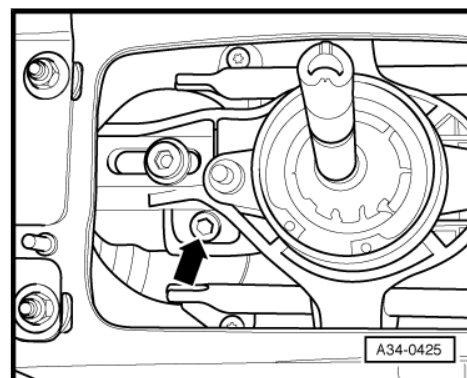
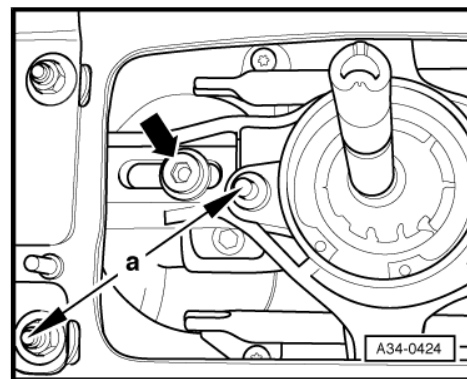
- Measure distance -a- between the two studs in the selector mechanism.
- Specification: distance -a- = 85 mm.



Note

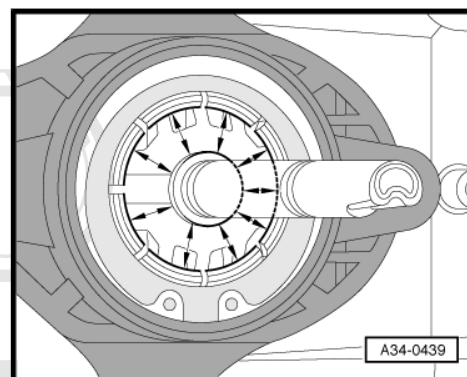
Measure from centre of one stud to centre of the other.

- If distance measured is not correct, adjust dimension -a- as follows:
- Loosen bolt -arrow- for push rod.
- The gear lever bearing should move freely in both directions on slide
- Set distance -a- by moving gear lever bearing.
- Tighten push rod bolt to 23 Nm.
- Slacken bolt -arrow- for selector rod.
- Connection between selector rod and selector mechanism should move freely.

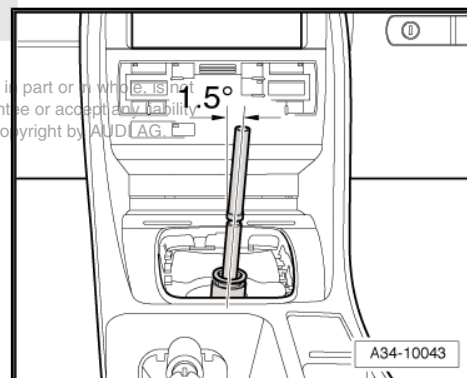


Align the gear lever as follows:

- Position gear lever in centre of ball guide.
- Distance between ball guide and bottom of gear lever must be the same at all points -arrows-.



- Align gear lever so that it points slightly (1.5°) to the right (as seen in direction of travel).
- Hold gear lever in this position.



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- Tighten bolt for selector rod -arrow- to 23 Nm.

**Note**

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

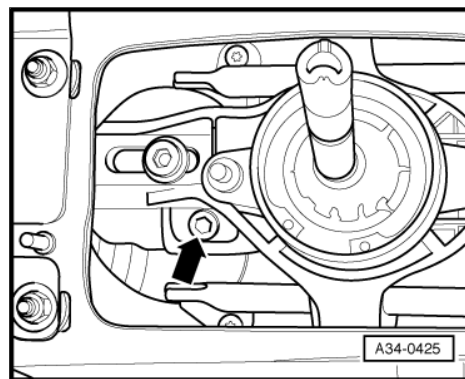
Checking gear lever adjustment

- With the gearbox in neutral, the gear lever should rest in the 3rd/4th gear gate.
- Depress clutch.
- Select all gears several times.
- Pay particular attention to the operation of the reverse gear locking mechanism.
- It should only be possible to engage reverse gear after overcoming the reverse gear detent.
- The gear lever should return by itself from the reverse gear gate to the 3rd/4th gear gate.

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

Assembly is carried out in the reverse order to removal; note the following:

- Install rear and front sections of centre console ⇒ General body repairs, interior; Rep. gr. 68 .



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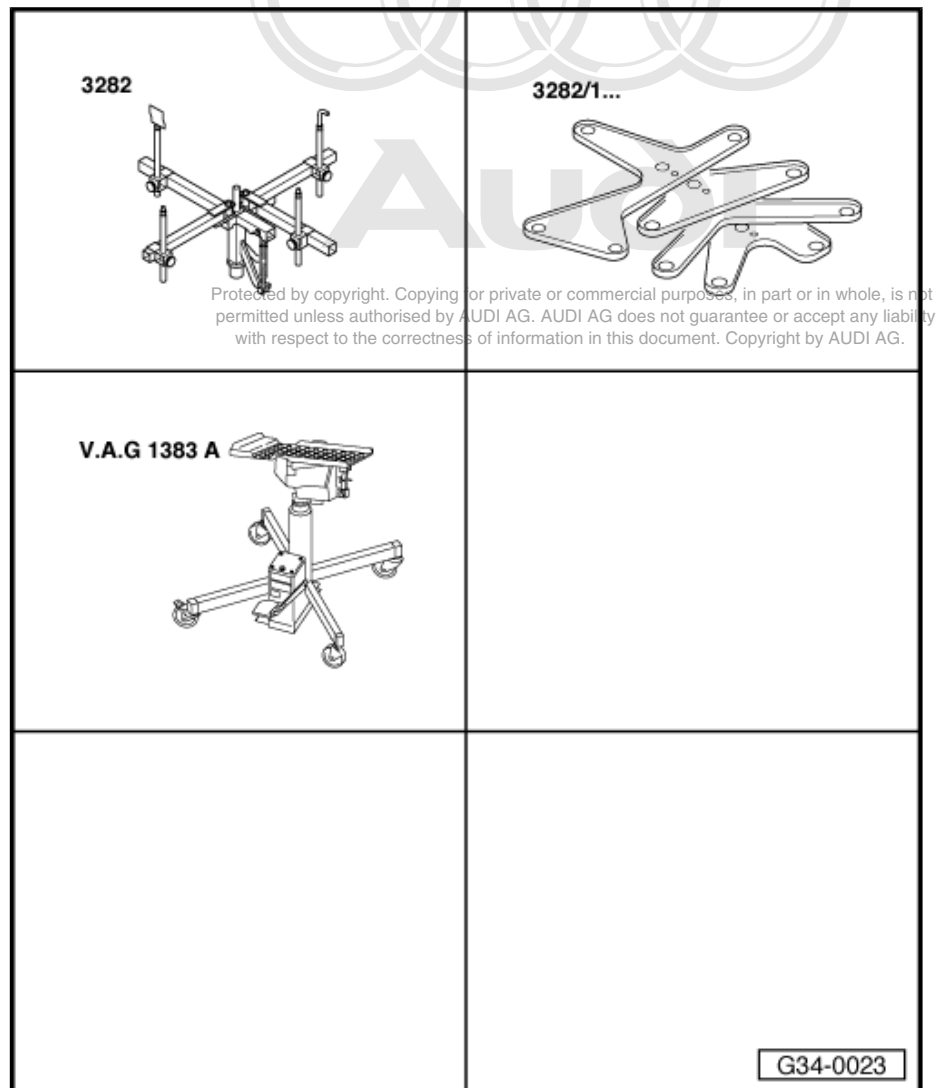
2 Removing and installing gearbox

- ◆ Removing gearbox - vehicles with 2.0 ltr. TFSI engine
⇒ [page 57](#)
- ◆ Installing gearbox in vehicles with 2.0 ltr. TFSI engine
⇒ [page 64](#)
- ◆ Removing gearbox in vehicles with 2.0 ltr. TDI engine
⇒ [page 68](#)
- ◆ Installing gearbox in vehicles with 2.0 ltr. TDI engine
⇒ [page 75](#)
- ◆ Removing gearbox in vehicles with V6 petrol engine
⇒ [page 79](#)
- ◆ Installing gearbox in vehicles with V6 petrol engine
⇒ [page 89](#)

2.1 Removing gearbox - vehicles with 2.0 ltr. TFSI engine

Special tools and workshop equipment required

- ◆ Gearbox support - 3282-
- ◆ Adjustment plate - 3282/43-
- ◆ Engine and gearbox jack - V.A.G 1383 A-
- ◆ Grease for clutch plate splines - G 000 100-
- ◆ Copper grease (commercially available)
- ◆ 2 bolts (M10 x 20)



Procedure

- Lock carrier and torque reaction support installed.

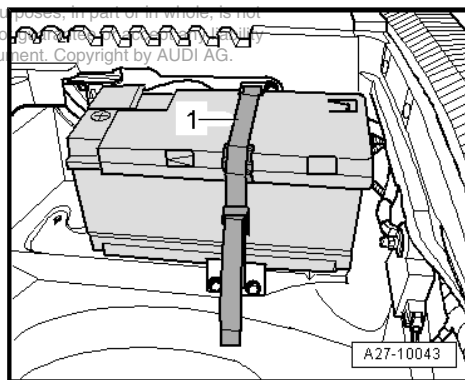
**Note**

All cable ties which are released or cut open during removal must be fitted in the same position when installing.

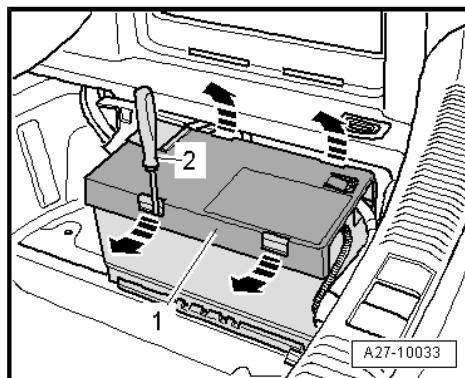
**Caution**

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

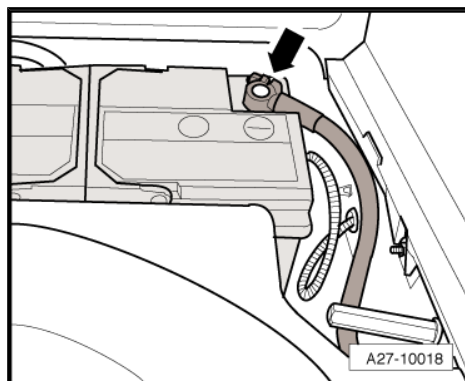
- Switch off ignition and remove ignition key.
- Release battery retaining strap -1- (if fitted).
- Take out luggage compartment floor covering.



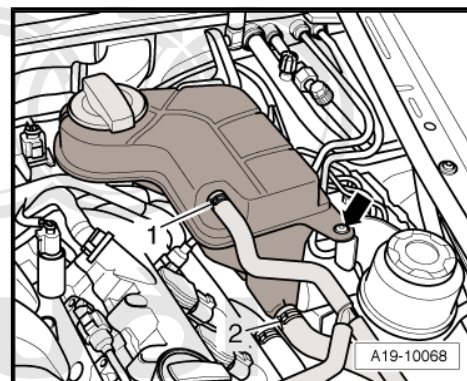
- Release retaining clips -arrows- using a screwdriver -2- and remove cover -1- for negative terminal.



- Disconnect earth wire -arrow- at battery.

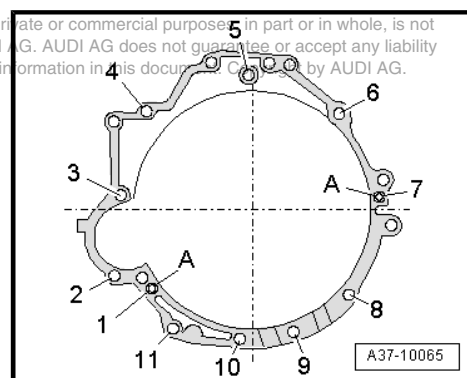


- Unbolt coolant expansion tank -arrow-.
- Unplug electrical connector for coolant shortage indicator switch - F66- at expansion tank (bottom) and move expansion tank clear to one side, with coolant hoses -1- and -2- attached.

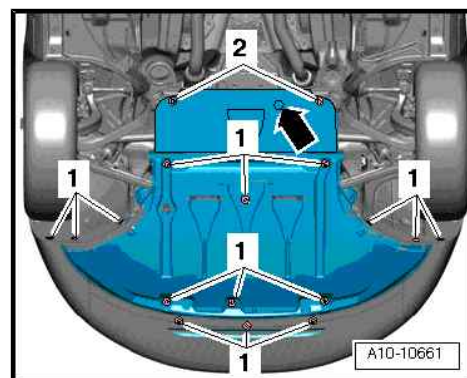


- Unscrew engine/gearbox securing bolts -4-, -5- and -6- (accessible from above).
- Tie up wiring harness.

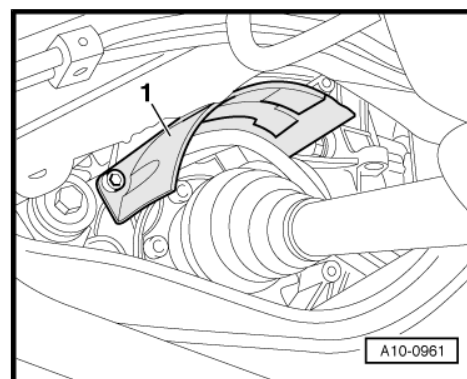
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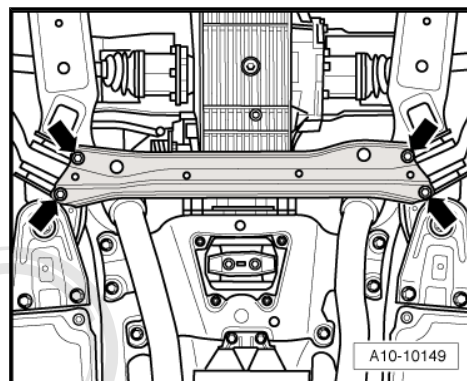
- Remove both front wheels.
- Remove noise insulation panels (release fasteners marked -1, 2 and arrow-).



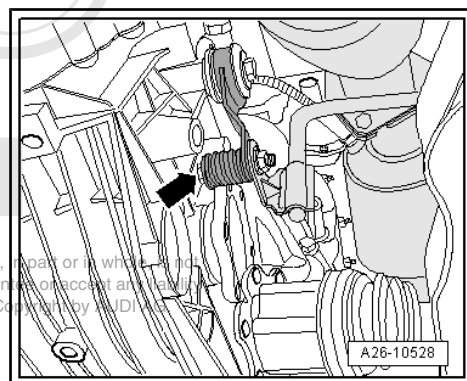
- Remove heat shield -1- for drive shaft (right-side) at gearbox.
- Unbolt drive shafts (left and right) from gearbox flange shafts.



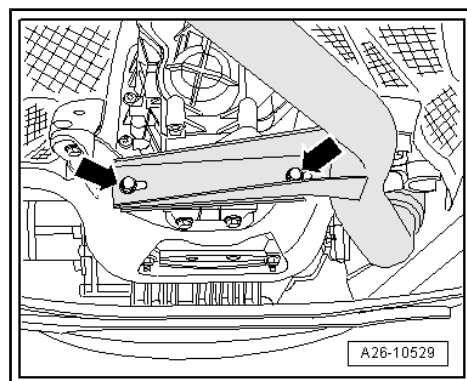
- Unscrew cross member from subframe -arrows-.



- Remove bolt -arrow- on bracket for front exhaust pipe.



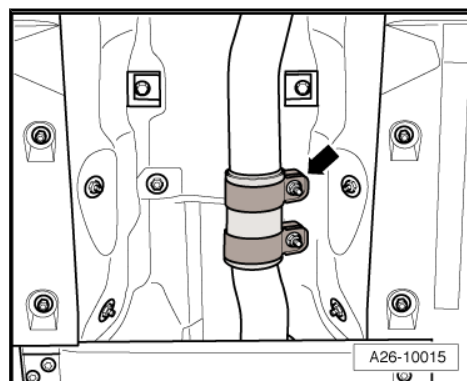
- Remove bolts -arrows- on rear bracket for front exhaust pipe.



Note

The flexible pipe connection (de-coupling element) on the front exhaust pipe must not be bent more than 10° – otherwise it can be damaged.

- Separate the exhaust system at the clamp -arrow- and slide the clamp to rear.



- Slacken bolts -arrows- at stop for torque reaction support.
- Press stop for torque reaction support upwards using a lever and tighten bolts again.

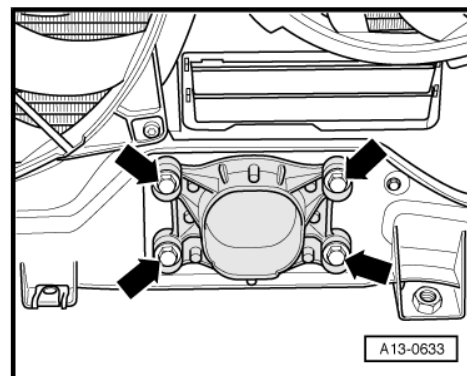
 Note

Adjusting the stop for torque reaction support prevents the engine from tilting at the front after the gearbox is removed.

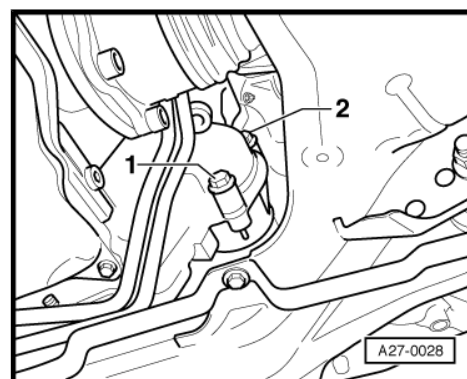


WARNING

The lock carrier must remain installed throughout the following procedure; it must not be moved to the service position.



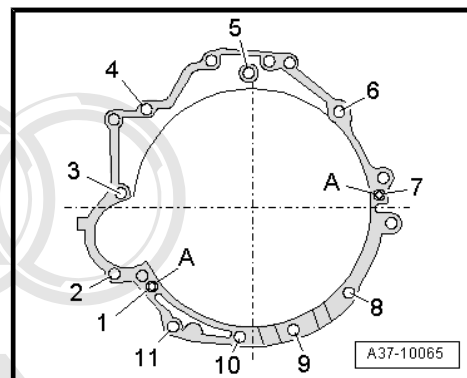
- Remove bolts -1- and -2-, but do not remove starter.



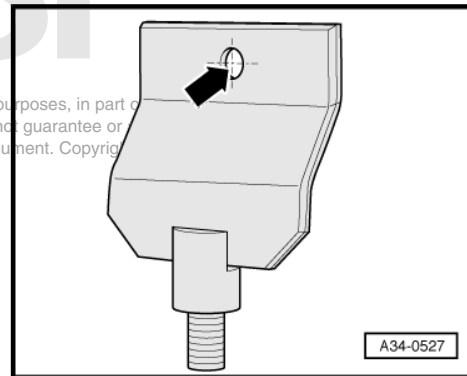
- Remove engine/gearbox securing bolts -1, 9, 10, 11- and nut -8- (accessible from below).

 Note

Bolt -7- should remain screwed in hand-tight.



- If not already provided, drill a hole of 10.2 mm Ø -arrow- in the support elements of gearbox support - 3282- .



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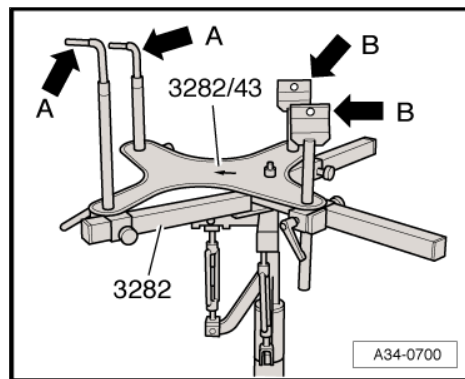
- To remove manual gearbox 01X, set up gearbox support - 3282- with adjustment plate - 3282/43- and place on engine and gearbox jack - V.A.G 1383 A- .



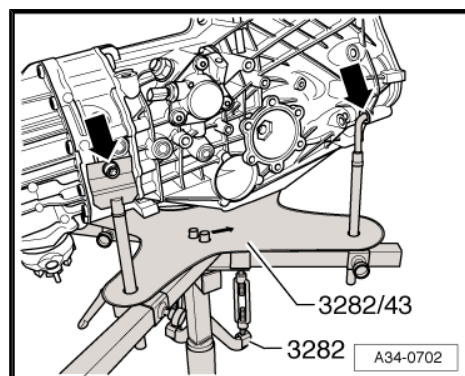
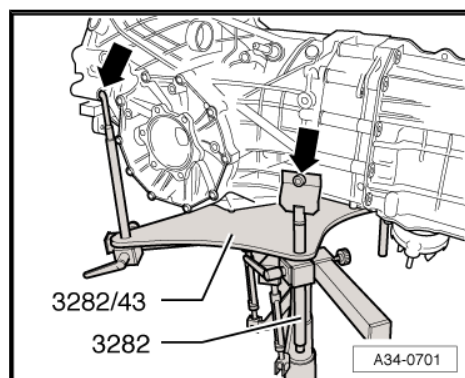
Note

- ◆ The support elements -arrows A- and -arrows B- are shown in schematic form on the adjustment plate . The arrow on the adjustment plate points in the direction of travel.
- ◆ Adjustment plate can only be fitted in one correct position.

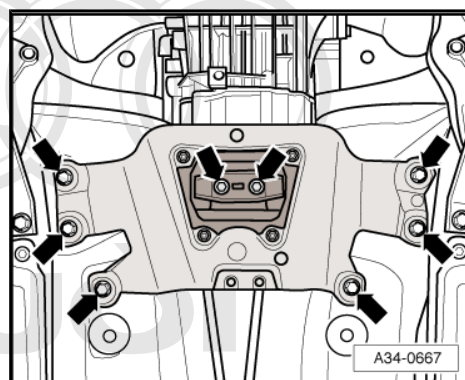
- Align the adjustment plate parallel to the gearbox.
- Secure support elements to left side of gearbox, as shown in illustration. Tighten bolt (M10 x 20) -arrow on right side- to 20 Nm.



- Secure support elements to right side of gearbox, as shown in illustration. Tighten bolt (M10 x 20) -arrow on left side- to 20 Nm.

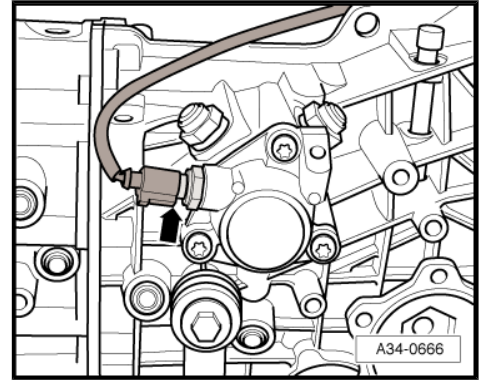


- Unscrew bolts -arrows- and detach tunnel cross member with gearbox mounting.
- Lower gearbox slightly.

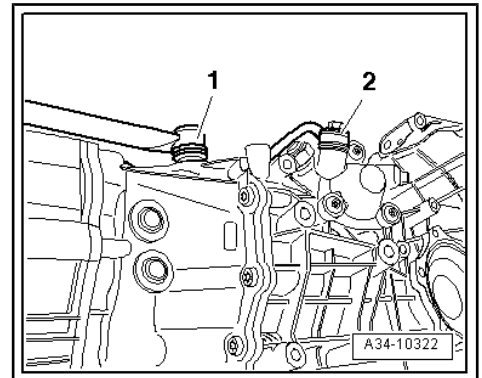


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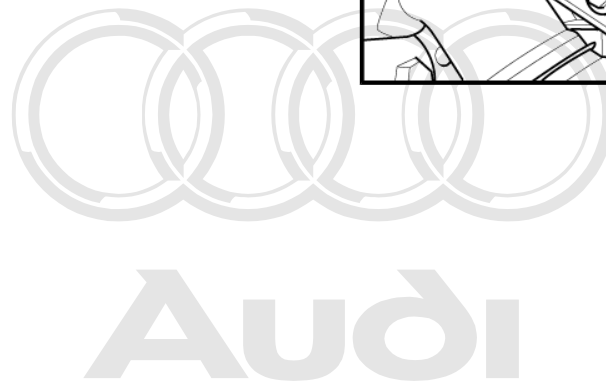
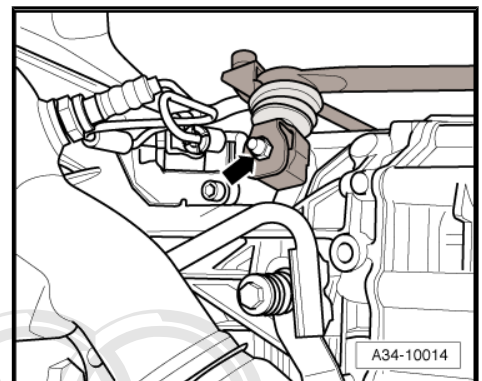
- Unplug electrical connector -arrow- for reversing light switch - F4- and move electrical wire clear.



- Unscrew connecting rod -2- for selector rod.
- Unscrew push rod -1-, using an 8 mm hexagon key when unscrewing bolt.



- Unscrew nut -arrow- and detach gearbox selector lever from selector shaft.



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- Remove clutch slave cylinder -arrow- and tie up with wire. Do not disconnect hoses/pipes.



Caution

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

- Remove the last engine/gearbox securing bolt.
- Unseat gearbox from dowel sleeves and lower carefully with engine and gearbox jack - V.A.G 1383 A- .

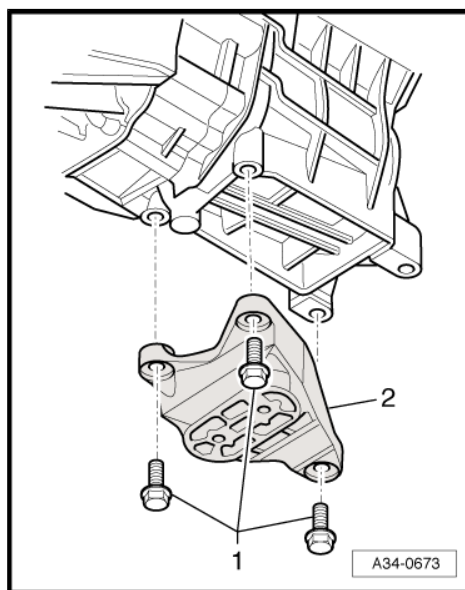
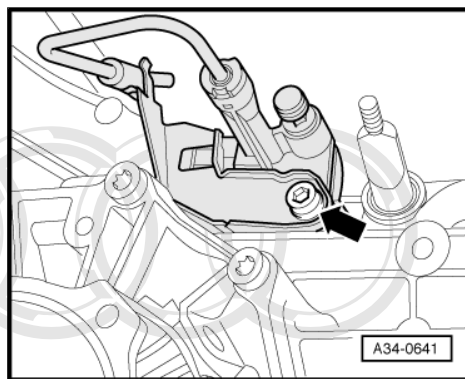


Note

When lowering gearbox, make sure there is sufficient clearance for drive shafts.

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- Before carrying out assembly work, secure gearbox to assembly stand or engine and gearbox support - VAS 6095- , using engine and gearbox support - VW 540- ➔ [page 100](#) .
- If the removed gearbox is being renewed, the gearbox support -2- must be transferred to the replacement gearbox -bolts 1- ➔ [page 95](#) .



2.2 Installing gearbox in vehicles with 2.0 ltr. TFSI engine



Note

- ◆ *Renew self-locking nuts and bolts when performing assembly work.*
- ◆ *Re-attach all cable ties at the same locations when re-installing.*

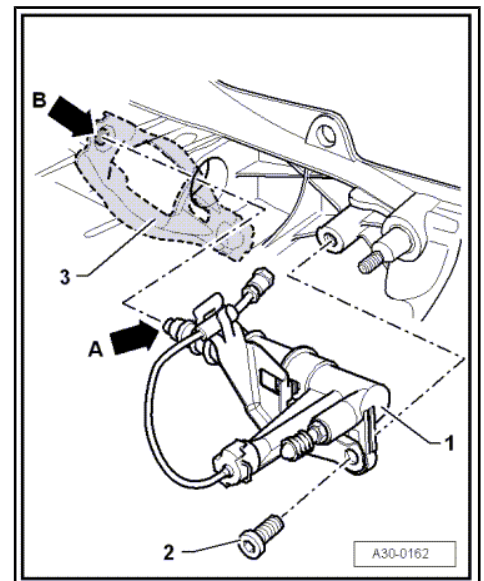
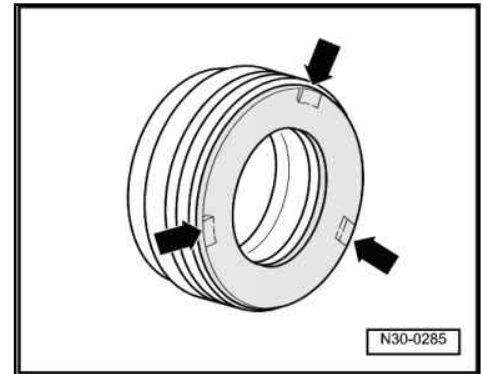
Observe the general repair instructions ➔ [page 7](#) .

- Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease for clutch plate splines - G 000 100- to the splines. Do not grease the guide sleeve.

- It should be possible to push the clutch plate back and forth slightly on the input shaft.
- Check clutch release bearing for wear and renew if necessary
⇒ [page 29](#) .
- Check that dowel sleeves for centralising engine/gearbox are in the cylinder block, install if necessary.
- Place intermediate plate on dowel sleeves at engine flange.
- Before installing gearbox, tie electrical wiring off to one side so that it cannot be trapped between the engine and the gearbox.
- Lightly lubricate surface where plunger and clutch release lever make contact -arrow B- using copper grease (commercially available).
- Raise gearbox far enough to be able to install clutch slave cylinder with bracket for pipe/hose assembly.
- Guide slave cylinder -1- into opening in gearbox housing, keeping it as straight as possible (without tilting plunger -arrow A-) and insert in recess -arrow B- on clutch release lever -3-.

 Note

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



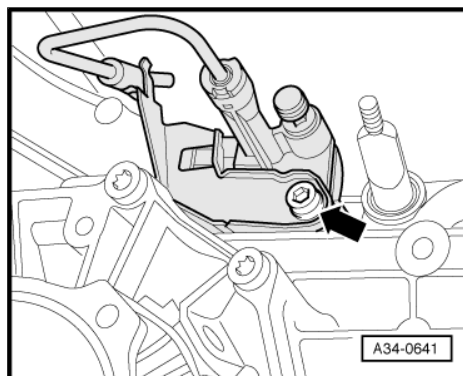
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- Secure clutch slave cylinder with new bolt -arrow-. Tightening torque ⇒ [Item 13 \(page 28\)](#)



Caution

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



- When aligning the gearbox with the engine, turn crankshaft back and forth slightly to make it easier to insert the gearbox input shaft splines into the clutch plate.
- Bolt gearbox onto engine.

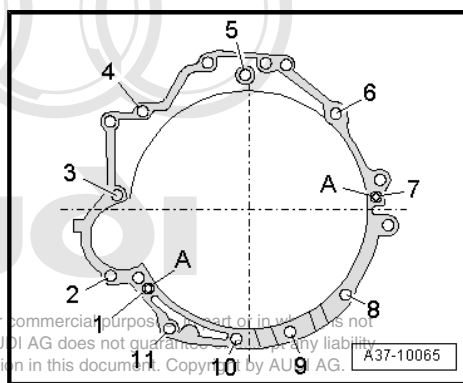


Note

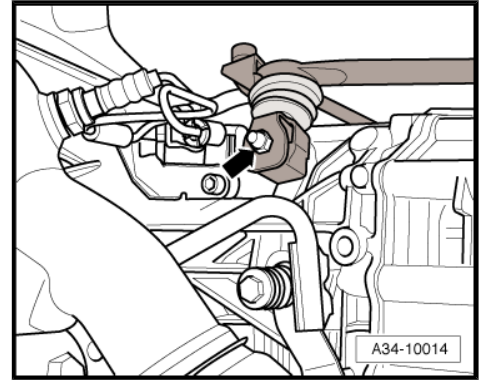
- ◆ *Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.*
- ◆ *Additional lubricant such as engine or gear oil may be used, but do not use graphite lubricant.*
- ◆ *Do not use parts which have been degreased.*
- ◆ *Tolerance for tightening torques is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

Engine/gearbox securing bolts

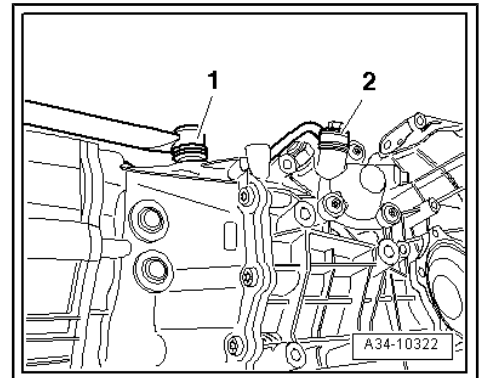
Item	Bolt	Nm
1	M12 x 67	65
2	M10 x 60	45
3, 4, 5	M12 x 75	65
6	M12 x 100	65
7	M12 x 90	65
8	M10 x 60	45
9, 10, 11	M12 x 45	65
A	Dowel sleeves for centralising	



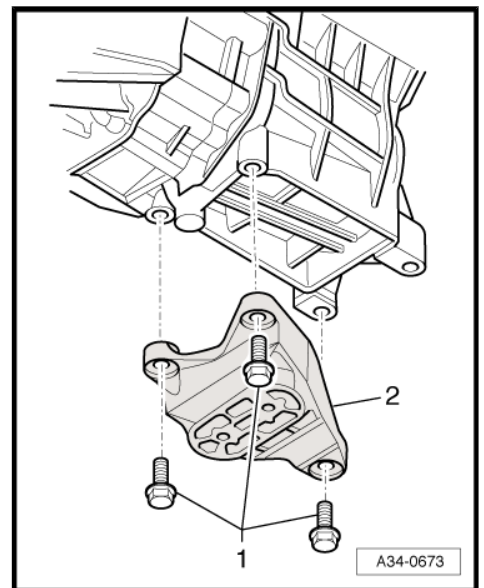
- Install gearbox selector lever and tighten nut -arrow-.



- Install push rod -1-; to do so, tighten hexagon socket head bolt.
- Secure connecting rod -2- for selector rod.

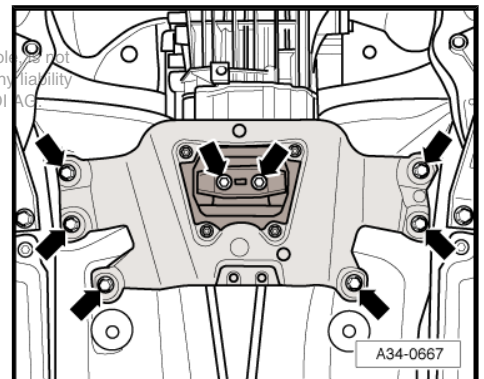


- If removed earlier, fit gearbox support -2- to gearbox and tighten bolts -1- to specified torque ⇒ [page 95](#).



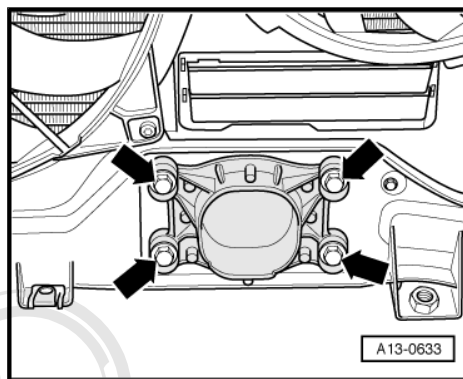
- Tighten bolts -arrows- for tunnel cross member. Tightening torques

⇒ [“3 Exploded view - tunnel cross member, gearbox mounting and gearbox support”, page 95](#)



The remaining installation steps are carried out in the reverse sequence; note the following points:

- Loosen bolts -arrows- for torque reaction support.
- Allow stop for torque reaction support to settle on rubber buffer for torque reaction support under its own weight and re-tighten bolts.
- Bolt drive shafts to flange shafts ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Install front exhaust pipe ⇒ Engine, mechanics; Rep. gr. 26 .
- Follow steps required after connecting battery ⇒ Electrical system; Rep. gr. 27 .



Caution

Never use a charger to aid starting. Otherwise, the vehicle's control units could be damaged.

Tightening torques



Note

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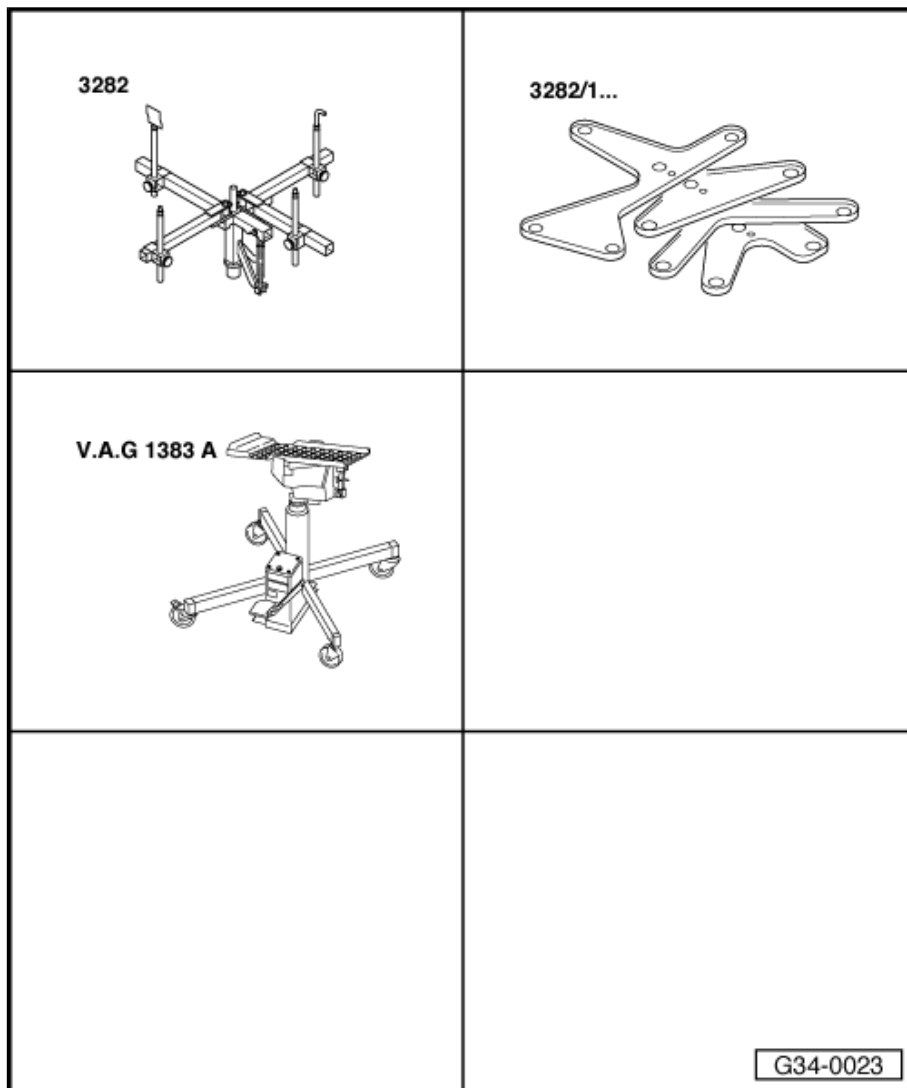
- ◆ *Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.*
- ◆ *Additional lubricant such as engine or gear oil may be used, but do not use graphite lubricant.*
- ◆ *Do not use parts which have been degreased.*
- ◆ *Tolerance for tightening torques is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

Component	Nm
Stop for torque reaction support to lock carrier	23
Clutch slave cylinder to gearbox	23 ¹⁾
Gearbox selector lever to selector shaft	23
Push rod to gearbox	40
Connecting rod for selector rod to gearbox	23
Heat shield for drive shaft to gearbox	23
¹⁾ Renew bolt	

2.3 Removing gearbox in vehicles with 2.0 ltr. TDI engine

Special tools and workshop equipment required

- ◆ Gearbox support - 3282-
- ◆ Adjustment plate - 3282/43-
- ◆ Engine and gearbox jack - V.A.G 1383 A-
- ◆ Grease for clutch plate splines - G 000 100-
- ◆ Copper grease (commercially available)
- ◆ 2 bolts (M10 x 20)



Procedure

- Lock carrier and torque reaction support installed.



Note

All cable ties which are released or cut open during removal must be fitted in the same position when installing.



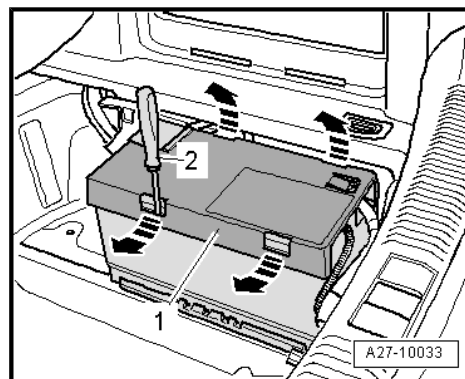
Caution

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

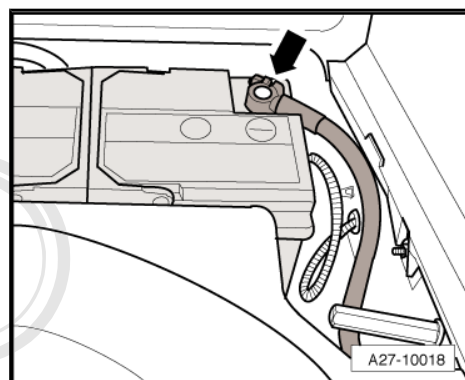
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- Switch off ignition and remove ignition key.

- Take out luggage compartment floor covering.
- Release retaining clips -arrows- using a screwdriver -2- and remove cover -1- for negative terminal.

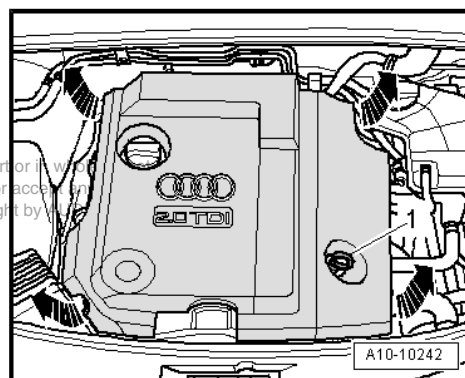


- Disconnect earth wire -arrow- at battery.

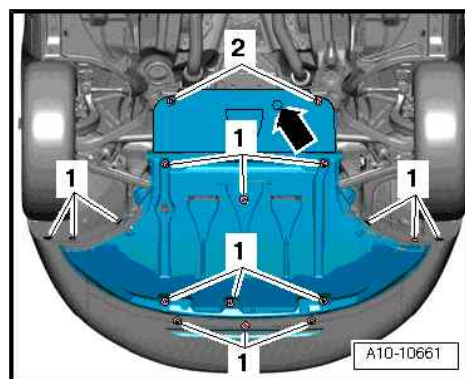


- Pull dipstick -1- out of guide tube.
- Pull off engine cover panel -arrows-.
- Re-insert dipstick in guide tube.

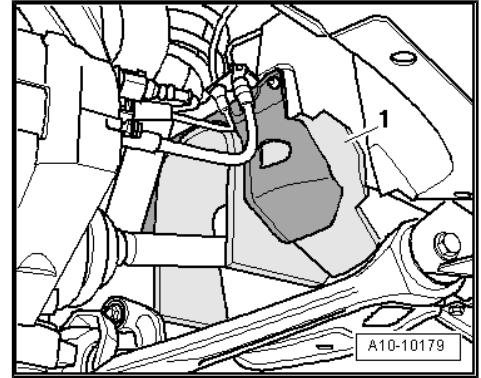
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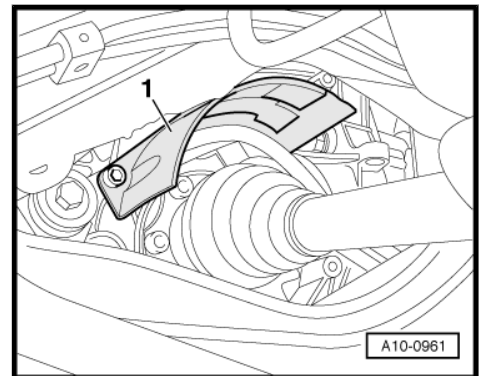
- Release fasteners marked -1-, -2- and -arrow- (if fitted) and remove noise insulation panels.



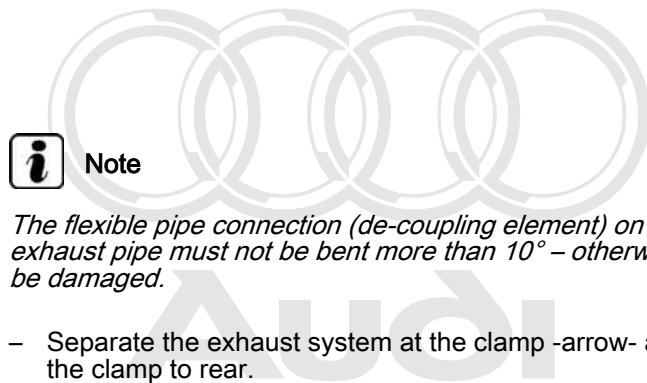
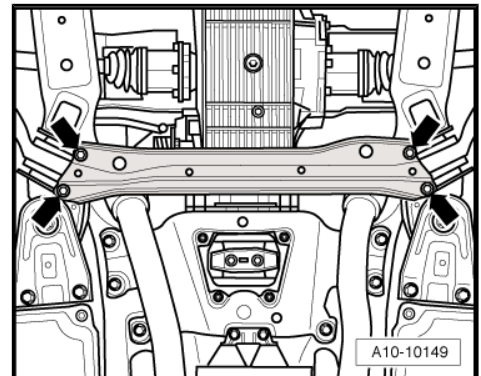
- Remove noise insulation -1- in wheel housing (right-side).



- Remove heat shield -1- for drive shaft (right-side) at gearbox.
- Unbolt drive shafts (left and right) from gearbox flange shafts.



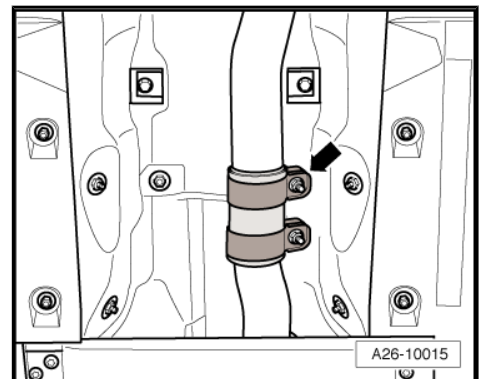
- Unscrew cross member from subframe -arrows-.



 Note

The flexible pipe connection (de-coupling element) on the front exhaust pipe must not be bent more than 10° – otherwise it can be damaged.

- Separate the exhaust system at the clamp -arrow- and slide the clamp to rear.



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Vehicles with diesel particulate filter:

- Unscrew nut/bolts -1 ... 3- and remove bracket for front exhaust pipe. Then remove front exhaust pipe ⇒ Engine, mechanics; Rep. gr. 26 .

Continued for all vehicles:

- Slacken bolts -arrows- at stop for torque reaction support.
- Press stop for torque reaction support upwards using a lever and tighten bolts again.



Note

Adjusting the stop for torque reaction support prevents the engine from tilting at the front after the gearbox is removed.



WARNING

The lock carrier must remain installed throughout the following procedure; it must not be moved to the service position.

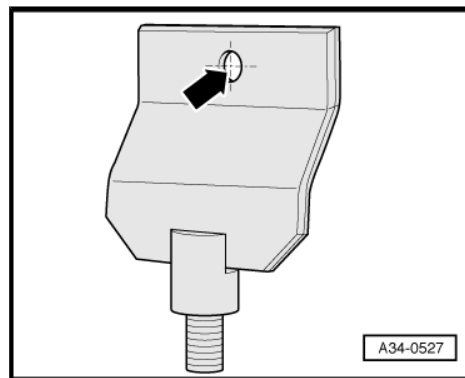
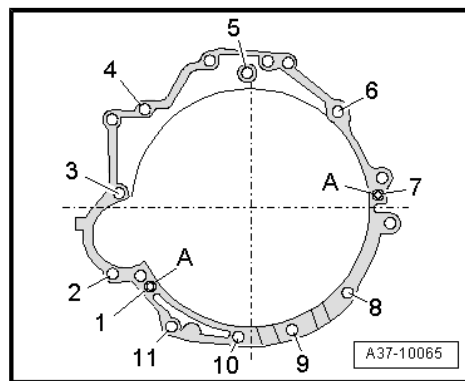
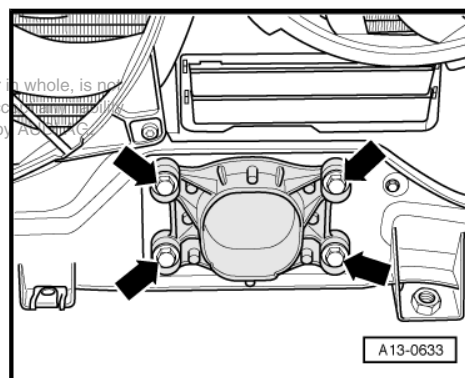
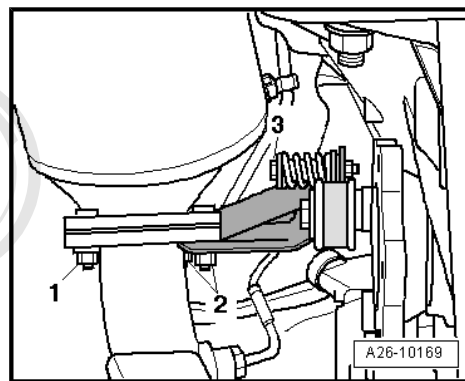
- Remove engine/gearbox securing bolts -1 ... 6- and -8 ... 11-.



Note

Bolt -7- should remain screwed in hand-tight.

- If not already provided, drill a hole of 10.2 mm Ø -arrow- in the support elements of gearbox support - 3282- .

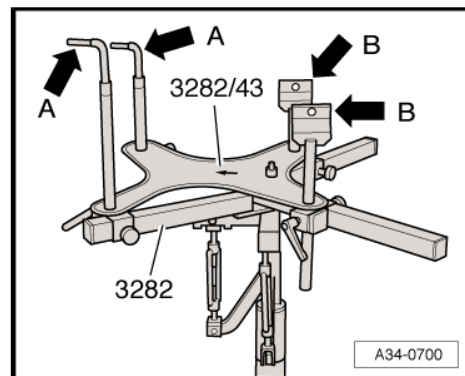


- To remove manual gearbox 01X, set up gearbox support - 3282- with adjustment plate - 3282/43- and place on engine and gearbox jack - V.A.G 1383 A- .

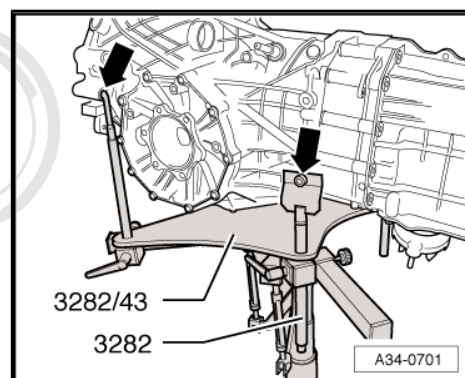


Note

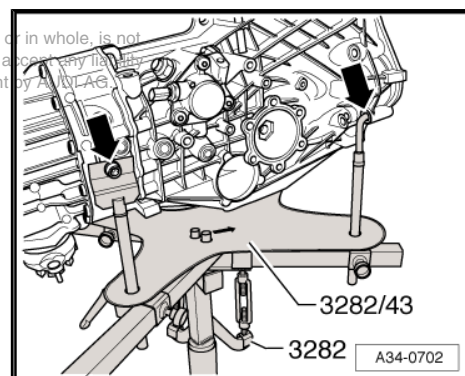
- ◆ The support elements -arrows A- and -arrows B- are shown in schematic form on the adjustment plate . The arrow on the adjustment plate points in the direction of travel.
- ◆ Adjustment plate can only be fitted in one correct position.



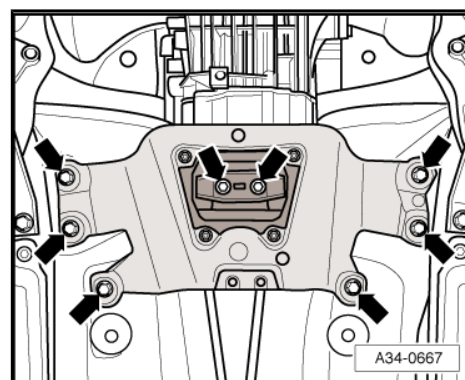
- Align the adjustment plate parallel to the gearbox.
- Secure support elements to left side of gearbox, as shown in illustration. Tighten bolt (M10 x 20) -arrow on right side- to 20 Nm.



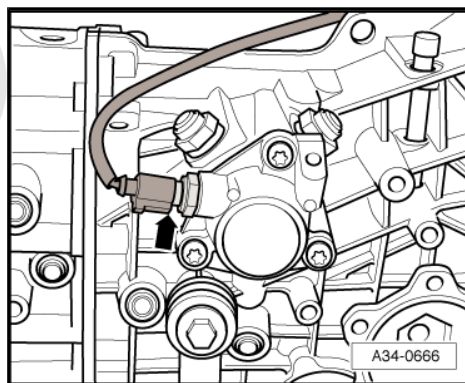
- Secure support elements to right side of gearbox, as shown in illustration. Tighten bolt (M10 x 20) -arrow on left side- to 20 Nm.



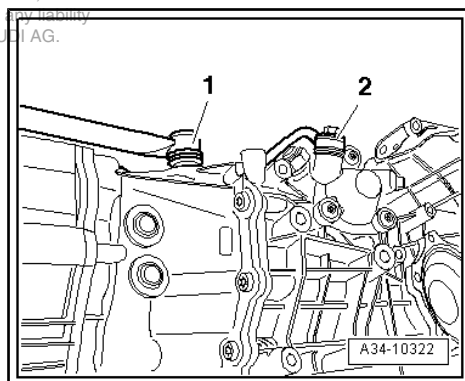
- Unscrew bolts -arrows- and detach tunnel cross member with gearbox mounting.
- Lower gearbox slightly.



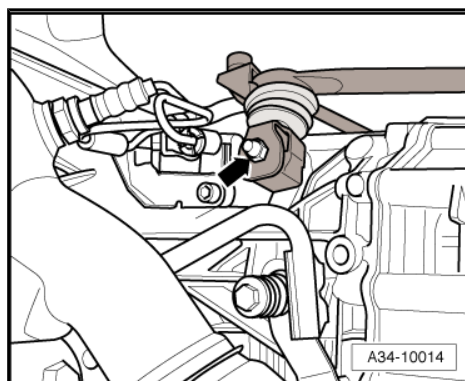
- Unplug electrical connector -arrow- for reversing light switch - F4- and move electrical wire clear.



- Unscrew connecting rod -2- for selector rod.
- Unscrew push rod -1-, using an 8 mm hexagon key when unscrewing bolt.



- Unscrew nut -arrow- and detach gearbox selector lever from selector shaft.

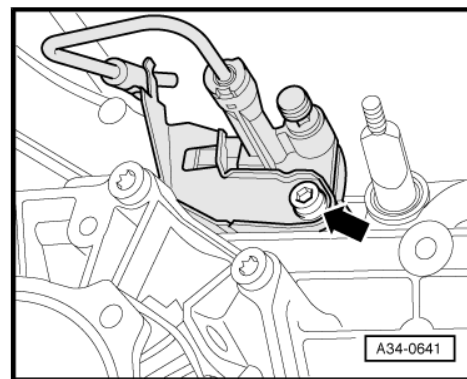


- Remove clutch slave cylinder -arrow- and tie up with wire. Do not disconnect hoses/pipes.



Caution

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



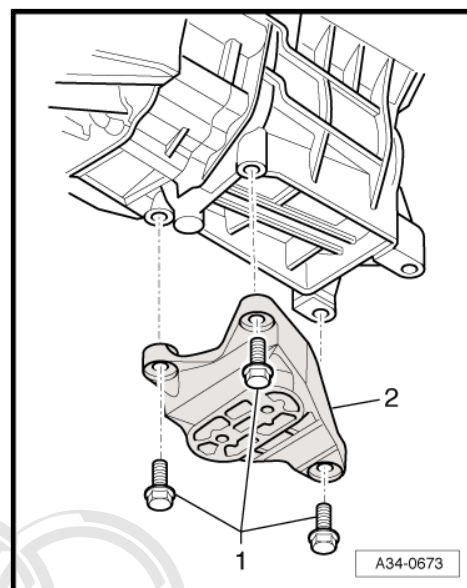
- Remove the last engine/gearbox securing bolt.
- Unseat gearbox from dowel sleeves and lower carefully with engine and gearbox jack - V.A.G 1383 A- .



Note

When lowering gearbox, make sure there is sufficient clearance for drive shafts.

- Before carrying out assembly work, secure gearbox to assembly stand or engine and gearbox support - VAS 6095- , using engine and gearbox support - VW 540- ⇒ [page 100](#) .
- If the removed gearbox is being renewed, the gearbox support -2- must be transferred to the replacement gearbox -bolts 1- ⇒ [page 95](#) .



2.4 Installing gearbox - vehicles with 2.0 ltr. TDI engine



Note

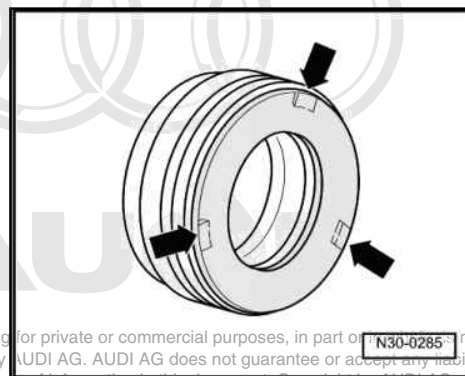
- ◆ *Renew self-locking nuts and bolts when performing assembly work.*
- ◆ *Re-attach all cable ties at the same locations when re-installing.*

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Observe the general repair instructions ⇒ [page 7](#) .

- Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease for clutch plate splines - G 000 100- to the splines. Do not grease the guide sleeve.

- It should be possible to push the clutch plate back and forth slightly on the input shaft.
- Check clutch release bearing for wear and renew if necessary
⇒ [page 29](#) .
- Check that dowel sleeves for centralising engine/gearbox are in the cylinder block, install if necessary.
- Place intermediate plate on dowel sleeves at engine flange.
- Before installing gearbox, tie electrical wiring off to one side so that it cannot be trapped between the engine and the gearbox.

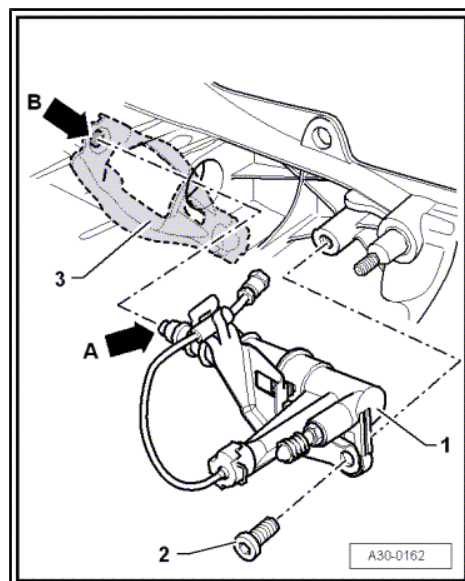


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- Lightly lubricate surface where plunger and clutch release lever make contact -arrow B- using copper grease (commercially available).
- Raise gearbox far enough to be able to install clutch slave cylinder with bracket for pipe/hose assembly.
- Guide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


Note

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

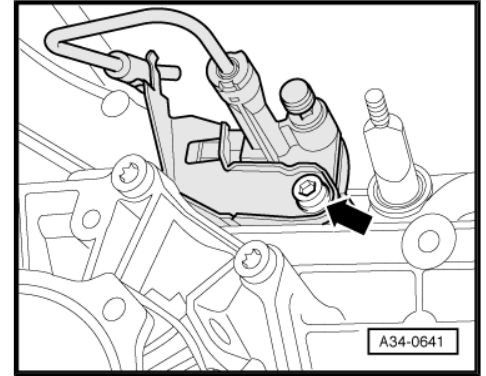


- Secure clutch slave cylinder with new bolt -arrow-. Tightening torque ➔ [Item 13 \(page 28\)](#)



Caution

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



- When aligning the gearbox with the engine, turn crankshaft back and forth slightly to make it easier to insert the gearbox input shaft splines into the clutch plate.
- Bolt gearbox onto engine.

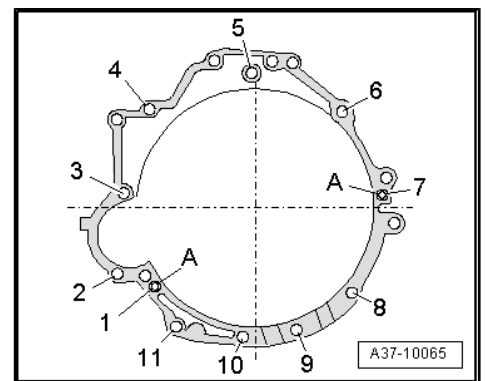


Note

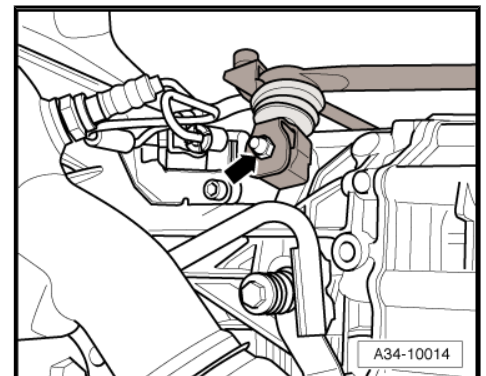
- ◆ *Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.*
- ◆ *Additional lubricant such as engine or gear oil may be used, but do not use graphite lubricant.*
- ◆ *Do not use parts which have been degreased.*
- ◆ *Tolerance for tightening torques is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

Engine/gearbox securing bolts

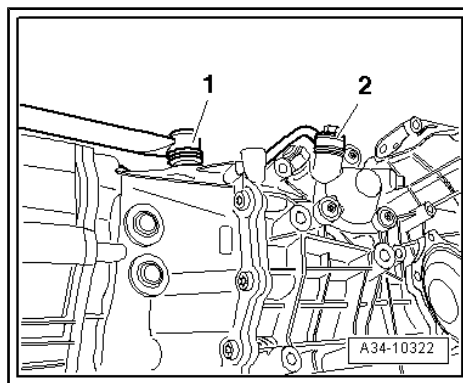
Item	Bolt	Nm
1, 6	M12 x 105	65
2, 4	M12 x 80	65
3	M12 x 90	65
5, 7	M12 x 95	65
8	M10 x 50	45
9, 10, 11	M10 x 45	45
A	Dowel sleeves for centralising	



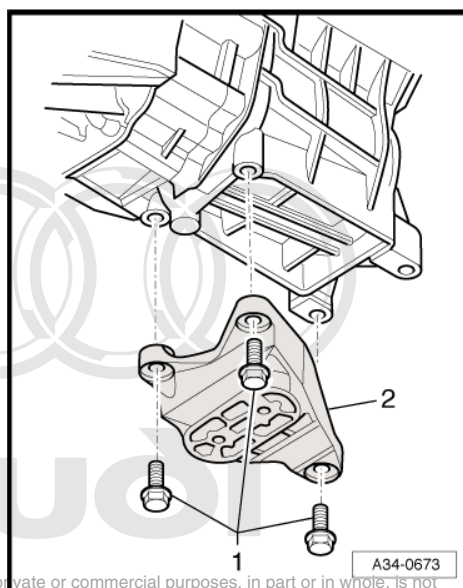
- Install gearbox selector lever and tighten nut -arrow-.



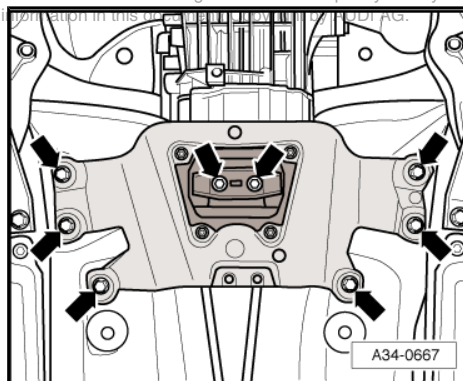
- Install push rod -1-; to do so, tighten hexagon socket head bolt.
- Secure connecting rod -2- for selector rod.



- If removed earlier, fit gearbox support -2- to gearbox and tighten bolts -1- to specified torque ⇒ [page 95](#).

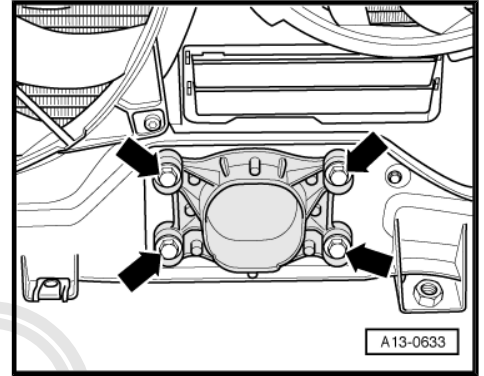


- Tighten bolts -arrows- for tunnel cross member. Tightening torques
⇒ [“3 Exploded view - tunnel cross member, gearbox mounting and gearbox support”, page 95](#)



The remaining installation steps are carried out in the reverse sequence; note the following points:

- Loosen bolts -arrows- for torque reaction support.
- Allow stop for torque reaction support to settle on rubber buffer for torque reaction support under its own weight and re-tighten bolts.
- Bolt drive shafts to flange shafts ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Fit cross member on subframe and install front cross member ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- If previously removed, install front exhaust pipe ⇒ Engine, mechanics; Rep. gr. 26 .
- Align exhaust system so it is free of stress ⇒ Engine, mechanics; Rep. gr. 26 .
- Follow steps required after connecting battery ⇒ Electrical system; Rep. gr. 27 .



Caution

Never use a charger to aid starting. Otherwise, the vehicle's control units could be damaged.

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Tightening torques



Note

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

Component	Nm
Stop for torque reaction support to lock carrier	23
Clutch slave cylinder to gearbox	23 ¹⁾
Gearbox selector lever to selector shaft	23
Push rod to gearbox	40
Connecting rod for selector rod to gearbox	23
Heat shield for drive shaft to gearbox	23
¹⁾ Renew bolt	

2.5 Removing gearbox in vehicles with V6 petrol engine

Special tools and workshop equipment required

- ◆ Gearbox support - 3282-
- ◆ Adjustment plate - 3282/43-
- ◆ Engine and gearbox jack - V.A.G 1383 A-
- ◆ Adapter - T40058-
- ◆ Grease for clutch plate splines - G 000 100-
- ◆ Copper grease (commercially available)
- ◆ 2 bolts (M10 x 20)

3282	3282-43
V.A.G 1383 A	T40058
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G34-10000	

Procedure

- Lock carrier and torque reaction support installed.



Note

All cable ties which are released or cut open during removal must be fitted in the same position when installing.

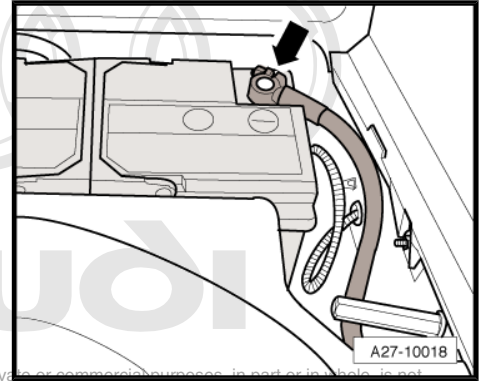


Caution

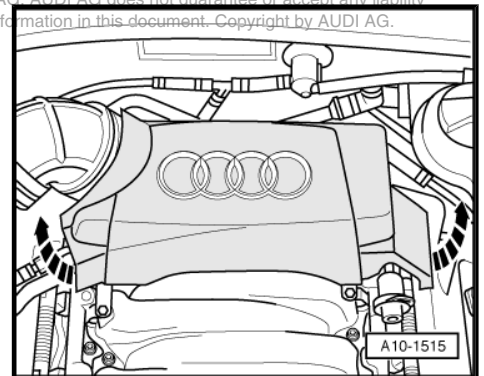
Follow steps required when disconnecting battery ⇒ Electrical system; Rep. gr. 27 .

- Switch off ignition and remove ignition key.

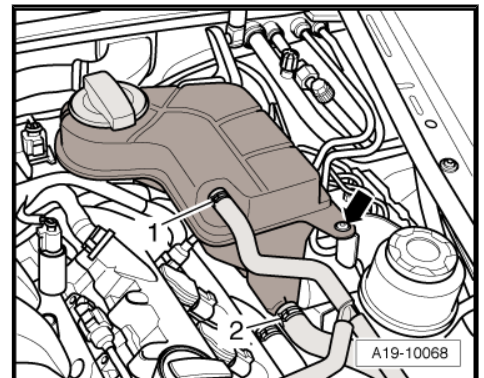
- Take out luggage compartment floor covering.
- Disconnect earth wire -arrow- at battery.



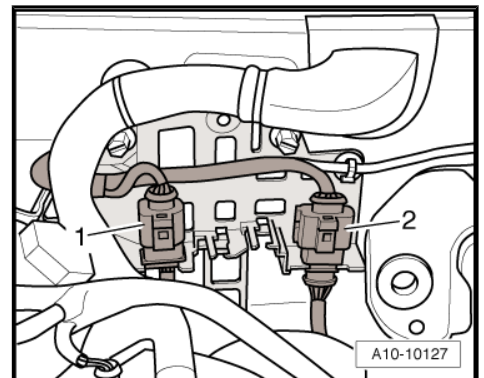
- Pull off rear engine cover panel -arrows-.



- Unbolt coolant expansion tank -arrow-.
- Unplug electrical connector for coolant shortage indicator switch - F66- at expansion tank (bottom) and move expansion tank clear to one side, with coolant hoses -1- and -2- attached.



- Unplug electrical connector -2- for Lambda probe 2 after catalytic converter - G131- and move electrical wire clear from below.



Note

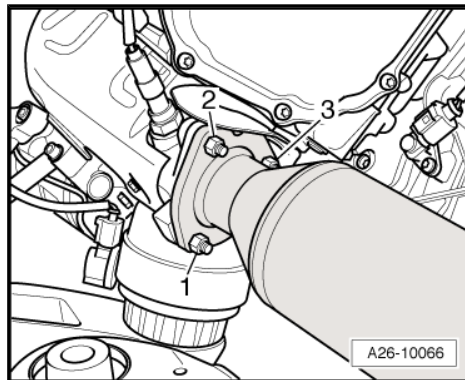
-Item 1- can be disregarded.

- Unscrew nut -2- (access from above), connecting left front exhaust pipe with exhaust manifold.

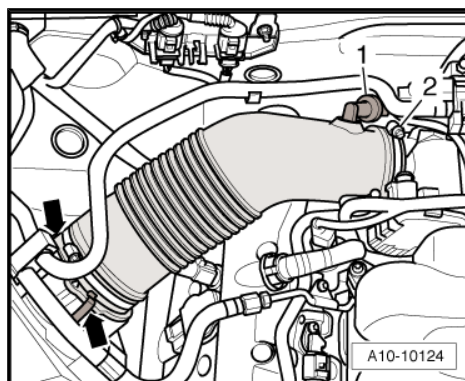


Note

For illustration purposes here shown from rear, with engine removed.



- Pull non-return valve -1- off air intake hose.
- Slacken hose clip -2- and release clamps -arrows- to remove air intake hose.

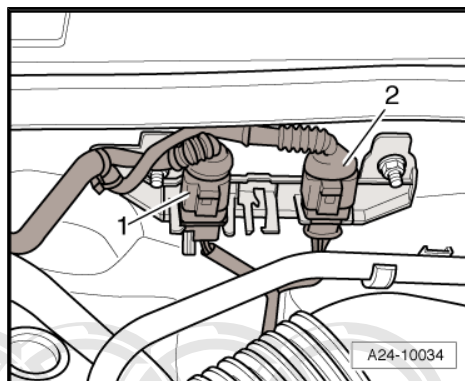


- Unplug electrical connector -2- for Lambda probe after catalytic converter - G130- and move electrical wire clear from below.



Note

-Item 1- can be disregarded.

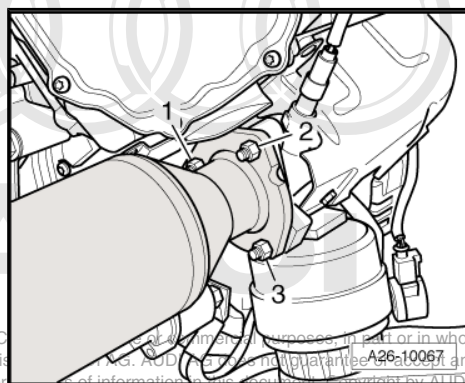


- Unscrew nut -2- (access from above), connecting right front exhaust pipe with exhaust manifold.



Note

For illustration purposes here shown from rear, with engine removed.



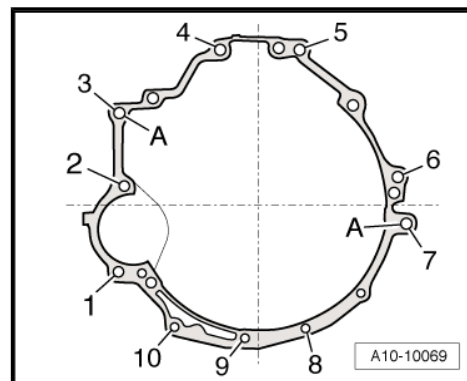
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- Remove bolts accessible from above -4- and -5-.
- Remove both front wheels.

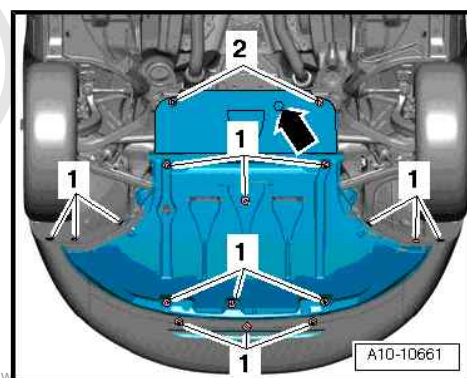


Note

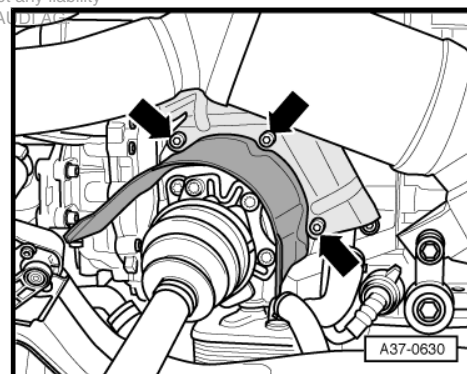
Secure brake discs with wheel bolts.



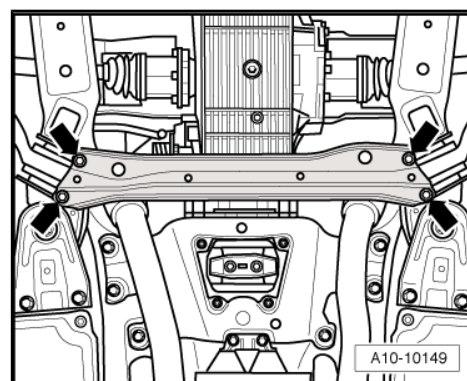
- Release fasteners marked -1-, -2- and -arrow- (if fitted) and remove noise insulation panels.



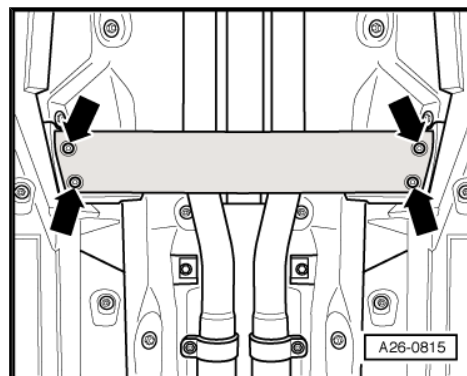
- Unbolt heat shields for drive shafts (left and right) from gearbox -arrows-.



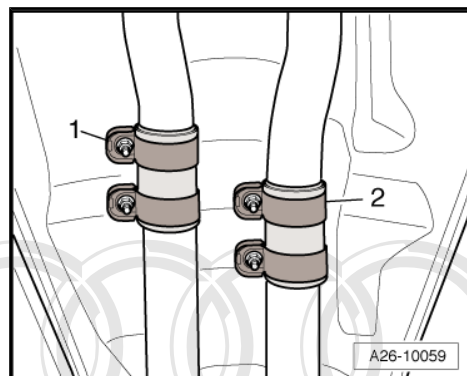
- Unscrew cross member from subframe -arrows-.



- Remove front cross member -arrows-.



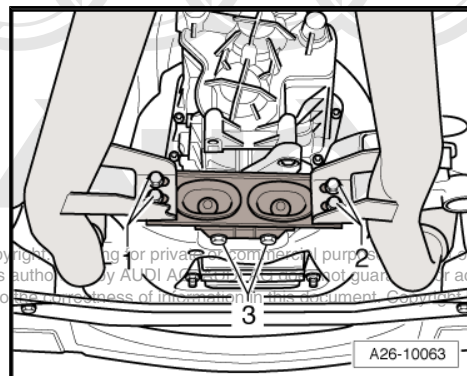
Disconnect exhaust system at clamps -1- and -2-.



Note

The flexible pipe connection (de-coupling element) on the front exhaust pipe must not be bent more than 10° – otherwise it can be damaged.

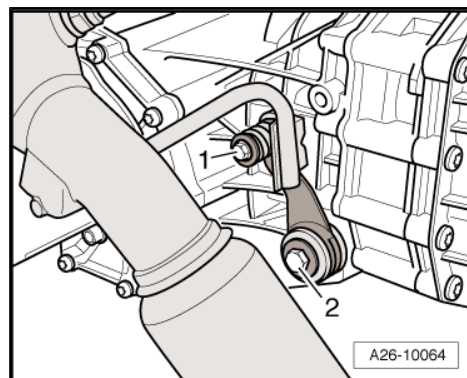
- Unscrew bolts -1- and -2- at rear bracket for front exhaust pipes.



Note

-Item 3- can be disregarded.

- Unscrew bolts -1- and -2- and remove front exhaust pipe bracket (left-side).



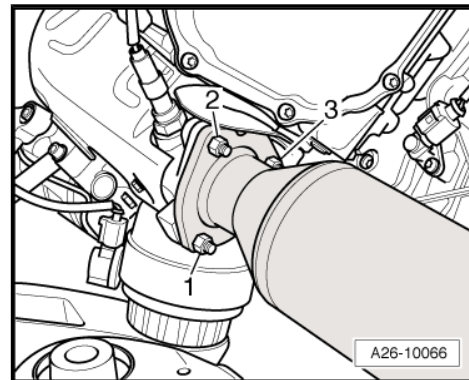
- Unscrew nuts -1- and -3- (accessible from below) connecting front exhaust pipe to exhaust manifold.



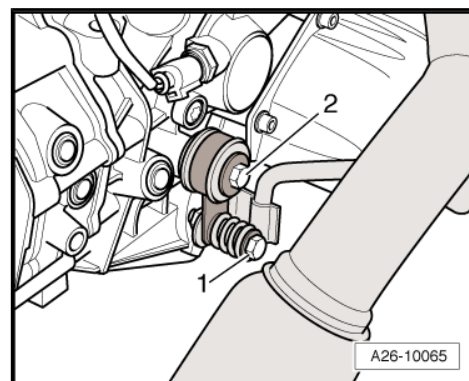
Note

For illustration purposes here shown with engine removed.

- Remove front exhaust pipe (left-side) with catalytic converter.



- Unscrew bolts -1- and -2- and remove front exhaust pipe bracket (right-side).



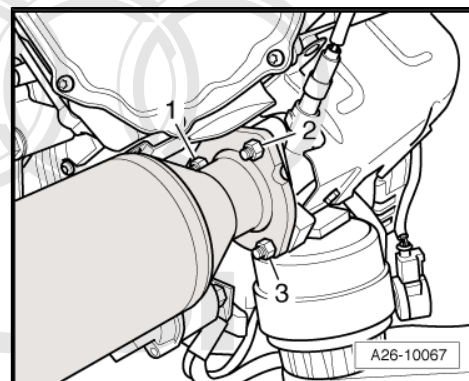
- Unscrew nuts -1- and -3- (accessible from below) connecting front exhaust pipe to exhaust manifold.



Note

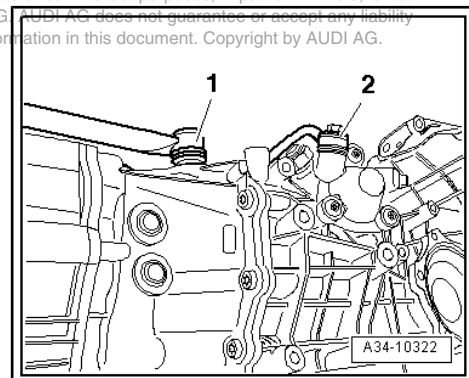
For illustration purposes here shown with engine removed.

- Remove front exhaust pipe (right-side) with catalytic converter.
- Unbolt drive shafts (left and right) from gearbox flange shafts.

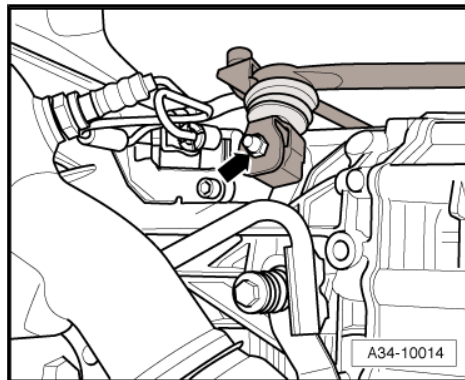


- Unscrew connecting rod -2- for selector rod.
- Unscrew push rod -1-, using an 8 mm hexagon key when unscrewing bolt.

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- Unscrew nut -arrow- and detach gearbox selector lever from selector shaft.

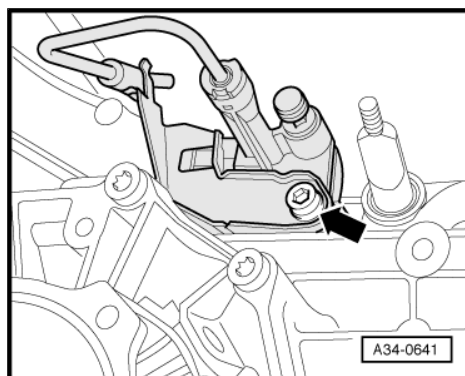


- Remove clutch slave cylinder -arrow- and tie up with wire. Do not disconnect hoses/pipes.

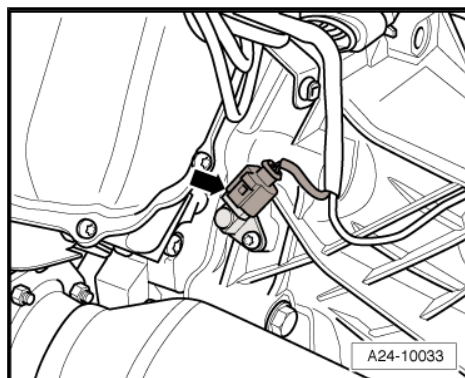


Caution

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



- Unplug connector for engine speed sender - G28- on left side of gearbox -arrow-.

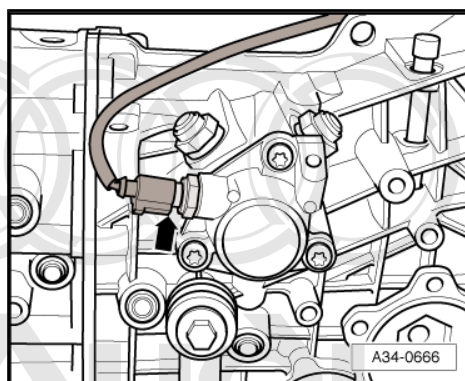


- Unplug electrical connector -arrow- for reversing light switch - F4- and move electrical wire clear.



WARNING

The lock carrier must remain installed throughout the following procedure; it must not be moved to the service position.

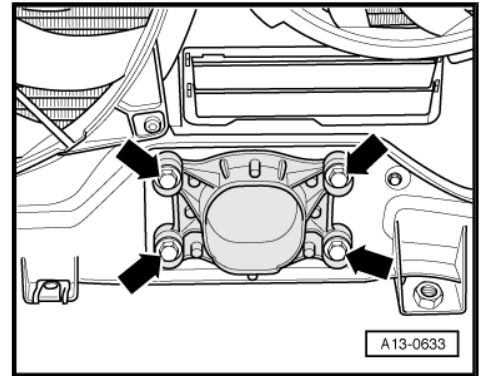


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- Slacken bolts -arrows- at stop for torque reaction support.
- Press stop for torque reaction support upwards and tighten bolts again.

 Note

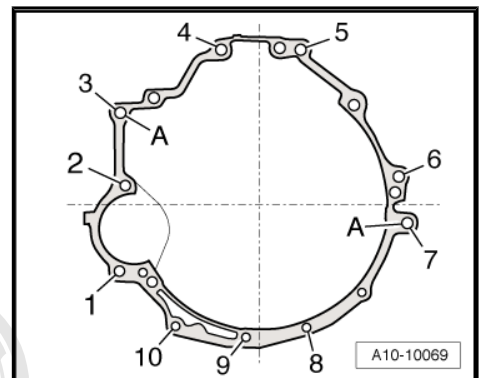
Adjusting the stop for torque reaction support prevents the engine from tilting at the front after the gearbox is removed.



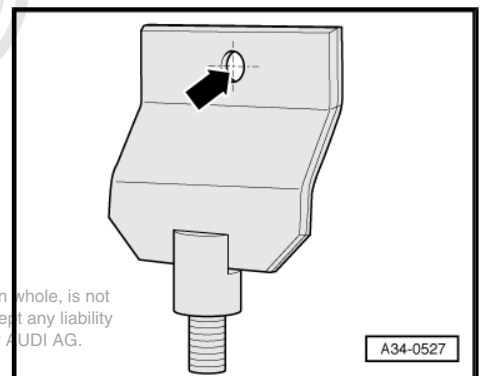
- Remove bolts -1-, -2- and -7 ... 10-.

 Note

Bolts -3- and -6- remain screwed in hand-tight.



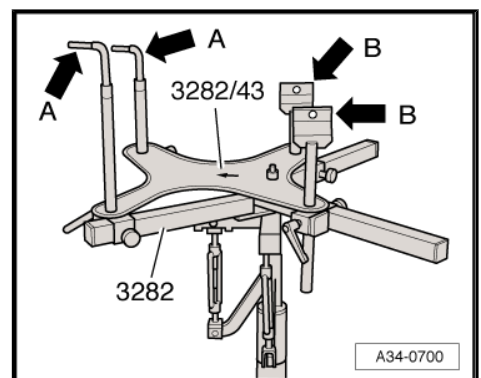
- If not already provided, drill a hole of 10.2 mm Ø -arrow- in the support elements of gearbox support - 3282- .



- To remove manual gearbox 01X, set up gearbox support - 3282- with adjustment plate - 3282/43- and place on engine and gearbox jack - V.A.G 1383 A- .

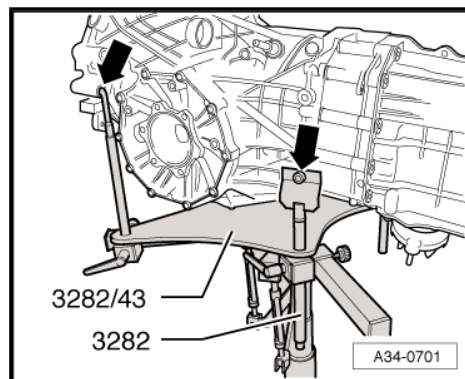
 Note

- ◆ *The support elements -arrows A- and -arrows B- are shown in schematic form on the adjustment plate . The arrow on the adjustment plate points in the direction of travel.*
- ◆ *Adjustment plate can only be fitted in one correct position.*



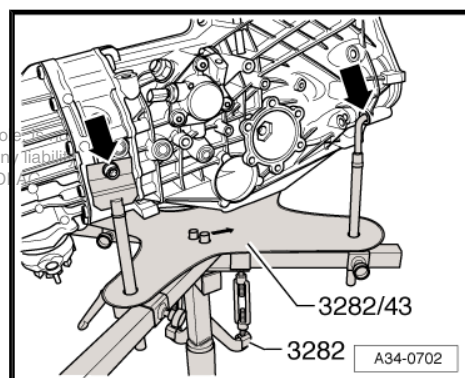
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- Align the adjustment plate parallel to the gearbox.
- Secure support elements to left side of gearbox, as shown in illustration. Tighten bolt (M10 x 20) -arrow on right side- to 20 Nm.



- Secure support elements to right side of gearbox, as shown in illustration. Tighten bolt (M10 x 20) -arrow on left side- to 20 Nm.

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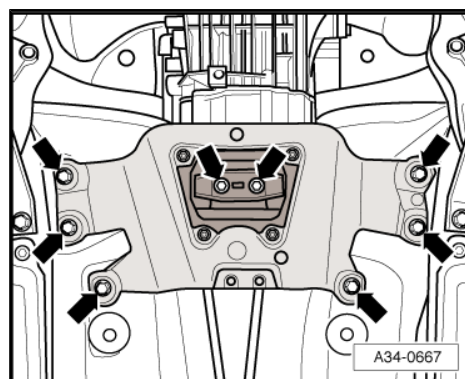
- Unscrew bolts -arrows- and detach tunnel cross member with gearbox mounting.
- Remove the last two engine/gearbox securing bolts.
- Unseat gearbox from dowel sleeves and lower carefully with engine and gearbox jack - V.A.G 1383 A- .



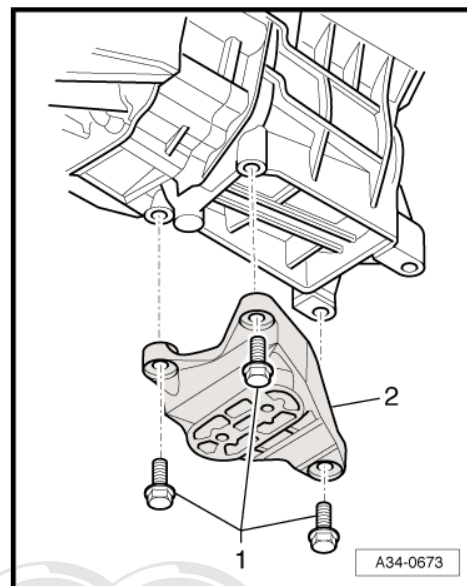
Note

When lowering gearbox, make sure there is sufficient clearance for drive shafts.

- Before carrying out assembly work, secure gearbox to assembly stand or engine and gearbox support - VAS 6095- , using engine and gearbox support - VW 540- ➔ [page 100](#) .



- If the removed gearbox is being renewed, the gearbox support -2- must be transferred to the replacement gearbox -bolts 1- [⇒ page 95](#) .



2.6 Installing gearbox in vehicles with V6 petrol engine

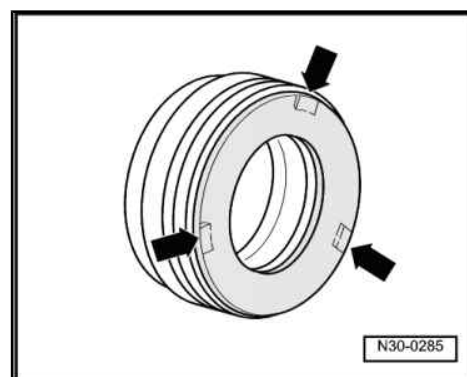


Note

- ◆ *Renew self-locking nuts and bolts when performing assembly work.*
- ◆ *Re-attach all cable ties at the same locations when re-installing.*

Observe the general repair instructions [⇒ page 7](#).
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- Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease for clutch plate splines - G 000 100- to the splines. Do not grease the guide sleeve.
- It should be possible to push the clutch plate back and forth slightly on the input shaft.
- Check clutch release bearing for wear and renew if necessary [⇒ page 29](#) .
- Check that dowel sleeves for centralising engine/gearbox are in the cylinder block, install if necessary.
- Place intermediate plate on dowel sleeves at engine flange.
- Before installing gearbox, tie electrical wiring off to one side so that it cannot be trapped between the engine and the gearbox.

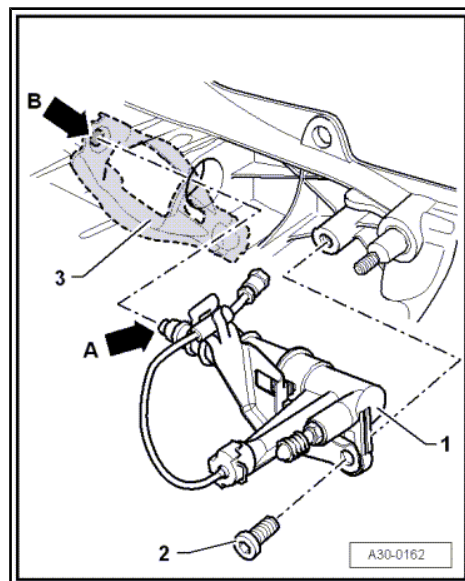


- Lightly lubricate surface where plunger and clutch release lever make contact -arrow B- using copper grease (commercially available).
- Raise gearbox far enough to be able to install clutch slave cylinder with bracket for pipe/hose assembly.
- Guide slave cylinder -1- into opening in gearbox housing,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



Note

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

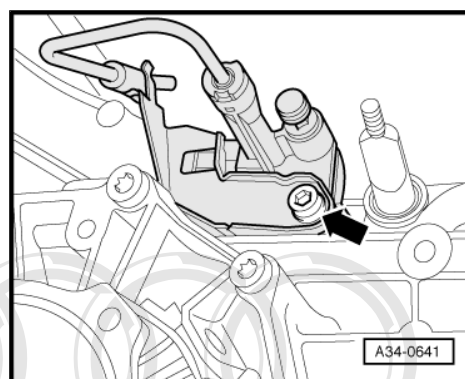


- Secure clutch slave cylinder with new bolt -arrow-. Tightening torque ⇒ [Item 13 \(page 28\)](#)



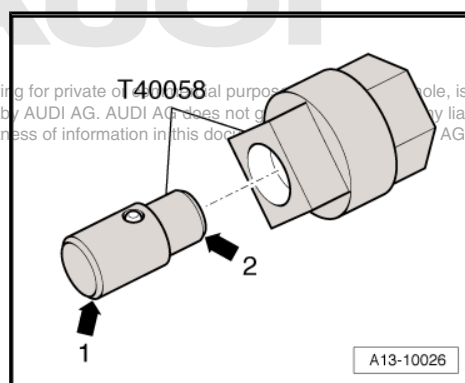
Caution

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



- Insert guide pin of adapter - T40058- so that the large diameter -arrow 1- faces engine. The smaller diameter -arrow 2- faces adapter.

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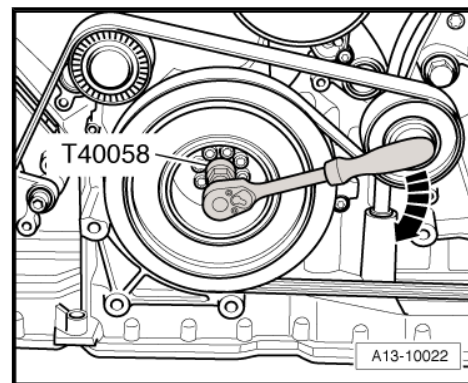


- When joining gearbox with engine, turn crankshaft backwards and forwards using adapter - T40058- to help splines on input shaft engage in clutch plate.
- Bolt gearbox onto engine.



Note

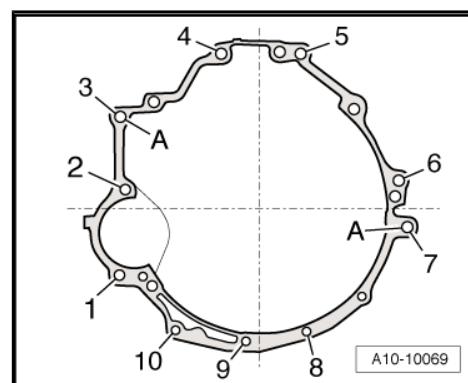
- ◆ Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.
- ◆ Additional lubricant such as engine or gear oil may be used, but do not use graphite lubricant.
- ◆ Do not use parts which have been degreased.
- ◆ Tolerance for tightening torques is $\pm 15\%$.



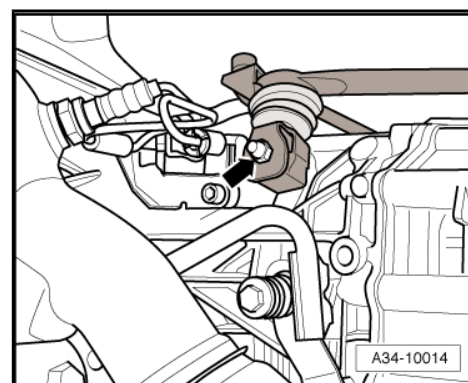
Engine/gearbox securing bolts

Item	Bolt	Nm
1	M12 x 130	65
2	M12 x 140	65
3, 4, 5	M12 x 105	65
6	M12 x 120	65
7	M10 x 150	65 ¹⁾
8, 9, 10	M10 x 70	45
A	Dowel sleeves for centralising	

¹⁾ Property class 10.9.

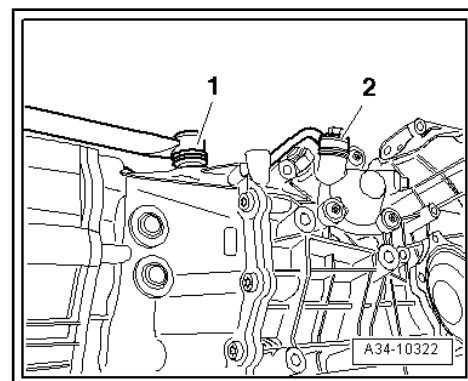


- Install gearbox selector lever and tighten nut -arrow-.

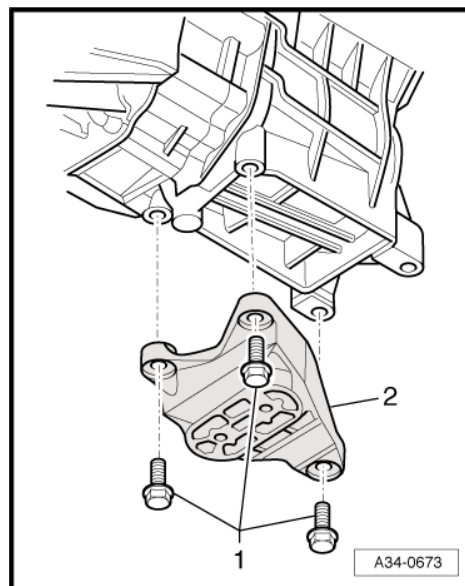


- Install push rod -1-; to do so, tighten hexagon socket head bolt.
- Secure connecting rod -2- for selector rod.

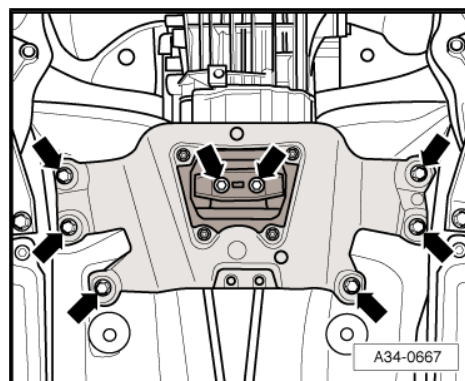
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- If removed earlier, fit gearbox support -2- to gearbox and tighten bolts -1- to specified torque ⇒ [page 95](#) .

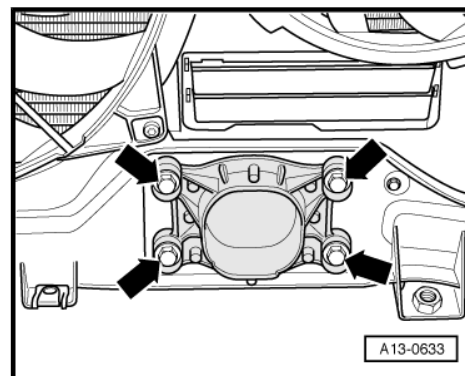


- Tighten bolts -arrows- for tunnel cross member. Tightening torques
⇒ [“3 Exploded view - tunnel cross member, gearbox mounting and gearbox support”, page 95](#)



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- Loosen bolts -arrows- for torque reaction support.
- Allow stop for torque reaction support to settle on rubber buffer for torque reaction support under its own weight and re-tighten bolts.
- Bolt drive shafts to flange shafts ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Install front exhaust pipes and ensure stress-free alignment of exhaust system ⇒ Engine, mechanics; Rep. gr. 26 .
- Fit cross member on subframe and install front cross member ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Follow steps required after connecting battery ⇒ Electrical system; Rep. gr. 27 .



Caution

Never use a charger to aid starting. Otherwise, the vehicle's control units could be damaged.

Tightening torques



Note

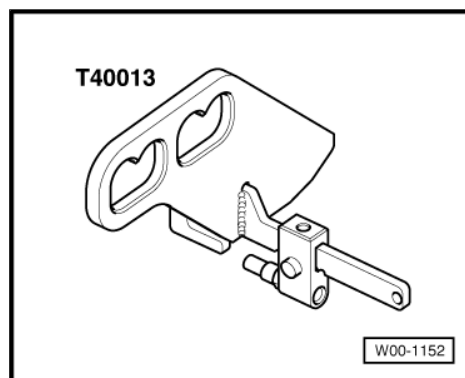
- ◆ *Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.*
- ◆ *Additional lubricant such as engine or gear oil may be used, but do not use graphite lubricant.*
- ◆ *Do not use parts which have been degreased.*
- ◆ *Tolerance for tightening torques is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

Component	Nm
Stop for torque reaction support to lock carrier	23
Clutch slave cylinder to gearbox	23 ¹⁾
Gearbox selector lever to selector shaft	23
Push rod to gearbox	40
Connecting rod for selector rod to gearbox	23
Heat shields above drive shafts to gearbox	23
¹⁾ Renew bolt	

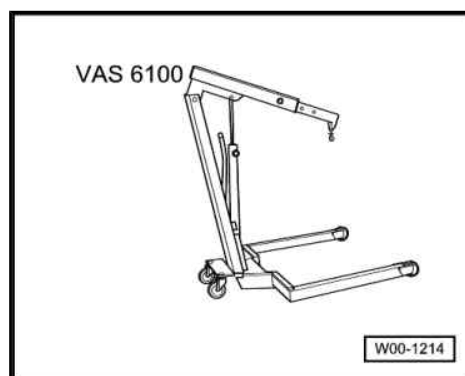
2.7 Transporting gearbox

Special tools and workshop equipment required

◆ Lifting aid - T40013-

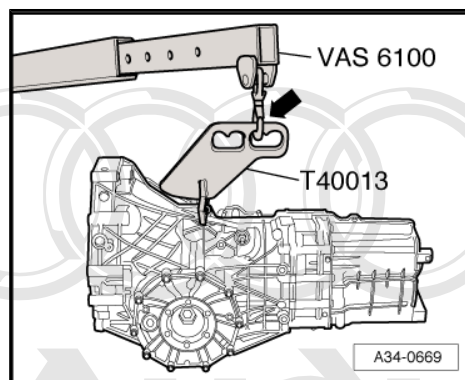


◆ Workshop hoist - VAS 6100-



Procedure

- Insert lifting aid - T40013- in lifting eye on gearbox and secure.
- Engage hook of workshop hoist - VAS 6100- in 3rd notch -arrow- on lifting aid .
- Lift gearbox with workshop hoist - VAS 6100- and lifting aid - T40013- .



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3 Exploded view - tunnel cross member, gearbox mounting and gearbox support

1 - Manual gearbox

2 - Gearbox support

Removing and installing
⇒ [page 95](#)

3 - Bolt

- ☐ 23 Nm
- ☐ For securing gearbox support to gearbox

4 - Gearbox mounting

Removing and installing
⇒ [page 95](#)

5 - Bolt

- ☐ 23 Nm
- ☐ For securing gearbox mounting to gearbox support

6 - Tunnel cross member

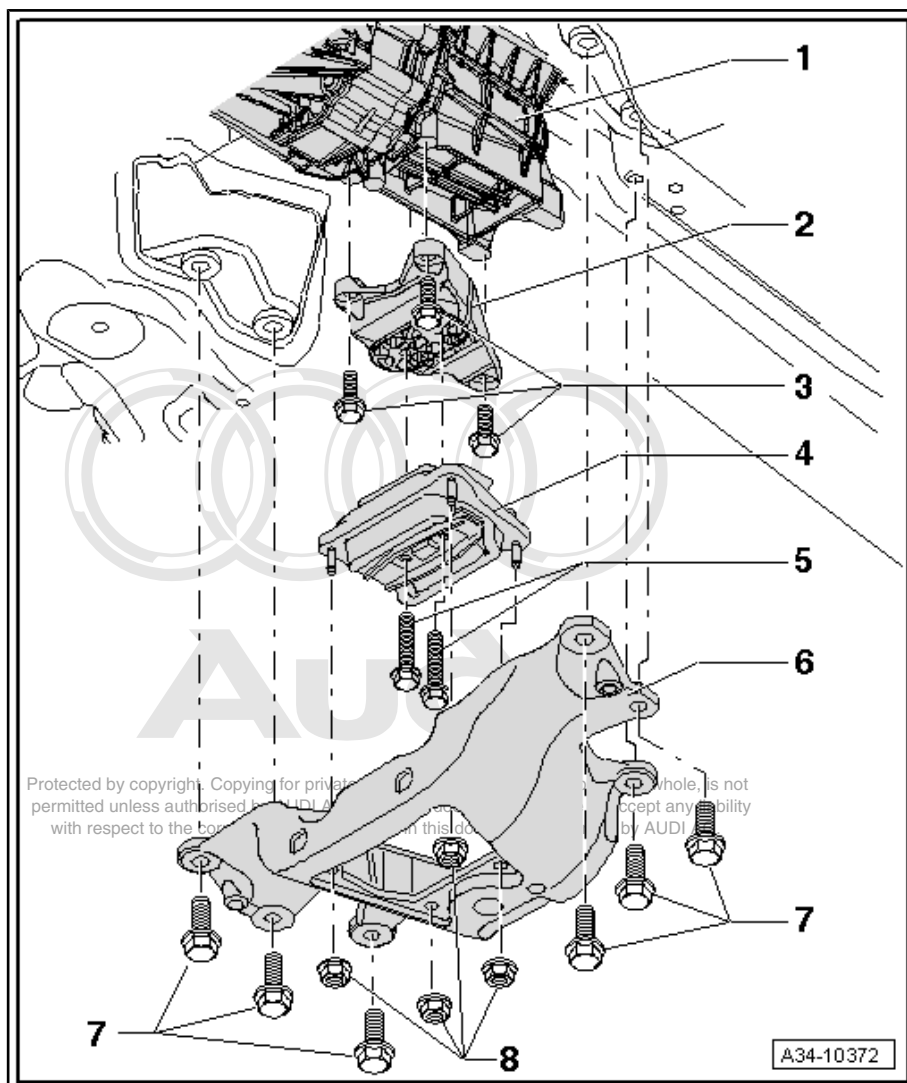
Removing and installing
⇒ [page 95](#)

7 - Bolt

- ☐ 50 Nm
- ☐ For securing tunnel cross member to body

8 - Nut

- ☐ 23 Nm
- ☐ For securing tunnel cross member to gearbox mounting

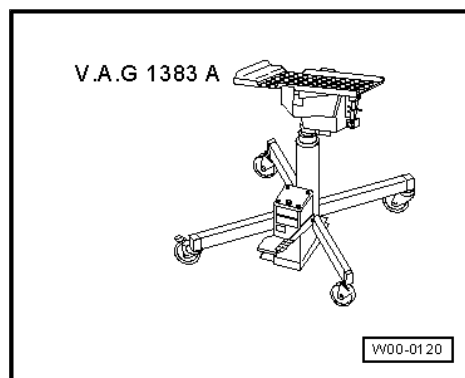


3.1 Removing and installing tunnel cross member, gearbox mounting and gearbox support

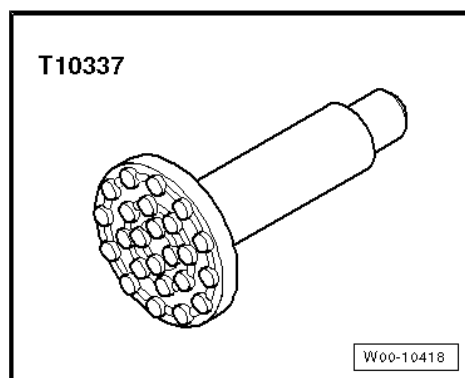
Special tools and workshop equipment required



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



◆ Gearbox support - T10337-



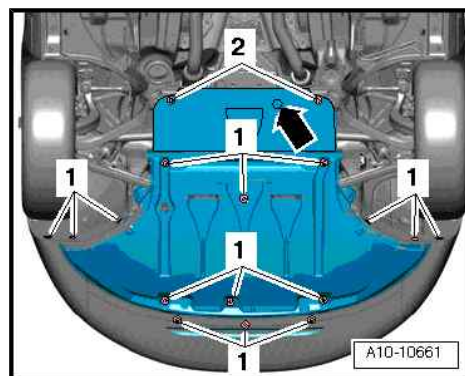
Removing

- Remove rear noise insulation (loosen fasteners -2-).

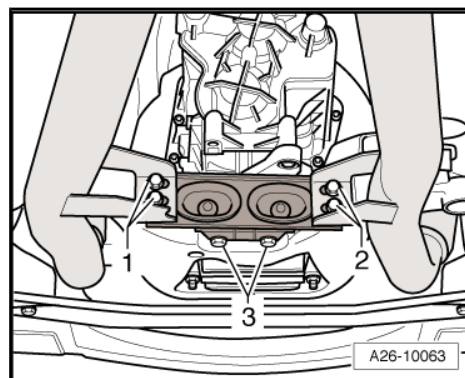


Note

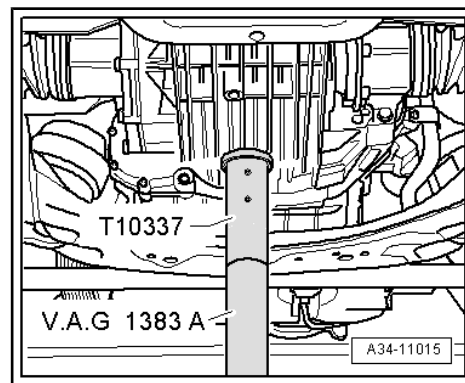
Items marked -1- and -arrow- can be disregarded.



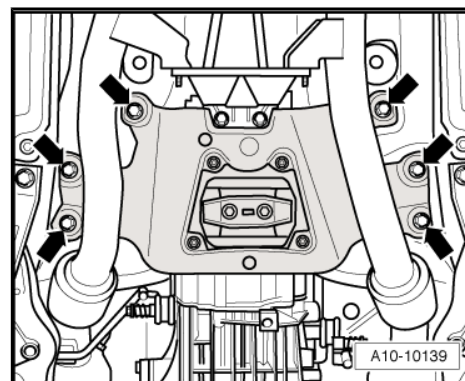
- Remove bolts -1 ... 3- and detach brackets for front exhaust pipes from tunnel cross member.



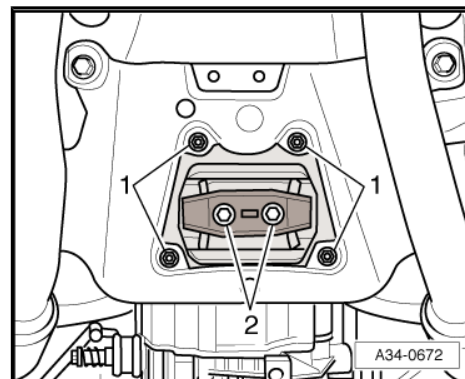
- Apply lifting column of engine and gearbox jack - V.A.G 1383 A- to gearbox from below (with gearbox support - T10337- attached).
- Use engine and gearbox jack - V.A.G 1383 A- to lift gearbox up slightly.



- Remove bolts -arrows- securing tunnel cross member to body.



- Remove nuts -1- and bolts -2- and move tunnel cross member slightly towards rear.
- Remove gearbox mounting between gearbox support and tunnel cross member.



- Remove bolts -1- and detach gearbox support -2- from gearbox.

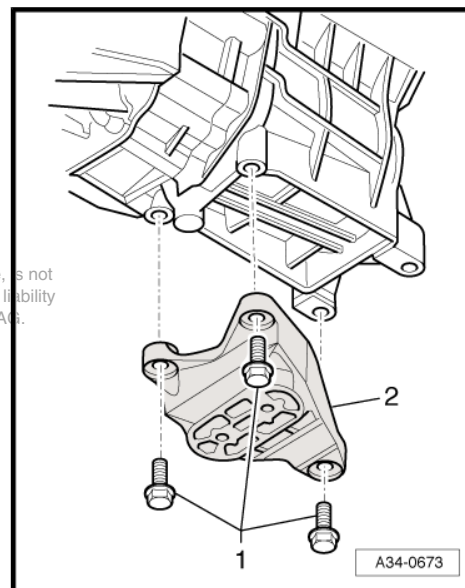
Installing

Perform installation in reverse sequence of removal.

Tightening torques

⇒ **“3 Exploded view - tunnel cross member, gearbox mounting and gearbox support”, page 95**

Component	Nm
Bracket for front exhaust pipes to gearbox	23
Front exhaust pipes to bracket	23



4 Checking oil level in manual gearbox

Procedure



Note

The vehicle must be horizontal when checking gear oil level.

- Release fasteners marked -1-, -2- and -arrow- (if fitted) and remove noise insulation panels.
- Remove front left wheel.

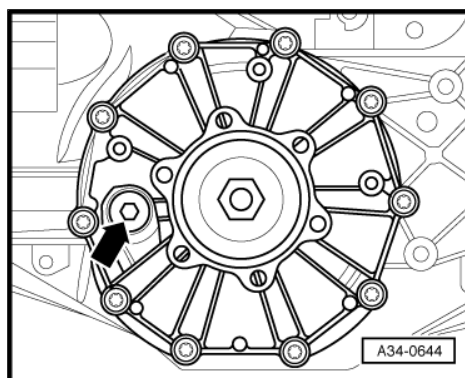
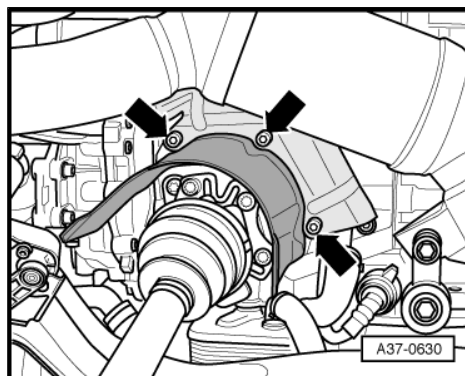
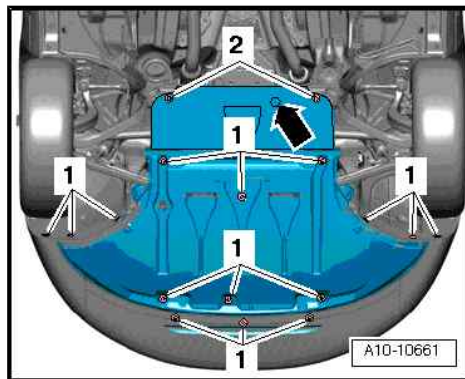


Note

Secure brake disc with one wheel bolt.

- If fitted, unscrew heat shield -arrows- for drive shaft (left side).

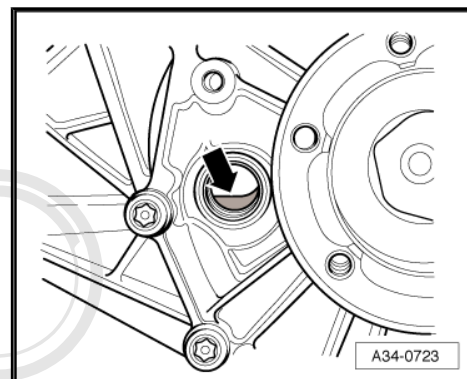
- Remove oil filler plug -arrow-.



- Specification: oil level up to bottom lip of filler hole -arrow-.
- Top up gear oil if necessary. Specifications ⇒ Electronic parts catalogue
- Tighten oil filler plug to specified torque.

Note the following when filling with new oil:

- Fill gearbox oil up to bottom lip of filler hole.
- Screw in oil filler plug.
- Start engine.
- Let gearbox turn for approx. 2 minutes without pressing clutch pedal.
- Switch off engine and remove oil filler plug.
- Top up gearbox oil again to bottom lip of filler hole.
- Tighten oil filler plug to specified torque.



Tightening torques

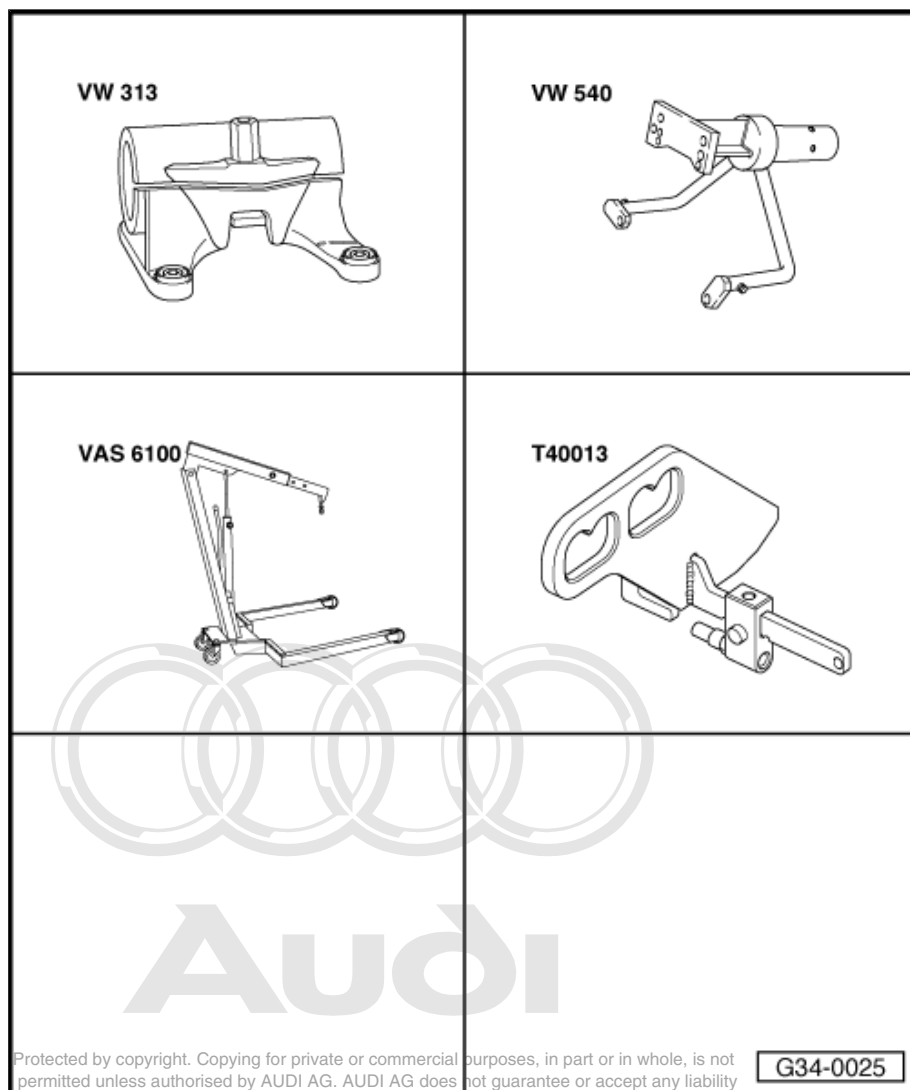
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Component	Nm
Oil filler plug	45
Heat shield above drive shaft to gearbox	23

5 Mounting gearbox on assembly stand

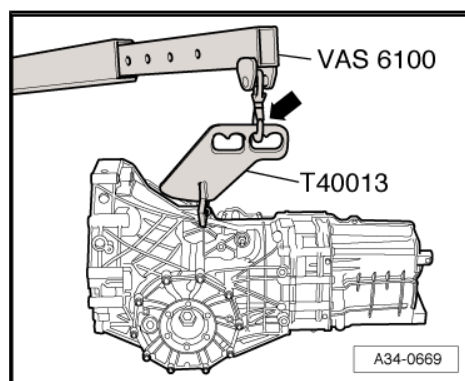
Special tools and workshop equipment required

- ◆ Support clamp - VW 313-
- ◆ Engine and gearbox support - VW 540-
- ◆ Workshop hoist - VAS 6100-
- ◆ Lifting aid - T40013-

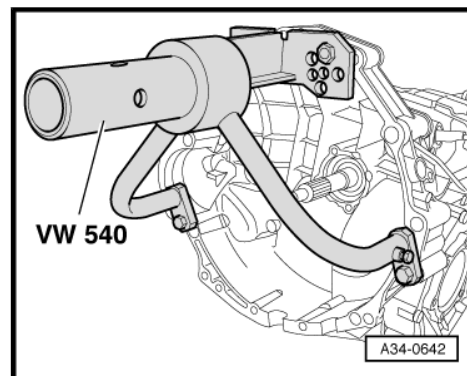


Procedure

- Insert lifting aid - T40013- in lifting eye on gearbox and secure.
- Engage hook of workshop hoist - VAS 6100- in 3rd notch -arrow- on lifting aid - T40013- .
- Lift gearbox with workshop hoist - VAS 6100- and lifting aid - T40013- .



- Secure engine and gearbox support - VW 540- to gearbox and fit into support clamp - VW 313- or engine and gearbox support - VAS 6095- .



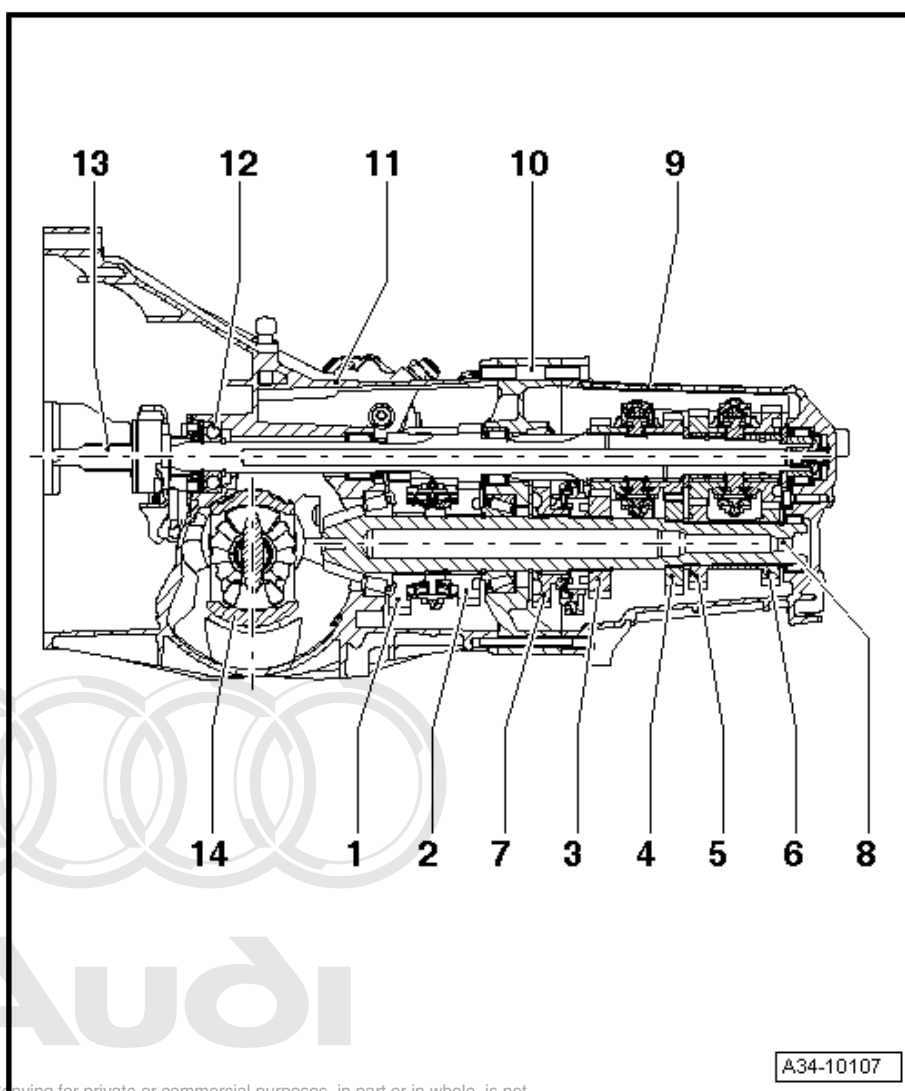
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6 Dismantling and assembling gearbox

- ◆ ⇒ [“6.1 General layout of gearbox”, page 102](#)
- ◆ ⇒ [“6.2 Exploded view”, page 103](#)
- ◆ ⇒ [“6.3 Exploded view - removing and installing ball bearing for input shaft, gearbox cover, bearing housing and selector shaft”, page 103](#)
- ◆ ⇒ [“6.4 Exploded view - removing and installing 3rd to 6th gear”, page 106](#)
- ◆ ⇒ [“6.5 Exploded view - removing and installing input shaft, output shaft, reverse gear wheel and reverse selector gear”, page 108](#)
- ◆ ⇒ [“7 Assembly sequence - dismantling and assembling gearbox”, page 111](#)

6.1 General layout of gearbox

- 1 - 1st gear
- 2 - 2nd gear
- 3 - 3rd gear
- 4 - 4th gear
- 5 - 5th gear
- 6 - 6th gear
- 7 - Reverse gear
- 8 - Pinion shaft (output shaft)
- 9 - Gearbox cover
- 10 - Bearing housing
- 11 - Gearbox housing
- 12 - Ball bearing
 - For input shaft
- 13 - Input shaft (main shaft)
- 14 - Differential



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6.2 Exploded view

Sequence for dismantling and assembling

⇒ ["7 Assembly sequence - dismantling and assembling gearbox", page 111](#)

1 - Gearbox housing with differential, ball bearing for input shaft and selector shaft

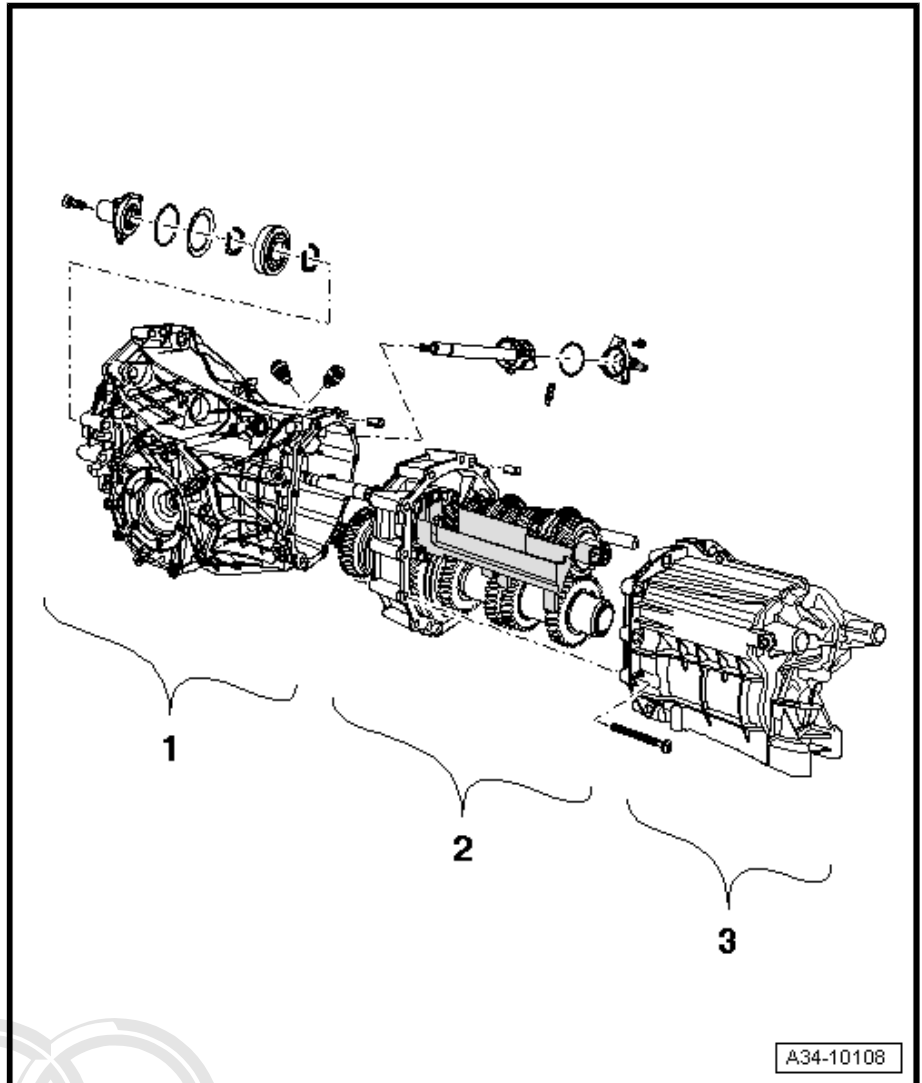
- ☐ Removing and installing ball bearing for input shaft, gearbox cover, bearing housing and selector shaft
⇒ [page 103](#)
- ☐ Removing and installing differential ⇒ [page 192](#)
- ☐ Servicing gearbox housing ⇒ [page 144](#)

2 - Bearing housing with gear cluster

- ☐ Removing and installing 3rd to 6th gear
⇒ [page 106](#)
- ☐ Removing and installing input shaft, output shaft with selector gear for 1st and 2nd gear, reverse gear wheel and reverse selector gear
⇒ [page 108](#)

3 - Gearbox cover

- ☐ Servicing ⇒ [page 133](#)



6.3 Exploded view - removing and installing ball bearing for input shaft, gearbox cover, bearing housing and selector shaft

Sequence for dismantling and assembling

⇒ ["7 Assembly sequence - dismantling and assembling gearbox", page 111](#)

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1 - TORX bolt

- ☐ 35 Nm
- ☐ 3x
- ☐ Apply locking fluid - AMV 185 101 A1- when fitting

2 - Guide sleeve

- ☐ With oil seal
- ☐ Removing
⇒ ["7 Assembly sequence - dismantling and assembling gearbox", page 111](#)
- ☐ Installing
⇒ ["7.2 Assembling gearbox", page 123](#)

3 - O-ring

- ☐ Always renew

4 - Dished spring

- ☐ Smaller diameter (convex side) faces guide sleeve
⇒ [Item 2 \(page 104\)](#) .

5 - Circlip

- ☐ Note thickness
- ☐ Re-determining thickness
⇒ ["1.3 Adjusting input shaft", page 164](#)

6 - Ball bearing

- ☐ Removing
⇒ ["7 Assembly sequence - dismantling and assembling gearbox", page 111](#)
- ☐ Installing ⇒ ["7.2 Assembling gearbox", page 123](#)

7 - Circlip

- ☐ Note thickness
- ☐ Re-determining thickness ⇒ ["1.3 Adjusting input shaft", page 164](#)

8 - Locking bolt

- ☐ 45 Nm
- ☐ 2x
- ☐ Apply locking fluid - AMV 185 101 A1- when fitting

9 - Dowel sleeve

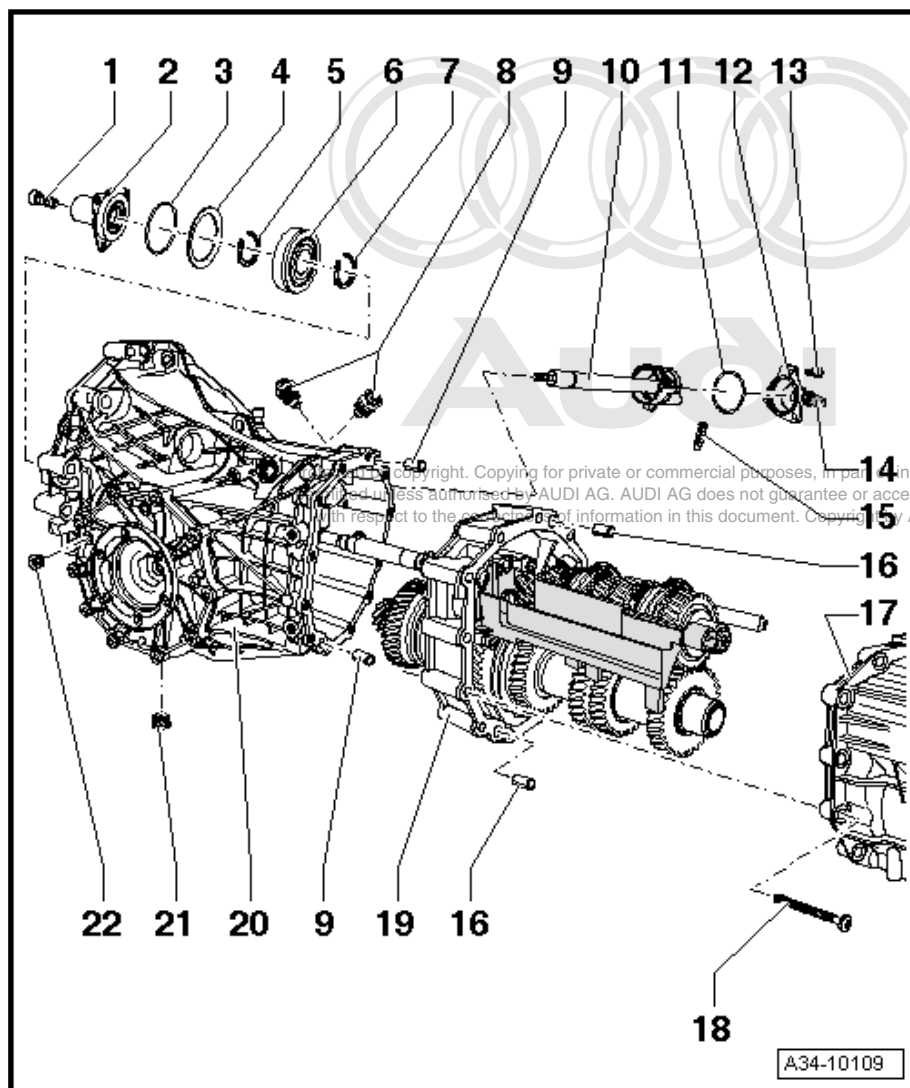
- ☐ 2x
- ☐ Insert in gearbox housing
- ☐ Remove and install with drift - 3121-

10 - Selector shaft with selector cylinder

- ☐ Removing ⇒ ["7 Assembly sequence - dismantling and assembling gearbox", page 111](#)
- ☐ Installing ⇒ ["7.2 Assembling gearbox", page 123](#)

11 - O-ring

- ☐ For selector shaft cover
- ☐ Always renew



- ☐ Lubricate with gear oil

12 - Selector shaft cover

- ☐ With reversing light switch - F4-
- ☐ Removing ⇒ [“7 Assembly sequence - dismantling and assembling gearbox”, page 111](#)
- ☐ Installing ⇒ [“7.2 Assembling gearbox”, page 123](#)

13 - Bolt

- ☐ 24 Nm
- ☐ 3x
- ☐ Apply locking fluid - AMV 185 101 A1- when fitting

14 - Reversing light switch - F4- , 20 Nm

15 - Pin

- ☐ For selector shaft stop
- ☐ Insert in gearbox housing
- ☐ Installation position: groove on threaded pin points towards selector shaft cover

16 - Dowel sleeve

- ☐ 2x
- ☐ Insert in bearing housing
- ☐ Remove and install with drift - 3121-

17 - Gearbox cover

- ☐ Servicing ⇒ [page 133](#)



Note

If only the gearbox cover is removed for technical purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

If only the gearbox cover is removed from the gearbox, the bearing housing ⇒ Item 19 (page 105) must be removed as well so that new sealant can be applied between the gearbox housing and the bearing housing.

18 - Bolt

- ☐ 35 Nm and then turn 90° further
- ☐ 12x

19 - Bearing housing

- ☐ Removing and installing 3rd to 6th gear ⇒ [page 106](#)
- ☐ Removing and installing input shaft, output shaft with selector gear for 1st and 2nd gear, reverse gear wheel and reverse selector gear ⇒ [page 108](#)
- ☐ Servicing ⇒ [page 138](#)

20 - Gearbox housing

- ☐ With differential and flange shafts
- ☐ Removing and installing differential ⇒ [page 192](#)
- ☐ Servicing gearbox housing ⇒ [page 144](#)

21 - Oil drain plug

- ☐ 45 Nm

22 - Oil filler plug

- ☐ 45 Nm

6.4 Exploded view - removing and installing 3rd to 6th gear

Sequence for dismantling and assembling

⇒ **"7 Assembly sequence - dismantling and assembling gearbox",
page 111**



Note

3rd to 6th speed selector gears should have an axial play of 0.20 ... 0.50 mm after installation.

1 - Bearing housing

- ☐ With input shaft and output shaft

2 - Oil collector

- ☐ With magnet
- ☐ Clipped into reverse shaft support

3 - Circlip

- ☐ Install the thickest circlip that will still just fit.
- ☐ Re-determining thickness

⇒ **"7.2 Assembling gearbox", page 123**

4 - 6th gear wheel

- ☐ Installation position: high inside collar faces spacer sleeve

⇒ **Item 5 (page 106)**

5 - Spacer sleeve

6 - 5th gear wheel

- ☐ Installation position: high inside collar faces 4th gear wheel

7 - 4th gear wheel

- ☐ Installation position: high inside collar faces 5th gear wheel

8 - Circlip

- ☐ Install the thickest circlip that will still just fit.
- ☐ Re-determining thickness

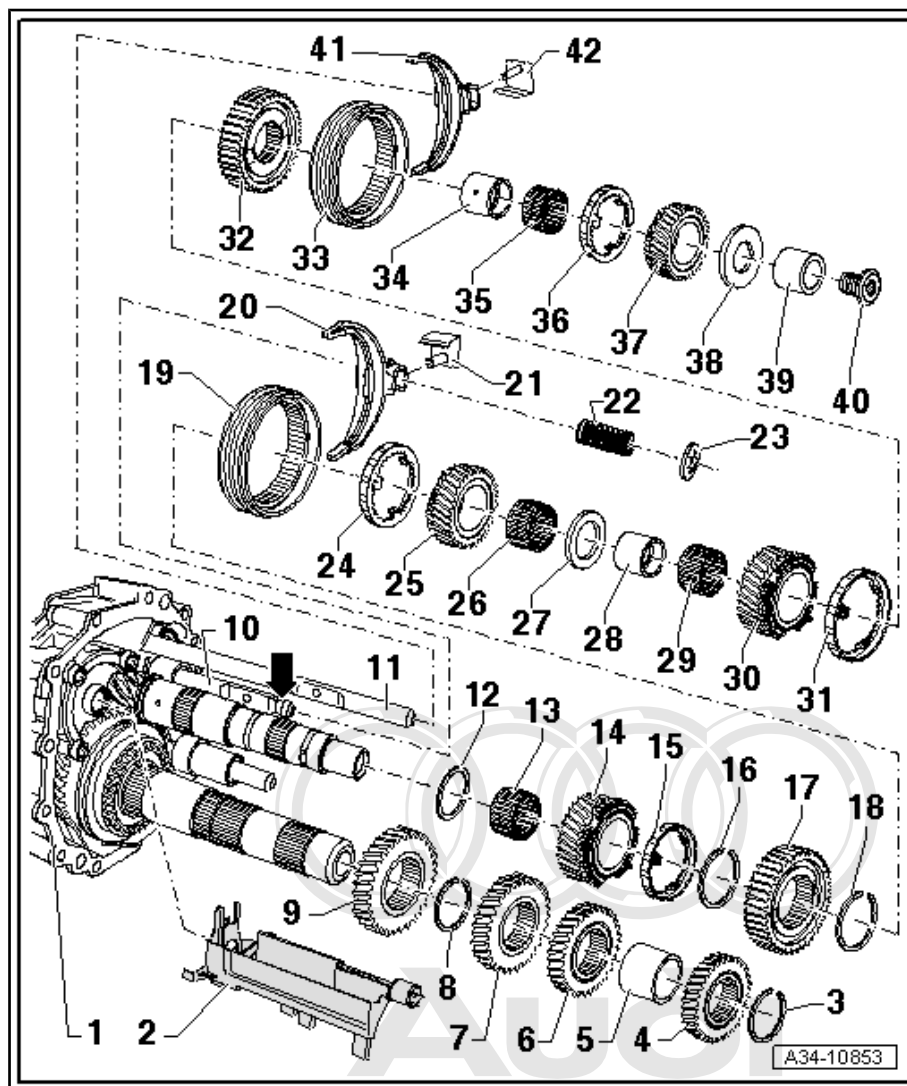
⇒ **"7.2 Assembling gearbox", page 123**

9 - 3rd gear wheel

- ☐ Installation position: machined side faces reverse gear synchro-hub

10 - Selector rod for 3rd and 4th gear

- ☐ When combined with spring-loaded selector fork, clamping washer ⇒ **Item 23 (page 107)** must engage behind shoulder -arrow-
- ☐ For correct version, refer to ⇒ Electronic parts catalogue



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11 - Selector rod for 5th and 6th gear

12 - Thrust washer

- ☐ For 3rd speed selector gear

13 - Needle bearing

- ☐ For 3rd gear

14 - 3rd speed selector gear

- ☐ Insert spring before installing ⇒ [page 163](#)
- ☐ Check axial clearance after installing using feeler gauge (0.20 ... 0.50 mm)

15 - 3rd gear synchro-ring

- ☐ Checking for wear ⇒ [page 164](#)

16 - Circlip

- ☐ Mark
- ☐ Do not interchange with other circlip ⇒ [Item 18 \(page 107\)](#)

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

- ☐ Installation position: high inside collar faces 3rd speed selector gear

18 - Circlip

- ☐ Do not interchange with other circlip ⇒ [Item 16 \(page 107\)](#)
- ☐ Re-determining thickness ⇒ ["7.2 Assembling gearbox", page 123](#)

19 - Locking collar for 3rd and 4th gear

- ☐ Mark position in relation to synchro-hub prior to removing

20 - Selector fork for 3rd and 4th gear

21 - Pin with clip

- ☐ For securing selector fork for 3rd and 4th gear to selector rod

22 - Spring

- ☐ Not fitted on all versions
- ☐ For correct version, refer to ⇒ Electronic parts catalogue

23 - Clamping washer

- ☐ Must engage below shoulder -arrow- on selector rod for 3rd and 4th gear
- ☐ Not fitted on all versions
- ☐ Always renew
- ☐ For correct version, refer to ⇒ Electronic parts catalogue

24 - 4th gear synchro-ring

- ☐ Checking for wear ⇒ [page 164](#)

25 - 4th speed selector gear

- ☐ Insert spring before installing ⇒ [page 163](#)
- ☐ Check axial clearance after installing using feeler gauge (0.20 ... 0.50 mm)

26 - Needle bearing

- ☐ For 4th gear

27 - Thrust washer

- ☐ For 4th speed and 5th speed selector gears

28 - Needle bearing inner race

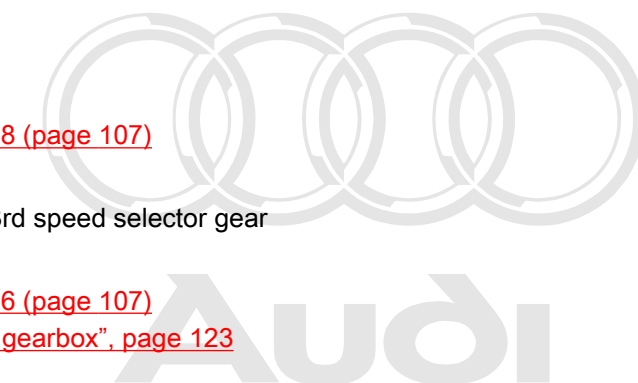
- ☐ For 5th gear

29 - Needle bearing

- ☐ For 5th gear

30 - 5th speed selector gear

- ☐ Insert spring before installing ⇒ [page 163](#)



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- ☐ Check axial clearance after installing using feeler gauge (0.20 ... 0.50 mm)

31 - 5th gear synchro-ring

- ☐ Checking for wear ⇒ [page 164](#)

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

33 - Locking collar for 5th and 6th gear

- ☐ Mark position in relation to synchro-hub prior to removing

34 - Needle bearing inner race

- ☐ For 6th gear

35 - Needle bearing

- ☐ For 6th gear

36 - 6th gear synchro-ring

- ☐ Checking for wear ⇒ [page 164](#)

37 - 6th speed selector gear

- ☐ Insert spring before installing ⇒ [page 163](#)
- ☐ Check axial clearance after installing using feeler gauge (0.20 ... 0.50 mm)

38 - Thrust washer

- ☐ For 6th speed selector gear

39 - Inner race

- ☐ For needle roller bearing

40 - Multi-point socket head bolt

- ☐ 200 Nm
- ☐ Self-locking
- ☐ Always renew

41 - Selector fork for 5th and 6th gear

42 - Pin with clip

- ☐ For securing selector fork for 5th and 6th gear to selector rod



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6.5 Exploded view - removing and installing input shaft, output shaft, reverse gear wheel and reverse selector gear

Sequence for dismantling and assembling

⇒ ["7 Assembly sequence - dismantling and assembling gearbox",
page 111](#)

1 - Bearing housing

2 - Reverse gear wheel

- ☐ With support for reverse shaft
- ☐ Exploded view - reverse gear wheel
⇒ [page 110](#)

3 - Bolt

- ☐ 30 Nm
- ☐ 3x

4 - Reverse gear selector fork

5 - Pin with clip

- ☐ For securing reverse gear selector fork to selector rod

6 - Reverse gear locking collar

- ☐ Mark position in relation to synchro-hub prior to removing
- ☐ Installation position: taper faces reverse gear synchro-ring

7 - Reverse gear synchro-hub

- ☐ Installation position: high inside collar faces 3rd gear wheel

8 - Synchro-ring for reverse gear

- ☐ Checking for wear
⇒ [page 172](#)

9 - Reverse selector gear

- ☐ Insert spring before installing ⇒ [page 172](#)
- ☐ Check axial clearance after installing using feeler gauge (0.20 ... 0.50 mm)

10 - Needle bearing

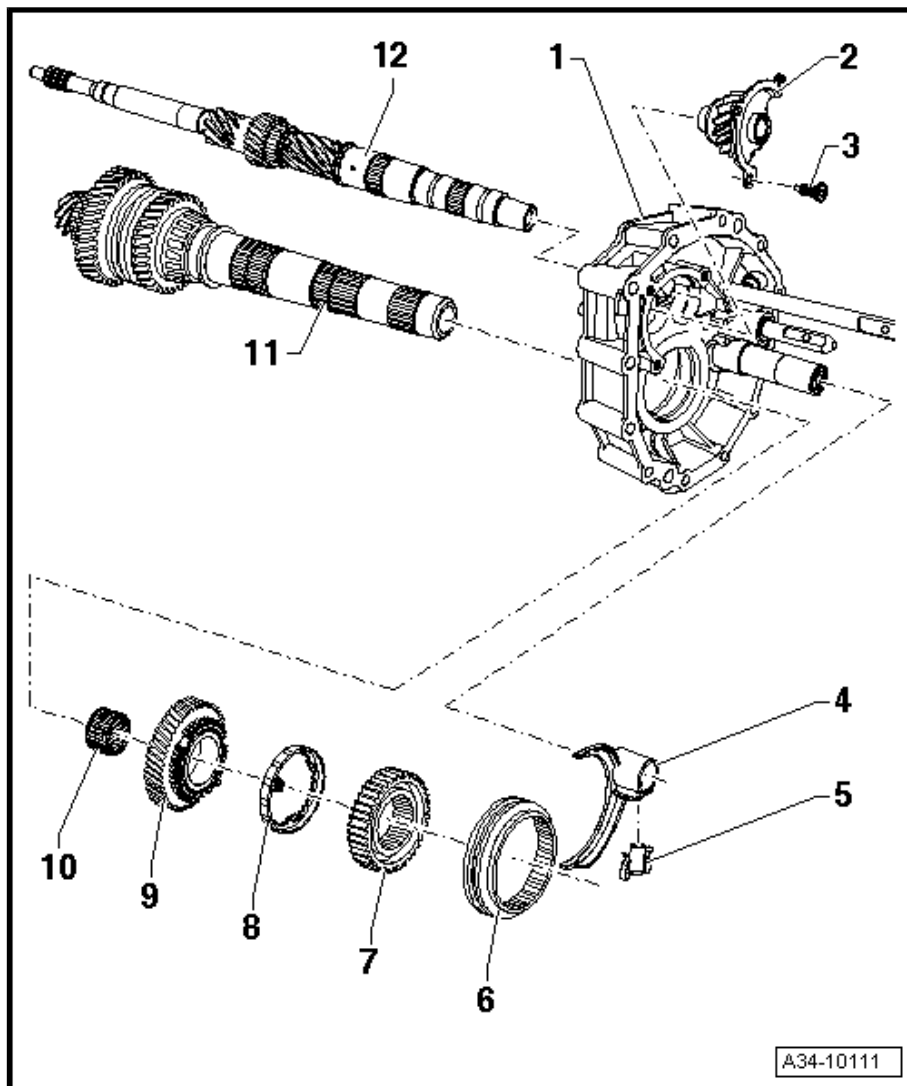
- ☐ For reverse gear

11 - Pinion shaft (output shaft)

- ☐ With tapered roller bearing and selector gears for 1st and 2nd speed
- ☐ Dismantling and assembling ⇒ [page 172](#)

12 - Input shaft

- ☐ Dismantling and assembling ⇒ [page 160](#)

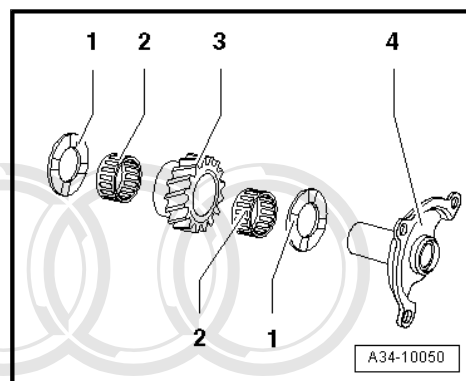


Exploded view - reverse gear wheel

- 1 - Thrust washer
- 2 - Needle bearing
- 3 - Reverse gear wheel

Installation position: collar points towards bearing housing

- 4 - Reverse shaft support



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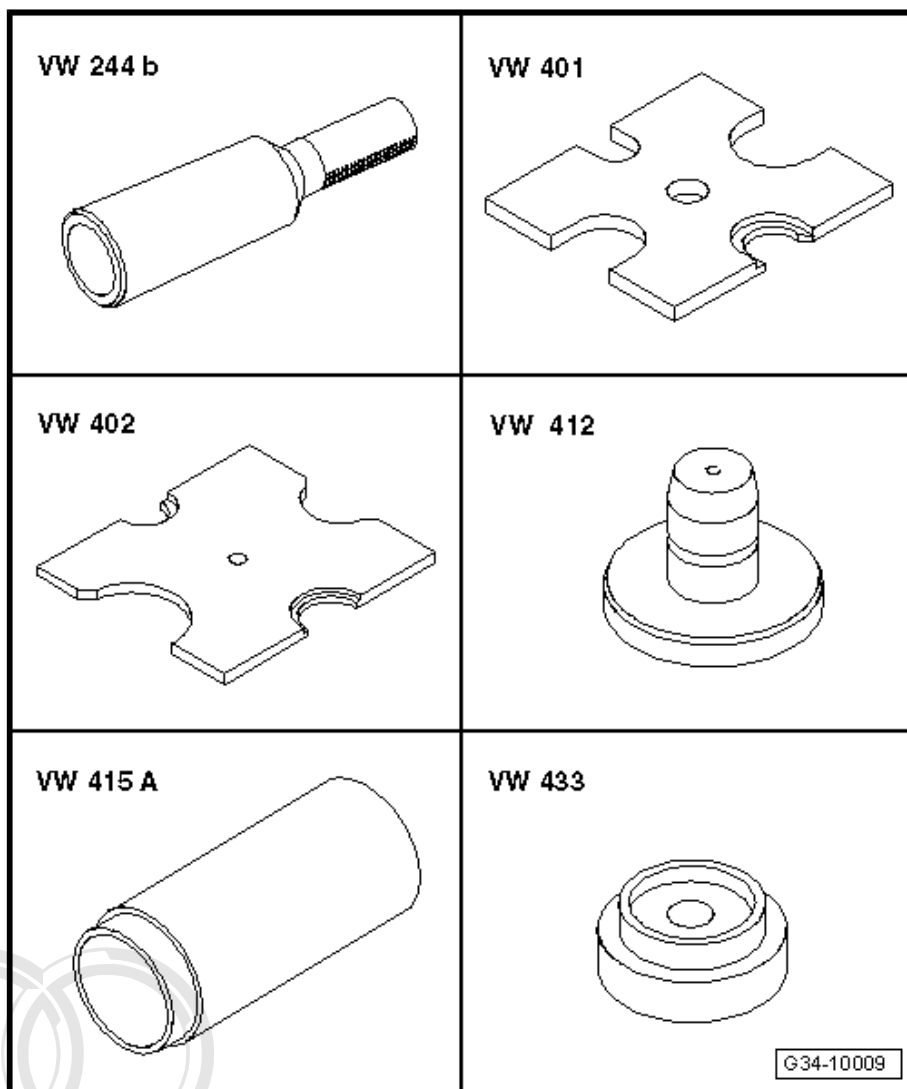
7 Assembly sequence - dismantling and assembling gearbox

Removing and installing ball bearing for input shaft, selector shaft, gearbox cover and bearing housing with input shaft and pinion shaft.

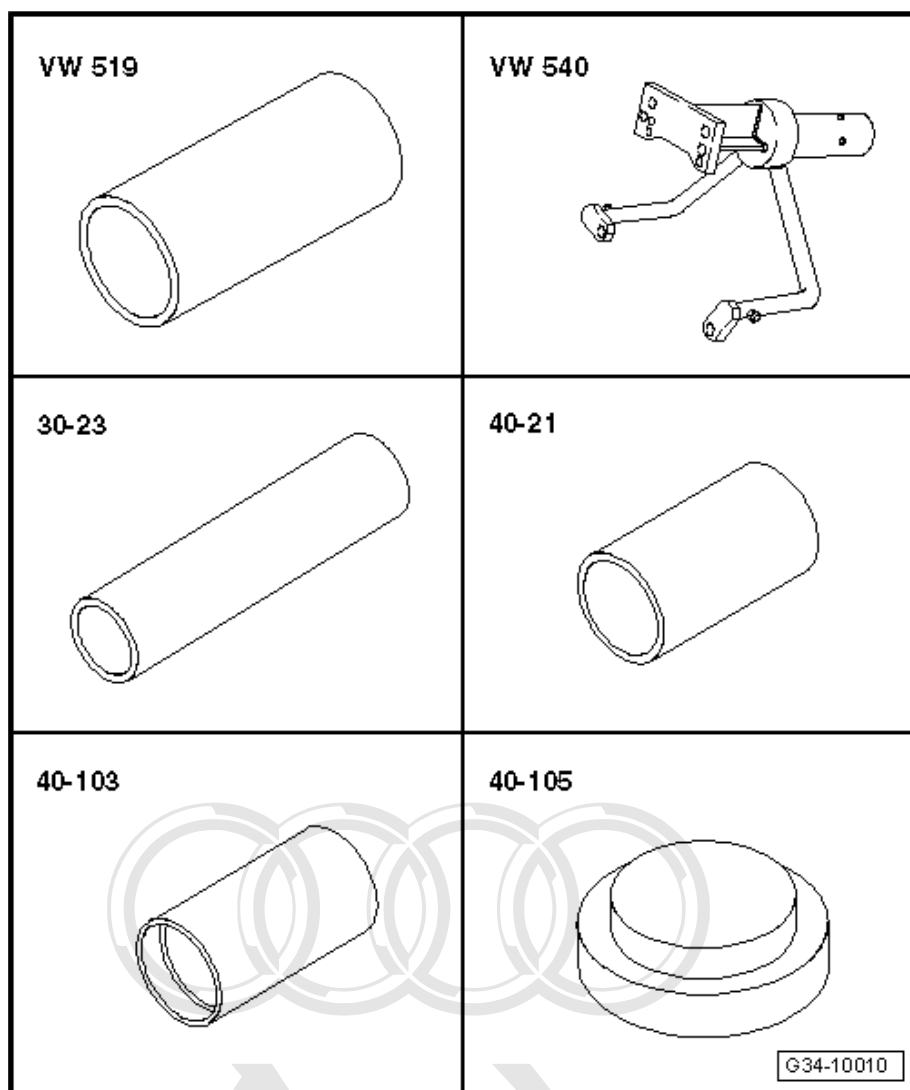
7.1 Dismantling gearbox

Special tools and workshop equipment required

- ◆ Drift sleeve - VW 244 B-
- ◆ Thrust plate - VW 401-
- ◆ Thrust plate - VW 402-
- ◆ Press tool - VW 412-
- ◆ Tube - VW 415 A-
- ◆ Press tool - VW 433-

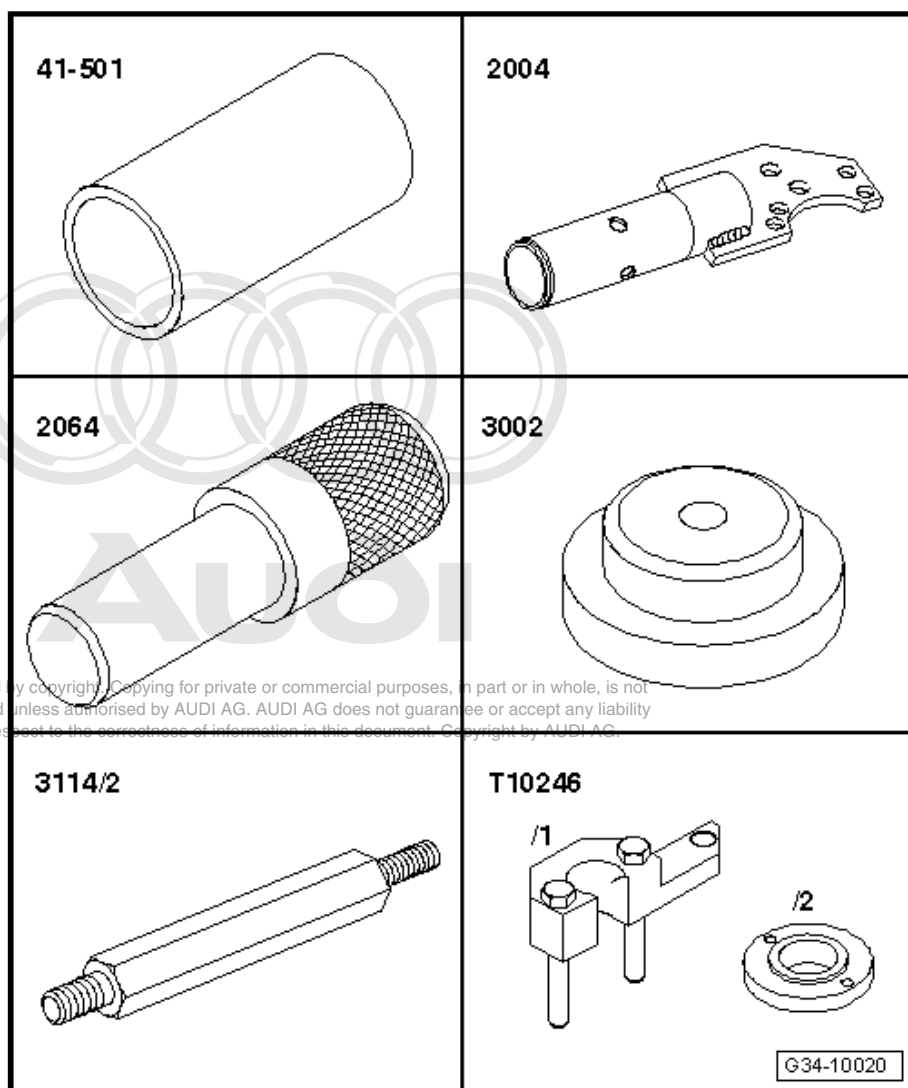


- ◆ Tube - VW 519-
- ◆ Engine and gearbox support - VW 540-
- ◆ Extension - 30 - 23-
- ◆ Press tool - 40 - 21-
- ◆ Support - 40 - 103-
- ◆ Thrust plate - 40 - 105-



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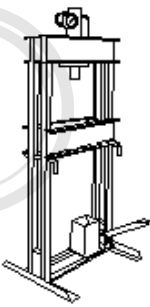
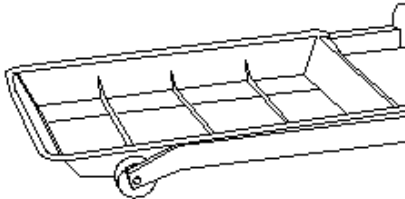
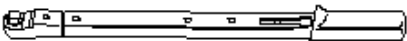
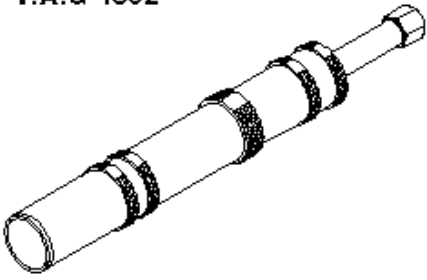
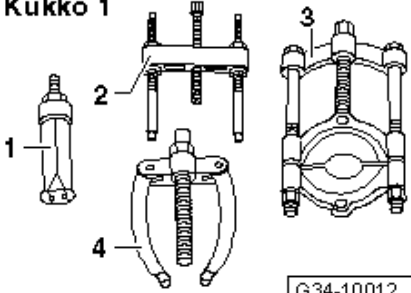
- ◆ Drift sleeve - 41 - 501-
- ◆ Gearbox bracket - 2004-
- ◆ Locking pin - 2064-
- ◆ Thrust piece - 3002-
- ◆ Pin (M8 and M10) - 3114/2-
- ◆ Fitting tool - T10246-



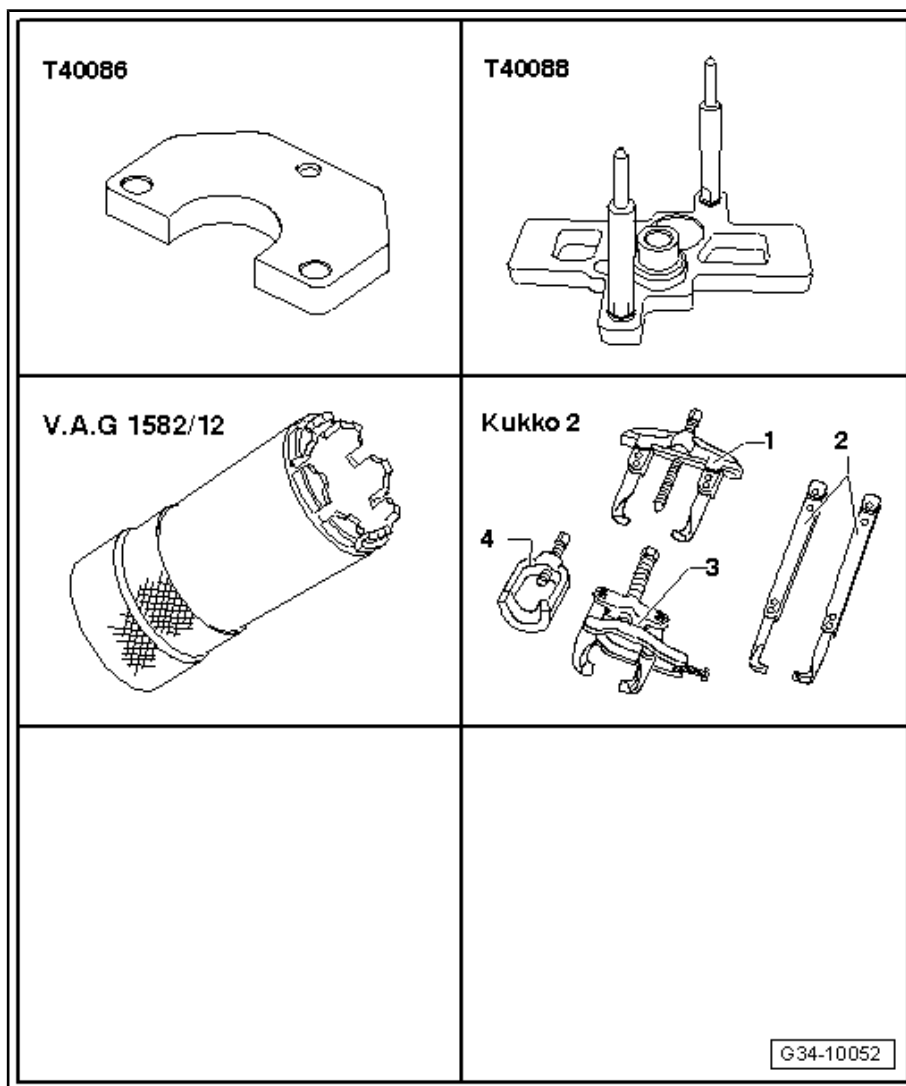
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- ◆ Workshop press , e.g. - V.A.G 1290 A-
- ◆ Drip tray , e.g. -V.A.G 1306-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-
- ◆ Tapered roller bearing puller - V.A.G 1582-
- ◆ -1- Internal puller - Kukko 21/2-
- ◆ -2- Puller - Kukko 18/2-

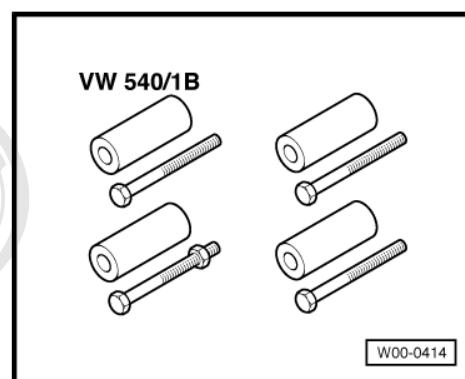
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V.A.G 1290 A 	V.A.G 1306 
V.A.G 1331 	V.A.G 1332 
V.A.G 1582 	Kukko 1  G34-10012

- ◆ Plate - T40086-
- ◆ Plate - T40088/1-
- ◆ Adapter - V.A.G 1582/12-
- ◆ -1- Two-arm puller - Kukko 20/10-
- ◆ -2- Puller hook, length 200 mm
- ◆ -2- Puller hook, length 250 mm

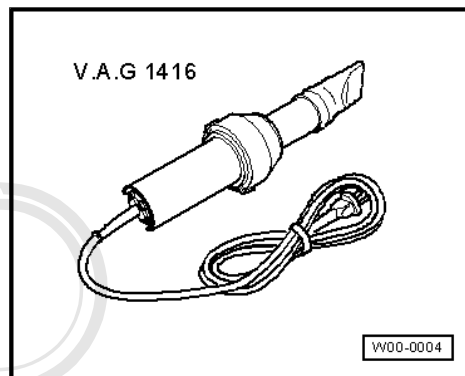


- ◆ Engine and gearbox support supplement - VW 540/1 B-

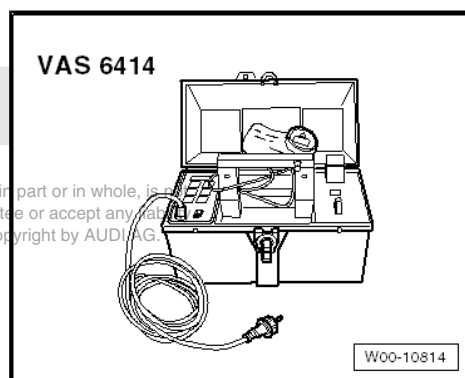


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◆ Hot air blower - V.A.G 1416-



◆ Inductive heater - VAS 6414-

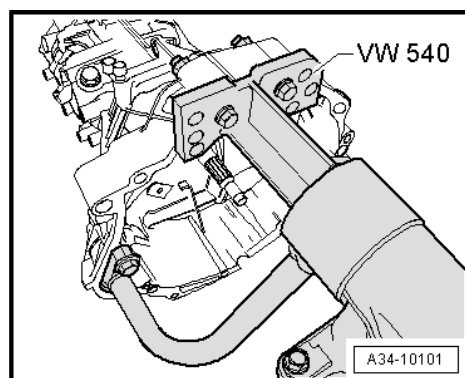


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- ◆ Feeler gauge
- ◆ 2 bolts M8 (length 70 mm) with washers
- ◆ Sealing paste - AMV 188 001 02-
- ◆ Assembly sleeve - 01E 311 120-
- ◆ Locking fluid - AMV 185 101 A1-

Procedure

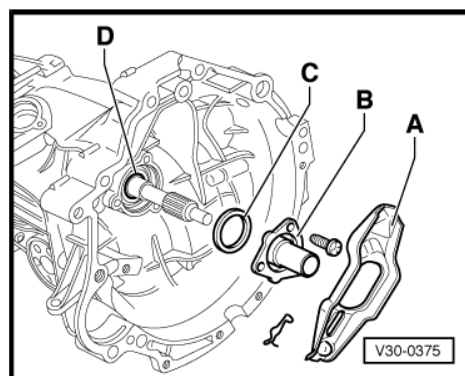
- Mount gearbox on assembly stand.
- Place drip tray , e.g. -V.A.G 1306- , under gearbox.
- Drain gear oil.



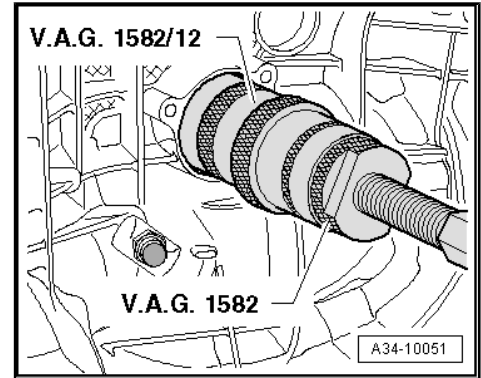
- Remove clutch release lever -A- together with release bearing.
- Remove guide sleeve -B-
- Remove dished spring -C-.
- Then remove circlip -D- in front of ball bearing for input shaft.

Note

If the input shaft or gearbox housing is not to be renewed, note the thickness of the circlip.



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

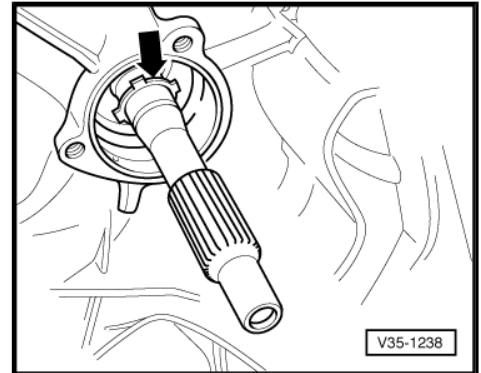


- Remove the circlip -arrow- behind the ball bearing for input shaft.

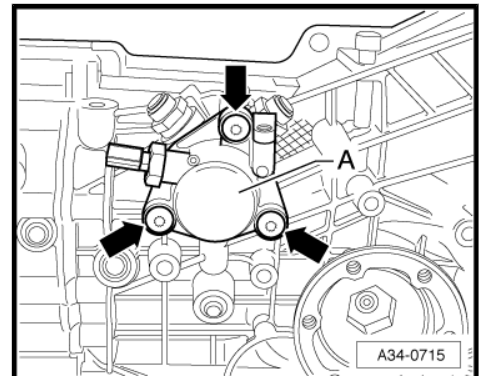


Note

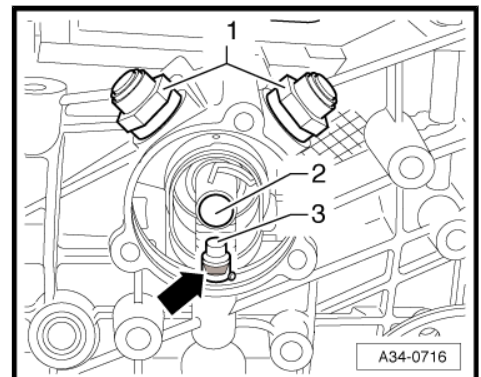
If the input shaft or gearbox housing is not to be renewed, note the thickness of the circlip.



- Remove bolts -arrows- and take off selector shaft cover -A-.

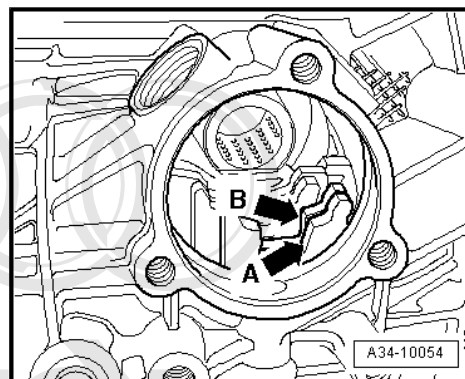


- Unscrew the two locking bolts -1- for selector shaft.
 - Make sure that no gear has been engaged.
- Push selector shaft -2- into gearbox as far as it will go, simultaneously removing pin -3-.
- Pull out selector shaft.



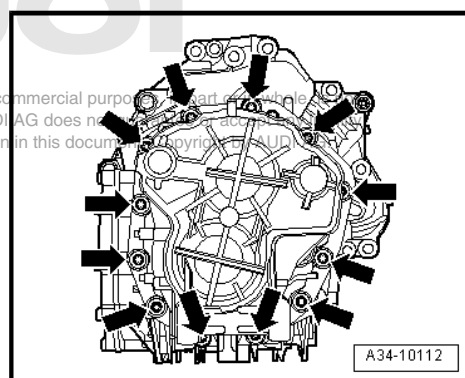
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- Move two selector rods -arrow A- and -arrow B- to lock input shaft by selecting two gears (e.g. reverse gear and 1st gear).

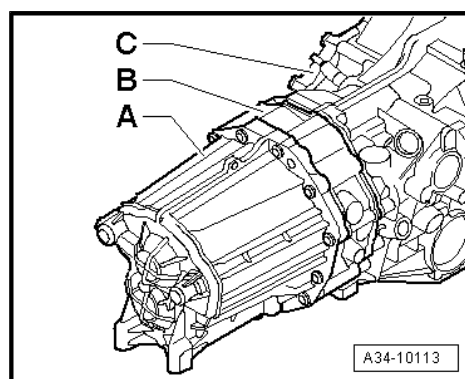


- Unscrew securing bolts for gearbox cover -arrows-.

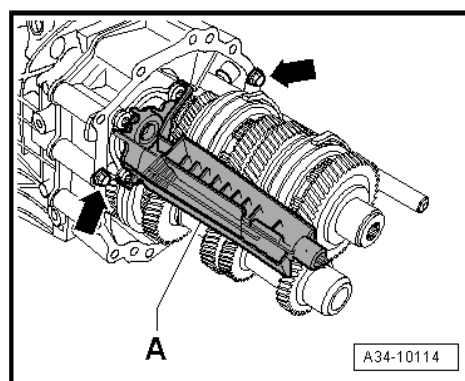
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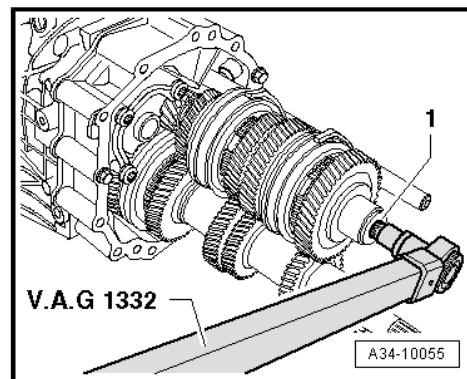
- Carefully pull off gearbox cover -A- towards rear. The bearing housing -B- remains fitted to the gearbox housing -C-.



- Secure bearing housing to gearbox housing -arrows- with two M8 bolts (length approx. 70 mm) and washers.
- Tighten these 2 bolts -arrows- to max. 5 Nm.
- Detach oil collector -A-.



- Check that the 2 gears are still engaged and then remove multi-point socket head bolt -1- for input shaft.



- Detach 6th speed selector gear with inner race for roller bearing and thrust washer.

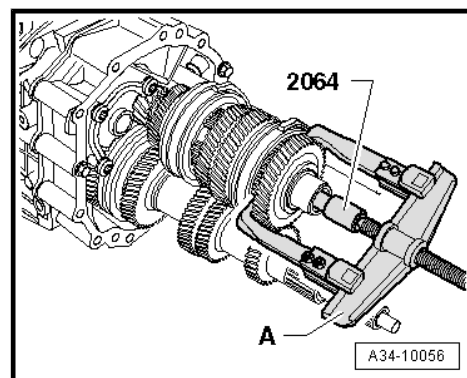
A - Two-arm puller , e.g. -Kukko 20/10-



Caution

Risk of damage to dog teeth on 6th speed selector gear.

- Hooks of two-arm puller must not come into contact with dog teeth of 6th speed selector gear during removal.



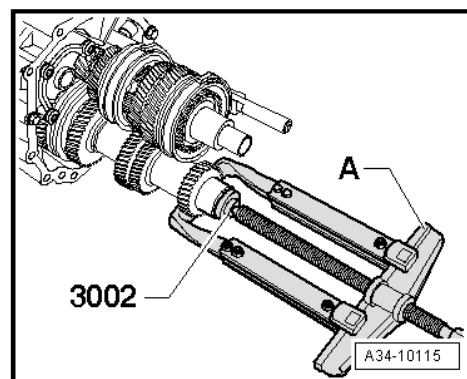
Note

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted without the prior written consent of AUDI AG. All rights reserved. **Check the gear teeth on the selector gears and gear wheels for damage after pulling them off.**

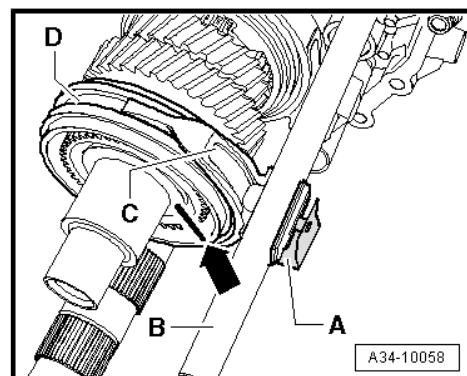
- Remove synchro-ring and needle bearing for 6th speed selector gear.
- Pull off 6th gear wheel.

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

- Remove spacer sleeve from output shaft.



- Pull out pin with clip -A- for securing selector fork for 5th and 6th gear from selector rod -B-.
- Mark installation position of locking collar in relation to synchro-hub -arrow-.
- Move selector fork -C- downwards and detach with locking collar -D-.



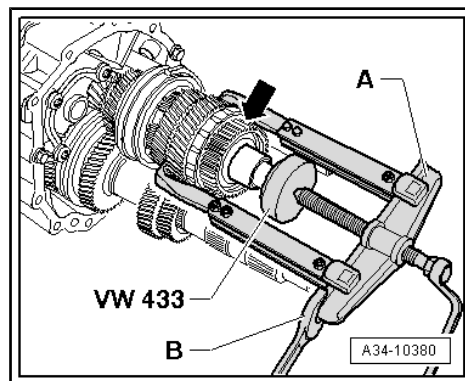
- Heat synchro-hub -arrow- for 5th and 6th gear to approx. 100 ° C using hot air blower - V.A.G 1416- .
- Pull off 5th speed selector gear together with needle bearing inner race for 6th gear and synchro-hub for 5th/6th gear.

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



Note

- ♦ Counter-hold two-arm puller using e.g. open end spanner -B-.
- ♦ If the needle bearing inner race for 6th gear is in contact with press tool - VW 433- , insert locking pin - 2064- into hole in input shaft to pull off the components all the way.



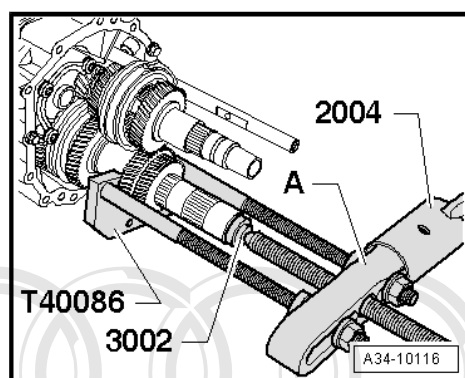
- Pull off 4th and 5th gear wheels together.

A - Puller , e.g. -Kukko 18/2-



Note

Counter-hold puller -A- using e.g. gearbox bracket - 2004- .



- Pull off 4th speed selector gear with needle bearing inner race for 5th gear and thrust washer.



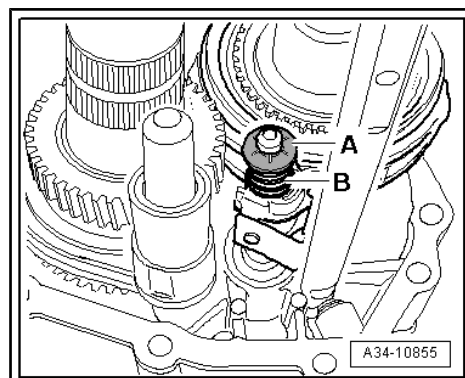
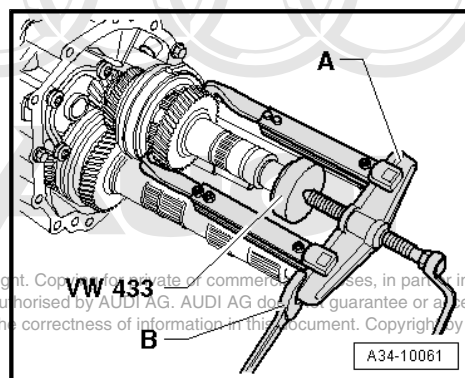
Caution

Risk of damage to dog teeth on 4th speed selector gear.

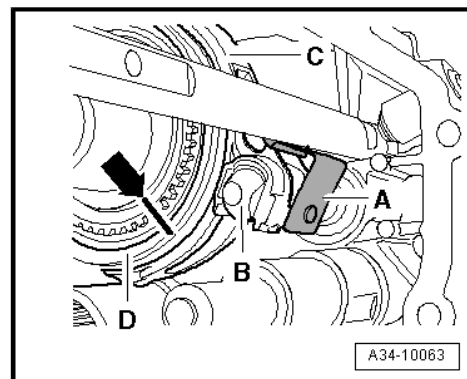
- Hooks of two-arm puller must not come into contact with dog teeth of 4th speed selector gear during removal.

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

- Counter-hold two-arm puller using e.g. open end spanner -B-.
- Remove synchro-ring and needle bearing for 4th speed selector gear.
- If fitted, remove clamping washer -A- from selector rod for 3rd and 4th gear, using side-cutting pliers or similar.
- Remove spring -B-.



- Pull pin with clip -A- securing selector fork for 3rd and 4th gear out from selector rod -B-.
- Mark installation position of locking collar in relation to synchro-hub -arrow-.
- Detach selector fork -C- with locking collar -D-.
- Remove circlip for 3rd gear and 4th gear synchro-hub and note thickness of circlip.



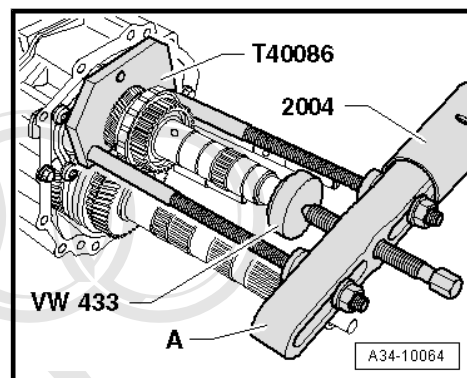
- Pull off 3rd speed selector gear with synchro-hub for 3rd and 4th gear.

A - Puller , e.g. -Kukko 18/2-



Note

Counter-hold puller -A- using e.g. gearbox bracket - 2004- to prevent plate - T40086- from making contact with 3rd gear wheel or selector rod for 5th and 6th gear.

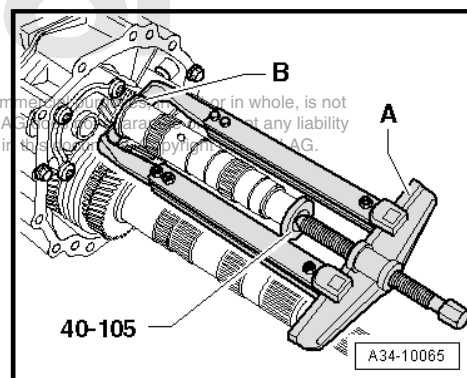


- Remove circlip for 3rd speed selector gear needle bearing and detach 3rd gear needle bearing.

- Pull off thrust washer -B- for 3rd speed selector gear.

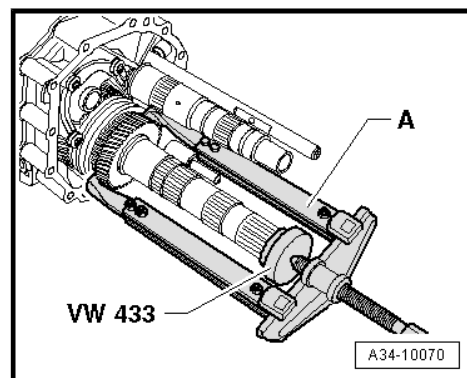
A - Two-arm puller , e.g. -Kukko 20/10- with 250 mm hooks

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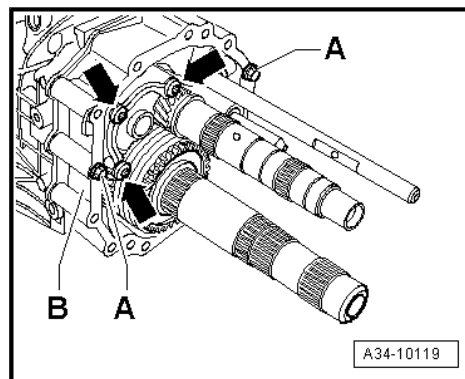


- Remove circlip for 3rd gear wheel and note thickness of circlip.
- Pull off 3rd gear wheel.

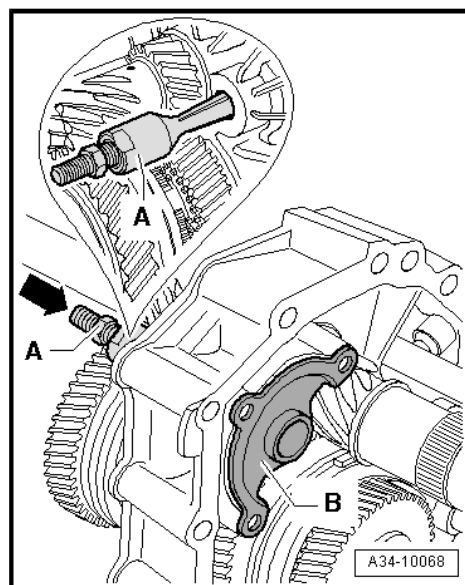
A - Two-arm puller , e.g. -Kukko 20/10- with 250 mm hooks



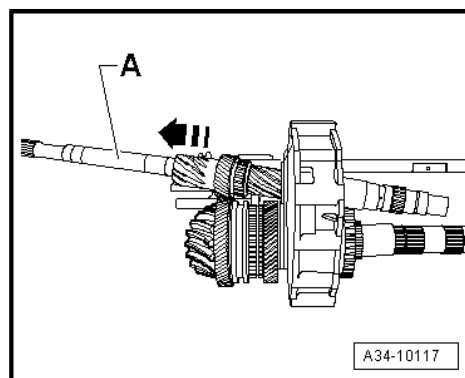
- Unscrew bolts -arrows- for reverse shaft support.
- Unscrew the 2 bolts -A- for bearing housing at gearbox housing.
- Remove the bearing housing -B- together with the shafts.



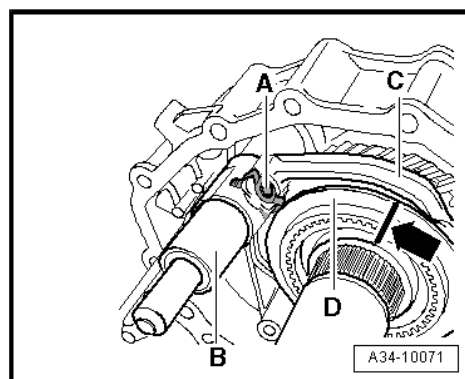
- Insert an internal puller -A- e.g. -Kukko 21/2- into bore for reverse shaft support.
- Spread open internal puller far enough for it to make contact with reverse shaft support -B-.
- Drive reverse shaft support carefully out of bearing housing -direction of arrow- and remove with reverse gear wheel.



- Now pull out input shaft -A- carefully from bearing housing at an angle from the front -direction of arrow-.



- Pull pin with clip -A- for securing selector fork for reverse gear out from selector rod -B-.
- Mark installation position of locking collar in relation to synchro-hub -arrow-.
- Detach selector fork -C- with locking collar -D-.



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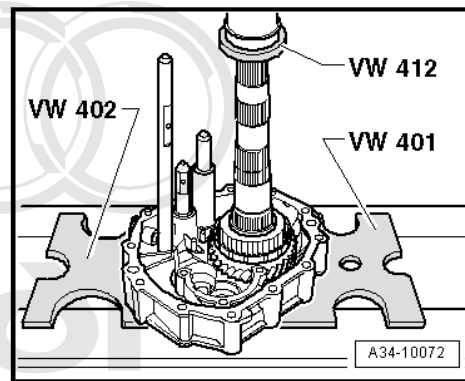
- Press off synchro-hub for reverse gear from output shaft.



Note

Place the bearing housing onto thrust plates - VW 401- and -VW 402- so that the output shaft and selector rods are not damaged when pressing off the synchro-hub.

- Detach reverse selector gear, needle bearing for reverse selector gear and reverse gear synchro-hub.
- Guide output shaft out of selector fork for 1st and 2nd gear and bearing housing.



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7.2 Assembling gearbox



Note

*The special tools required are listed in the procedure for
⇒ ["7.1 Dismantling gearbox", page 111](#) .*

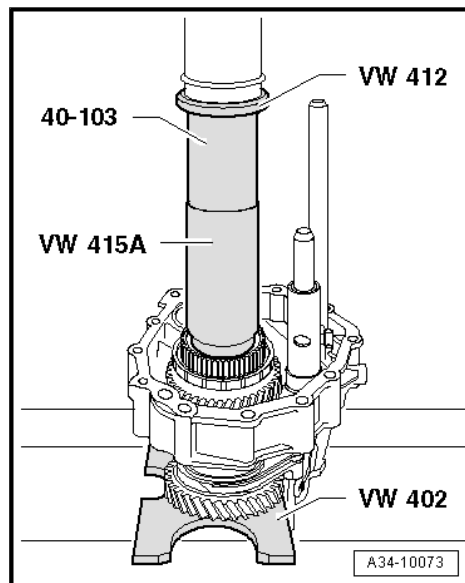
- If the input shaft or the gearbox housing have been renewed, you must first re-determine the thickness of the input shaft cir-clips ⇒ ["1.3 Adjusting input shaft", page 164](#) .



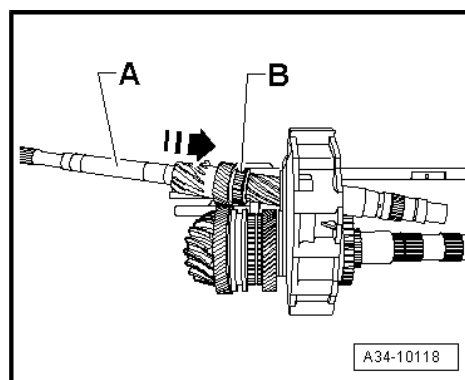
Note

- ◆ *Lubricate all needle bearings with gear oil before fitting.*
- ◆ *Check synchro-rings for wear ⇒ [page 164](#)*
- ◆ *Insert spring in selector gear ⇒ [page 163](#)*
- ◆ *Clean residual locking fluid from threaded hole in input shaft.*
- ◆ *Heat gear wheels, needle bearing inner races and synchro-hubs to 130 °C (max.) before pressing on (wear protective gloves).*
- Insert output shaft in bearing housing and selector fork for 1st and 2nd gear.
- Place reverse gear selector gear with needle bearing, spring and synchro-ring onto output shaft.
- The lugs on the synchro-ring should engage into the recesses in the selector gear.

- Press on reverse gear synchro-hub.
- Installation position: high inside collar faces 3rd gear wheel.
- Check axial clearance of reverse selector gear.

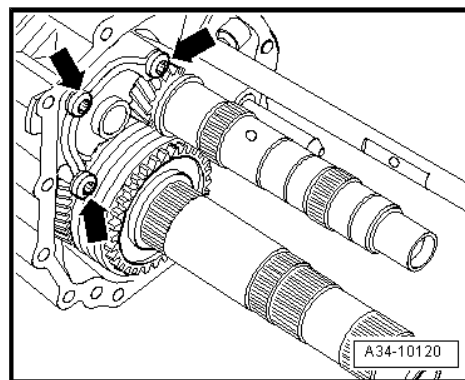


- Now insert input shaft -A- with needle roller bearing -B- into bearing housing in -direction of arrow- at an angle towards the rear.

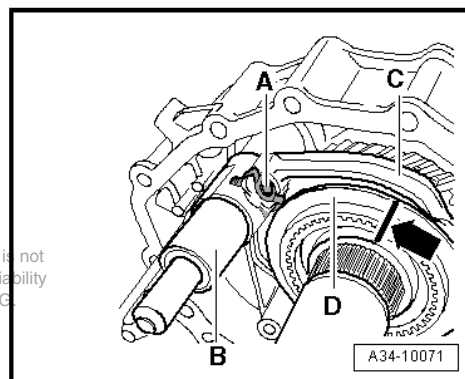


- Install reverse gear wheel and tighten 3 bolts -arrows- for reverse shaft support to 30 Nm.

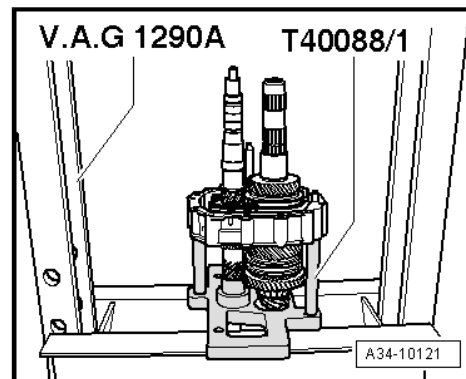
Exploded view - reverse gear wheel ⇒ [page 110](#)



- Slide reverse gear selector fork -C- together with locking collar -D- onto selector rod -B- and reverse gear synchro-hub.
- The markings on locking collar and synchro-hub -arrow- must coincide.
- The chamfer on the locking collar faces the reverse selector gear.
- If the bores of selector fork and selector rod coincide, clip in pin with clip -A-.



- Place plate - T40088/1- on press table and insert the bearing housing with shafts and selector rods.



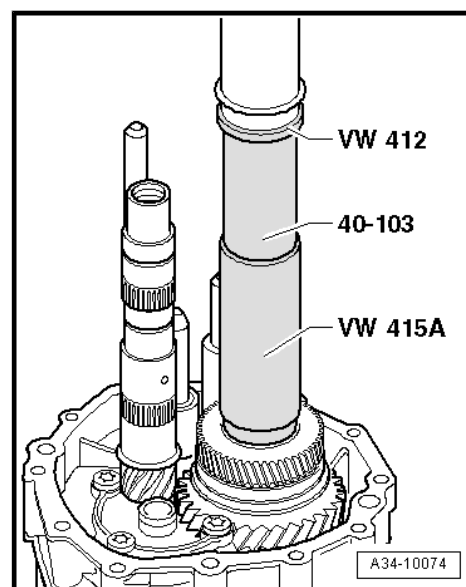
- Press on 3rd gear wheel.
- Installation position: machined side faces reverse gear synchro-hub.
- Insert circlip for 3rd gear wheel.
- When renewing gear wheel or output shaft:

Re-determine thickness of circlip for 3rd gear wheel:

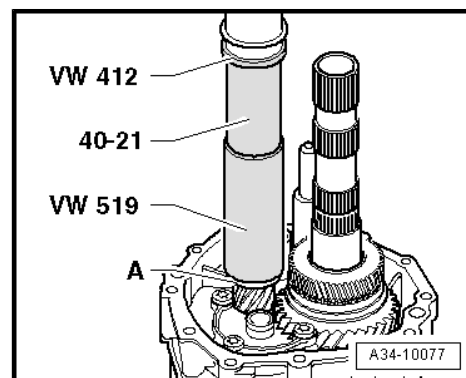
- Determine the thickest circlip that will just fit and install it. For part number refer to ⇒ Electronic parts catalogue .

The following circlips are available:

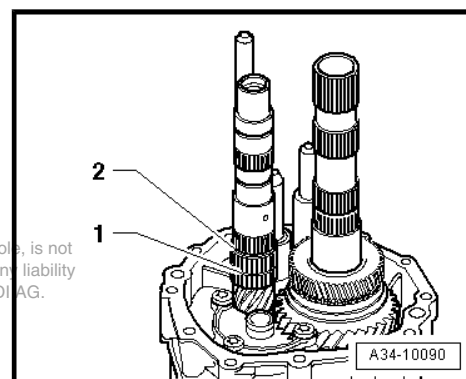
Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	2.10



- Press on thrust washer -A- for 3rd speed selector gear until limit stop.

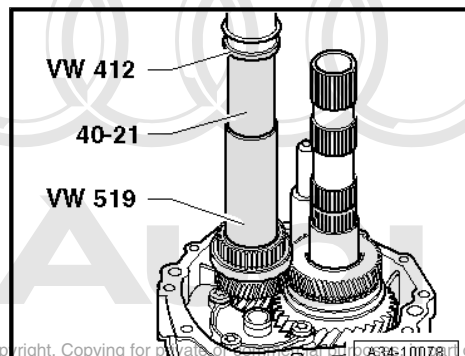


- Fit needle bearing for 3rd speed selector gear -1- and circlip -2- for 3rd gear needle bearing onto input shaft.
- Then fit 3rd speed selector gear with spring and synchro-ring.
- The lugs on the synchro-ring should engage into the recesses in the selector gear.



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- Press on heated synchro-hub for 3rd and 4th gear
- Installation position: high inside collar faces 3rd speed selector gear.



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- Insert circlip for synchro-hub for 3rd and 4th gear.

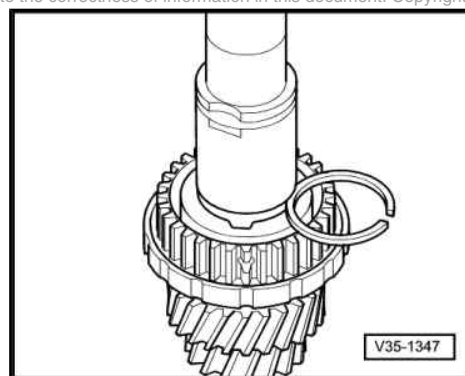
- When renewing synchro-hub or input shaft:

Re-determine thickness of circlip for synchro-hub for 3rd and 4th gear:

- Determine the thickest circlip that will just fit and install it. For part number refer to ⇒ Electronic parts catalogue .

The following circlips are available:

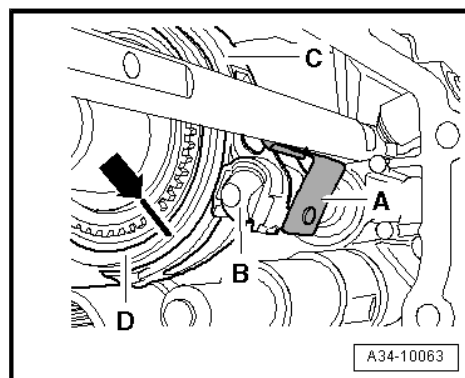
Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05



- Check axial clearance of 3rd speed selector gear.
- Slide selector fork for 3rd and 4th gear -C- together with locking collar -D- onto selector rod -B- and synchro-hub for 3rd and 4th gear.
- The markings on locking collar and synchro-hub -arrow- must coincide.
- If the bores of selector fork and selector rod coincide, clip in pin with clip -A-.

Note

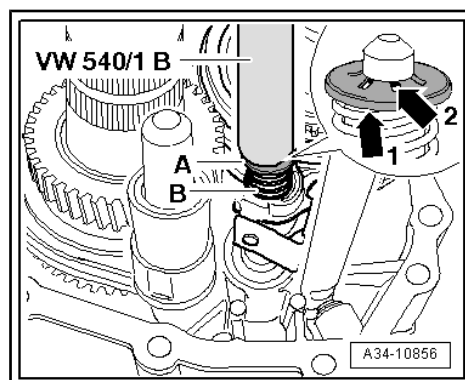
Do not insert pin with clip for 5th/6th gear selector fork (Ø 6 mm) into selector fork for 3rd and 4th gear.



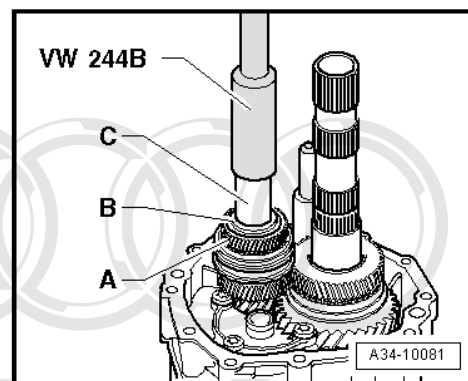
- If previously fitted, install spring -B- on selector rod for 3rd and 4th gear and drive on clamping washer -A-.
- Engage 3rd gear before driving on clamping washer -A-.
- Installation position of clamping washer: collar -arrow 1- faces spring -B-.
- Clamping washer must engage below shoulder -arrow 2- on selector rod.

Note

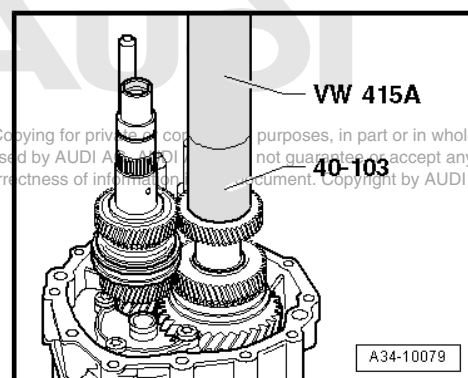
Different versions are fitted - either with or without spring on selector rod for 3rd and 4th gear.



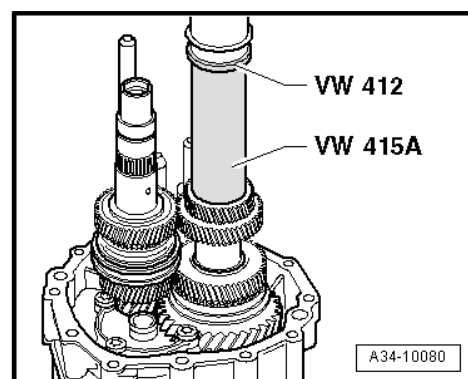
- Fit 4th speed selector gear -A- with spring, synchro-ring, needle bearing and thrust washer for 3rd and 4th gear -B-.
- Press on heated inner race -C- for needle bearing for 5th speed selector gear.
- Check axial clearance of 4th speed selector gear.



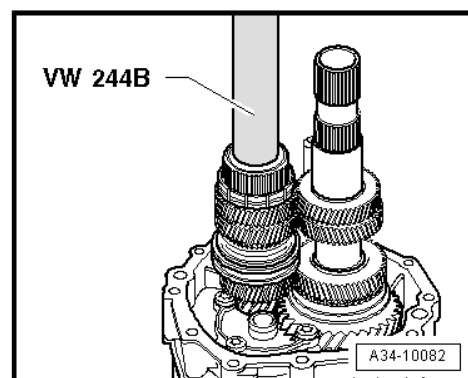
- Heat 4th gear wheel and press on.
- Installation position: high inside collar faces 5th gear wheel.



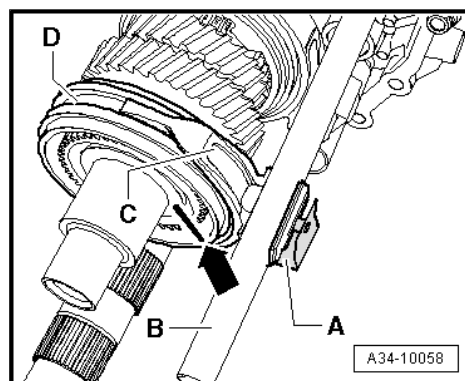
- Heat 5th gear wheel and press on.
- Installation position: high inside collar faces 4th gear.



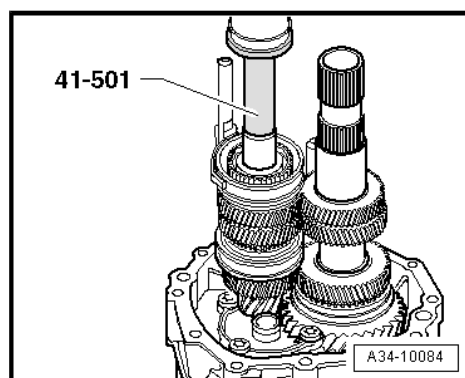
- Place 5th speed selector gear with spring, synchro-ring and needle bearing onto input shaft.
- The lugs on the synchro-ring should engage into the recesses in the selector gear.
- Fit and press on heated synchro-hub for 5th and 6th gear.
- Check axial clearance of 5th speed selector gear.



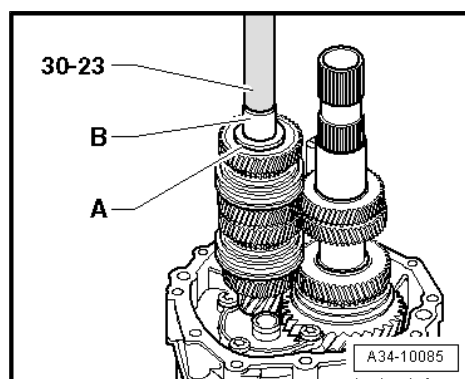
- Slide selector fork for 5th and 6th gear -C- together with locking collar -D- onto synchro-hub for 5th and 6th gear.
- The markings on locking collar and synchro-hub -arrow- must coincide.
- Move selector fork for 5th and 6th gear -C- into selector rod -B-.
- If the bores of selector fork and selector rod coincide, clip in pin with clip -A-.



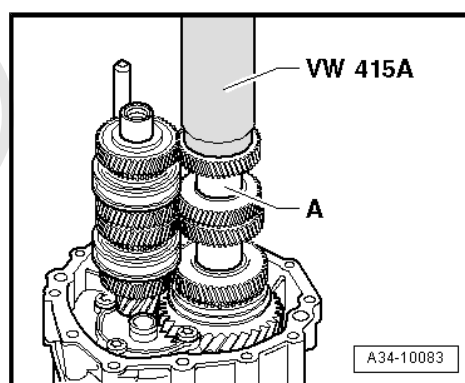
- Press on heated inner race for needle bearing for 5th speed selector gear.



- Fit 6th speed selector gear with spring, synchro-ring, needle bearing and thrust washer for 6th gear -A-.
- Heat inner race -B- for needle roller bearing and press on.
- Check axial clearance of 6th speed selector gear.



- Fit spacer sleeve -A- onto output shaft.
- Heat 6th gear wheel and press on.



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Insert circlip -A- for 6th gear wheel.

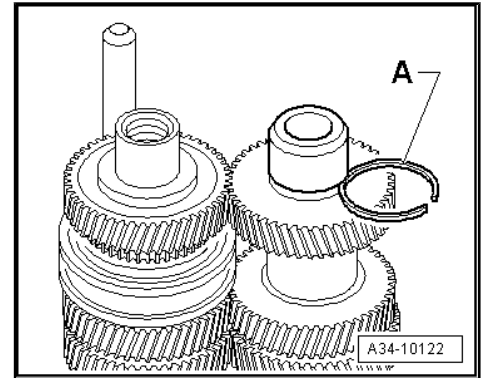
- When renewing gear wheel or output shaft:

Re-determine circlip -A- for 6th gear wheel:

- Determine the thickest circlip that will just fit and install it. For part number refer to ⇒ Electronic parts catalogue .

The following circlips are available:

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17
1.96	2.08	2.20
1.99	2.11	

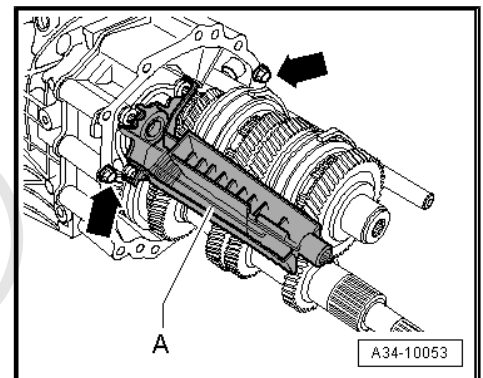


- Take out bearing housing from plate - T40088/1- .
- Secure bearing housing to gearbox housing with two M8 bolts (length approx. 70 mm) -arrows- and washers.
- Tighten these 2 bolts -arrows- to max. 5 Nm.



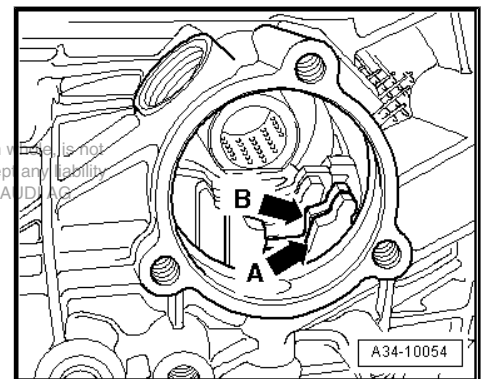
Note

Do not install oil collector -A- at this stage.

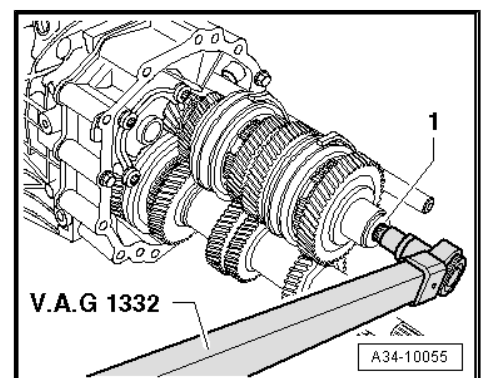


- Move two selector rods -arrow A- and -arrow B- to lock input shaft by selecting two gears (e.g. reverse gear and 1st gear).

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- Tighten multi-point socket head bolt -1- for input shaft to specified torque ⇒ [Item 40 \(page 108\)](#) .
- Then remove the complete bearing housing from the gearbox housing.
- Check if the 2 dowel sleeves are installed between the gearbox housing and bearing housing.
- Apply sealing paste - AMV 188 001 02- evenly and not too thickly onto contact surfaces between gearbox housing and bearing housing.
- Fit bearing housing onto gearbox housing.

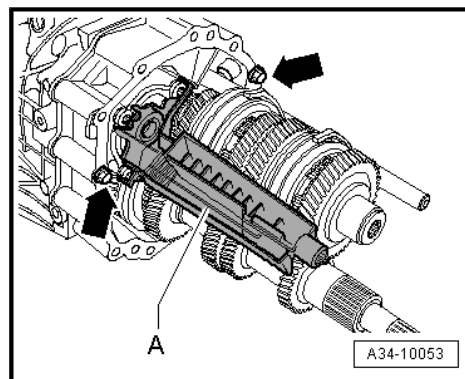


- Clip oil collector -A- into reverse shaft support.

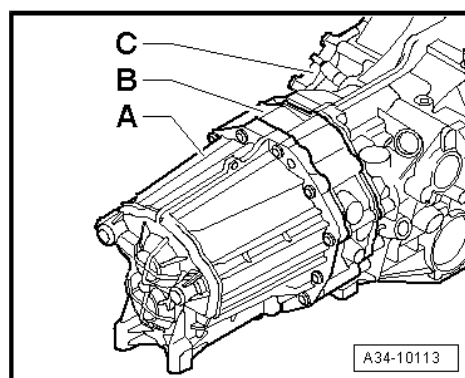


Note

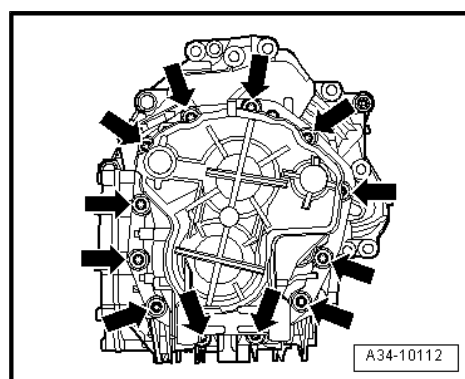
Make sure that the bolts -arrows- are removed.



- Check if the 2 dowel sleeves are installed between the bearing housing -B- and gearbox cover -A-.
- Apply sealing paste - AMV 188 001 02- evenly and not too thickly onto contact surfaces between bearing housing and gearbox cover.
- Insert securing bolts for gearbox cover -A- and bearing housing -B- to gearbox housing -C-.



- Tighten bolts -arrows- to specified torque
⇒ [Item 18 \(page 105\)](#) .



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

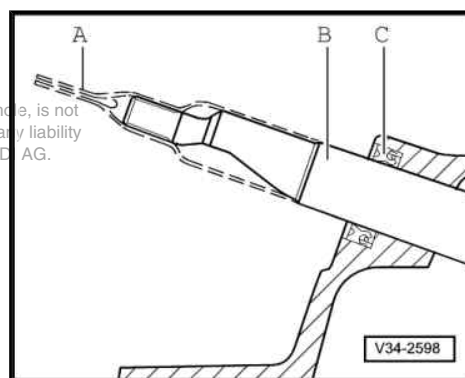


Note

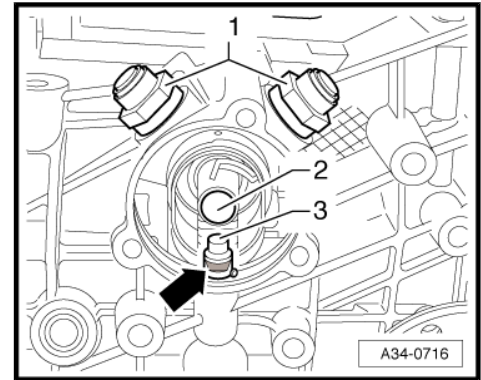
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To avoid damaging oil seal -C-, always use assembly sleeve - 01E 311 120- -A- when installing oil seal and selector shaft.

- Move selector rods to neutral.
- Install complete selector shaft.
- ◆ Installation position: Chamfer of selector shaft points downwards.

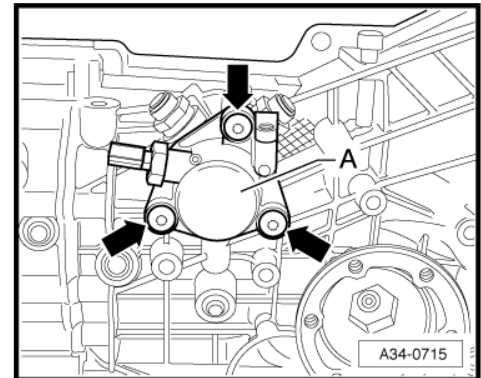


- Push selector shaft -2- into gearbox as far as it will go, simultaneously inserting pin -3-.
- Installation position for pin -3-: groove -arrow- on pin points towards selector shaft cover.
- Clean threads of locking bolts -1- with a wire brush. Then install bolts with locking fluid - AMV 185 101 A1- and tighten to specified torque ⇒ [Item 8 \(page 104\)](#) .



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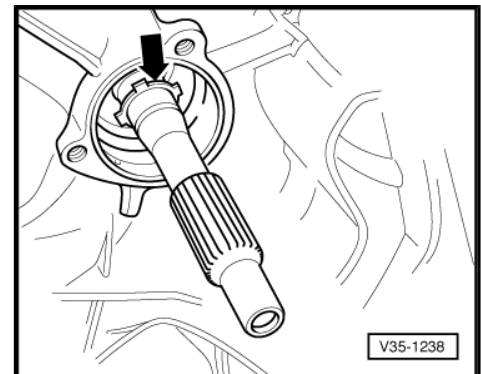
- Fit cover -A- with new O-ring.
- Clean threads of bolts -arrows- with a wire brush. Then install bolts with locking fluid - AMV 185 101 A1- and tighten to specified torque ⇒ [Item 13 \(page 105\)](#) .



- Fit rear circlip -arrow- for input shaft ball bearing.
- Then push ball bearing onto input shaft.

Installation position:

The closed side of the ball cage faces the gearbox housing.



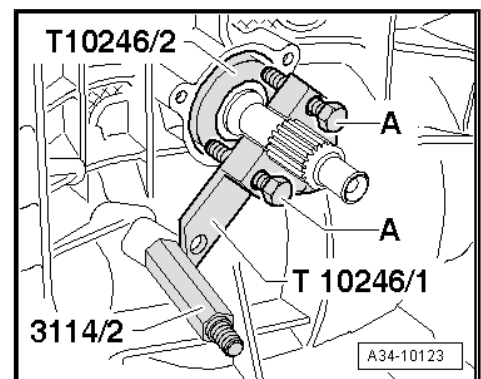
- Pressing in ball bearing:

First screw door hinge alignment tool (M8 and M10) - 3114/2- into tapped hole for ball-head pin.

Slide the thrust plate - T10246/2- onto input shaft.

Now position fitting tool - T10246/1- behind splines for clutch plate. Tighten bolts -A- only slightly. The bolts locate in the recesses in the thrust plate - T10246/2- .

Press in ball bearing onto the stop by tightening the bolts alternately (1/2 turn at a time).

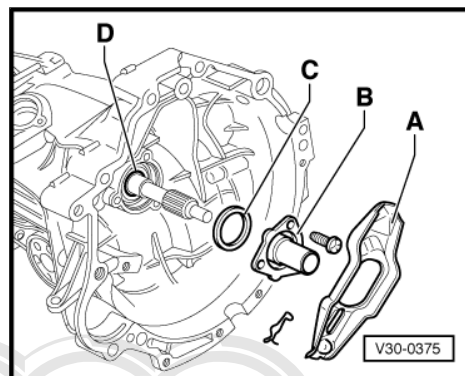


- Now fit front circlip -D- for input shaft ball bearing.
- Then fit dished spring -C-.

Installation position:

The convex side faces guide sleeve -B-.

- Fit a shrink hose onto input shaft splines.
- Fit guide sleeve -B- for release bearing ⇒ [page 26](#) .
- Remove shrink hose.
- Fit clutch release lever -A- with release bearing ⇒ [page 26](#) .
- Select all gears.

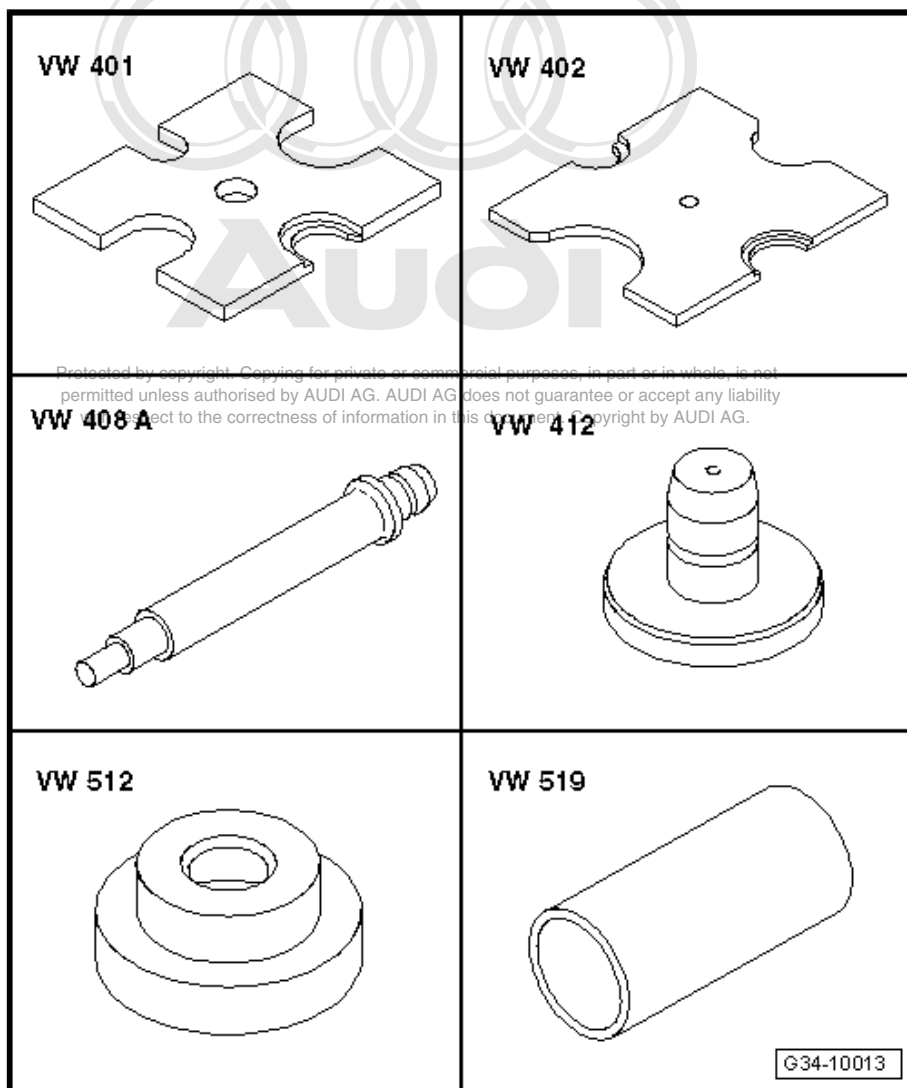


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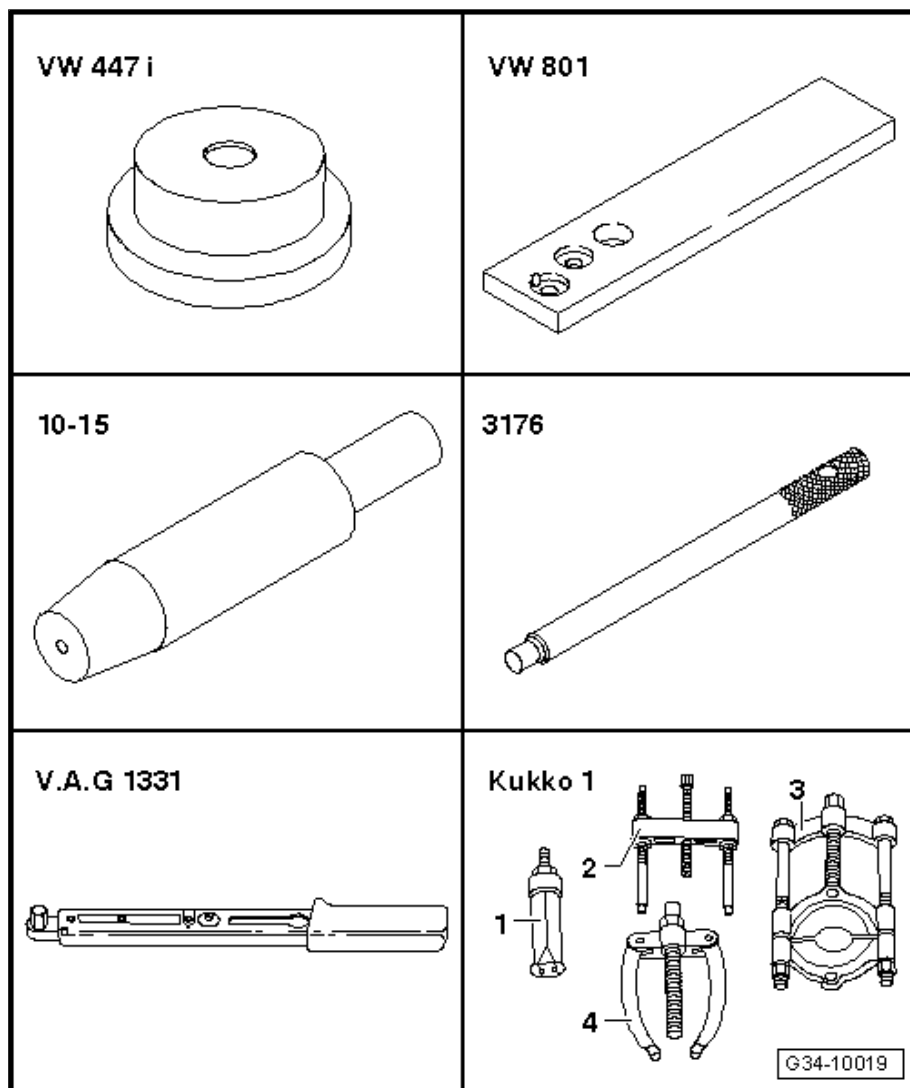
8 Servicing gearbox cover

Special tools and workshop equipment required

- ◆ Thrust plate - VW 401-
- ◆ Thrust plate - VW 402-
- ◆ Press tool - VW 408 A-
- ◆ Press tool - VW 412-
- ◆ Thrust pad - VW 512-
- ◆ Tube - VW 519-



- ◆ Thrust plate - VW 447 i-
- ◆ Support plate - VW 801-
- ◆ Guide pin - 10 - 15-
- ◆ Centring mandrel - 3176-
- ◆ Torque wrench - V.A.G 1331-
- ◆ -1- Internal puller - Kukko 21/2-
- ◆ -1- Internal puller - Kukko 21/5-
- ◆ -1- Internal puller - Kukko 21/6-
- ◆ -4- Counter-support - Kukko 22/2-



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1 - Gearbox cover

- ☐ Fit sealing plug on new gearbox cover
⇒ [Item 9 \(page 135\)](#)
- ☐ Drive in new sealing plug until flush
⇒ [page 137](#)

2 - Dowel sleeve

- ☐ 2x
- ☐ For centralising gearbox cover on bearing housing
- ☐ Drive out and in with drift - 3121-

3 - Roller bearing

- ☐ Bearing for output shaft in gearbox cover
- ☐ Always renew
- ☐ Pulling out ⇒ [page 136](#)
- ☐ Pressing in ⇒ [page 136](#)

4 - Roller bearing

- ☐ Bearing for input shaft in gearbox cover
- ☐ With oil guide
- ☐ Always renew
- ☐ Pulling out ⇒ [page 137](#)
- ☐ Pressing in ⇒ [page 137](#)

5 - Ball sleeve

- ☐ For selector rod for 1st and 2nd gear
- ☐ Pulling out ⇒ [page 136](#)
- ☐ Driving in ⇒ [page 136](#)

6 - Ball sleeve

- ☐ For selector rod for 5th and 6th gear
- ☐ Pulling out ⇒ [page 136](#)
- ☐ Driving in ⇒ [page 136](#)

7 - Multi-point socket head bolt

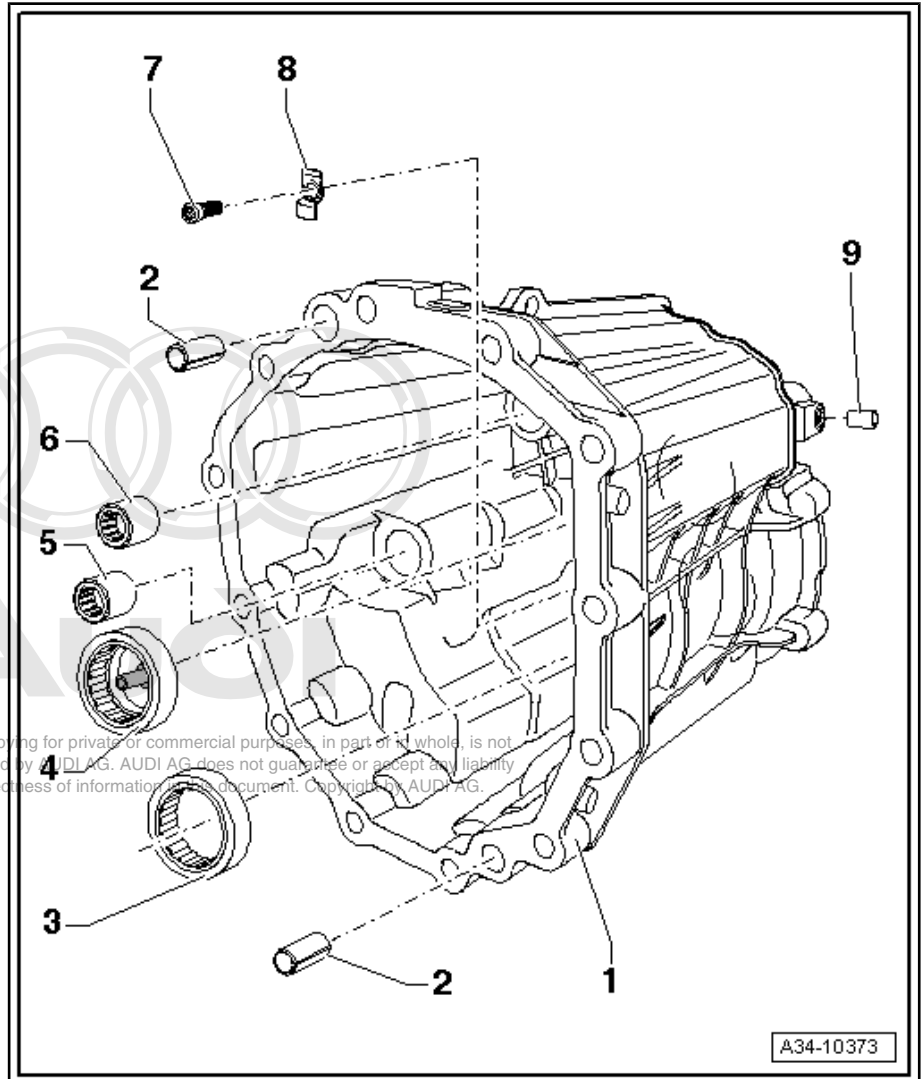
- ☐ 24 Nm

8 - Retaining plate

- ☐ Secures needle bearing ⇒ [Item 3 \(page 135\)](#) and needle roller bearing ⇒ [Item 4 \(page 135\)](#) in gearbox cover
- ☐ Installation position ⇒ [page 137](#)

9 - Sealing plug

- ☐ Drive in flush ⇒ [page 137](#)



Pulling roller bearing for output shaft out of gearbox cover

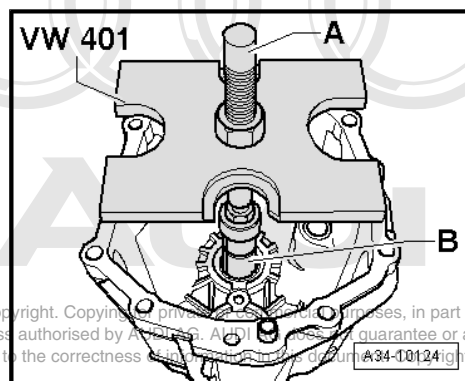
A - Counter-support , e.g. -Kukko 22/2-

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



Note

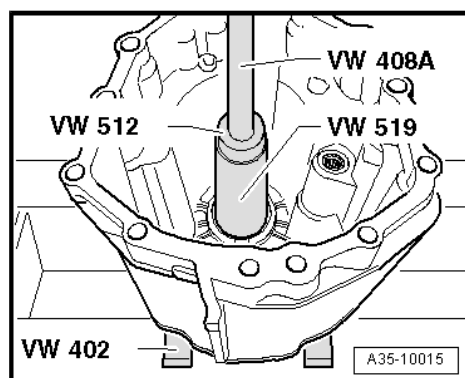
Always renew roller bearing after pulling out.



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Pressing new roller bearing for output shaft into gearbox cover as far as the stop (press in carefully)

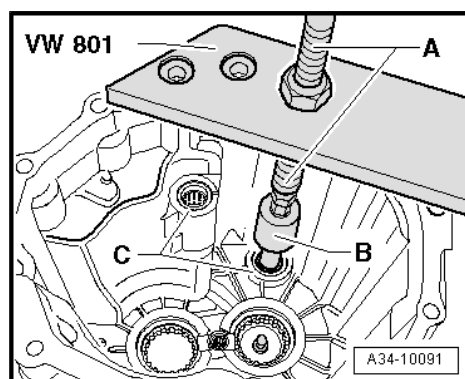
Support gearbox cover with thrust plate - VW 447 i- directly below bearing mounting.



Pulling out ball sleeve -C- from gearbox cover

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

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



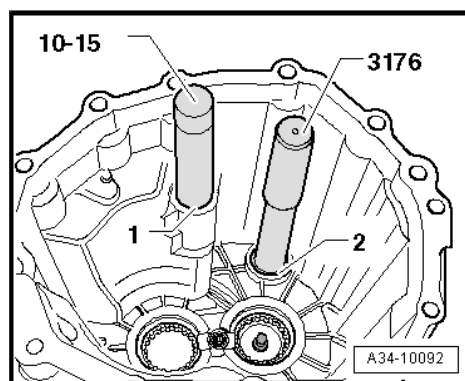
Driving ball sleeve into gearbox cover until flush

Fit ball sleeve -1- and -2- so that side with lettering (thicker metal) faces guide pin - 10 - 15- or centring mandrel - 3176- .



Note

Due to the housing depth use centring mandrel - 3176- for driving in ball sleeve -2-.



Pulling roller bearing for input shaft out of gearbox cover

Shorten (cut off) oil guide in roller bearing in order to insert internal puller -B-.

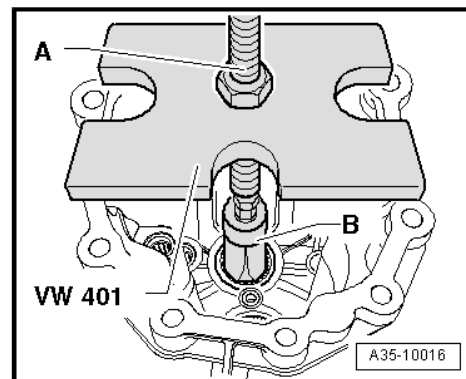
A - Counter-support , e.g. -Kukko 22/2-

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



Note

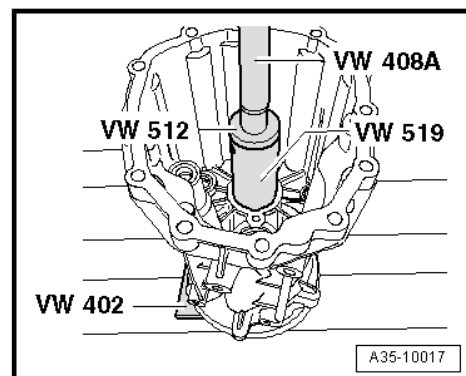
Always renew roller bearing after pulling out.



Pressing new roller bearing for input shaft into gearbox cover as far as the stop (press in carefully)

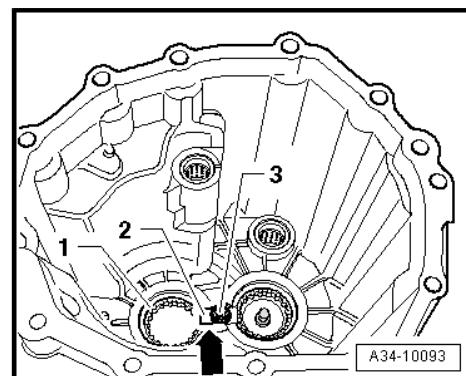
Support gearbox cover with thrust plate - VW 447 i- directly below bearing mounting.

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Securing roller bearing and needle bearing in gearbox cover.

- Insert retaining plate -2- with the high shoulder -arrow- facing needle bearing -1- into gearbox cover.
- Tighten bolt -3- to specified torque ⇒ [Item 7 \(page 135\)](#) .

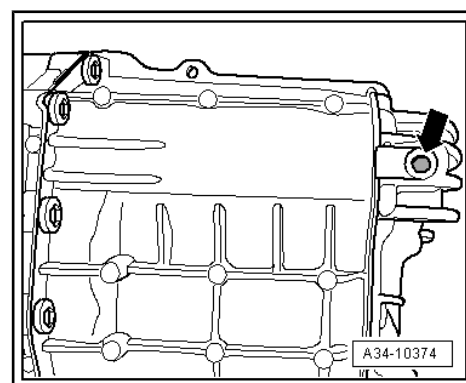


Drive in plug until flush -arrow-



Caution

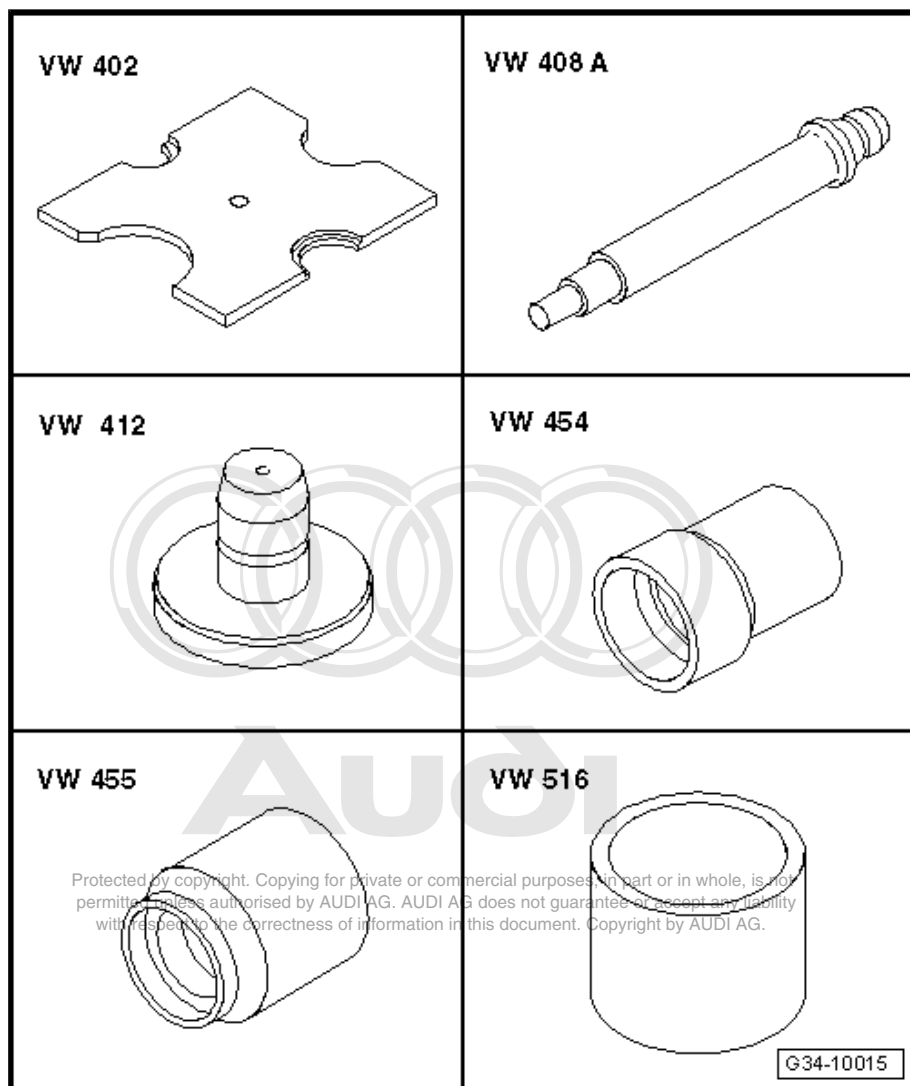
Depending on the version, a new gearbox cover can be supplied with or without the sealing plug -arrow-.



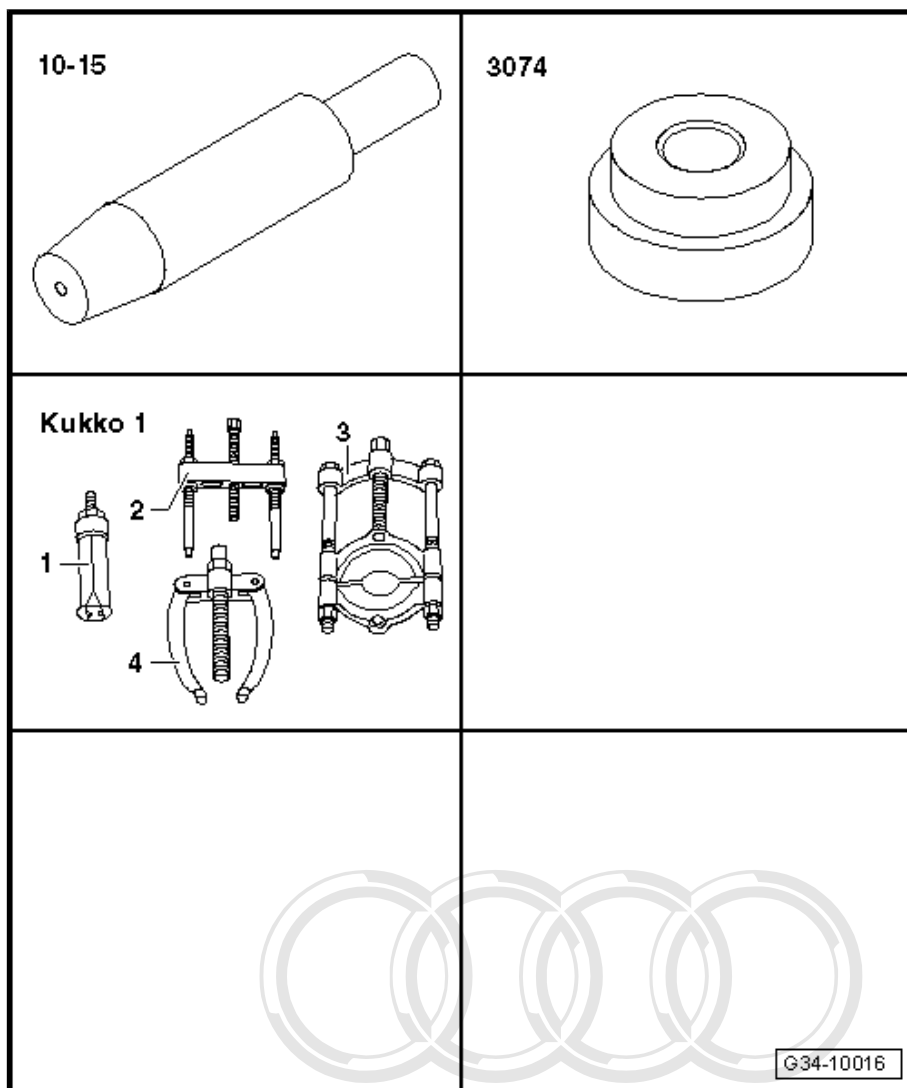
9 Servicing bearing housing

Special tools and workshop equipment required

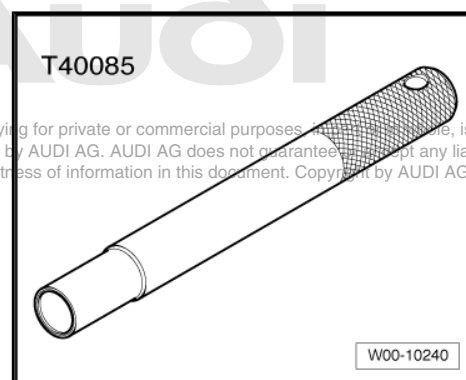
- ◆ Thrust plate - VW 402-
- ◆ Press tool - VW 408 A-
- ◆ Press tool - VW 412-
- ◆ Press tool - VW 454-
- ◆ Installing sleeve - VW 455-
- ◆ Tube - VW 516-



- ◆ Guide pin - 10 - 15-
- ◆ Thrust plate - 3074-
- ◆ -1- Internal puller - Kukko 21/2-
- ◆ -4- Counter-support - Kukko 22/1-



- ◆ Drift - T40085-



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1 - Bearing housing

- ☐ Re-determine shim "S4" when renewing
⇒ [page 214](#)

2 - Outer race

- ☐ For needle roller bearing on input shaft
- ☐ Driving out ⇒ [page 141](#)
- ☐ Pressing in ⇒ [page 141](#)

3 - Shim "S4"

- ☐ Table of adjustments
⇒ [page 204](#)
- ☐ Re-determine when renewing bearing housing
⇒ [page 214](#)

4 - Tapered roller bearing outer race

- ☐ For output shaft
- ☐ Removing and installing
⇒ [Item 25 \(page 171\)](#)

5 - Selector rod for 1st and 2nd gear

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

6 - Reverse gear selector rod

7 - Ball sleeve

- ☐ (Front) for reverse gear selector rod
- ☐ Pulling out ⇒ [page 141](#)
- ☐ Pressing in ⇒ [page 142](#)

8 - Ball sleeve

- ☐ (Rear) for reverse gear selector rod
- ☐ Pulling out ⇒ [page 142](#)
- ☐ Pressing in ⇒ [page 142](#)

9 - Selector rod for 3rd and 4th gear

- ☐ With or without spring-loaded selector fork (depending on version) ⇒ [Item 10 \(page 106\)](#)
- ☐ For correct version, refer to ⇒ Electronic parts catalogue

10 - Selector rod for 5th and 6th gear

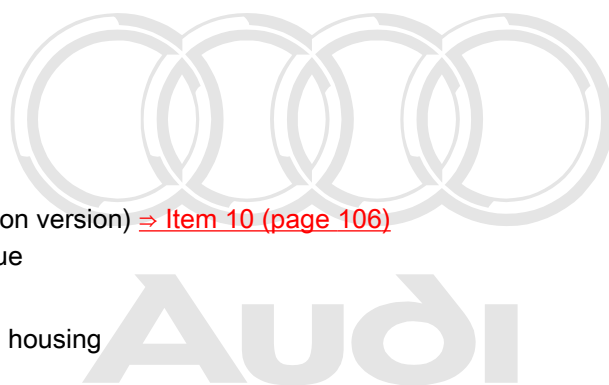
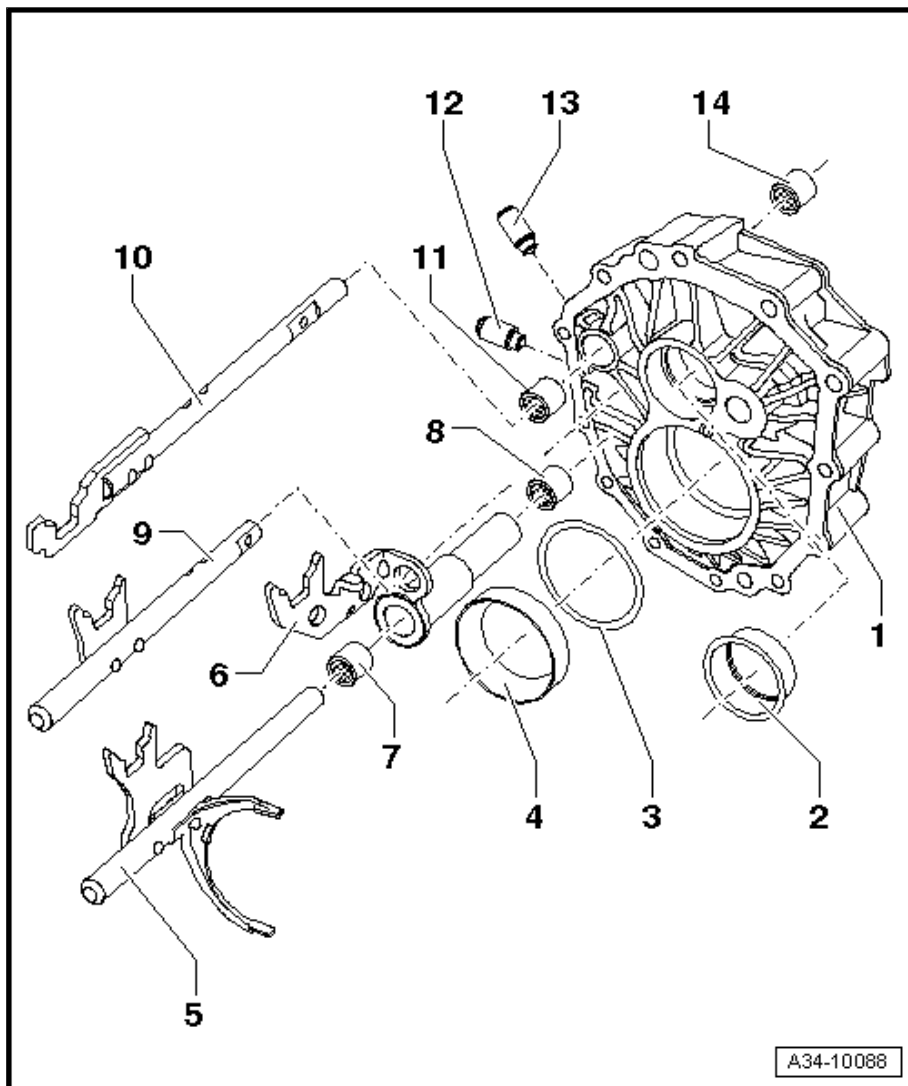
- ☐ Remove burrs and scoring after removing from bearing housing

11 - Ball sleeve

- ☐ For selector rod for 5th and 6th gear
- ☐ Pull out with internal puller - Kukko 21/2-
- ☐ Drive in until flush using guide pin - 10 - 15-

12 - Locking bush

- ☐ For selector rod for 3rd and 4th gear
- ☐ Removing and installing ⇒ [page 143](#)



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13 - Locking bush

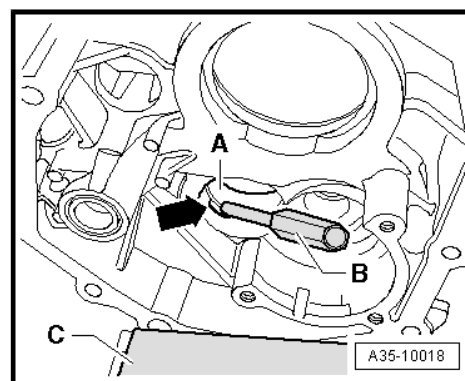
- ☐ For selector rod for 5th and 6th gear
- ☐ Removing and installing ⇒ [page 143](#)

14 - Ball sleeve

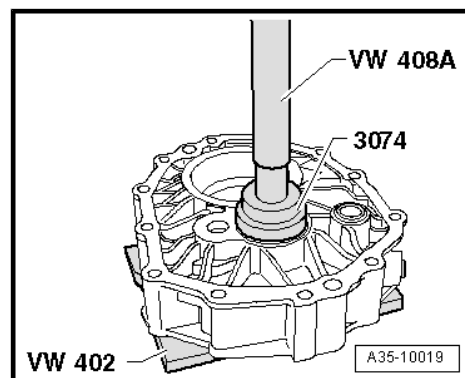
- ☐ For selector rod for 3rd and 4th gear
- ☐ Pull out with internal puller - Kukko 21/2-
- ☐ Driving in ⇒ [page 142](#)

Driving outer race for needle roller bearing out of bearing housing

- Clamp bearing housing in vice, using jaw protectors -C-.
- Drive out outer race -A- using drift -B- by alternately applying drift to the bearing housing recesses located opposite to each other -arrow-.



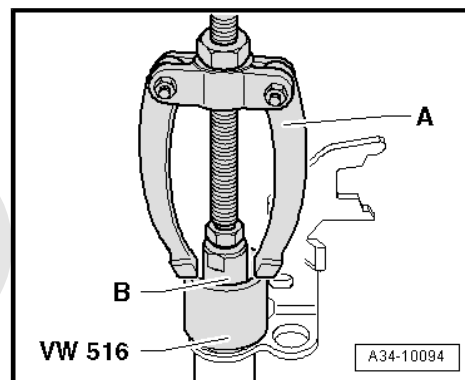
Pressing outer race for needle roller bearing into bearing housing until limit stop



Pulling front ball sleeve out of reverse gear selector rod

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

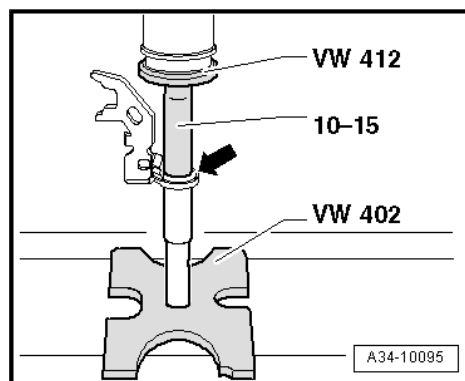
B - Internal puller 14.5 ... 18.5 mm , e.g. -Kukko 21/2-



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Pressing front ball sleeve into reverse gear selector rod until limit stop.

Fit ball sleeve -arrow- so that side with lettering (thicker metal) faces guide pin - 10 - 15- .

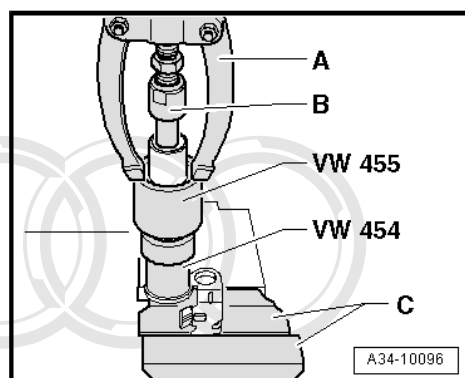


Pulling out rear ball sleeve for reverse gear selector rod

- Clamp yoke of selector rod in vice, using jaw protectors -C-.
- Fit press tool - VW 454- and installing sleeve - VW 455- onto selector rod.

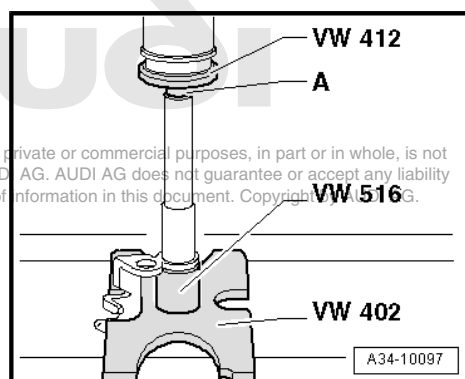
A - Counter-support , e.g. -Kukko 22/1-

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



Pressing in rear ball sleeve -A- for reverse gear selector rod

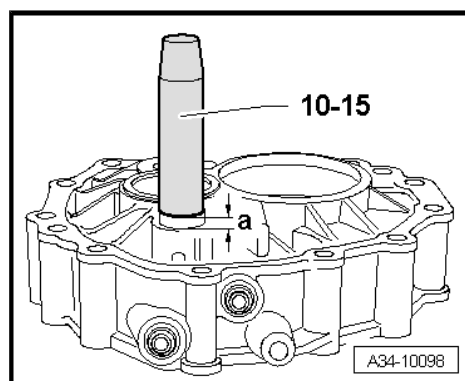
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Driving in ball sleeve for selector rod for 3rd and 4th gear

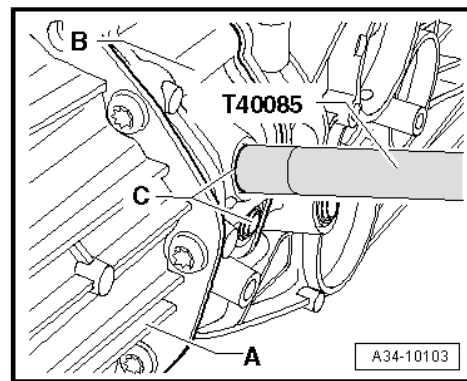
Fit ball sleeve so that side with lettering (thicker metal) faces guide pin - 10 - 15- .

- Dimension for pressing in -a- = 2.5 mm



Removing and installing locking bush for selector rod

- Remove the relevant selector rod (for 3rd and 4th gear or for 5th and 6th gear).
- Bolt bearing housing -B- with gearbox cover -A- onto gearbox housing prior to driving out and driving in the locking bushes -C-.
- Drive out the old locking bush inwards into bearing housing.
- Drive in new locking bush until flush.



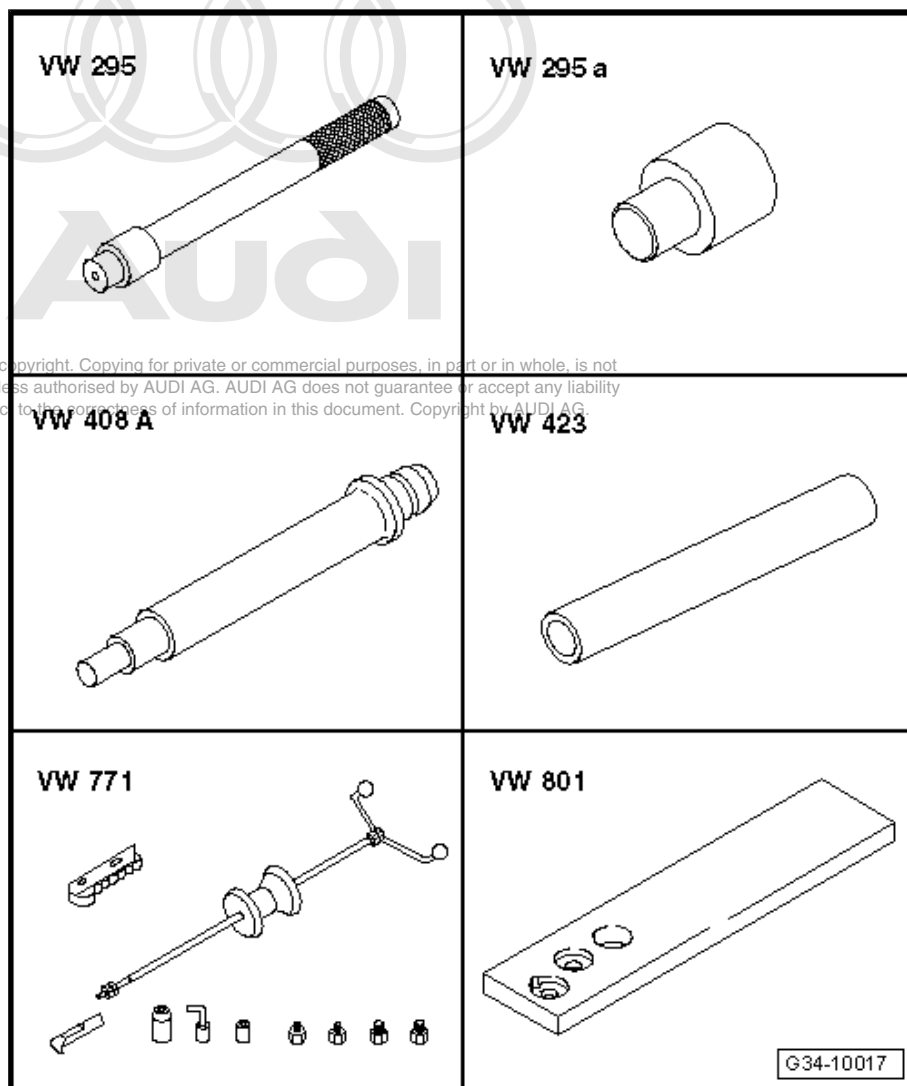
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10 Servicing gearbox housing

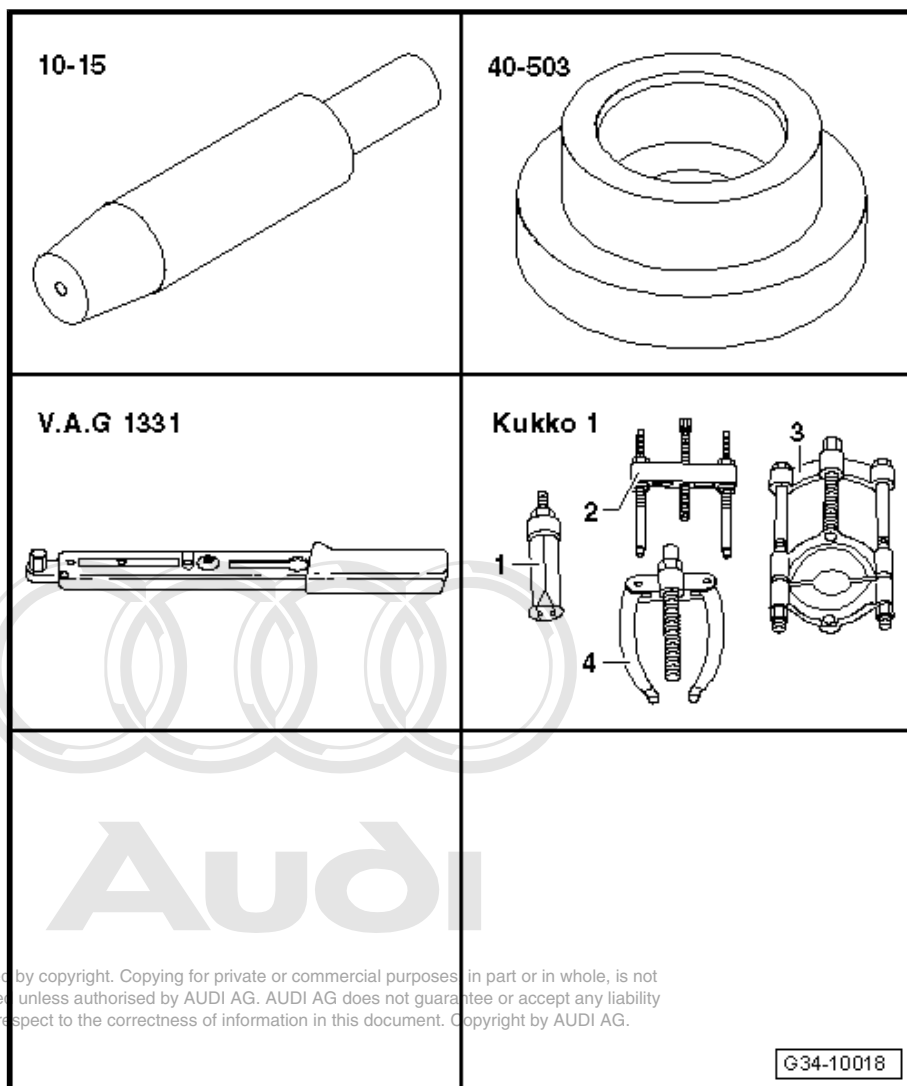
Special tools and workshop equipment required

- ◆ Drift - VW 295-
- ◆ Adapter - VW 295 A-
- ◆ Press tool - VW 408 A-
- ◆ Tube - VW 423-
- ◆ Multi-purpose tool - VW 771-
- ◆ Support plate - VW 801-

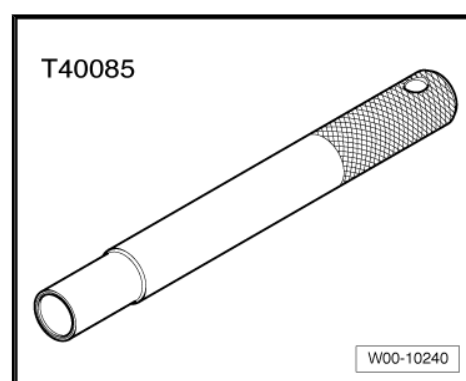
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- ◆ Guide pin - 10 - 15-
- ◆ Installing tool - 40 - 503-
- ◆ Torque wrench - V.A.G 1331-
- ◆ -1- Internal puller - Kukko 21/2-
- ◆ -4- Counter-support - Kukko 22/2-



- ◆ Drift - T40085-



1 - Gearbox housing

- ☐ When renewing: adjust input shaft
⇒ [page 164](#), adjust output shaft and differential (final drive gear set)
⇒ [page 204](#)

2 - Oil seal for selector shaft

- ☐ Pulling out ⇒ [page 148](#)
- ☐ Driving in ⇒ [page 148](#)
- ☐ ⇒ ["11.2 Renewing oil seal for selector shaft \(with gearbox installed in vehicle\)", page 154](#)
- ☐ ⇒ ["11.3 Renewing oil seal for selector shaft with gearbox removed \(gearbox remains assembled\)", page 156](#)
- ☐ Always use assembly sleeve to fit oil seal (if selector shaft remains installed in gearbox)
⇒ [page 156](#)

3 - Tapered roller bearing outer race (right-side)

- ☐ For differential
- ☐ If renewing: adjust differential (crown wheel)
⇒ [page 217](#)
- ☐ Removing and installing
⇒ [Item 3 \(page 198\)](#)

4 - Shim "S2"

- ☐ Note thickness
- ☐ Table of adjustments
⇒ [page 204](#)

5 - Bush

- ☐ Secures magnet ⇒ [Item 6 \(page 146\)](#)
- ☐ Drive in (for example, with press tool - VW 408 A- when renewing gearbox)

6 - Magnet

- ☐ Clean

7 - Ball-head pin

- ☐ 25 Nm
- ☐ Lubricate with grease for clutch plate splines - G 000 100-

8 - Oil drain plug

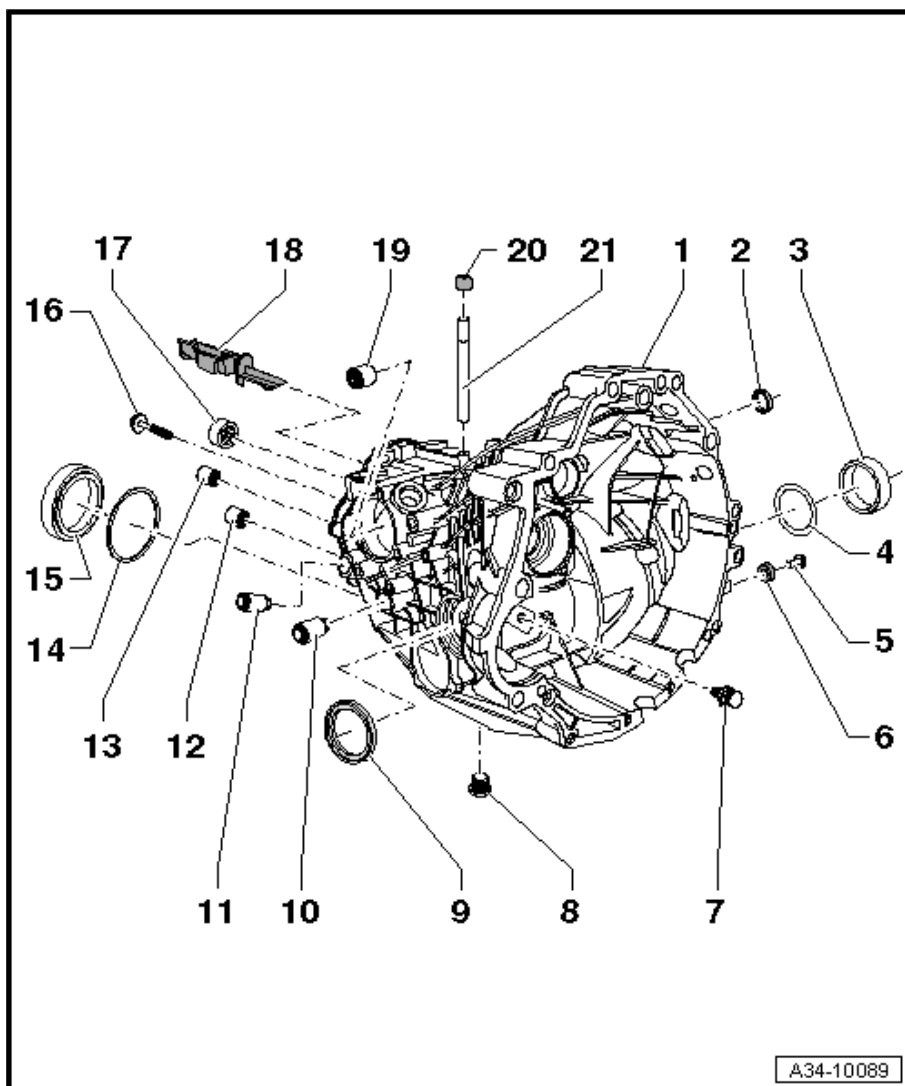
- ☐ 45 Nm

9 - Oil seal

- ☐ For flange shaft (right-side)
- ☐ Renewing ⇒ ["1.2 Renewing oil seal for flange shaft \(right-side\)", page 187](#)

10 - Locking bush

- ☐ For selector rod for 1st and 2nd gear
- ☐ Removing and installing ⇒ [page 143](#)



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11 - Locking bush

- ☐ For reverse gear selector rod
- ☐ Removing and installing ⇒ [page 143](#)

12 - Ball sleeve

- ☐ For selector rod for 1st and 2nd gear
- ☐ Pulling out ⇒ [page 141](#)
- ☐ Drive in until flush using guide pin - 10 - 15-

13 - Ball sleeve

- ☐ For selector rod for 3rd and 4th gear
- ☐ Pulling out ⇒ [page 141](#)
- ☐ Drive in until flush using guide pin - 10 - 15-

14 - Shim "S3"

- ☐ Note thickness
- ☐ Table of adjustments ⇒ [page 204](#)

15 - Tapered roller bearing outer race

- ☐ For output shaft
- ☐ Removing and installing ⇒ [Item 3 \(page 169\)](#)

16 - Bolt

- ☐ 24 Nm
- ☐ Secures needle bearing ⇒ [Item 17 \(page 147\)](#) for input shaft

17 - Needle bearing

- ☐ For input shaft
- ☐ Driving out ⇒ [page 149](#)
- ☐ Driving in ⇒ [page 149](#)

18 - Oil collector

- ☐ With magnet
- ☐ Installation position in gearbox housing ⇒ [page 149](#)

19 - Ball sleeve

- ☐ For selector shaft
- ☐ Pulling out ⇒ [page 149](#)
- ☐ Driving in ⇒ [page 150](#)

20 - Cap

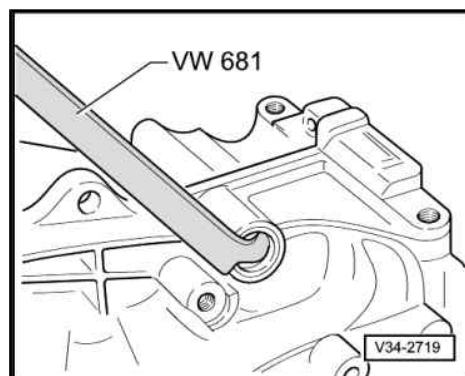
- ☐ For gearbox breather

21 - Breather pipe

- ☐ Drive in onto stop
- ☐ Clip in cap for gearbox breather

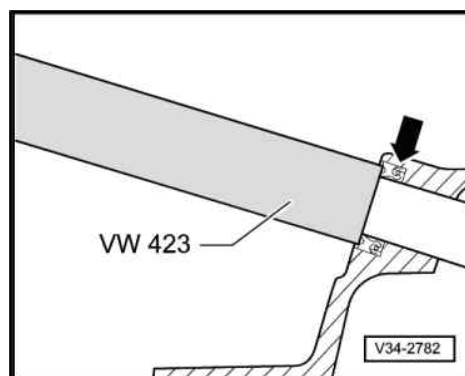
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Pulling out oil seal for selector shaft with gearbox dismantled



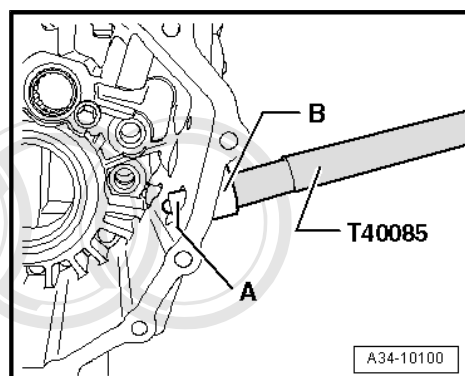
Driving in oil seal for selector shaft

- Pack space between sealing lip and dust lip half-full with sealing grease - G 052 128 A1- .
- Lightly oil outer circumference of oil seal.
- Drive oil seal -arrow- into housing as far as it will go.



Removing and installing locking bush for selector rod

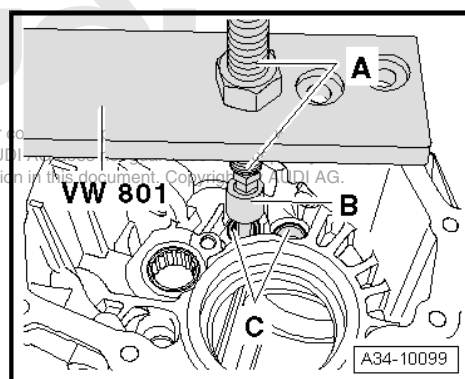
- Drive out the used locking bush -A- inwards into gearbox housing.
- Drive in new locking bush into gearbox housing -B- until flush.



Pulling out ball sleeve -C- from gearbox housing.

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

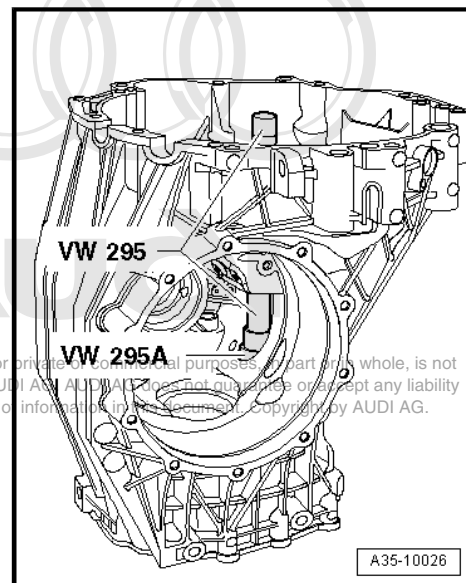
B - Internal puller 14.5 ... 18.5 mm , e.g. -Kukko 21/2-



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Driving out input shaft needle bearing from gearbox housing

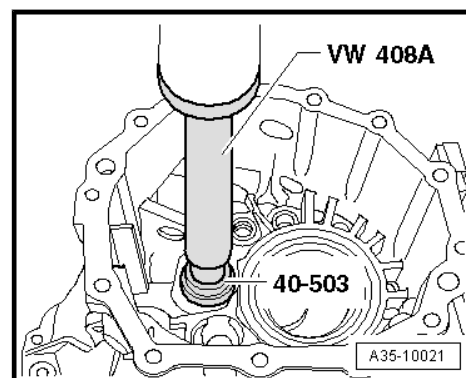
- Unscrew bolt for securing needle bearing ⇒ [page 149](#) .
- Fit adapter - VW 295 A- with smaller outside diameter into needle bearing.
- Drive out needle bearing with drift - VW 295- .



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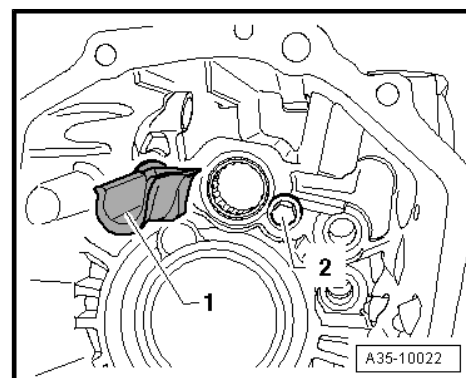
Pressing in input shaft needle bearing until limit stop

- Secure needle bearing after pressing in ⇒ [page 149](#) .



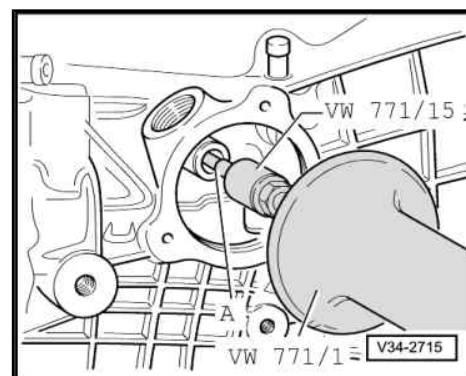
Securing input shaft needle bearing

- Secure input shaft needle bearing with bolt -2-.
- Then insert oil collector -1- into gearbox housing.



Pulling out selector shaft ball sleeve

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





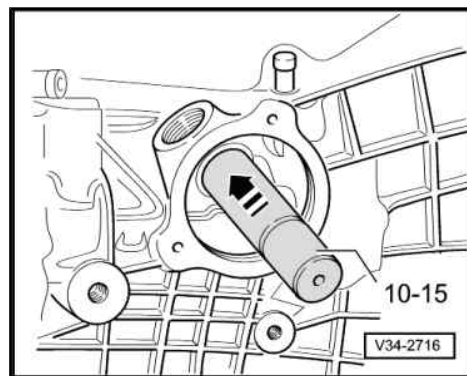
Driving in ball sleeve for selector shaft

Fit ball sleeve so that side with lettering (thicker metal) faces guide pin - 10 - 15- .

- Drive in ball sleeve until flush.



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11 Servicing selector shaft

⇒ "11.1 Removing and installing selector shaft with gearbox installed", page 151

⇒ "11.2 Renewing oil seal for selector shaft (with gearbox installed in vehicle)", page 154

⇒ "11.3 Renewing oil seal for selector shaft with gearbox removed (gearbox remains assembled)", page 156

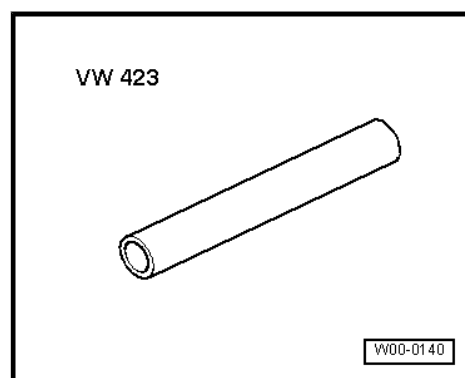
⇒ "11.4 Removing and installing reversing light switch F4", page 158

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11.1 Removing and installing selector shaft with gearbox installed

Special tools and workshop equipment required

- ◆ Tube - VW 423-



- ◆ Assembly sleeve - 01E 311 120-

- ◆ Locking fluid - AMV 185 101 A1-

Removing

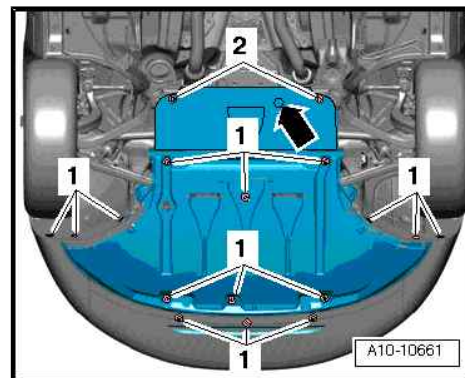
- Release fasteners -2- and remove rear noise insulation (if fitted).



Note

Items marked -1- and -arrow- can be disregarded.

- Remove front exhaust pipes (left and right) ⇒ Rep. gr. 26 .

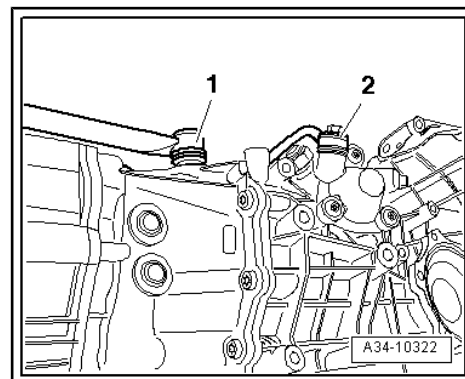


- Unscrew connecting rod -2- for selector rod.

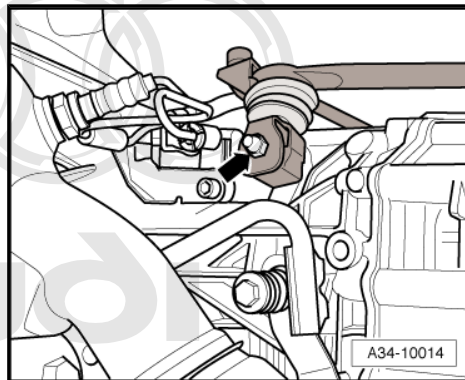


Note

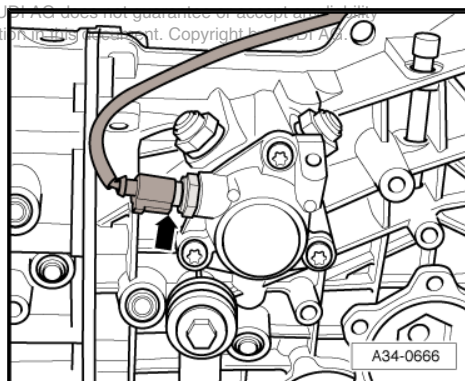
-Item 1- can be disregarded.



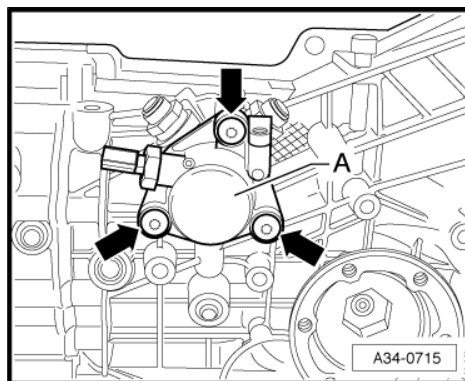
- Remove nut -arrow- and detach gearbox selector lever from selector shaft.



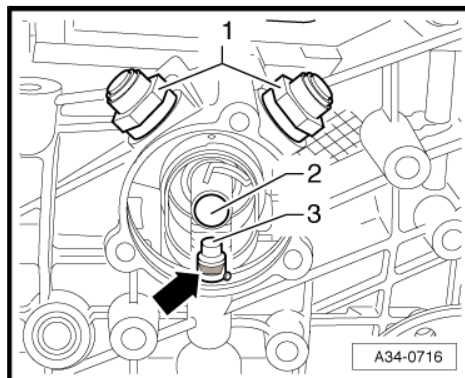
- Unplug electrical connector -arrow- for reversing light switch -F4-.



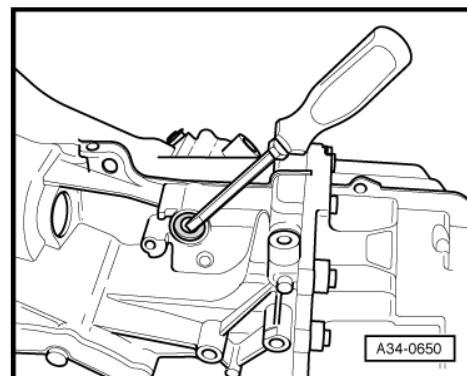
- Remove bolts -arrows- and take off selector shaft cover -A-.



- Unscrew the two locking bolts -1- for selector shaft.
- Make sure that no gear has been engaged.
- Push selector shaft -2- into gearbox as far as it will go, simultaneously removing pin -3-.
- Pull out selector shaft.



- Carefully pry out oil seal with a screwdriver.



Installing

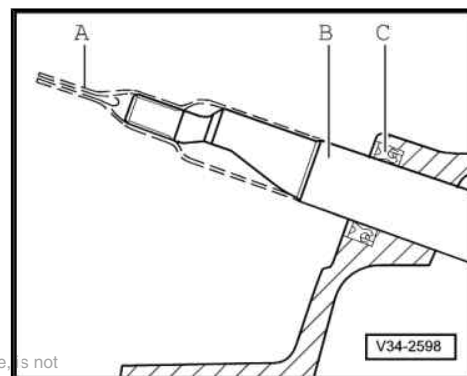
Perform installation in reverse sequence of removal. Note the following:



Note

Renew oil seals and O-rings.

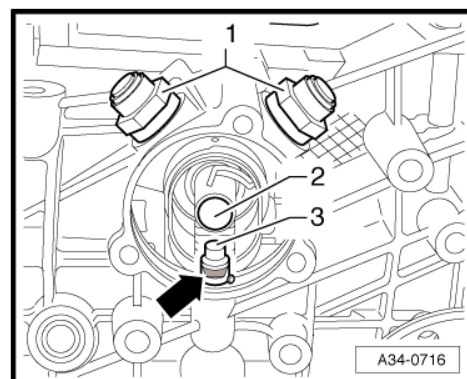
- Install selector shaft.
- Installation position: Chamfer on selector shaft -B- points downwards.



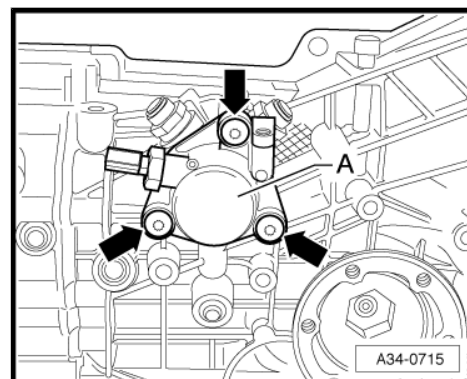
Note

Ignore -item A- and -item C-.

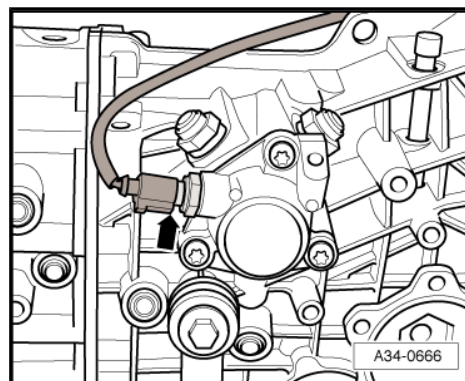
- Push selector shaft -2- into gearbox as far as it will go, simultaneously inserting pin -3-.
- Installation position: groove -arrow- on pin faces towards selector shaft cover.
- Clean threads of locking bolts -1- with a wire brush. Then install bolts with locking fluid - AMV 185 101 A1- and tighten to specified torque.



- Fit cover -A- with new O-ring.
- Clean threads of bolts -arrows- with a wire brush. Then install bolts with locking fluid - AMV 185 101 A1- and tighten to specified torque.



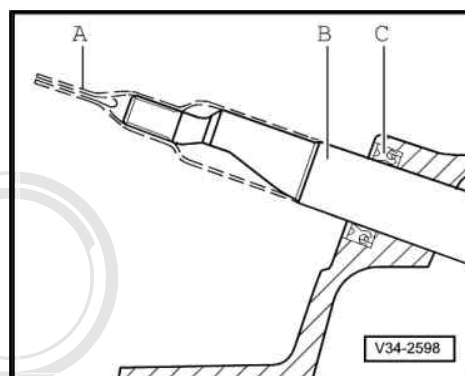
- Plug connector -arrow- into reversing light switch - F4- .



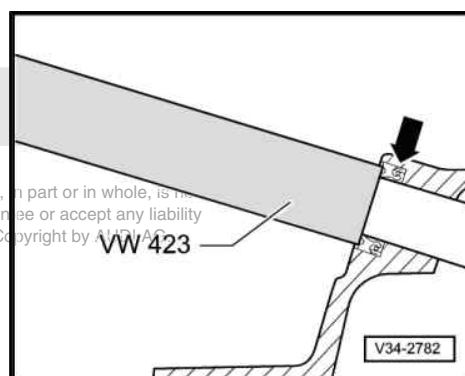
Note

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

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



- Drive oil seal -arrow- into housing as far as stop using tube - VW 423- .
- Fit the selector linkage.
- Install front exhaust pipes and perform stress-free alignment
⇒ Rep. gr. 26 .



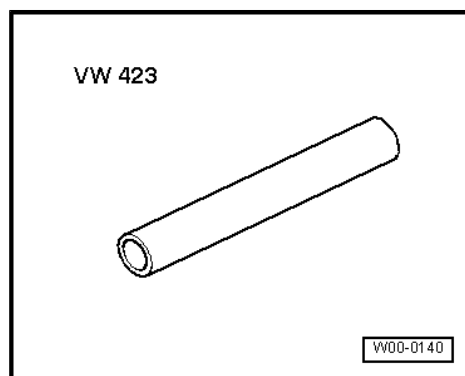
Tightening torques

Component	Nm
Locking bolts for selector shaft	45
Selector shaft cover	24
Gearbox selector lever to selector shaft	23
Connecting rod to selector rod	23

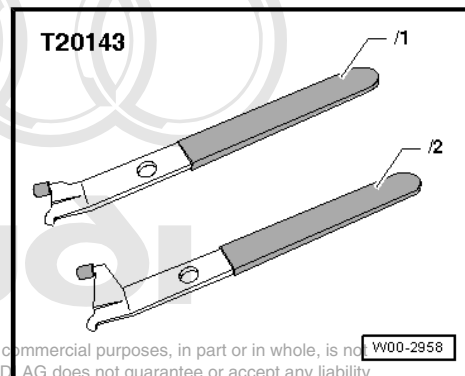
11.2 Renewing oil seal for selector shaft (with gearbox installed in vehicle)

Special tools and workshop equipment required

- ◆ Tube - VW 423-



- ◆ Extractor tool - T20143/1-



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- ◆ Assembly sleeve - 01E 311 120-
- ◆ Sealing grease - G 052 128 A1-

Procedure

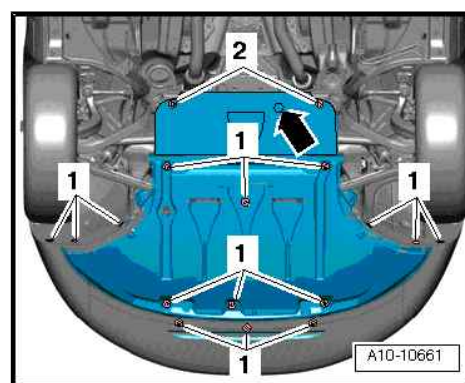
- Release fasteners -2- and remove rear noise insulation (if fitted).



Note

Items marked -1- and -arrow- can be disregarded.

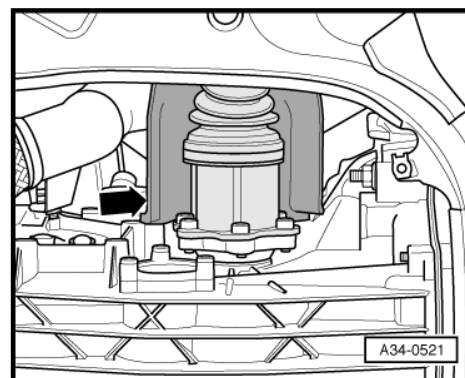
- Remove front exhaust pipe (left-side) ⇒ Rep. gr. 26 .
- Remove front right wheel.



Note

Secure brake disc with one wheel bolt.

- Unbolt heat shield -arrow- for drive shaft (right-side).

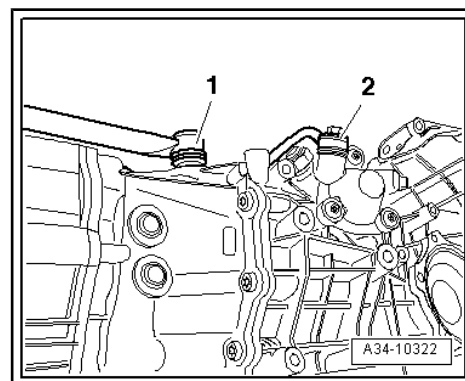


- Unscrew connecting rod -2- for selector rod.

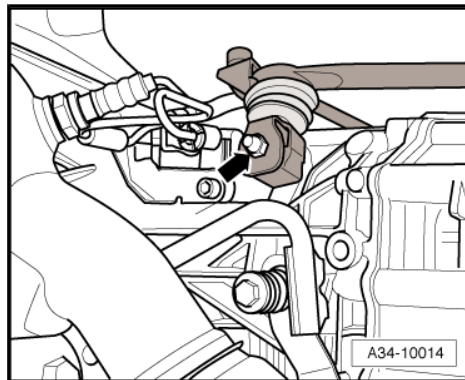


Note

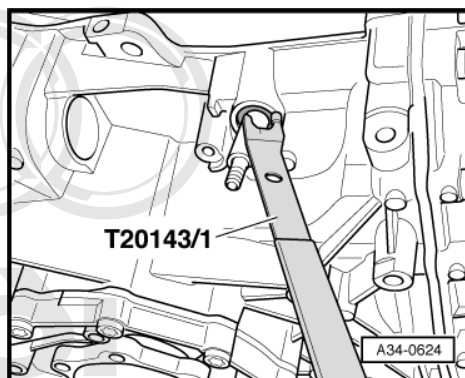
-Item 1- can be disregarded.



- Unscrew nut -arrow- and detach gearbox selector lever from selector shaft.



- Carefully lever out oil seal, taking care not to damage shaft.

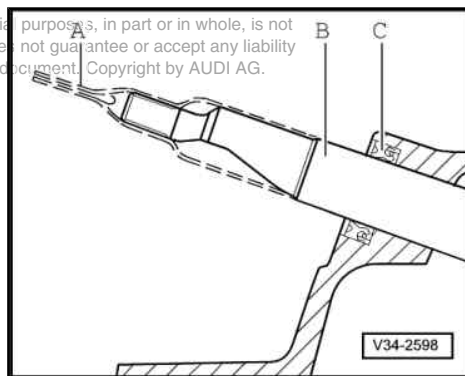


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Use assembly sleeve - 01E 311 120- -item A- to avoid damaging the oil seal -C- when installing.

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



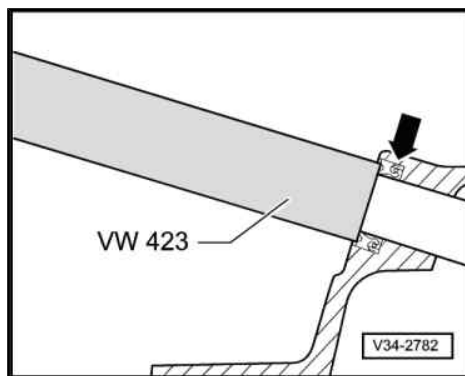
- Drive oil seal -arrow- into housing as far as stop using tube - VW 423- .

Assembly is carried out in the reverse order to removal; note the following:

- Install front exhaust pipe (left side) ⇒ Rep. gr. 26 .

Tightening torques

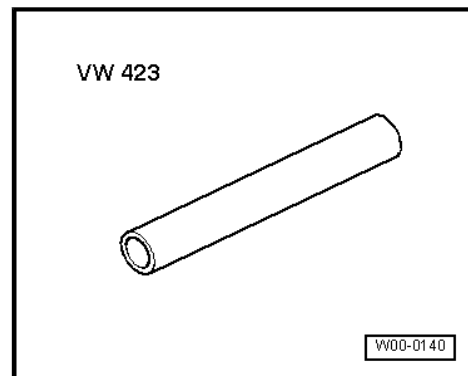
Component	Nm
Gearbox selector lever to selector shaft	23
Connecting rod to selector rod	23
Heat shield above drive shaft to gearbox	23



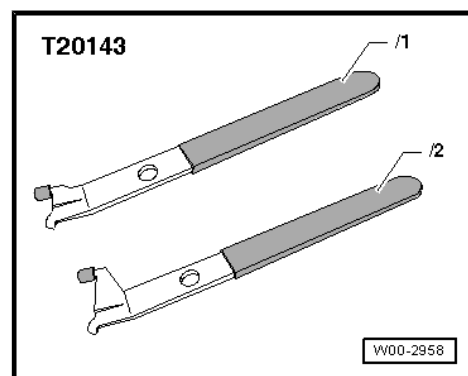
11.3 Renewing oil seal for selector shaft with gearbox removed (gearbox remains assembled)

Special tools and workshop equipment required

◆ Tube - VW 423-



◆ Extractor tool - T20143/1-

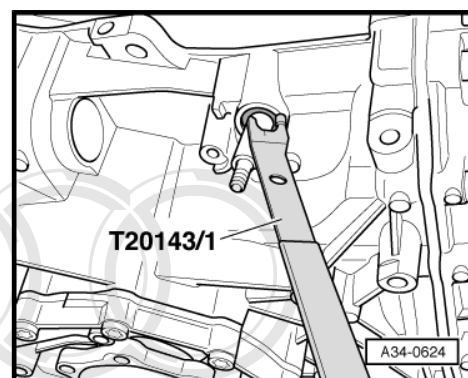


◆ Assembly sleeve - 01E 311 120-

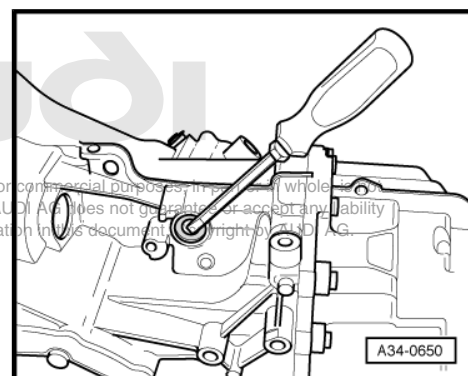
◆ Sealing grease - G 052 128 A1-

Removing

- With selector shaft installed
- Carefully lever out oil seal, taking care not to damage shaft.



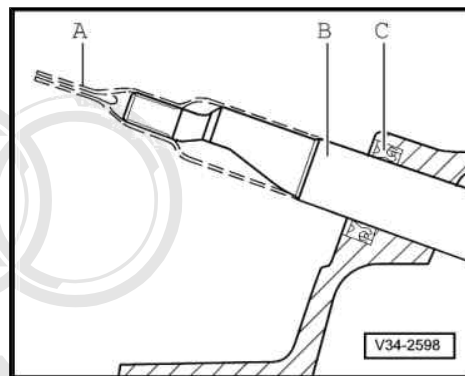
- With selector shaft removed
- Carefully lever out oil seal using a screwdriver or oil seal extractor lever - VW 681- .



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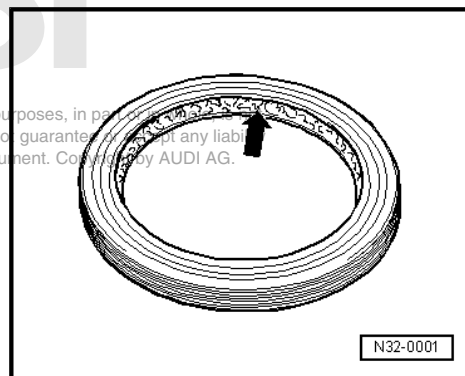
Installing

- To avoid damaging oil seal -C-, always use assembly sleeve - 01E 311 120- -A- when installing oil seal and selector shaft.

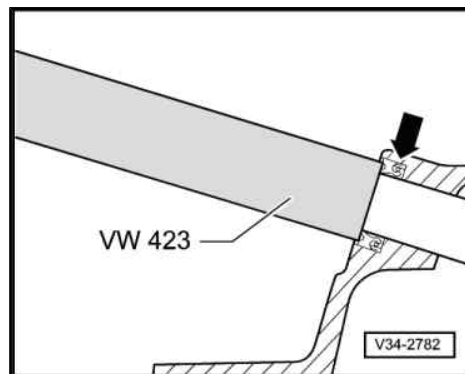


- Pack space between sealing lip and dust lip -arrow- half full with sealing grease - G 052 128 A1- .
- Lightly oil outer circumference of oil seal.

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- Drive oil seal -arrow- into housing as far as it will go.



11.4 Removing and installing reversing light switch - F4-

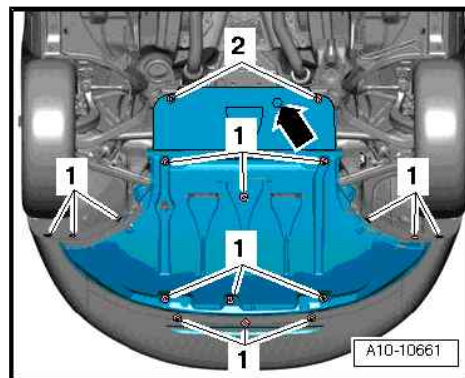
Removing

- Release fasteners -2- and remove rear noise insulation (if fitted).

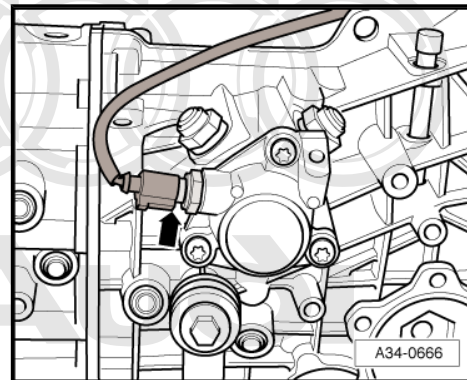


Note

Items marked -1- and -arrow- can be disregarded.

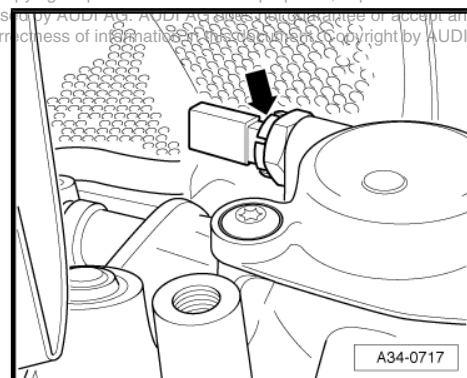


- Unplug electrical connector -arrow- for reversing light switch - F4- on gearbox (right-side).



- Unscrew reversing light switch - F4- from selector shaft cover -arrow-.

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Installing

Perform installation in reverse sequence of removal.

Tightening torque

Component	Nm
Reversing light switch - F4- in selector shaft cover	20

35 – Gears, shafts

1 Dismantling and assembling input shaft

- ◆ ⇒ [“1.1 Exploded view - input shaft”, page 160](#)
- ◆ ⇒ [“1.2 Dismantling and assembling input shaft”, page 163](#)
- ◆ ⇒ [“1.3 Adjusting input shaft”, page 164](#)

1.1 Exploded view - input shaft



Note

- ◆ Refer to technical data when installing new gears ⇒ [page 1](#).
- ◆ Lubricate all bearings on input shaft with gear oil before installing.
- ◆ The position of the ball bearing ⇒ [Item 2 \(page 160\)](#) is affected when the gearbox housing ⇒ [Item 4 \(page 160\)](#) or input shaft ⇒ [Item 7 \(page 161\)](#) is renewed. In this case the input shaft must be re-adjusted ⇒ [page 164](#).

1 - Circlip

- ☐ Mark
- ☐ Installation position
⇒ [page 164](#), -item 1-
- ☐ Determining thickness
⇒ [“1.3 Adjusting input shaft”, page 164](#)

2 - Ball bearing

- ☐ Removing
⇒ [“7 Assembly sequence - dismantling and assembling gearbox”, page 111](#)
- ☐ Installing
⇒ [“7.2 Assembling gearbox”, page 123](#)

3 - Circlip

- ☐ Mark
- ☐ Installation position
⇒ [page 164](#), -item 2-
- ☐ Determining thickness
⇒ [“1.3 Adjusting input shaft”, page 164](#)

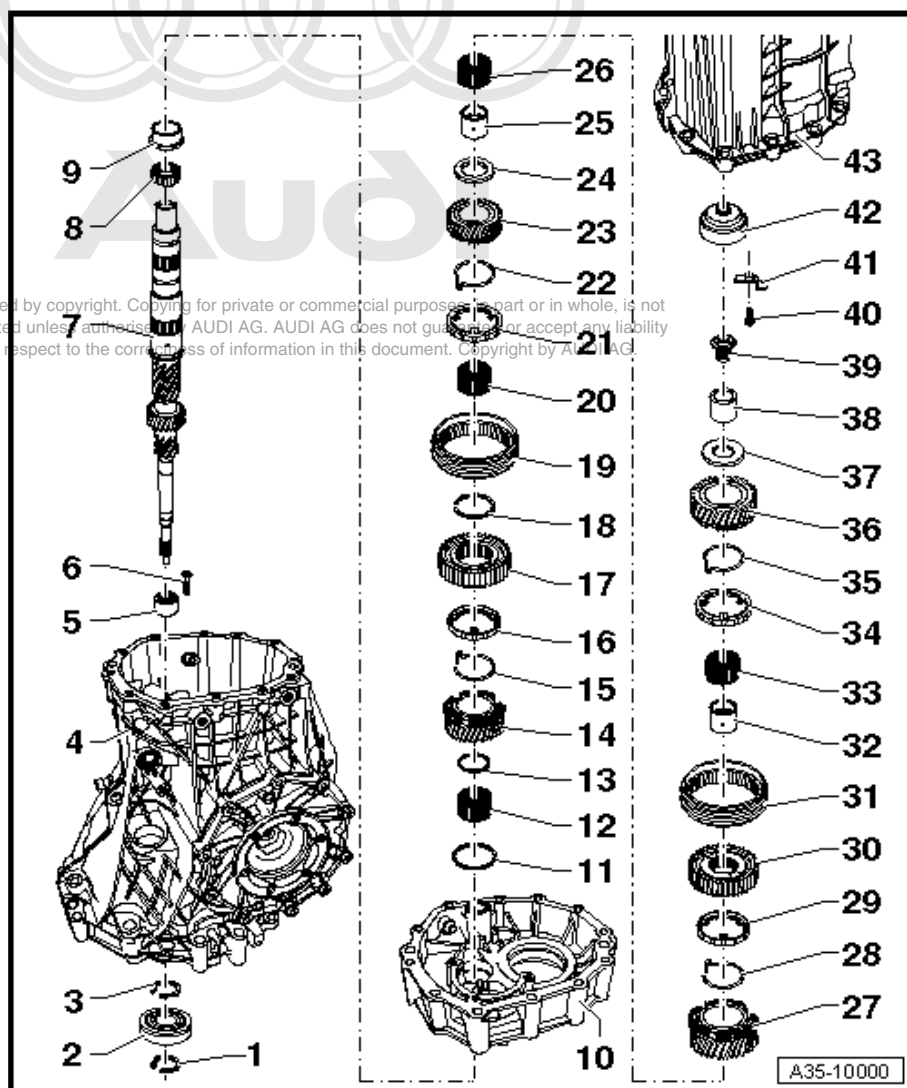
4 - Gearbox housing

5 - Needle bearing

- ☐ For input shaft
- ☐ Secured with bolt
⇒ [Item 6 \(page 160\)](#)
- ☐ Removing and installing
⇒ [Item 17 \(page 147\)](#)

6 - Bolt

- ☐ 24 Nm



- ☐ Secures needle bearing
⇒ [Item 5 \(page 160\)](#) for input shaft

7 - Input shaft

- ☐ Adjusting ⇒ [page 164](#)



Note

The thread must be cleaned if a self-locking multi-point socket head bolt ⇒ [Item 39 \(page 162\)](#) was previously fitted in the threaded hole.

8 - Roller bearing

- ☐ Detaching and fitting ⇒ [page 163](#)
- ☐ Installation position: collar faces splines for 2nd gear

9 - Outer race

- ☐ For needle roller bearing
- ☐ Removing and installing ⇒ [Item 2 \(page 140\)](#)

10 - Bearing housing

11 - Thrust washer

- ☐ For 3rd speed selector gear

12 - Needle bearing

- ☐ For 3rd gear

13 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 164](#) , -item 3-

14 - 3rd speed selector gear

15 - Spring

- ☐ Insert in 3rd speed selector gear ⇒ [page 163](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

16 - 3rd gear synchro-ring

- ☐ Checking for wear ⇒ [page 164](#)

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

- ☐ Installation position: high inside collar faces 3rd speed selector gear

18 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 164](#) , -item 4-
- ☐ Do not interchange with other circlip ⇒ [Item 13 \(page 161\)](#)
- ☐ Re-determining thickness ⇒ [page 164](#)

19 - Locking collar for 3rd and 4th gear

- ☐ Mark position in relation to synchro-hub prior to removing

20 - Needle bearing

- ☐ For 4th gear

21 - 4th gear synchro-ring

- ☐ Checking for wear ⇒ [page 164](#)

22 - Spring

- ☐ Insert in 4th speed selector gear ⇒ [page 163](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

23 - 4th speed selector gear**24 - Thrust washer**

- ☐ For 4th speed and 5th speed selector gears

25 - Needle bearing inner race

- ☐ For 5th gear

26 - Needle bearing

- ☐ For 5th gear

27 - 5th speed selector gear**28 - Spring**

- ☐ Insert in 5th speed selector gear ⇒ [page 163](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

29 - 5th gear synchro-ring

- ☐ Checking for wear ⇒ [page 164](#)

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

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31 - Locking collar for 5th and 6th gear

- ☐ Mark position in relation to synchro-hub prior to removing

32 - Needle bearing inner race

- ☐ For 6th gear

33 - Needle bearing

- ☐ For 6th gear

34 - 6th gear synchro-ring

- ☐ Checking for wear ⇒ [page 164](#)

35 - Spring

- ☐ Insert in 6th speed selector gear ⇒ [page 163](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

36 - 6th speed selector gear**37 - Thrust washer**

- ☐ For 6th speed selector gear

38 - Inner race

- ☐ For needle roller bearing ⇒ [Item 42 \(page 162\)](#)

39 - Multi-point socket head bolt

- ☐ 200 Nm
- ☐ Self-locking
- ☐ Always renew

40 - Multi-point socket head bolt

- ☐ 24 Nm

41 - Retaining plate

- ☐ Secures needle roller bearing ⇒ [Item 42 \(page 162\)](#) in gearbox cover

42 - Roller bearing

- ☐ Bearing for input shaft in gearbox cover
- ☐ With oil guide
- ☐ Always renew
- ☐ Removing and installing ⇒ [Item 4 \(page 135\)](#)

43 - Gearbox cover

1.2 Dismantling and assembling input shaft



Note

Removing and installing 3rd to 6th speed selector gears is described in
⇒ ["7 Assembly sequence - dismantling and assembling gearbox"](#),
[page 111](#).

Special tools and workshop equipment required

◆ Depth gauge

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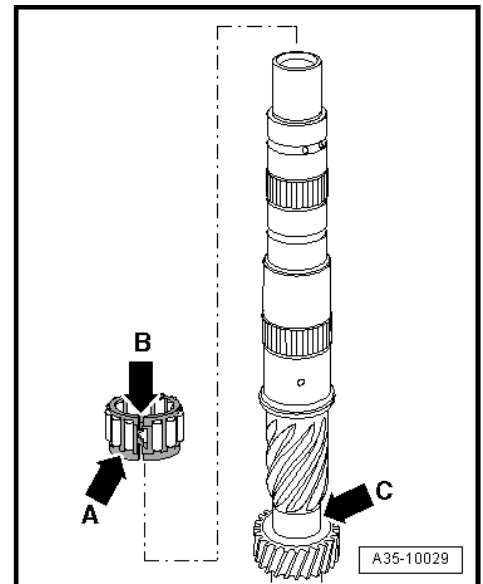
Detaching needle roller bearing from input shaft and fitting needle roller bearing onto input shaft

Detaching needle roller bearing:

- Bend open needle roller bearing at separating point
-arrow B- just far enough for it to be detached from input shaft
(do not bend open more than necessary).

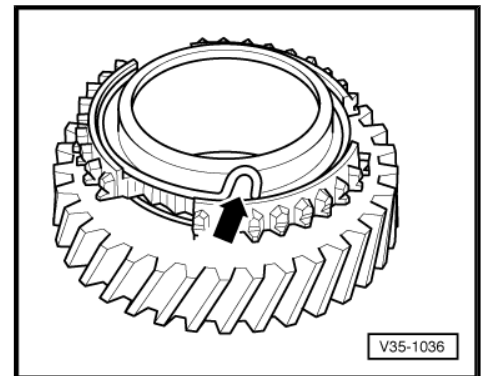
Fitting needle roller bearing:

- The shoulder -arrow A- faces towards splines for 2nd gear.
- Bend open needle roller bearing at separating point
-arrow B- just far enough for it to be guided over the input shaft
and onto its seat -arrow C-.



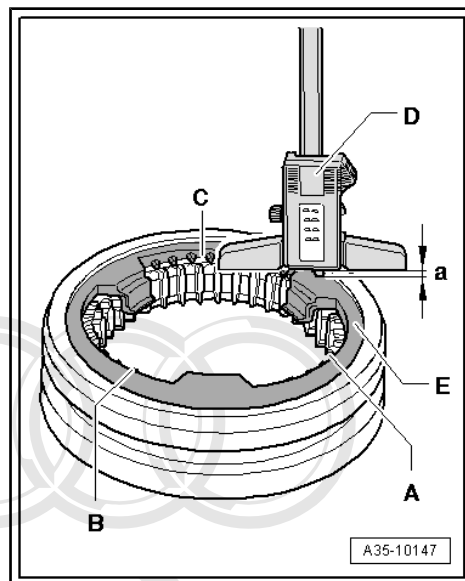
Inserting spring in selector gear

The bent end of the spring -arrow- must be hooked into the hole in the selector gear.



Checking synchro-ring for wear

- Press synchro-ring -E- into locking collar and measure gap -a- at positions -A-, -B- and -C- using depth gauge -D-.
- Add the measured values and divide by 3.
- The determined value should not exceed 0.45 mm.



Installation position of circlips

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

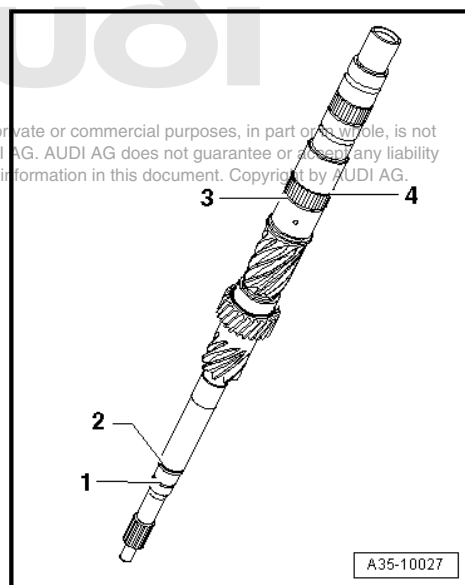
Determining thickness ⇒ [page 164](#) .

- ◆ The circlip -3- secures the needle bearing for 3rd speed selector gear and the 3rd and 4th gear synchro-hub.

Thickness: 2.00 mm.

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

Determining thickness ⇒ [page 164](#) .

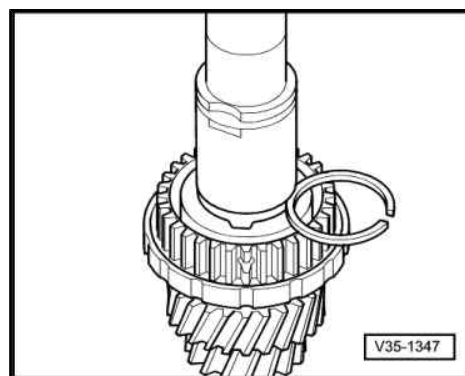


Determining thickness of circlip for synchro-hub for 3rd and 4th gear

- Synchro-hub is pressed on as far as stop.
- Determine the thickest circlip that will just fit and install it. For part number refer to ⇒ Electronic parts catalogue .

The following circlips are available:

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05



1.3 Adjusting input shaft

Determining circlips for input shaft ball bearing

It is necessary to readjust the input shaft when the:

- ◆ Gearbox housing

or the

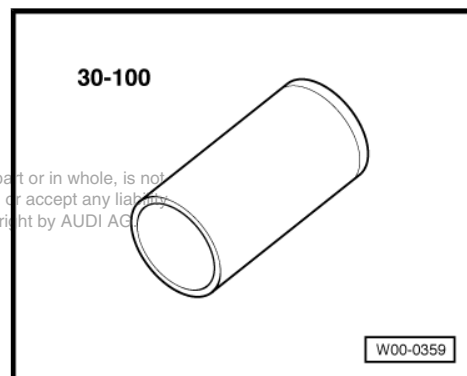
◆ Input shaft

are renewed.

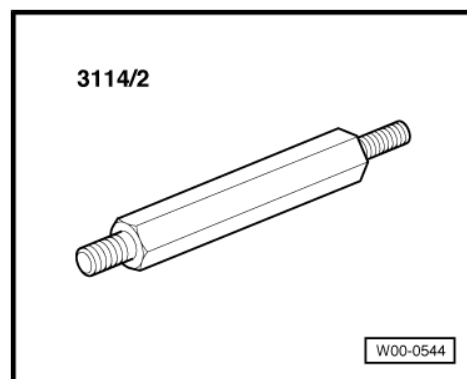
Special tools and workshop equipment required

◆ Drift sleeve - 30 - 100-

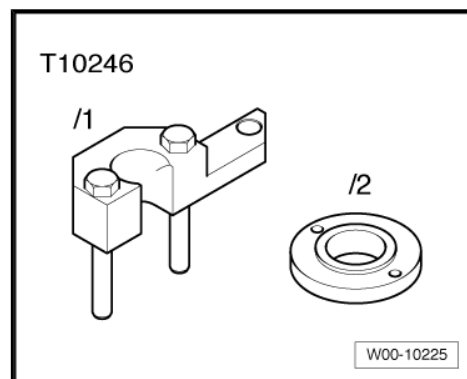
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◆ Pin (M8 and M10) - 3114/2-



◆ Fitting tool - T10246-



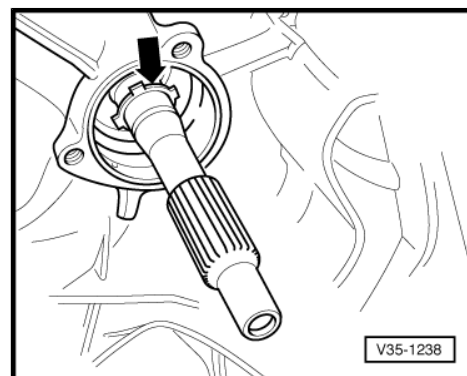
◆ Digital depth gauge , e.g. -VAS 6087-

Determining thickness for circlip behind input shaft ball bearing

- Fit a provisional circlip -arrow- in the rear groove on the input shaft.
- Then push ball bearing onto input shaft.

Installation position:

The closed side of the ball cage faces the gearbox housing.



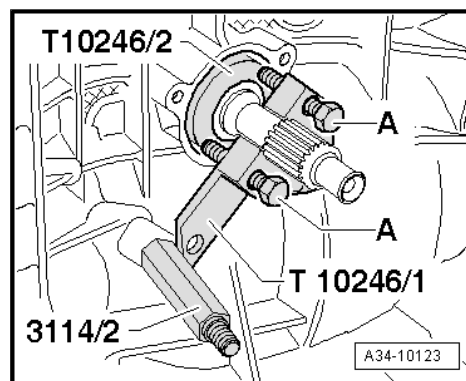
- Pressing in ball bearing:

First screw pin (M8 and M10) - 3114/2- into tapped hole for ball-head pin.

Slide the thrust plate - T10246/2- onto input shaft.

Now position fitting tool - T10246/1- behind splines for clutch plate. Tighten bolts -A- only slightly. The bolts locate in the recesses in the thrust plate - T10246/2- .

Press in ball bearing onto stop by tightening bolts -A- alternately (1/2 turn at a time).

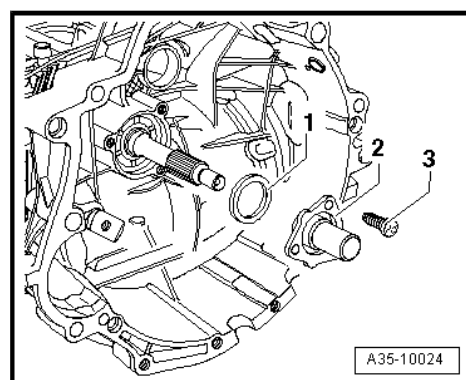


- Then fit dished spring -1-.

Installation position:

The convex side faces guide sleeve -2-.

- Fit a shrink hose onto input shaft splines.
- Bolt guide sleeve to gearbox housing -2- with bolts -3-.
- Then turn the gearbox housing so the joint flange for the bearing housing points upwards.
- The contact surface must be cleaned to remove sealing paste .



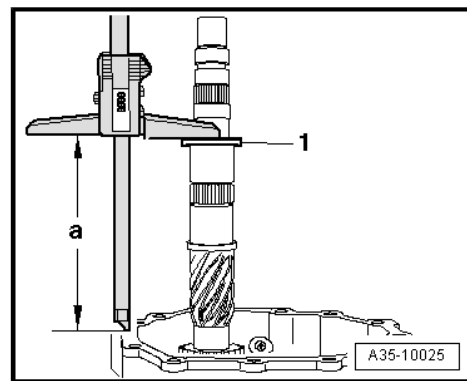
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- Place thrust washer -1- for 4th and 5th speed selector gears onto input shaft.
- Apply digital depth gauge (e.g. -VAS 6087-) to thrust washer -1- and measure distance to contact surface of housing. The measuring point on the housing contact surface must be as close to the input shaft as possible.



Note

When measuring, lift the input shaft with e.g. support bridge - 30-211A- or the help of a 2nd mechanic so that the play in the ball bearing is taken up.



- Specification: distance “a” = 164.14 mm



Note

- ◆ *If the measured value exceeds the specification, use a thinner circlip than the circlip installed so that the specification is attained.*
- ◆ *If the measured value is below the specification, use a thicker circlip than the circlip installed so that the specification is attained.*
- ◆ *Determine the circlip thickness to meet the specification as exactly as possible (164.14 mm).*

The following circlips are available:

Circlip thickness (mm)		
1.54	2.08	2.62
1.63	2.17	2.71
1.72	2.26	2.80
1.81	2.35	2.89
1.90	2.44	
1.99	2.53	

- Select circlip from table. For part number, refer to ⇒ Electronic parts catalogue .

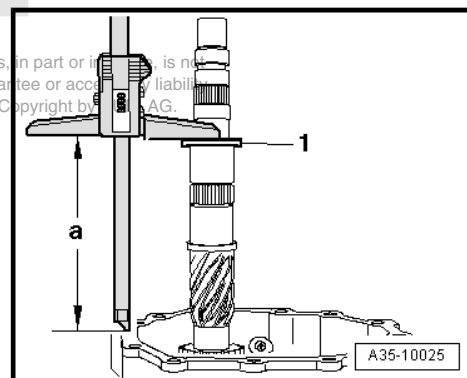
Checking adjustment and checking distance “a”:

- Determined circlip is installed.

The distance “a” should be 164.14 mm ± 0.04 mm if the correct circlip has been selected.

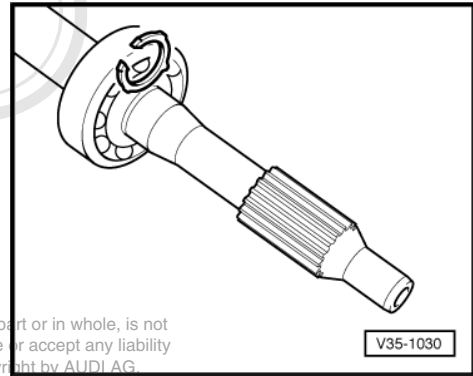
Determining thickness for circlip in front of input shaft ball bearing

- Knock rear circlip (as determined) and ball bearing onto input shaft using drift sleeve - 30 - 100- .





- Determine the thickest circlip which will still just fit.
- Refer to table ⇒ [page 167](#) to determine correct circlip. For part number, refer to ⇒ Electronic parts catalogue .



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2 Pinion shaft (output shaft)

◆ ⇒ "2.1 Exploded view - pinion shaft (output shaft)",
page 169

◆ ⇒ "2.2 Dismantling and assembling pinion shaft (output shaft)",
page 172

2.1 Exploded view - pinion shaft (output shaft)



Note

- ◆ When installing new gear wheels or the final drive set consult technical data ⇒ page 1 .
- ◆ Lubricate all needle bearings on output shaft with gear oil before installing.
- ◆ Adjustment work is required when renewing the parts marked with ¹⁾. Table of adjustments ⇒ page 204

1 - Gearbox housing ¹⁾

- Servicing ⇒ page 144

2 - Shim "S3"

- Table of adjustments
⇒ page 204

3 - Tapered roller bearing outer race ¹⁾

- Pulling out ⇒ page 176
- Pressing in
⇒ page 176 and
⇒ page 177

4 - Pinion shaft (output shaft) ¹⁾

- Is mated with crown wheel, always renew together as a set
- Adjusting pinion shaft and crown wheel
⇒ page 202

5 - Tapered roller bearing inner race ¹⁾

- Will be damaged during removal
- Renew
- Pressing off
⇒ page 178
- Pressing on
⇒ page 179

6 - Circlip

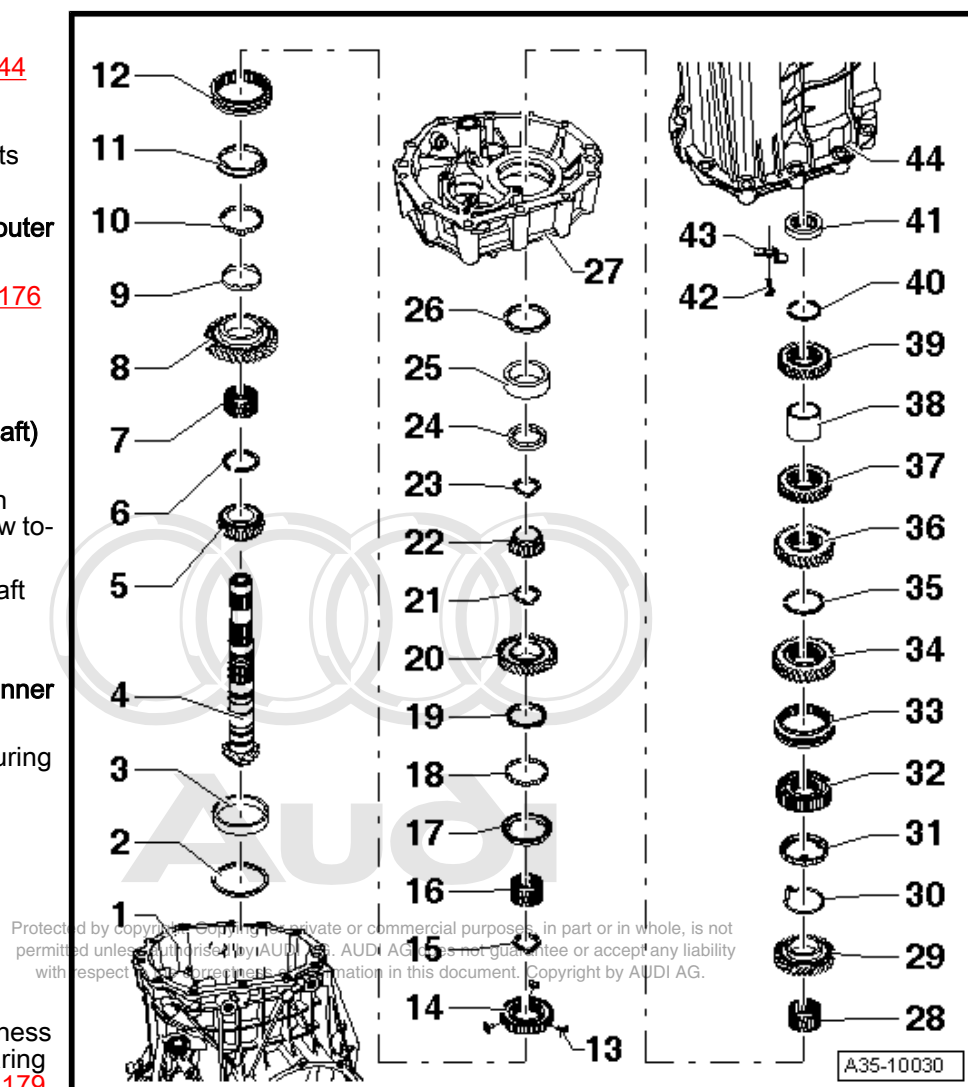
- Re-determine thickness if tapered roller bearing is renewed ⇒ page 179
- Installation position ⇒ page 180 , -item 1-

7 - Needle bearing

- For 1st gear

8 - 1st speed selector gear

- Check axial clearance after installing using feeler gauge ⇒ page 182 (0.20 ... 0.50 mm)



9 - Inner ring for 1st gear

- ☐ Installation position ⇒ [page 181](#)
- ☐ Checking for wear ⇒ [page 181](#)
- ☐ Renew if scored or if there are visible traces of wear

10 - Intermediate ring for 1st gear

- ☐ Installation position ⇒ [page 181](#)
- ☐ Checking for wear ⇒ [page 181](#)

11 - Synchro-ring for 1st gear

- ☐ Installation position ⇒ [page 181](#)
- ☐ Checking for wear ⇒ [page 181](#)
- ☐ Renew if scored or if there are visible traces of wear

12 - Locking collar for 1st and 2nd gear

- ☐ Mark position in relation to synchro-hub prior to removing
- ☐ Assembling locking collar/synchro-hub ⇒ [page 182](#)

13 - Thrust block

- ☐ Installing thrust blocks (3x) ⇒ [page 182](#)

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

- ☐ Installation position: high inside collar faces 2nd speed selector gear
- ☐ Pressing off ⇒ [page 178](#)
- ☐ Pressing on ⇒ [page 181](#)
- ☐ Assembling locking collar/synchro-hub ⇒ [page 182](#)

15 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 180](#) , -item 2-
- ☐ Re-determine thickness when renewing 1st and 2nd gear synchro-hub or pinion shaft ⇒ [page 179](#)

16 - Needle bearing

- ☐ For 2nd gear

17 - Synchro-ring for 2nd gear

- ☐ Installation position ⇒ [page 181](#)
- ☐ Checking for wear ⇒ [page 181](#)
- ☐ Renew if scored or if there are visible traces of wear

18 - Intermediate ring for 2nd gear

- ☐ Installation position ⇒ [page 181](#)
- ☐ Checking for wear ⇒ [page 181](#)

19 - Inner ring for 2nd gear

- ☐ Installation position ⇒ [page 181](#)
- ☐ Checking for wear ⇒ [page 181](#)
- ☐ Renew if scored or if there are visible traces of wear

20 - 2nd speed selector gear

- ☐ Check axial clearance after installing using feeler gauge ⇒ [page 183](#) (0.20 ... 0.50 mm)

21 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 180](#) , -item 3-

22 - Tapered roller bearing inner race ¹⁾

- ☐ Pressing off ⇒ [page 178](#)
- ☐ Pressing on ⇒ [page 182](#)



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23 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 180](#) , -item 4-

24 - Thrust washer

- ☐ For reverse selector gear
- ☐ Pressing off ⇒ [page 177](#)
- ☐ Pressing on ⇒ [page 183](#)

25 - Tapered roller bearing outer race ¹⁾

- ☐ Pulling out ⇒ [page 177](#)
- ☐ Pressing in ⇒ [page 177](#)

26 - Shim "S₄"

- ☐ Table of adjustments ⇒ [page 204](#)

27 - Bearing housing ¹⁾

28 - Needle bearing

- ☐ For reverse selector gear

29 - Reverse selector gear

- ☐ Check axial clearance after installing using feeler gauge (0.20 ... 0.50 mm)

30 - Spring

- ☐ Insert into reverse selector gear ⇒ [page 172](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

31 - Synchro-ring for reverse gear

- ☐ Checking for wear ⇒ [page 172](#)

32 - Reverse gear synchro-hub

- ☐ Installation position: high inside collar faces 3rd gear wheel

33 - Reverse gear locking collar

- ☐ Mark position in relation to synchro-hub prior to removing
- ☐ Installation position: taper faces reverse gear synchro-ring

34 - 3rd gear wheel

- ☐ Installation position: machined side faces reverse gear synchro-hub

35 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 180](#) , -item 5-
- ☐ Re-determine thickness when renewing 3rd gear wheel, reverse gear synchro-hub or pinion shaft ⇒ [page 179](#)

36 - 4th gear wheel

- ☐ Installation position: high inside collar faces 5th gear wheel

37 - 5th gear wheel

- ☐ Installation position: high inside collar faces 4th gear wheel

38 - Spacer sleeve

39 - 6th gear wheel

- ☐ Installation position: high inside collar faces spacer sleeve ⇒ [Item 38 \(page 171\)](#)

40 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 180](#) , -item 6-
- ☐ Re-determine thickness when renewing gear wheels for 4th ... 6th gear, the spacer sleeve or the pinion shaft ⇒ [page 179](#)



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41 - Needle bearing

- ☐ Bearing for pinion shaft in gearbox cover
- ☐ Removing and installing ⇒ [Item 3 \(page 135\)](#)

42 - Multi-point socket head bolt

- ☐ 24 Nm

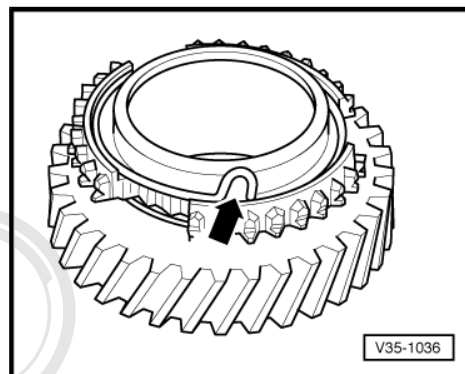
43 - Retaining plate

- ☐ Secures needle bearing ⇒ [Item 41 \(page 172\)](#) in gearbox cover

44 - Gearbox cover

Inserting spring in selector gear

The bent end of the spring -arrow- must be hooked into the hole in the selector gear.

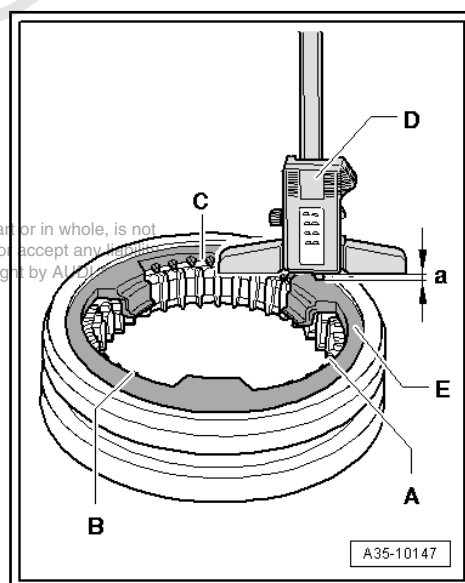


Checking synchro-ring for wear

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

The determined value should not exceed 0.45 mm.

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2.2 Dismantling and assembling pinion shaft (output shaft)

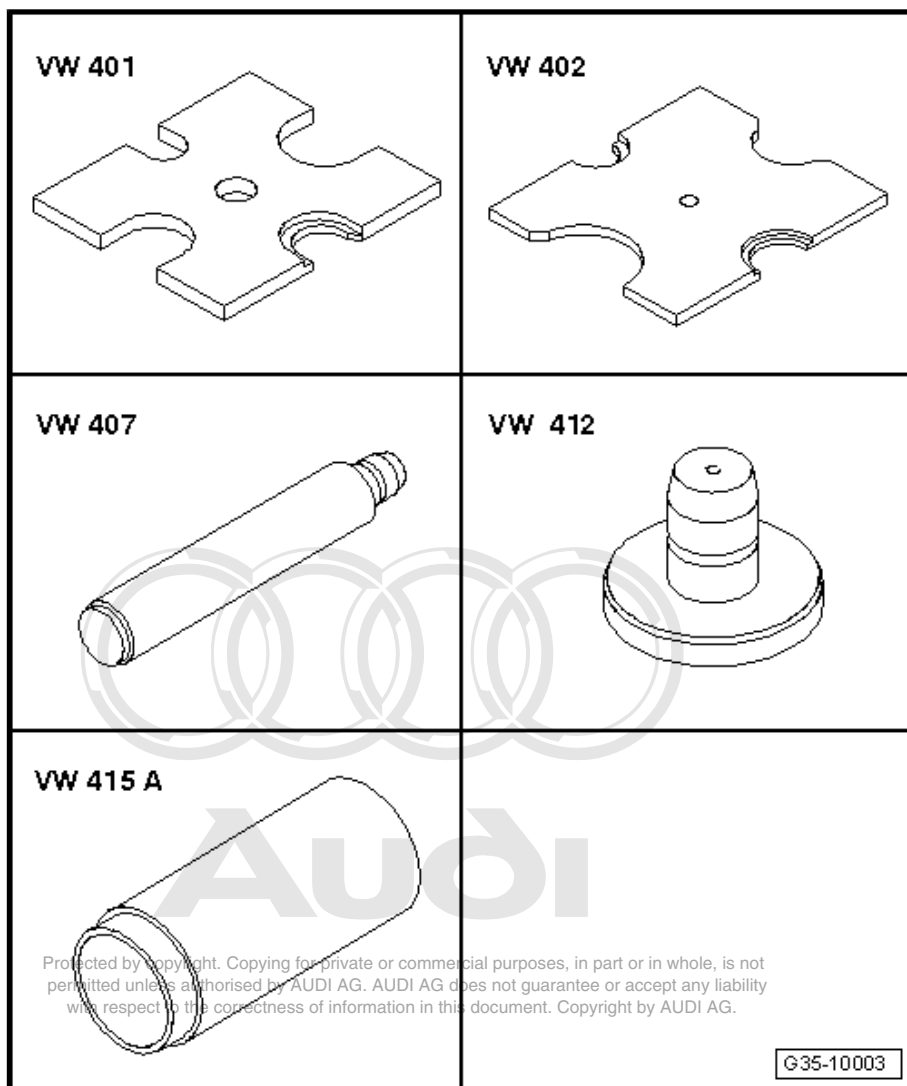


Note

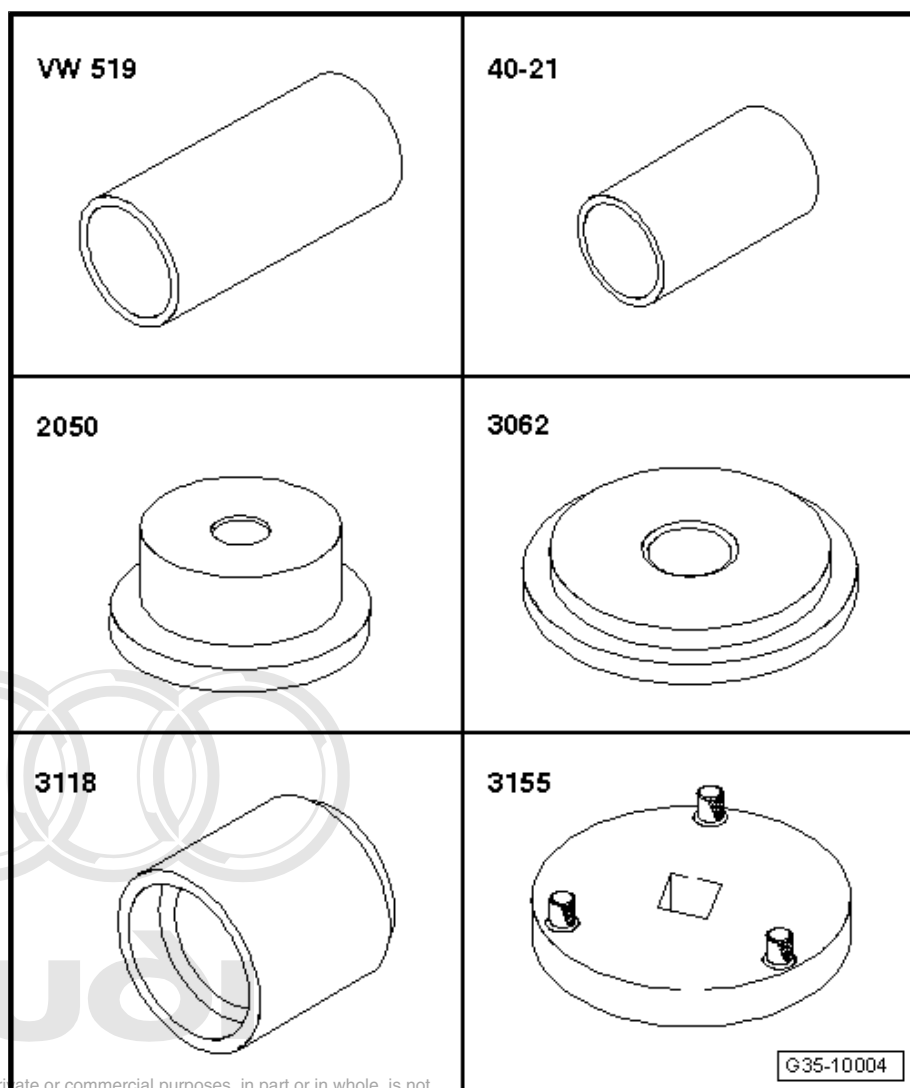
Removing and installing gear wheels for 3rd to 6th gear and the reverse selector gear is described in
⇒ ["7 Assembly sequence - dismantling and assembling gearbox", page 111](#).

Special tools and workshop equipment required

- ◆ Thrust plate - VW 401-
- ◆ Thrust plate - VW 402-
- ◆ Press tool - VW 407-
- ◆ Press tool - VW 412-
- ◆ Tube - VW 415 A-

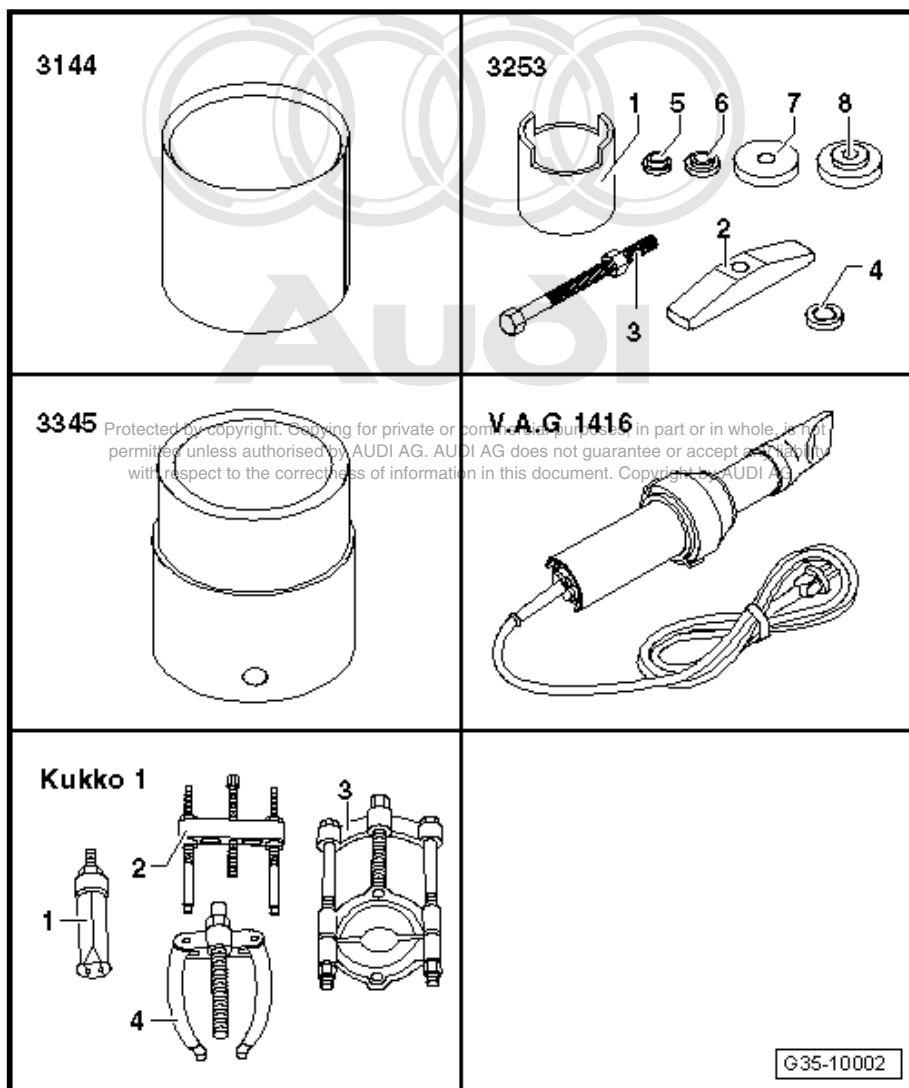


- ◆ Tube - VW 519-
- ◆ Press tool - 40 - 21-
- ◆ Thrust piece - 2050-
- ◆ Thrust pad - 3062-
- ◆ Press tool - 3118-
- ◆ Slotted nut wrench - 3155-

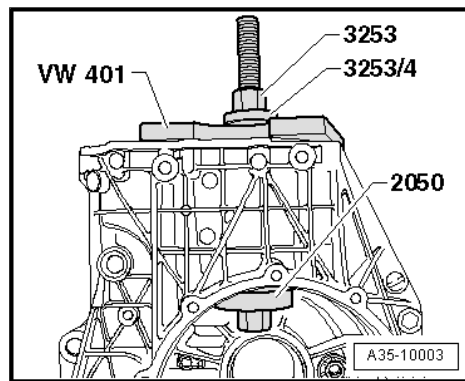
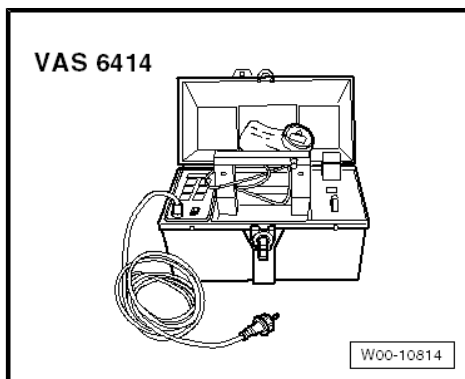


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- ◆ Sleeve - 3144-
- ◆ Assembly tool - 3253-
- ◆ Wheel bearing tube - 3345-
- ◆ Hot air blower - V.A.G 1416-
- ◆ -1- Internal puller - Kukko 21/8-
- ◆ -3- Splitter - Kukko 17/2-
- ◆ -4- Counter-support - Kukko 22/2-



- ◆ Inductive heater - VAS 6414-



- ◆ Feeler gauge

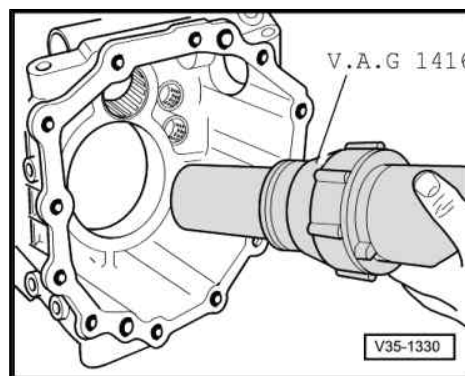
Pulling tapered roller bearing outer race out of gearbox housing

- Remove differential
⇒ [page 192](#).
- Fit thrust piece - 2050- with the large diameter pointing towards the outer race.
- Fit threaded spindle and thrust pad of assembly tool - 3253- with thrust plate - VW 401- onto gearbox housing.

The outer race will be pulled out of the gearbox housing when the nut is tightened.

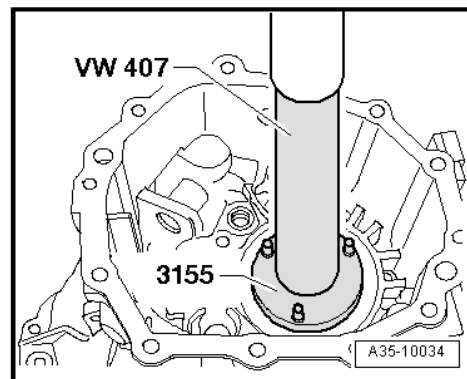
Heating gearbox housing in order to fit tapered roller bearing outer race

- Heat gearbox housing in area of bearing seat for approx. 15 minutes, to approx. 100°C, with hot air blower - V.A.G 1416-.



Pressing tapered roller bearing outer race into gearbox housing

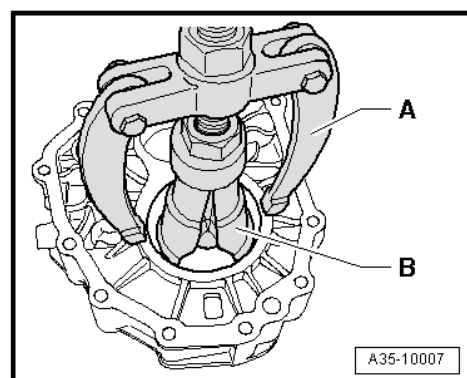
- Insert outer race only after heating gearbox housing and push into position under workshop press until heat exchange has taken place.



Pulling tapered roller bearing outer race out of bearing housing

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

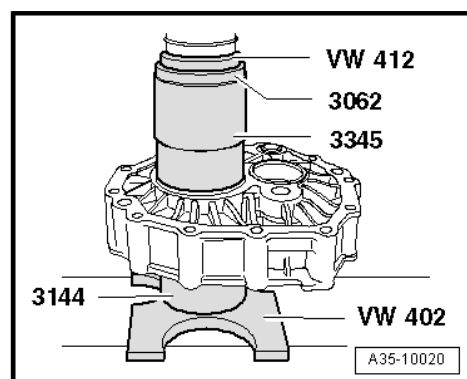
B - Internal puller 56 ... 70 mm , e.g. -Kukko 21/8-



Pressing tapered roller bearing outer race into bearing housing

Support bearing housing with sleeve - 3144- directly below bearing mounting.

- Press in outer race until limit stop.



Pressing off thrust washer for reverse selector gear

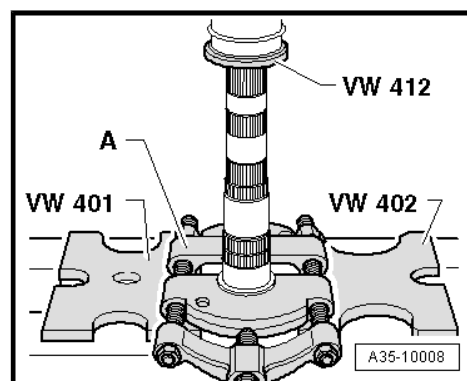
A - Splitter 22...115 mm , e.g. -Kukko 17/2-



Note

Fit splitter -A- below thrust washer, and not below circlip.

- Then detach circlip below thrust washer.



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Pressing off tapered roller bearing inner race with 2nd speed selector gear

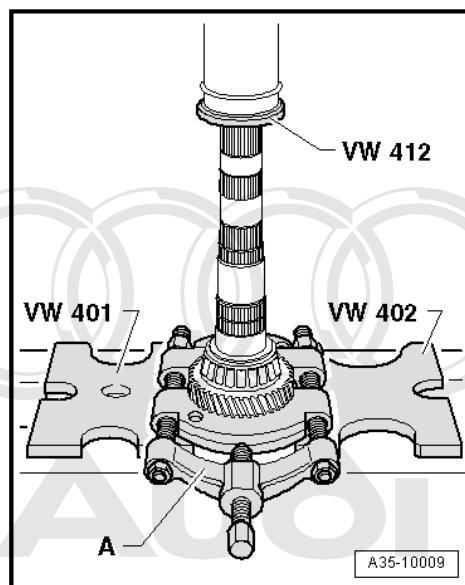
A - Splitter 22...115 mm , e.g. -Kukko 17/2-



Caution

When pressing off, make sure that only the gear teeth (driving teeth) of the selector gear and not the dog teeth contact the splitter -A-. Otherwise the dog teeth will be damaged.

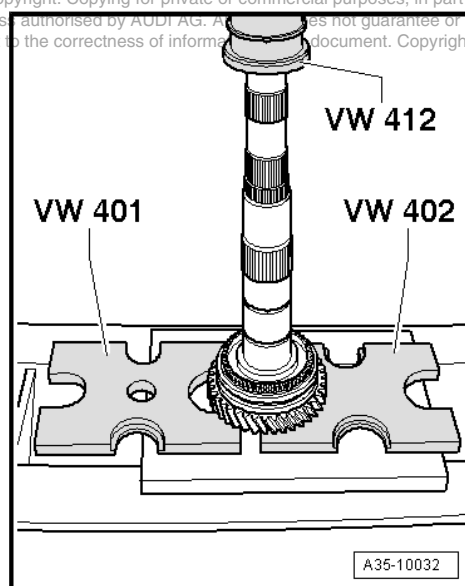
- Remove circlip for tapered roller bearing inner race.



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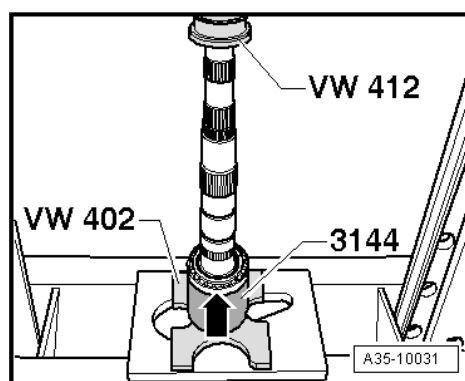
Pressing off 1st and 2nd gear synchro-hub

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



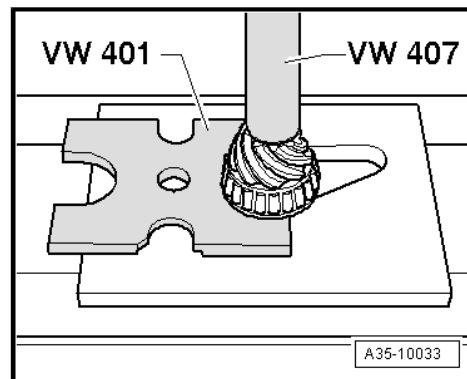
Pressing off tapered roller bearing inner race

- Remove circlip before pressing off.
- The outer race of the tapered roller bearing -arrow- must be fitted prior to pressing off the inner race.



Pressing on tapered roller bearing inner race

- Heat inner race to approx. 100 °C and press on.
- Determine thickness of required circlip ⇒ [page 179](#) and install circlip.



Determining thickness of circlip

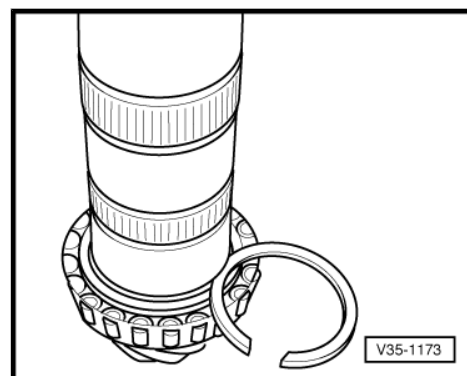
- Determine the thickest circlip that will just fit and install it. For part number refer to ⇒ Electronic parts catalogue .



Note

The thickness of the circlips for the synchro-hubs and individual gear wheels must also be determined as shown for the tapered roller bearing.

Overview for installation position of circlips ⇒ [page 180](#)



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Installation position of circlips

The required circlips for the inner races of the tapered roller bearings, the synchro-hubs and individual gear wheels should be selected as shown in ⇒ [page 179](#) .

- ◆ Circlip -1- secures the tapered roller bearing inner race.

Circlip thickness (mm)		
2.50	2.56	2.62
2.53	2.59	2.65

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

Identification: blue colour

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17
1.96	2.08	
1.99	2.11	

- ◆ Circlip -3- secures the tapered roller bearing inner race.

Circlip thickness (mm)		
3.50		

- ◆ Circlip -4- secures thrust washer for reverse selector gear.

Circlip thickness (mm)		
3.50		

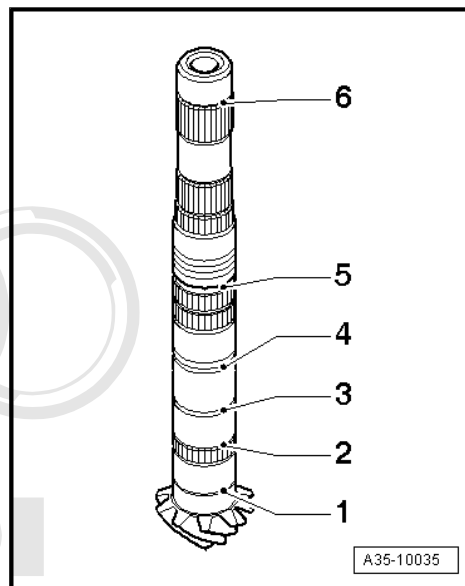
- ◆ Circlip -5- secures the 3rd gear wheel.

Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	2.10

- ◆ Circlip -6- secures the 6th gear wheel.

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17
1.96	2.08	2.20
1.99	2.11	

- Determine circlips according to table. For part number, refer to ⇒ [Electronic parts catalogue](#) .



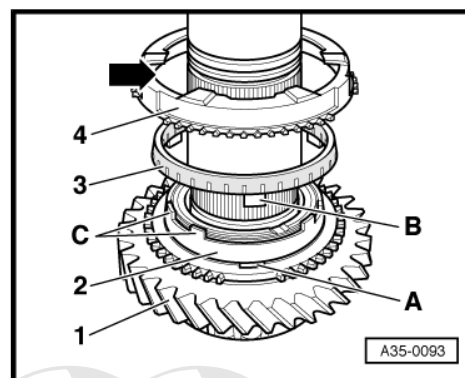
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Installation position of synchro-rings for 1st and 2nd gear



If components are not being renewed, make sure they are re-installed on the same gear.

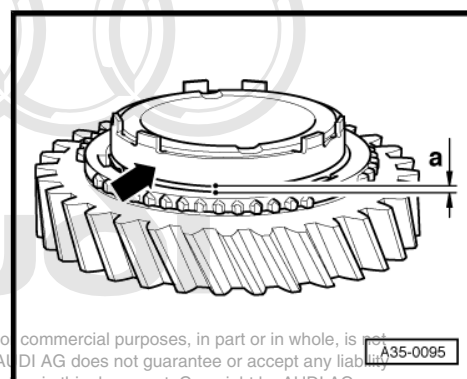
- Fit inner ring -2- onto selector gear -1-.
- Fit intermediate ring -3-. Lug -B- must be inserted into recess -A-.
- Synchro-ring -4- fitted. Guide lugs -C- through recess -arrow-.



Checking 1st gear inner ring for wear

- Check outer contact surface -arrow- for scoring or visible traces of wear and renew if necessary.
- Press inner ring onto chamfer on selector gear and measure gap -a- using a feeler gauge .

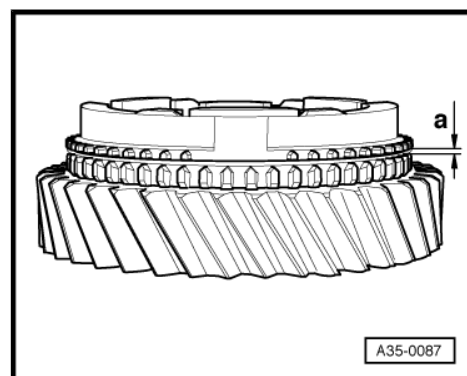
Gap -a-	As-new installation value	Wear limit
Inner ring for 1st gear	1.2 ... 2.0 mm	0.6 mm



Checking 1st and 2nd gear intermediate ring for wear

- Check inner friction surface of synchro-ring for grooves or scoring and renew if necessary.
- Press inner ring, intermediate ring and synchro-ring onto chamfer on selector gear and measure gap -a- using a feeler gauge .

Gap -a-	As-new installation value	Wear limit
1st and 2nd gear	1.4 ... 2.0 mm	0.8 mm

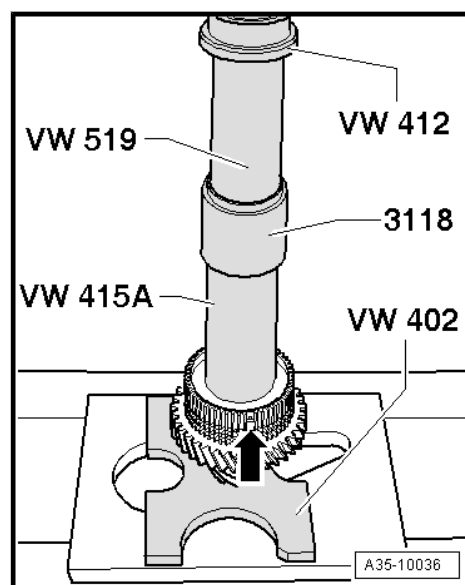


Pressing on 1st and 2nd gear synchro-hub

- ◆ Installation position:

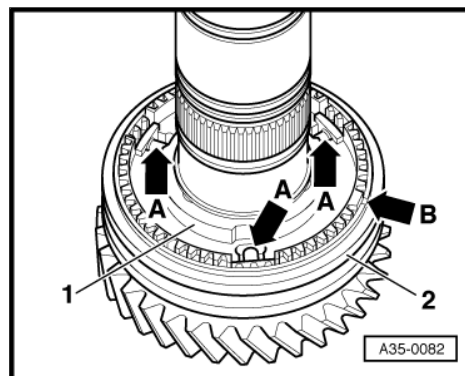
Higher inside collar faces 2nd gear.

- The lugs of 1st gear synchro-ring and recesses on synchro-hub must align -arrow- when pressing on.



Assembling 1st and 2nd gear locking collar/synchro-hub

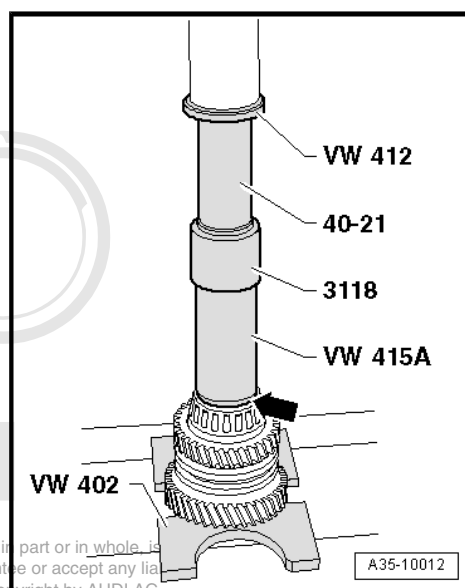
- Fit thrust blocks -arrows A- into mounted synchro-hub -1-.
- Fit locking collar -2- onto synchro-hub so that the wide teeth of locking collar and synchro-hub -arrow B- coincide.
- Install circlip for 1st and 2nd gear synchro-hub.
- Install 2nd speed selector gear with needle bearing and synchro-rings.



Pressing on tapered roller bearing inner race

- Fit circlip for tapered roller bearing inner race onto pinion shaft.
- Shoulder of tube - VW 415 A- faces inner race -arrow-.

Then check axial play of 1st speed and 2nd speed selector gears
⇒ [page 182](#) and ⇒ [page 183](#).



Checking axial play of 1st speed selector gear

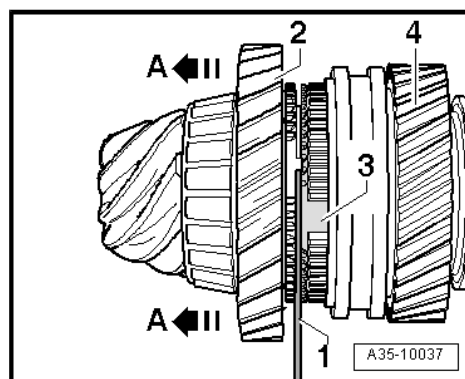
- Press 1st speed selector gear -2- in direction of -arrow A- as far as the stop.
- Measure the distance between the 1st speed selector gear -2- and synchro-ring -3- using a feeler gauge -1-.

Example: 2.55 mm

- Now press 1st speed selector gear -2- in direction of 2nd speed selector gear -4-.
- Measure the distance again between the 1st speed selector gear -2- and synchro-ring -3- using a feeler gauge -1-.

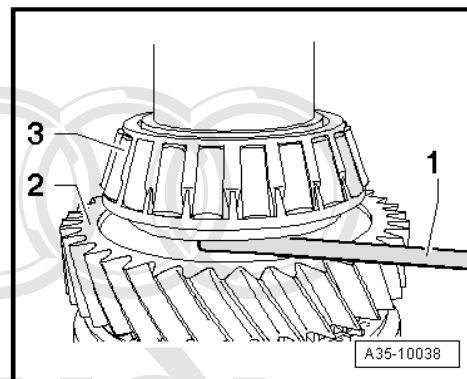
Example: 2.15 mm

- The difference between the two measured values must be between 0.20 ... 0.50 mm.



Checking axial play of 2nd speed selector gear

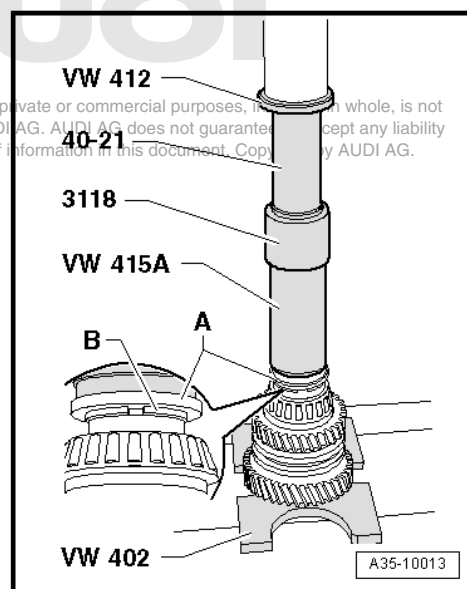
- Check axial play between 2nd speed selector gear -2- and inner race of tapered roller bearing -3- using a feeler gauge -1-.
- The play must be 0.20 ... 0.50 mm.



Pressing on thrust washer for reverse selector gear

- Fit circlip -B- onto pinion shaft (output shaft).
- Press on thrust washer -A- until it makes contact with circlip.

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39 – Final drive - differential

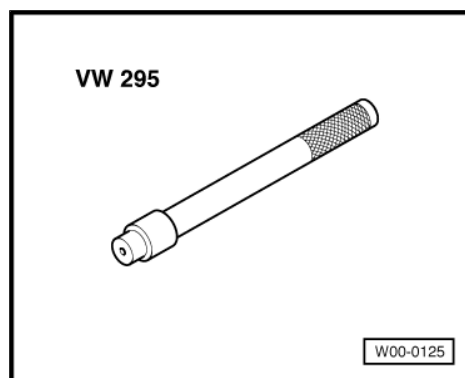
1 Renewing oil seals for flange shaft

- ◆ ⇒ [“1.1 Renewing oil seal for flange shaft \(left-side\)”, page 184](#)
- ◆ ⇒ [“1.2 Renewing oil seal for flange shaft \(right-side\)”, page 187](#)

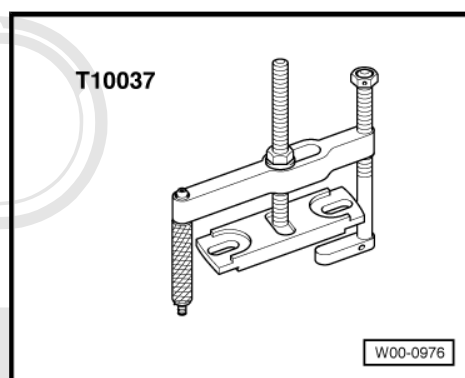
1.1 Renewing oil seal for flange shaft (left-side)

Special tools and workshop equipment required

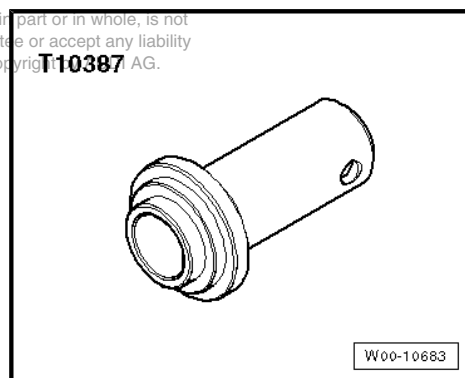
- ◆ Drift - VW 295-



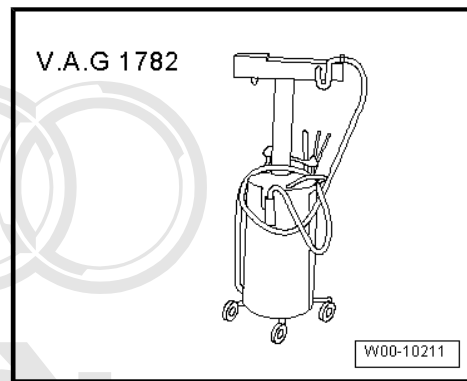
- ◆ Puller - T10037-



- ◆ Thrust piece - T10387



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



- ◆ Sealing grease - G 052 128 A1-

Procedure

- Gearbox is installed.

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Observe the general repair instructions [⇒ page 7](#).

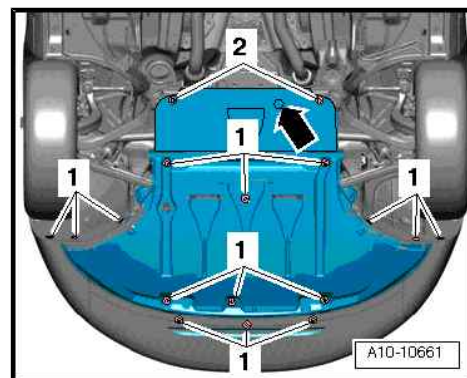
- Remove front left wheel.



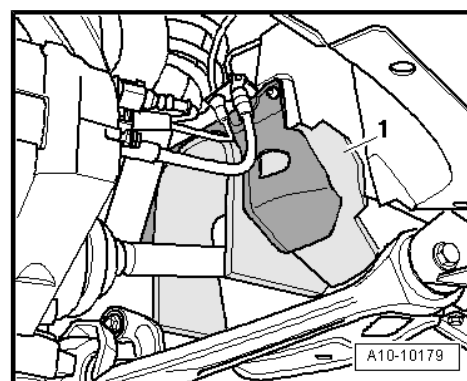
Note

Secure brake disc with one wheel bolt.

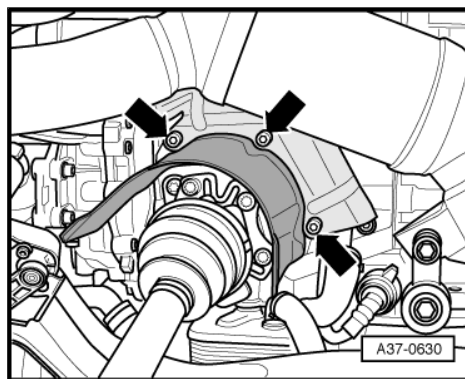
- Release fasteners marked -1-, -2- and -arrow- (if fitted) and remove noise insulation panels.



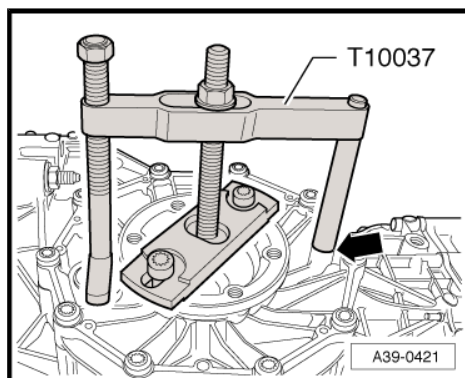
- If fitted, remove noise insulation -1- in wheel housing (left-side).



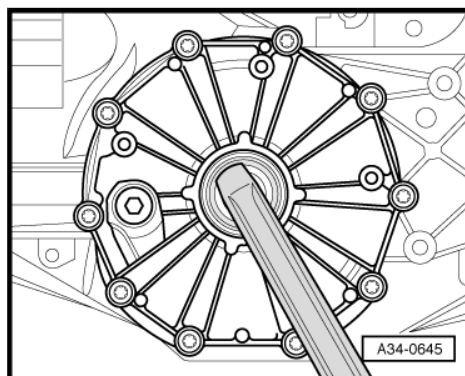
- If fitted, unscrew heat shield -arrows- for drive shaft (left side).
- Unbolt drive shaft (left-side) from gearbox flange shaft.
- Tie up drive shaft towards the front as far as possible. Make sure not to damage surface protection.
- Place used oil collection and extraction unit - V.A.G 1782- underneath.



- Remove flange shaft (left-side); to do so, secure puller - T10037- to cover for final drive -arrow-.



- Lever out flange shaft oil seal using a suitable lever.

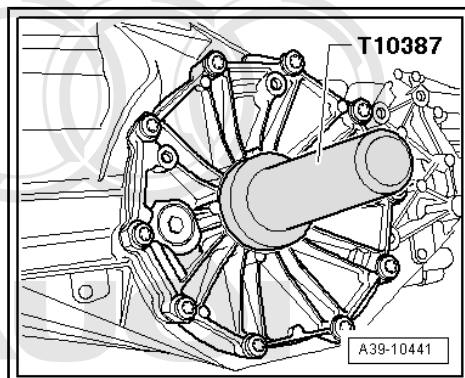


- Lightly oil outer circumference of new oil seal.
- Drive in new flange shaft oil seal using thrust piece - T10387- until thrust piece reaches stop; keep seal straight when installing.



Note

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



- Pack space between sealing lip and dust lip half-full with sealing grease - G 052 128 A1- .

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 Note

- ◆ *Inspect for visible signs of damage to polygon bearings -2- (such as cracking in outer race).*
- ◆ *If the polygon bearings -2- do not run smoothly with the flange shaft removed, this does not necessarily indicate that the bearings are defective. A test for noisy bearings can only be performed with the bearings installed.*
- ◆ *The polygon bearings can only be renewed together with the flange shaft.*
- ◆ *Always renew circlip for flange shaft -5-.*

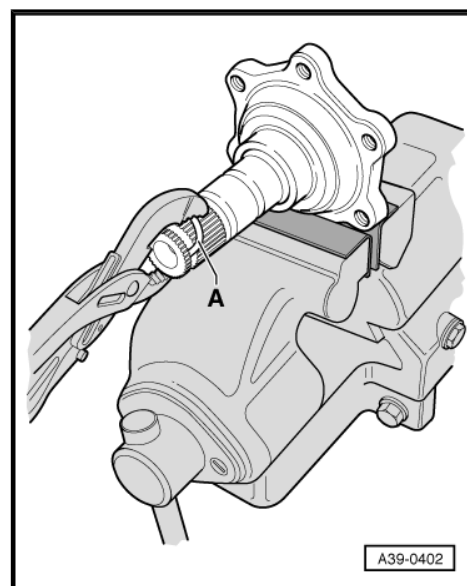
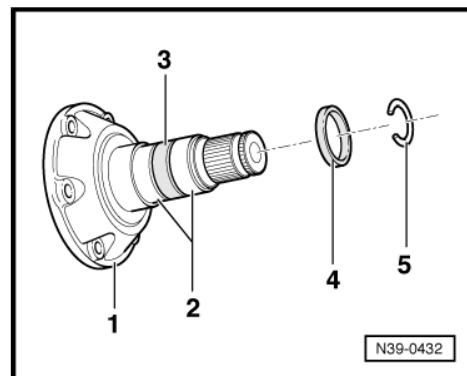
- Clamp flange shaft in vice, using jaw protectors. Use new circlip -A- to press old circlip out of groove in flange shaft.
- Knock flange shaft in with drift - VW 295- .

Assembly is carried out in the reverse order to removal; note the following:

- Bolt drive shaft to flange shaft ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- If applicable, bolt on heat shield for drive shaft (left-side).
- Fill up oil in gearbox and check oil level ⇒ [page 98](#) .

Tightening torque

Component	Nm
Heat shield above drive shaft to gearbox	23

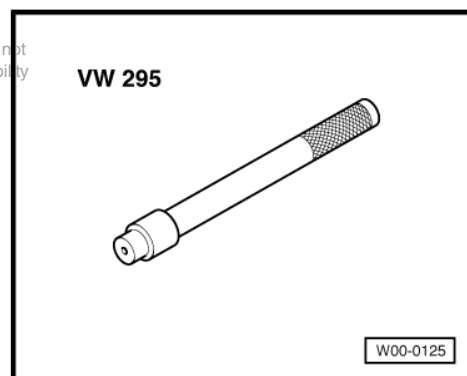


1.2 Renewing oil seal for flange shaft (right-side)

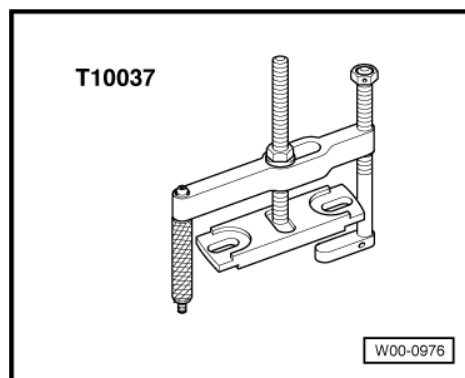
Special tools and workshop equipment required

- ◆ Drift - VW 295-

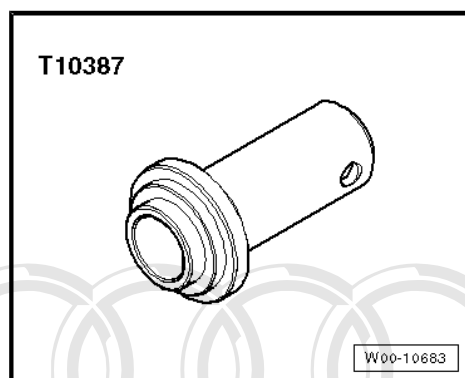
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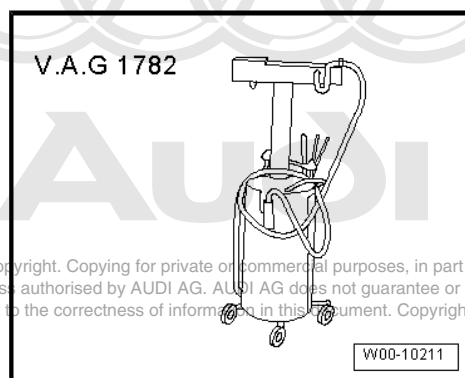
◆ Puller - T10037-



◆ Thrust piece - T10387-



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



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◆ Sealing grease - G 052 128 A1-

Procedure

- Gearbox is installed.

Observe the general repair instructions ⇒ [page 7](#) .

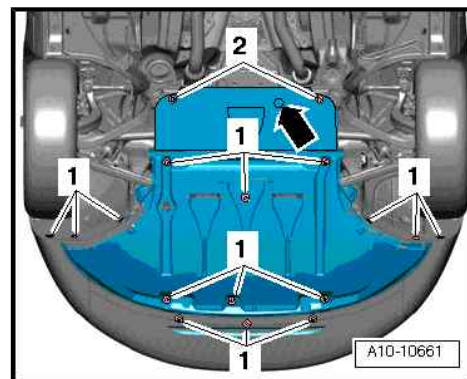
- Remove front right wheel.



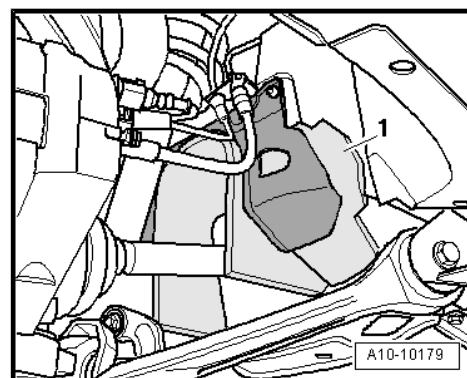
Note

Secure brake disc with one wheel bolt.

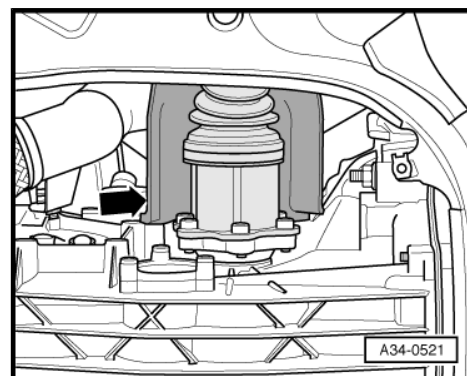
- Release fasteners marked -1-, -2- and -arrow- (if fitted) and remove noise insulation panels.



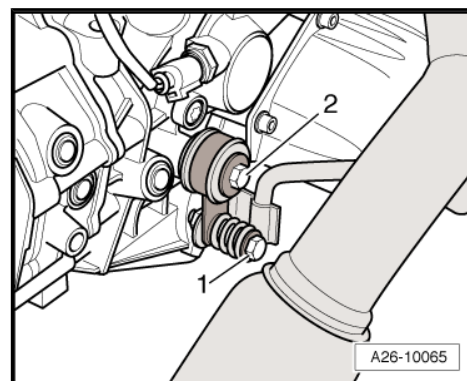
- If fitted, remove noise insulation -1- in wheel housing (right-side).



- Unbolt heat shield -arrow- for drive shaft (right-side).

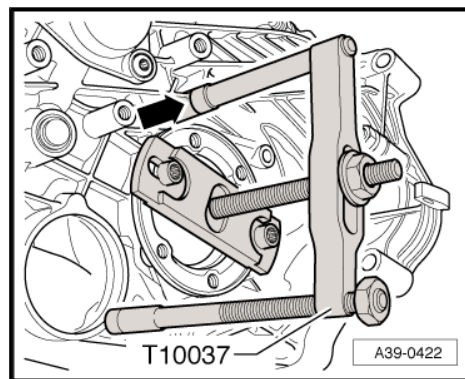


- Unscrew bolts -1- and -2- and remove front exhaust pipe bracket (right-side).
- Unbolt drive shaft (right side) from gearbox flange shaft.
- Push drive shaft towards the rear as far as possible. Make sure not to damage surface protection.
- Place used oil collection and extraction unit - V.A.G 1782- underneath.

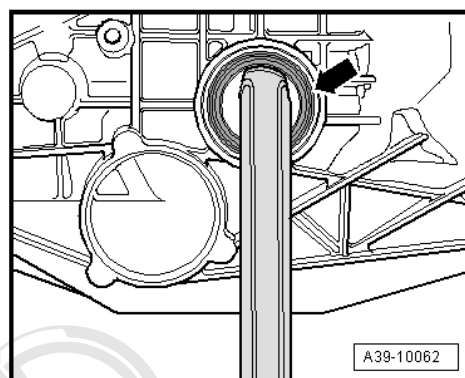


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- Remove flange shaft (right-side); to do so, secure puller - T10037- to gearbox housing -arrow-.



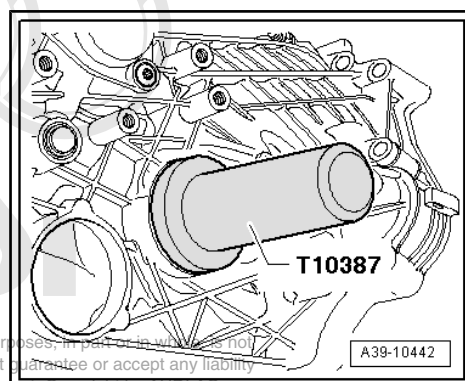
- Lever out flange shaft oil seal -arrow- using a suitable lever.



- Lightly oil outer circumference of new oil seal.
- Drive in new flange shaft oil seal using thrust piece - T10387- until thrust piece reaches stop; keep seal straight when installing.

Note

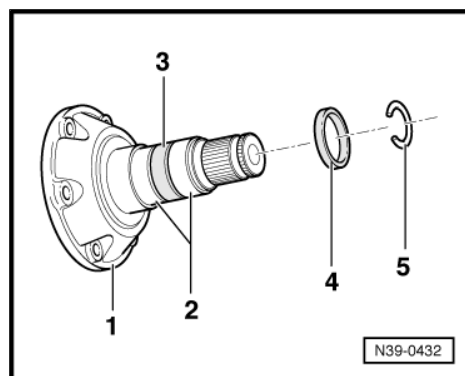
- ◆ *Driving-in depth (standard): 5.5 mm beneath surface of cover*
- ◆ *When carrying out a repair, the oil seal is driven in to a depth of 6.5 mm using thrust piece -T10387- so that the new seal does not bear on the same contact surface on the used flange shaft.*



- Pack space between sealing lip and dust lip half-full with sealing grease - G 052 128 A1- .

Note

- ◆ *Inspect for visible signs of damage to polygon bearings -2- (such as cracking in outer race).*
- ◆ *If the polygon bearings -2- do not run smoothly with the flange shaft removed, this does not necessarily indicate that the bearings are defective. A test for noisy bearings can only be performed with the bearings installed.*
- ◆ *The polygon bearings can only be renewed together with the flange shaft.*
- ◆ *Always renew circlip for flange shaft -5-.*



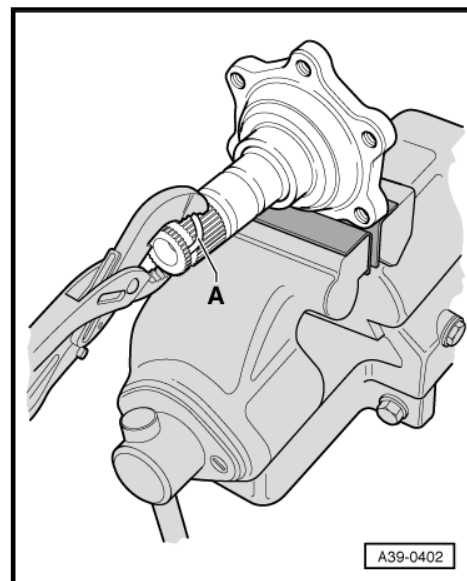
- Clamp flange shaft in vice, using jaw covers. Use new circlip -A- to press old circlip out of groove in flange shaft.
- Knock flange shaft in with drift - VW 295- .

Assembly is carried out in the reverse order to removal; note the following:

- Bolt drive shaft to flange shaft ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Bolt on heat shield for drive shaft (right-side).
- Fill up oil in gearbox and check oil level ⇒ [page 98](#) .

Tightening torque

Component	Nm
Heat shield above drive shaft to gearbox	23

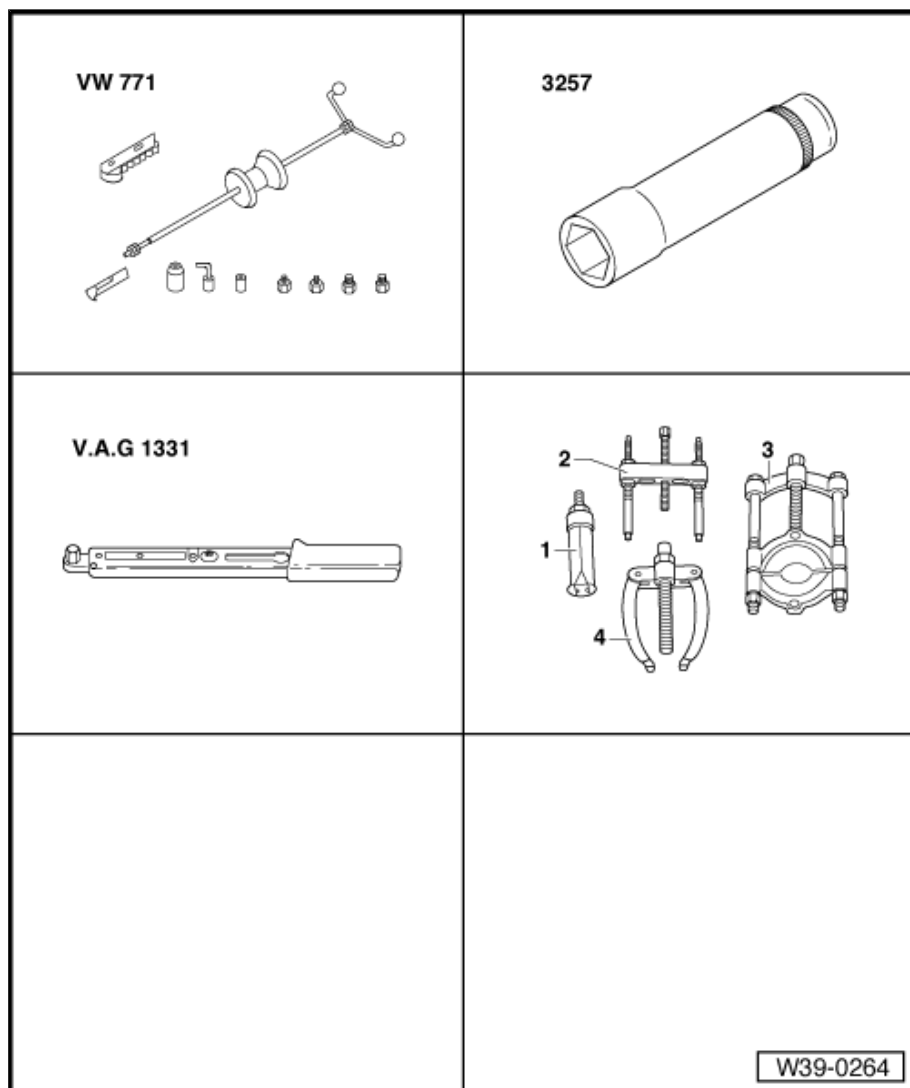


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2 Removing and installing differential

Special tools and workshop equipment required

- ◆ Multi-purpose tool - VW 771-
- ◆ Socket (27 mm) - 3257-
- ◆ Torque wrench - V.A.G 1331-
- ◆ -1- Internal puller - Kukko 21/5-



Note

- ◆ Removing and installing is possible with the gearbox installed.
- ◆ The differential can be removed and installed without removing the selector mechanism, input shaft, pinion shaft and bearing housing. These components must be removed if the differential needs to be adjusted.
- ◆ Inspect polygon bearings for visible damage.
- ◆ The polygon bearings can only be renewed together with the flange shaft.
- ◆ If the polygon bearings do not run smoothly with the flange shaft removed, this does not necessarily indicate that the bearings are defective. A test for noisy bearings can only be performed with the bearings installed.
- ◆ A spacer ring is fitted between the polygon bearing and the differential sun wheel on flange shafts with 30 mm spline diameter ⇒ [page 194](#) - item 4-
- ◆ Adjustment work is required when renewing the parts marked with ¹⁾. Table of adjustments ⇒ [page 204](#)

1 - Gearbox housing ¹⁾

2 - Oil seal

- ☐ Renewing for flange shaft (left-side)
⇒ [page 184](#)
- ☐ Renewing for flange shaft (right-side)
⇒ [page 187](#)

3 - Circlip

- ☐ Renew
- ☐ Removing and installing
⇒ [page 191](#)

4 - Spacer ring

- ☐ Is only fitted on flange shafts with a spline diameter of 30 mm
- ☐ Remove with Internal puller 30 ...37 mm , e.g. -Kukko 21/5-
- ☐ Installing ⇒ [page 194](#)

5 - Flange shaft

- ☐ Removing (left-side)
⇒ [page 193](#)
- ☐ Removing (right-side)
⇒ [page 194](#)
- ☐ Drive in with drift - VW 295- .
- ☐ Flange shaft assembly
⇒ [page 194](#)

6 - Differential with crown wheel ¹⁾

- ☐ Dismantling and assembling ⇒ [page 195](#)

7 - O-ring

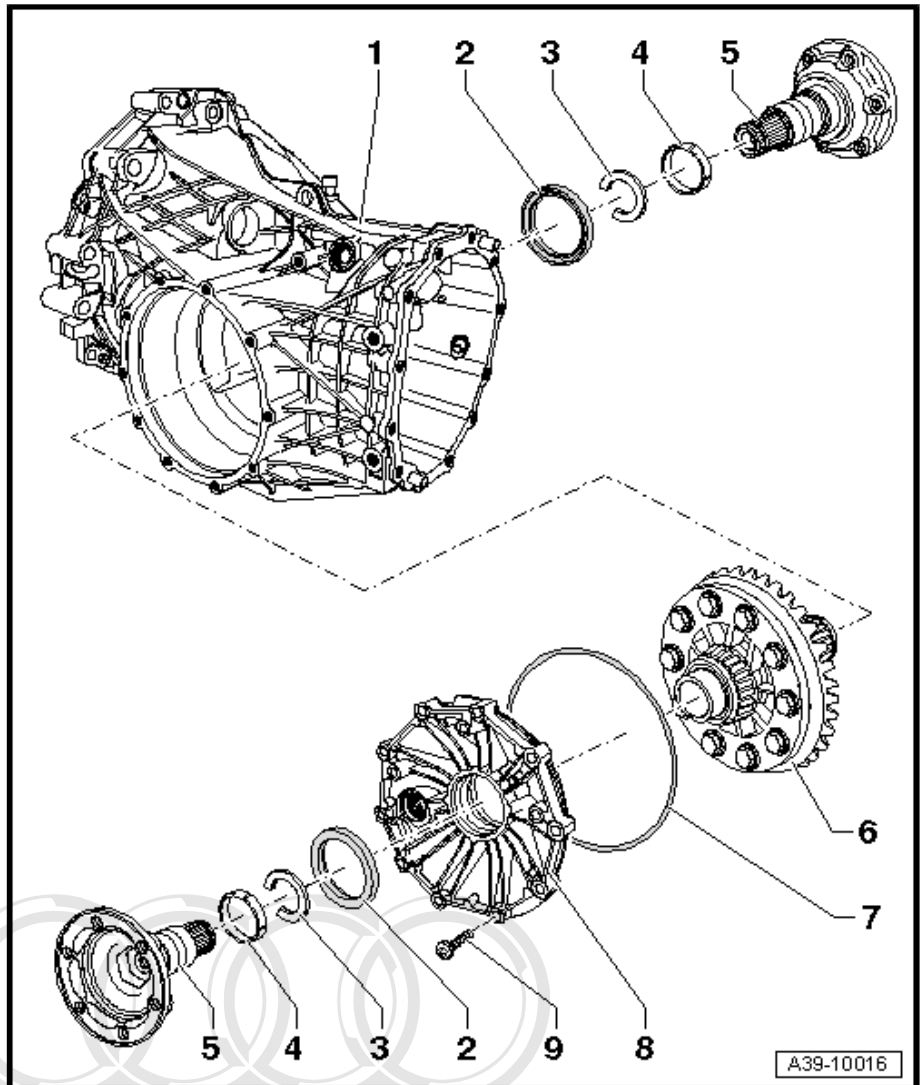
- ☐ Always renew
- ☐ Lubricate with gear oil

8 - Cover for final drive ¹⁾

9 - TORX bolt

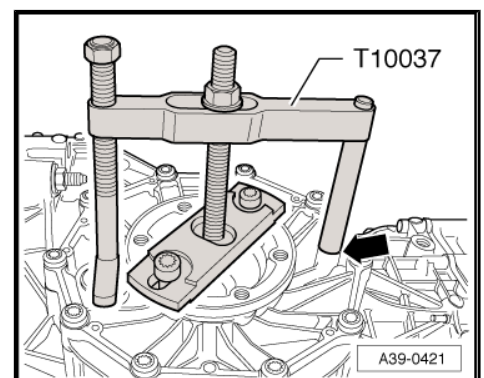
- ☐ 20 Nm and then turn 90° further

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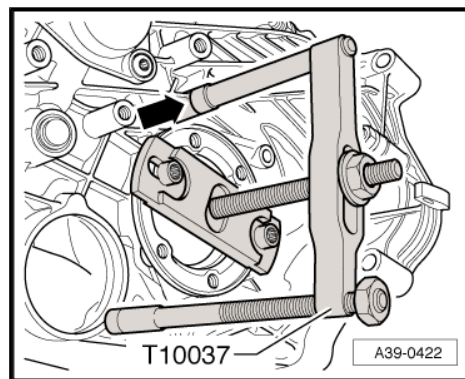
Removing flange shaft (left-side)

- Remove flange shaft (left-side); to do so, secure puller - T10037- to cover for final drive -arrow-.



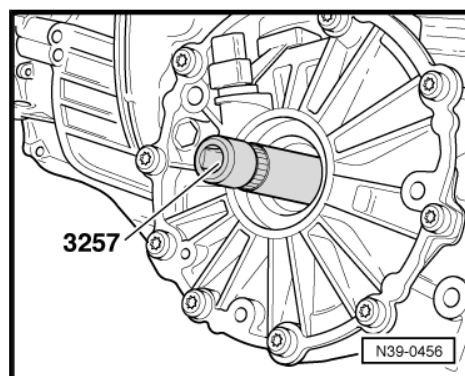
Removing flange shaft (right-side)

- Remove flange shaft (right-side); to do so, secure puller - T10037- to gearbox housing -arrow-.



Installing spacer ring

- Drive new spacer ring in onto stop, taking care to keep ring straight.



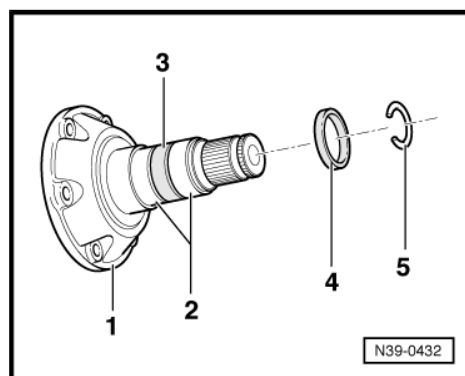
Flange shaft assembly

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



Note

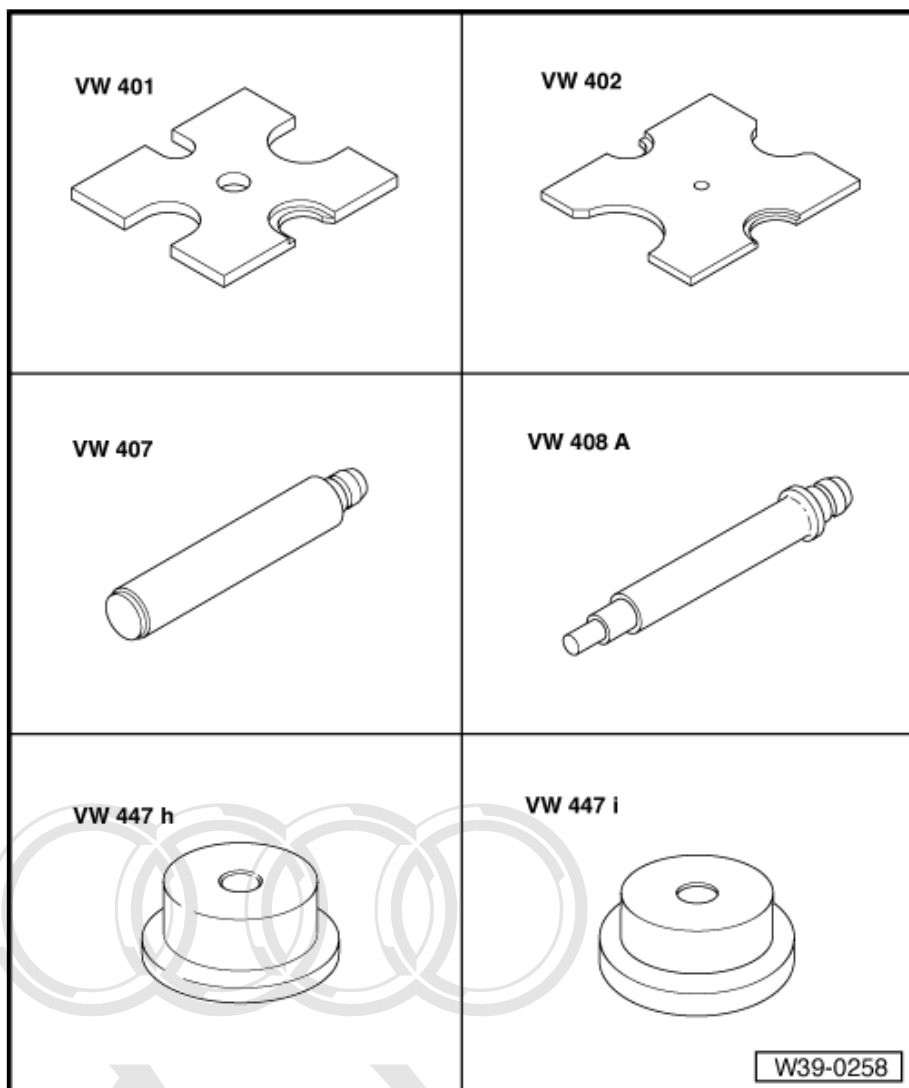
The needle bearings (polygon bearings) do not turn easily when the flange shaft is removed. This does not indicate that a bearing is defective.



3 Dismantling and assembling differential

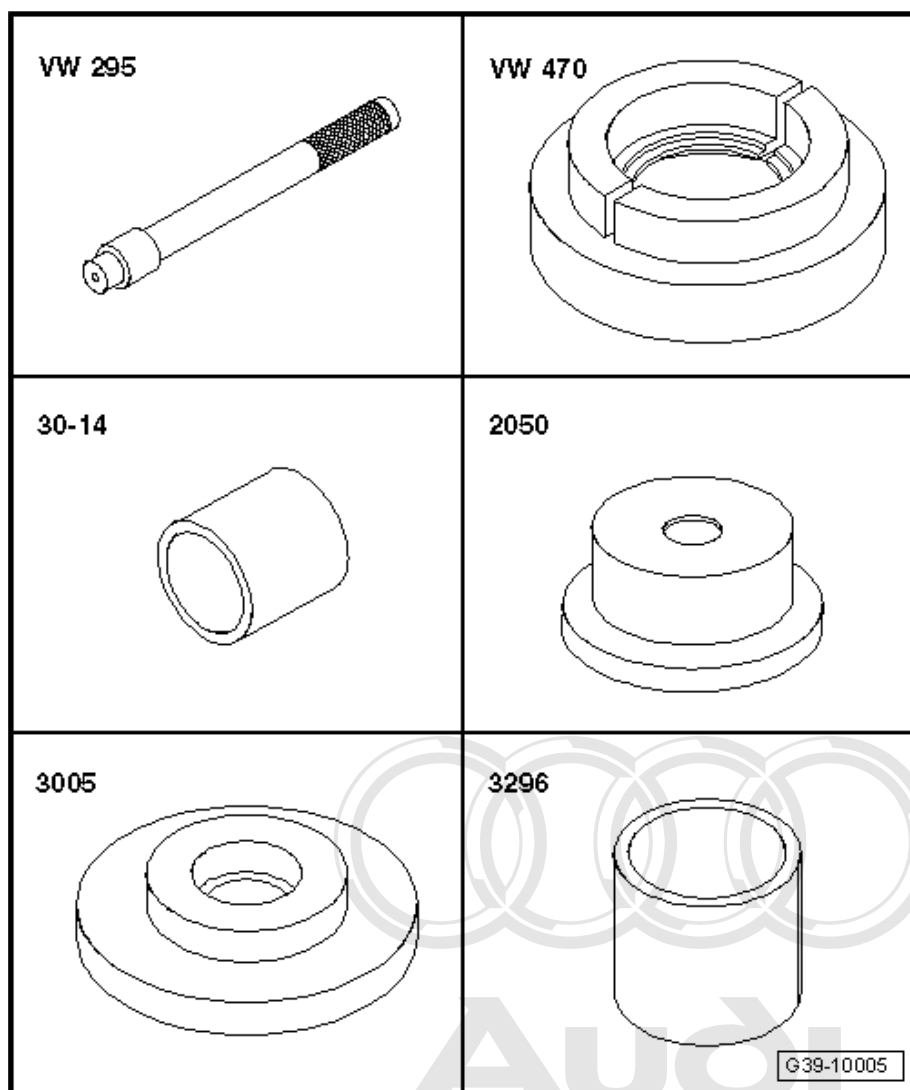
Special tools and workshop equipment required

- ◆ Thrust plate - VW 401-
- ◆ Thrust plate - VW 402-
- ◆ Press tool - VW 407-
- ◆ Press tool - VW 408 A-
- ◆ Thrust plate - VW 447 H-
- ◆ Thrust plate - VW 447 i-



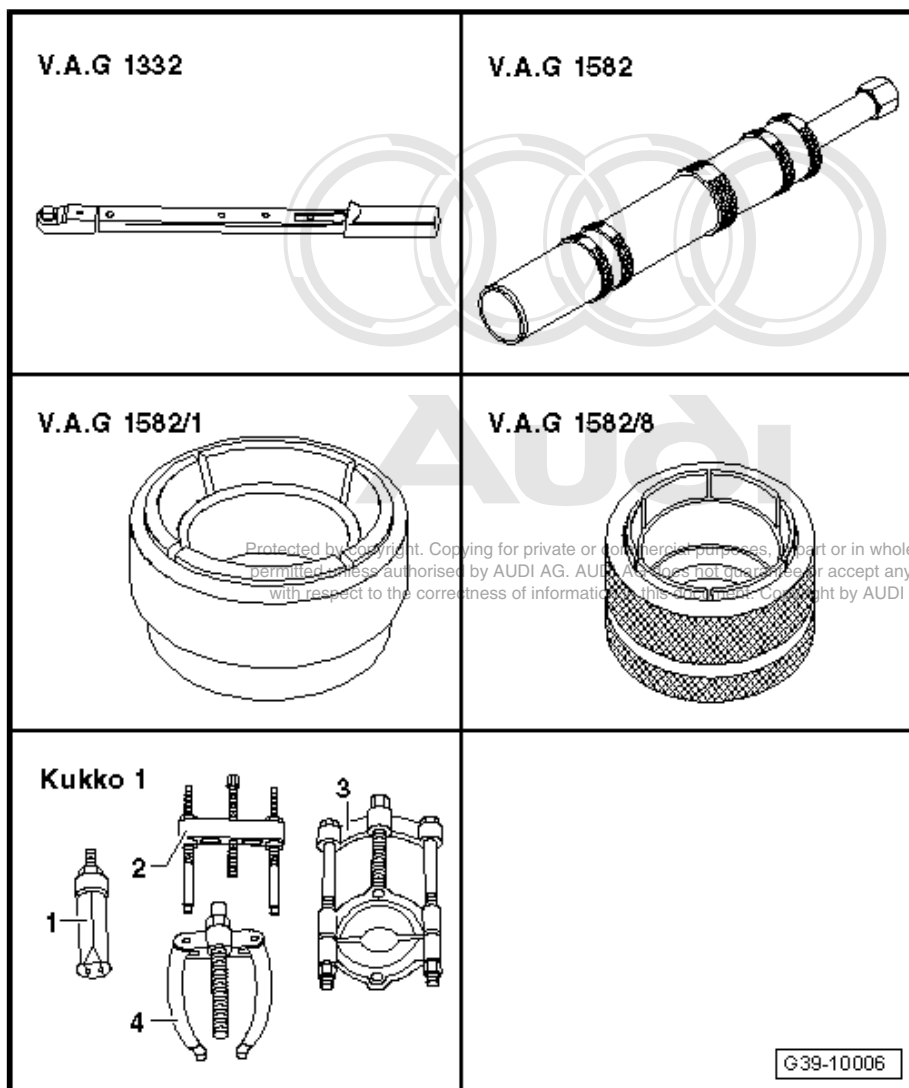
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- ◆ Drift - VW 295-
- ◆ Thrust pieces for pinion shaft bearing - VW 470-
- ◆ Tube - 30 - 14-
- ◆ Thrust piece - 2050-
- ◆ Thrust plate - 3005-
- ◆ Tube - 3296-

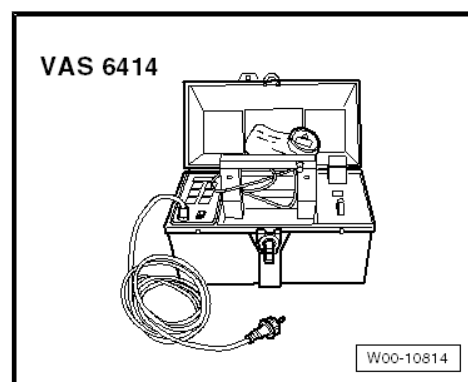


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- ◆ Torque wrench - V.A.G 1332-
- ◆ Tapered roller bearing puller - V.A.G 1582-
- ◆ Adapter - V.A.G 1582/1-
- ◆ Adapter - V.A.G 1582/8-
- ◆ -1- Internal puller - Kukko 21/8-
- ◆ -4- Counter-support - Kukko 22/2-



- ◆ Inductive heater - VAS 6414-



Removing and installing differential ⇒ [page 192](#)



Note

- ◆ Always renew both tapered roller bearings together.
- ◆ Adjustment work is required when renewing the parts marked with ¹⁾. Table of adjustments ⇒ [page 204](#)

1 - Gearbox housing ¹⁾

2 - Shim "S₂"

- ☐ Note thickness
- ☐ Table of adjustments
⇒ [page 204](#)

3 - Tapered roller bearing outer race (right-side) ¹⁾

- ☐ Pulling out ⇒ [page 199](#)
- ☐ Driving in ⇒ [page 199](#)

4 - Tapered roller bearing inner race (right-side) ¹⁾

- ☐ Pulling off ⇒ [page 199](#)
- ☐ Pressing on
⇒ [page 200](#)

5 - Crown wheel¹⁾

- ☐ Is paired with pinion shaft (final drive gear set)
- ☐ Select correct version according to gearbox code letters ⇒ Electronic parts catalogue
- ☐ Drive crown wheel off differential cage using a punch ⇒ [page 201](#)
- ☐ Fitting on differential cage ⇒ [page 201](#)

6 - Differential cage¹⁾

7 - Bolt

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

8 - Tapered roller bearing inner race (left-side) ¹⁾

- ☐ Pulling off ⇒ [page 200](#)
- ☐ Pressing on ⇒ [page 200](#)

9 - Tapered roller bearing outer race (left-side) ¹⁾

- ☐ Pulling out ⇒ [page 200](#)
- ☐ Pressing in ⇒ [page 201](#)

10 - Shim "S₁"

- ☐ Note thickness
- ☐ Table of adjustments ⇒ [page 204](#)

11 - Cover for final drive ¹⁾

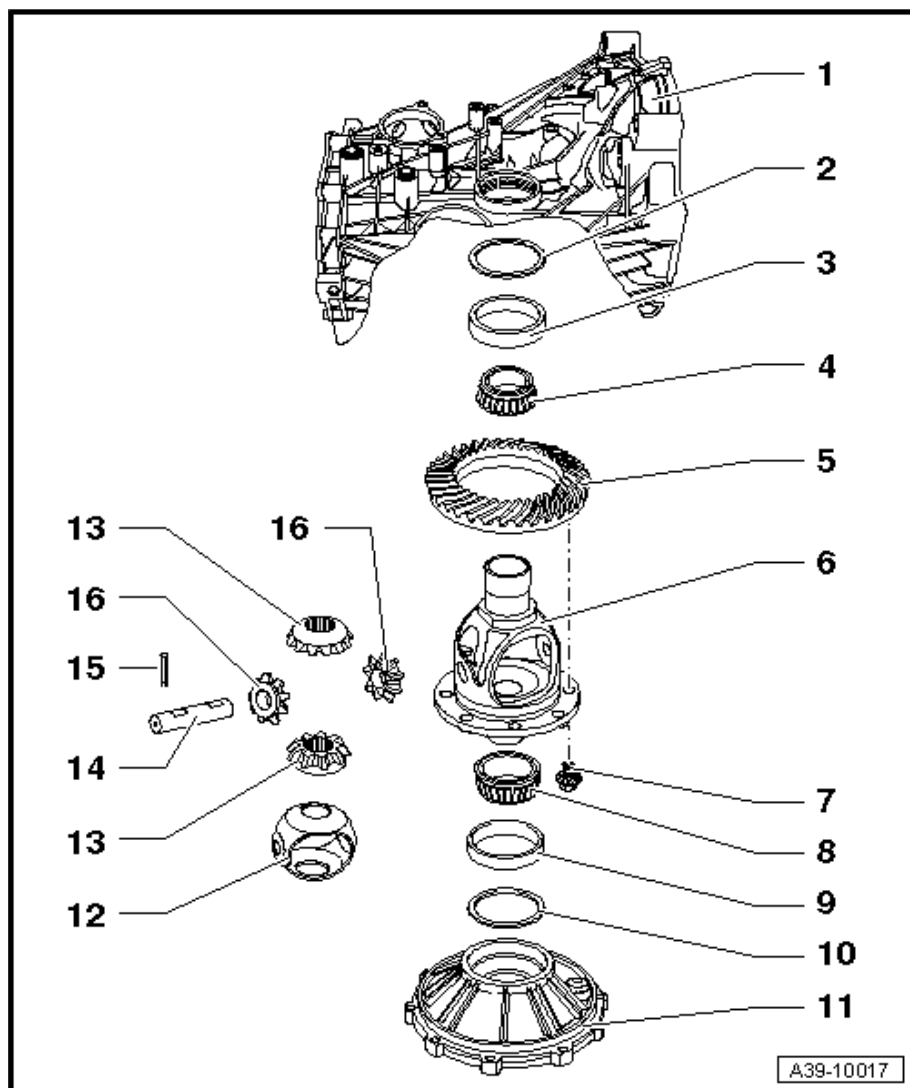
- ☐ With O-ring

12 - One-piece thrust washer

- ☐ Lubricate with gear oil before installing

13 - Sun wheel

- ☐ Installing ⇒ [page 201](#)



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14 - Differential pinion pin

- ☐ Drive out with drift after removing spring pin

15 - Spring pin

- ☐ Secures differential pinion pin
- ☐ Drive out of differential cage with drift
- ☐ Press in until 1.5 mm above differential cage

16 - Planet pinion

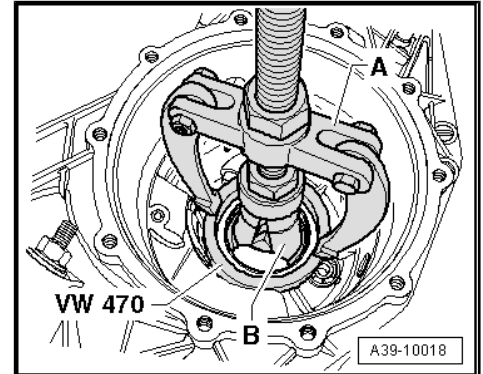
- ☐ Installing ⇒ [page 201](#)

Pulling tapered roller bearing outer race (right-side) out of gear-box housing

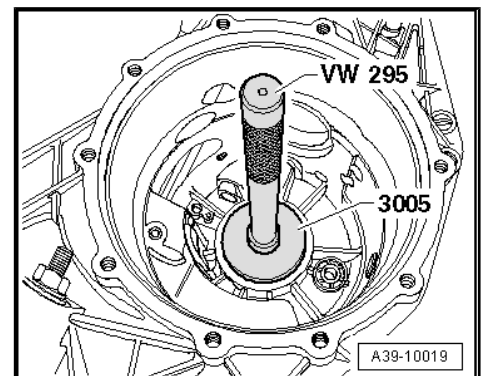
A - Counter-support , e.g. -Kukko 22/2-

B - Internal puller 56 ... 70 mm , e.g. -Kukko 21/8-

- After removing, check shims for damage.

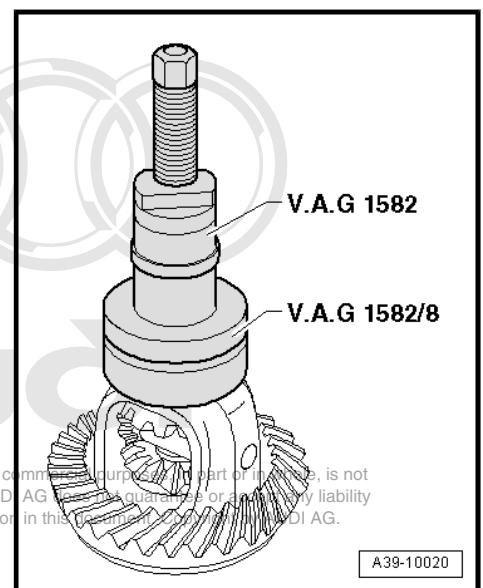


Driving outer race for tapered roller bearing (right-side) into gear-box housing



Pulling off tapered roller bearing inner race (right-side)

- Before setting up puller, place thrust pad - VW 447 H- on differential cage.



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Pressing on tapered roller bearing inner race (left and right)



Note

Use the same tools for pressing on tapered roller bearing inner race on left side and right side.



WARNING

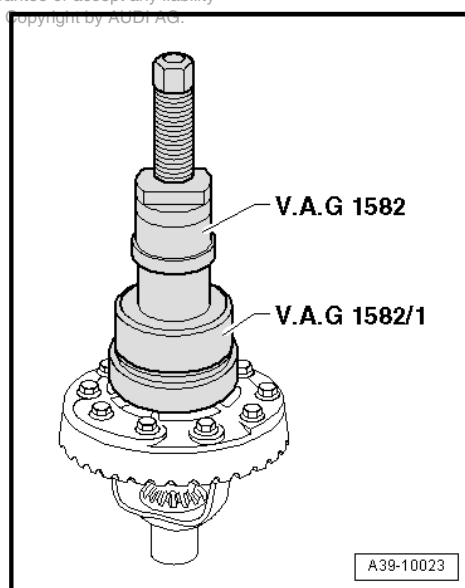
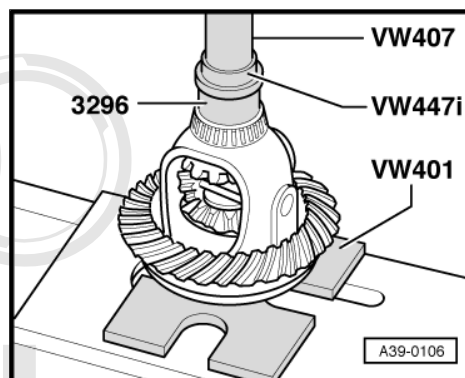
Wear protective gloves.

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

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Pulling off tapered roller bearing inner race (left-side)

- Before setting up puller, place thrust pad - VW 447 H- on differential cage.

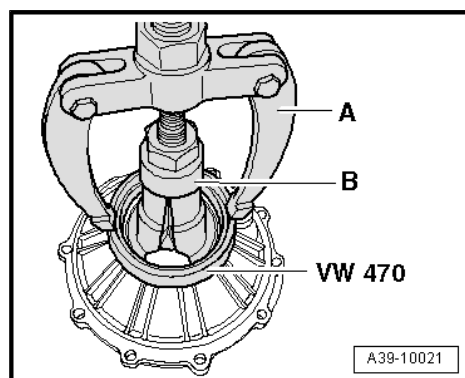


Pulling tapered roller bearing outer race (left-side) out of cover for final drive

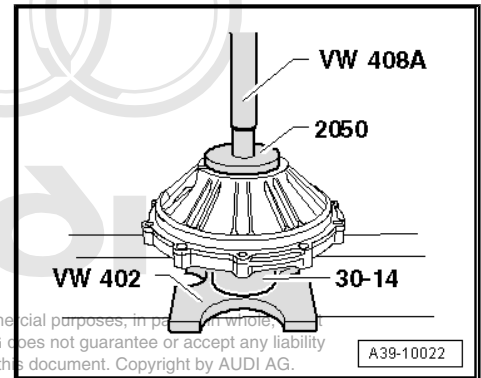
A - Counter-support , e.g. -Kukko 22/2-

B - Internal puller 56 ... 70 mm , e.g. -Kukko 21/8-

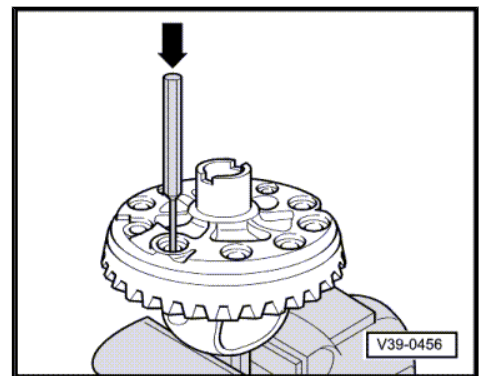
- After removing, check shims for damage.



Pressing tapered roller bearing outer race (left-side) into cover for final drive.



Driving crown wheel off cage



Heating crown wheel to approx. 100 °C and installing

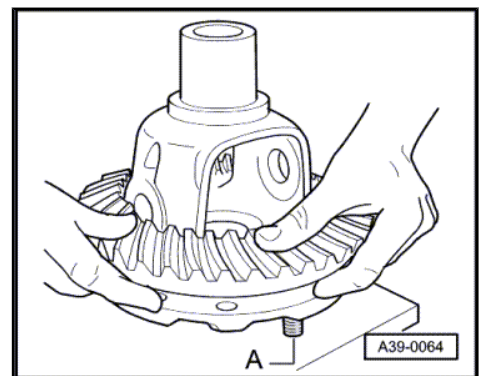
- When fitting crown wheel, use centralising pins -A- (shop-made tool) to locate.



WARNING

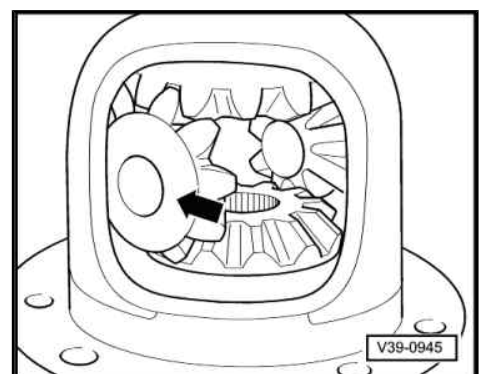
Wear protective gloves.

- Allow to cool slightly before screwing in new securing bolts.
- Then tighten bolts in stages and in diagonal sequence until crown wheel makes full contact with differential cage.
- Then tighten bolts to specified torque ⇒ [Item 7 \(page 198\)](#) .



Installing differential bevel gears

- Lubricate one-piece thrust washer with gear oil and install.
- Fit sun wheels.
- Insert planet pinions (spaced 180° apart) and pivot into position -arrow-.
- Drive differential pinion pin into final position and secure.



4 Adjusting pinion shaft (output shaft) and crown wheel



Note

- ◆ *Careful adjustment of the crown wheel and pinion shaft is essential to ensure that the final drive gives long service and runs silently. For this reason, the pinion shaft and crown wheel are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions of rotation. The position of quietest running is found by moving the pinion shaft in an axial direction and at the same time lifting the crown wheel out of the zero-play mesh position by the amount necessary to maintain the backlash within the specified tolerance.*
- ◆ *The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.*
- ◆ *The allowance "r" in relation to the master gauge "Ro" is measured for the final drive gear sets supplied as replacement parts and marked on the outer circumference of the crown wheel. The final drive gear set (pinion shaft and crown wheel) may only be renewed together as a matched pair.*
- ◆ *Observe the general repair instructions for tapered roller bearings and shims.*

4.1 Adjustment and marking of final drive gear set



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1 - "43185" number of matched pair of gears

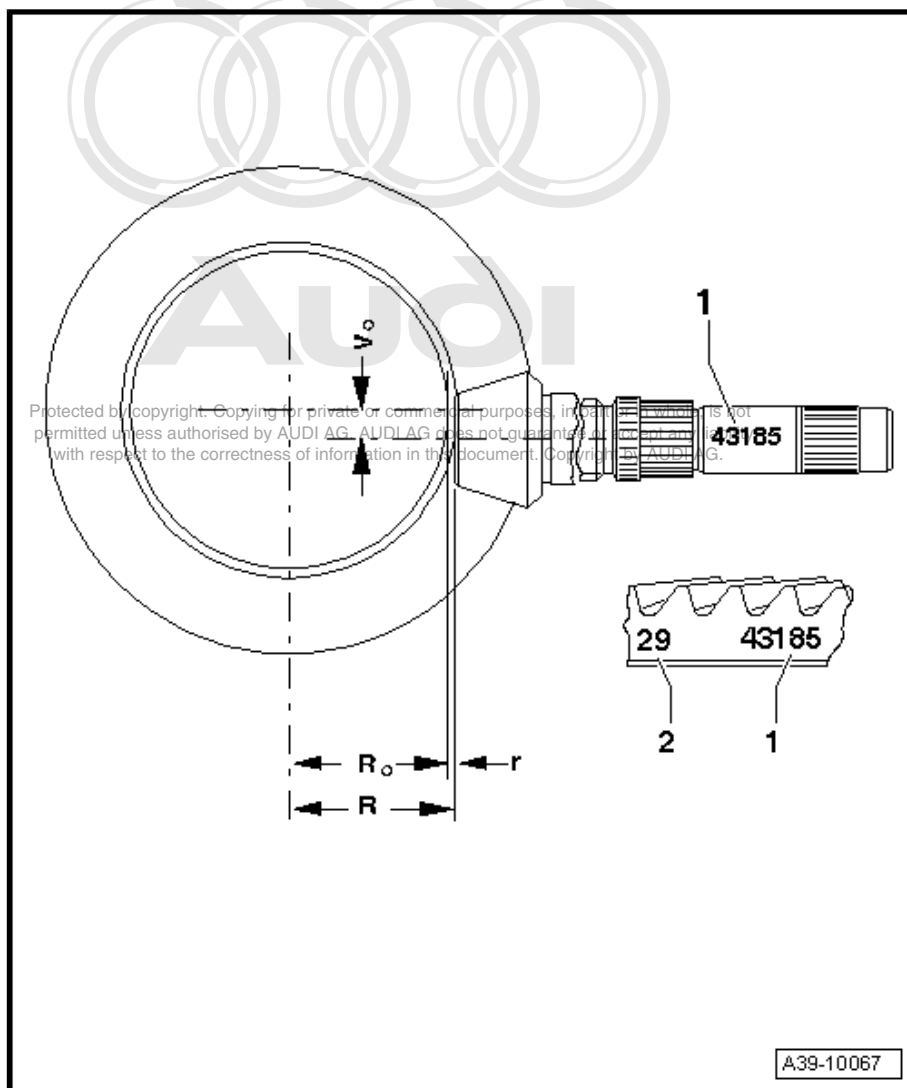
2 - Allowance "r" is based on the master gauge used on the test machine in production. The allowance "r" is always given in 1/100 mm. For example: "29" indicates $r = 0.29$ mm

R_o - Length of master gauge used on test machine

R_o - Crown wheel $\varnothing$ 188 mm = 59.65 mm

R - Actual distance between centre axis of crown wheel and face of pinion shaft in position of quietest running for this gear set

V_o - Hypoid offset



4.2 Position of shims



Note

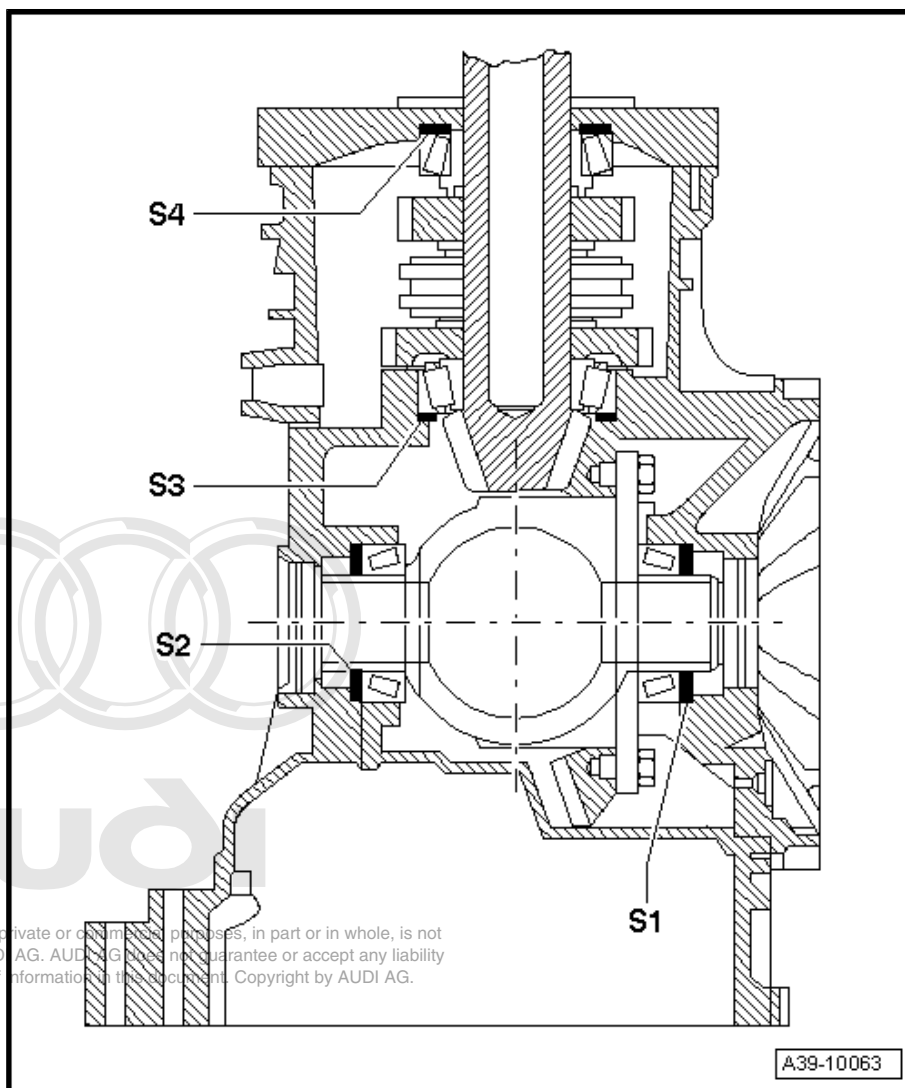
Table of adjustments when renewing individual components of gearbox ⇒ [page 204](#).

S1 - Shim for crown wheel in cover for final drive

S2 - Shim for crown wheel in gearbox housing

S3 - Shim for pinion shaft in gearbox housing

S4 - Shim for pinion shaft in bearing housing



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4.3 Table of adjustments



Note

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

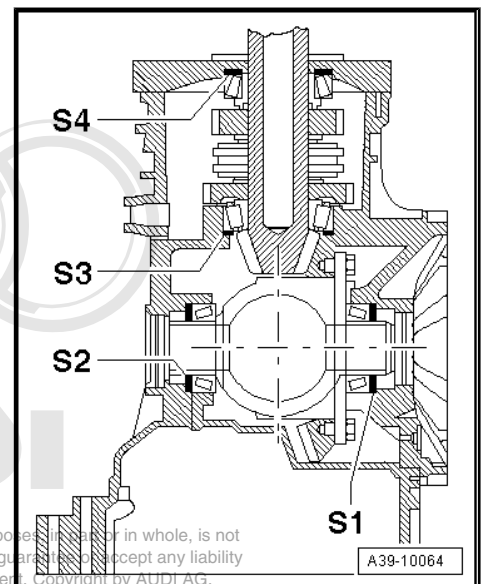
Components requiring adjustment:	Crown wheel ("S1" + "S2")	Pinion shaft ("S3" + "S4") via allowance "r"	Pinion shaft Shim "S4" only	Backlash 0.12 - 0.28
	⇒ page 217	⇒ page 205	⇒ page 214	⇒ page 221

Component renewed				
Gearbox housing ¹⁾	X	X		X
Bearing housing		X	X	
Differential cage	X			X
Tapered roller bearings for pinion shaft		X		X
Tapered roller bearings for differential	X			X
Final drive gear set ²⁾	X	X		X
Cover for final drive	X			X
¹⁾ If the gearbox housing is renewed the input shaft must also be adjusted ⇒ page 164 . ²⁾ Pinion shaft and crown wheel; if necessary, pinion shaft and crown wheel must always be renewed together.				

4.4 Recommended sequence for adjusting gear set

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

- ◆ Determine total shim thickness "S_{total}" (S₃ plus S₄) for the specified preload on pinion shaft tapered roller bearings.
- ◆ Distribute total shim thickness "S_{total}" (S₃ plus S₄) so that distance from centre of crown wheel to end face of pinion shaft corresponds to installation dimension "R" determined during production.
- ◆ Determine total shim thickness "S_{total}" (S₁ plus S₂) to obtain specified preload on differential tapered roller bearings.
- ◆ Distribute total shim thickness "S_{total}" (S₁ plus S₂) so that the specified backlash between crown wheel and pinion shaft is obtained.



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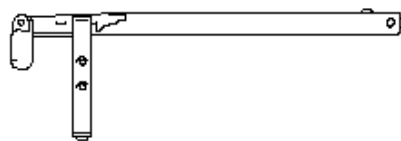
4.5 Adjusting pinion shaft (output shaft)

Repairs after which the pinion shaft must be adjusted
[⇒ page 204](#) .

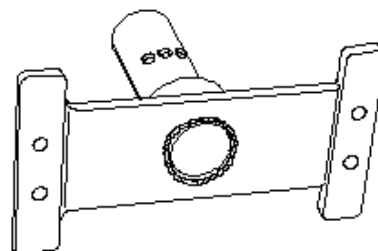
Special tools and workshop equipment required

- ◆ Transmission removal lever - VW 296-
- ◆ Support plate - VW 309-
- ◆ Gearbox support - VW 353-
- ◆ Universal measuring tool - VW 385-
- ◆ Universal dial gauge bracket - VW 387-
- ◆ Thrust plate - VW 402-

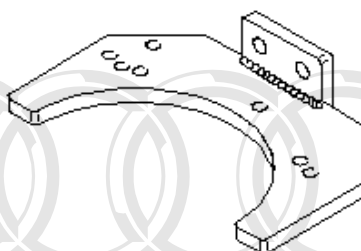
VW 296



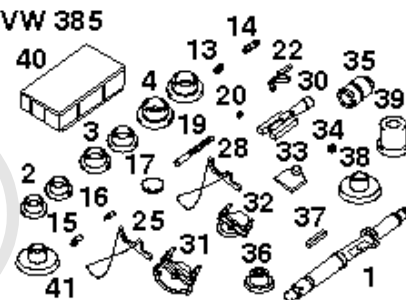
VW 309



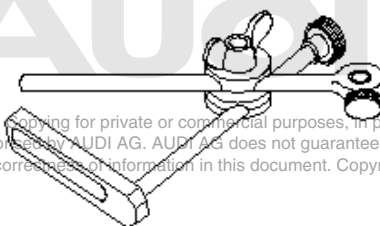
VW 353



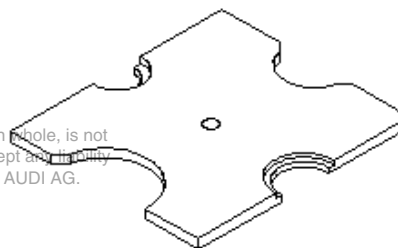
VW 385



VW 387



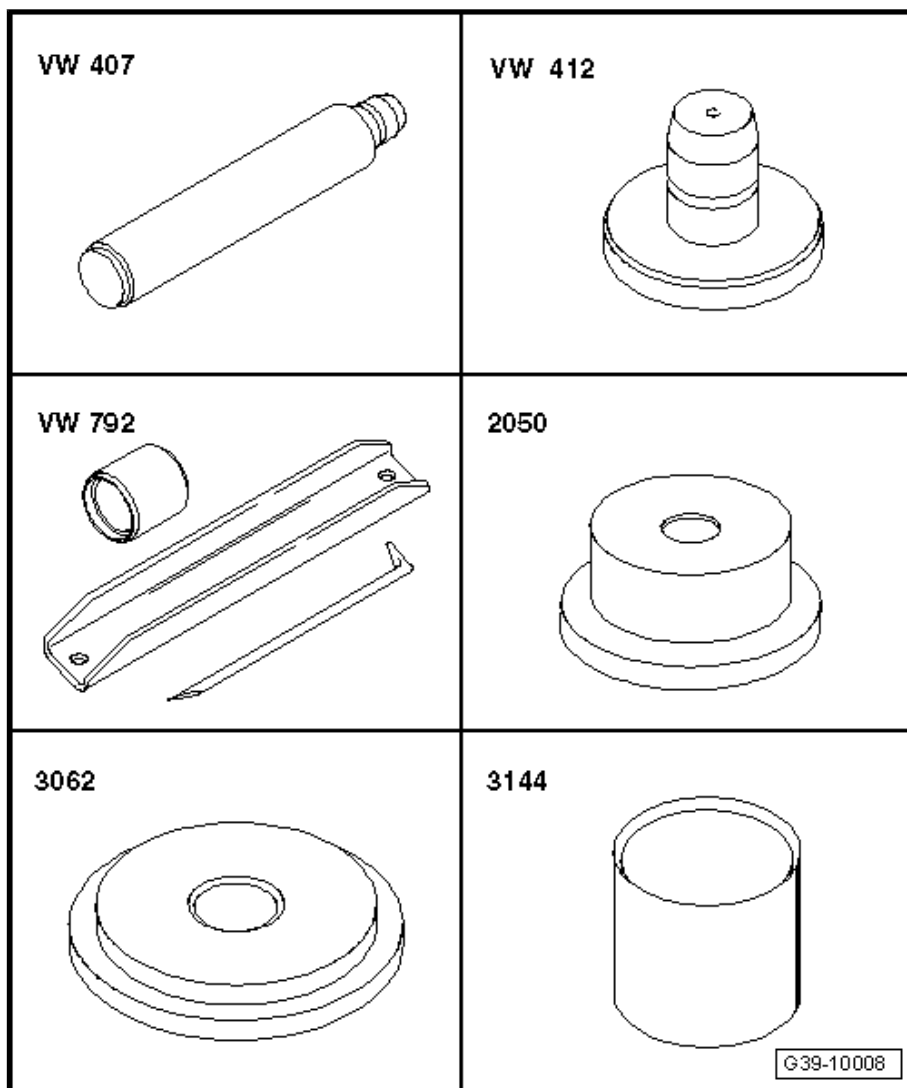
VW 402



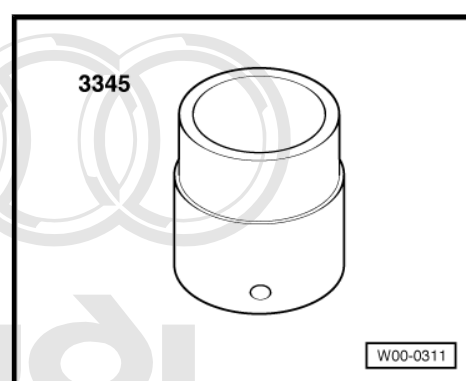
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- ◆ Press tool - VW 407-
- ◆ Press tool - VW 412-
- ◆ Assembly device - VW 792-
- ◆ Thrust piece - 2050-
- ◆ Thrust pad - 3062-
- ◆ Sleeve - 3144-

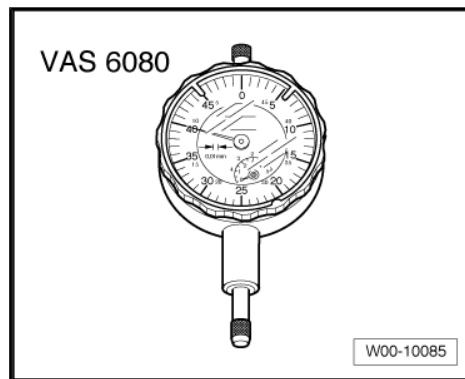


- ◆ Wheel bearing tube - 3345-



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- ◆ Dial gauge , e.g. -VAS 6080-

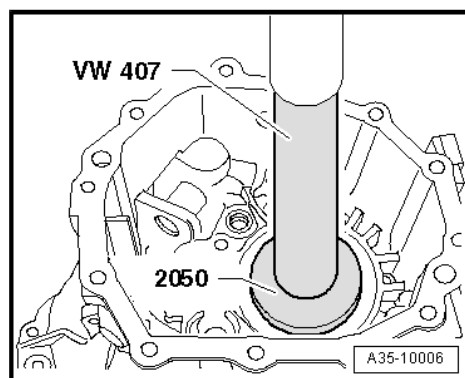


- ◆ Dial gauge extension, 30 mm

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

(Setting preload of tapered roller bearings for pinion shaft)

- Differential removed
- Press tapered roller bearing outer race for pinion shaft into gearbox housing without shims.

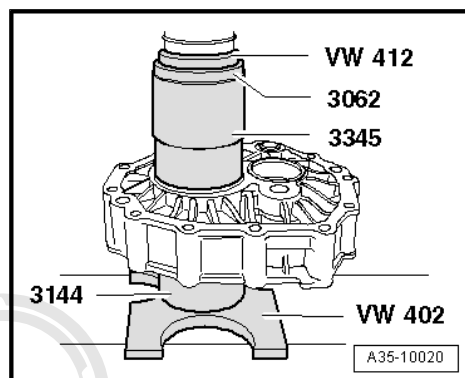


- Press in tapered roller bearing outer race for pinion shaft with shim "S₄^{*}" (thickness 1.01 mm) into bearing housing.

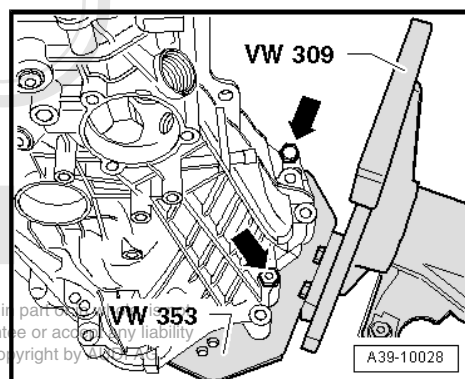


Note

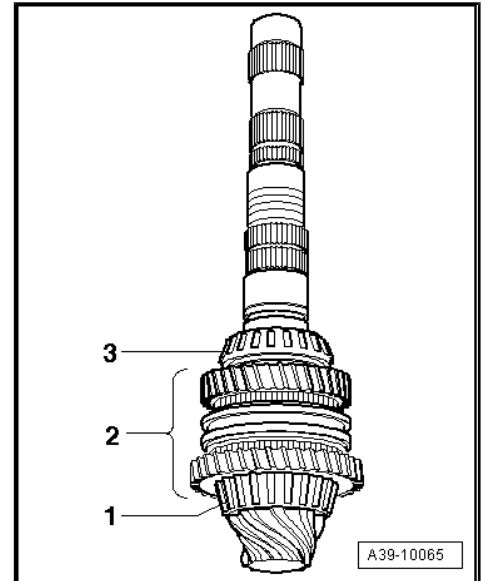
For measurement purposes a shim "S₄" with a thickness of 1.01 mm is inserted provisionally. This is referred to in the following as "S₄^{*}". "S₄^{*}" is exchanged with the final shim "S₄" after determining measured value "e".



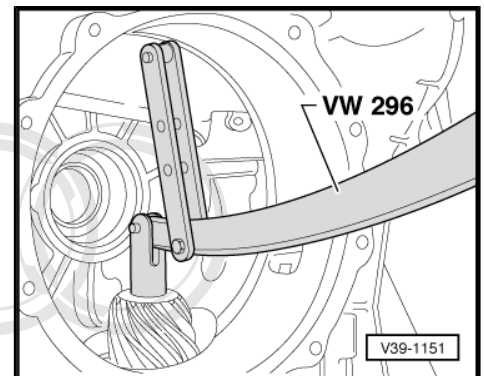
- Secure gearbox housing onto gearbox support - VW 353- with bolts -arrows-.



- Press tapered roller bearing inner race -1- onto pinion shaft and secure ⇒ [page 179](#) .
- Fit selector gears and locking collar for 1st and 2nd gears -2- ⇒ [page 172](#) .
- Press tapered roller bearing inner race -3- onto pinion shaft ⇒ [page 182](#) .
- Insert completely assembled pinion shaft in gearbox housing.
- Fit bearing housing and gearbox cover with the 4 dowel sleeves and tighten bolts to 35 Nm.
- Turn gearbox so that the gearbox cover points downwards.

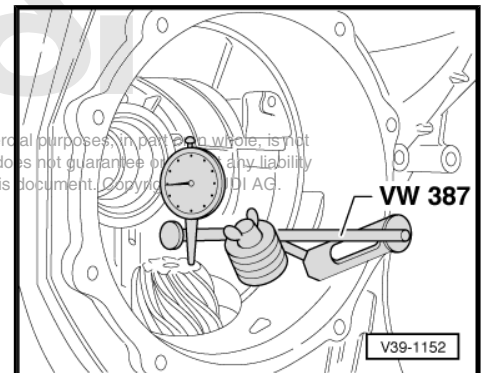


- Press down on face of pinion shaft with transmission removal lever - VW 296- until the tapered bearing outer race contacts the bearing housing.
- Maintain pressure and rotate pinion shaft 5 turns in both directions to seat tapered roller bearing.



- Fit dial gauge (3 mm measuring range) with 30 mm dial gauge extension to gearbox housing.
- Preload dial gauge to 1 mm and set to "0".

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

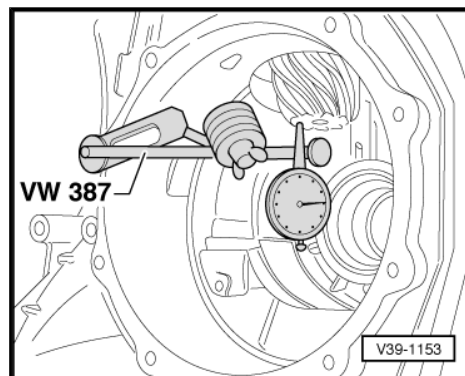


- Turn gearbox so that the gearbox cover points upwards.
- Rotate pinion shaft 5 turns in each direction so that the tapered roller bearing seats properly. Otherwise the result of the measurement will be incorrect.
- Read off play on dial gauge and note reading.
- ◆ Measurement in example: 0.46 mm



Note

If the measuring procedure needs to be repeated, the pinion shaft must first be rotated 5 turns in each direction again so that the tapered roller bearing seats properly. Preload dial gauge to 1 mm and set to "0" again.



Formula: $S_{total} = S_4^{**} + \text{measured value} + \text{bearing preload}$

Example:

Inserted shim S_4^{**}	1.01 mm
+ Measured value (example)	0.46 mm
+ Bearing preload (constant value)	0.12 mm
= Total shim thickness S_{total} for $S_3^{**} + S_4^{**}$	1.59 mm

Determining thickness of shim S_3^{**}

Formula: $S_3^{**} = S_{total} - S_4^{**}$

Example:

Total shim thickness S_{total} for $S_3^{**} + S_4^{**}$	1.59 mm
- Inserted shim S_4^{**}	1.01 mm
= Thickness of shim S_3^{**}	0.58 mm

- Remove tapered roller bearing outer race from gearbox housing ⇒ [page 176](#).
- Fit shim S_3^{**} in gearbox housing and install outer race again ⇒ [Item 3 \(page 169\)](#).
- Insert completely assembled pinion shaft into gearbox housing again.
- Fit bearing housing and gearbox cover with the 4 dowel sleeves and tighten bolts to 35 Nm.
- Turn pinion shaft 5 turns in each direction so that tapered roller bearings seat properly.

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- Attach assembly device - VW 792- to gearbox housing; when doing so, insert an M12 nut -A- between assembly device -VW 792- and gearbox housing.
- Fit universal dial gauge bracket - VW 387- with dial gauge and 30 mm extension.

 Note

Apply dial gauge extension exactly at centre of intersection of ribs on gearbox cover -arrow-.

- Set dial gauge (3 mm measuring range) to “0” with 1 mm pre-load.
- Loosen gearbox cover bolts and turn pinion shaft several times.
- If the correct shims have been selected the dial gauge will now indicate the following value:
◆ 0.06 ... 0.12 mm
- Tighten gearbox cover bolts again to 35 Nm.
- Take down measuring tools.
- Turn pinion shaft 5 turns in each direction so that tapered roller bearings seat properly.

Determining dimension “e”

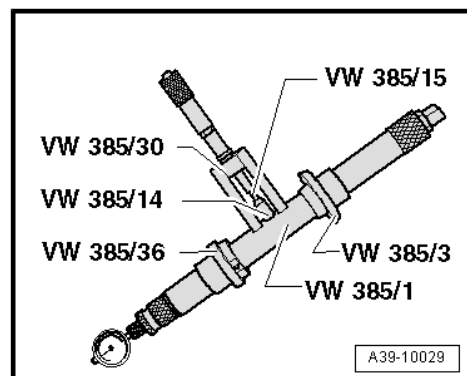
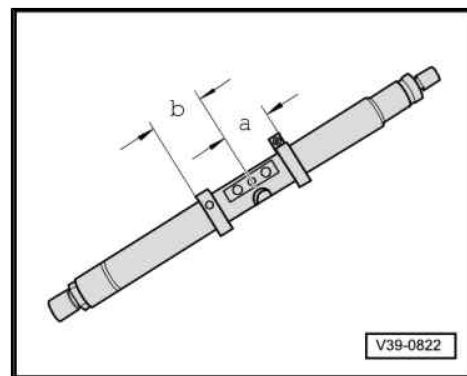
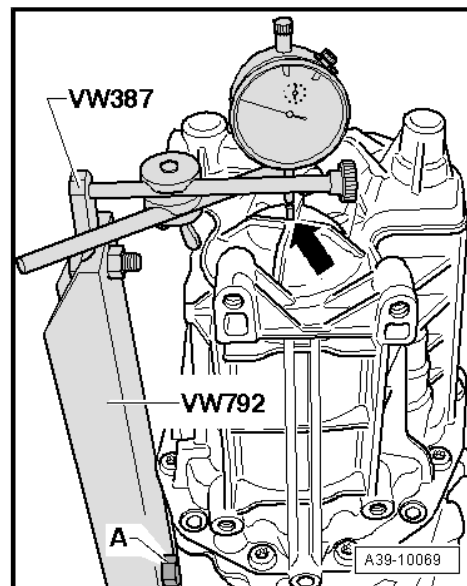
 Note

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

- Set adjustment rings of universal measuring tool - VW 385/1- to the following values:
◆ Dimension -a- = 45 mm
◆ Dimension -b- = 75 mm

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- Assemble universal measuring tool - 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 universal measuring tool .
– Set dial gauge (3 mm measuring range) to “0” with 2 mm pre-load.



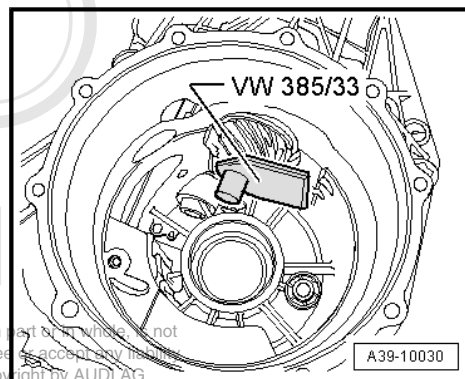
- Place end measuring plate - VW 385/33- on face of pinion gear.



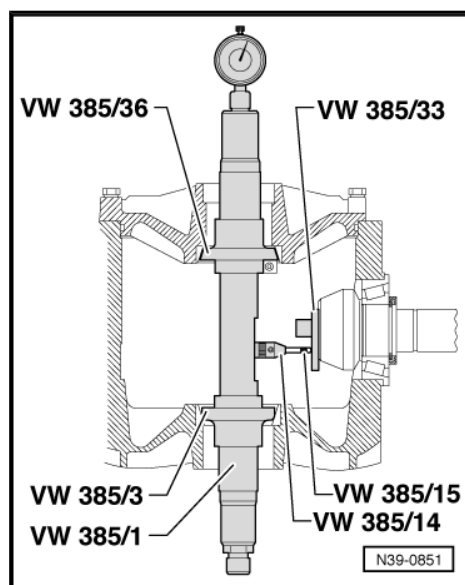
Note

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

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- Detach master gauge - VW 385/30- and insert universal measuring tool in housing.
- ◆ The dial gauge faces towards the final drive cover.
- Fit cover for final drive and tighten 4 bolts to 20 Nm.
- Using the adjustable ring, pull 2nd centring disc - VW 385/36- out as far as possible so that the universal measuring tool can still just be turned by hand.

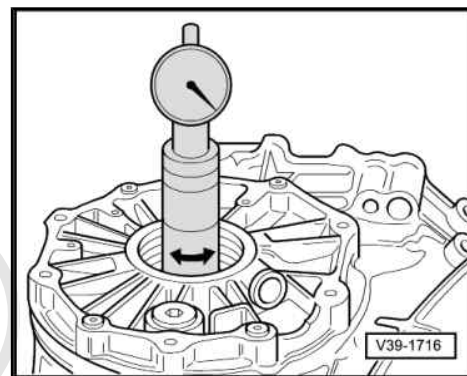


- Turn universal measuring tool until tip of dial gauge touches end measuring plate on face of pinion gear, and measure maximum deflection (return point).
- ◆ Measurement in following example: “e” = 0.17 mm (in red scale).



Note

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



Determining thickness of shim “S₃”

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

Formula:

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

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

Example:

Inserted shim “S ₃ [*] ”	0.58 mm
+ Allowance “r”	0.29 mm
- Determined value “e” (in red scale)	0.17 mm
= Thickness of shim “S ₃ ”	0.70 mm

- Determine shim(s) according to table. For part number, refer to ⇒ Electronic parts catalogue .

Available shims for “S₃”

Shim thickness (mm) ¹⁾		
0.53	0.85	1.17
0.57	0.89	1.21
0.61	0.93	1.25
0.65	0.97	1.29
0.69	1.01	1.33
0.73	1.05	1.37
0.77	1.09	1.41
0.81	1.13	

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

Determining thickness of shim “S₄”

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

Example:

Total shim thickness "S _{total} " for "S ₃ " + "S ₄ "	1.59 mm
- Thickness of shim "S ₃ "	0.70 mm
= Thickness of shim "S ₄ "	0.89 mm

- Determine shim(s) according to table. For part number, refer to ⇒ Electronic parts catalogue .

Shims available for "S₄"

Shim thickness (mm) ¹⁾		
0.33	0.73	1.13
0.37	0.77	1.17
0.41	0.81	1.21
0.45	0.85	1.25
0.49	0.89	1.29
0.53	0.93	1.33
0.57	0.91	1.37
0.61	1.01	1.41
0.65	1.05	1.45
0.69	1.09	1.49

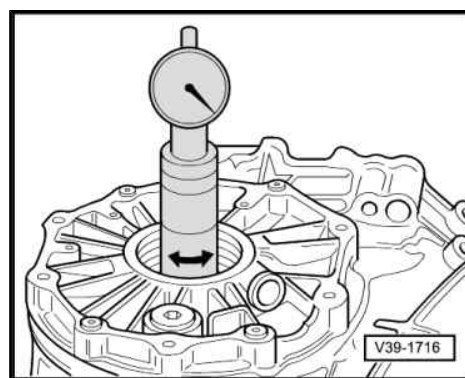
¹⁾ The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

Checking adjustment

Checking allowance (tolerance) "r"

- Install pinion shaft with appropriate measured shims "S₃" and "S₄".
- Turn pinion shaft 5 turns in each direction so that tapered roller bearings seat properly.
- Insert universal measuring tool and check adjustment.
- Read off dial gauge anti-clockwise (red scale).
- ◆ If the shims have been correctly selected, the allowance "r" (marked on outer circumference of crown wheel) should be indicated within a tolerance of ± 0.04 mm.

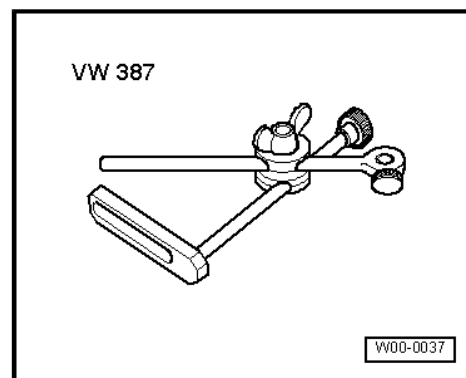
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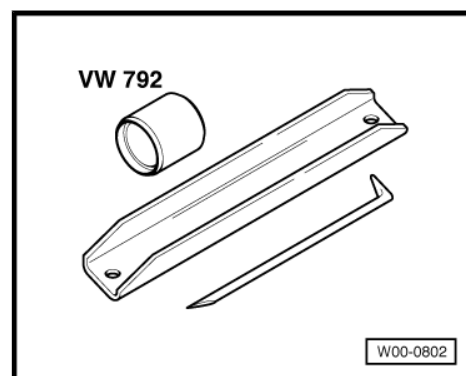
4.6 Re-determining shim "S₄" when renewing bearing housing

Special tools and workshop equipment required

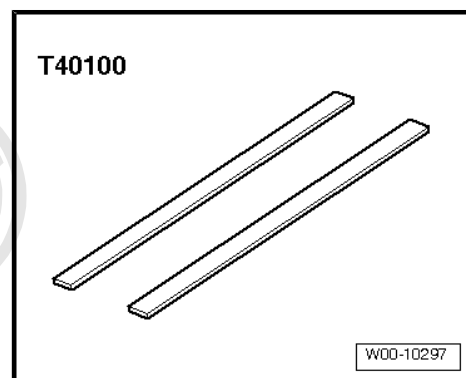
- ◆ Universal dial gauge bracket - VW 387-



- ◆ Assembly device - VW 792-

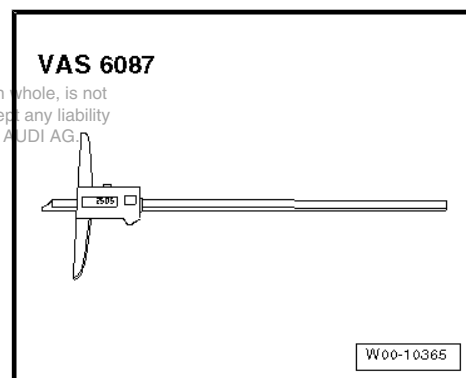


- ◆ Ruler - T40100-

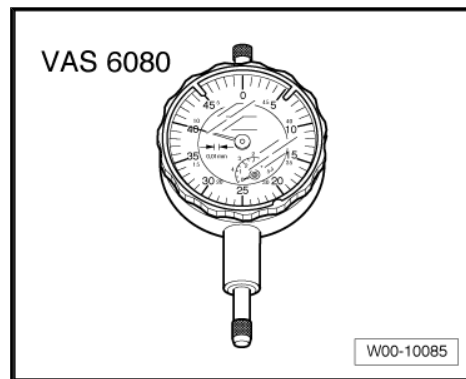


- ◆ Digital depth gauge , e.g. -VAS 6087-

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- ◆ Dial gauge , e.g. -VAS 6080-



- ◆ Dial gauge extension, 30 mm
- Clean housing flanges.
- Place straightedge (e.g. -T40100- , 39.70 mm wide) -1- on housing flange.
- Measure difference between depth -a- on old and new bearing housing with a digital depth gauge (e.g. -VAS 6087-).

Example:

Depth -a- of previous bearing housing (with straightedge width)	46.50 mm
Depth -a- of new bearing housing (with straightedge width)	46.65 mm
= Difference	0.15 mm

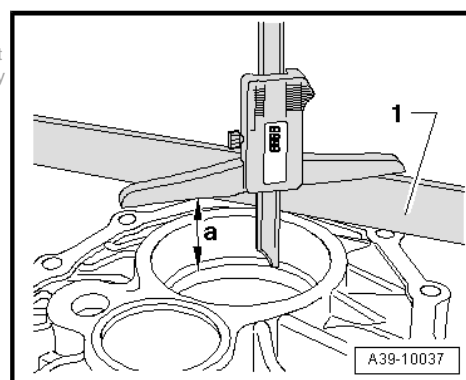
- If new bearing housing is deeper, install a thicker “S4” shim.
- If previous bearing housing is deeper, install a thinner “S4” shim.

Example:

Previous shim “S4”	0.95 mm
+ Difference	0.15 mm
= New shim “S4”	1.10 mm

Shims available ⇒ [page 214](#) .

- Press tapered roller bearing outer race with shim “S4” into bearing housing ⇒ [page 177](#) .
- Insert completely assembled pinion shaft into gearbox housing again.
- Fit bearing housing and gearbox cover and tighten bolts to 35 Nm.
- Turn pinion shaft 5 turns in each direction so that tapered roller bearings seat properly.



- Attach assembly device - VW 792- to gearbox housing; when doing so, insert an M12 nut -A- between assembly device -VW 792- and gearbox housing.
- Fit universal dial gauge bracket - VW 387- with dial gauge and 30 mm extension.



Note

Apply dial gauge extension exactly at centre of intersection of ribs on gearbox cover -arrow-.

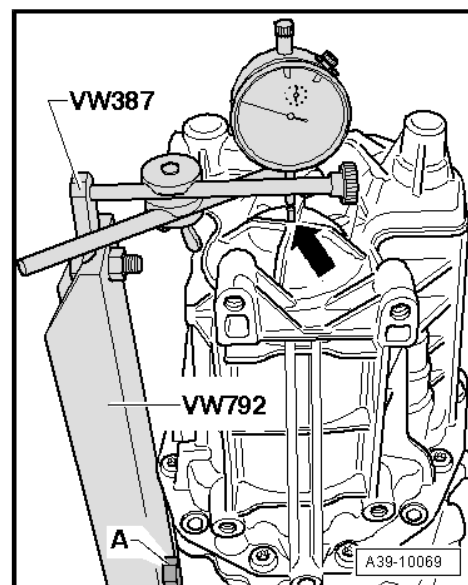
- Set dial gauge (3 mm measuring range) to "0" with 1 mm pre-load.

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- Loosen gearbox cover bolts and turn pinion shaft several times.
- If the correct shims have been selected the dial gauge will now indicate the following value:

◆ 0.06 ... 0.12 mm

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

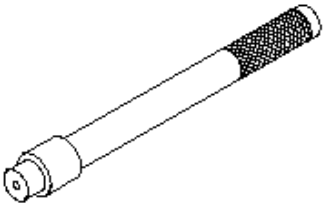
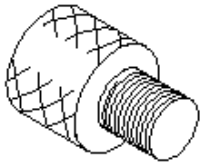
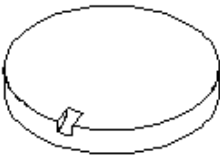
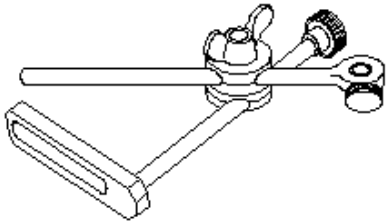
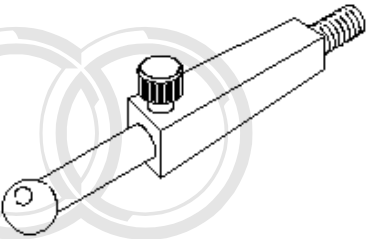
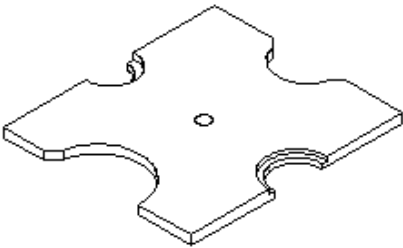


4.7 Adjusting crown wheel

(Adjusting differential)

Special tools and workshop equipment required

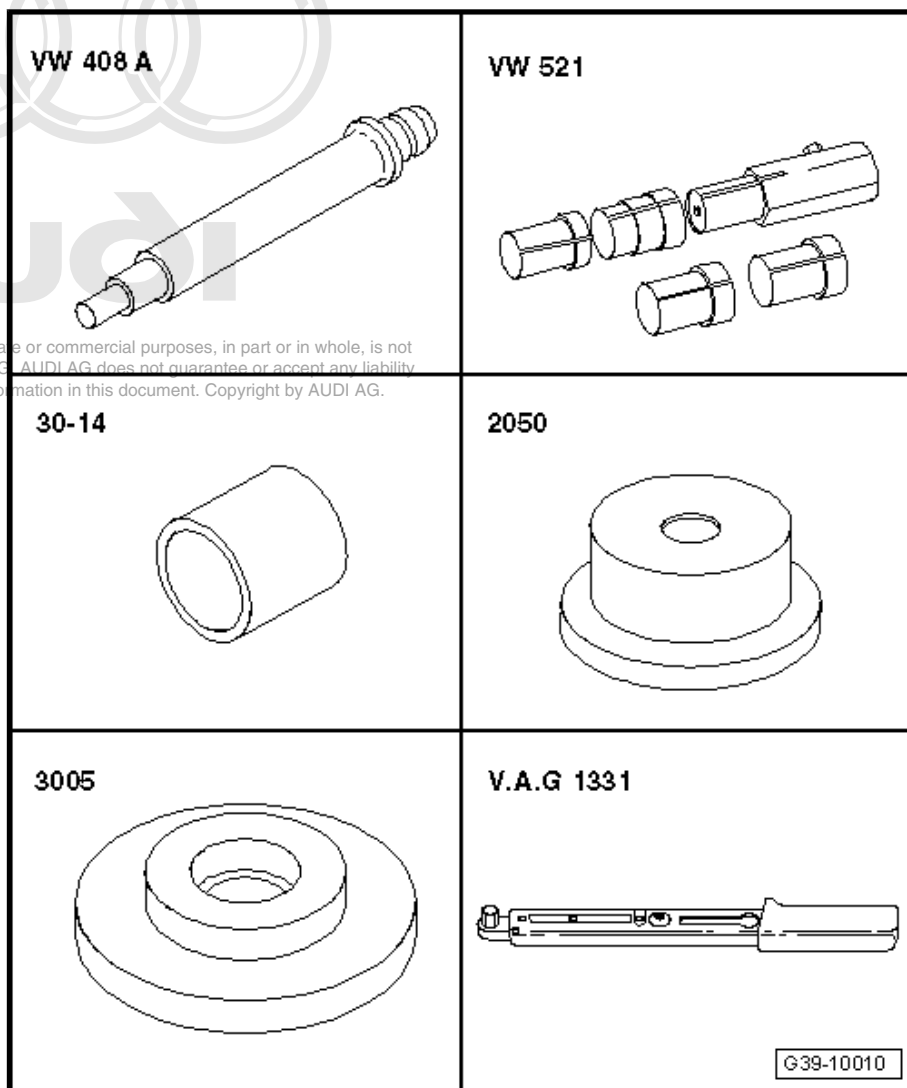
- ◆ Drift - VW 295-
- ◆ Dial gauge extension - VW 382/10-
- ◆ End measuring plate - VW 385/17-
- ◆ Universal dial gauge bracket - VW 387-
- ◆ Adjustable measuring lever - VW 388-
- ◆ Thrust plate - VW 402-

VW 295 	VW 382/10 
VW 385/17 	VW 387 
VW 388 	VW 402  G39-10009

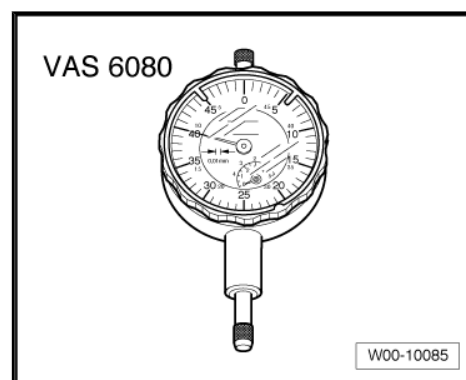
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- ◆ Press tool - VW 408 A-
- ◆ Crown wheel adjusting tool - VW 521-
- ◆ Tube - 30 - 14-
- ◆ Thrust piece - 2050-
- ◆ Thrust plate - 3005-
- ◆ Torque wrench - V.A.G 1331-

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- ◆ Dial gauge , e.g. -VAS 6080-



- ◆ Dial gauge extension, 30 mm

It is necessary to readjust the crown wheel when the following components have been renewed:

Gearbox housing, cover for final drive, tapered roller bearings for differential, differential cage or final drive gear set

Table of adjustments ⇒ [page 204](#)

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

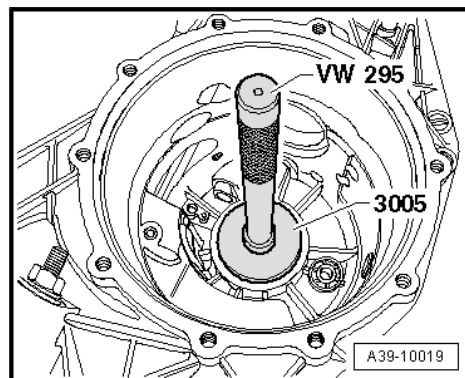
(Setting preload of tapered roller bearings for differential)

- Pinion shaft removed
- Remove flange shaft oil seals.
- Remove tapered roller bearing outer races for differential and take out shims ⇒ [page 195](#).
- Drive outer race for tapered roller bearing (right-side) with shim "S₂" into gearbox housing. For measurement purposes use a 1.30 mm thick "S₂" shim (or 2 shims of 0.65 mm).

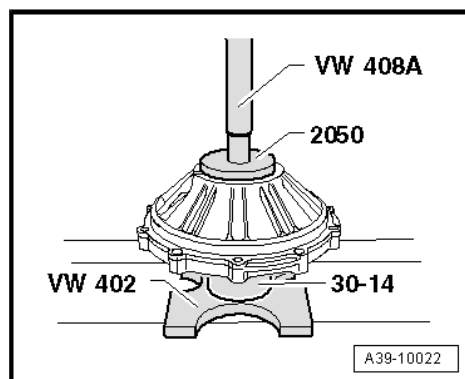


Note

For measurement purposes a 1.30 mm thick shim "S₂" is inserted provisionally. This is referred to in the following as "S₂*". "S₂*" is exchanged with the final shim "S₂" after determining backlash.



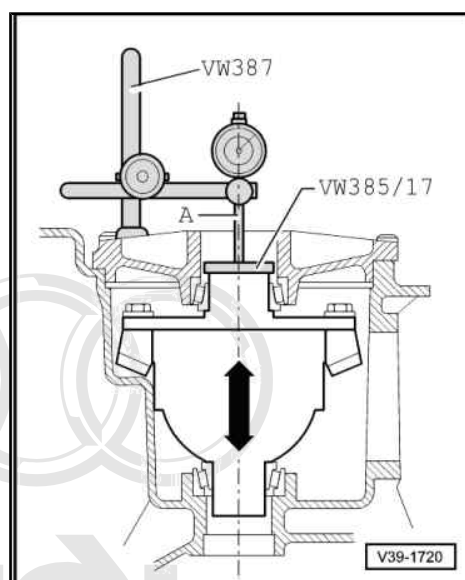
- Press outer race for tapered roller bearing (left-side) without shim "S₁" into cover for final drive.
- Install differential in gearbox housing. The crown wheel is positioned on the left-hand side (same side as cover for final drive).
- Fit cover for final drive with 4 bolts (20 Nm).
- Turn gearbox so that cover for final drive points upwards.
- Turn differential 5 turns in both directions so that the tapered roller bearings settle.
- Place measuring plate - VW 385/17- on differential.
- Set up measuring tool using 30 mm dial gauge extension .
- Set dial gauge (3 mm measuring range) -A- to "0" with 2 mm preload.



Note

The tip of the dial gauge must be applied to the centre of the differential.

- Raise differential without turning, read clearance off dial gauge and note down.
- Measurement in following example: 0.62 mm



 Note

- ◆ To lift differential, secure crown wheel adjusting tool - VW 521/4- and -VW 521/12- on right side of differential (housing side).
- ◆ If the measurement has to be repeated, the differential must again first be turned 5 turns in each direction to settle the tapered roller bearings.

Formula: $S_{total} = S_2^{**} + \text{measured value} + \text{bearing preload}$

Example:

Inserted shim(s) S_2^{**}	1.30 mm
+ Measured value	0.62 mm
+ Bearing preload (constant value)	0.25 mm
= Total shim thickness S_{total} for $S_1 + S_2$	2.17 mm

Determining thickness of shim S_1^{**}

 Note

- ◆ Provisional shim S_1^{**} is replaced with final shim S_1 after determining backlash.
- ◆ Total shim thickness S_{total} remains unchanged.

Formula: $S_1^{**} = S_{total} - S_2^{**}$

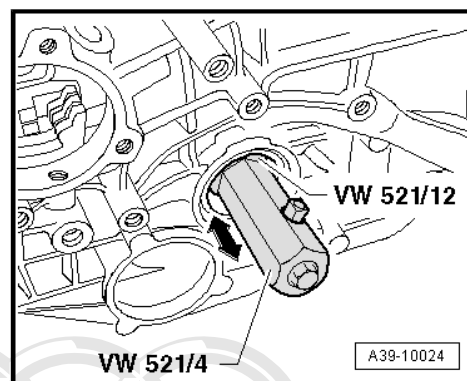
Example:

Total shim thickness S_{total} for $S_1 + S_2$	2.17 mm
- Inserted shim(s) S_2^{**}	1.30 mm
= Thickness of shim S_1^{**}	0.87 mm

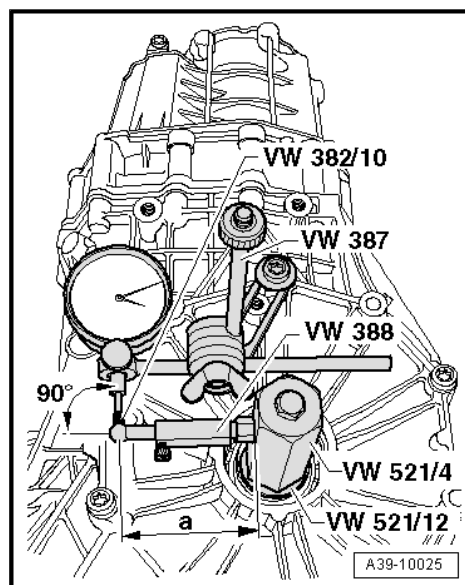
Select correct shims from ⇒ Electronic parts catalogue .

Measuring backlash

- Pinion shaft fitted with shims S_3 and S_4 .
- Install differential with crown wheel: S_1 is fitted on cover side, S_2 in gearbox housing.
- Fit cover for final drive and tighten bolts to 20 Nm.
- Insert crown wheel adjusting tool - VW 521/4- and -VW 521/12- .
- Turn differential 5 turns in both directions to settle tapered roller bearings.



- Secure universal dial gauge bracket - VW 387- to housing.
- Fit dial gauge with dial gauge extension - VW 382/10- (6 mm flat).
- Adjust measuring lever - VW 388- to distance “a” = 79 mm (for $\varnothing$ 188 mm crown wheel).
- Measure play between teeth faces (backlash) as follows:
- Turn crown wheel until it makes contact with the face of one tooth (end of backlash travel).
- Preload dial gauge to 2 mm and set to “0”.
- Turn back crown wheel until it makes contact with opposite tooth face (backlash).
- Take backlash reading and note down measured value.
- Turn crown wheel through 90° and repeat measurement another 3 times.



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 Note

If the pinion shaft turns when taking the measurement, it can be locked by engaging 2 gears at the same time (e.g. reverse gear -arrow A- and 1st gear -arrow B-).

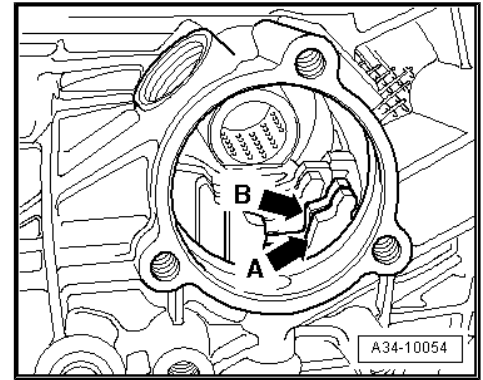
Determining average backlash

- Add the four measured values together and divide by four.

Example:

1st measured value	0.28 mm
+ 2nd measured value	0.30 mm
+ 3rd measured value	0.30 mm
+ 4th measured value	0.28 mm
= Sum of measured values	1.16 mm

- Result: the average backlash is $1.16 \text{ mm} : 4 = 0.29 \text{ mm}$



 Note

If the individual measurements differ by more than 0.06 mm, this means that the installation of the crown wheel is not correct or that the final drive gear set itself is defective. Check the installation; renew the final drive gear set if necessary.

Determining thickness of shim "S₂"

Formula: $"S_2" = "S_2^*" - \text{measured backlash} + \text{specified backlash}$

Example:

Inserted shim "S ₂ [*] "	1.30 mm
- Measured average backlash	0.29 mm
+ Specified backlash (desired average value for backlash)	0.20 mm
= Thickness of shim "S ₂ "	1.21 mm

- Determine shim(s) according to table. For part number, refer to ⇒ Electronic parts catalogue .

Available shims for "S₂"

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

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

Determining thickness of shim "S₁"

Formula: $"S_1" = "S_{\text{total}}" - "S_2"$

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Example:

Total shim thickness " S_{total} " for " S_1 " + " S_2 "	2.17 mm
- Thickness of shim " S_2 "	1.21 mm
= Thickness of shim " S_1 "	0.96 mm

- Determine shim(s) according to table. For part number, refer to ⇒ Electronic parts catalogue .

Available shims for " S_1 "

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

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

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Checking adjustment

- After installing shims " S_1 " and " S_2 ", turn differential 5 turns in both directions so that the tapered roller bearings settle.
- Measure backlash four times on circumference.
- ◆ Specification: 0.12 ... 0.28 mm



Note

- ◆ Adjustment must be repeated if backlash is outside tolerance. The total shim thickness " S_{total} " must remain unchanged.
- ◆ The discrepancy between individual measured values must not exceed 0.06 mm.

