

Workshop Manual Audi A6 2005 ➤

6-speed manual gearbox 02X, four-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 - front differential



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

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00 – Technical data

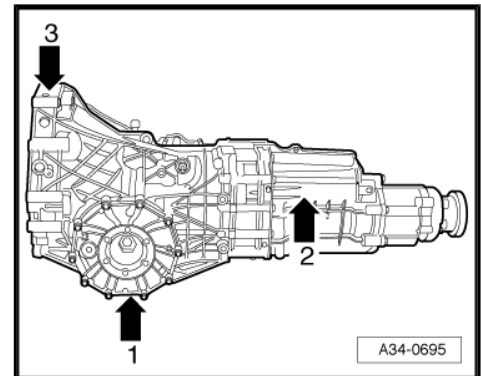
1 Gearbox identification

(ARL003910; Edition 07.2014)

The 6-speed manual gearbox 02X, four-wheel drive is installed in the Audi A6 2005 ► in conjunction with the 2.4 ltr., 2.8 ltr. and 3.2 ltr. V6 petrol engines.

Location on gearbox

- ◆ Code letters and date of manufacture -arrow 1- or -arrow 3-
- ◆ Manual gearbox 02X -arrow 2-



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

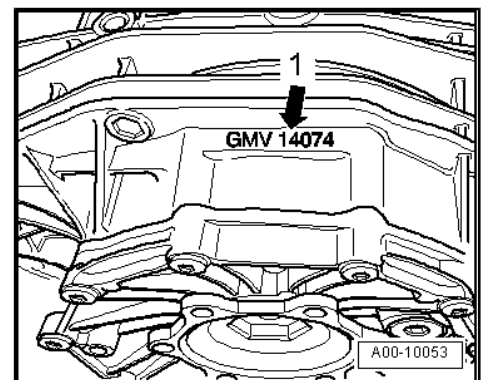
Example:	GMV	14	07	4
	Code letters	Day	Month	Year of manufacture (2004)

Additional data are manufacture-related.

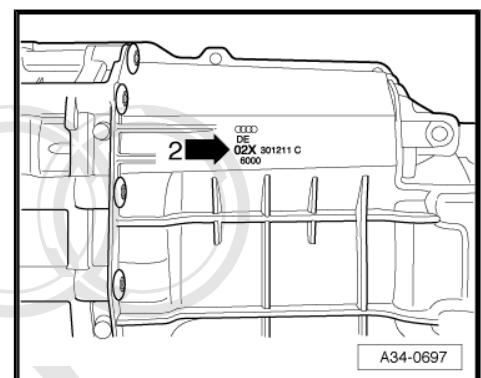


Note

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



Manual gearbox 02X -arrow 2-



1.1 Code letters, allocation, transmission ratios, capacities

Manual gearbox		6-speed 02X, four-wheel drive		
Code letters		GMV	HGV	JAG
Allocation	Model	A6 2005 ►	A6 2005 ►	A6 2005 ►
	Engine	3.2 ltr. - 188 kW FSI	2.4 ltr. -130 kW MPI	3.2 ltr. - 188 kW FSI
Ratio	Final drive	35 : 8 = 4.375	35 : 8 = 4.375	37 : 9 = 4.111
Z ₂ : Z ₁ = i	1st gear	33 : 10 = 3.300	33 : 9 = 3.667	33 : 9 = 3.667
	2nd gear	37 : 20 = 1.850	39 : 19 = 2.053	39 : 19 = 2.053



Manual gearbox		6-speed 02X, four-wheel drive		
	3rd gear	36 : 28 = 1.286	37 : 27 = 1.370	37 : 26 = 1.423
	4th gear	31 : 33 = 0.939	32 : 31 = 1.032	33 : 31 = 1.065
	5th gear	27 : 36 = 0.750	28 : 35 = 0.800	29 : 34 = 0.853
	6th gear	25 : 39 = 0.641	25 : 38 = 0.658	27 : 37 = 0.730
	Reverse gear	34 : 10 = 3.400	34 : 10 = 3.400	34 : 10 = 3.400
Capacity		3.5 ltr.		
Specification		Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)		
Clutch mechanism		Hydraulic		
Clutch plate Ø		240 mm	240 mm	240 mm
Drive shaft flange Ø		88 mm	88 mm	88 mm
Overall ratio $i_{ov.}$ in top gear		2.804	2.878	3.001
The following data can be found in the ⇒ Electronic parts catalogue .				
◆ Correct type of clutch plate and pressure plate				
◆ Correct type of rear final drive according to code and PR number				

Manual gearbox		6-speed 02X, four-wheel drive		
Code letters		KJA		
Allocation	Model	A6 2005 ►		
	Engine	2.8 ltr. - 140 kW FSI		
Ratio	Final drive	35 : 9 = 3.889		
$Z_2 : Z_1 = i$	1st gear	33 : 9 = 3.667		
	2nd gear	39 : 19 = 2.053		
	3rd gear	37 : 27 = 1.370		
	4th gear	32 : 31 = 1.032		
	5th gear	28 : 35 = 0.800		
	6th gear	25 : 38 = 0.658		
	Reverse gear	34 : 10 = 3.400		
Capacity		3.5 ltr.		
Specification		Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)		
Clutch mechanism		Hydraulic		
Clutch plate Ø		240 mm		
Drive shaft flange Ø		88 mm		
Overall ratio $i_{ov.}$ in top gear		2.559		
The following data can be found in the ⇒ Electronic parts catalogue .				
◆ Correct type of clutch plate and pressure plate				
◆ Correct type of rear final drive according to code and PR number				

2 Identification of rear final drive units 01R, 0AR and 08V

Depending on version and engine, the following rear final drives are allocated to the manual gearbox 02X four-wheel drive:

- ◆ ⇒ ["2.1 Rear final drive 01R", page 3](#)
- ◆ ⇒ ["2.2 Rear final drive 0AR", page 4](#)
- ◆ ⇒ ["2.3 Rear final drive 08V", page 4](#)

Note

When installing a new rear final drive unit, it is important to verify not only the code letters of the final drive but also the PR No. and the engine code of the vehicle in the ⇒ [Electronic parts catalogue](#). This is necessary to ensure that the correct version is installed.

2.1 Rear final drive 01R

Note

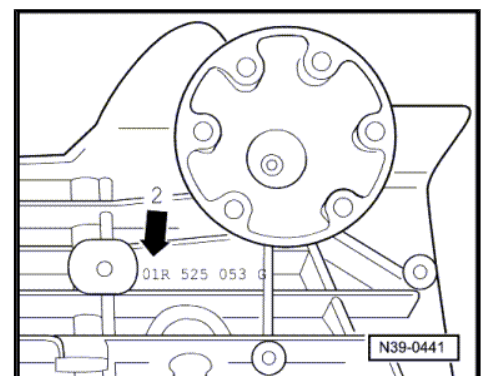
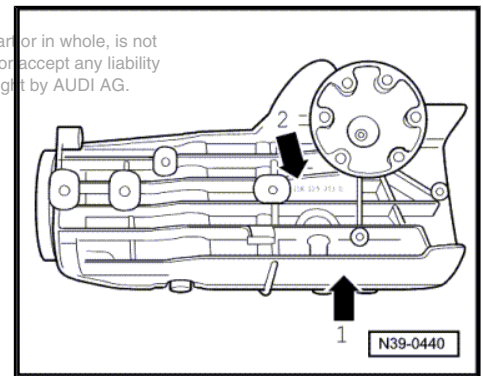
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- ◆ *Code letters, allocation, ratio and capacities ⇒ [Rear final drive 01R; Rep. gr. 00](#).*
- ◆ *For repairs on the propshaft or the rear final drive refer to ⇒ [Rear final drive 01R; Rep. gr. 39](#).*

Location on final drive

- ◆ Code letters and date of manufacture -arrow 1-
- ◆ Rear final drive 01R -arrow 2-

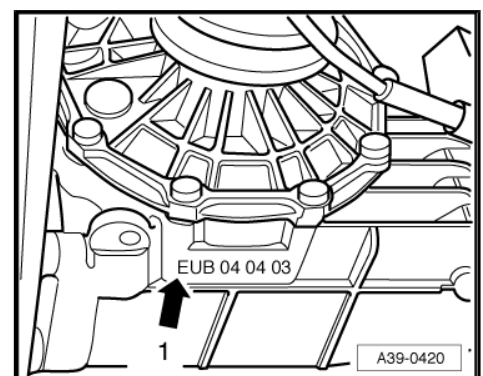
Rear final drive 01R -arrow 2-



Code letters and date of manufacture of final drive -arrow 1-

Example:	EUB	04	04	03
	Code letters	Day	Month	Year -2003- of manufacture

Additional data are manufacture-related.



2.2 Rear final drive 0AR



Note

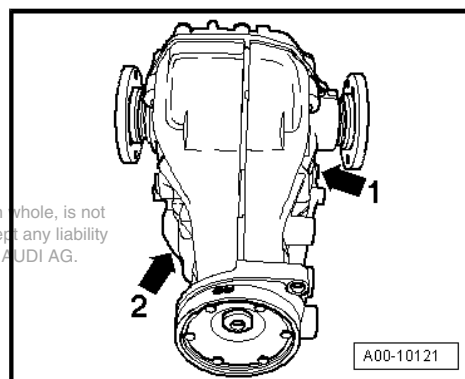
- ◆ *Code letters, allocation, ratio, capacities ⇒ Rear final drive 0AR; Rep. gr. 00.*
- ◆ *Refer to Workshop Manual ⇒ Rear final drive 0AR; Rep. gr. 39 for repairs on the propshaft or the final drive.*

Location on final drive

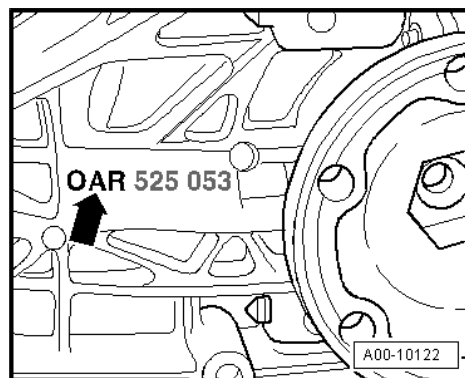
Final drive 0AR -arrow 1-

Code letters and date of manufacture -arrow 2-

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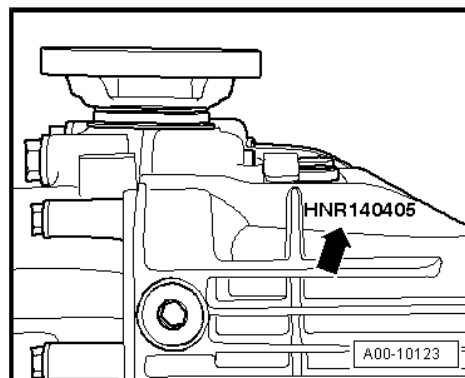
Final drive 0AR -arrow-



Code letters and date of manufacture for rear final drive -arrow-

Example:	HNR	14	04	05
	Code letters	Day	Month	Year of manufacture -2005-

Other information can be disregarded.



2.3 Rear final drive 08V

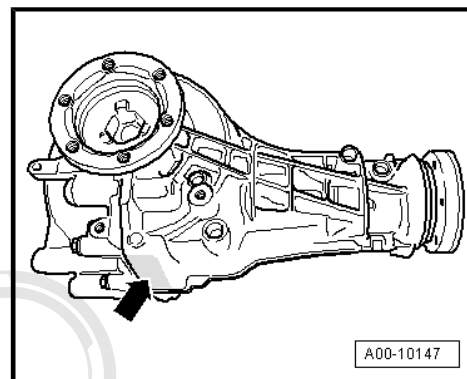


Note

- ◆ *Code letters, allocation, ratio, capacities ⇒ Rear final drive 08V; Rep. gr. 00.*
- ◆ *Refer to Workshop Manual ⇒ Rear final drive 08V; Rep. gr. 39 for repairs on the propshaft or the final drive.*

Location on rear final drive

Final drive 08V, code letters and date of manufacture -arrow-

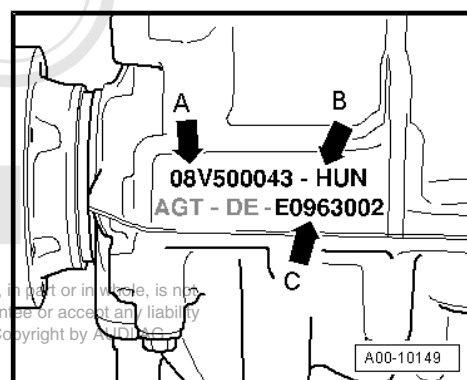


-Arrow A- Final drive 08V with Part No. (in this example 08V 500 043)

-Arrow B- Code letters "HUN"

-Arrow C- Manufacturing data of rear final drive

Example:	E	096	3002
Year of manufacture -2005-	Day of manufacture		
E = 2005,	-96th day of year-		
F = 2006,	(always specified		
G = 2007,	in three digits)		
H = 2008 ...			
	Serial number on day of manufacture		



Other information can be disregarded.

3 Transmission layout

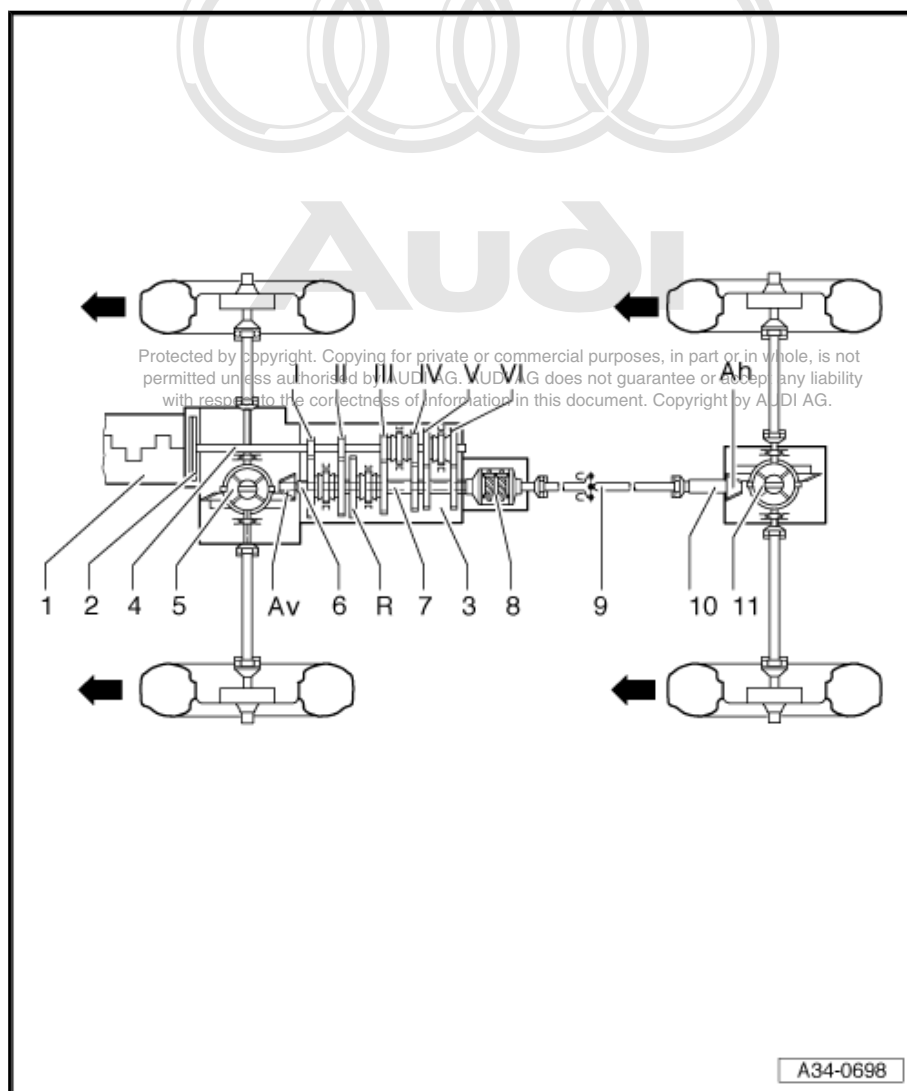
Identification



Note

-Arrows- point in direction of travel.

- 1 - Engine
- 2 - Clutch
- 3 - Manual gearbox
- 4 - Input shaft (main shaft)
- 5 - Front differential
- 6 - Front pinion shaft (output shaft)
- 7 - Hollow shaft
- 8 - Self-locking centre differential
- 9 - Propshaft
- 10 - Rear pinion shaft
- 11 - Rear differential



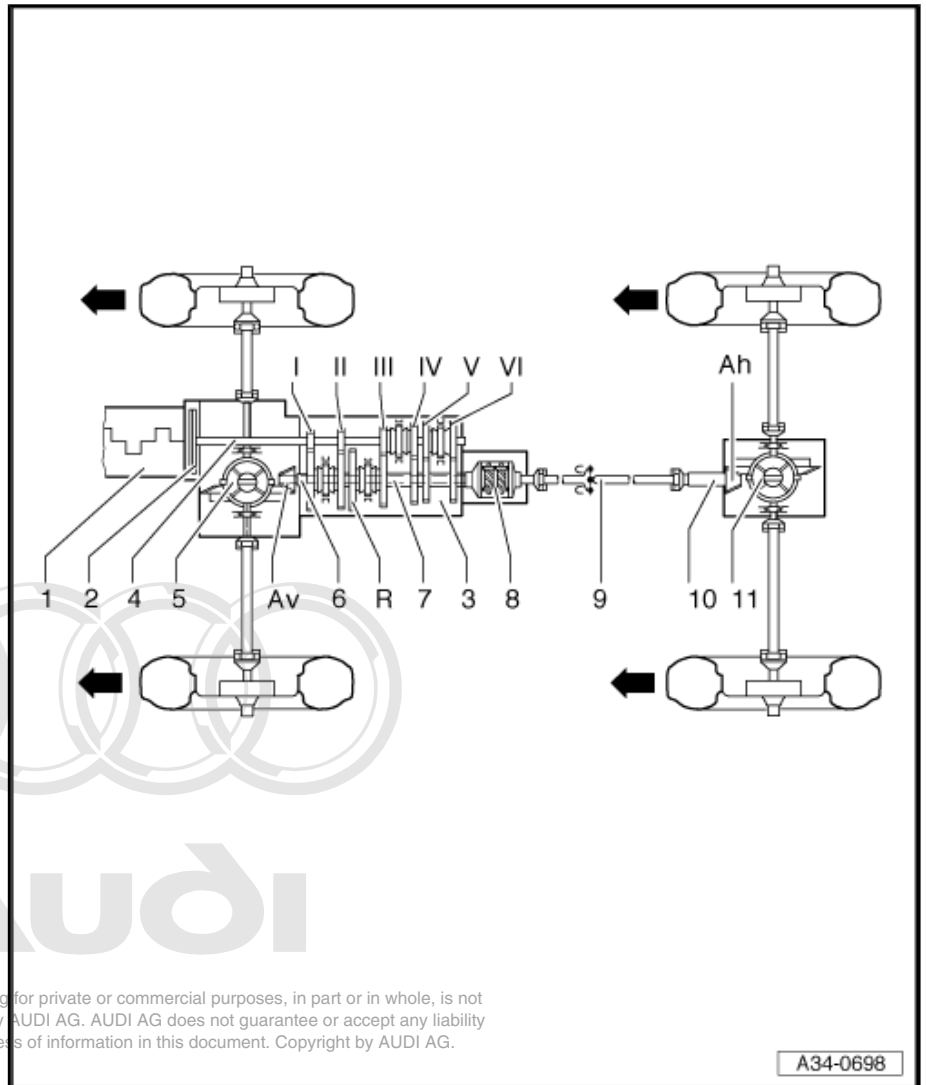
Ratio



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
- Av - Final drive (front)
- Ah - Final drive (rear)





4 Calculating ratio "i"

Transmission ratio

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

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

Example:

	6th gear	Final drive
Driving gear	$Z_{G1} = 38$	$Z_{A1} = 8$
Driven gear	$Z_{G2} = 25$	$Z_{A2} = 30$

Calculations:

i_G	=	$25 : 38 = 0.658$
i_A	=	$30 : 8 = 3.750$
i_{ov}	=	$0.658 \times 3.750 = 2.467$



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5 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" ⇒ ["5.2 Components", page 9](#) . They apply to the work described in this Manual.

5.1 Special tools

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

5.2 Components

Gearbox

- ◆ Allocate bolts and other components according to gearbox code letters; refer to ⇒ Electronic parts catalogue
⇒ ["1.1 Code letters, allocation, transmission ratios, capacities", page 1](#) .
- ◆ After installing a replacement gearbox, check oil level and fill up with gear oil as required ⇒ [page 77](#) .
- ◆ Capacities and specifications
⇒ ["1.1 Code letters, allocation, transmission ratios, capacities", page 1](#)
- ◆ Thoroughly clean all joints and connections and the surrounding areas before dismantling.
- ◆ When installing gearbox ensure dowel sleeves are correctly seated.

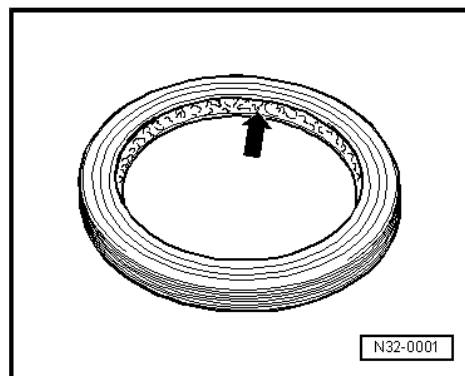
Sealants

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

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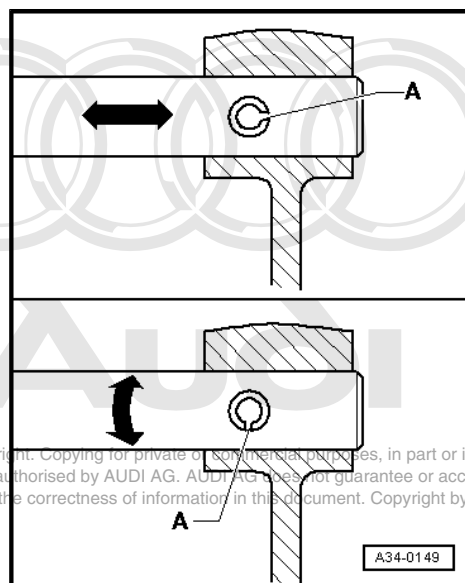
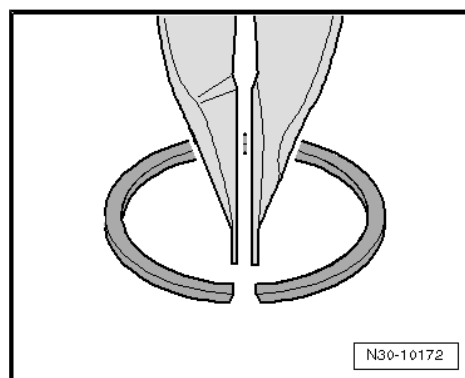
O-rings, oil seals and gaskets

- ◆ Always renew O-rings, oil seals and gaskets.
- ◆ After removing gaskets and oil seals, always inspect the contact surface on the housing or shaft for burrs resulting from removal or for other signs of damage.
- ◆ 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 77](#) .



Locking elements

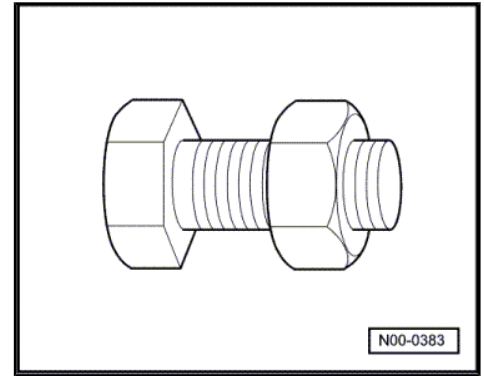
- ◆ Do not over-stretch circlips.
- ◆ Installation position for some circlips: the circlip is fitted so that the narrow part of the gap is at the top. This also gives the pliers a better grip when removing and installing.
- ◆ Always renew circlips which have been damaged or over-stretched.
- ◆ Circlips 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-.



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Nuts, bolts

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



Bearings

- ◆ Lubricate all bearings in gearbox housing with gear oil before 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.
- ◆ Install needle bearings, ball sleeves and roller bearings so the lettering (side with thicker metal) faces towards the installing tool.
- ◆ Mark the needle bearings of the selector gears when removing. This ensures the same installation position when re-installing.
- ◆ Grease needle bearing for gearbox input shaft in rear of fly-wheel.

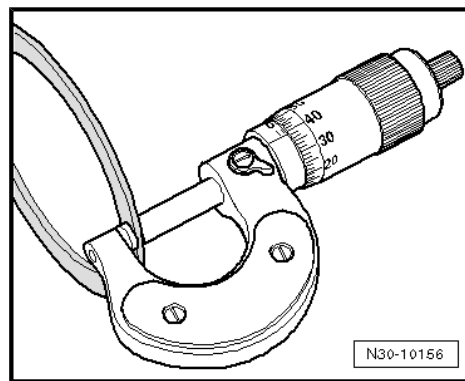
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Shims

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

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

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



Selector gears

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

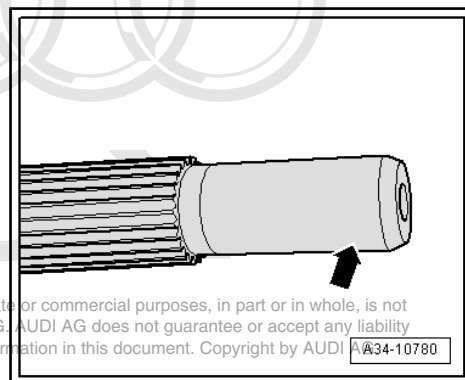
Input shaft

- ◆ 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 .

Synchro-rings

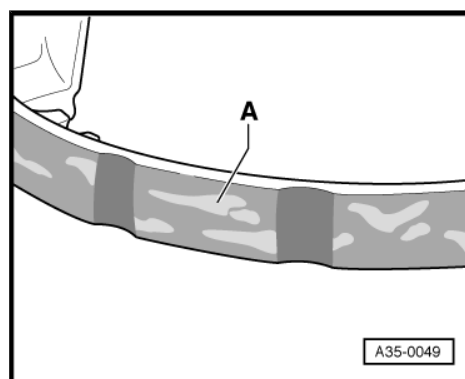
- ◆ Do not interchange. When reusing synchro-rings, always fit to the same selector gear.
- ◆ Check for wear; renew if necessary.
- ◆ Lubricate with gear oil when installing.

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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.

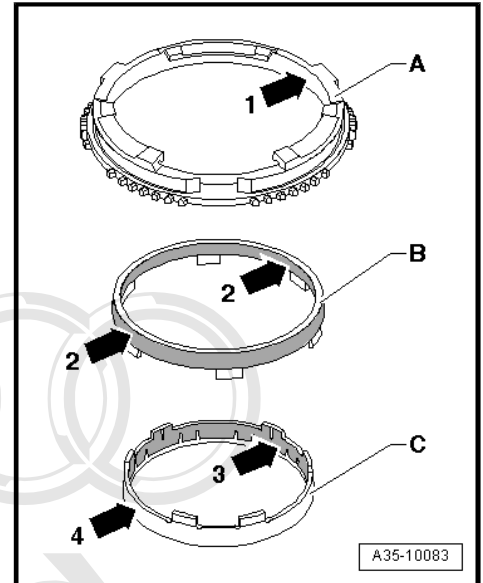


Checking synchro-rings for 1st and 2nd gear

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).

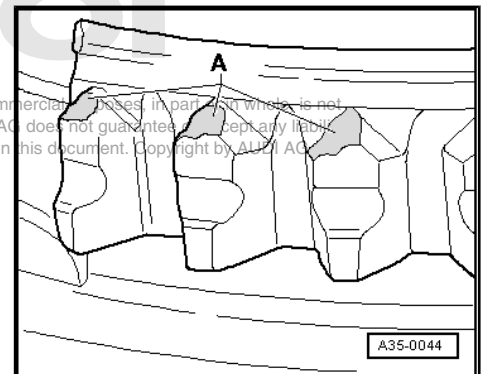


Abnormal wear on selector gears and locking collars

◆ Abnormal wear on synchro-ring or selector gear:

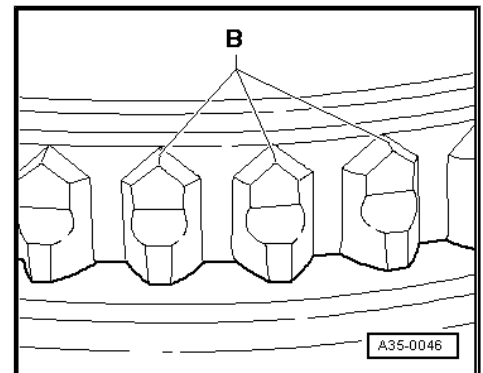
A - Worn chamfer on dog teeth of synchro-ring or selector gear

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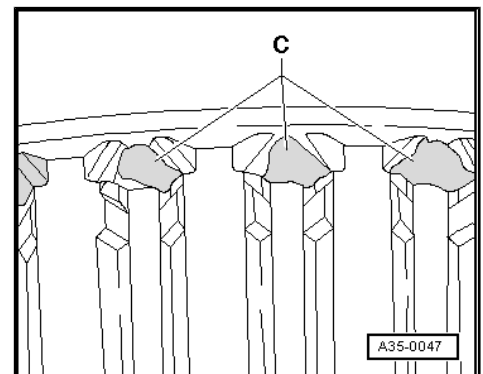
◆ In comparison: intact synchro-ring or selector gear:

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



◆ Abnormal wear on locking collar:

C - Worn chamfer on internal splines of locking collar



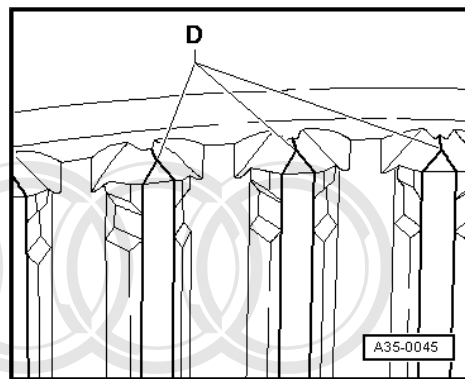
- ◆ In comparison: intact locking collar:

D - Intact chamfer on internal splines of locking collar

- ◆ Always renew synchro-rings with carbon coating together with locking collar. Renew selector gears also if there are traces of wear.

Clutch mechanism, clutch

- ◆ 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 ⇒ [page 23](#)).
- ◆ 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 44](#) .
- ◆ On vehicles with SAC pressure plate an adjuster ring has to be reset when only the clutch plate is renewed ⇒ [page 46](#) .
- ◆ 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.



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30 – Clutch

1 Servicing clutch mechanism

⇒ [“1.1 Exploded view - pedal cluster \(LHD vehicles\)”, page 15](#)

⇒ [“1.2 Removing and installing over-centre spring”, page 17](#)

⇒ [“1.3 Clutch pedal switch for engine start F194 ”, page 17](#)

⇒ [“1.4 Removing and installing clutch position sender G476 ”, page 19](#)

⇒ [“1.5 Exploded view - pedal cluster \(RHD vehicles\)”, page 20](#)

⇒ [“1.6 Exploded view - hydraulic system”, page 22](#)

⇒ [“1.7 Notes on removing and installing clutch master cylinder and slave cylinder”, page 23](#)

⇒ [“1.8 Function check for clutch master cylinder and slave cylinder”, page 23](#)

⇒ [“1.9 Removing and installing clutch master cylinder”, page 25](#)

⇒ [“1.10 Bleeding clutch system”, page 26](#)

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.*
- ◆ *When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.*
- ◆ *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.*

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1 - Mounting bracket

- ❑ Removing and installing
⇒ [page 25](#)

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 - Mounting bracket

8 - Over-centre spring

- ❑ Black side points towards clutch pedal
- ❑ Removing and installing
⇒ [page 17](#)
- ❑ 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 25](#)

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 18](#)
- ❑ Depress clutch pedal by hand all the way when removing or installing switch.
- ❑ Removing and installing ⇒ [page 17](#)
- ❑ Engine can only be started when clutch is fully depressed (clutch pedal switch for engine start activated).

14 - Clutch pedal

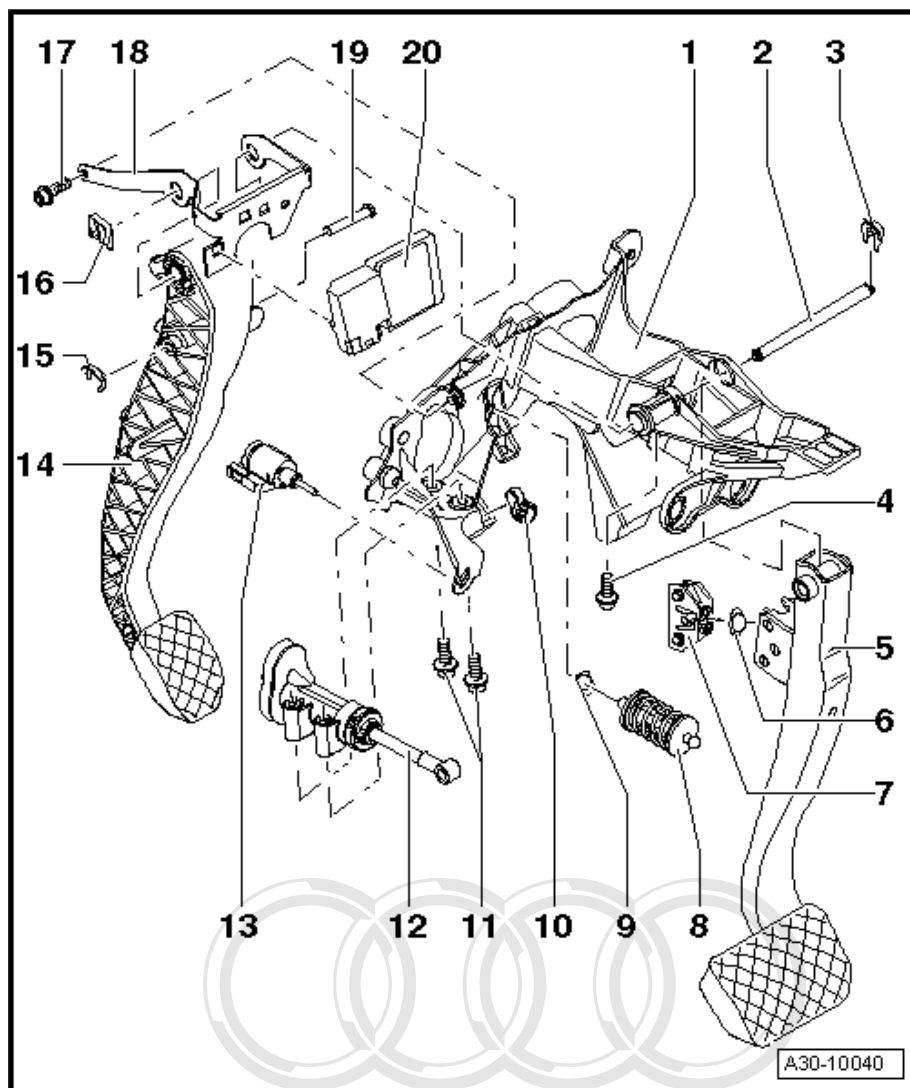
- ❑ Removing and installing ⇒ [page 25](#)

15 - Retaining clip

16 - Retaining clip

17 - Bolt

- ❑ 10 Nm



18 - Bracket

19 - Pivot pin

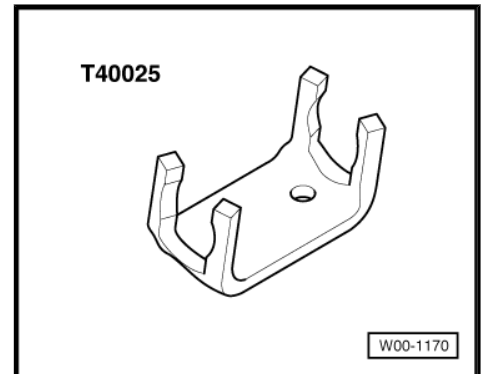
20 - Clutch position sender - G476-

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

1.2 Removing and installing over-centre spring

Special tools and workshop equipment required

- ◆ Assembly clip - T40025-



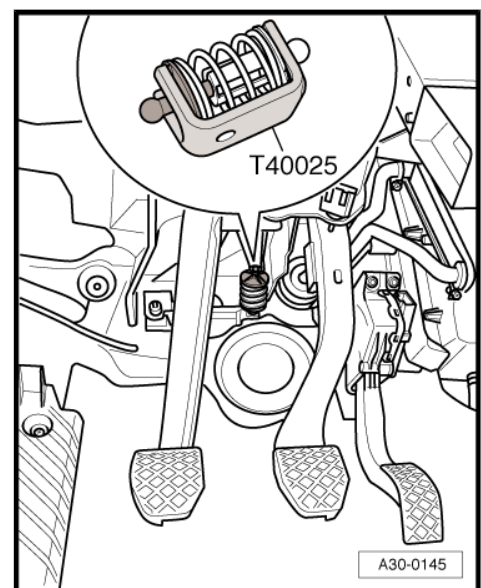
Removing

- Remove storage compartment on driver's side ⇒ 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 ⇒ Rep. gr. 68 .



1.3 Clutch pedal switch for engine start - F194-



Note

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

Removing

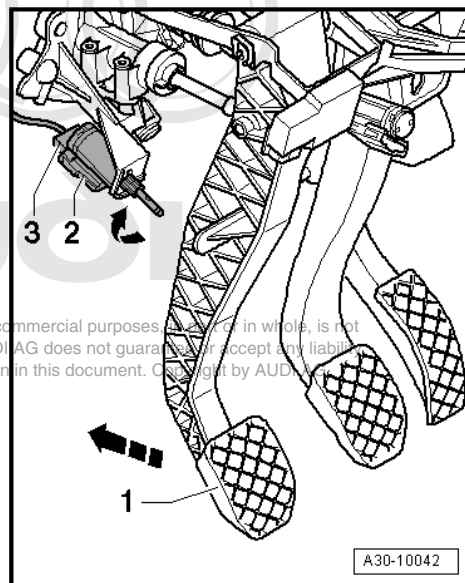
- Remove storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .

- Detach electrical connector -3- on clutch pedal switch for engine start - F194- .
- Press clutch pedal -1- all the way down by hand and hold 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 18

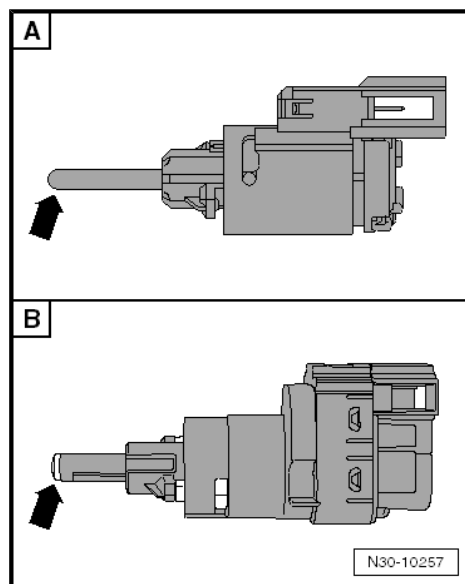
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1.3.1 Installing clutch pedal switch for engine start - F194-

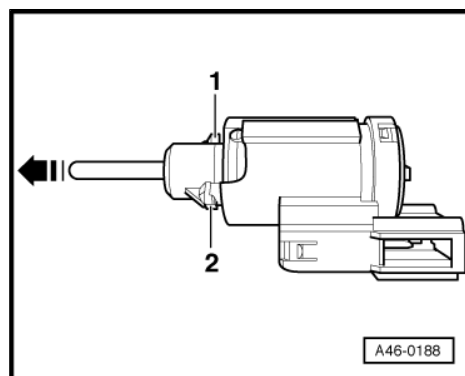
Different versions of clutch pedal switch for engine start - F194-

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.



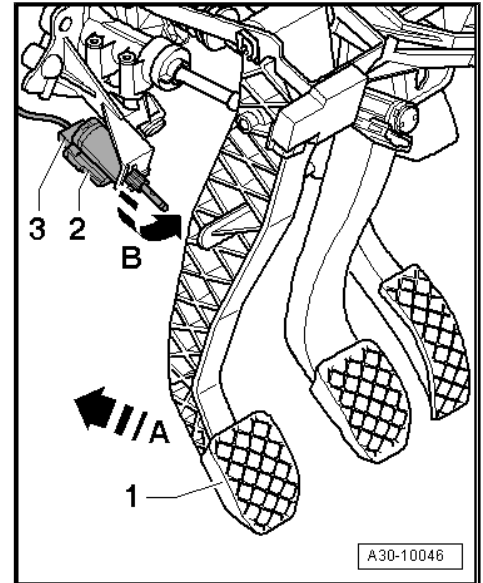
Clutch pedal switch for engine start with part number -1J0 927 189 F-

- 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

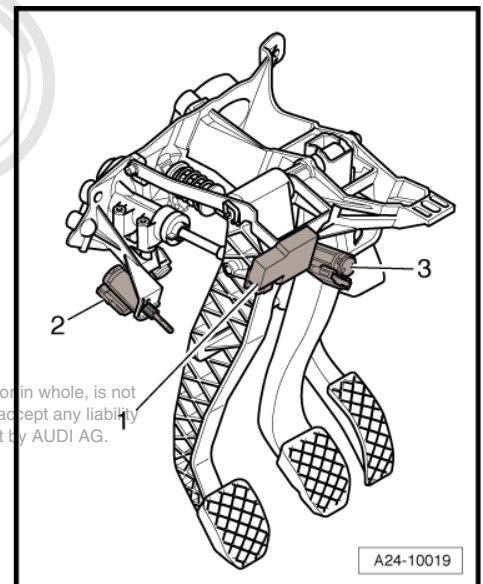
The clutch position sender - G476- can be checked in "Guided Fault Finding" using ⇒ Vehicle diagnostic tester.

Removing

- Remove storage compartment on driver's side ⇒ General body repairs, interior; Rep. gr. 68 .
- Unplug connector at clutch position sender - G476- -1-.

Note

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



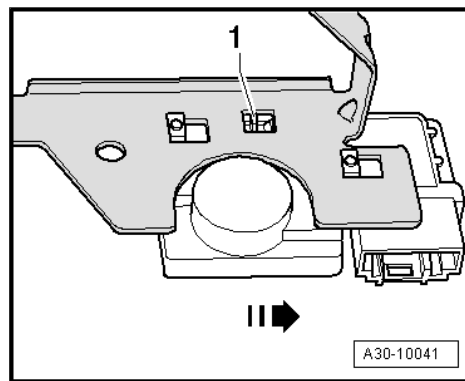
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- Press retainer tab -1- inwards and push clutch position sender - G476- in direction of -arrow- onto limit stop.

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

- ◆ *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.*
- ◆ *When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.*
- ◆ *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.*

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
for engine start - F194-
⇒ [Item 8 \(page 21\)](#)

7 - Bolt

- ☐ 10 Nm

8 - 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 18](#)
- ☐ Depress clutch pedal by hand all the way when removing or installing switch.
- ☐ Removing and installing
⇒ [page 17](#)
- ☐ 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

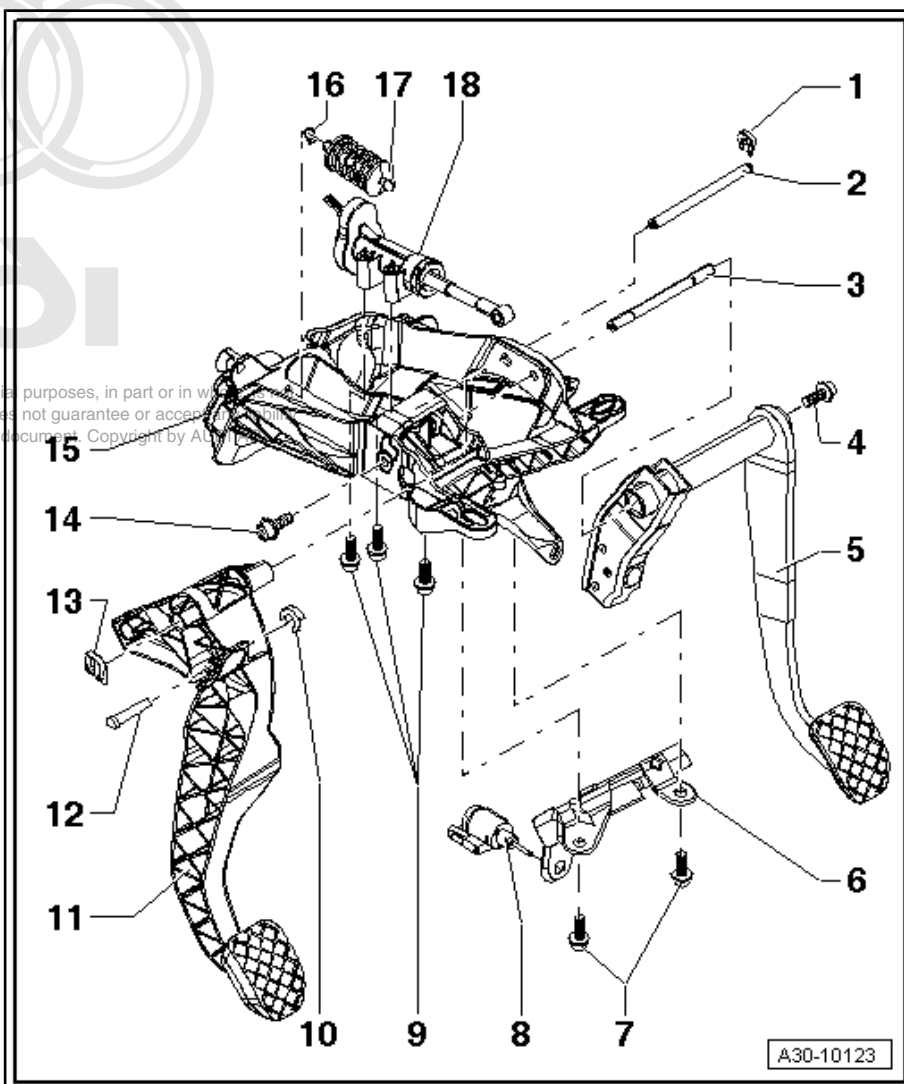
16 - Bearing

- ☐ 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



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 26
- ❑ 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 slave cylinder
- ❑ Removing and installing
⇒ **page 23**

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 25](#)
- ❑ Removing and installing
pipe/hose assembly
⇒ [page 23](#)

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

11 - Pivot pin

12 - Retaining clip

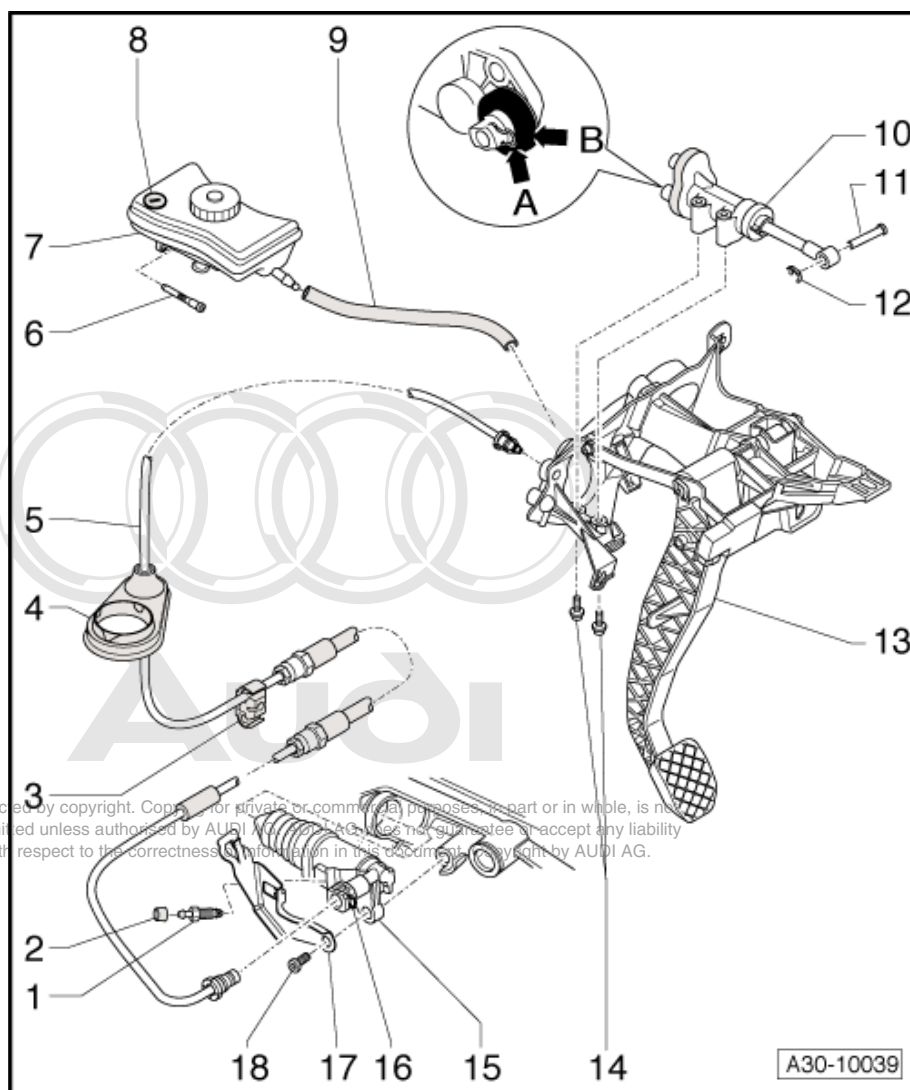
13 - Clutch pedal with mounting bracket

14 - Bolt

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

15 - Clutch slave cylinder

- ❏ Removing and installing ⇒ [page 33](#)



- ☐ Removing and installing pipe/hose assembly ➔ [page 23](#)
- ☐ Do not operate clutch pedal after slave cylinder has been removed
- ☐ After working on hydraulic clutch mechanism, bleed clutch system ➔ [page 26](#)

16 - Clip

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

17 - Bracket

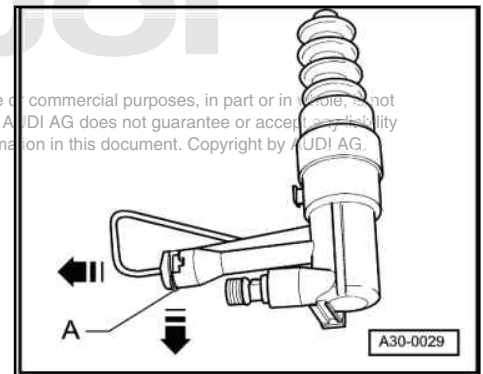
- ☐ For pipe/hose assembly
- ☐ Attached to gearbox together with slave cylinder

18 - Hexagon socket head bolt

- ☐ 25 Nm
- ☐ Self-locking
- ☐ Renew

Removing and installing pipe/hose assembly on clutch master cylinder and 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 slave cylinder.
- To install, press in retaining clip onto clutch master cylinder or slave cylinder as far as stop.
- Push pipe/hose assembly onto connection on clutch master cylinder or 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

- ◆ If you suspect that the clutch master cylinder or slave cylinder is defective, first carry out a function check
➔ ["1.8 Function check for clutch master cylinder and slave cylinder", page 23](#) before renewing any components.
- ◆ 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

If the following faults exist, you must first carry out the appropriate checks before renewing the clutch master cylinder or slave cylinder.

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 connecting points for external leaks (visual inspection).
- ◆ **If you identify any leaks you must renew the leaking component.**
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- ◆ **Bleed clutch system** ⇒ [page 26](#) .

High pedal force:

- ◆ Clutch plate is worn (except for SAC)
- ◆ Mechanically defective pressure plate/ clutch plate
⇒ [page 38](#)

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:

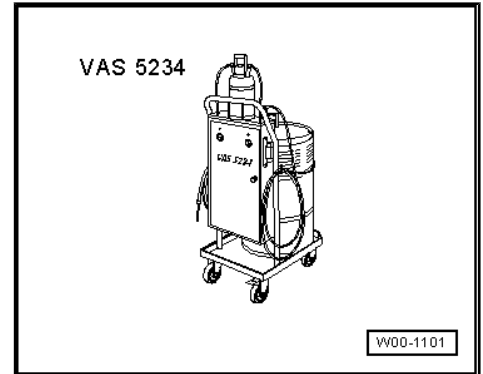
- ◆ Air in hydraulic system: bleed clutch system ⇒ [page 26](#) and check hydraulic system for external and internal leaks.
- ◆ Clutch plate does not move smoothly on input shaft splines (due to corrosion or dirt, etc.)
- ◆ Needle bearing in flywheel (centring bearing for input shaft) defective, renew needle bearing ⇒ Rep. gr. 13 .
- ◆ Foreign body in clutch system
- ◆ Mechanically defective pressure plate/ clutch plate
⇒ [page 38](#)

- ◆ 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-



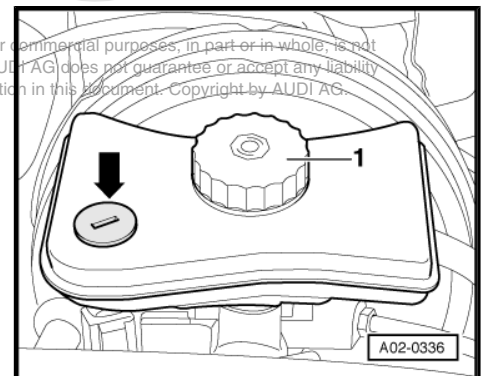
Removing



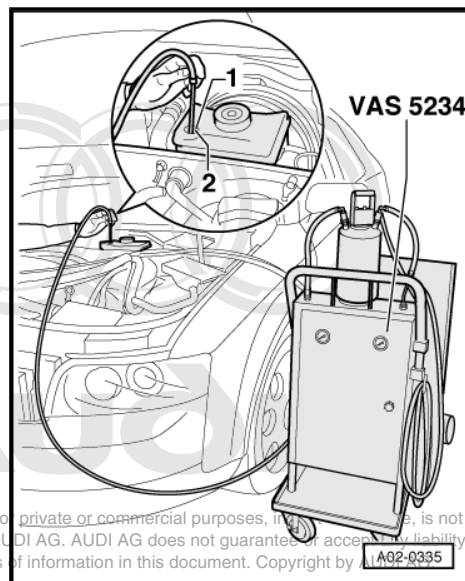
Note

- ◆ *If you suspect a defective clutch master cylinder, perform function test prior to renewing ⇒ [page 23](#).*
- ◆ *When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.*
- Remove windscreen wiper motor ⇒ Rep. gr. 92.
- Unscrew screw plug -arrow- in brake fluid reservoir.

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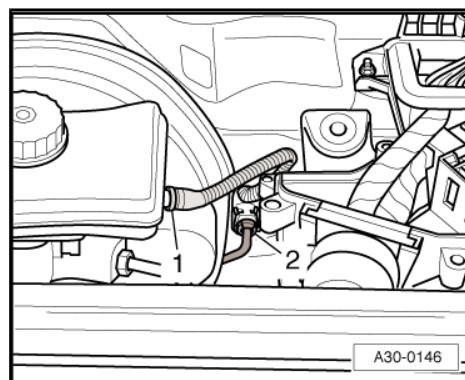


- Connect intake hose of brake filling and bleeding equipment - VAS 5234- to tube -1- of brake fluid reservoir and extract brake fluid.
- Repeat procedure at tube -2- of brake fluid reservoir.
- Fit screw plug back in brake fluid reservoir.



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- 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 ⇒ Rep. gr. 68 .
- Remove over-centre spring ⇒ [page 17](#) .

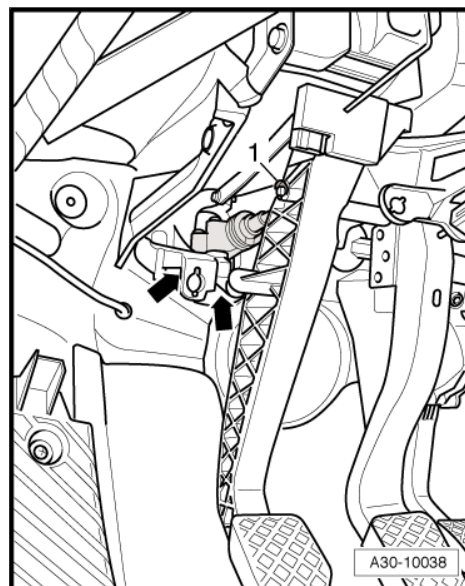


- Detach retaining clip -1- from pin.
- Press pin out of clutch pedal
- Unscrew bolts -arrows- and remove clutch master cylinder.

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 17](#) .
- Install storage compartment on driver's side ⇒ Rep. gr. 68 .
- Install windscreen wiper motor and wiper arms ⇒ Rep. gr. 92 .
- Bleed clutch system ⇒ [page 26](#) .



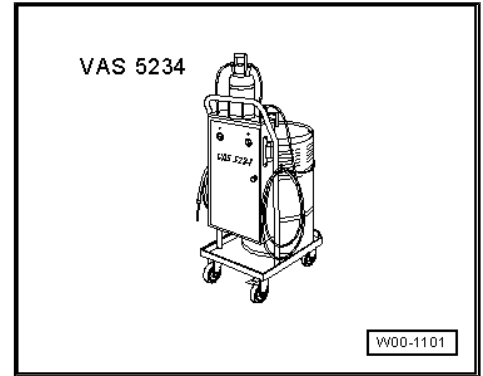
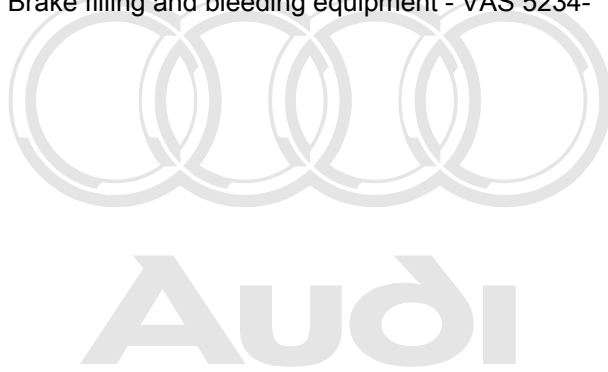
Tightening torque

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-



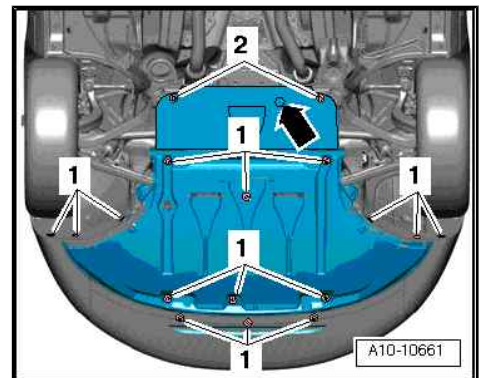
Brake fluid specification → Rep. gr. 47.
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 Note

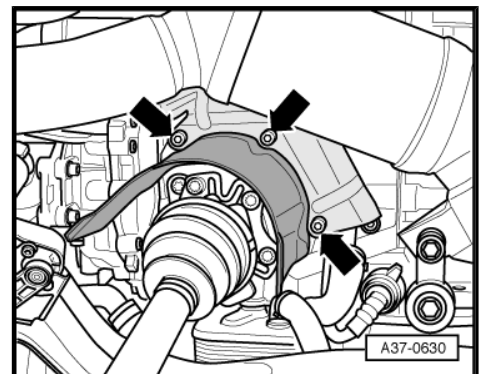
- ◆ *The clutch system must be bled after performing work on the hydraulic clutch mechanism.*
- ◆ *Before bleeding the clutch system, pull back the clutch pedal to the normal position and top up brake fluid to "Max" marking on brake fluid reservoir.*
- ◆ *Do not allow brake fluid to come into contact with the gearbox. If necessary, clean the gearbox housing.*
- ◆ *The clutch system should be bled at the same intervals as the brake system → Maintenance ; Booklet 8E .*
- ◆ *Open the bleeder screw before switching on the bleeding appliance.*
- Connect brake filling and bleeding equipment - VAS 5234- to brake fluid reservoir, but do not switch on at this stage.
- 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).

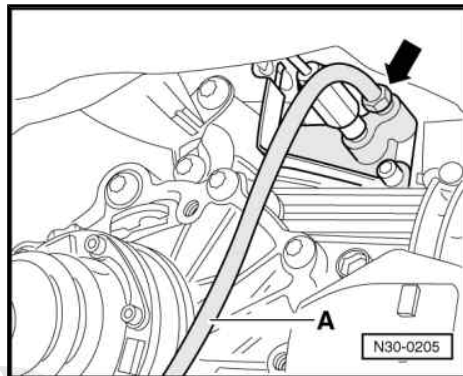


- Connect bleeder hose -A- to slave cylinder -arrow- and open bleeder screw.
- Connect bleeder hose to pressure hose of fluid collector bottle.
- Switch on bleeding appliance and allow about 100 cm³ of brake fluid to drain out.
- Operating pressure: 2.5 bar



Note

Ensure bleeder hose is correctly fitted during bleeding operation.



- Close bleeder screw. Tightening torque: 4.5 Nm
- Depress clutch pedal several times after bleeding process is completed.
- Bleed system once again if necessary.
- Disconnect bleeder hose and fit protective cap.
- Remove brake filling and bleeding equipment - VAS 5234- from brake fluid reservoir.

Assembly is performed in reverse sequence.

Tightening torque

Component	Nm
Heat shield for drive shaft to gearbox	23

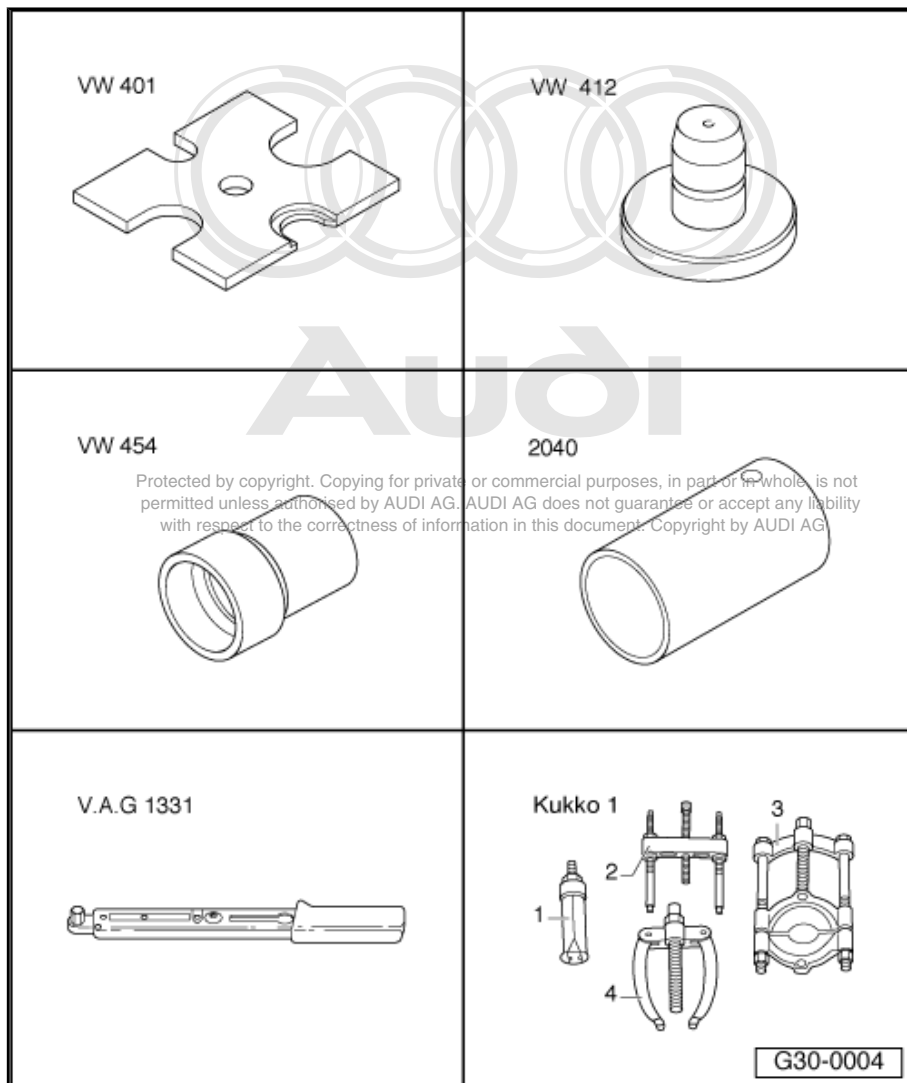
2 Servicing clutch release mechanism

- ◆ ⇒ [“2.1 Exploded view - clutch release mechanism”, page 29](#)
- ◆ ⇒ [“2.2 Checking release bearing”, page 32](#)
- ◆ ⇒ [“2.3 Removing and installing clutch slave cylinder”, page 33](#)

2.1 Exploded view - 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-



1 - Release bearing

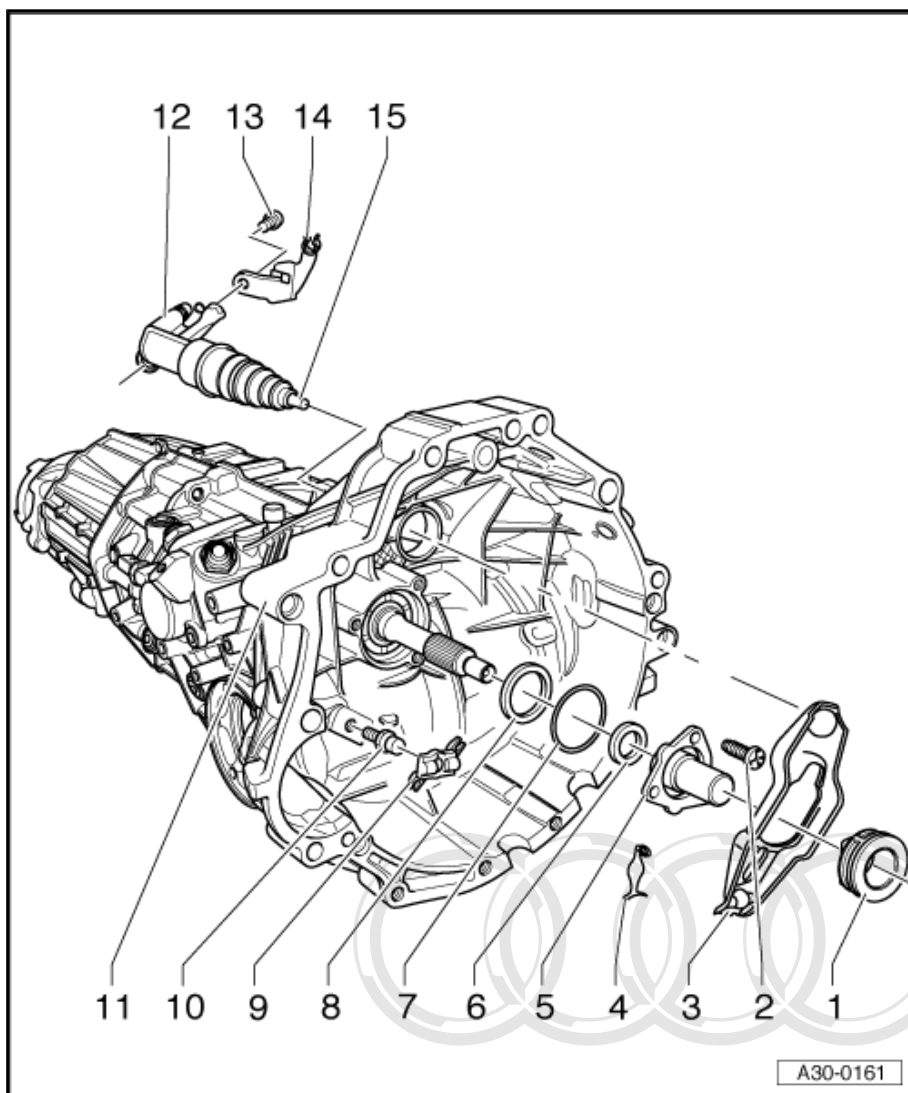
- ☐ Different versions
- ☐ Do not wash out; wipe clean only
- ☐ Renew bearing if noisy
- ☐ Surface on which release bearing moves on guide sleeve must be free of grease
- ☐ Grease bearing surface for clutch release lever thoroughly with lubricating paste - G 000 150- ⇒ [page 32](#) .
- ☐ Checking release bearing ⇒ [page 32](#)
- ☐ 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 32](#)
- Renew if groove worn on plastic ring is too deep ⇒ [page 32](#)

Release bearing with glued plastic ring

- Servicing release bearing with glued plastic ring ⇒ [page 32](#)
- Renew if groove worn on plastic ring is too deep (deeper than 0.8 mm)



2 - Bolt

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

3 - Clutch release lever

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

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 \(page 30\)](#) ⇒ [page 31](#) .
- ☐ Press into guide sleeve ⇒ [Item 5 \(page 30\)](#) ⇒ [page 32](#) .
- ☐ Pack space between sealing lip and dust lip half full with sealing grease - G 052 128 A1-

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7 - O-ring

- ☐ Renew

8 - Dished spring

- ☐ Inner diameter (convex side) faces guide sleeve ⇒ [Item 5 \(page 30\)](#)

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 33](#)
- ☐ Do not operate clutch pedal after slave cylinder has been removed
- ☐ Grease lightly before installing ⇒ [page 35](#)
- ☐ Follow correct procedure when bleeding ⇒ [page 26](#)
- ☐ 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

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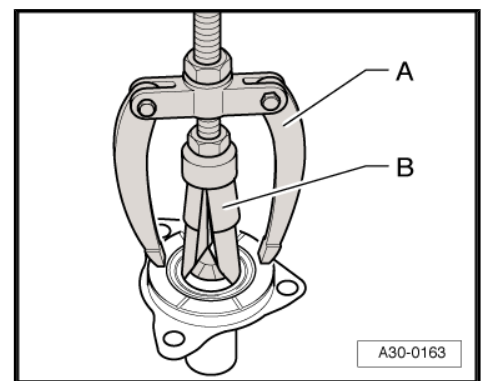
15 - Plunger

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

Pulling oil seal out of guide sleeve

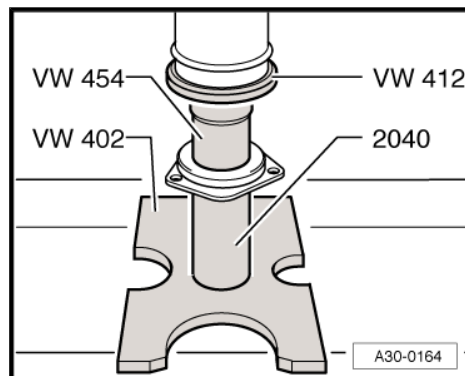
A - Counter-support , e.g. -Kukko 22/1-

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



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- .



2.2 Checking release bearing

Checking and servicing release bearing with glued plastic ring

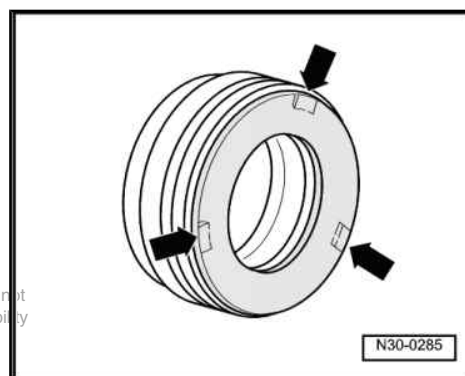
Identification: inner side of plastic ring has three lugs -arrows-.

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 KD101- .

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

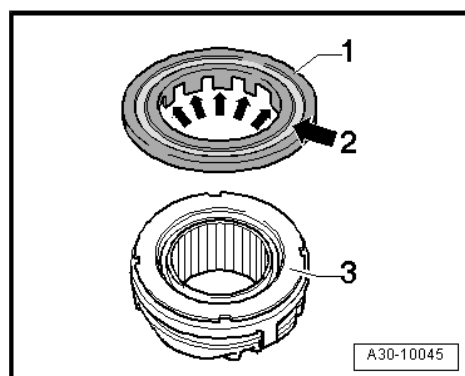
- ♦ The release bearing must be renewed if the groove worn on the plastic ring is deeper than 0.8 mm.



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.



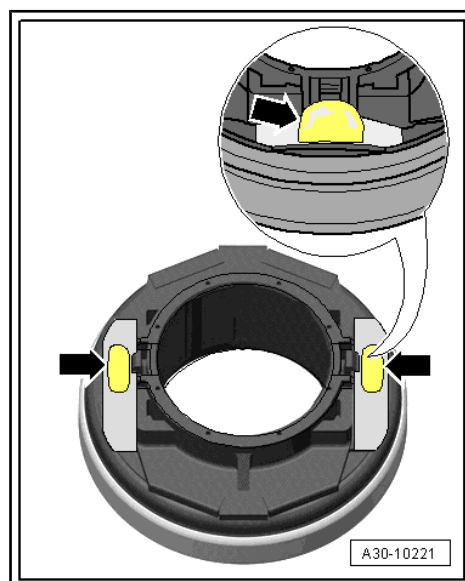
Greasing release bearing



Caution

Grating/creaking noises can occur when clutch is operated.

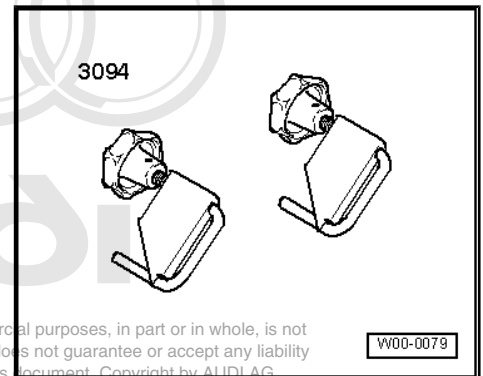
- *Lack of grease at the bearings -arrows- on the release bearing assembly can cause creaking/grating noises when the clutch is operated.*
- *Grease bearings -arrows- on release bearing assembly thoroughly with lubricating paste - G 000 150- . A thin coating of grease is not sufficient.*
- *Remove grease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



2.3 Removing and installing clutch slave cylinder

Special tools and workshop equipment required

- ◆ Hose clamps, up to Ø 25 mm - 3094-



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

Removing

Observe notes [⇒ page 9](#).



Note

Do not allow brake fluid to come into contact with the gearbox. If necessary, clean the gearbox housing.

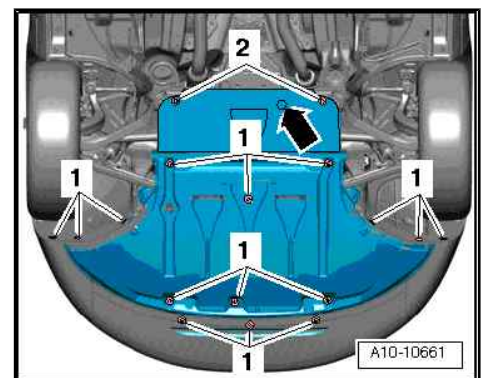


Caution

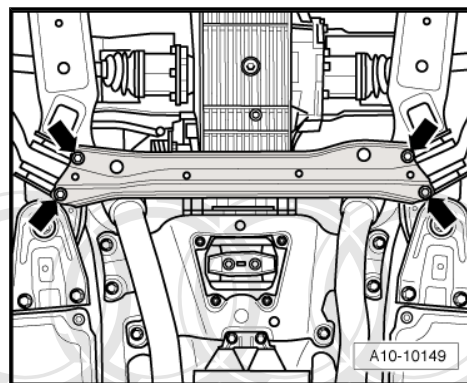
Make sure you do not press the clutch pedal if the clutch slave cylinder is removed from the gearbox with the pipe/hose assembly still attached. Otherwise, the piston will be pressed out of the slave cylinder and be destroyed.

Removing

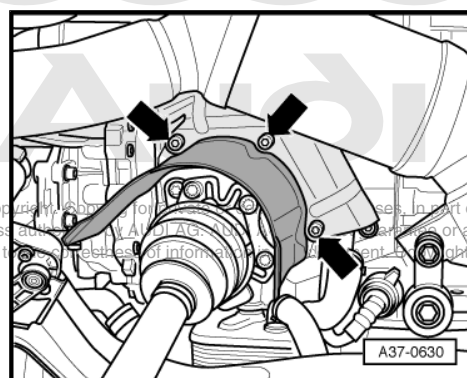
- Release fasteners marked -1-, -2- and -arrow- (if fitted) and remove noise insulation panels.



- Unscrew cross member from subframe -arrows-.



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

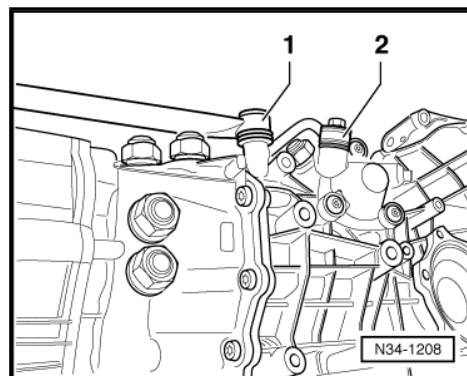


- Unscrew connecting rod -2- for selector rod.

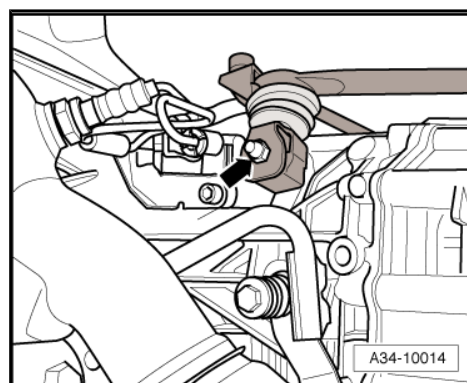


Note

-Item 1- can be disregarded.



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

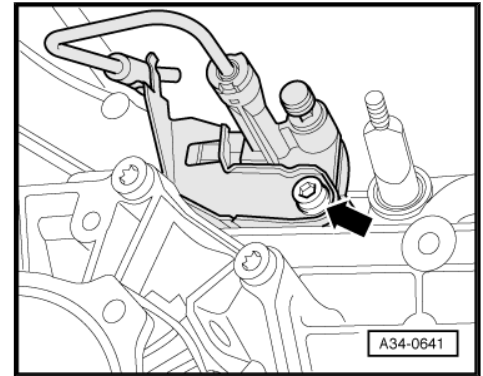


- Remove bolt -arrow- and take out clutch slave cylinder from the rear.



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.

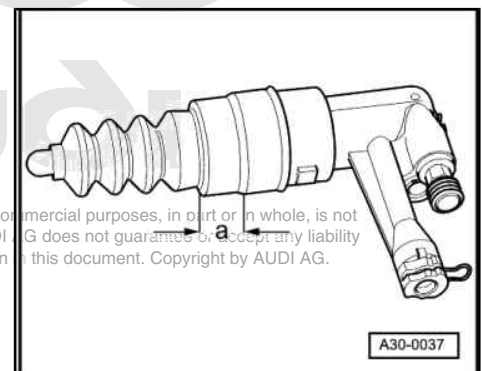
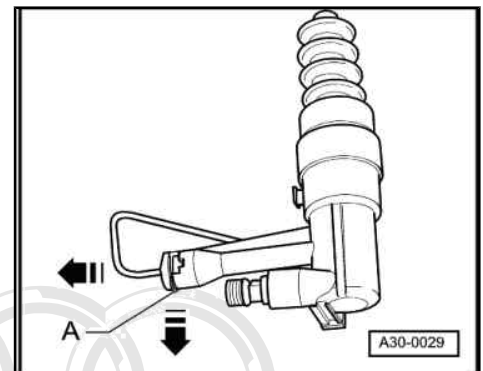
Installing

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

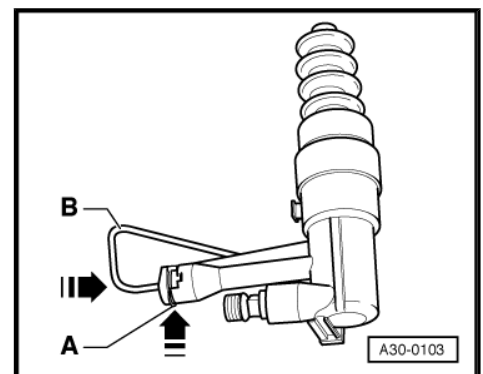


Note

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

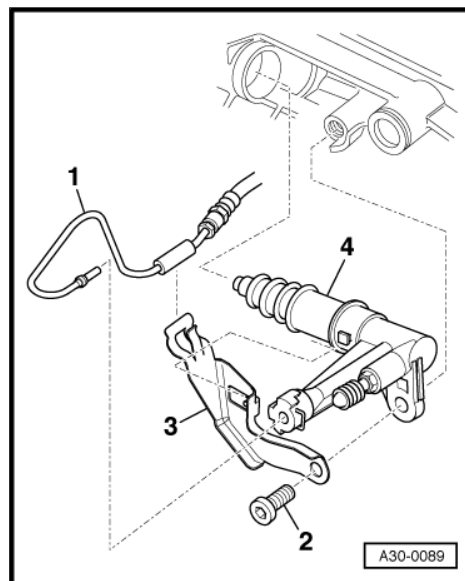


- Using copper grease (commercially available), lightly lubricate surface where plunger and clutch release lever make contact.
- Press retaining clip -A- in clutch slave cylinder onto limit stop.
- Push pipe/hose assembly -B- onto connection on clutch slave cylinder so that retaining clip snaps into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



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



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- 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 clutch slave cylinder is inserted at an angle, there is a danger that the operating rod will be guided past the clutch release lever.

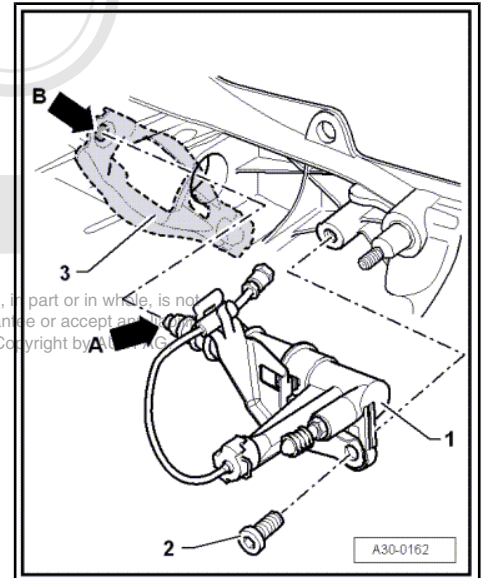
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- Secure slave cylinder with new bolt -2-.



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 26](#).

Tightening torques

Component	Nm
Clutch slave cylinder to gearbox	23 ¹⁾
Gearbox selector lever to selector shaft	20
Connecting rod to gearbox	20
Heat shield for drive shaft to gearbox	23
• ¹⁾ Renew bolt	

3 Servicing clutch

- ◆ ⇒ [“3.1 Servicing conventional clutch”, page 38](#)
- ◆ ⇒ [“3.2 Removing and installing conventional clutch”, page 41](#)
- ◆ ⇒ [“3.3 Servicing clutch with SAC pressure plate \(LuK version\)”, page 42](#)
- ◆ ⇒ [“3.4 Removing and installing clutch with SAC pressure plate”, page 44](#)
- ◆ ⇒ [“3.5 Resetting adjuster ring in SAC clutch pressure plate”, page 46](#)



Note

- ◆ Refer to general repair instructions ⇒ [page 9](#).
- ◆ Observe the notes on removing and installing the clutch master cylinder and slave cylinder ⇒ [page 23](#).
- ◆ “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 46](#).
- ◆ To avoid damaging SAC pressure plate when removing and installing, observe assembly instructions for SAC pressure plate ⇒ [page 44](#).
- ◆ Check that SAC pressure plate is not distorted ⇒ [page 44](#).
- ◆ Renew clutch plate and pressure plate if riveted fastening is **damaged or loose**.
- Permitted only for private use. Any use for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability
- ◆ ~~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 44](#).
- ◆ 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.
- ◆ Clutch pressure plates have an anti-corrosion coating and are greased. With the exception of the friction surface for the clutch plate, the pressure plate must not 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.

Servicing conventional clutch ⇒ [page 38](#)

Servicing clutch with SAC pressure plate (LuK version)
⇒ [page 42](#)

3.1 Servicing conventional clutch

1 - Flywheel/dual mass flywheel

- ☐ Ensure that dowel pins fit tightly
- ☐ Contact surface for clutch lining must be free of grooves, oil and grease
- ☐ Removing and installing ⇒ Rep. gr. 13
- ☐ Do not use a pneumatic wrench or impact wrench to remove dual-mass flywheel
⇒ [page 41](#)

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

- ☐ 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 38](#)
- ☐ Clutch plate diameter ⇒ ["1.1 Code letters, allocation, transmission ratios, capacities", page 1](#)

4 - Pressure plate

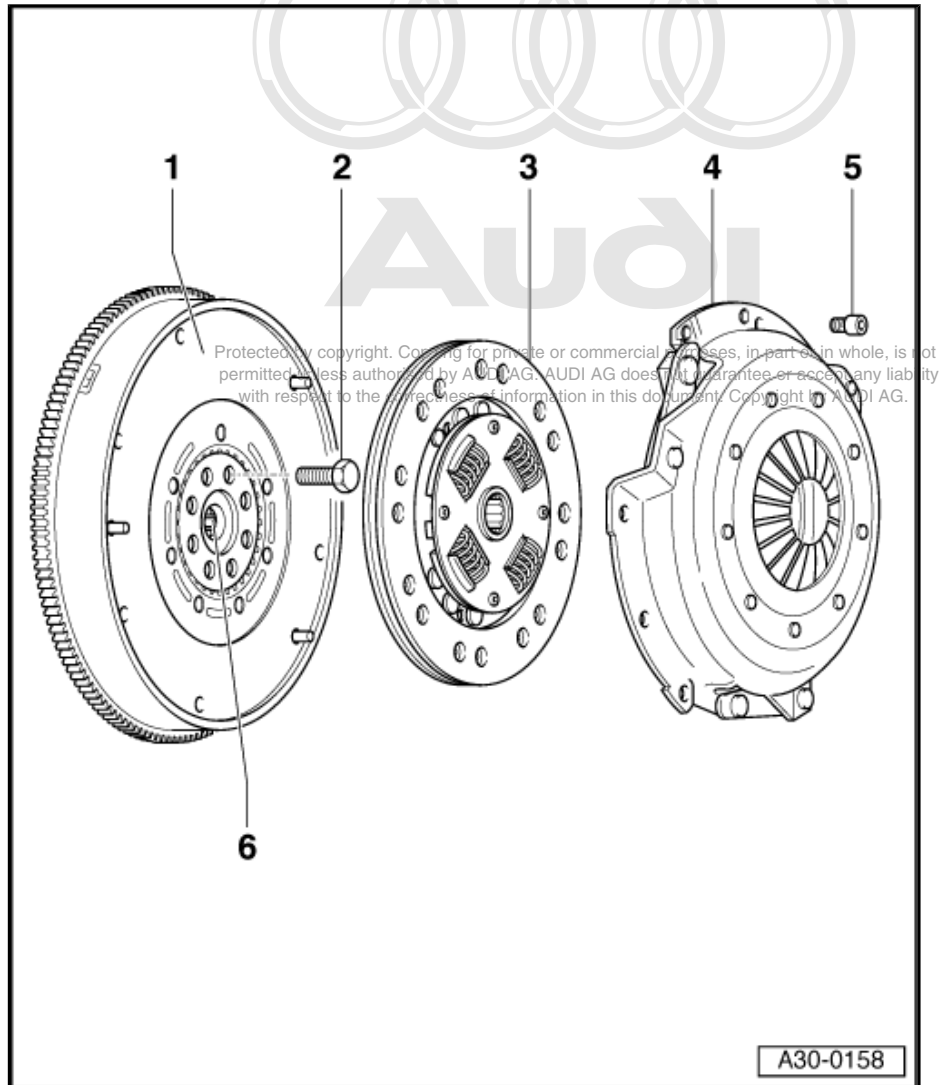
- ☐ Removing and installing ⇒ [page 41](#)
- ☐ Checking ends of diaphragm spring ⇒ [page 40](#)
- ☐ Checking springs and riveting ⇒ [page 40](#)
- ☐ Checking wire ring ⇒ [page 40](#)
- ☐ Contact surface for clutch lining must be free of grooves, oil and grease

5 - Bolt, 22 Nm

- ☐ Loosen and tighten gradually in several stages and in diagonal sequence

6 - Needle bearing

- ☐ Removing and installing ⇒ Rep. gr. 13



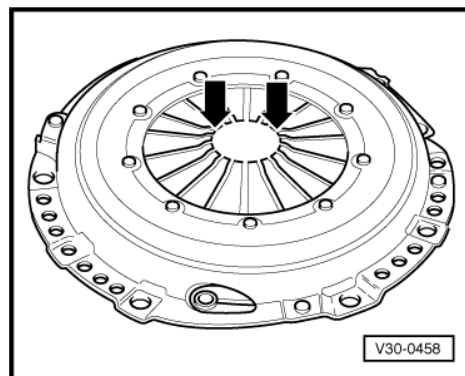
Checking ends of diaphragm spring

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



Note

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



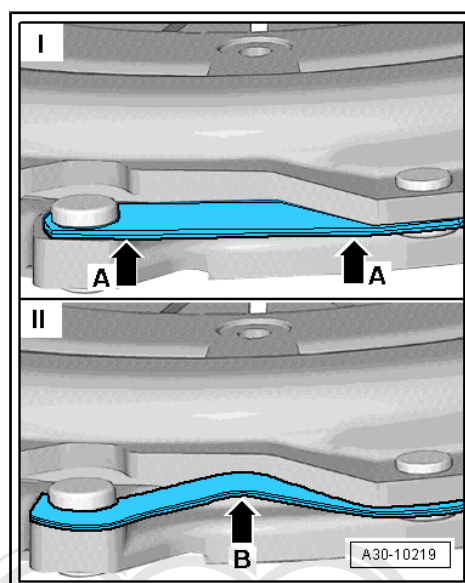
Checking springs and riveting

I - Springs OK

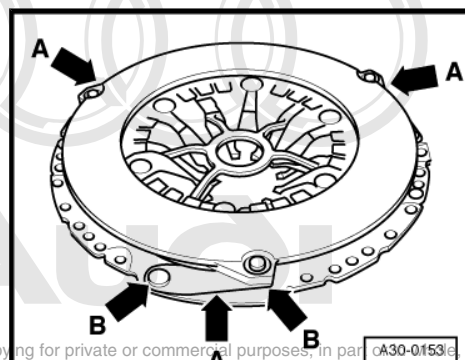
- Slight kinking on the outside -arrows A- is normal on production parts.

II - Springs damaged

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



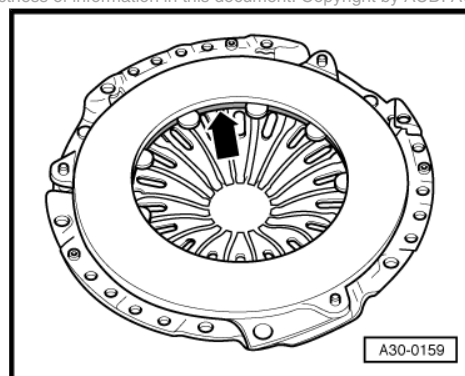
- Check that rivets -arrows B- are secure at all springs -arrows A-.
- Renew pressure plate if rivets -arrows B- are loose.



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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.



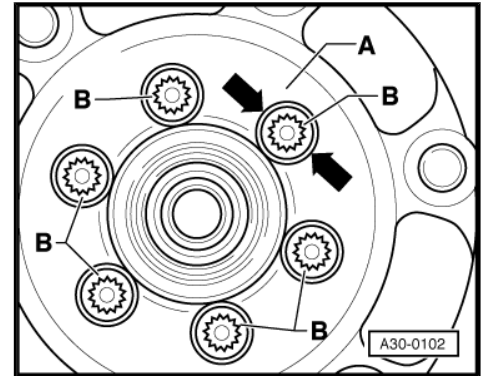
Removing dual-mass flywheel



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.

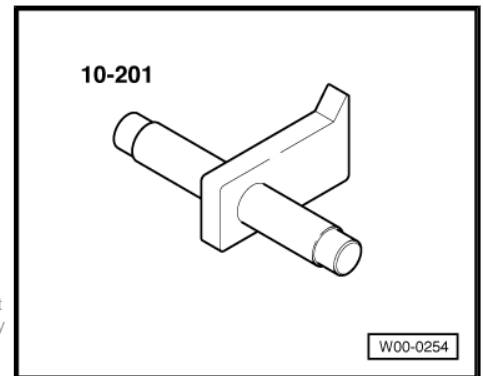
- Rotate dual-mass flywheel -A- so that the bolts are aligned centrally behind the holes -arrows-.
- When removing the bolts, make sure that none of the bolt heads contacts the dual-mass flywheel, as this would damage the flywheel when the bolts are unscrewed further.
- Removing and installing dual-mass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



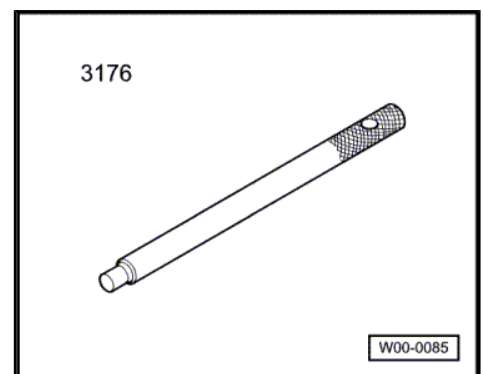
3.2 Removing and installing conventional clutch

Special tools and workshop equipment required

- ◆ Counterhold tool - 10-201- or -3067-



- ◆ 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.

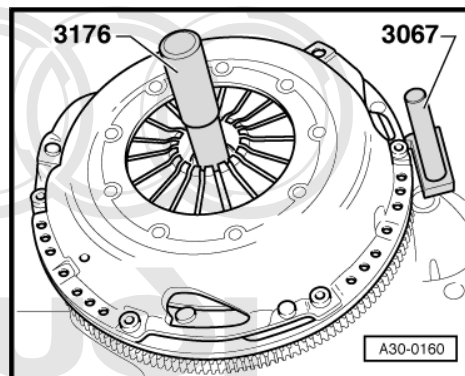
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Installing

- Apply counterhold tool - 10-201- or -3067- 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 fly-wheel.
- Tighten all bolts to final torque (22 Nm) consecutively in clockwise direction.



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3.3 Servicing clutch with SAC pressure plate (LuK version)

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 44](#)
- ☐ Removing and installing ⇒ Rep. gr. 13

2 - Needle bearing

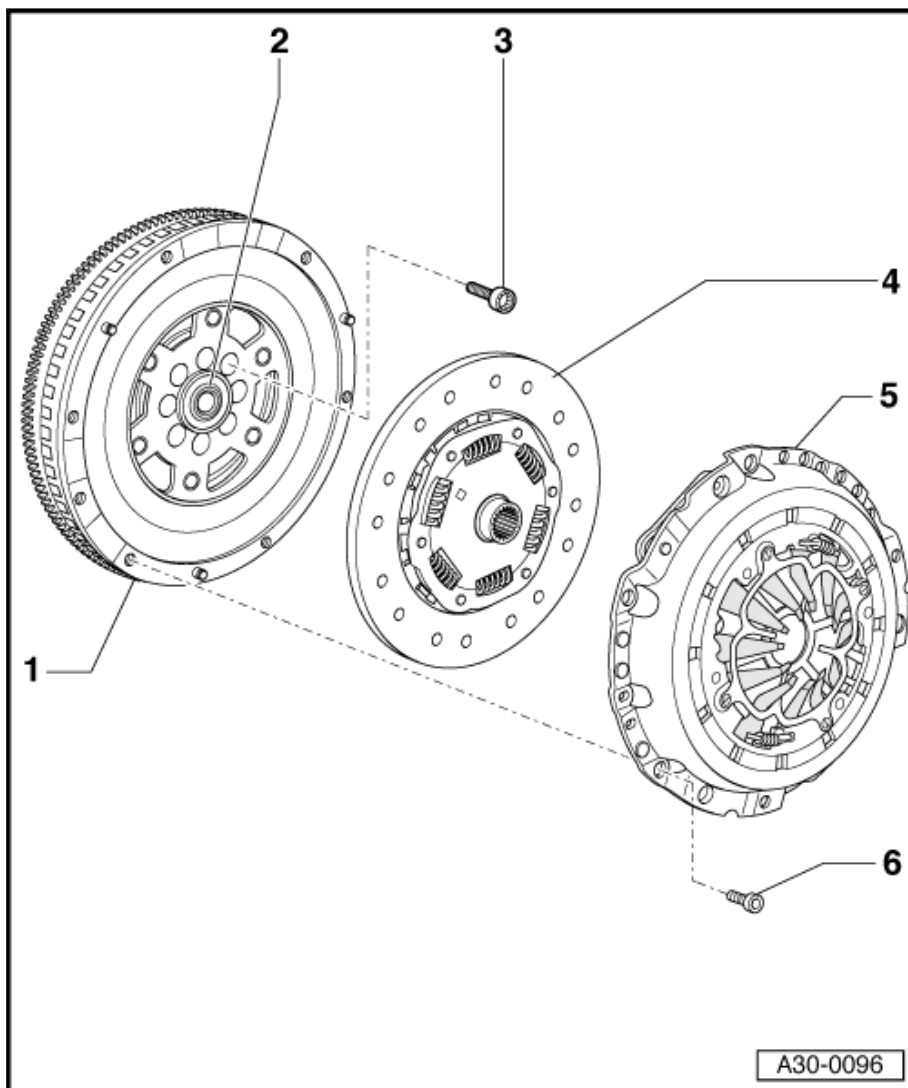
- ☐ Removing and installing ⇒ Rep. gr. 13

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 44](#)

4 - Clutch plate

- ☐ The marking "Getriebeseite" (gearbox side), if provided, faces towards pressure plate/gearbox
- ☐ Coil springs (damper assembly) point to-



wards pressure plate
and gearbox

- ☐ Centralising ⇒ [page 45](#)
- ☐ Lightly grease splines ⇒ [page 38](#)
- ☐ Clutch plate diameter ⇒ [“1.1 Code letters, allocation, transmission ratios, capacities”, page 1](#)

5 - SAC pressure plate

- ☐ Observe assembly instructions ⇒ [page 44](#) when removing and installing
- ☐ Resetting adjuster ring ⇒ [page 46](#)
- ☐ Checking ends of diaphragm spring ⇒ [page 43](#)
- ☐ Checking pressure plate for distortion ⇒ [page 44](#)
- ☐ Checking springs and riveting ⇒ [page 43](#)
- ☐ Contact surface for clutch lining must be free of grooves, oil and grease

6 - Bolt, 22 Nm

- ☐ Observe instructions for installation ⇒ [page 44](#)

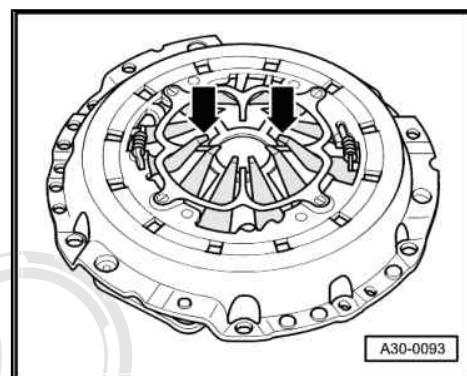
Checking ends of diaphragm spring

- 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

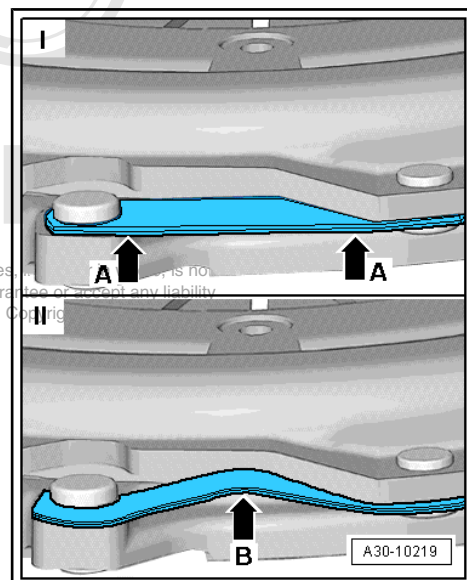
I - Springs OK

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

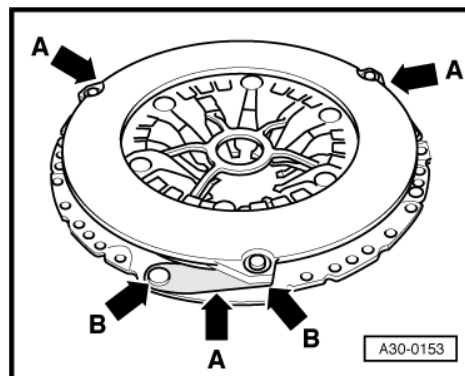
II - Springs damaged

- 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.

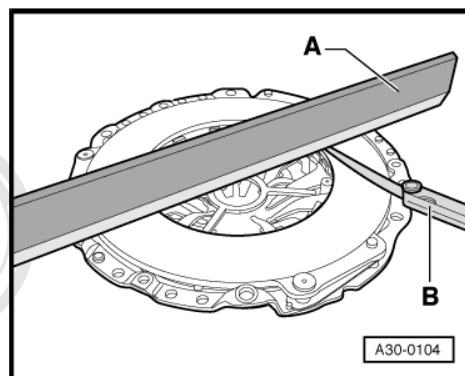


Checking SAC pressure plate for distortion, cracks and burning

A - Straightedge

B - Feeler gauge

- Pressure plate distortion up to 1.0 mm is permissible



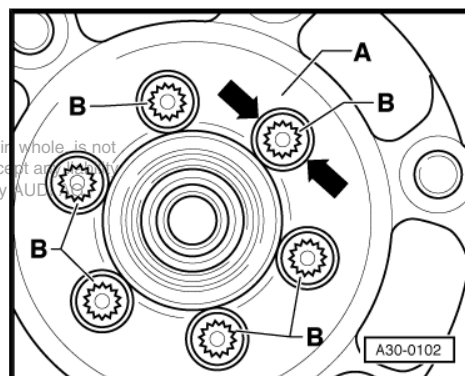
Removing dual-mass flywheel



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.

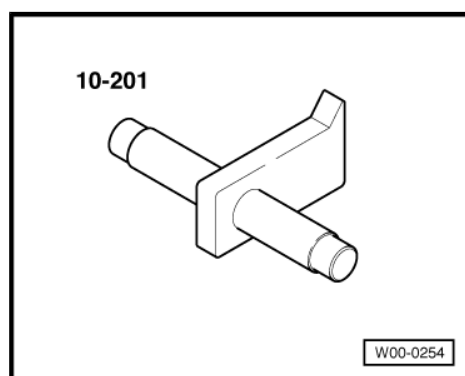
- Rotate flywheel -A- so that bolts -B- are aligned centrally behind the holes -arrows-.
- When unscrewing bolts -B-, make sure the bolt heads do not contact the flywheel -arrows- because this would damage the flywheel when the bolts are turned further.
- Removing and installing dual-mass flywheel ⇒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



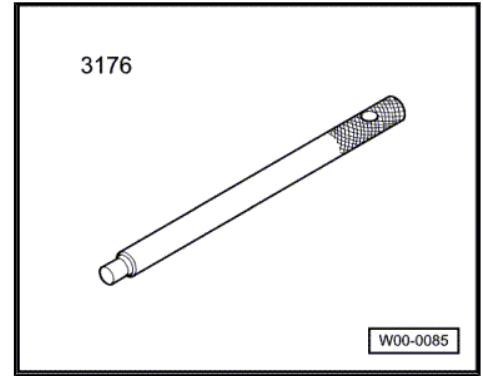
3.4 Removing and installing clutch with SAC pressure plate

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

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- ◆ **Before you re-install the SAC pressure plate check that it is not distorted ⇒ page 44.**

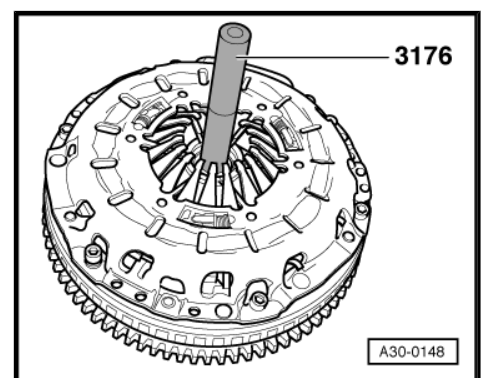
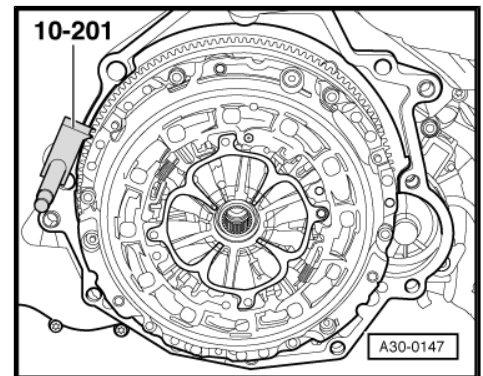
- ◆ **When only the clutch plate is renewed, the adjuster ring in the SAC pressure plate has to be reset before assembly ⇒ page 46.**

- 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

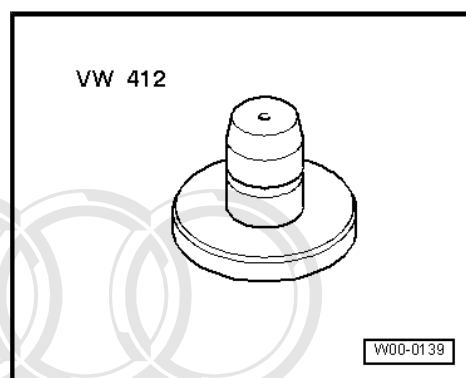


Note

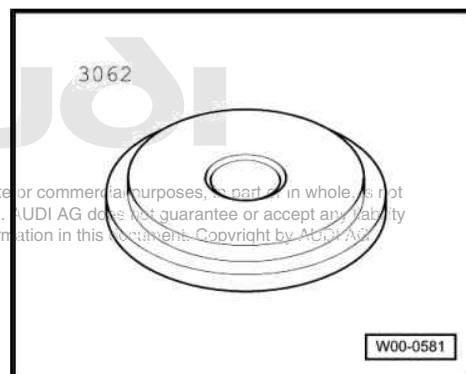
- ◆ *When fitting a new clutch plate in conjunction with a used SAC pressure plate, the adjuster ring in the pressure plate has to be reset by turning it back as far as it will go. If you do not reset the adjuster ring in the pressure plate, the SAC pressure plate will operate with reduced clamping force, 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-



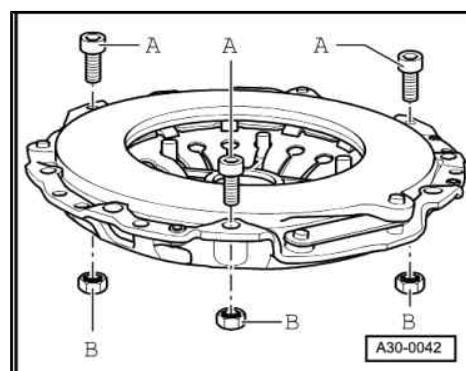
- ◆ Thrust pad - 3062-



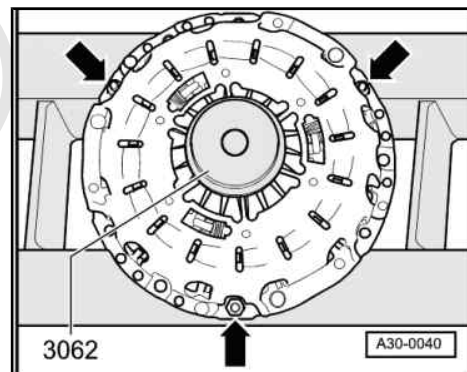
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Procedure

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

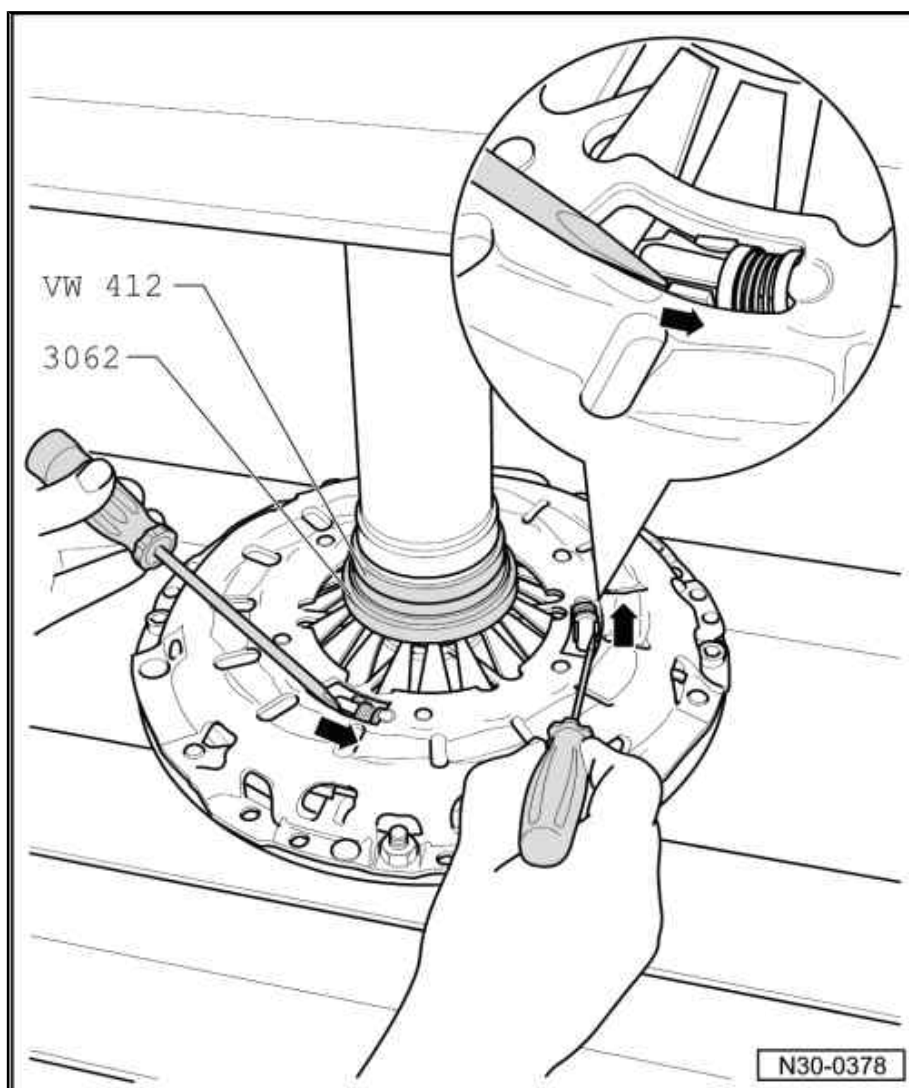


- Place the SAC pressure plate onto the press so that only the 3 bolt heads -arrows- make contact.
- Position thrust pad - 3062- in the centre of the pressure plate.



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

-Arrow A- gear selection movement

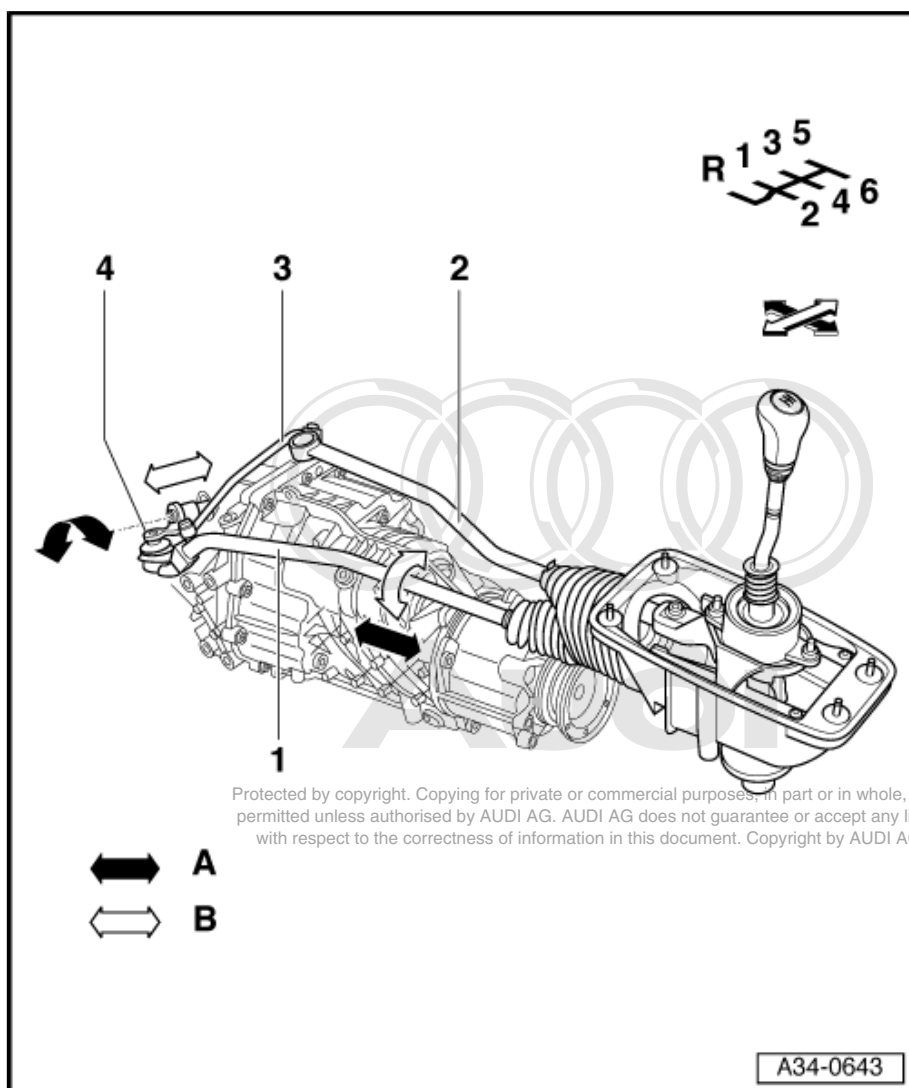
-Arrow B- gate selection movement

1 - Selector rod

2 - Push rod (front)

3 - Connecting rod

4 - Gearbox selector lever



22 - Bush

Part II



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

1 - Boot

- ☐ Secure to selector rod with commercially available instant adhesive

2 - Washer

3 - Ball socket

- ☐ To remove, bend open peened points on selector rod
⇒ [Item 22 \(page 52\)](#).

4 - Nut, 10 Nm

5 - Ball stud

6 - Ball socket

- ☐ To remove, pull off retaining clip
⇒ [Item 12 \(page 51\)](#)

7 - Connecting rod

- ☐ To remove, pull off retaining clip
⇒ [Item 12 \(page 51\)](#)

8 - Bush

9 - Bush

10 - Bolt, 20 Nm

11 - Sleeve

12 - Retaining clip

13 - Bolt, 40 Nm

14 - Push rod

- ☐ With bush, bolt and washers

15 - Hexagon socket head bolt, 23 Nm

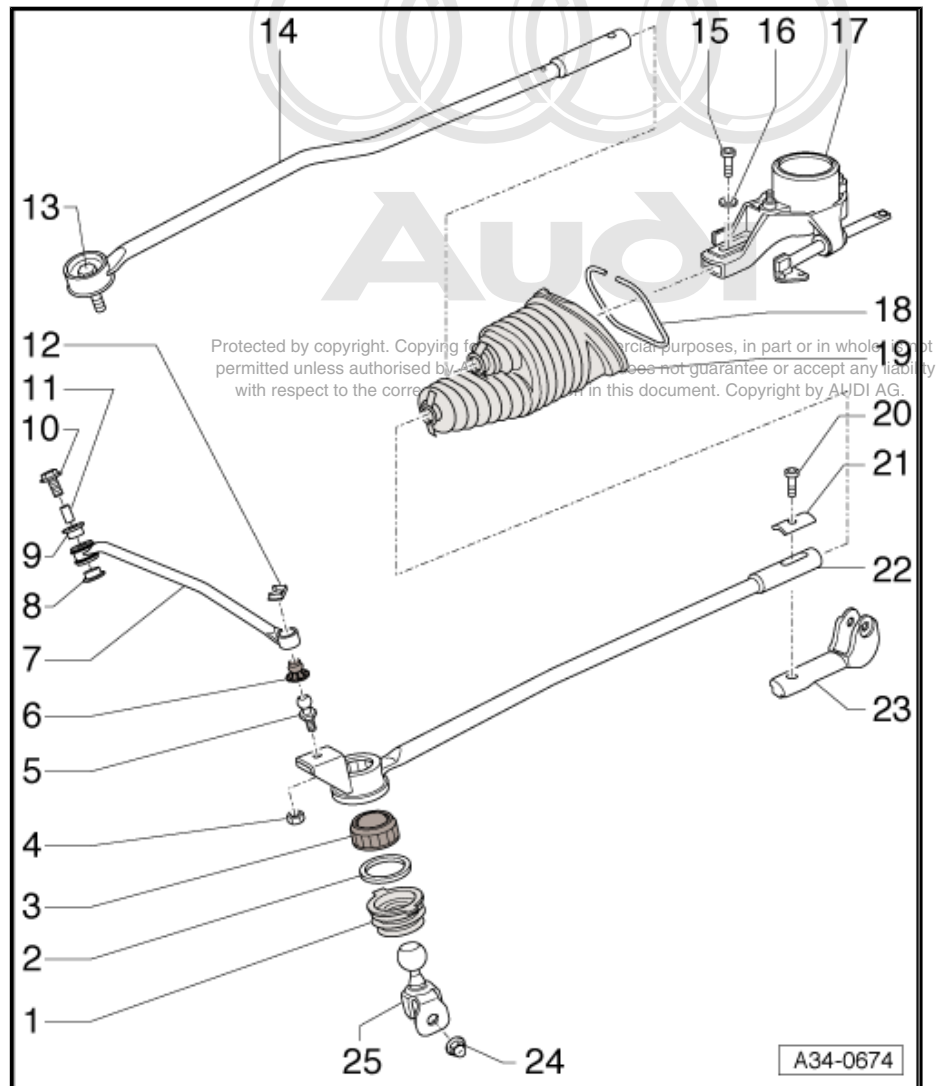
16 - Washer

17 - Gear lever bearing

18 - Clamping ring for bellows

19 - Bellows

- ☐ To remove, carefully pull bellows over selector rod ⇒ [Item 22 \(page 52\)](#) and push rod ⇒ [Item 14 \(page 51\)](#).
- ☐ When installing, align with markings on selector rod ⇒ [Item 22 \(page 52\)](#) and push rod ⇒ [Item 14 \(page 51\)](#).



20 - Hexagon socket head bolt, 23 Nm

21 - Clamp

22 - Selector rod

23 - Joint

□ For gear lever/selector rod

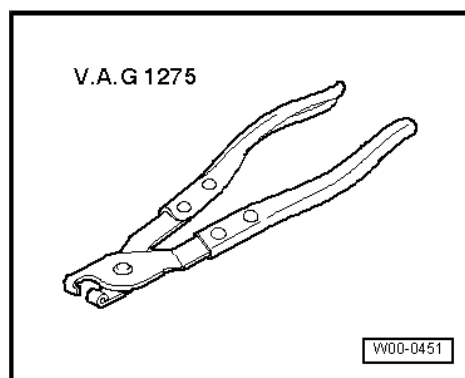
24 - Nut, 20 Nm

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-



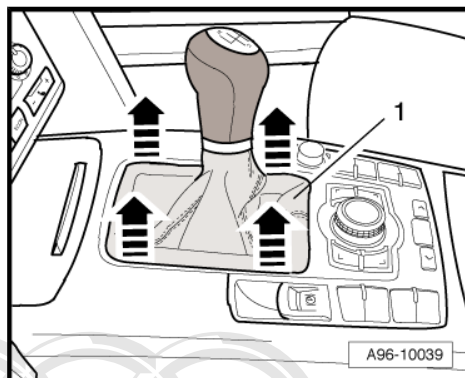
Removing



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-.



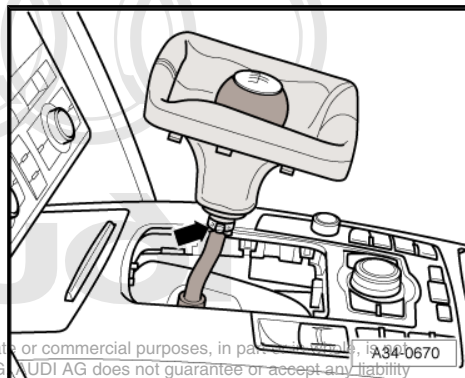
– Pull gear lever boot up and over gear knob.

– 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- .

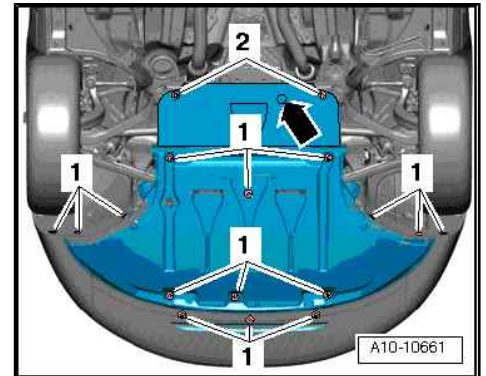


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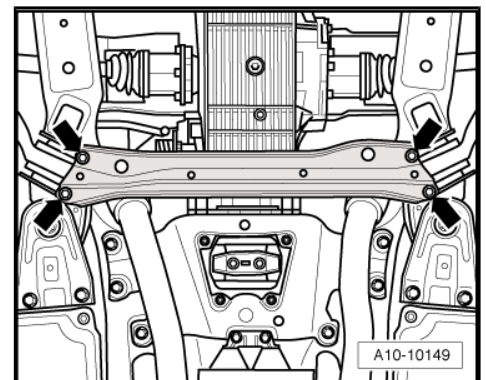
1.4 Removing and installing selector mechanism

Removing

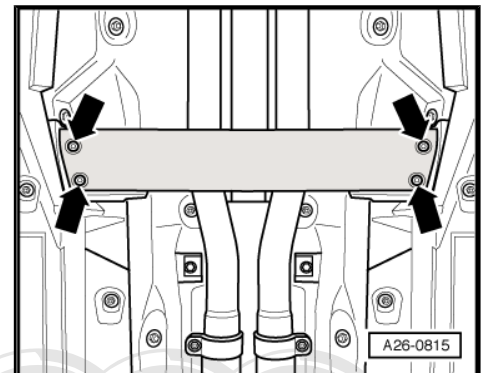
- Release fasteners marked -1-, -2- and -arrow- (if fitted) and remove noise insulation panels.



- Unscrew cross member from subframe -arrows-.



- Unscrew front cross member -arrows-.

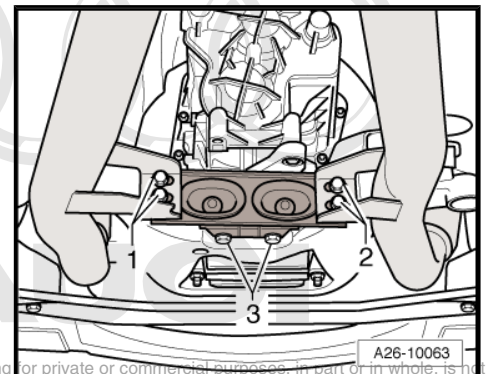


- Unscrew bolts -1- and -2- at rear bracket for front exhaust pipe.



Note

-Item 3- can be disregarded.



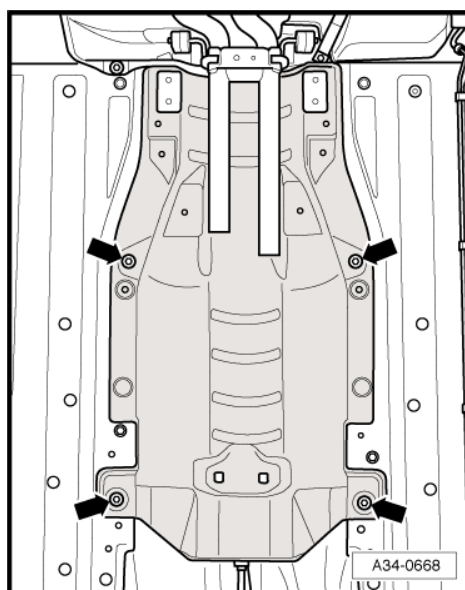
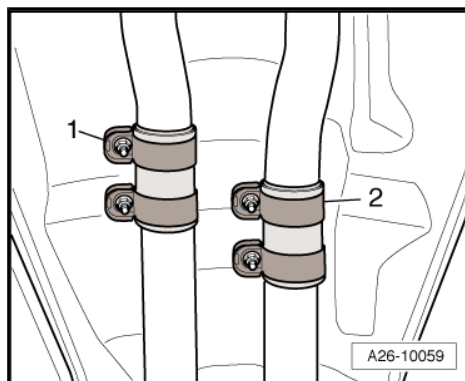
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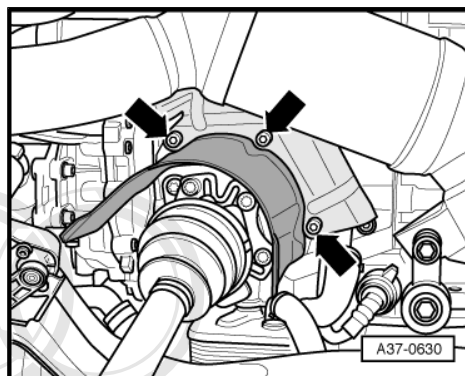
Note

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

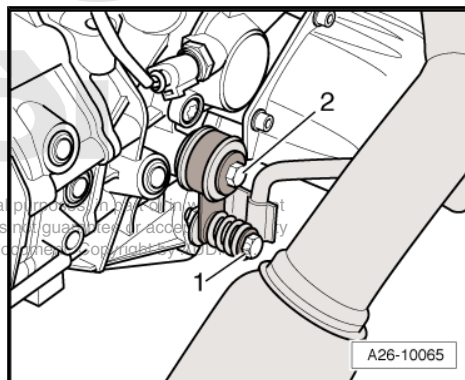
- Loosen clamps -1- and -2-.
- Tie up front exhaust pipes (left and right) to body.
- Remove propshaft ⇒ Rep. gr. 39 .
- Loosen inner side of covers on vehicle underside (left and right).
- Remove heat shield for selector mechanism -arrows-.



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

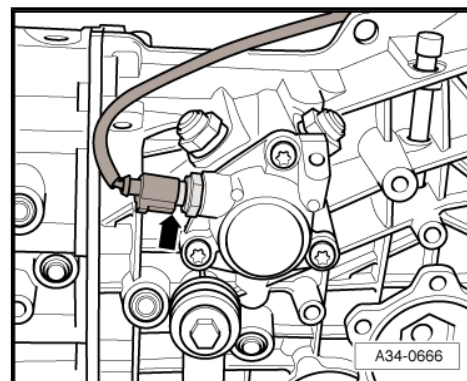


- Unscrew bolts -1- and -2- and remove front exhaust pipe bracket (right-side).

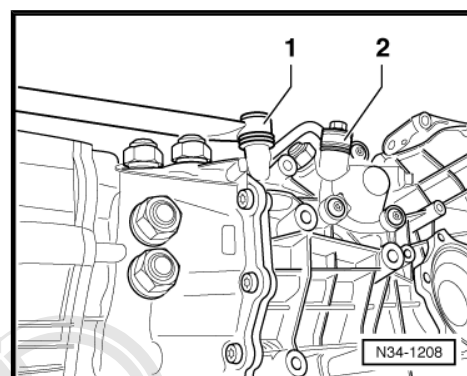


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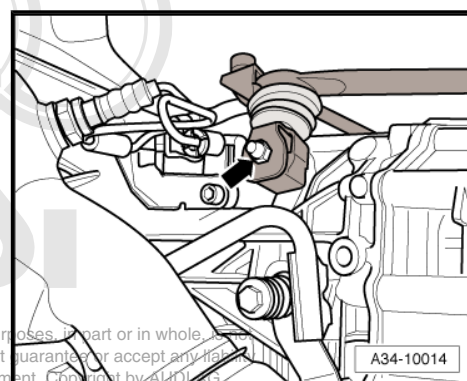
- Unplug electrical connector -arrow- for reversing light switch - F4- .



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

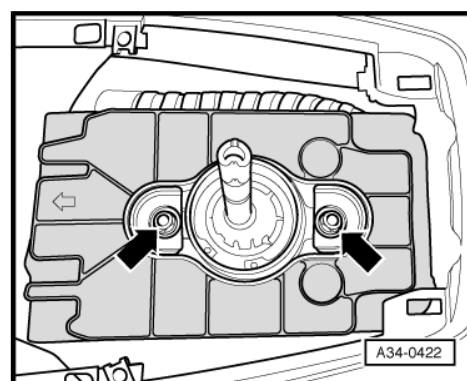


- Unscrew nut -arrow- and detach gearbox selector lever from selector shaft.
- Remove gear knob together with gear lever boot ⇒ [page 52](#) .
- Remove front and rear sections of centre console ⇒ Rep. gr. 68 .



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





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.

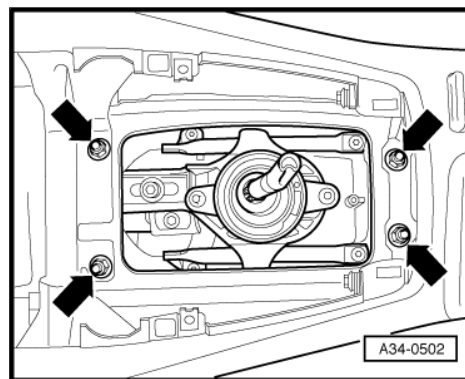
Installing

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

- Install propshaft ⇒ Rep. gr. 39 .
- Install cross member on subframe and install front and rear cross members ⇒ Rep. gr. 40 .
- Install exhaust system and perform stress-free alignment ⇒ Rep. gr. 26 .
- Adjust selector mechanism ⇒ [page 56](#) .
- Install front and rear sections of centre console ⇒ Rep. gr. 68 .

Tightening torques

Component	Nm
Gearbox selector lever to selector shaft	20
Push rod to gearbox	40
Connecting rod to gearbox	20
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:

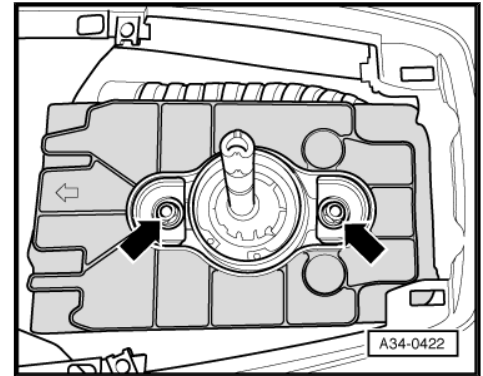
- Gear selector linkage must be in proper condition and undamaged.
- Selector mechanism must move freely.
- Gearbox, clutch and clutch mechanism must be in proper condition.
- Gearbox in neutral.

Procedure

- Remove front and rear sections of centre console ⇒ Rep. gr. 68 .

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- Lift off the noise insulation.
- Unscrew noise insulation for selector housing -arrows-.



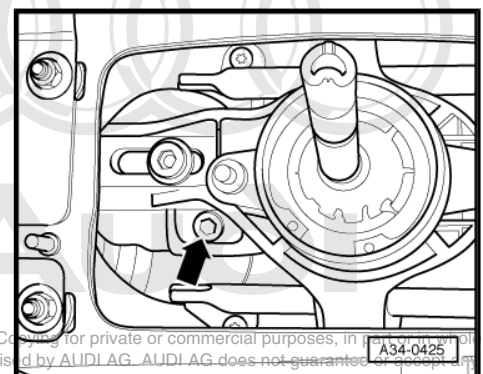
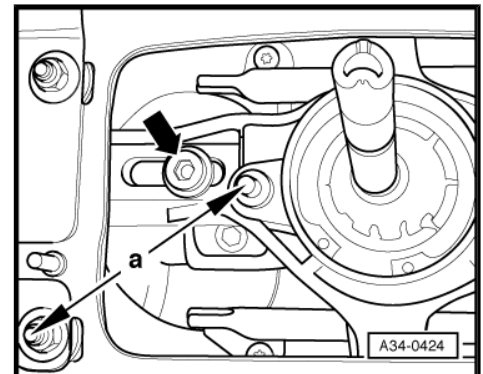
- Measure distance -a- between the two studs in the selector mechanism.
- Specification: distance -a- = 85 mm.

 Note

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

If result does not match specification:

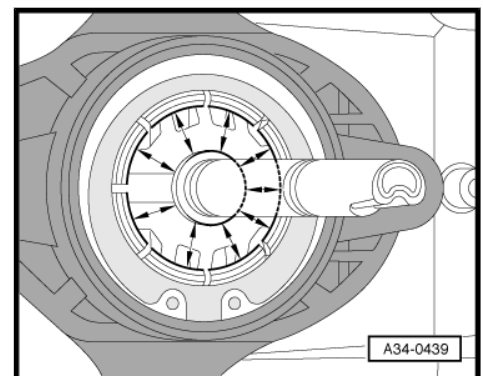
- Loosen bolt -arrow- for push rod.
- Rear push rod (in selector mechanism) should move freely in both directions on slide.
- Set to distance -a- by moving rear push rod (in selector mechanism).
- Tighten push rod bolt to 23 Nm.
- Slacken bolt -arrow- for selector rod.
- Connection between selector rod and selector mechanism should move freely.



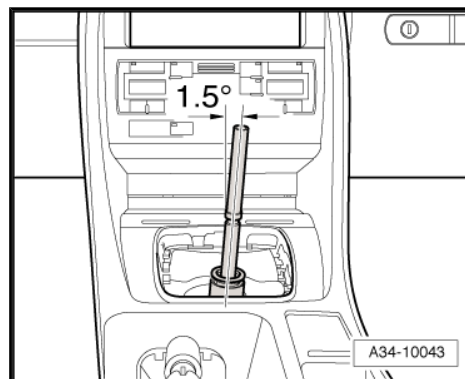
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Align the gear lever as follows:

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



- 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.



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

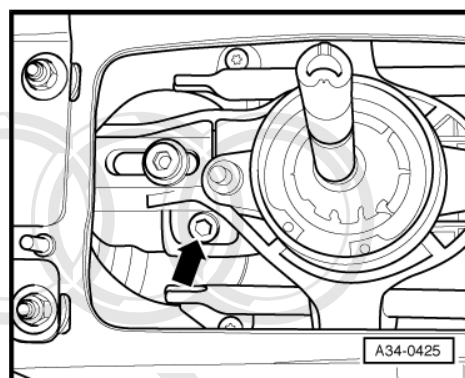


Note

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

Checking gear lever adjustment

- The gear lever should rest in the 3rd/4th gear gate when the gearbox is in neutral.
- Depress clutch.
- Check that all gears can be engaged.
- Check operation of reverse gear lock.
- It should only be possible to engage reverse gear after pressing the gear lever down to overcome the reverse gear detent.
- The gear lever should return by itself from the reverse gear gate to the 3rd/4th gear gate.



If the gear lever 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:

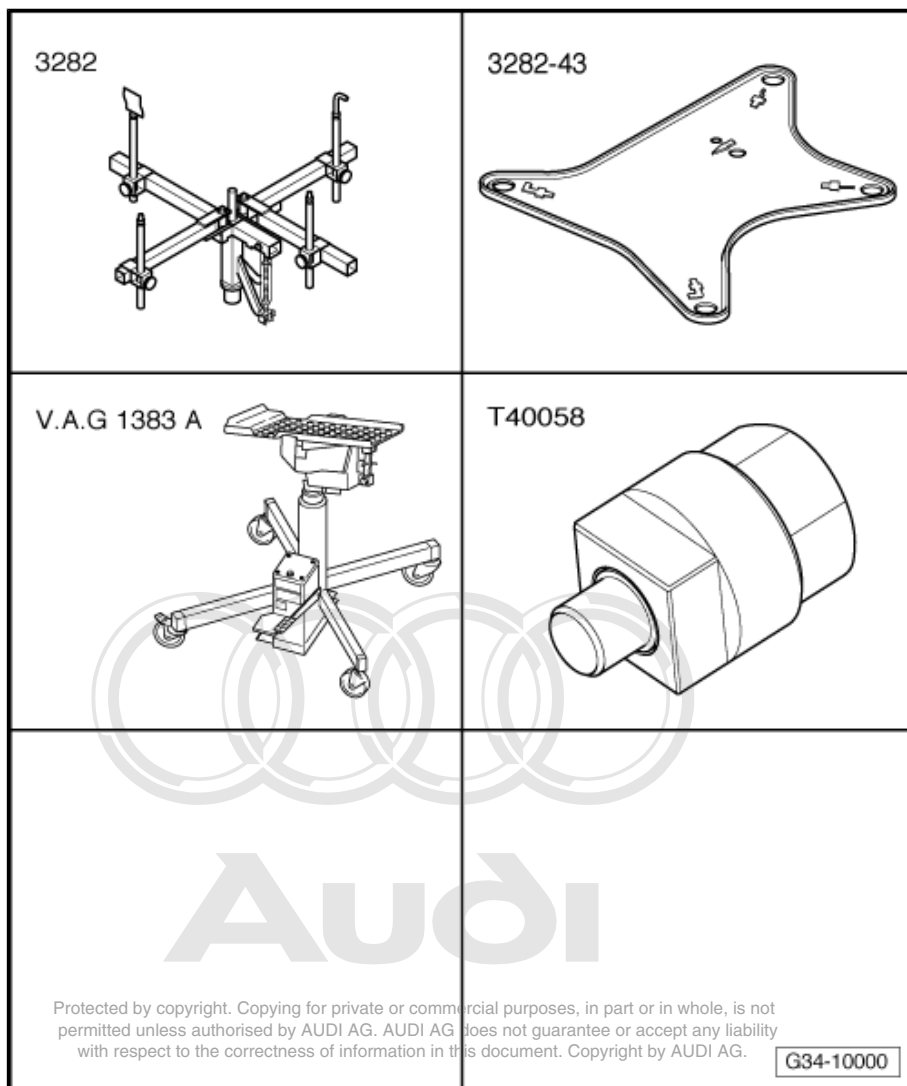
- Install front and rear sections of centre console ⇒ Rep. gr. 68.

2 Removing and installing gearbox

2.1 Removing gearbox on vehicles with 6-cylinder 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-
- ◆ Copper grease (commercially available)
- ◆ Grease for clutch plate splines - G 000 100-



Procedure



Note

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

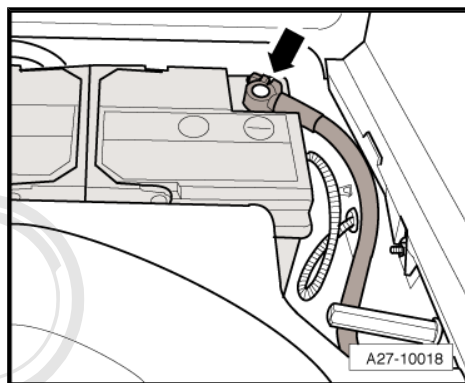


Caution

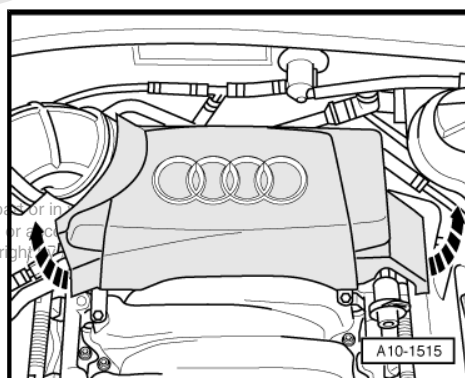
- ◆ *Follow steps required when disconnecting battery → Rep. gr. 27.*

- Switch off ignition and remove ignition key.

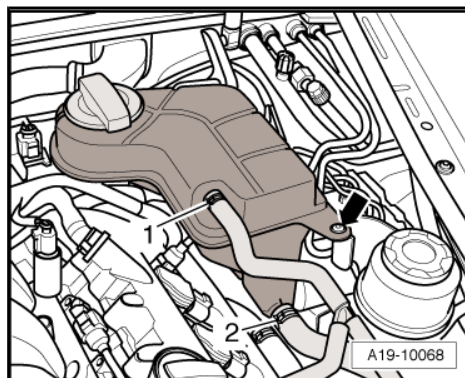
- Take out luggage compartment floor covering.
- Disconnect earth wire -arrow- at battery.



- 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.

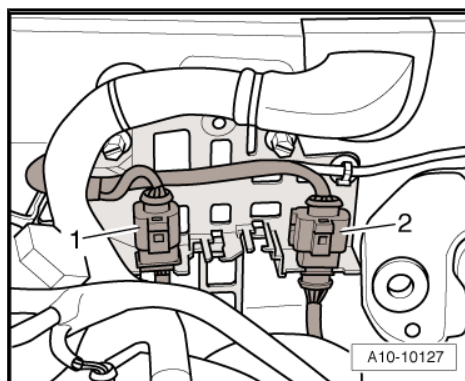


- Unplug electrical connector -2- for Lambda probe 2 after catalytic converter - G131- and move electrical wire clear from below.



Note

-Item 1- can be disregarded.

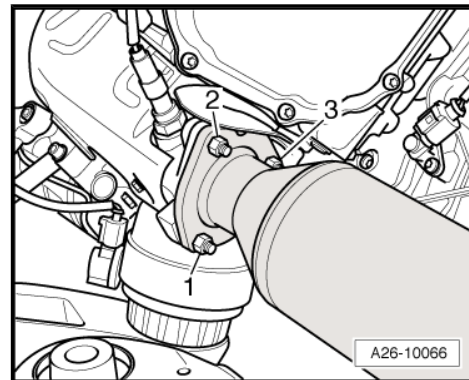


- Unscrew nut -2- (access from above), connecting left front exhaust pipe with exhaust manifold.

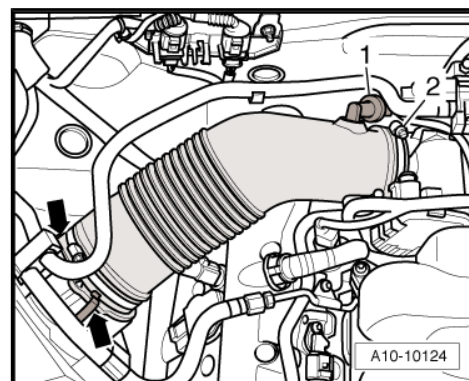


Note

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.

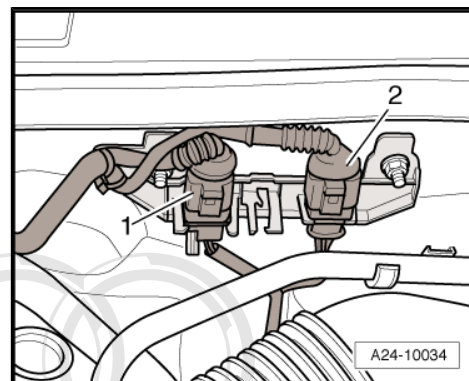


- Unplug electrical connector -2- for Lambda probe after catalytic converter - G130- and move electrical wire clear from below.



Note

-Item 1- can be disregarded.

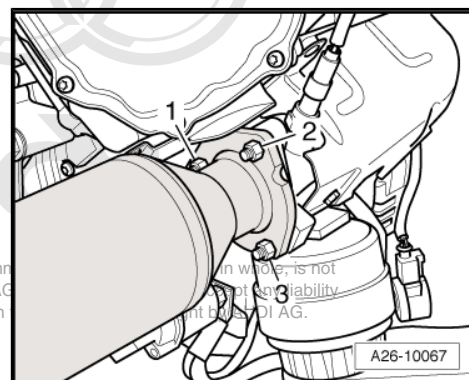


- Unscrew nut -2- (access from above), connecting right front exhaust pipe with exhaust manifold.



Note

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



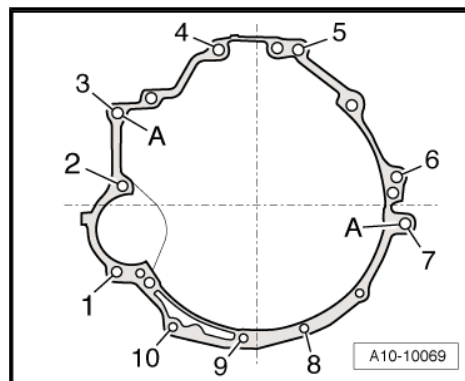
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- Remove bolts accessible from above -4- and -5-.
- Remove both front wheels.

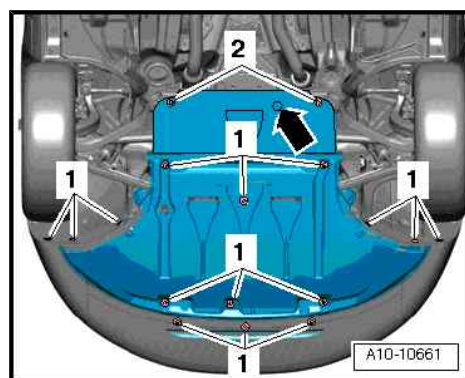


Note

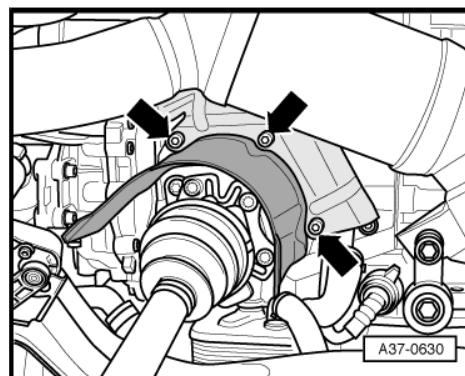
Secure brake discs with wheel bolts.



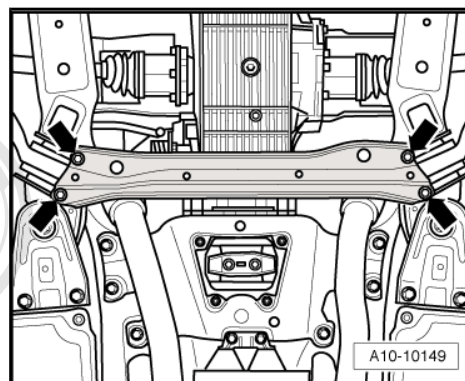
- Release fasteners marked -1-, -2- and -arrow- (if fitted) and remove noise insulation panels.



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

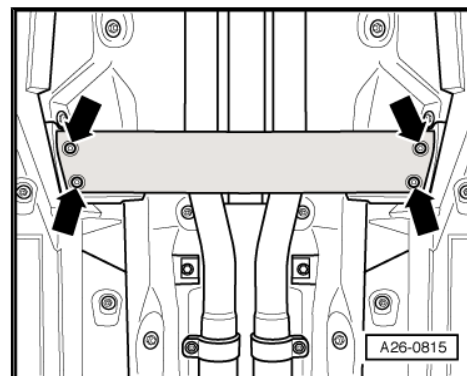


- Unscrew cross member from subframe -arrows-.

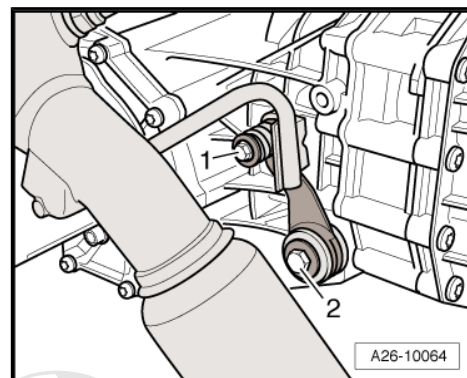


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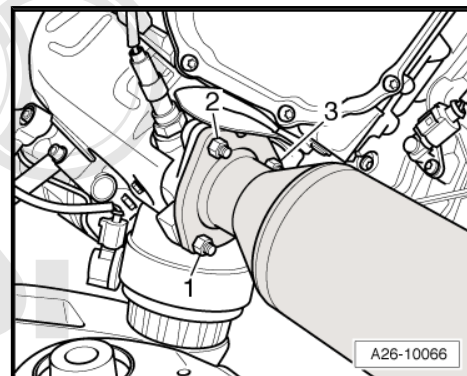
- Remove front cross member -arrows-.



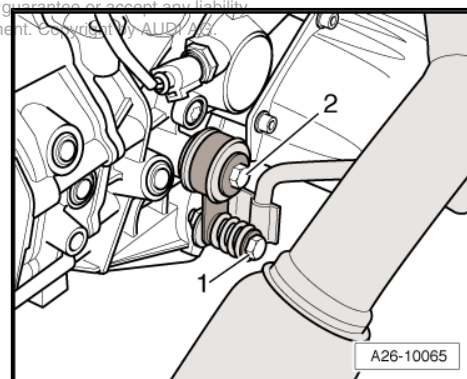
- Unscrew bolts -1- and -2- and remove front exhaust pipe bracket (left-side).



- Unscrew nuts -1- and -3- (accessible from below) connecting front exhaust pipe to exhaust manifold.
- Move Lambda probe wire clear (downwards).

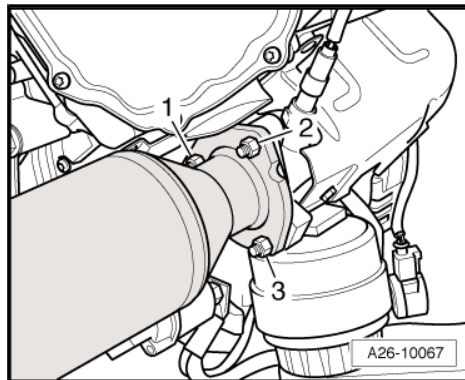


- Unscrew bolts -1- and -2- and remove front exhaust pipe bracket (right-side).



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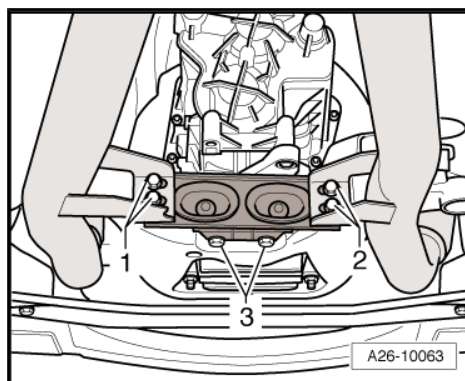
- Unscrew nuts -1- and -3- (accessible from below) connecting front exhaust pipe to exhaust manifold.
- Move Lambda probe wire clear (downwards).



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.

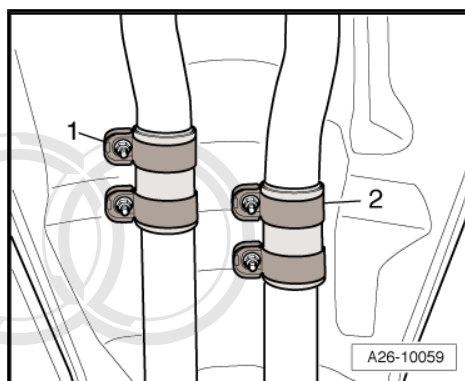


Note

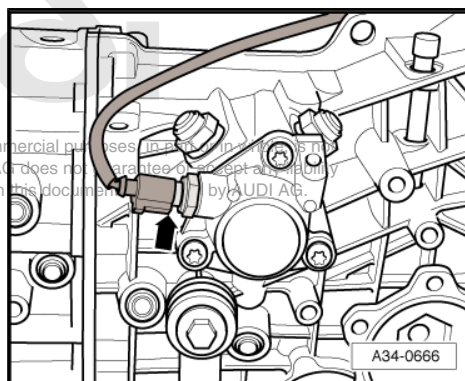
-Item 3- can be disregarded.

Separate exhaust system at clamps -1- and -2- and remove both front exhaust pipes with catalytic converter.

- Unbolt drive shafts (left and right) from gearbox flange shafts.

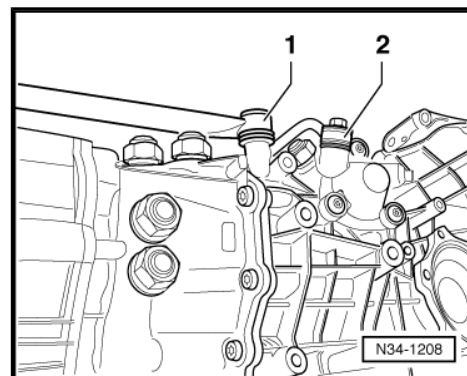


- Unplug electrical connector -arrow- for reversing light switch - F4- and move electrical wire clear.

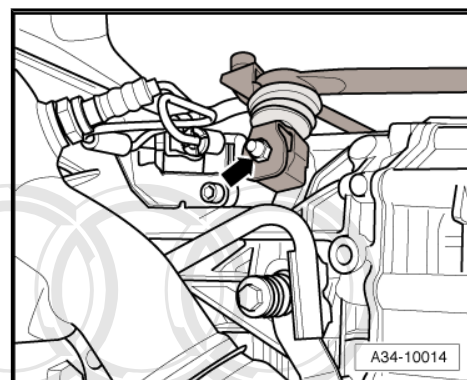


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- Unscrew connecting rod -2- for selector rod.
- Unscrew push rod -1-, using an 8 mm hexagon key when unscrewing bolt.



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

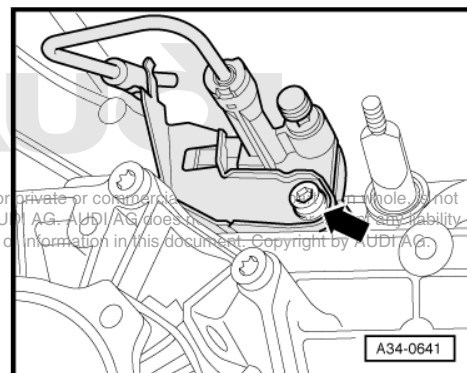


- Remove clutch slave cylinder -arrow- and tie up with wire. Do not disconnect hoses/pipes.

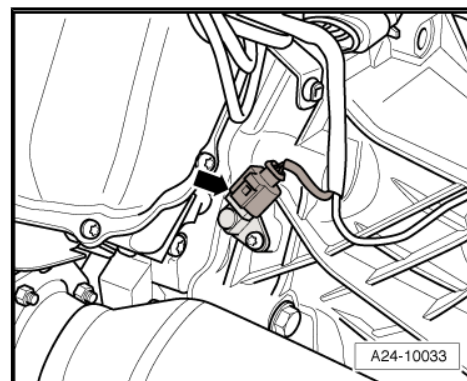


Caution

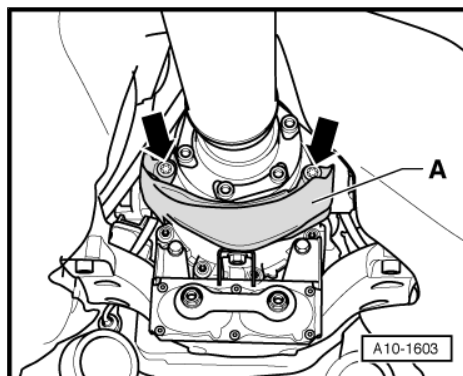
Do not depress clutch pedal after removing slave cylinder. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.



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



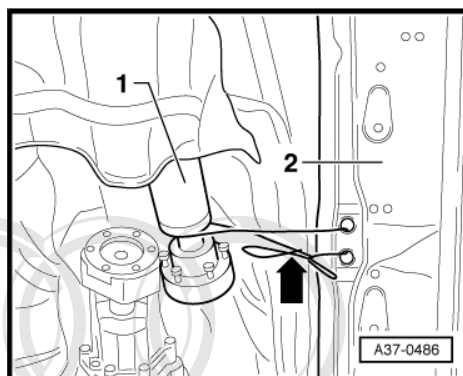
- Unscrew heat shield for propshaft -A- -arrows-.



- Unscrew bolts at gearbox/propshaft flange.
- Slide propshaft together towards rear final drive. The constant velocity joints can be moved axially.
- Tie the propshaft to side, onto body -arrow-.


WARNING

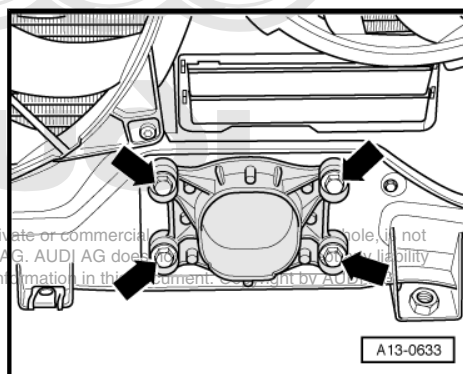
Make sure that the lock carrier remains installed during the following work steps and is not in the service position.



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


Note

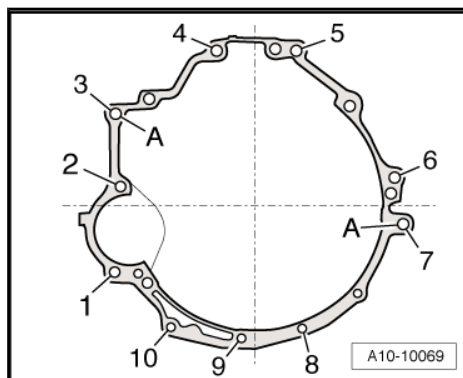
Adjusting the stop for torque reaction support prevents the engine from tilting at the front after the gearbox is removed.



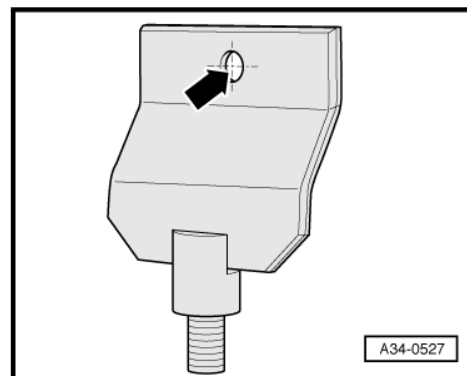
- Remove bolts -1-, -2- and -7 ... 10-.


Note

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



- Drill a hole of 10.2 mm $\varnothing$ -arrow- in the support elements of gearbox support - 3282- .

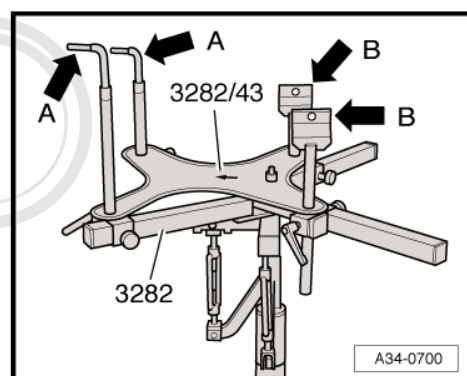


- To remove manual gearbox 02X set up gearbox support - 3282- with adjustment plate - 3282/43- and place on engine and gearbox jack - V.A.G 1383 A- .

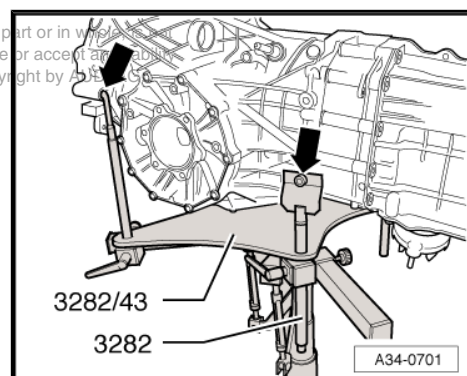


Note

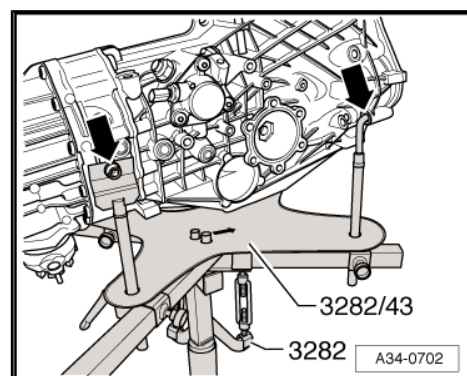
- ◆ The support elements -arrows A- and -arrows B- are shown in schematic form on the adjustment plate . The arrow on the adjustment plate points in the direction of travel.
- ◆ Adjustment plate can only be fitted in one correct position.



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



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



- Remove bolts -arrows- and detach tunnel cross member.
- 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- .

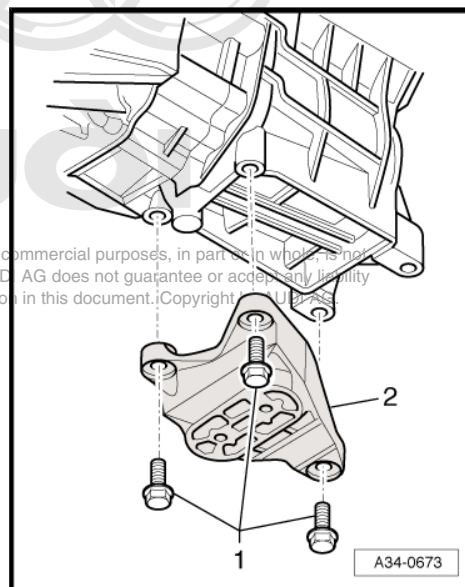
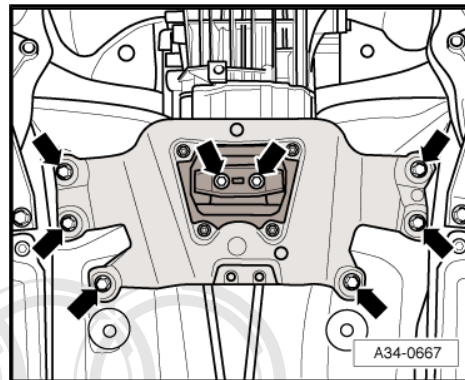


Note

- ◆ *When lowering gearbox, make sure that all wires are disconnected on the top of the gearbox.*
- ◆ *When lowering gearbox, make sure there is sufficient clearance for drive shafts.*

- If the removed gearbox is being renewed, the gearbox support -2- must be transferred to the replacement gearbox.

Tightening torque for bolts -1-: 23 Nm



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2.2 Installing gearbox

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

- Use a thread tap to remove any remaining locking fluid from all threaded holes which will accommodate self-locking bolts.
- Always renew self-locking bolts and nuts.
- Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease for clutch plate splines - G 000 100- to the splines. Do not grease the guide sleeve.
- It should be possible to push the clutch plate back and forth slightly on the input shaft.

- Check clutch release bearing for wear and renew if necessary
⇒ [Item 1 \(page 30\)](#) .
- Depending on the version, a release bearing with a loose plastic ring -arrows- can be repaired ⇒ [page 32](#) or must be renewed ⇒ [page 32](#) .

 Note

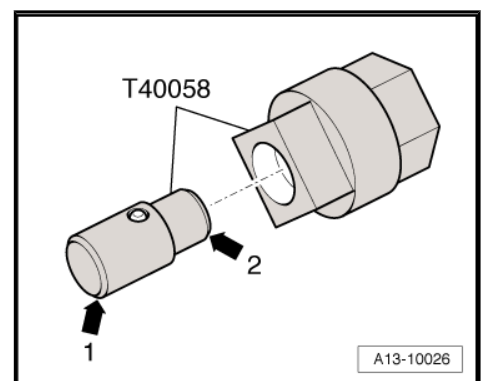
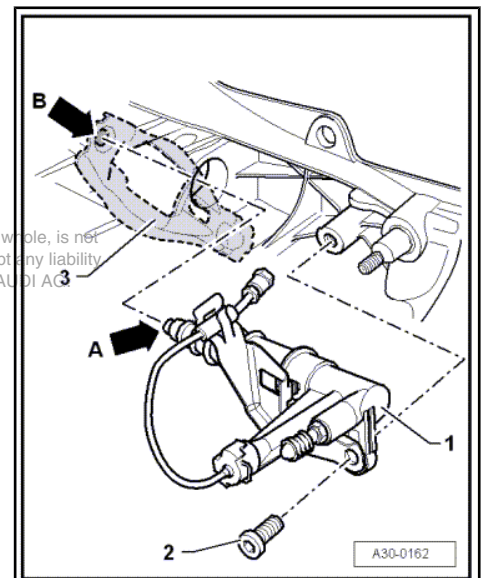
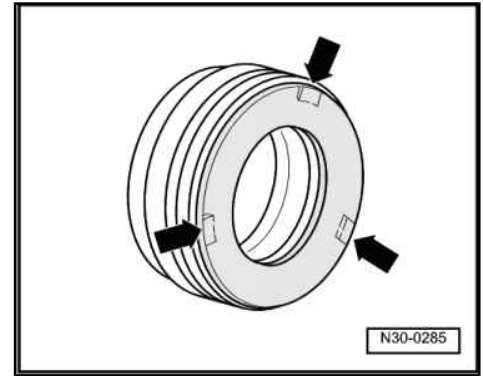
The release bearing must be renewed if the groove worn on the plastic ring is deeper than 0.8 mm.

- 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 -arrow A- contacts clutch release lever using copper grease (commercially available).
- Raise gearbox far enough to be able to install clutch slave cylinder -1- with bracket for hose/pipe 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 clutch slave cylinder is inserted at an angle, there is a danger that the operating rod will be guided past the clutch release lever.

- Secure slave cylinder with new bolt -2-.
- Insert guide pin of adapter - T40058- so that the large diameter -arrow 1- faces engine. The smaller diameter -arrow 2- faces adapter.

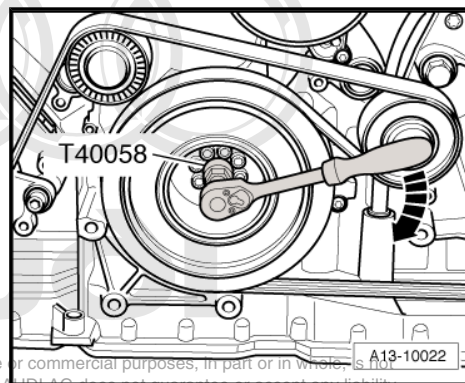


- When joining the gearbox with the engine, turn the crankshaft backwards and forwards using adapter - T40058- to help the splines on the input shaft engage in the clutch plate.
- Bolt gearbox to engine; for identification of bolts and tightening torques refer to [⇒ page 72](#) .

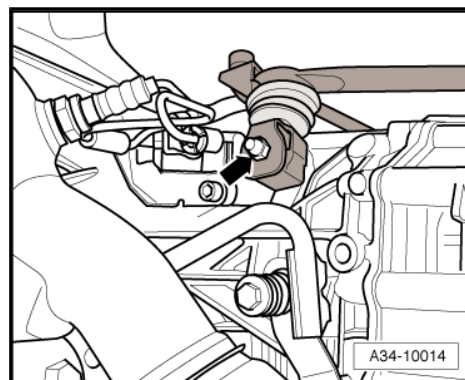


Caution

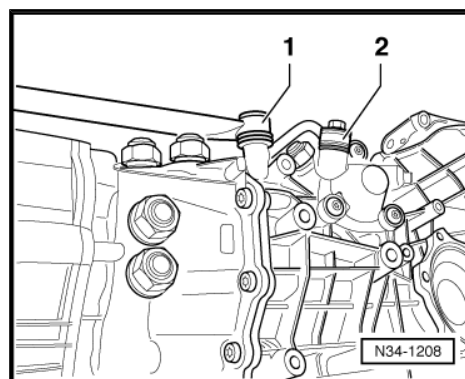
- ◆ *After installing the slave cylinder, press the clutch pedal carefully (gearbox must be bolted to engine).*
- ◆ *If you feel an unusually strong point of resistance when depressing the clutch pedal, you must not press it down further.*
- ◆ *The plunger of the slave cylinder is likely to have been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



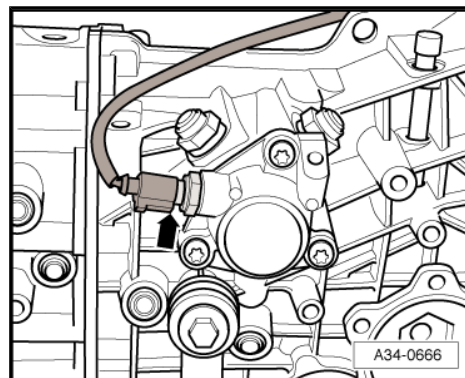
- Install gearbox selector lever and tighten nut -arrow-.



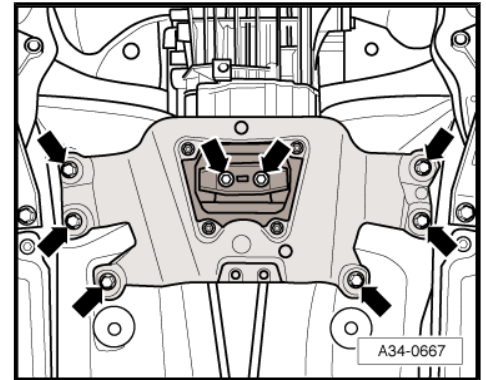
- Install push rod -1-; to do so, tighten hexagon socket head bolt.
- Secure connecting rod -2- for selector rod.



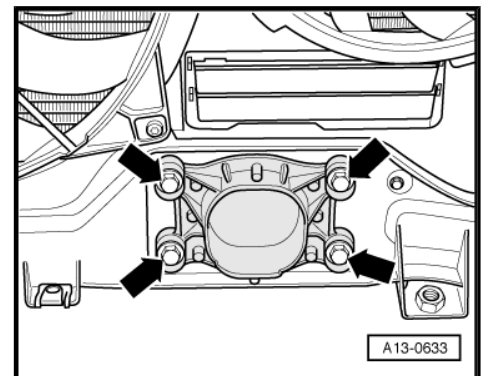
- Plug electrical connector onto reversing light switch - F4- -arrow- and secure electrical wire.



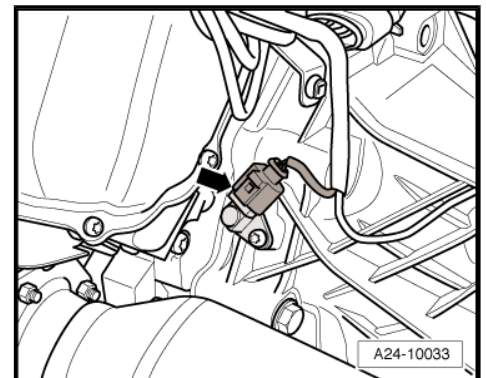
- Tighten bolts -arrows- for tunnel cross member
⇒ "3 Exploded view - tunnel cross member, gearbox mounting and gearbox support", page 74 .



- 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 ⇒ Rep. gr. 50 .



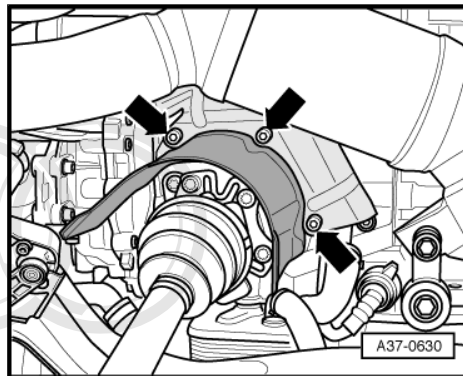
- Plug in electrical connector -arrow- for engine speed sender - G28- on left side of gearbox.



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Bolt drive shafts to flange shafts ⇒ Rep. gr. 40

- Bolt heat shields for drive shafts (left and right) onto gearbox -arrows-.
- Install propshaft ⇒ Rep. gr. 39 .
- Install front exhaust pipes and perform stress-free alignment ⇒ Rep. gr. 26 .
- Install cross member on subframe and install front cross member ⇒ Rep. gr. 40 .
- Check selector mechanism setting and adjust if necessary ⇒ [page 56](#) .
- Follow the steps required after connecting the battery ⇒ 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



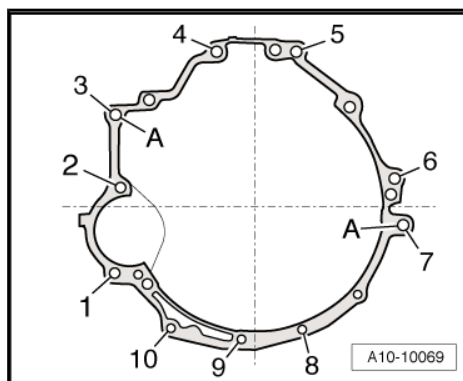
Note

- ◆ *Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.*
- ◆ *Additional lubricant such as engine or gearbox 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



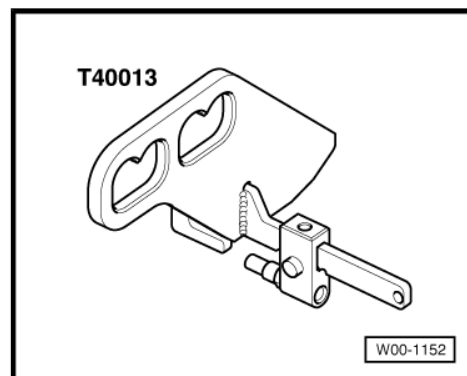
Component	Nm
Tunnel cross member to gearbox mounting	23
Clutch slave cylinder to gearbox	23 ¹⁾
Gearbox selector lever to selector shaft	20
Push rod to gearbox	40
Connecting rod for selector rod to gearbox	20
Heat shields above drive shafts to gearbox	23

¹⁾ Renew bolt

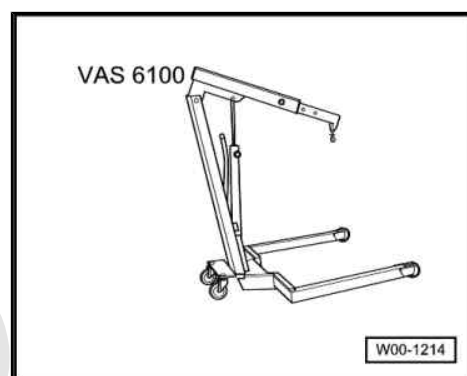
2.3 Transporting gearbox

Special tools and workshop equipment required

- ◆ Lifting aid - T40013-



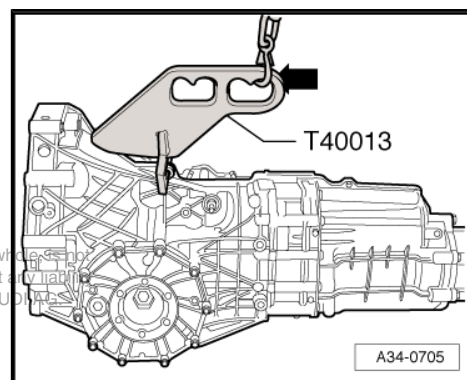
- ◆ Workshop hoist - VAS 6100-



Procedure

- Insert lifting aid - T40013- in lifting eye on gearbox and secure.
- Engage hook of workshop hoist - VAS 6100- in 4th 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 74](#)

3 - Bolt

□ 23 Nm

4 - Gearbox mounting

Removing and installing
⇒ [page 74](#)

5 - Bolt

□ 23 Nm

6 - Tunnel cross member

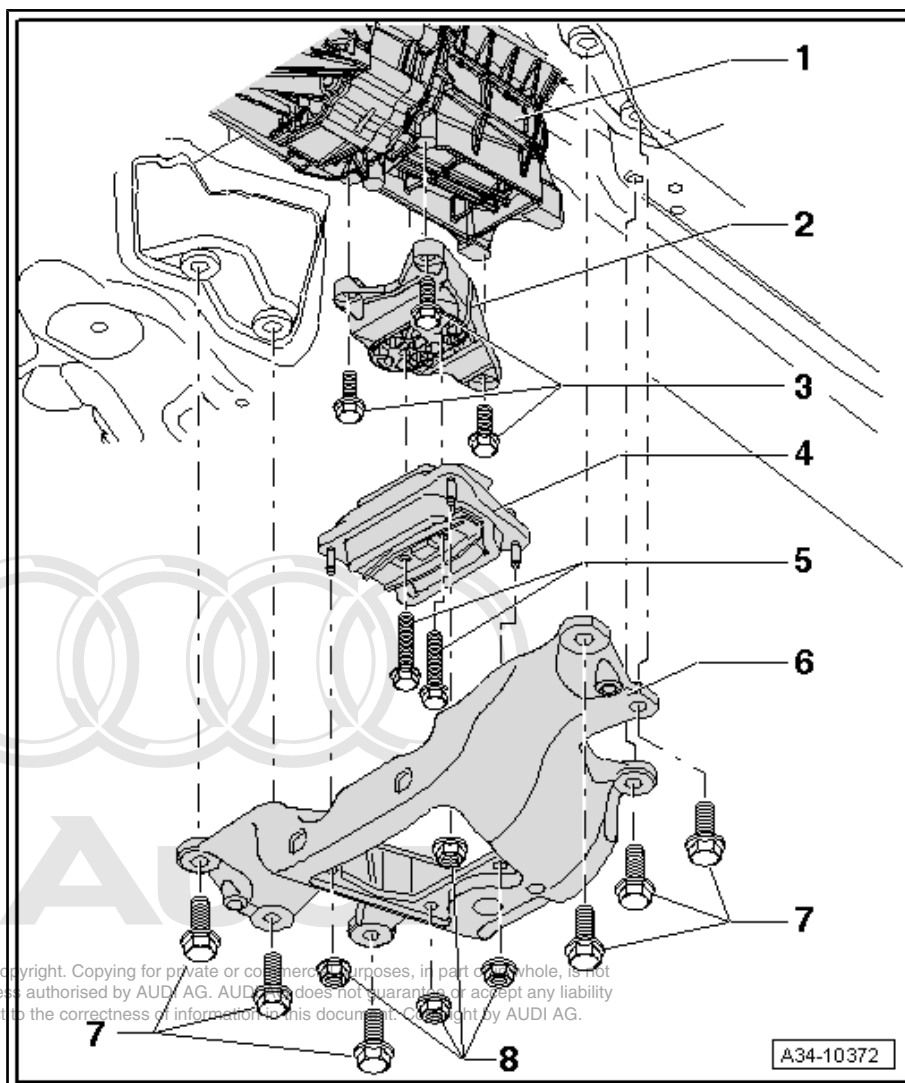
Removing and installing
⇒ [page 74](#)

7 - Bolt

□ 50 Nm

8 - Nut

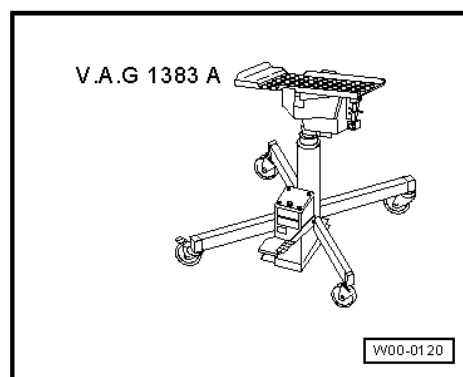
□ 23 Nm



3.1 Removing and installing gearbox mounting and gearbox support

Special tools and workshop equipment required

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



- ◆ Block of wood

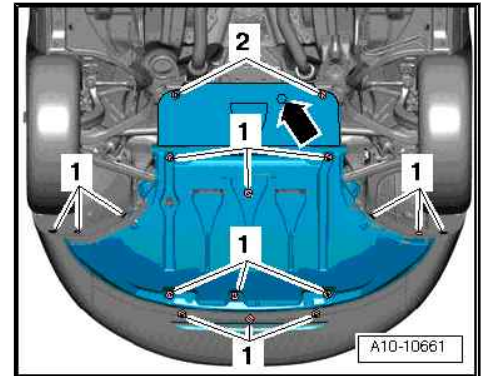
Removing

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

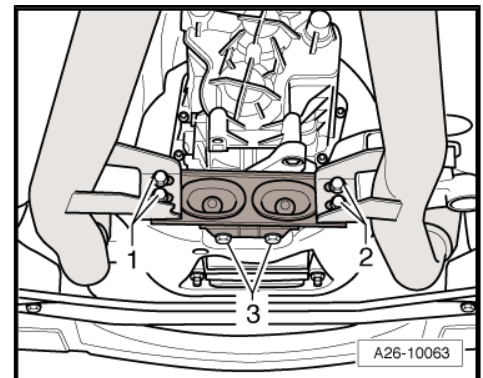


Note

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



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



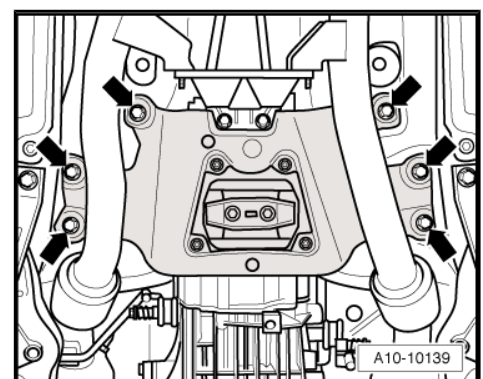
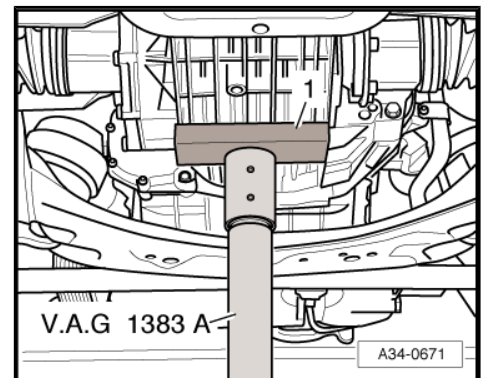
- Apply lifting column of engine and gearbox jack - V.A.G 1383 A- to gearbox from below (place a block of wood -1- between lifting column and gearbox).



Note

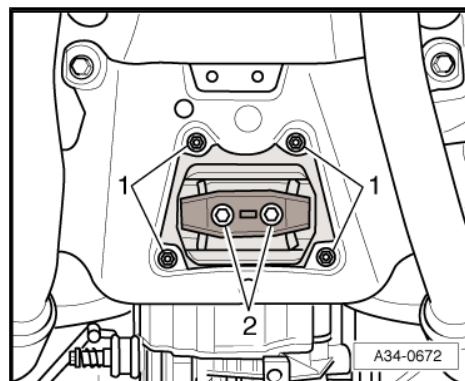
You can also insert gearbox support - T10337- in engine and gearbox jack - V.A.G 1383 A-.

- Use engine and gearbox jack - V.A.G 1383 A- to lift gearbox up slightly.
- Remove bolts -arrows- for tunnel cross member.



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



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

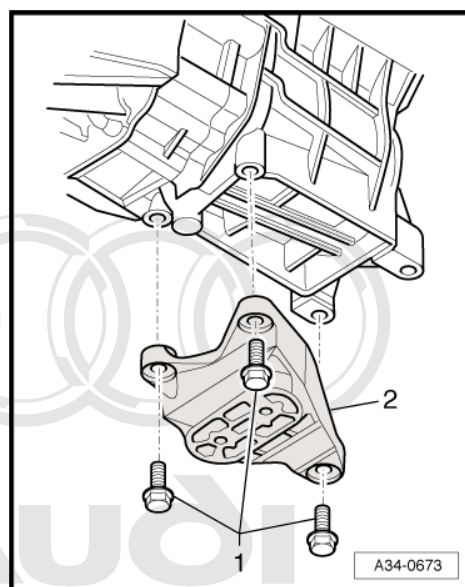
Installing

Perform installation in reverse sequence of removal.

Tightening torques

⇒ "3 Exploded view - tunnel cross member, gearbox mounting and gearbox support", page 74

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



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4 Checking oil level in manual gearbox

Procedure



The vehicle must be horizontal when checking gear oil level.

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

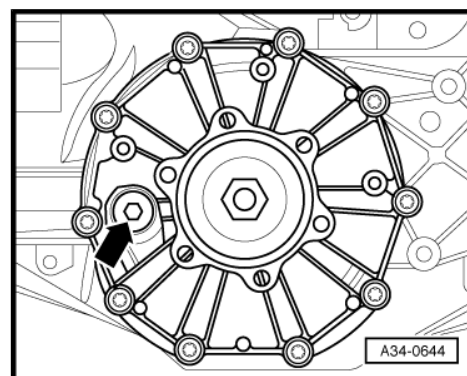
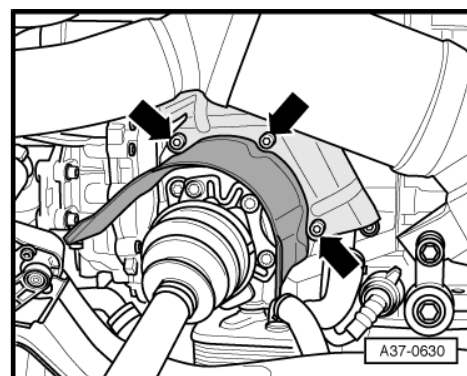
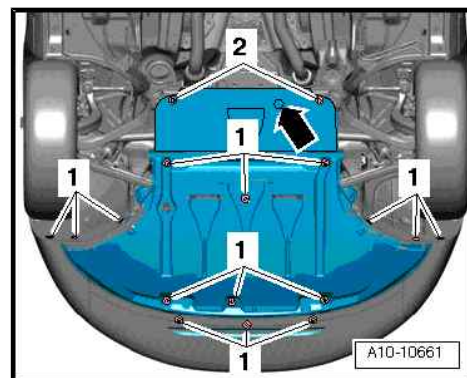
- **Remove front left wheel.** Private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



Secure brake disc with one wheel bolt.

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

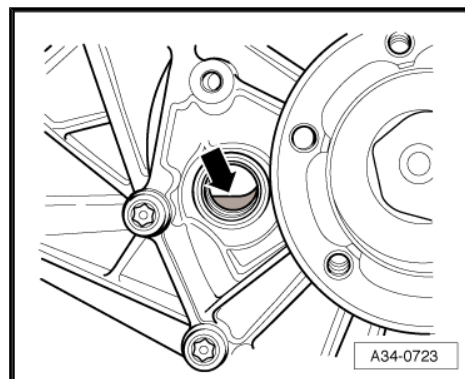
- Remove oil filler plug -arrow-.



- Specification: oil level up to bottom lip of filler hole -arrow-.
- Top up gear oil if necessary. Specification ⇒ [page 1](#) .
- 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, engage a gear and allow gearbox to turn for approx. 2 minutes.
- 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

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

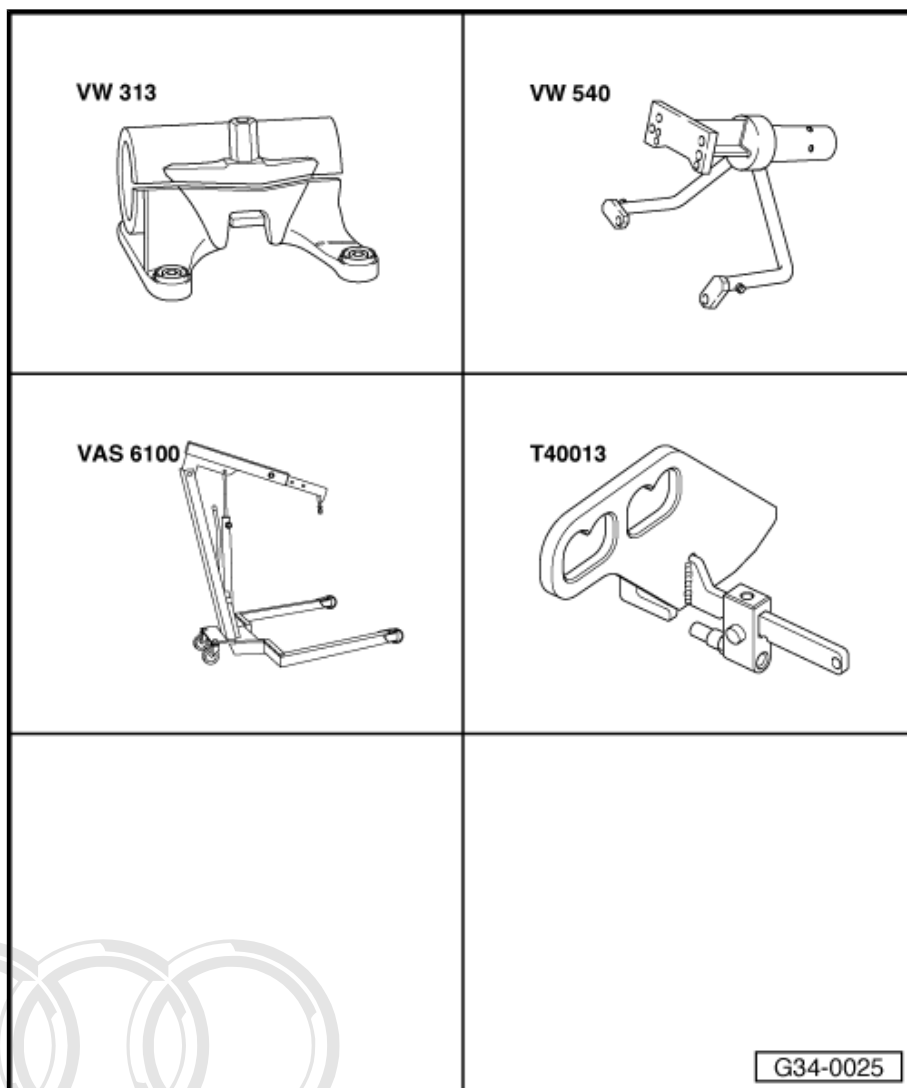


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5 Mounting gearbox on assembly stand

Special tools and workshop equipment required

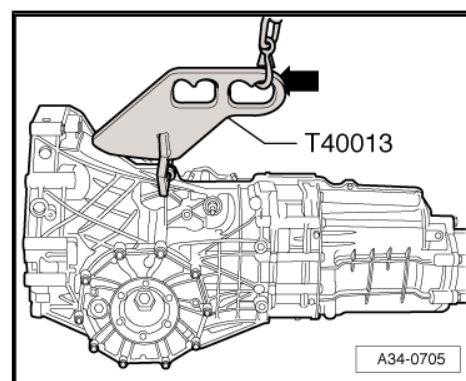
- ◆ Support clamp - VW 313-
- ◆ Engine and gearbox support - VW 540-
- ◆ Workshop hoist - VAS 6100-
- ◆ Lifting aid - T40013-



Procedure

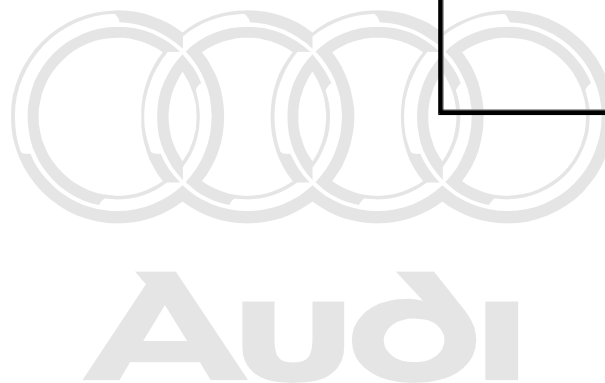
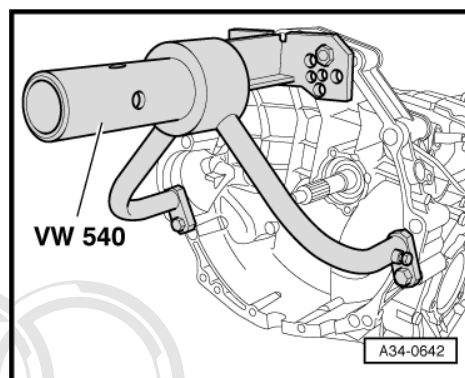
- Insert lifting aid - T40013- in lifting eye on gearbox and secure.
- Engage hook of workshop hoist - VAS 6100- in 4th notch -arrow- on lifting aid - T40013- .
- Lift gearbox with workshop hoist - VAS 6100- and lifting aid - T40013-

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



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6 Dismantling and assembling gearbox

⇒ [“6.1 General layout of gearbox”, page 81](#)

⇒ [“6.2 Exploded view - dismantling and assembling gearbox”, page 82](#)

⇒ [“6.3 Exploded view - removing and installing ball bearing for input shaft, gearbox cover, bearing housing and selector shaft”, page 83](#)

⇒ [“6.4 Exploded view - removing and installing centre differential housing and self-locking centre differential”, page 85](#)

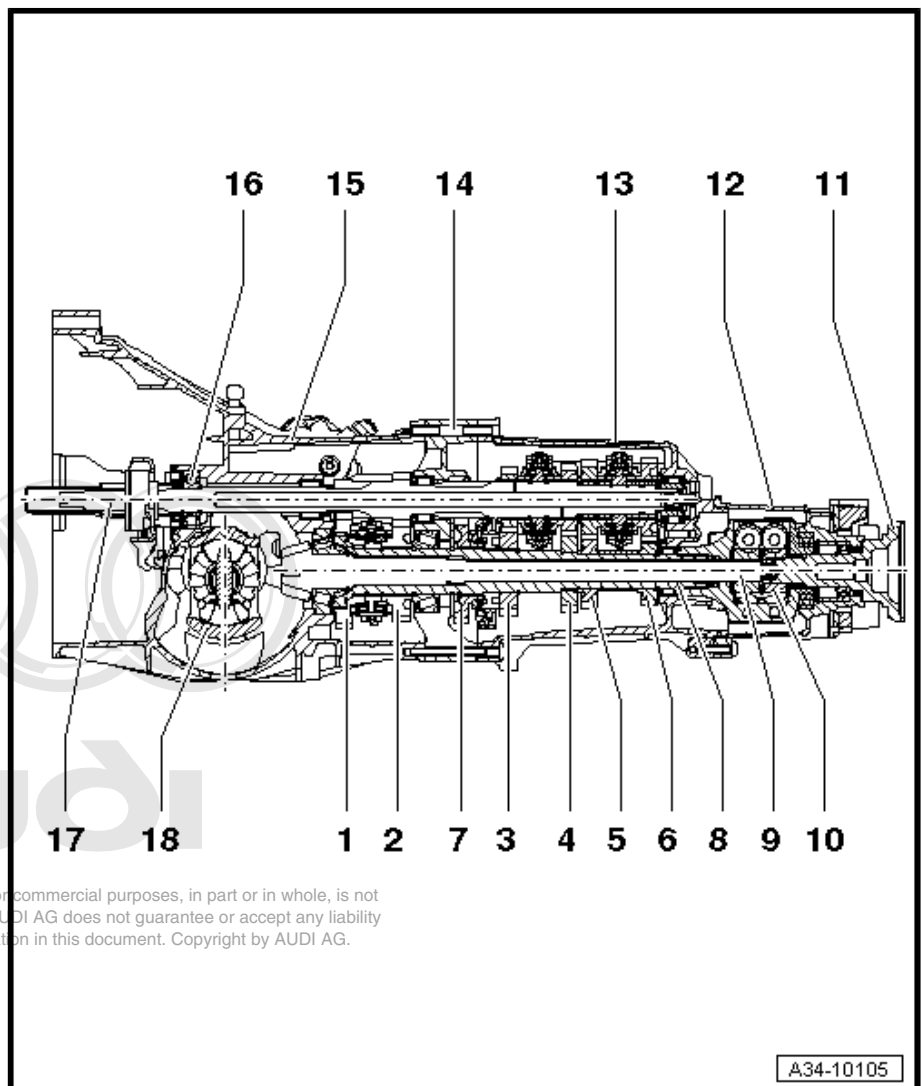
⇒ [“6.5 Exploded view - removing and installing 3rd to 6th gear”, page 86](#)

⇒ [“6.6 Exploded view - removing and installing input shaft, pinion shaft, hollow shaft, reverse gear wheel and reverse selector gear”, page 89](#)

⇒ [“6.7 Assembly sequence - dismantling and assembling gearbox”, page 90](#)

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 - Hollow shaft
- 9 - Pinion shaft (output shaft)
- 10 - Centre differential
- 11 - Flange shaft
- 12 - Centre differential housing
- 13 - Gearbox cover
- 14 - Bearing housing
- 15 - Gearbox housing
- 16 - Ball bearing
 - For input shaft
- 17 - Input shaft
- 18 - Differential



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6.2 Exploded view - dismantling and assembling gearbox

⇒ "6.7 Assembly sequence - dismantling and assembling gearbox", page 90

I - Removing and installing ball bearing for input shaft, gearbox cover, bearing housing and selector shaft

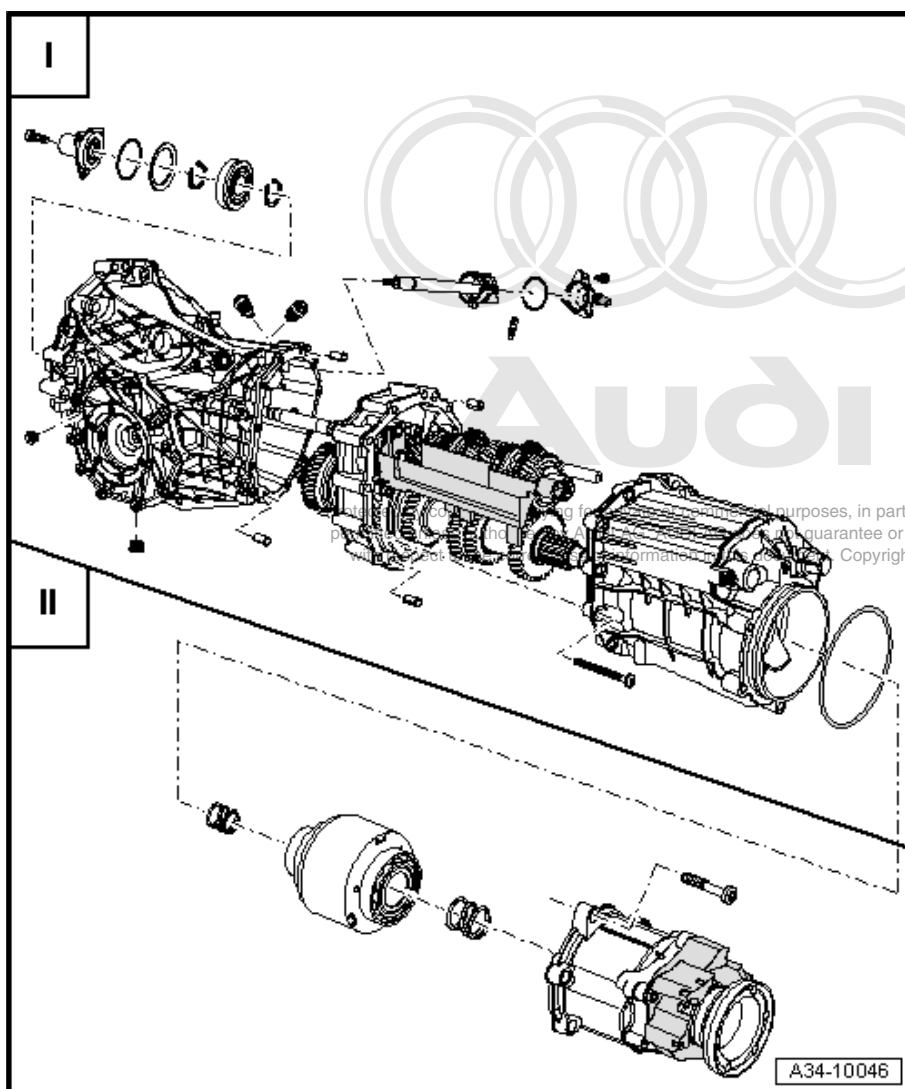
⇒ page 83

- ❑ Removing and installing 3rd to 6th gear
⇒ page 86
- ❑ Removing and installing input shaft, pinion shaft/hollow shaft, reverse gear wheel and reverse selector gear
⇒ page 89

II - Removing and installing centre differential housing and self-locking centre differential with gearbox removed

⇒ page 85

- ❑ Servicing bearings for centre differential
⇒ page 85
- ❑ Dismantling and assembling centre differential housing ⇒ page 114



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

⇒ ["6.7 Assembly sequence - dismantling and assembling gearbox", page 90](#)

1 - Bolt, 35 Nm

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

2 - Guide sleeve

- ☐ With oil seal
- ☐ Removing and installing
⇒ [Item 5 \(page 30\)](#)

3 - O-ring

- ☐ Always renew

4 - Dished spring

- ☐ Smaller diameter (convex side) faces guide sleeve
⇒ [Item 2 \(page 83\)](#)

5 - Circlip

- ☐ Note thickness
- ☐ Re-determining thickness
⇒ ["1.3 Adjusting input shaft", page 157](#)

6 - Ball bearing

- ☐ Removing and installing
⇒ [page 90](#)

7 - Circlip

- ☐ Note thickness
- ☐ Re-determining thickness
⇒ ["1.3 Adjusting input shaft", page 157](#)

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

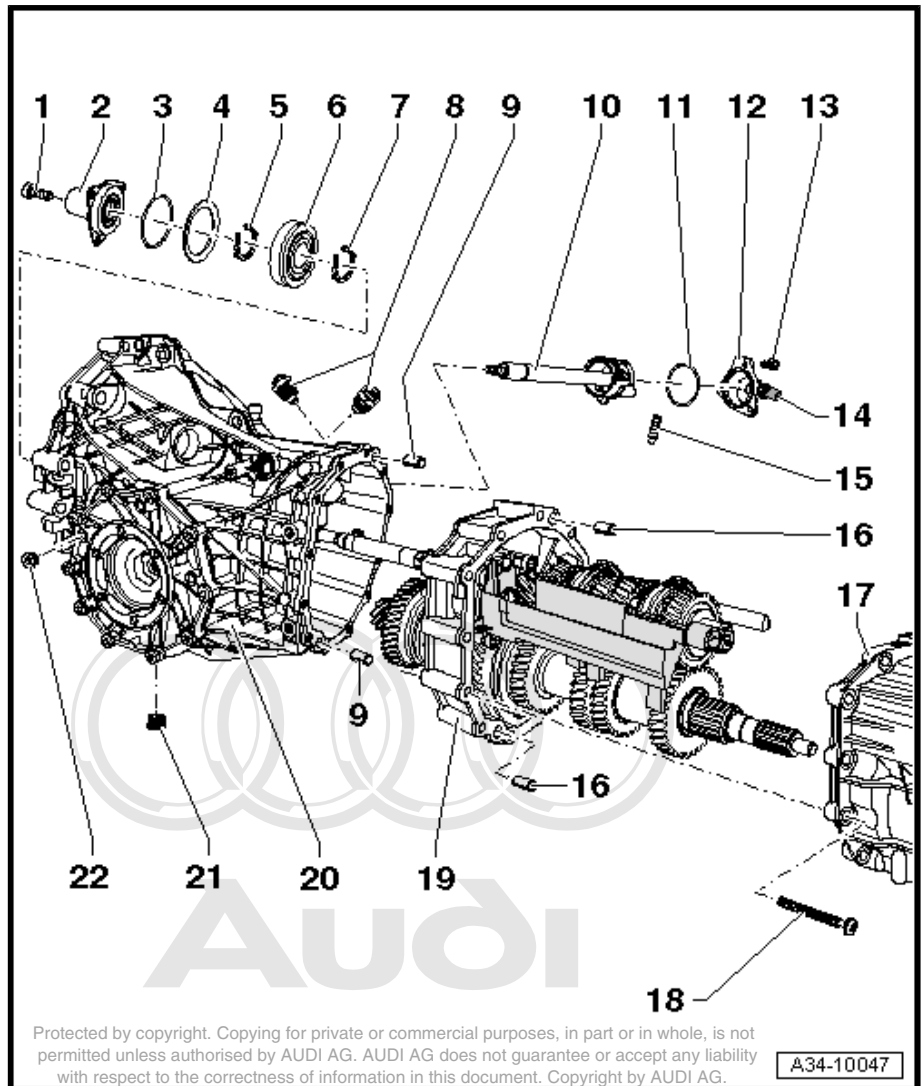
- ☐ Removing and installing ⇒ [page 143](#)

11 - O-ring

- ☐ For selector shaft cover
- ☐ Always renew
- ☐ Lubricate with gear oil

12 - Selector shaft cover

- ☐ With reversing light switch - F4-



- ☐ Removing and installing ⇒ [page 90](#)

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 124](#)

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If only the gearbox cover is removed from the gearbox, the bearing housing ⇒ [Item 19 \(page 84\)](#) must be removed as well so that new sealant can be applied between the gearbox housing and the bearing housing.

18 - Bolt, 35 Nm + 90° further

- ☐ 12x

19 - Bearing housing

- ☐ Removing and installing 3rd to 6th gear ⇒ [page 86](#)
- ☐ Removing and installing input shaft, pinion shaft/hollow shaft, reverse gear wheel and reverse selector gear ⇒ [page 89](#)
- ☐ Servicing ⇒ [page 130](#)

20 - Gearbox housing

- ☐ With differential and flange shafts
- ☐ Removing and installing differential ⇒ [page 182](#)
- ☐ Servicing gearbox housing ⇒ [page 136](#)

21 - Oil drain plug, 45 Nm**22 - Oil filler plug, 45 Nm**

6.4 Exploded view - removing and installing centre differential housing and self-locking centre differential

⇒ ["6.7 Assembly sequence - dismantling and assembling gearbox", page 90](#)

The centre differential housing can also be removed and installed with the gearbox installed in the vehicle ⇒ [page 117](#).

1 - Centre differential housing

- ☐ With or without vibration damper, depending on design
- ☐ Removing and installing (with gearbox removed) ⇒ [page 90](#)
- ☐ Removing and installing (with gearbox installed) ⇒ [page 117](#)
- ☐ Dismantling and assembling ⇒ [page 114](#)

2 - Bolt, 10 Nm + 45° further

- ☐ 6x

3 - Spring

- ☐ Fit onto flange shaft in centre differential housing
- ☐ Do not interchange with other spring ⇒ [Item 5 \(page 85\)](#)
- ☐ Outside diameter: approx. 35 mm

4 - Self-locking centre differential

- ☐ Can only be serviced by manufacturer
- ☐ Removing and installing (with gearbox installed) ⇒ [page 117](#)
- ☐ Pressing ball bearing off centre differential ⇒ [page 86](#)
- ☐ Pressing ball bearing onto centre differential ⇒ [page 86](#)

5 - Spring

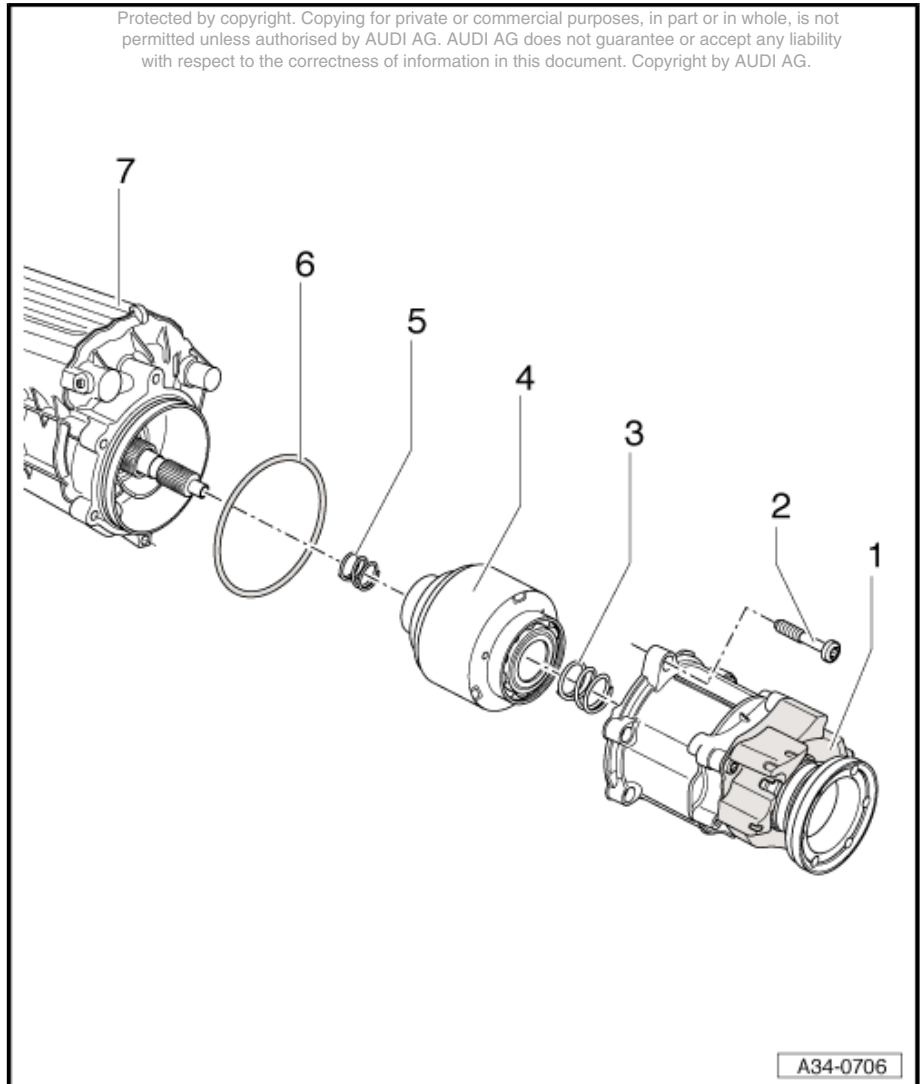
- ☐ Fit onto pinion shaft/hollow shaft
- ☐ Do not interchange with other spring ⇒ [Item 3 \(page 85\)](#)
- ☐ Outside diameter: approx. 31 mm

6 - O-ring

- ☐ Always renew
- ☐ Lubricate with gear oil

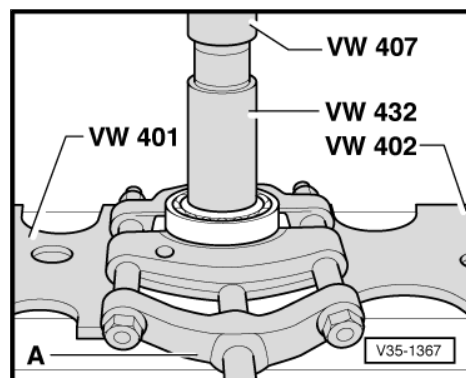
7 - Gearbox

- ☐ Mounting on assembly stand ⇒ [page 90](#)



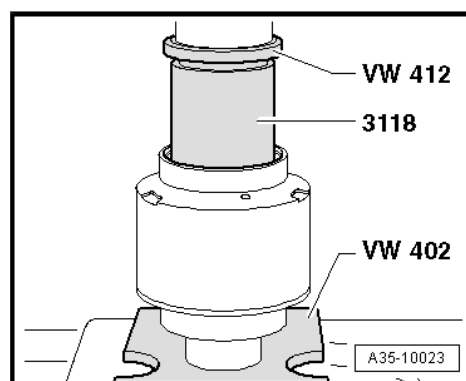
Pressing ball bearing off self-locking centre differential

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



Pressing ball bearing onto self-locking centre differential

The collar of press tool - 3118- points towards press tool - VW 412- .



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

⇒ [“6.7 Assembly sequence - dismantling and assembling gearbox”, page 90](#)



Note

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



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1 - Bearing housing

2 - Oil collector

- ☐ With magnet
- ☐ Clipped into reverse shaft support

3 - Circlip

- ☐ Install the thickest circlip that will still just fit.
- ☐ Re-determining thickness ⇒ [page 90](#)

4 - 6th gear wheel

- ☐ Installation position: high inside collar faces spacer sleeve
⇒ [Item 5 \(page 87\)](#)

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 - 3rd gear wheel

- ☐ Detach bearing housing from gearbox housing and remove pinion shaft prior to removing and installing ⇒ [page 90](#)

9 - Selector rod for 3rd and 4th gear

- ☐ When combined with spring-loaded selector fork, clamping washer ⇒ [Item 22 \(page 88\)](#) must engage behind shoulder -arrow-
- ☐ For correct version, refer to ⇒ Electronic parts catalogue

10 - Selector rod for 5th and 6th gear

11 - Thrust washer

- ☐ For 3rd speed selector gear

12 - Needle bearing

- ☐ For 3rd gear

13 - 3rd speed selector gear

- ☐ Insert spring before installing ⇒ [page 156](#)
- ☐ Check axial clearance after installing using feeler gauge (0.20 ... 0.50 mm)

14 - 3rd gear synchro-ring

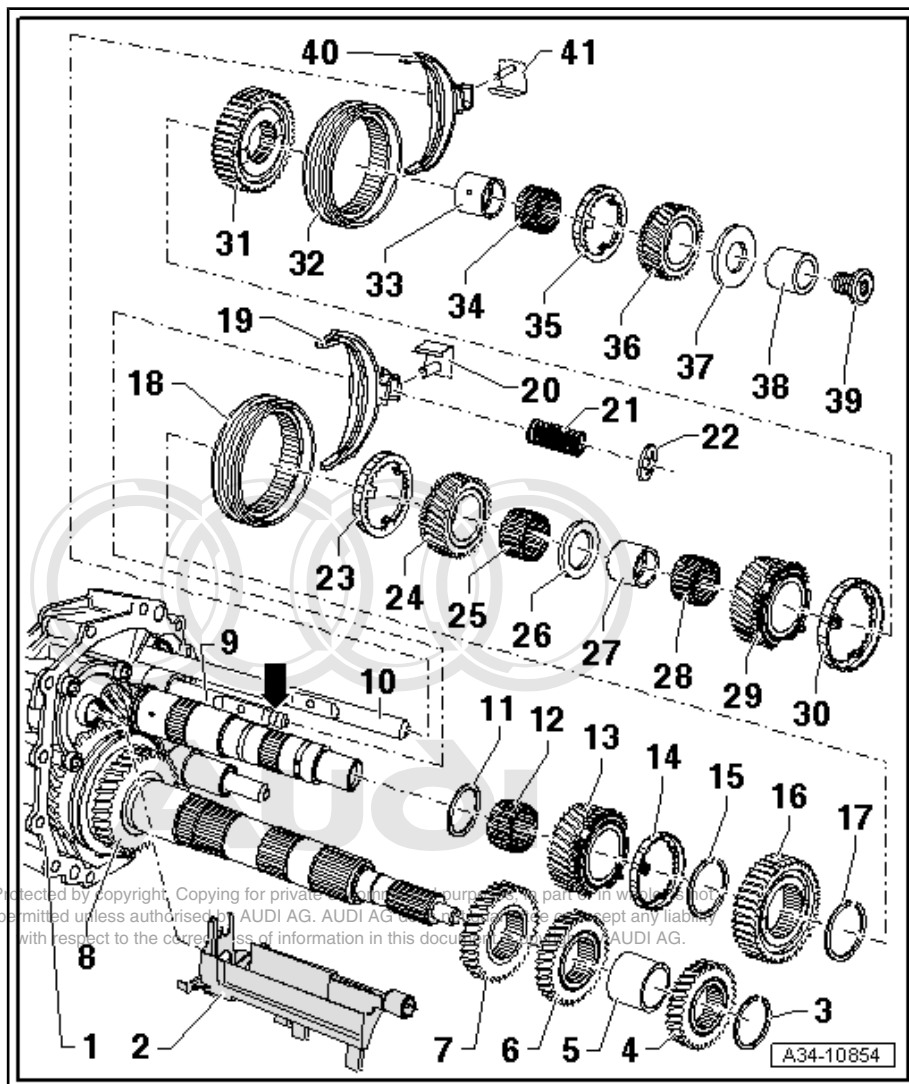
- ☐ Checking for wear ⇒ [page 156](#)

15 - Circlip

- ☐ Mark
- ☐ Do not interchange with other circlip ⇒ [Item 17 \(page 88\)](#)

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

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



17 - Circlip

- ☐ Do not interchange with other circlip ⇒ [Item 15 \(page 87\)](#)
- ☐ Re-determining thickness ⇒ [page 90](#)

18 - Locking collar for 3rd and 4th gear

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

19 - Selector fork for 3rd and 4th gear**20 - Pin with clip**

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

21 - Spring

- ☐ Not fitted on all versions
- ☐ For correct version, refer to ⇒ [Electronic parts catalogue](#)

22 - 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](#)

23 - 4th gear synchro-ring

- ☐ Checking for wear ⇒ [page 156](#)

24 - 4th speed selector gear

- ☐ Insert spring before installing ⇒ [page 156](#)
- ☐ Check axial clearance after installing using feeler gauge (0.20 ... 0.50 mm)

25 - Needle bearing

- ☐ For 4th gear

26 - Thrust washer

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

27 - Needle bearing inner race

- ☐ For 5th gear

28 - Needle bearing

- ☐ For 5th gear

29 - 5th speed selector gear

- ☐ Insert spring before installing ⇒ [page 156](#)
- ☐ Check axial clearance after installing using feeler gauge (0.20 ... 0.50 mm)

30 - 5th gear synchro-ring

- ☐ Checking for wear ⇒ [page 156](#)

31 - Synchro-hub for 5th and 6th gear**32 - Locking collar for 5th and 6th gear**

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

33 - Needle bearing inner race

- ☐ For 6th gear

34 - Needle bearing

- ☐ For 6th gear

35 - 6th gear synchro-ring

- ☐ Checking for wear ⇒ [page 156](#)

36 - 6th speed selector gear

- ☐ Insert spring before installing ⇒ [page 156](#)
- ☐ Check axial clearance after installing using feeler gauge (0.20 ... 0.50 mm)

37 - Thrust washer

- ☐ For 6th speed selector gear

38 - Inner race

- ☐ For roller bearing

39 - Multi-point socket head bolt

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

40 - Selector fork for 5th and 6th gear

41 - Pin with clip

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

6.6 Exploded view - removing and installing input shaft, pinion shaft, hollow shaft, reverse gear wheel and reverse selector gear

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⇒ **"6.7 Assembly sequence - dismantling and assembling gear-box", page 90**

1 - Bearing housing

2 - Reverse gear wheel

- ☐ With support for reverse shaft
- ☐ Exploded view - reverse gear wheel
⇒ [page 90](#)

3 - Bolt

- ☐ 30 Nm
- ☐ 3x

4 - Reverse gear selector fork

5 - Pin with clip

- ☐ For securing reverse gear selector fork to selector rod

6 - Circlip

- ☐ Install the thickest circlip that will still just fit.
- ☐ Re-determining thickness ⇒ [page 90](#)

7 - 3rd gear wheel

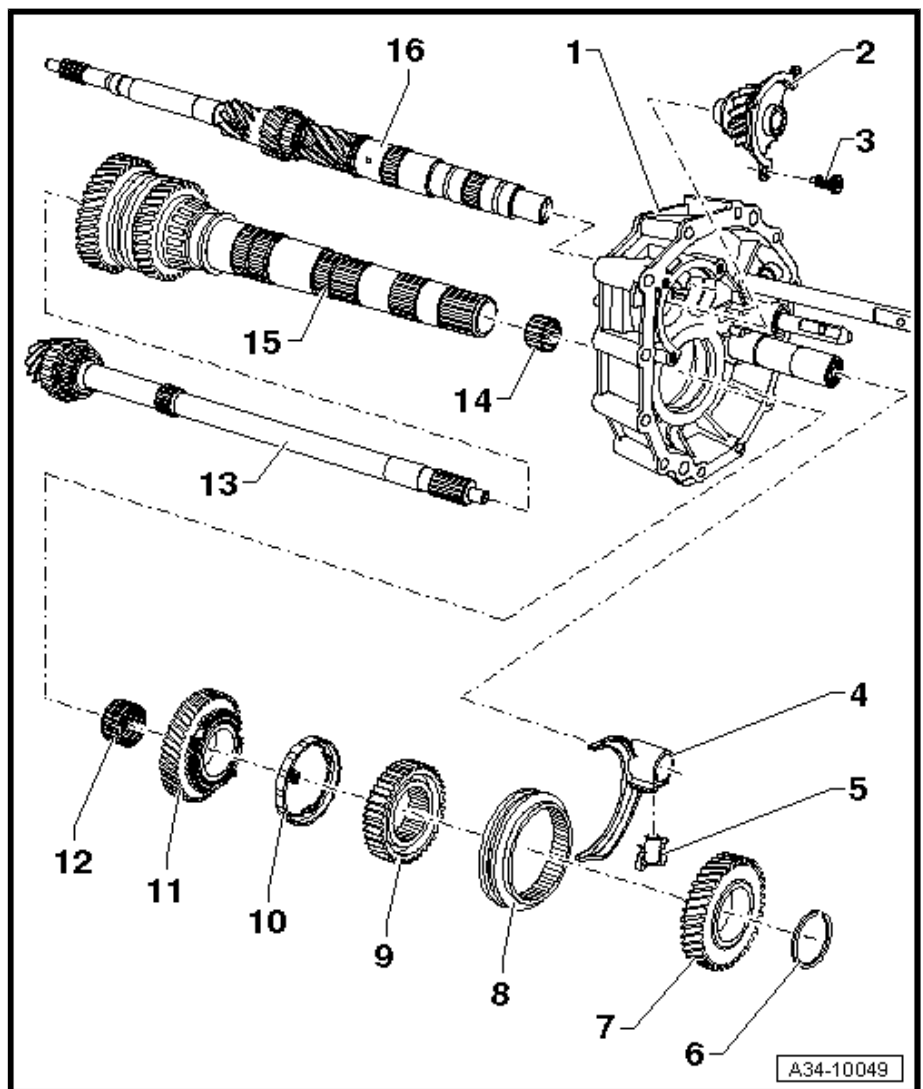
- ☐ Installation position: machined side faces reverse gear synchro-hub

8 - Reverse gear locking collar

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

9 - Reverse gear synchro-hub

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



10 - Synchro-ring for reverse gear

- ☐ Checking for wear ⇒ [page 164](#)

11 - Reverse selector gear

- ☐ Insert spring before installing ⇒ [page 164](#)
- ☐ Check axial clearance after installing using feeler gauge (0.20 ... 0.50 mm)

12 - Needle bearing

- ☐ For reverse gear

13 - Pinion shaft

- ☐ With inner race/double tapered roller bearing and needle bearing

- ☐ Dismantling and assembling ⇒ [page 161](#)

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14 - Needle bearing

- ☐ For pinion shaft/hollow shaft
- ☐ Remove needle bearing prior to pulling pinion shaft out of hollow shaft

15 - Hollow shaft

- ☐ With 1st speed and 2nd speed selector gears
- ☐ Dismantling and assembling ⇒ [page 161](#)

16 - Input shaft

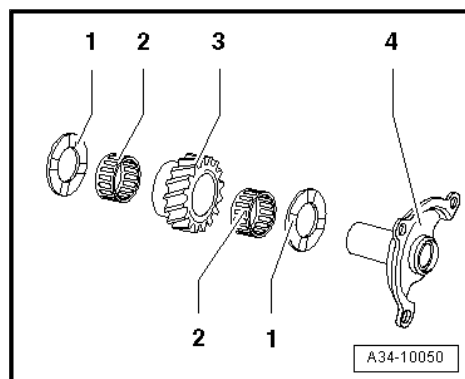
- ☐ Dismantling and assembling ⇒ [page 153](#)

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

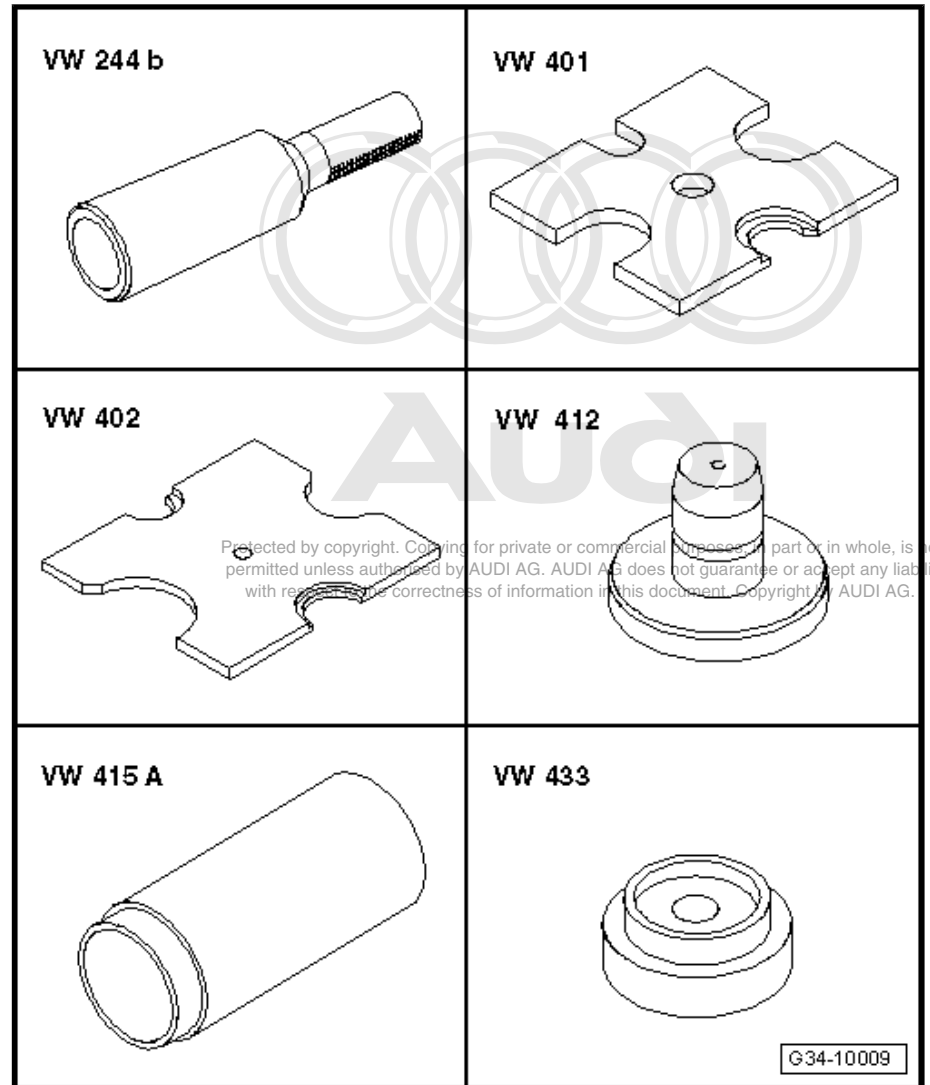


6.7 Assembly sequence - dismantling and assembling gearbox

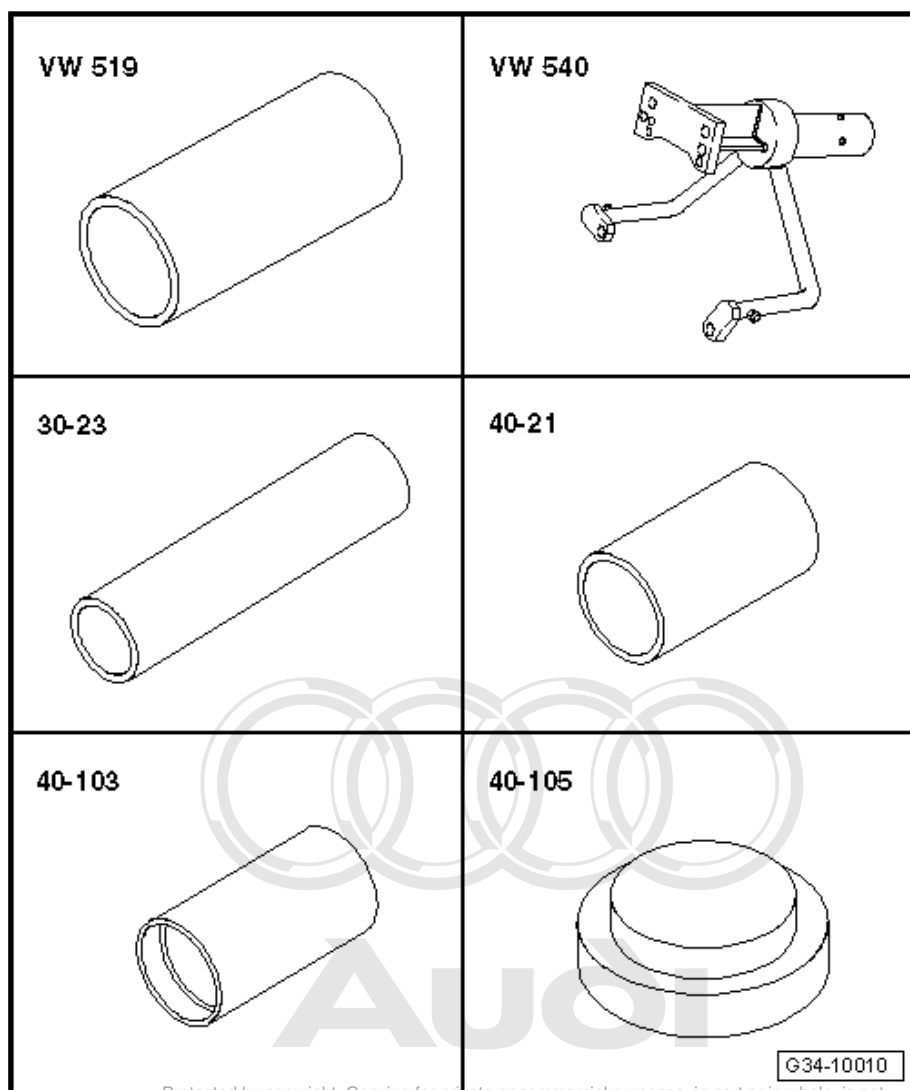
Removing and installing ball bearing for input shaft, centre differential housing, centre differential, gearbox cover, selector shaft and bearing housing with input shaft and pinion shaft/hollow shaft

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-

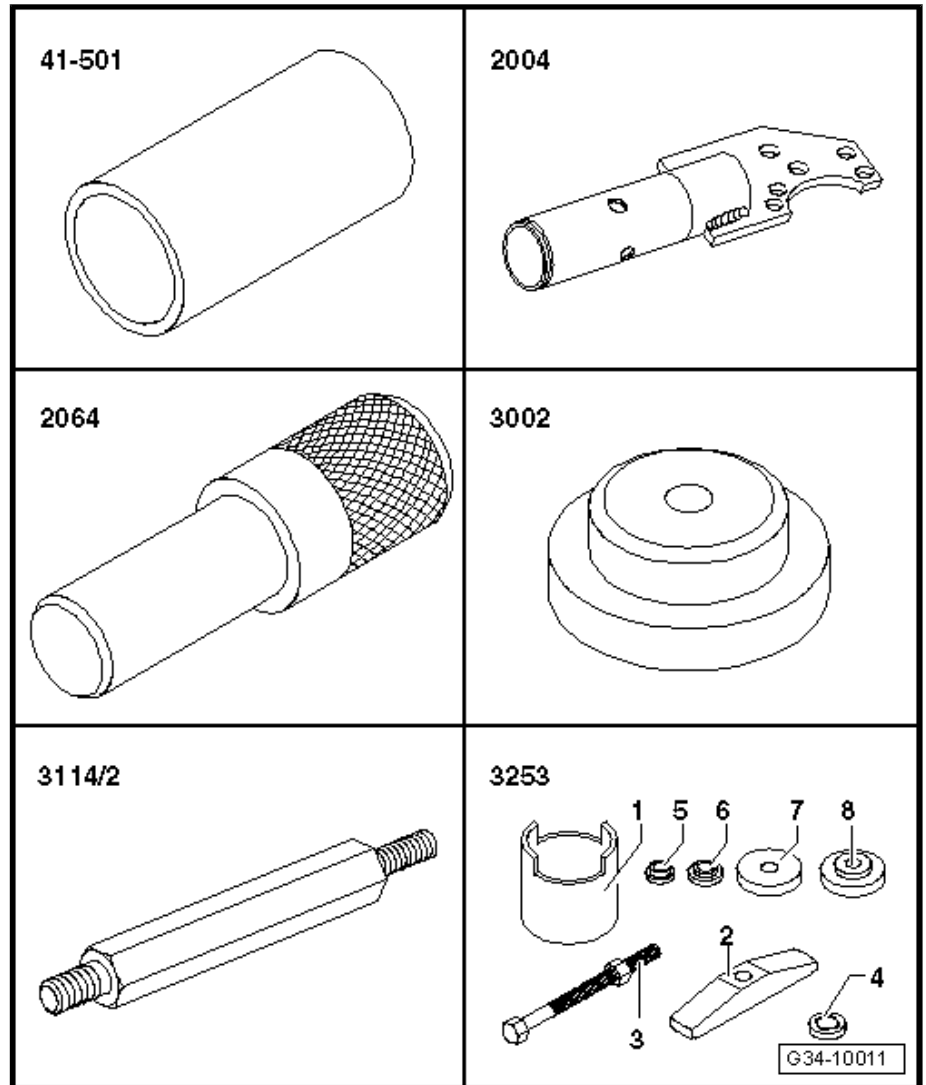


- ◆ Tube - VW 519-
- ◆ Engine and gearbox support - VW 540-
- ◆ Extension - 30 - 23-
- ◆ Press tool - 40 - 21-
- ◆ Support - 40 - 103-
- ◆ Thrust plate - 40 - 105-



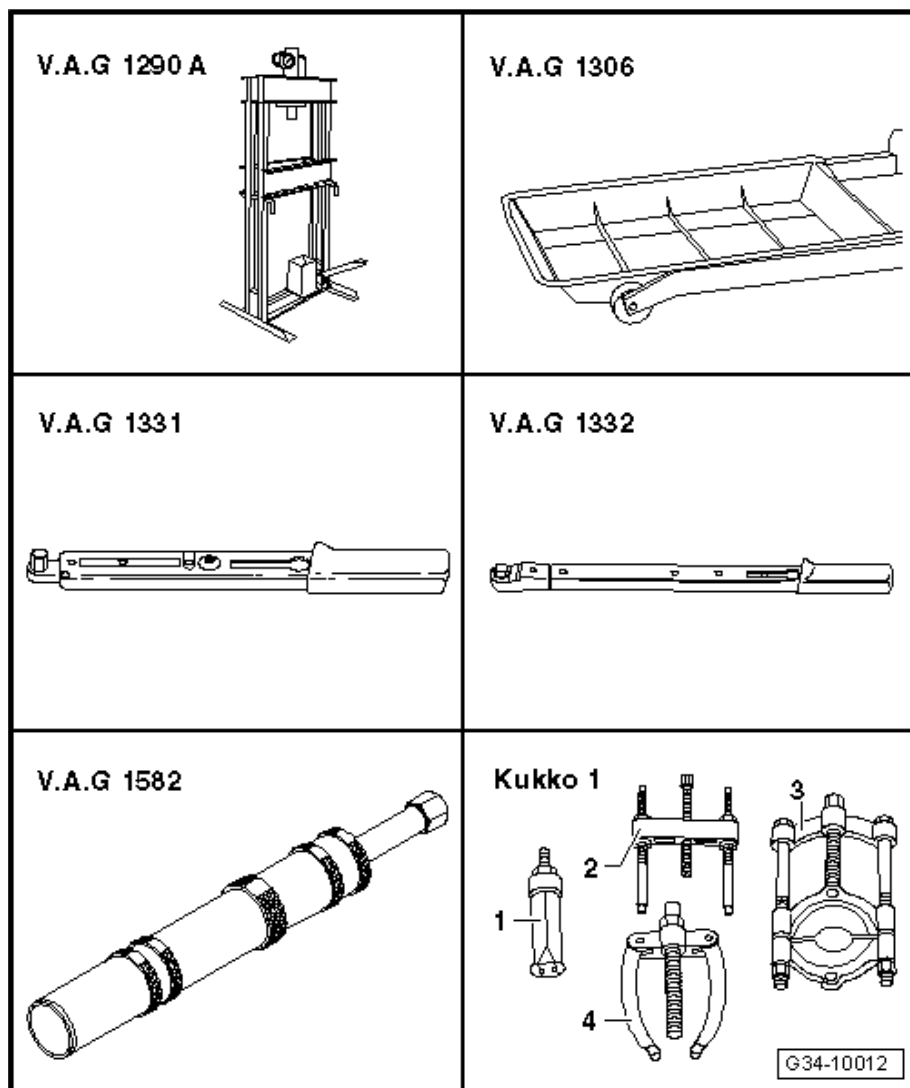
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- ◆ Drift sleeve - 41 - 501-
- ◆ Gearbox bracket - 2004-
- ◆ Locking pin - 2064-
- ◆ Thrust piece - 3002-
- ◆ Pin (M8 and M10) - 3114/2-
- ◆ Assembly tool - 3253-



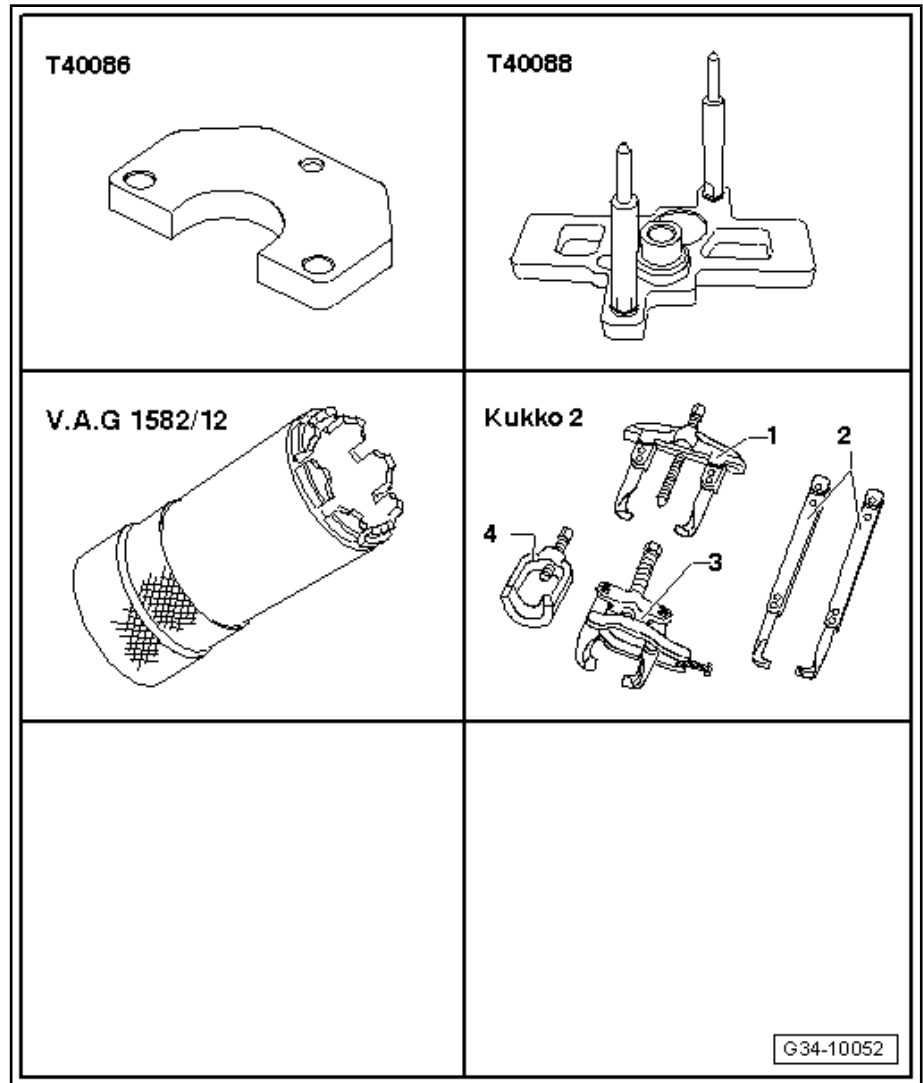
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- ◆ Workshop press - V.A.G 1290 A-
- ◆ Drip tray - V.A.G 1306- or drip tray for workshop hoist - VAS 6208-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-
- ◆ Tapered roller bearing puller - V.A.G 1582-
- ◆ -1- Internal puller - Kukko 21/2-
- ◆ -2- Puller - Kukko 18/2-

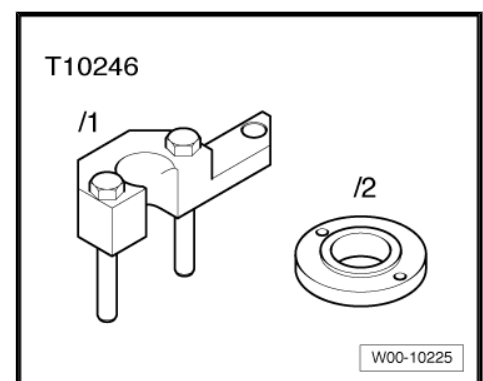


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- ◆ Plate - T40086-
- ◆ Plate - T40088/1-
- ◆ Sleeve - T40088/2-
- ◆ Adapter - V.A.G 1582/12-
- ◆ -1- Two-arm puller - Kukko 20/10-
- ◆ -2- Puller hook, length 200 mm
- ◆ -2- Puller hook, length 250 mm

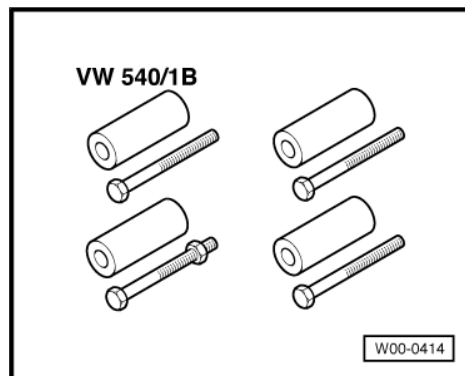


- ◆ Fitting tool - T10246-

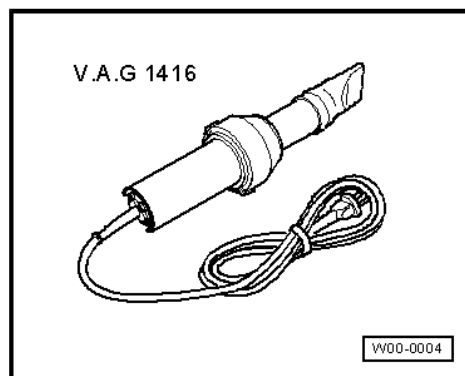


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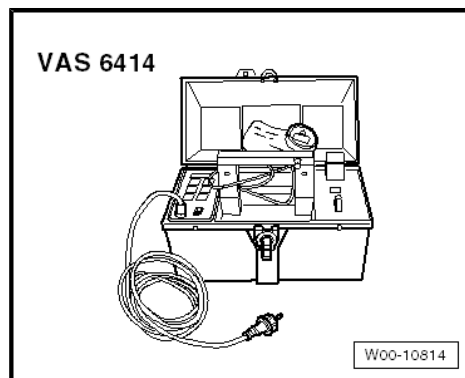
- ◆ Engine and gearbox support supplement - VW 540/1 B-



- ◆ Hot air blower - V.A.G 1416-



- ◆ Inductive heater - VAS 6414-



- ◆ Feeler gauge

- ◆ 2 bolts M8 (length 70 mm) with washers

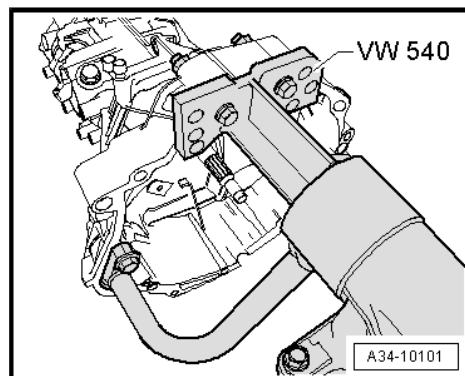
- ◆ Sealing paste - AMV 188 001 02-

- ◆ Assembly sleeve - 01E 311 120-

- ◆ Locking fluid - AMV 185 101 A1-

Dismantling gearbox

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



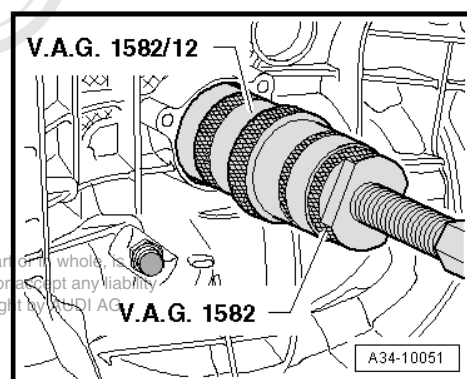
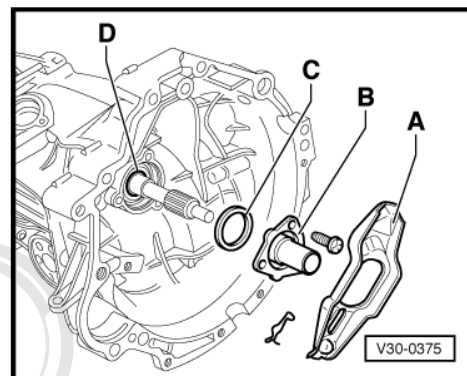
- Remove clutch release lever -A- together with release bearing.
- Remove guide sleeve -B-
- Remove dished spring -C-.
- Then remove circlip -D- in front of ball bearing for input shaft.



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.

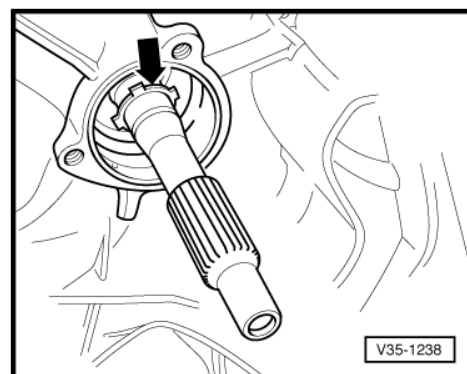


- Remove the circlip -arrow- behind the ball bearing for input shaft.



Note

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



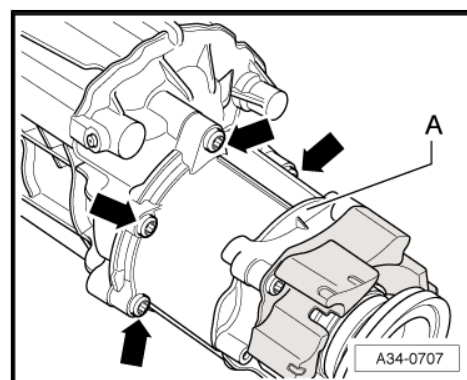
- Unscrew bolts -arrows- and detach centre differential housing -A-.



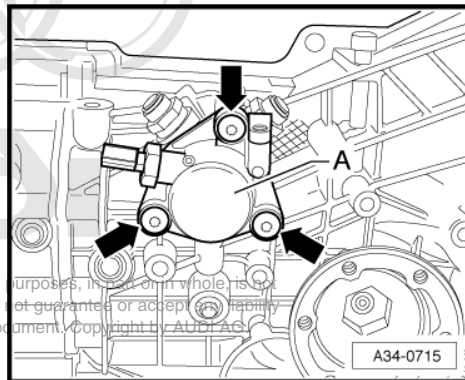
Note

The illustration shows only 4 of the 6 securing bolts.

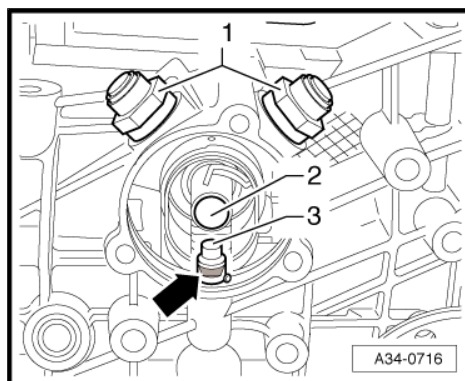
- Remove centre differential and spring from pinion shaft/hollow shaft.



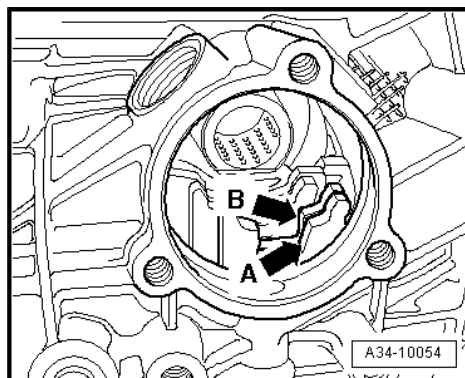
- Remove bolts -arrows- and take off selector shaft cover -A-.



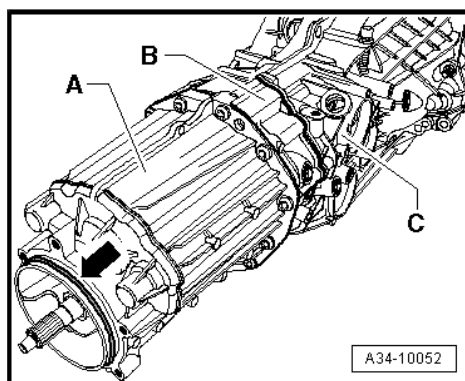
- Unscrew the two locking bolts -1- for selector shaft.
- Make sure that no gear has been engaged.
- Push selector shaft -2- into gearbox as far as it will go, simultaneously removing pin -3-.
- Pull out selector shaft.



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



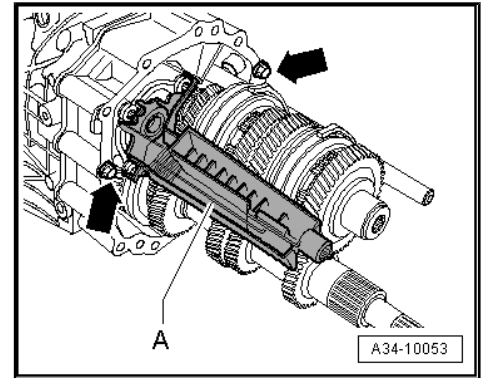
- Unscrew bolts securing gearbox cover -A- and bolts securing bearing housing -B- to gearbox housing -C-.
- Carefully pull gearbox cover towards rear and off. The bearing housing remains fitted to the gearbox housing.



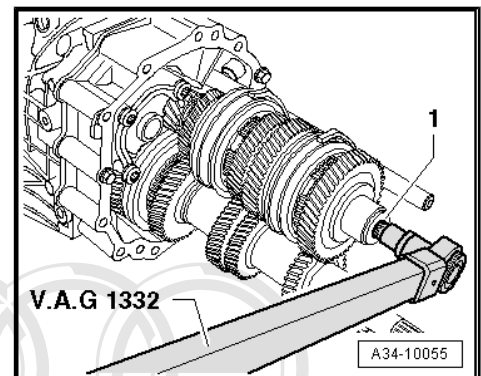
Note

Always renew O-ring -arrow- on gearbox cover.

- Secure bearing housing to gearbox housing -arrows- with two bolts M8 (length approx. 70 mm) and washers.
- Tighten the two bolts to max. 10 Nm.
- Detach oil collector -A-.



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



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

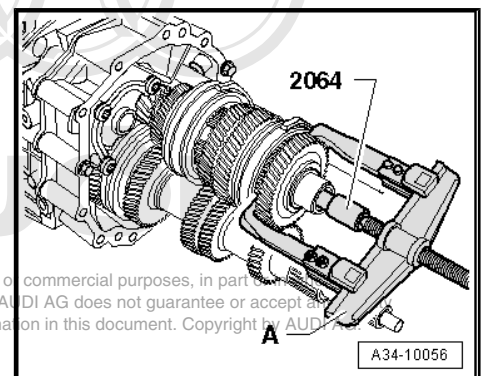
A - Two-arm puller , e.g. -Kukko 20/10-



Caution

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

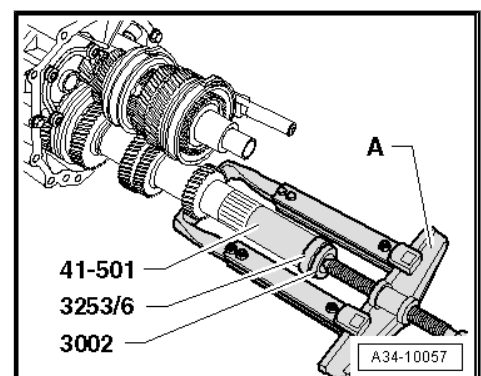
- **Hooks of two-arm puller must not come into contact with dog teeth of 6th speed selector gear during removal.**



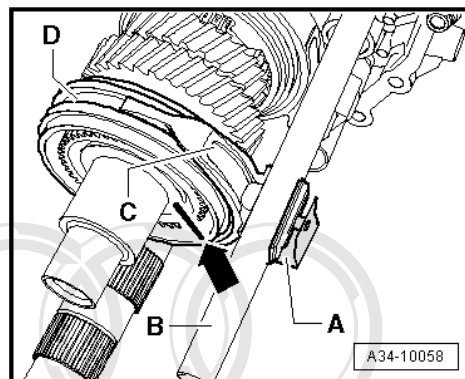
Note

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- with 200 mm hooks
- Remove spacer sleeve from hollow 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-.



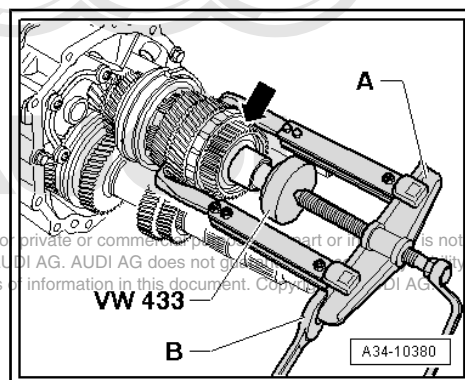
- Heat synchro-hub -arrow- for 5th and 6th gear to approx. 100° C using hot air blower - V.A.G 1416- .
- Pull off 5th speed selector gear together with needle bearing inner race for 6th gear and synchro-hub for 5th and 6th gear.

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.



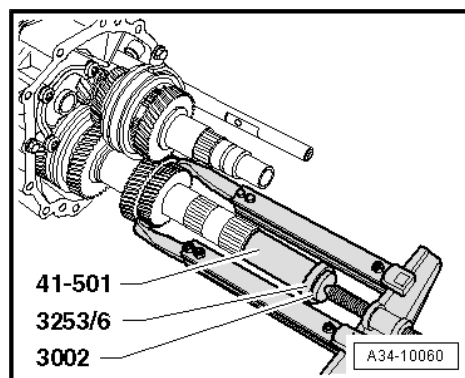
- Pull off 5th gear wheel.

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



Note

The 5th gear wheel can also be pulled off together with the 4th gear wheel ⇒ [page 100](#) .



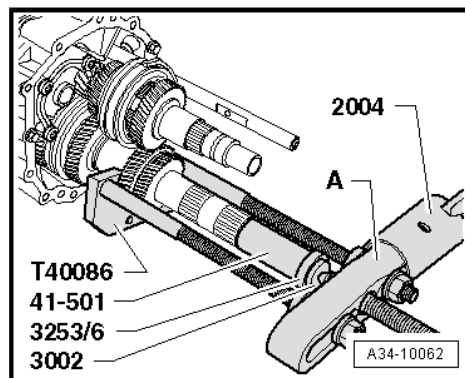
- Pull off 4th gear wheel.

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



Note

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



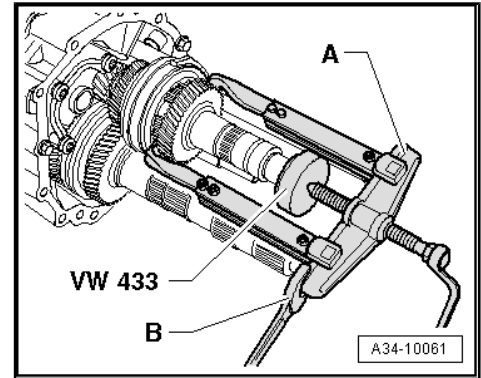
- Pull off 4th speed selector gear with needle bearing inner race for 5th gear and thrust washer.



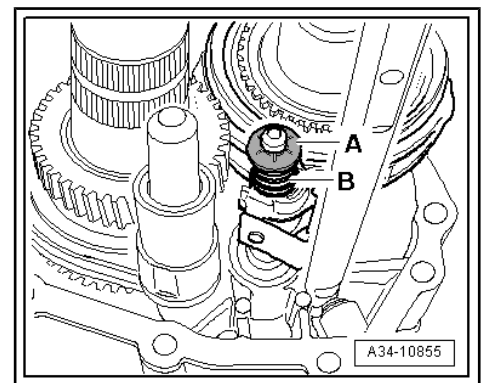
Caution

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

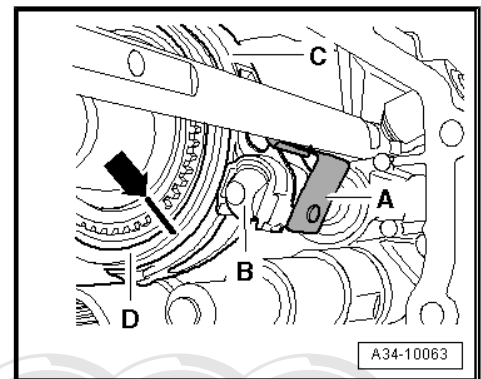
- Hooks of two-arm puller must not come into contact with dog teeth of 4th speed selector gear during removal.



- 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.

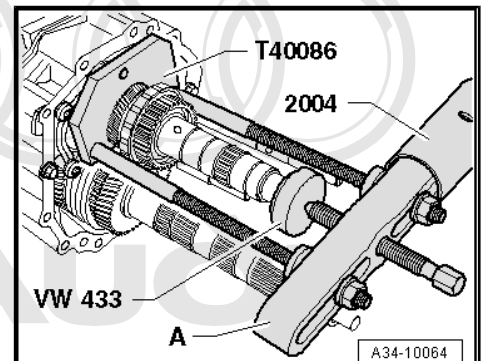
A - Puller, e.g. -Kukko 18/2-



Note

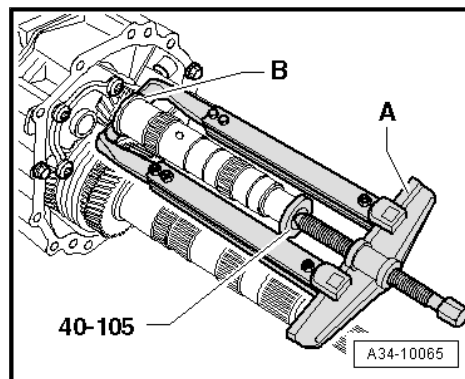
Counter-hold puller -A- using e.g. gearbox bracket -2004- to prevent plate -T40086- from making contact with 3rd gear wheel or selector rod for 5th and 6th gear.

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

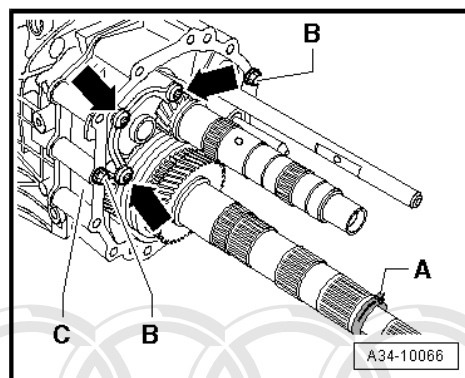


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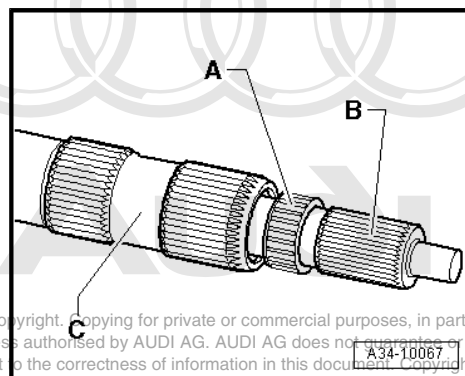
- Pull off thrust washer -B- for 3rd speed selector gear.
- A - Two-arm puller , e.g. -Kukko 20/10- with 250 mm hooks



- Unscrew bolts -arrows- for reverse shaft support.
- Prevent pinion shaft from falling out and secure onto hollow shaft using e.g. a hose clip -A-.
- Unscrew the two bolts -B- securing bearing housing to gear-box housing and detach bearing housing.
- Remove hose clip from pinion shaft.

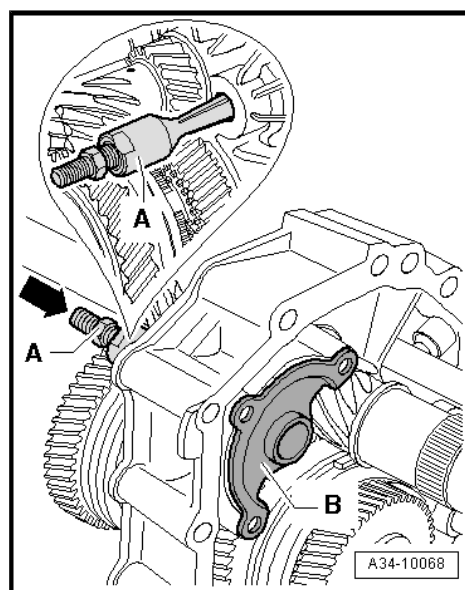


- Detach needle bearing -A- for pinion shaft -B- and pull out pinion shaft from hollow shaft -C-.



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- 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.



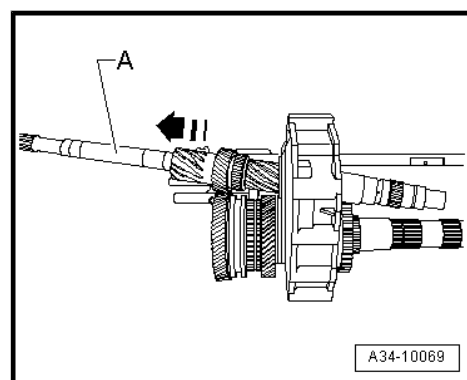
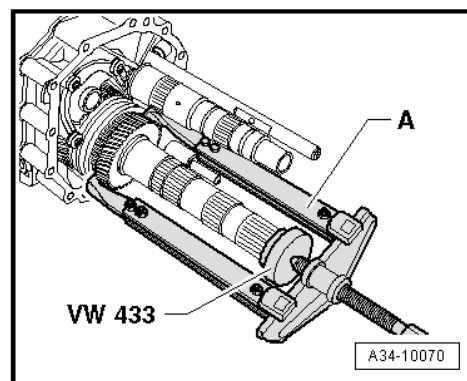
- Remove circlip for 3rd gear wheel and note thickness of circlip.
- Pull off 3rd gear wheel.

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

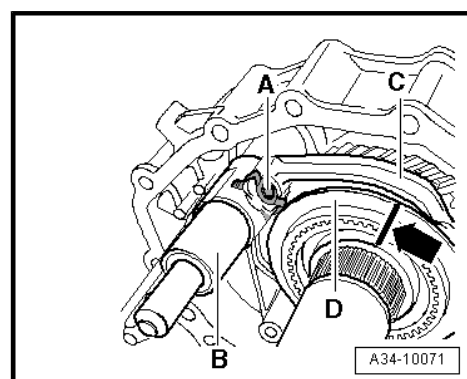


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- Now pull out input shaft -A- carefully from bearing housing at an angle from the front -direction of arrow-.



- 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-.



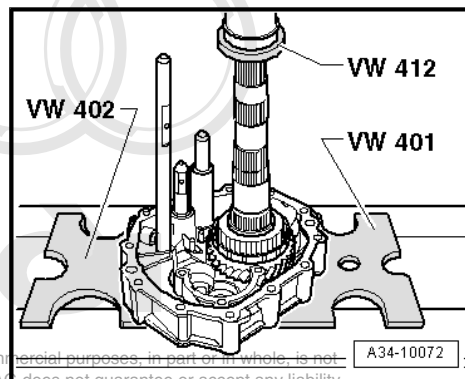
- Press off synchro-hub for reverse gear from hollow shaft.



Note

Place the bearing housing onto thrust plates - VW 401- and -VW 402- so that the hollow 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 hollow shaft out of selector fork for 1st and 2nd gear and bearing housing.



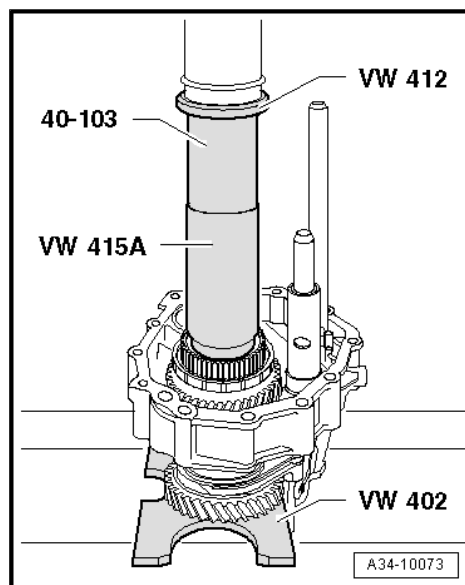
Assembling gearbox

- If the input shaft or the gearbox housing have been renewed, you must first re-determine the thickness of the input shaft circlips ⇒ [“1.3 Adjusting input shaft”, page 157](#) .

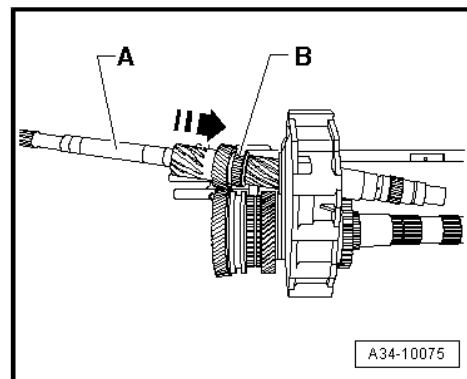


Note

- ◆ Lubricate all needle bearings with gear oil before fitting.
- ◆ Check synchro-rings for wear ⇒ [page 156](#)
- ◆ Insert spring in selector gear ⇒ [page 156](#)
- ◆ Heat gear wheels, needle bearing inner races and synchro-hubs to 130 °C (max.) before pressing on (wear protective gloves).
- Insert hollow 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 hollow 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.

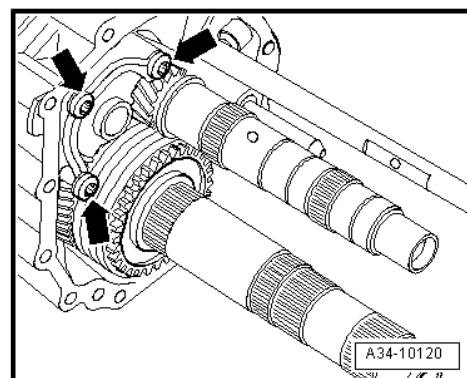


- Now insert input shaft -A- with roller bearing -B- into bearing housing in -direction of arrow- at an angle towards the rear.



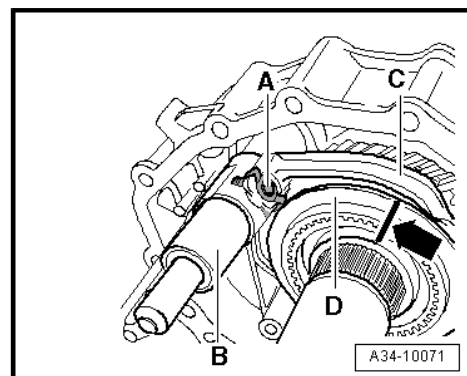
- Install reverse gear wheel and tighten 3 bolts -arrows- for reverse shaft support to specified torque ⇒ [Item 3 \(page 89\)](#).

Exploded view - reverse gear wheel ⇒ [page 90](#)



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- 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-.

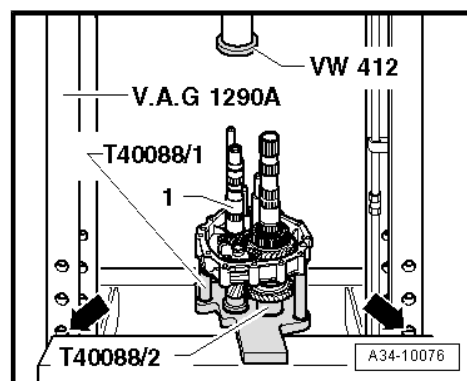


- Align work table of workshop press - V.A.G 1290 A- so that the 3rd bore -arrow- is visible above the work surface.
- Place holding plate - T40088/1- with sleeve - T40088/2- onto work table.
- Insert bearing housing with shafts and selector rods into holding plate - T40088/1-.



Note

The distance between input shaft -1- and press tool - VW 412- should be approx. 210 mm, so that it is possible to perform the following work steps without changing the position of the work table.



- 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 hollow shaft:

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

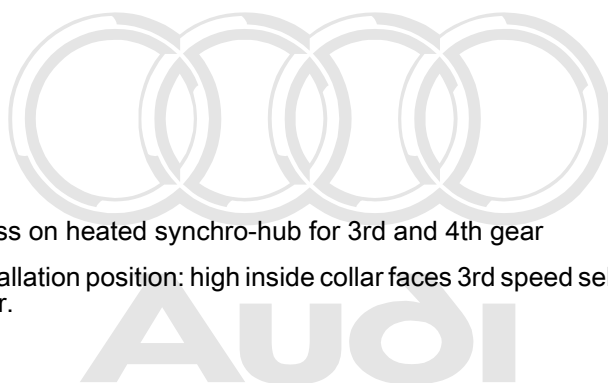
- Determine the thickest circlip that will just fit and install it. For part number refer to ⇒ Electronic parts catalogue .

The following circlips are available:

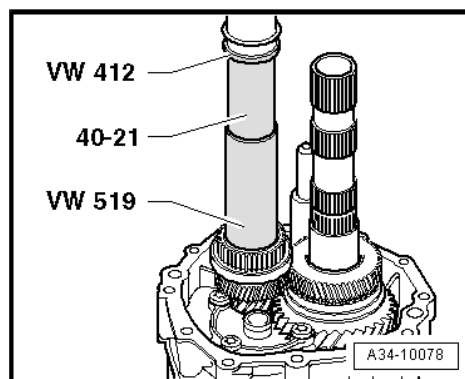
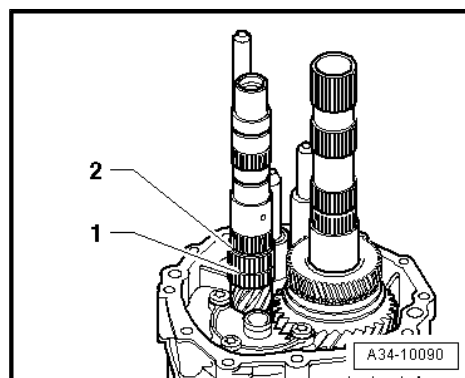
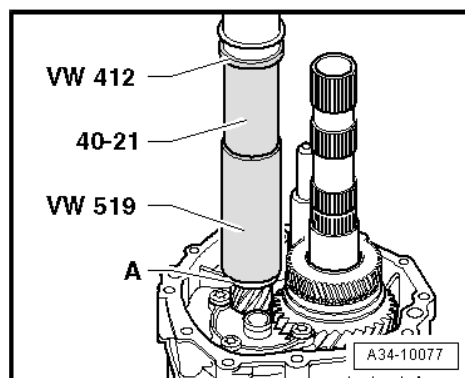
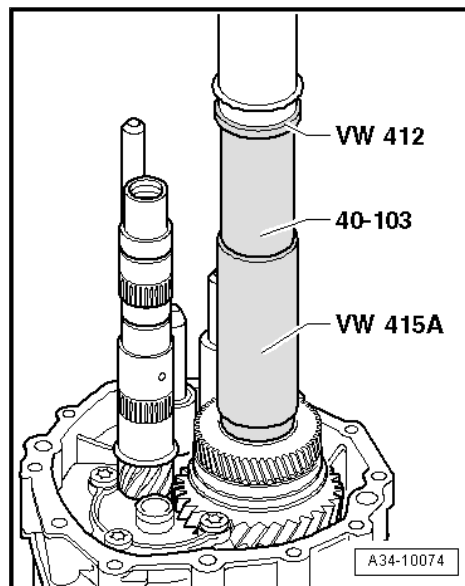
Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	2.10

- 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.



- 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.

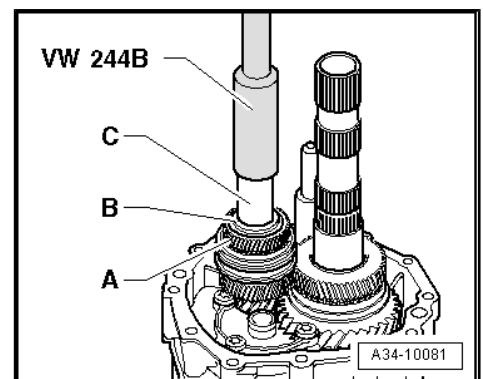
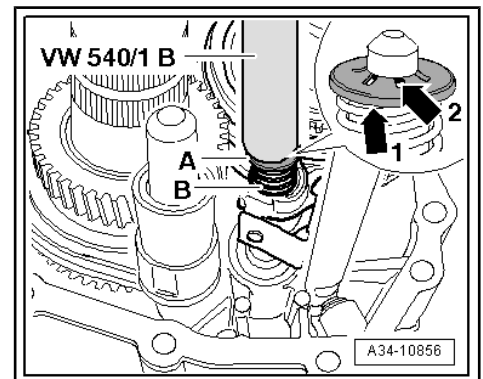
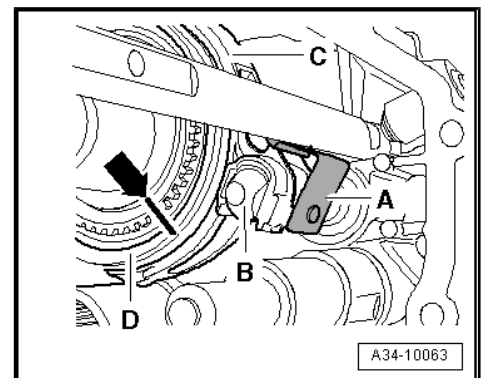
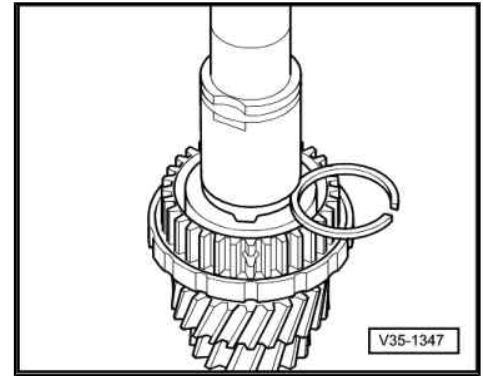
- If previously fitted, install spring -B- on selector rod for 3rd and 4th gear and drive on clamping washer -A-.
- Engage 3rd gear before driving on clamping washer -A-.
- Installation position of clamping washer: collar -arrow 1- faces spring -B-.
- Clamping washer must engage below shoulder -arrow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



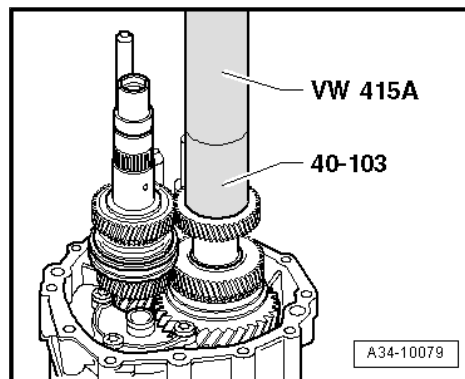
Note

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

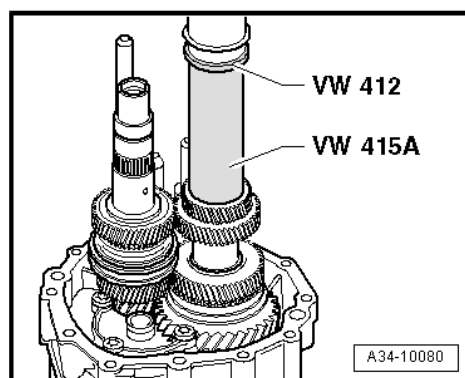
- Fit 4th speed selector gear -A- with spring, synchro-ring, needle bearing and thrust washer for 3rd and 4th gear -B-.
- Press on heated inner race -C- for needle bearing for 5th speed selector gear.
- Check axial clearance of 4th speed selector gear.



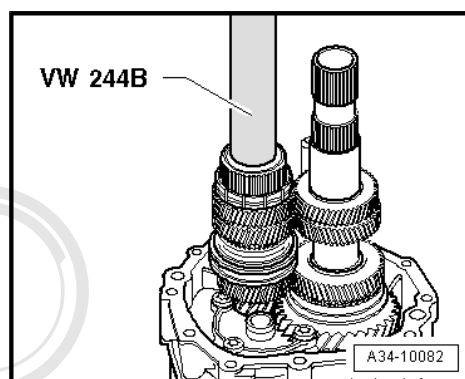
- Heat 4th gear wheel and press on.
- Installation position: high inside collar faces 5th gear wheel.



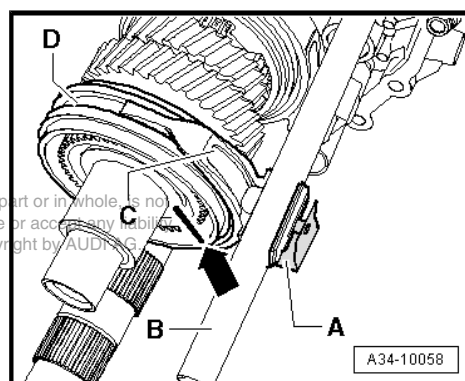
- Heat 5th gear wheel and press on.
- Installation position: high inside collar faces 4th gear.



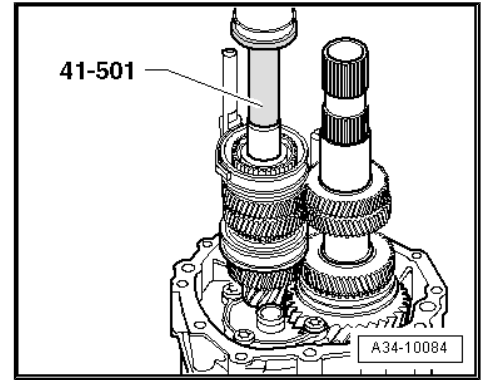
- Place 5th speed selector gear with spring, synchro-ring and needle bearing onto input shaft.
- The lugs on the synchro-ring should engage into the recesses in the selector gear.
- Fit and press on heated synchro-hub for 5th and 6th gear.
- Check axial clearance of 5th speed selector gear.



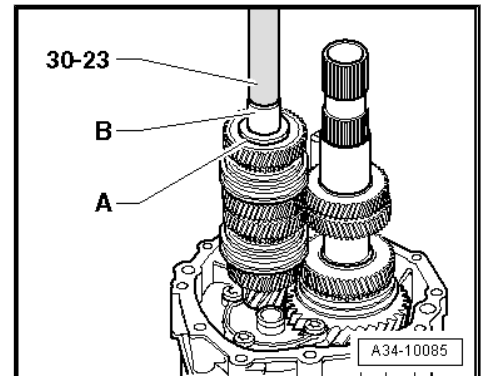
- Slide selector fork for 5th and 6th gear -C- together with locking collar -D- onto synchro-hub for 5th and 6th gear.
- The markings on locking collar and synchro-hub -arrow- must coincide.
- Move selector fork for 5th and 6th gear -C- into selector rod -B-.
- If the bores of selector fork and selector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



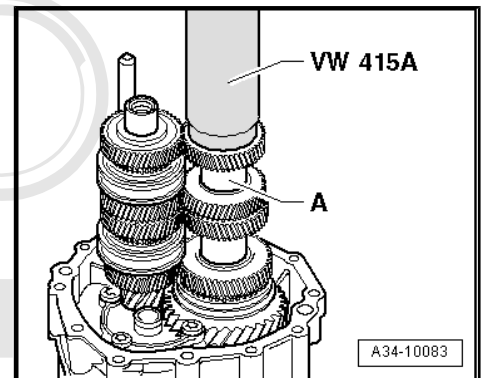
- Press on heated inner race for needle bearing for 5th speed selector gear.



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



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



Insert circlip -A- for 6th gear wheel!

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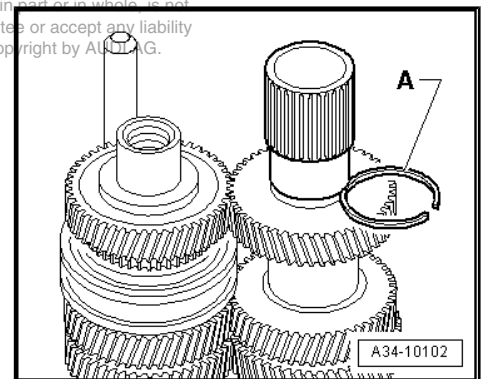
- When renewing gear wheel or hollow shaft:

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 .

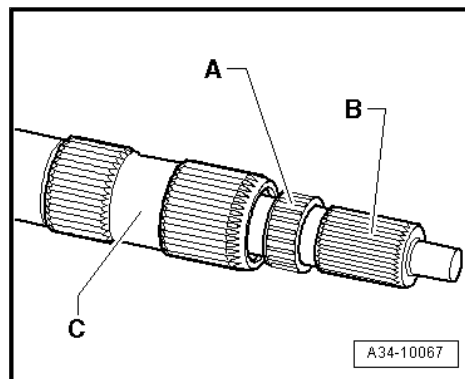
The following circlips are available:

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- .

- Push pinion shaft -B- with large needle bearing into hollow shaft -C- and fit small needle bearing -A-.
- Prevent pinion shaft from falling out and secure on hollow shaft using e.g. a hose clip ⇒ [page 102](#).

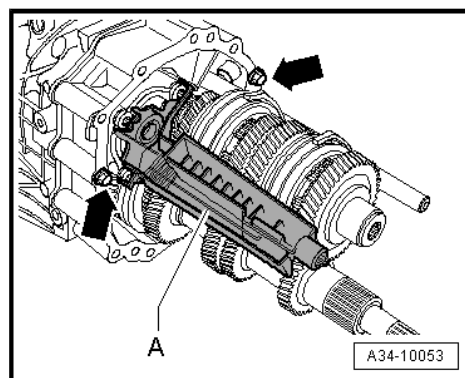


- Secure bearing housing to gearbox housing with two bolts M8 (length approx. 70 mm) -arrows- and washers.
- Tighten the two bolts to max. 10 Nm.

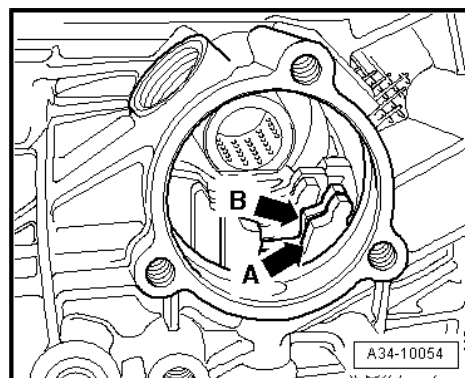


Note

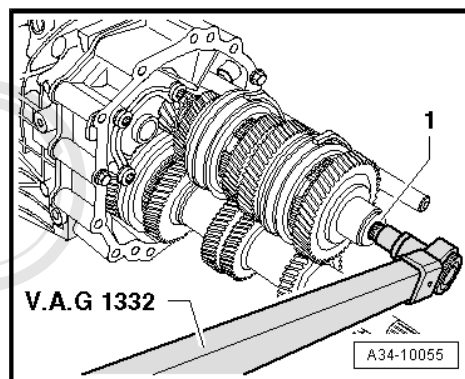
Do not install oil collector -A- at this stage.



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



- Tighten multi-point socket head bolt -1- for input shaft to specified torque ⇒ [Item 39 \(page 89\)](#).
- Then remove the complete bearing housing from the gearbox housing.
- Check that the two dowel sleeves for centralising the bearing housing are fitted in the gearbox 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.



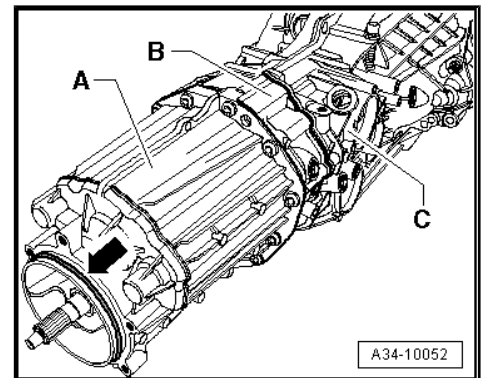
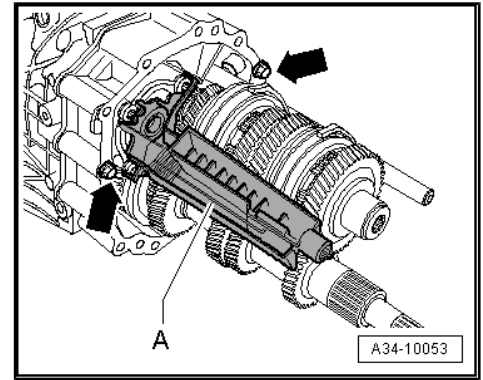
- Clip oil collector -A- into reverse shaft support.



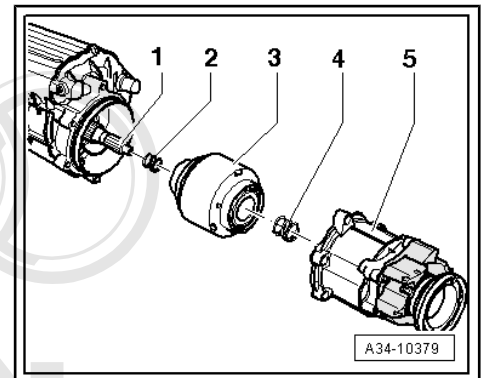
Note

Make sure that the bolts -arrows- are removed.

- Remove hose clip from pinion shaft ⇒ [page 102](#) .
- Check that the two dowel sleeves for centralising the gearbox cover are fitted in the bearing housing.
- Apply sealing paste - AMV 188 001 02- evenly and not too thickly onto contact surfaces between bearing housing and gearbox cover.
- Tighten bolts securing gearbox cover -A- and bearing housing -B- to gearbox housing -C- to specified torque ⇒ [Item 18 \(page 84\)](#) .
- Fit new O-ring -arrow- and lubricate lightly with gear oil.



- Place small spring -2- and centre differential -3- onto pinion shaft/hollow shaft -1-.
- Insert large spring -4-.
- Then fit centre differential housing -5- onto gearbox cover.



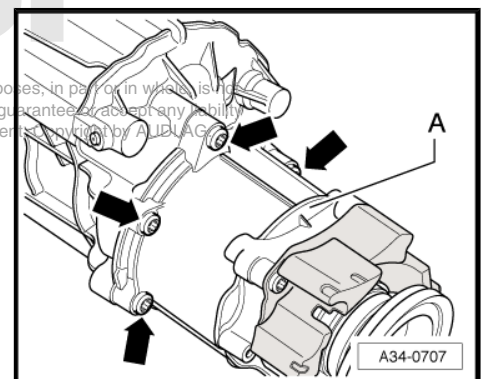
- Tighten bolts -arrows-. Tightening torque ⇒ [Item 2 \(page 85\)](#)



Note

The illustration shows only 4 of the 6 bolts.

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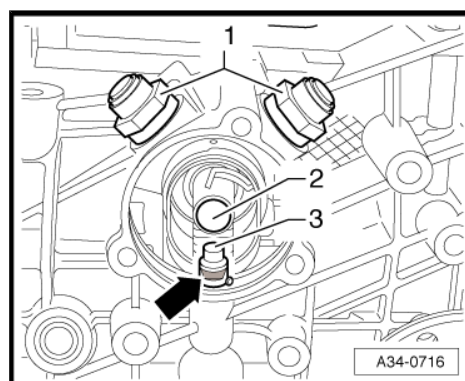
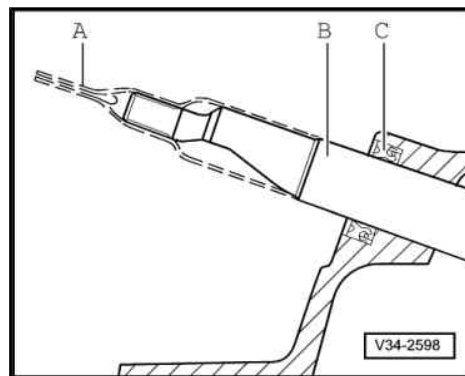
- Push assembly sleeve - 01E 311 120- -A- onto selector shaft -B-.



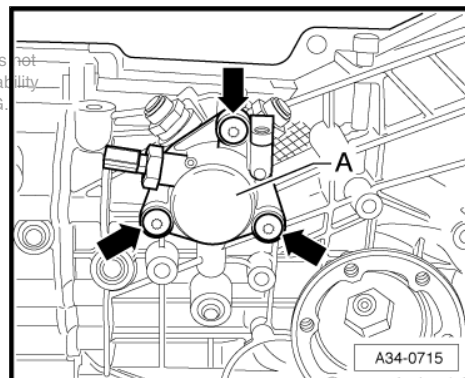
Note

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-: The 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 \(page 83\)](#).



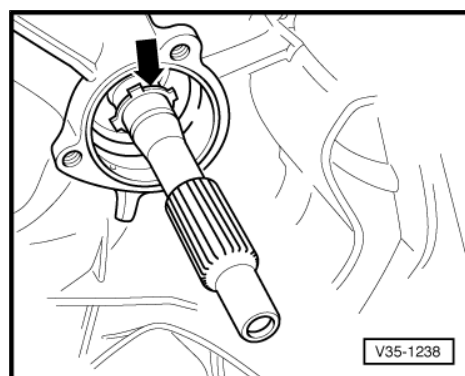
- Fit cover -A- with new O-ring.
- Clean threads of bolts -arrows- with a wire brush. Then install bolts with locking fluid - AMV 185 101 A1- and tighten to specified torque ⇒ [Item 13 \(page 84\)](#).



- 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.



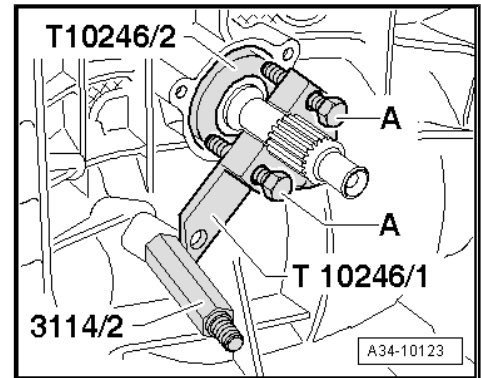
- Pressing in ball bearing:

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).

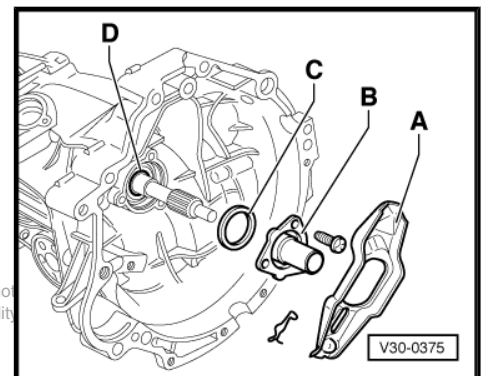


- Now fit front circlip -D- for input shaft ball bearing.
- Then fit dished spring -C-.

Installation position:

The convex side faces guide sleeve -B-.

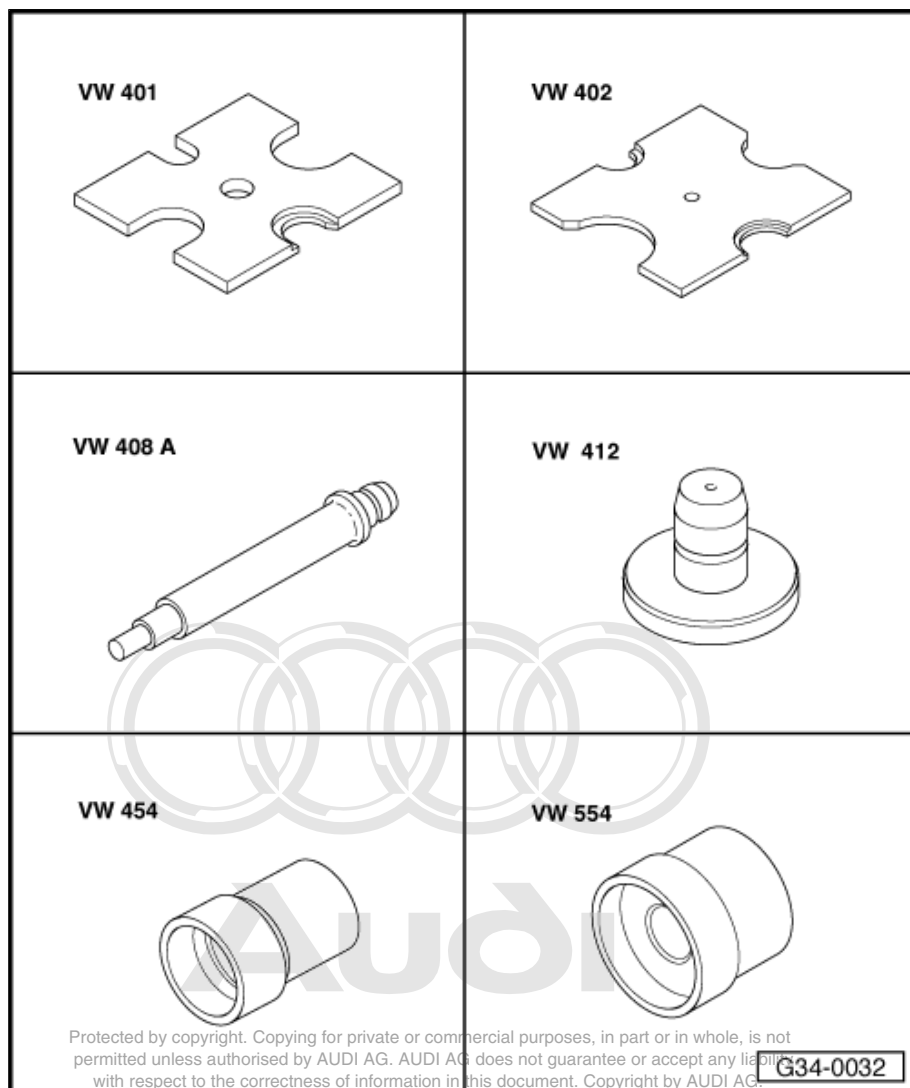
- Fit a shrink hose onto input shaft splines.
- Fit guide sleeve -B- for release bearing ⇒ [page 29](#) .
- ~~Remove shrink hose.~~
- Fit clutch release lever -A- with release bearing ⇒ [page 29](#) .
- Select all gears.



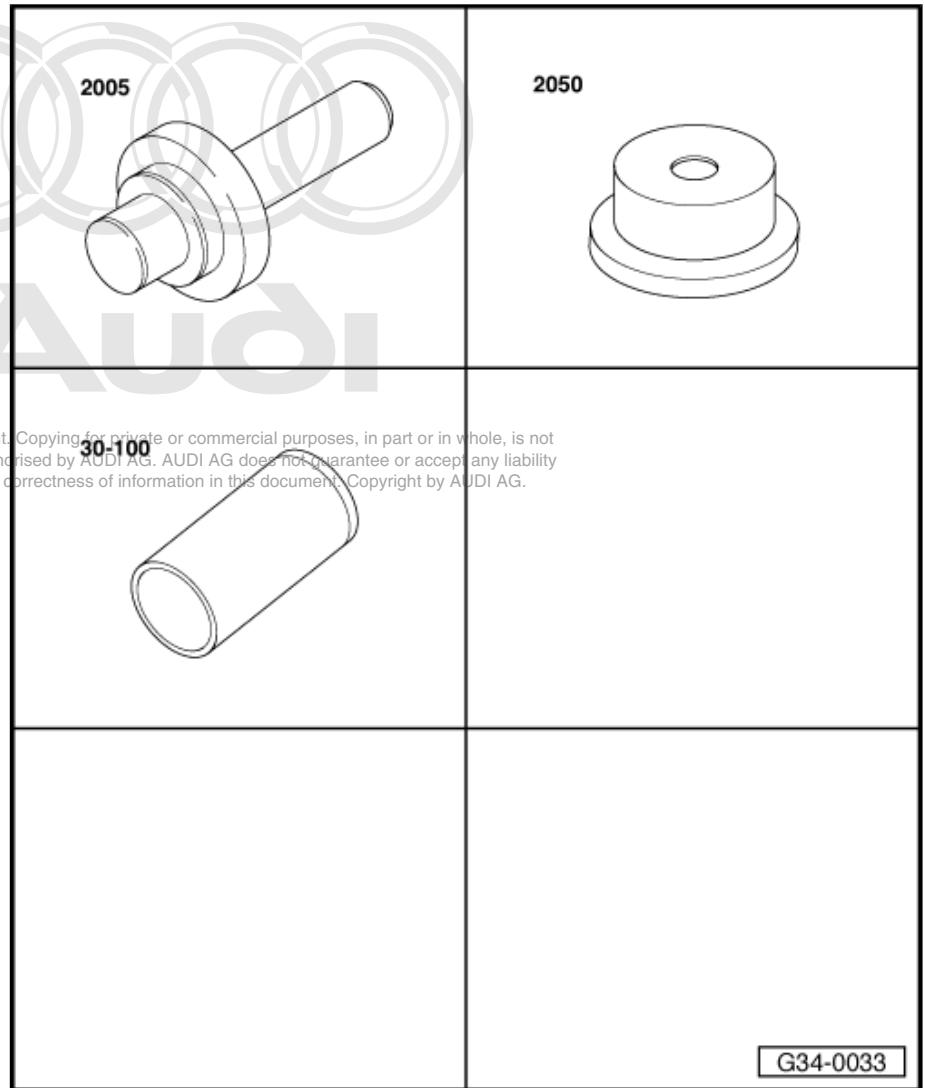
7 Exploded view - dismantling and assembling centre differential housing

Special tools and workshop equipment required

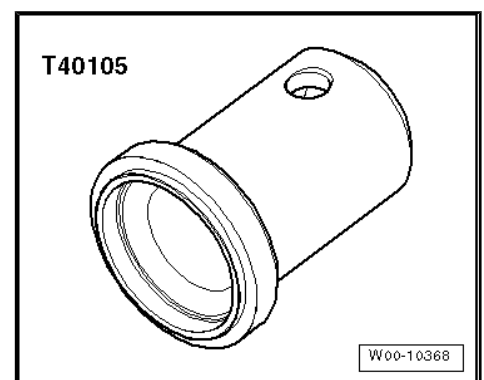
- ◆ Thrust plate - VW 401-
- ◆ Thrust plate - VW 402-
- ◆ Press tool - VW 408 A-
- ◆ Press tool - VW 412-
- ◆ Press tool - VW 454-
- ◆ Press tool - VW 554-



- ◆ Punch - 2005-
- ◆ Thrust piece - 2050-
- ◆ Drift sleeve - 30 - 100-



- ◆ Thrust piece - T40105-



- ◆ Shim - 016 311 391 A-
- ◆ Locking fluid - AMV 185 101 A1-
- ◆ Sealing grease - G 052 128 A1-



Note

Due to the introduction of an oil seal with additional dust lip (from manufacture date 30 08 4 onwards) ⇒ [page 121](#) , the flange shaft ⇒ [page 121](#) was provided with a groove. Select correct components from ⇒ [Electronic parts catalogue](#) .

1 - Flange shaft (rear)

- ☐ Without vibration damper
- ☐ Modification: from manufacture date 30 08 4 onwards with groove ⇒ [page 121](#)
- ☐ Select correct components from ⇒ [Electronic parts catalogue](#)
- ☐ Pressing out ⇒ [page 120](#)
- ☐ Pressing in ⇒ [page 121](#)

2 - Needle bearing

- ☐ Pull out of flange shaft (rear) using internal puller - Kukko 21/1- and counter-support - Kukko 22/1-
- ☐ Press into flange shaft (rear) as far as it will go using press tool - VW 408 A-

3 - Bolt

- ☐ 15 Nm and then turn 90° further
- ☐ For vibration damper
- ☐ 3x
- ☐ Apply locking fluid - AMV 185 101 A1- when fitting

4 - Vibration damper

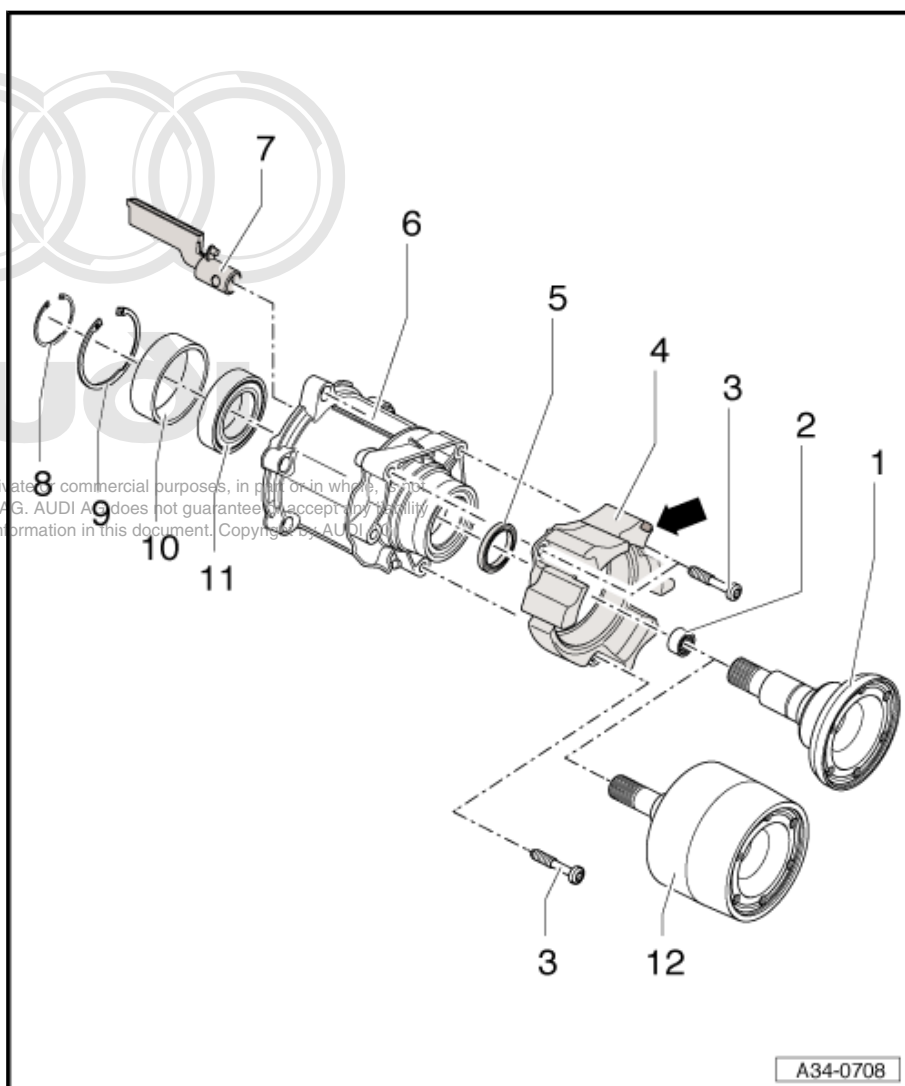
- ☐ Not fitted on all versions
- ☐ Select correct part according to colour marking -arrow- or gearbox code ⇒ [Electronic parts catalogue](#)

5 - Oil seal

- ☐ For flange shaft (rear)
- ☐ ⇒ ["7.2 Renewing oil seal and ball bearing for flange shaft \(rear\)", page 120](#)
- ☐ Levering out ⇒ [page 121](#)
- ☐ Preparing for installation (up to manufacture date 29 08 4) ⇒ [page 122](#)
- ☐ Driving in (up to manufacture date 29 08 4) ⇒ [page 122](#)
- ☐ Modification: from manufacture date 30 08 4 onwards with additional dust lip ⇒ [page 121](#)
- ☐ Driving in (from manufacture date 30 08 4 onwards) ⇒ [page 122](#)
- ☐ Select correct components from ⇒ [Electronic parts catalogue](#)

6 - Centre differential housing

- ☐ Removing and installing (with gearbox removed) ⇒ [page 90](#)
- ☐ Removing and installing (with gearbox installed) ⇒ [page 117](#)



7 - Oil collector

- ☐ Insert in hole on gearbox cover

8 - Circlip

- ☐ For flange shaft (rear)
- ☐ Installation position ⇒ [page 123](#)

9 - Circlip

- ☐ For ball bearing and sleeve
- ☐ Installation position ⇒ [page 123](#)

10 - Sleeve

- ☐ Can be removed and installed by hand once the circlip has been removed ⇒ [Item 9 \(page 117\)](#)

11 - Ball bearing

- ☐ For flange shaft (rear)
- ☐ ⇒ [“7.2 Renewing oil seal and ball bearing for flange shaft \(rear\)”, page 120](#)
- ☐ Pressing out ⇒ [page 122](#)
- ☐ Pressing in ⇒ [page 123](#)

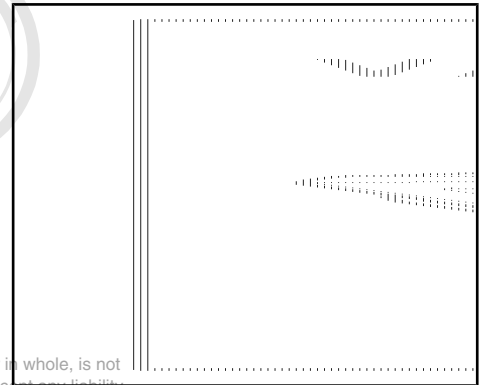
12 - Flange shaft (rear) with vibration damper

- ☐ Not fitted on all versions
- ☐ Only renew as complete unit
- ☐ Pressing out ⇒ [page 120](#)
- ☐ Pressing in ⇒ [page 121](#)

7.1 Removing and installing centre differential housing and centre differential with gearbox installed

Special tools and workshop equipment required

- ◆ Drip tray for workshop hoist - VAS 6208-



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Removing

- Disconnect exhaust system at clamps -arrows-.



Note

- ♦ The flexible pipe connection (de-coupling element) in the front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.
- ♦ The illustration shows the exhaust system in conjunction with the 3.0 ltr. V6 petrol engine.

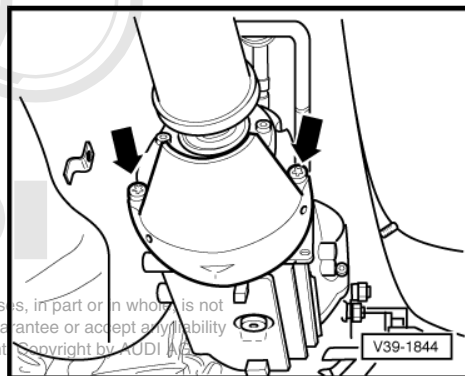
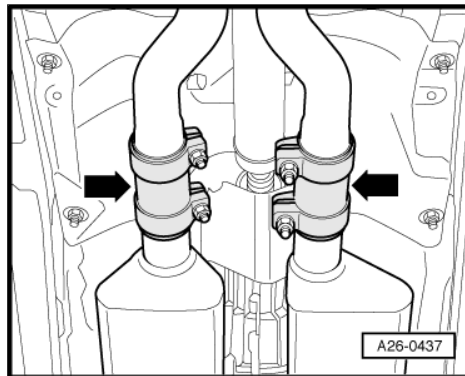
- Disengage rear section of exhaust system at rubber mountings and remove.



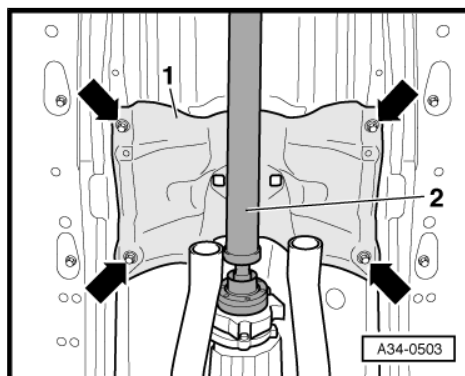
Note

A second mechanic is required for removing the rear section of the exhaust system.

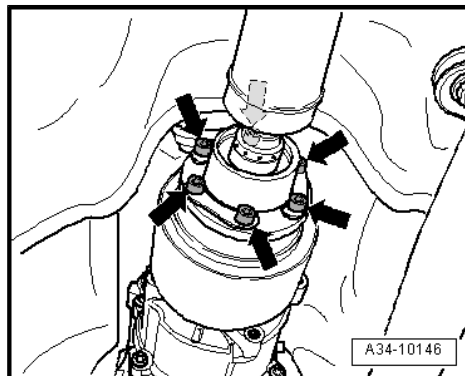
- If fitted, unbolt heat shield for propshaft -arrows-.



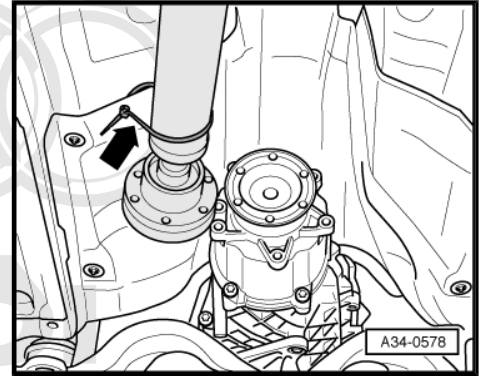
- Remove heat shield -1- for exhaust system below selector mechanism -arrows-.



- Remove bolts -arrows- at gearbox/propshaft flange.
- Slide propshaft together towards rear final drive. The constant velocity joints can be moved axially.



- Tie propshaft up to side onto heat shield -arrow-.
- Place drip tray e.g. -VAS 6208- under the gearbox.
- Drain off gear oil.



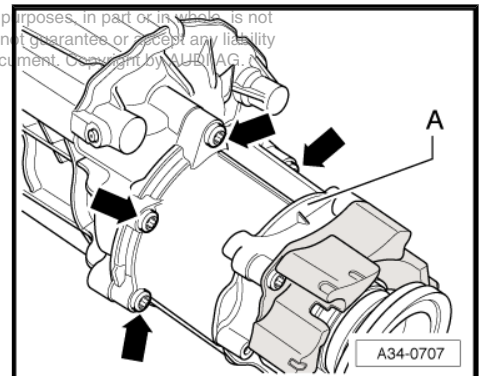
- Unscrew bolts -arrows- and carefully detach centre differential housing -A-.



Note

The illustration shows only 4 of the 6 securing bolts.

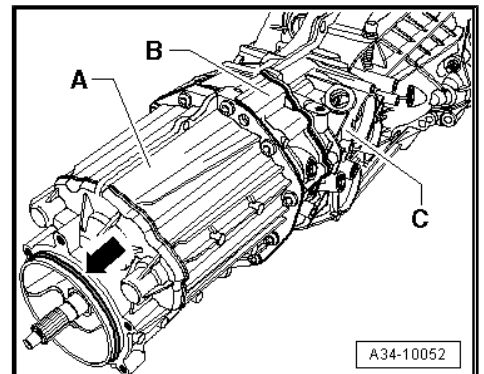
- Remove centre differential and spring from pinion shaft/hollow shaft.



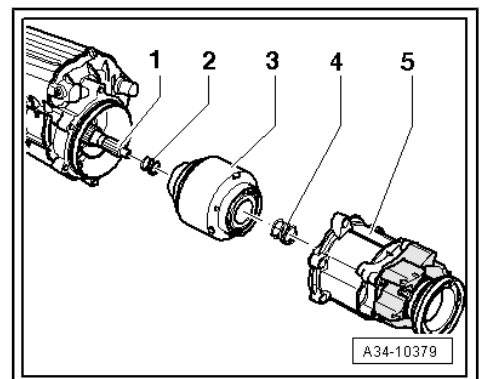
Installing

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

- Fit new O-ring -arrow- and lubricate lightly with gear oil.



- Place small spring -2- and centre differential -3- onto pinion shaft/hollow shaft -1-.
- Insert large spring -4-.
- Then fit centre differential housing -5- onto gearbox cover.



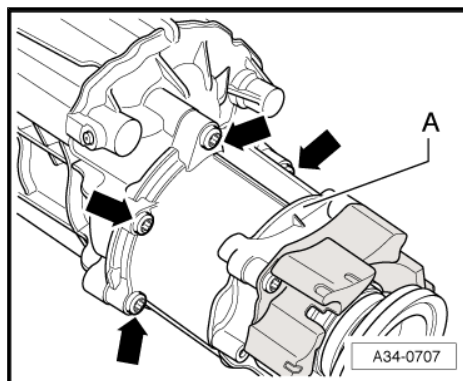
- Tighten bolts -arrows-. Tightening torque ⇒ [Item 2 \(page 85\)](#)



Note

The illustration shows only 4 of the 6 bolts.

- It is important to clean the threaded holes for the propshaft bolts to remove any remaining locking fluid. The residue can be removed using a tap.
- Fill up with gear oil and check gear oil level ⇒ [page 77](#) .
- Bolt propshaft to gearbox ⇒ Rep. gr. 39 .
- Install exhaust system and align so it is free of stress ⇒ Rep. gr. 26 for the relevant engine code.



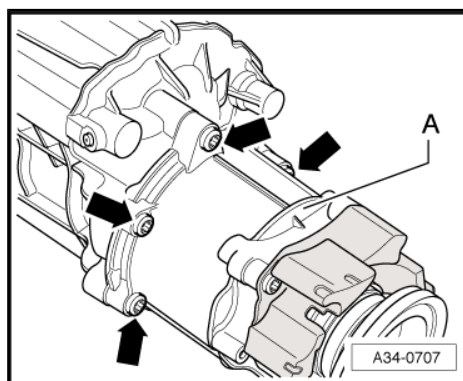
Tightening torque

Component	Nm
Heat shield for propshaft to centre differential housing	25

7.2 Renewing oil seal and ball bearing for flange shaft (rear)

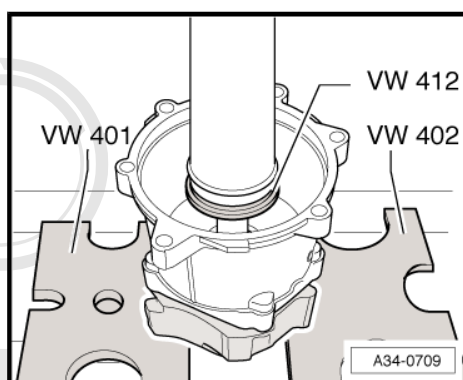
Removing centre differential housing -A- with gearbox removed
⇒ [page 117](#)

Removing centre differential housing -A- with gearbox installed
⇒ [page 90](#)



Pressing out flange shaft

- Before pressing out flange shaft remove circlip from flange shaft ⇒ [page 123](#) .
- Position centre differential housing in such a way that the flange shaft does not make contact with thrust plates - VW 401- and -VW 402- when it is pressed out.



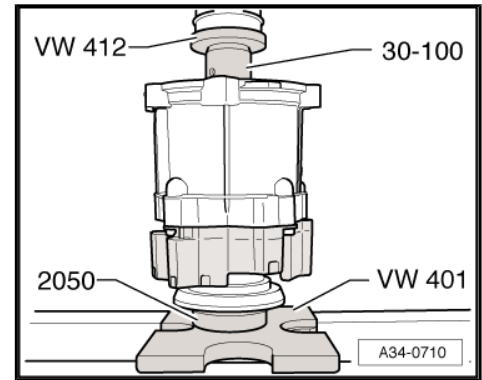
Pressing in flange shaft

- Before pressing in the flange shaft, secure the vibration damper (if fitted).

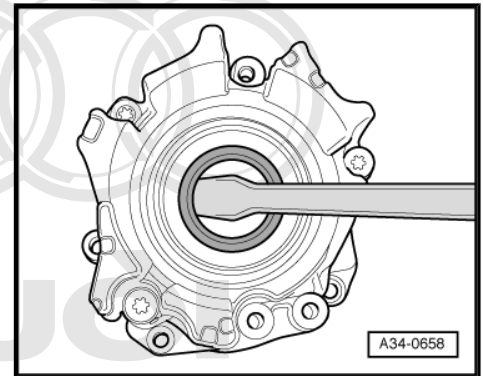
Note

Fit a flange shaft with a groove [⇒ page 121](#) if an oil seal with additional dust lip [⇒ page 121](#) is installed. Select correct components from [⇒ Electronic parts catalogue](#).

- Support the flange shaft with the thrust piece - 2050- .
- Fit circlip onto flange shaft [⇒ page 123](#) .



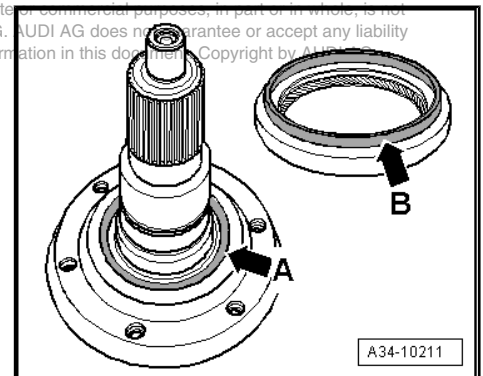
Levering out oil seal



From manufacture date 30 08 4 onwards: flange shaft with groove -arrow A- and oil seal with additional dust lip -arrow B-

Note

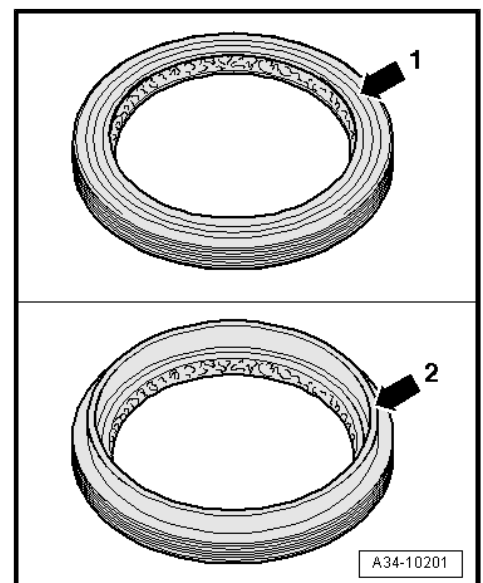
An oil seal with additional dust lip -arrow B- must be fitted in conjunction with a flange shaft which has a groove -arrow A-.



Identification of oil seals

A - Oil seal (up to manufacture date 29 08 4) without additional dust lip -arrow 1-.

B - Oil seal (from manufacture date 30 08 4 onwards) with additional dust lip -arrow 2-.

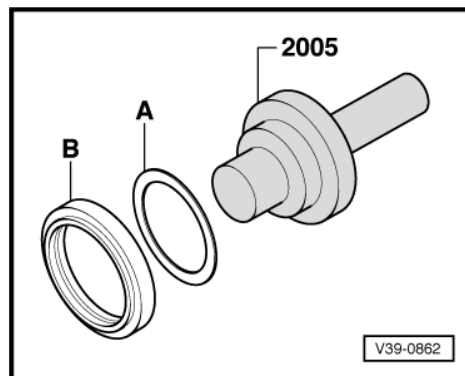


Preparing oil seal (up to manufacture date 29 08 4) for installation

A - Shim - 016 311 391 A- (1.4 mm thick)

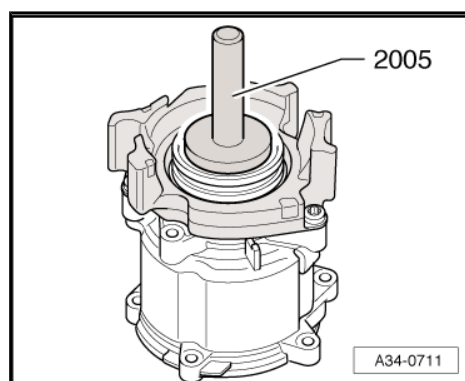
B - Oil seal

- Pack space between sealing lip and dust lip half-full with sealing grease - G 052 128 A1- .
- Place shim and oil seal on tool, as shown in illustration.
- ◆ Installation position: open side of oil seal points towards centre differential housing.

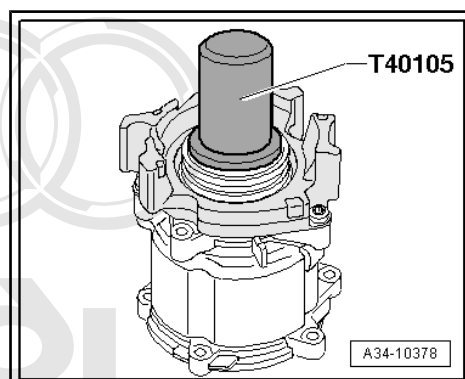


Driving in oil seal (up to manufacture date 29 08 4) as far as stop

- Remove shim.

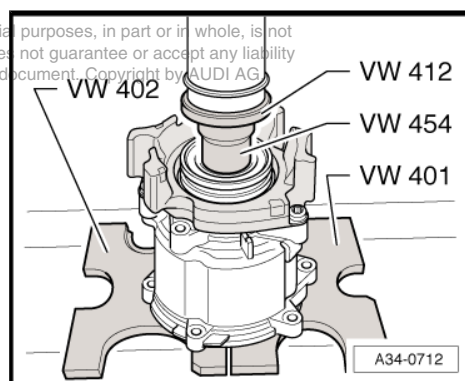


Driving in oil seal with additional dust lip (from manufacture date 30 08 4 onwards) as far as stop



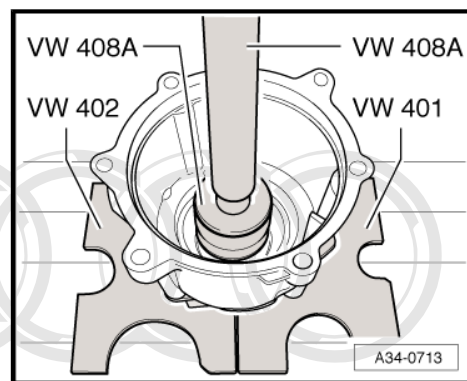
Pressing out ball bearing for flange shaft

- Before pressing out ball bearing, remove circlip - [page 123](#) and sleeve.



Pressing in ball bearing for flange shaft

- Insert sleeve.
- Install circlip for ball bearing and sleeve ⇒ [page 123](#) .

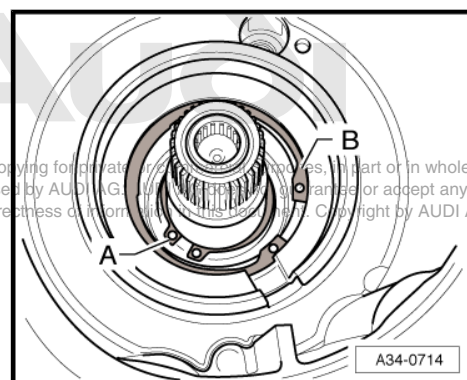


Installation position of circlips -A- and -B-

A - Circlip for flange shaft

B - Circlip for ball bearing and sleeve

- Install centre differential housing ⇒ [page 119](#) .



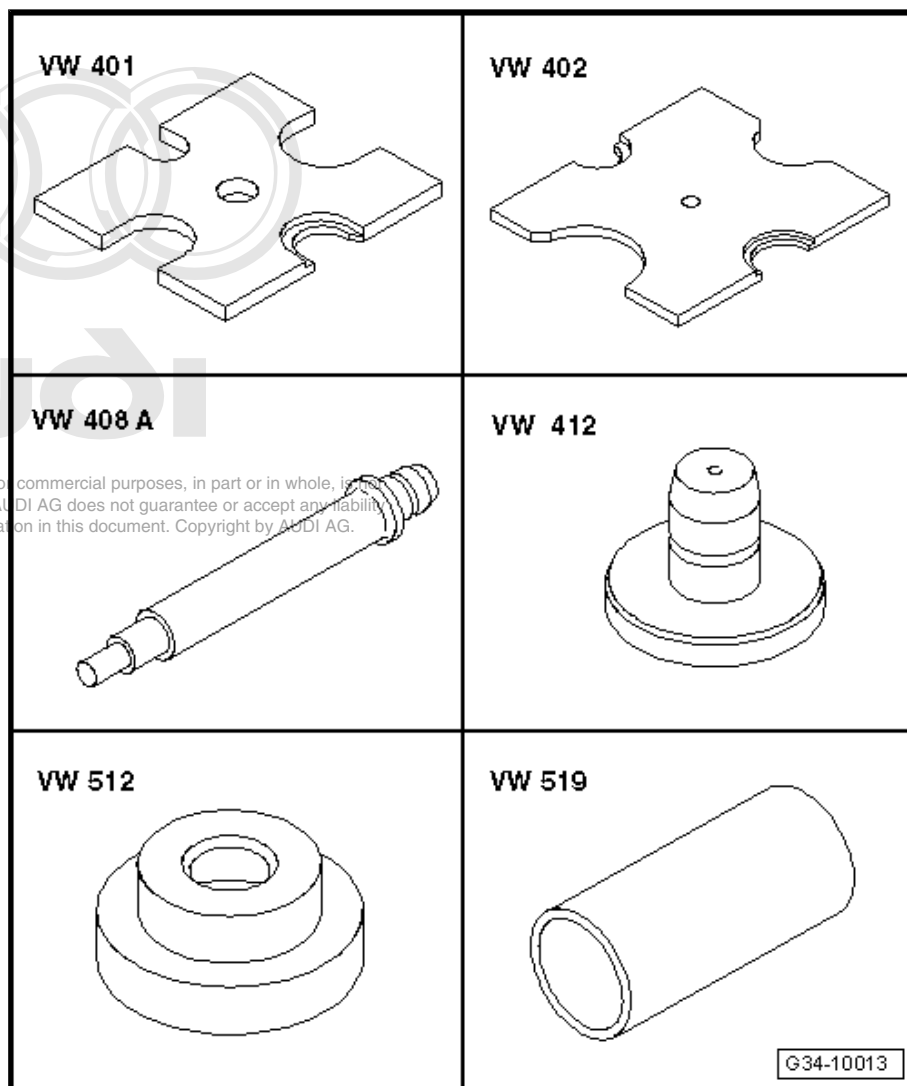
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8 Exploded view - servicing gearbox cover

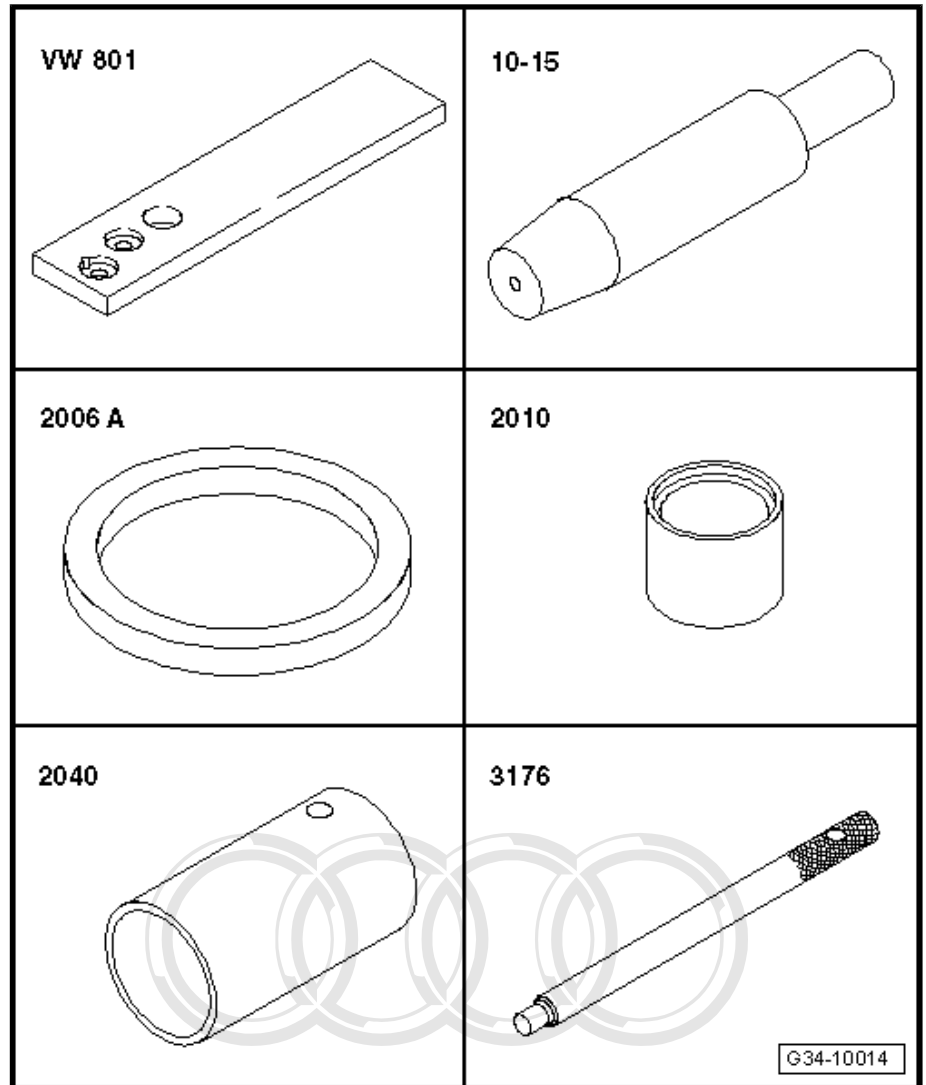
Special tools and workshop equipment required

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

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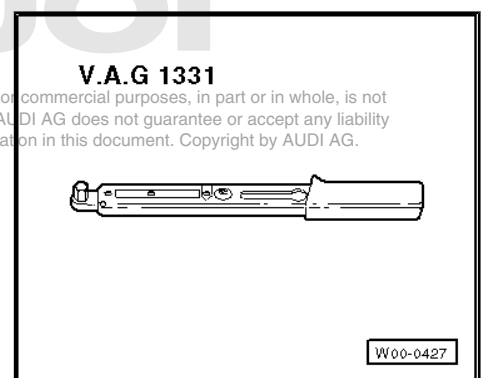


- ◆ Support plate - VW 801-
- ◆ Guide pin - 10 - 15-
- ◆ Thrust ring - 2006 A-
- ◆ Tube - 2010-
- ◆ Tube - 2040-
- ◆ Centring mandrel - 3176-

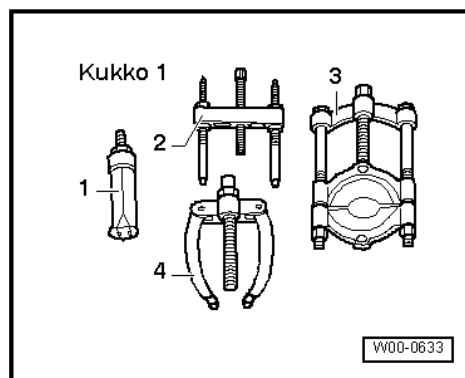


- ◆ Torque wrench - V.A.G 1331-

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◆ -1- Internal puller - Kukko 21/2-



◆ -1- Internal puller - Kukko 21/5-

◆ -4- Counter-support - Kukko 22/2-

1 - Gearbox cover

- ☐ Fit sealing plug on new gearbox cover
⇒ [Item 9 \(page 127\)](#)
- ☐ Drive in new sealing plug until flush
⇒ [page 129](#)

2 - Dowel sleeve

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

3 - Needle bearing

- ☐ Bearing for hollow shaft in gearbox cover
- ☐ Pressing out
⇒ [page 127](#)
- ☐ Pressing in
⇒ [page 127](#)

4 - Roller bearing

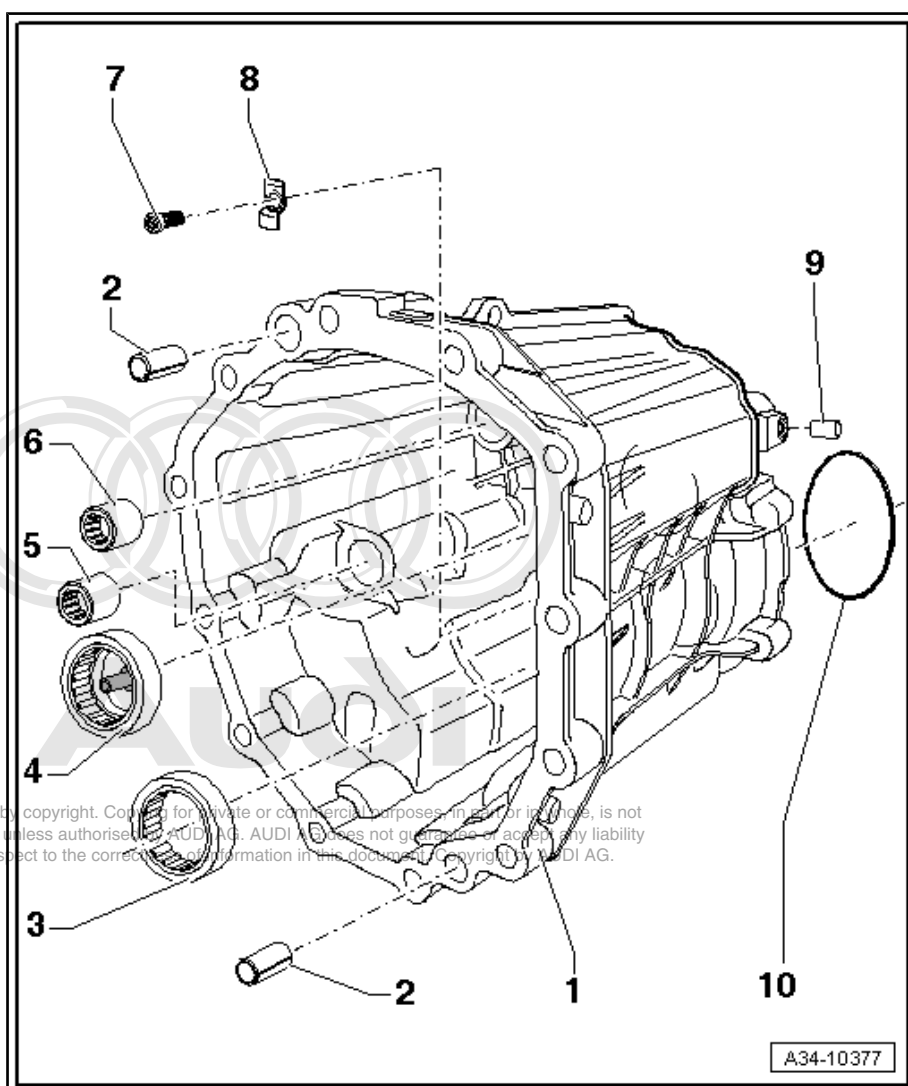
- ☐ Bearing for input shaft in gearbox cover
- ☐ With oil guide
- ☐ Always renew
- ☐ Pulling out ⇒ [page 128](#)
- ☐ Pressing in
⇒ [page 128](#)

5 - Ball sleeve

- ☐ For selector rod for 1st and 2nd gear
- ☐ Pulling out ⇒ [page 127](#)
- ☐ Driving in ⇒ [page 128](#)

6 - Ball sleeve

- ☐ For selector rod for 5th and 6th gear
- ☐ Pulling out ⇒ [page 127](#)
- ☐ Driving in ⇒ [page 128](#)



7 - Multi-point socket head bolt

- ☐ 24 Nm

8 - Retaining plate

- ☐ Secures needle bearing $\Rightarrow$ [Item 3 \(page 126\)](#) and roller bearing $\Rightarrow$ [Item 4 \(page 126\)](#) in gearbox cover
- ☐ Installation position $\Rightarrow$ [page 128](#)

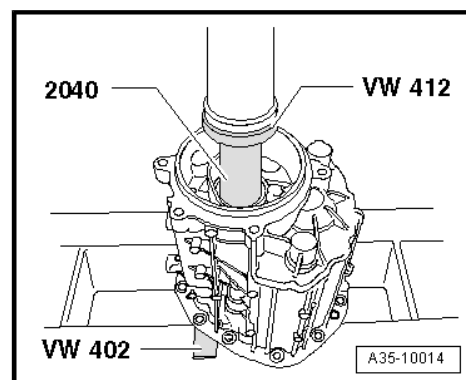
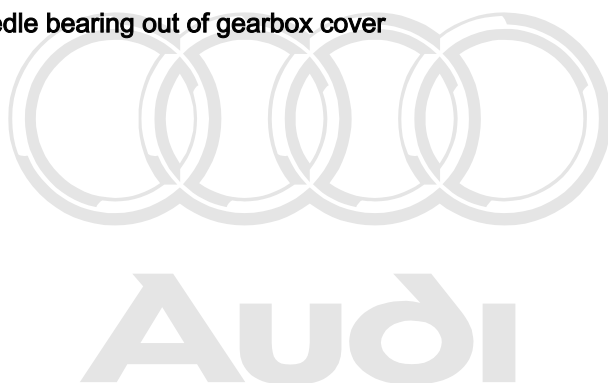
9 - Sealing plug

- ☐ Drive in flush $\Rightarrow$ [page 129](#)

10 - O-ring

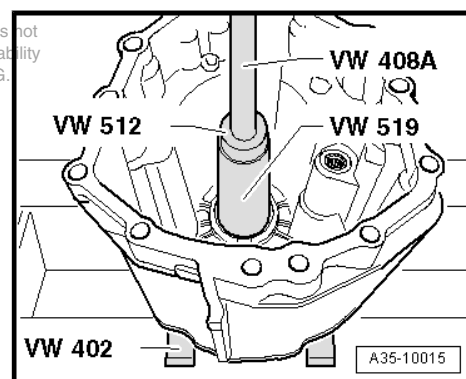
- ☐ Always renew

Pressing needle bearing out of gearbox cover



Pressing needle bearing into gearbox cover

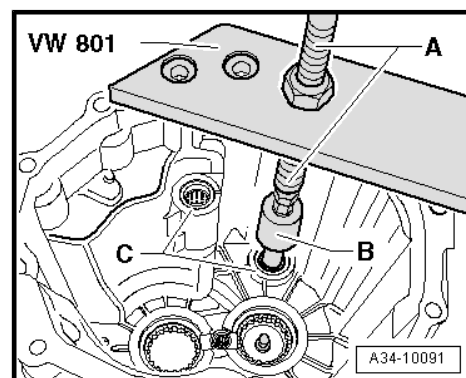
Support gearbox cover with tube 2010 directly below bearing mounting.



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-



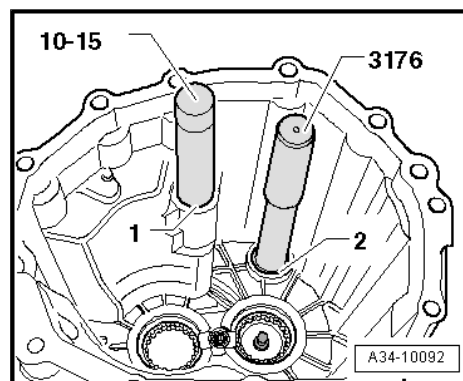
Driving ball sleeve into gearbox cover until flush

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 out roller bearing from gearbox cover

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

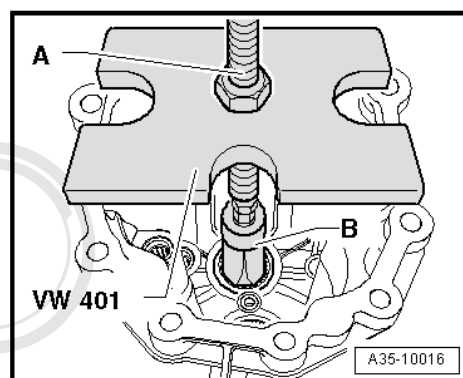
A - Counter-support , e.g. -Kukko 22/2-

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



Note

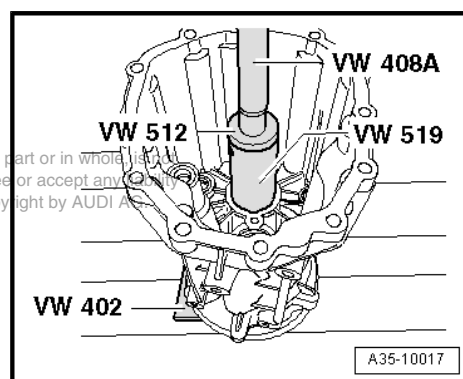
Always renew roller bearing after pulling out.



Carefully press in new roller bearing into gearbox cover until limit stop.

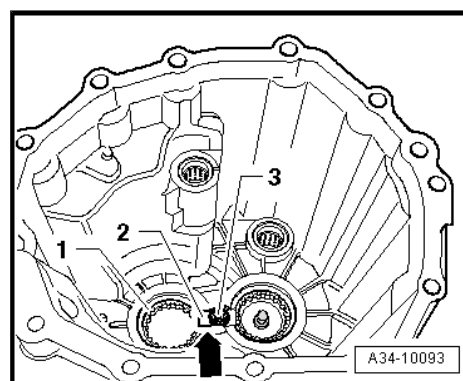
Support gearbox cover below bearing seat using thrust ring - 2006 A- .

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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 \(page 127\)](#) .

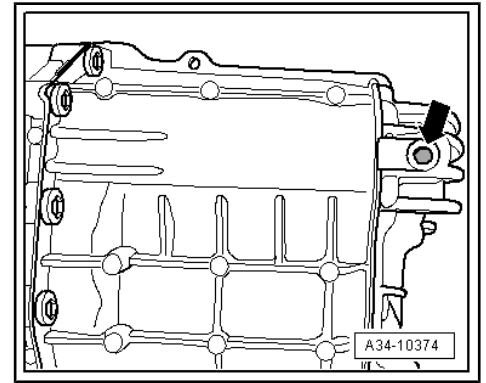


Drive in plug until flush -arrow-



Caution

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

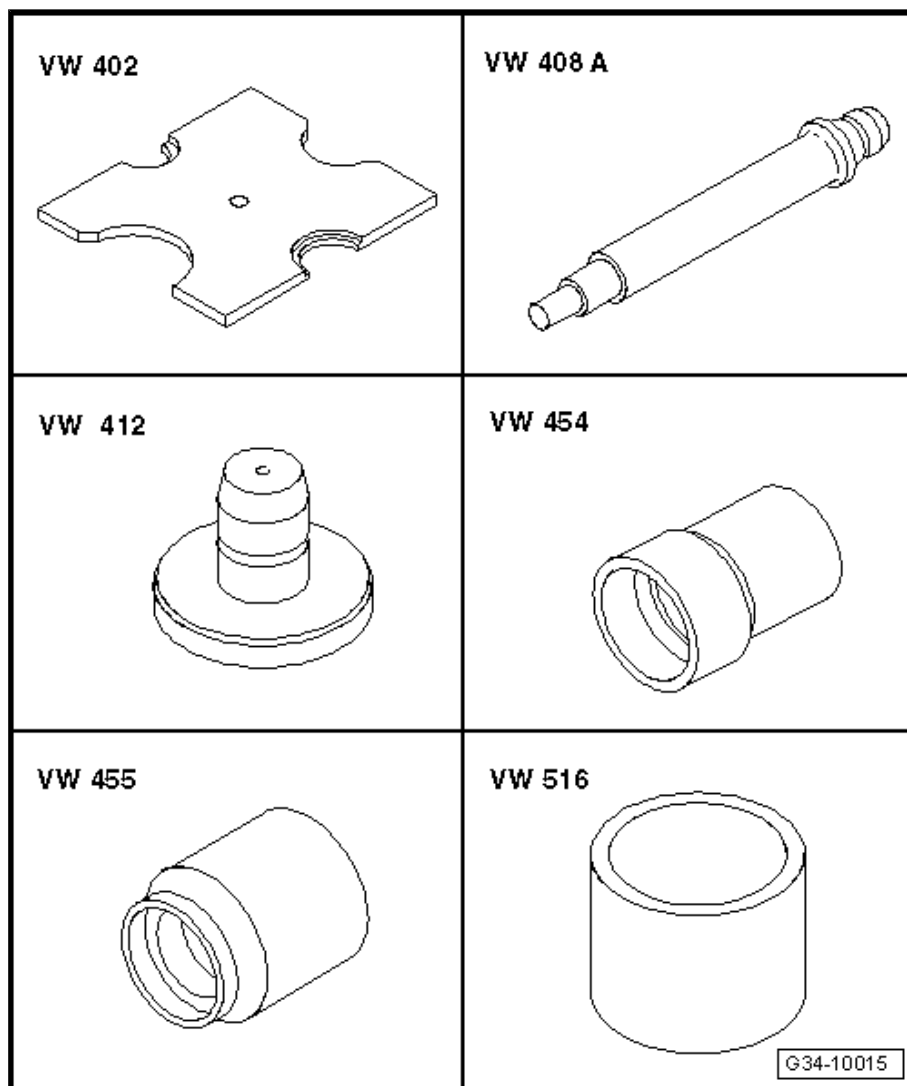


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9 Exploded view - servicing bearing housing

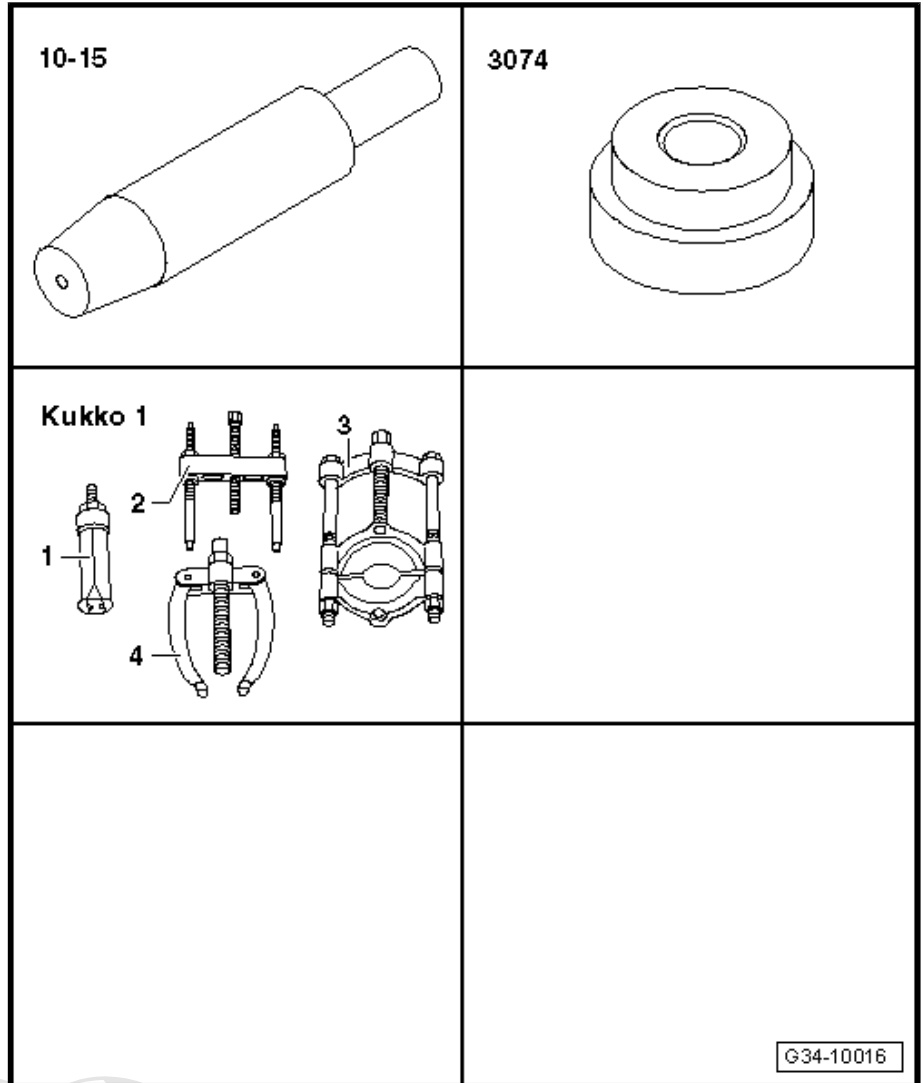
Special tools and workshop equipment required

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

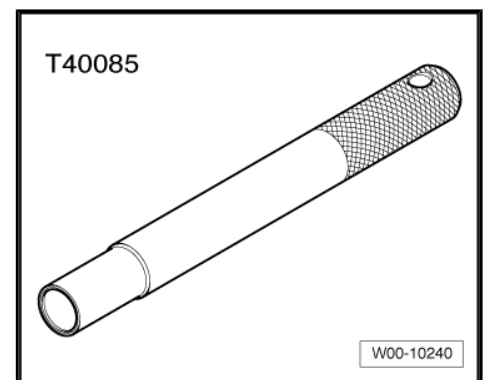


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- ◆ Guide pin - 10 - 15-
- ◆ Thrust plate - 3074-
- ◆ -1- Internal puller - Kukko 21/2-
- ◆ -4- Counter-support - Kukko 22/1-



- ◆ Drift - T40085-



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1 - Bearing housing

- ☐ Re-determine shim "S4" when renewing
⇒ [page 204](#)

2 - Outer race

- ☐ For roller bearing on input shaft
- ☐ Driving out ⇒ [page 133](#)
- ☐ Pressing in
⇒ [page 133](#)

3 - Shim "S4"

- ☐ Table of adjustments
⇒ [page 194](#)
- ☐ Re-determine when renewing bearing housing
⇒ [page 204](#)

4 - Tapered roller bearing outer race

- ☐ For pinion shaft/hollow shaft
- ☐ Removing and installing
⇒ [Item 29 \(page 163\)](#)

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 133](#)
- ☐ Pressing in ⇒ [page 134](#)

8 - Ball sleeve

- ☐ (Rear) for reverse gear selector rod
- ☐ Pulling out ⇒ [page 134](#)
- ☐ Pressing in ⇒ [page 134](#)

9 - Selector rod for 3rd and 4th gear

- ☐ With or without spring-loaded selector fork (depending on version) ⇒ [Item 9 \(page 87\)](#)
- ☐ For correct version, refer to ⇒ Electronic parts catalogue

10 - Selector rod for 5th and 6th gear

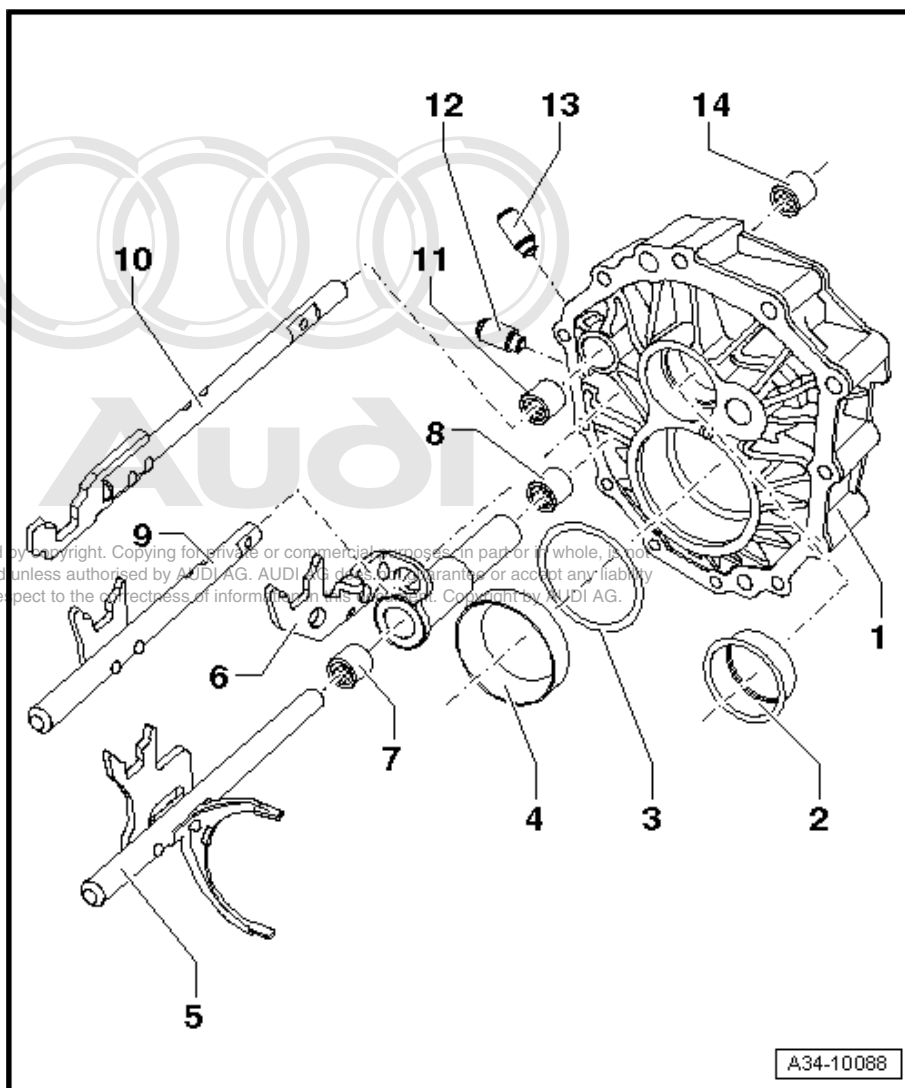
- ☐ Remove burrs and scoring after removing from bearing housing

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 135](#)



13 - Locking bush

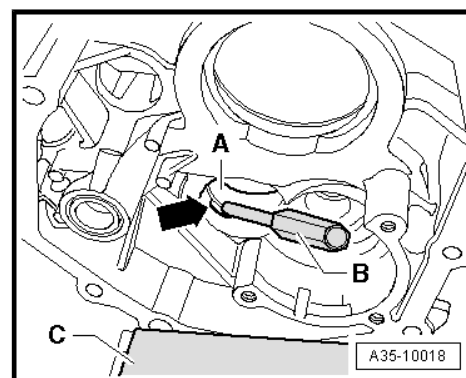
- ☐ For selector rod for 5th and 6th gear
- ☐ Removing and installing ⇒ [page 135](#)

14 - Ball sleeve

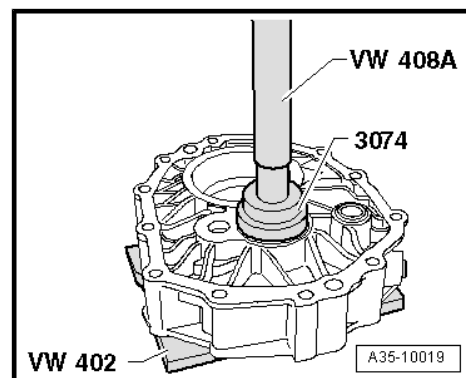
- ☐ For selector rod for 3rd and 4th gear
- ☐ Pull out with internal puller - Kukko 21/2-
- ☐ Driving in ⇒ [page 134](#)

Driving outer race for 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-.



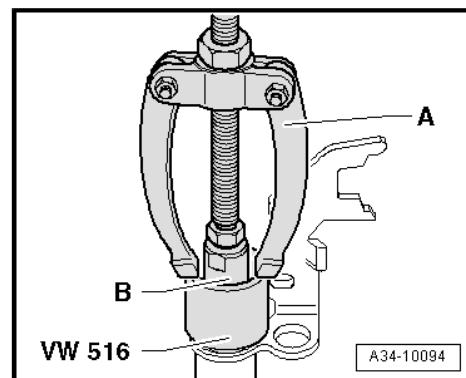
Pressing outer race for roller bearing into bearing housing until limit stop



Pulling front ball sleeve out of reverse gear selector rod

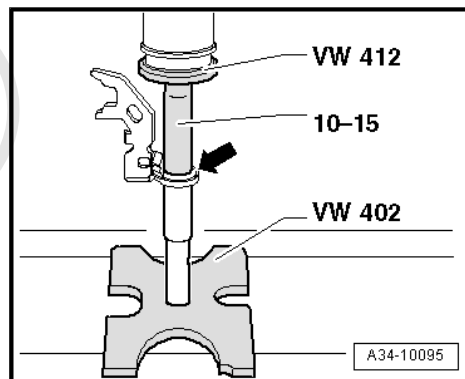
A - Counter-support, e.g. -Kukko 22/1-

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



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- .

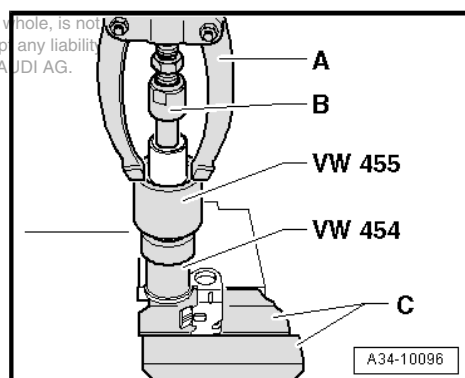


Pulling out rear ball sleeve for reverse gear selector rod

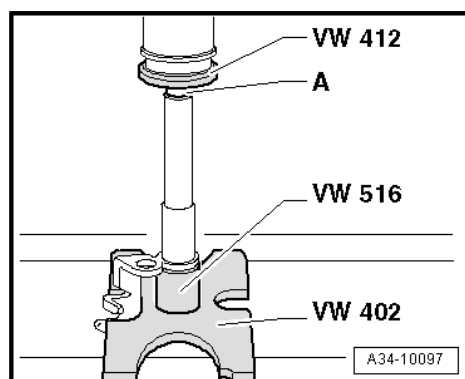
- Clamp yoke of selector rod in vice, using jaw protectors -C-
- Fit press tool - VW 454- and installing sleeve - VW 455- onto selector rod.

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

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



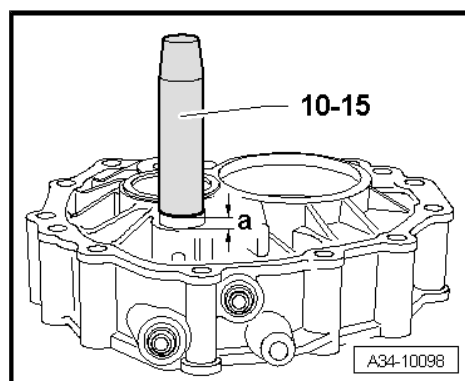
Pressing in rear ball sleeve -A- for reverse gear selector rod



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

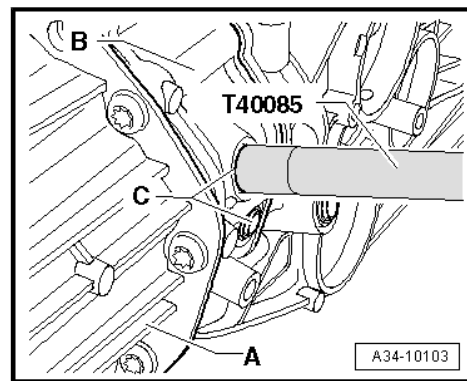
Fit ball sleeve so that side with lettering (thicker metal) faces guide pin - 10 - 15- .

- 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.

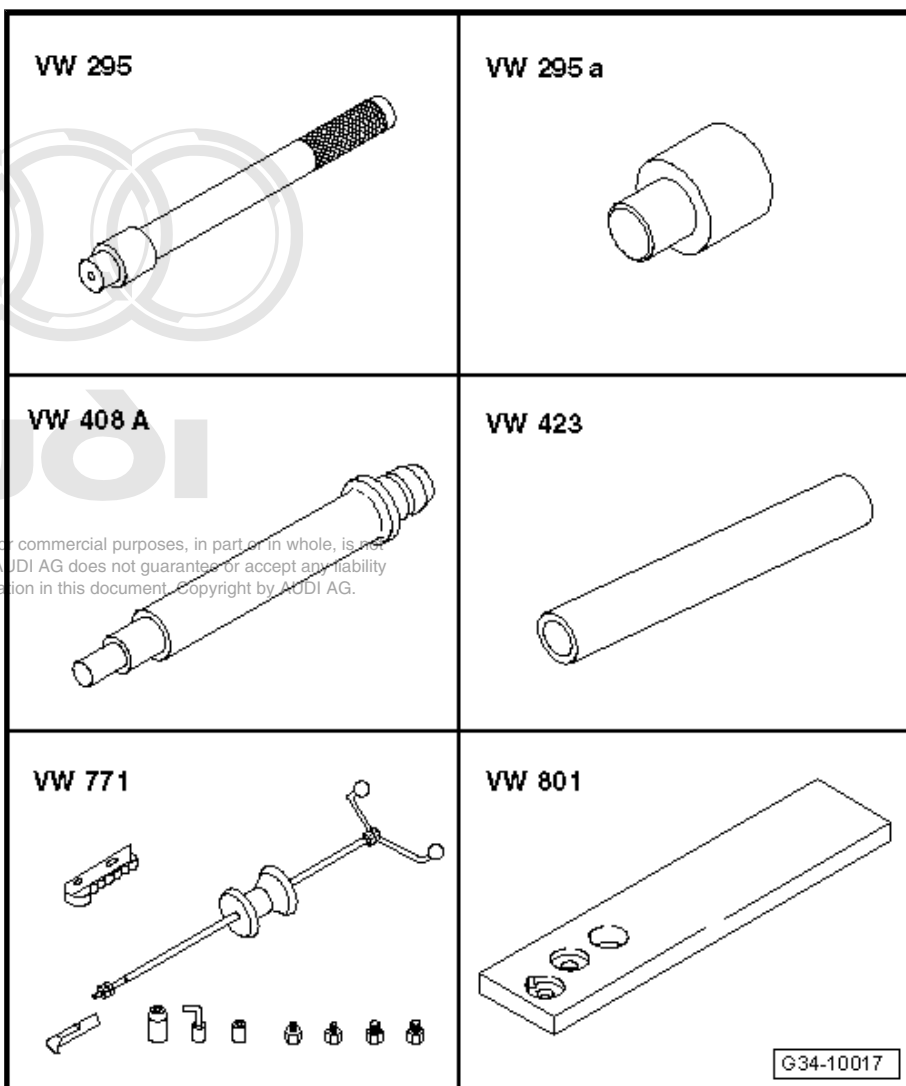


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10 Exploded view - servicing gearbox housing

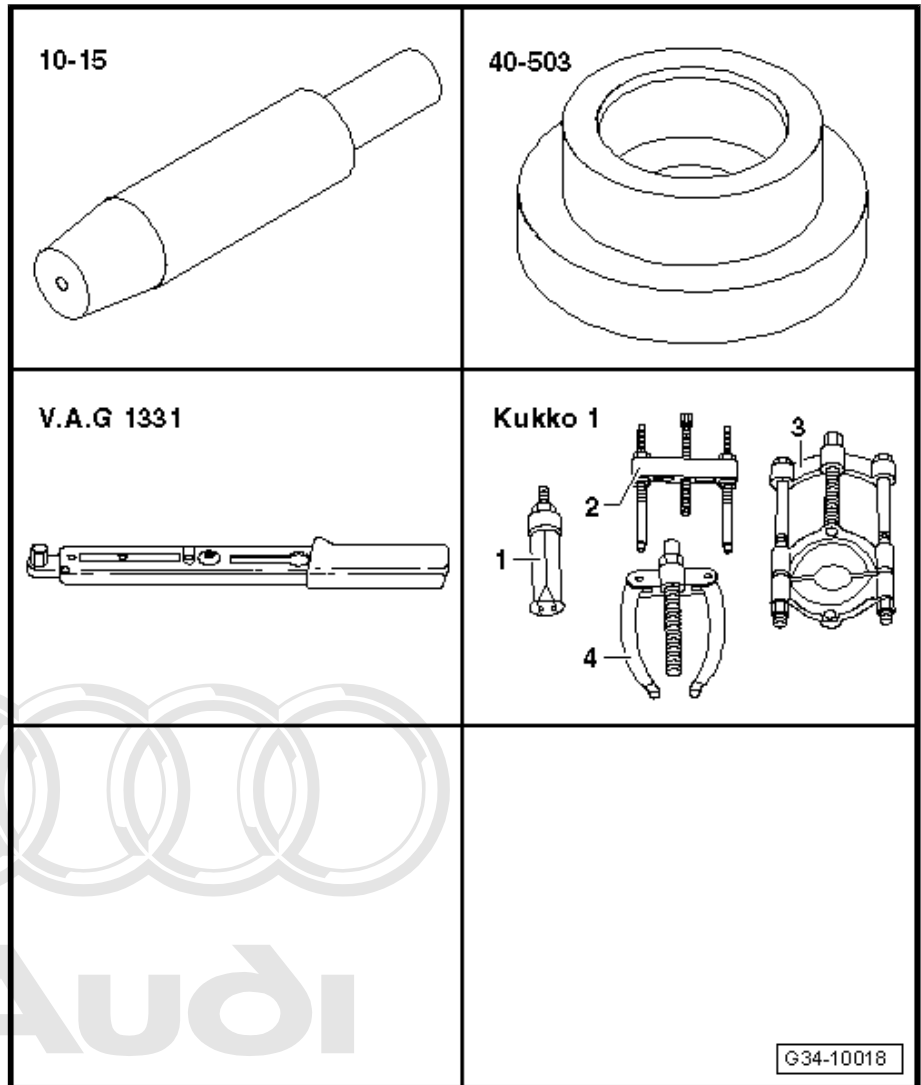
Special tools and workshop equipment required

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



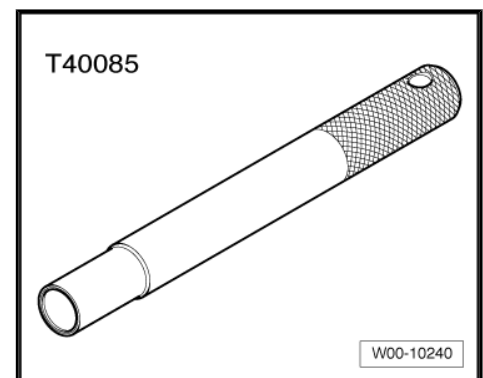
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- ◆ Guide pin - 10 - 15-
- ◆ Installing tool - 40 - 503-
- ◆ Torque wrench - V.A.G 1331-
- ◆ -1- Internal puller - Kukko 21/2-
- ◆ -4- Counter-support - Kukko 22/2-



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- ◆ Drift - T40085-



1 - Gearbox housing

- ❑ When renewing: adjust input shaft
⇒ [page 157](#) , adjust pinion shaft/hollow shaft and differential (final drive gear set)
⇒ [page 194](#)

2 - Oil seal for selector shaft

- ❑ Pulling out ⇒ [page 140](#)
- ❑ Driving in ⇒ [page 140](#)
- ❑ ⇒ [“11.2 Renewing oil seal for selector shaft with gearbox installed”, page 146](#)
- ❑ ⇒ [“11.3 Renewing oil seal for selector shaft with gearbox removed \(gearbox remains assembled\)”, page 149](#)
- ❑ Always use assembly sleeve to fit oil seal (if selector shaft remains installed in gearbox)
⇒ [page 146](#)

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

- ❑ For differential
- ❑ If renewing: adjust differential (crown wheel)
⇒ [page 206](#)
- ❑ Removing and installing
⇒ [Item 3 \(page 188\)](#)

4 - Shim “S2”

- ❑ Note thickness
- ❑ Table of adjustments ⇒ [page 194](#)

5 - Bush

- ❑ Secures magnet ⇒ [Item 6 \(page 138\)](#)
- ❑ 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

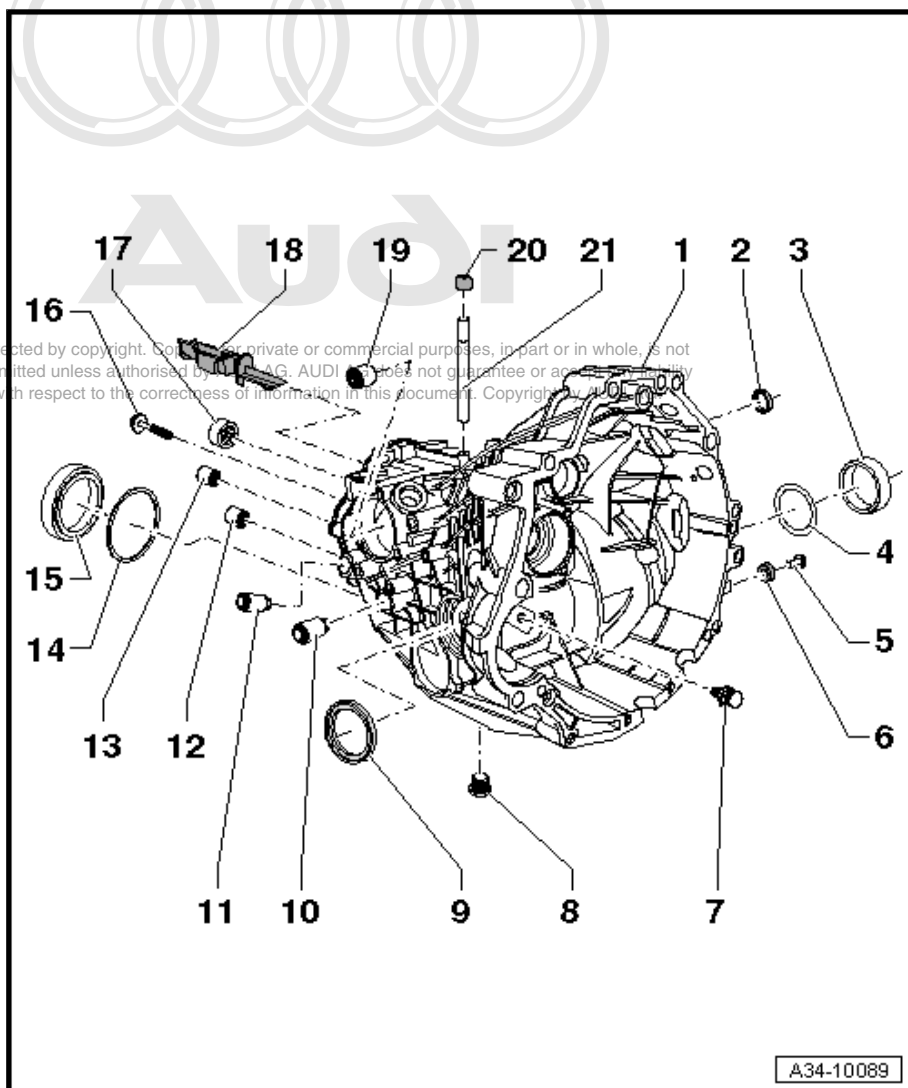
- ❑ 45 Nm

9 - Oil seal

- ❑ For flange shaft (right-side)
- ❑ Renewing ⇒ [“1.2 Renewing oil seal for flange shaft \(right-side\)”, page 178](#)

10 - Locking bush

- ❑ For selector rod for 1st and 2nd gear
- ❑ Removing and installing ⇒ [page 140](#)



11 - Locking bush

- ☐ For reverse gear selector rod
- ☐ Removing and installing ⇒ [page 140](#)

12 - Ball sleeve

- ☐ For selector rod for 1st and 2nd gear
- ☐ Pulling out ⇒ [page 140](#)
- ☐ Drive in until flush using guide pin - 10 - 15-

13 - Ball sleeve

- ☐ For selector rod for 3rd and 4th gear
- ☐ Pulling out ⇒ [page 140](#)
- ☐ Drive in until flush using guide pin - 10 - 15-

14 - Shim "S3"

- ☐ Note thickness
- ☐ Table of adjustments ⇒ [page 194](#)

15 - Outer race of double tapered roller bearing

- ☐ For pinion shaft
- ☐ Removing and installing ⇒ [Item 3 \(page 161\)](#)

16 - Bolt

- ☐ 24 Nm
- ☐ Secures needle bearing ⇒ [Item 17 \(page 139\)](#) for input shaft

17 - Needle bearing

- ☐ For input shaft
- ☐ Driving out ⇒ [page 141](#)
- ☐ Driving in ⇒ [page 141](#)

18 - Oil collector

- ☐ With magnet
- ☐ Installation position in gearbox housing ⇒ [page 141](#)

19 - Ball sleeve

- ☐ For selector shaft
- ☐ Pulling out ⇒ [page 141](#)
- ☐ Driving in ⇒ [page 142](#)

20 - Cap

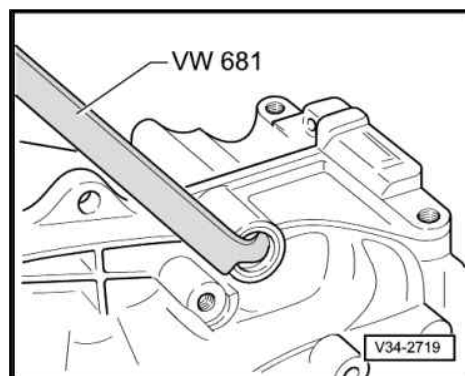
- ☐ For gearbox breather

21 - Breather pipe

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

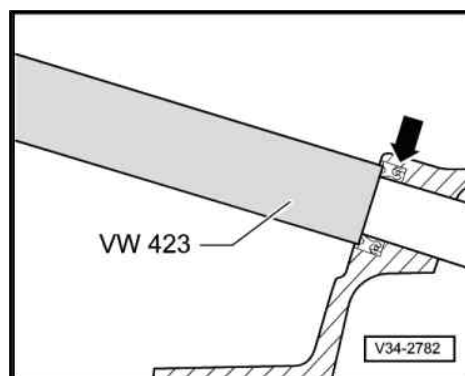
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Pulling out oil seal for selector shaft with gearbox dismantled



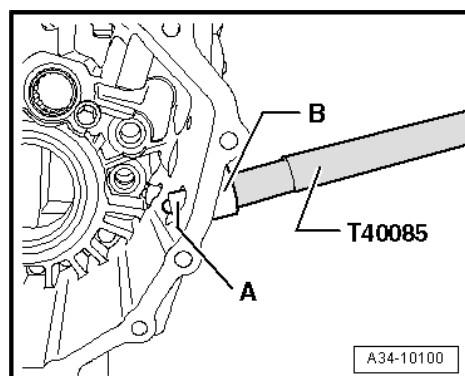
Driving in oil seal for selector shaft

- 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

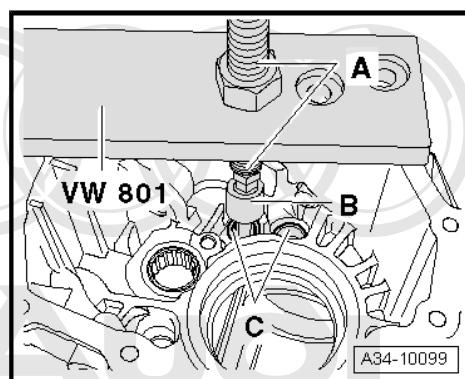
- Drive out the used locking bush -A- inwards into gearbox housing.
- Drive in new locking bush into gearbox housing -B- until flush.



Pulling out ball sleeve -C- from gearbox housing.

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

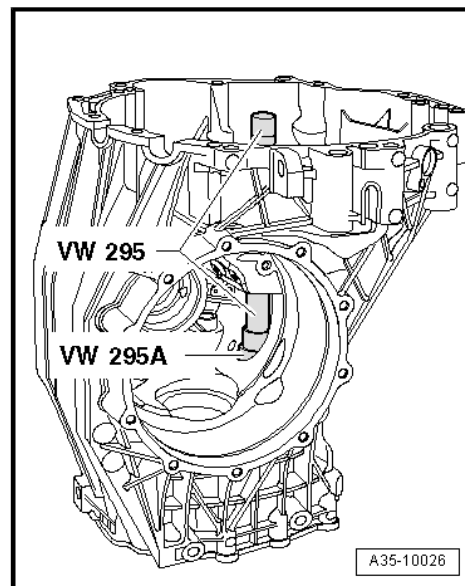
B - Internal puller 14.5 ... 18.5 mm , e.g. -Kukko 21/2-



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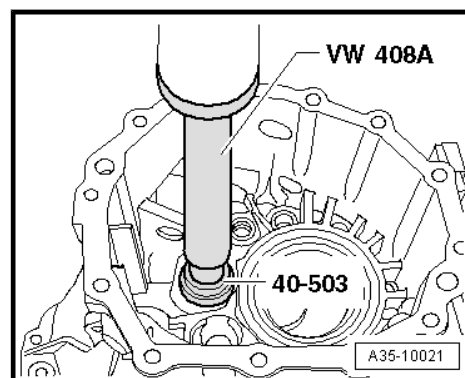
Driving out input shaft needle bearing from gearbox housing

- Unscrew bolt for securing needle bearing ⇒ [page 141](#) .
- Fit adapter - VW 295 A- with smaller outside diameter into needle bearing.
- Drive out needle bearing with drift - VW 295- .



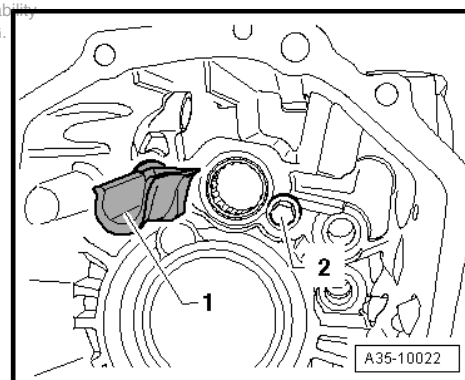
Pressing in input shaft needle bearing until limit stop

- Secure needle bearing after pressing in ⇒ [page 141](#) .



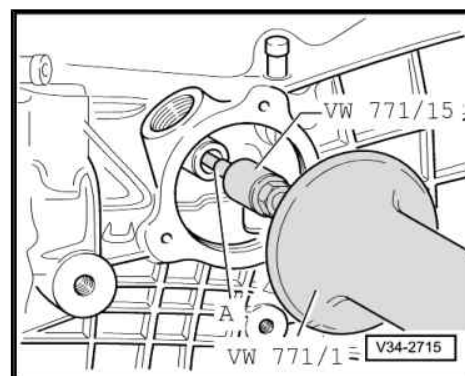
Securing input shaft needle bearing

- 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-

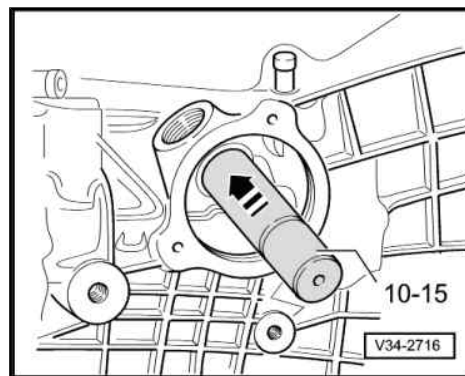




Driving in ball sleeve for selector shaft

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 Removing and installing selector shaft and oil seal for selector shaft

⇒ "11.1 Removing and installing selector shaft with gearbox installed", page 143

⇒ "11.2 Renewing oil seal for selector shaft with gearbox installed", page 146

⇒ "11.3 Renewing oil seal for selector shaft with gearbox removed (gearbox remains assembled)", page 149

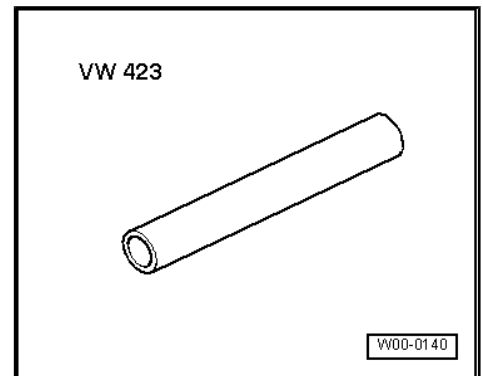
⇒ "11.4 Removing and installing reversing light switch F4", page 151

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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

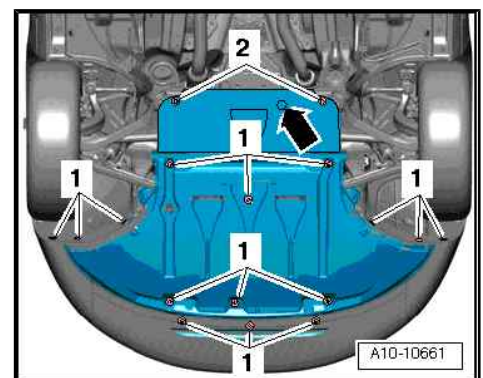
- Release fasteners -2- and remove rear noise insulation (if fitted).



Note

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

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

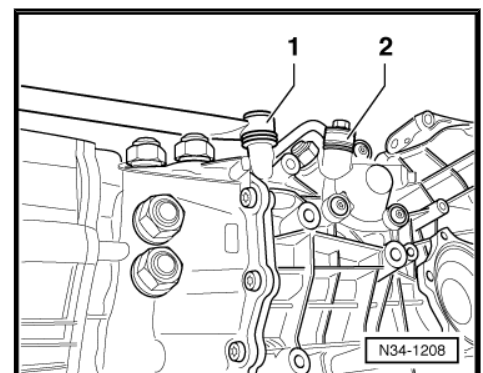


- Unscrew connecting rod -2- for selector rod.

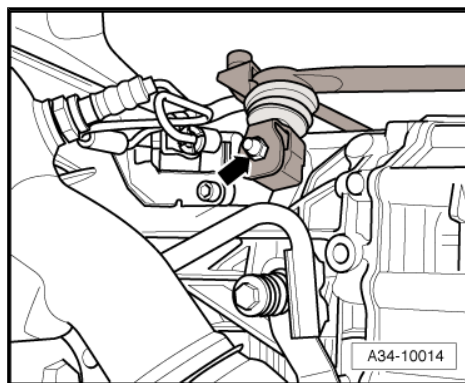


Note

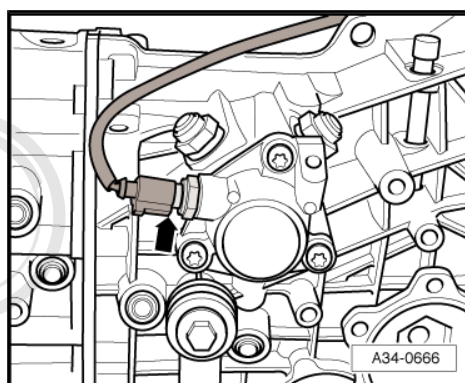
-Item 1- can be disregarded.



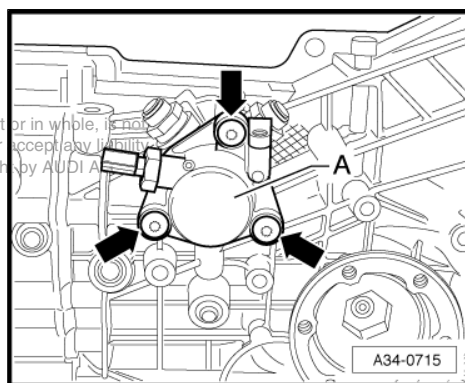
- Unscrew nut -arrow- and detach gearbox selector lever from selector shaft.



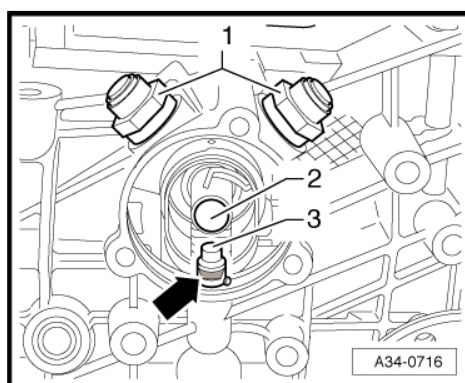
- Unplug electrical connector -arrow- for reversing light switch -F4-.



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

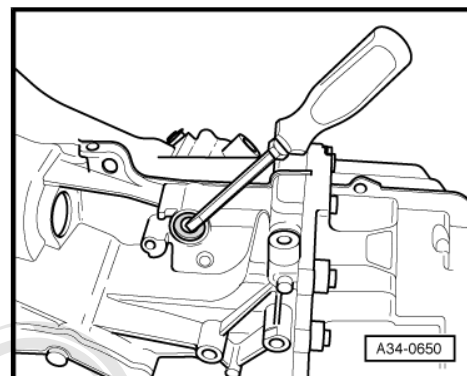


- Unscrew the two locking bolts -1- for selector shaft.
- Make sure that no gear has been engaged.
- Push selector shaft -2- into gearbox as far as it will go, simultaneously removing pin -3-.
- Pull out selector shaft.



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- Carefully pry out oil seal with a screwdriver.



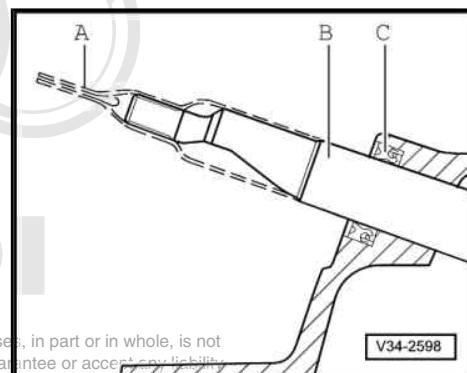
Installing



Note

Renew oil seals and O-rings.

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

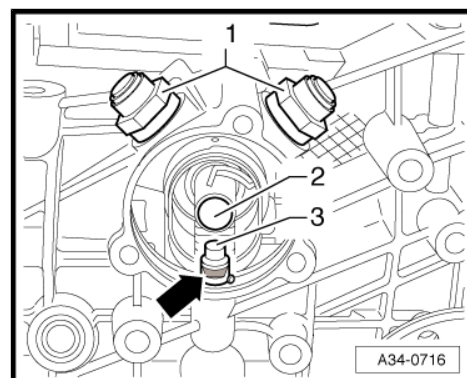


Note

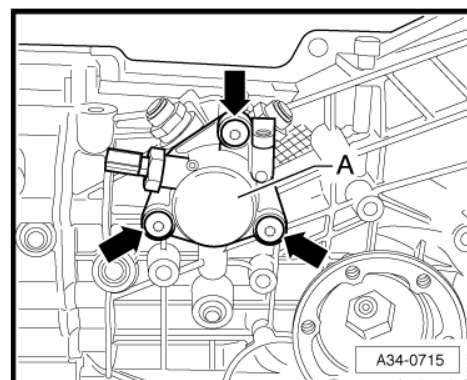
Ignore -item A- and -item C-.

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- 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 apply locking fluid - AMV 185 101 A1- to bolts and tighten.



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





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.

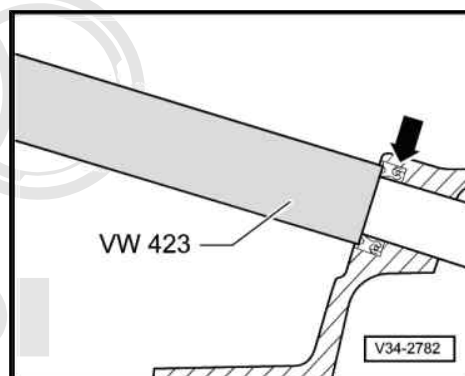
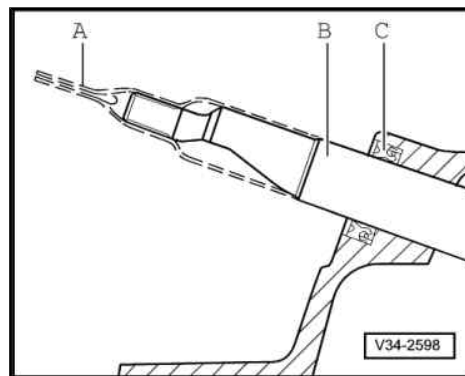
- Drive oil seal -arrow- into housing as far as stop using tube - VW 423- .

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

- Install front exhaust pipes and perform stress-free alignment
⇒ Rep. gr. 26 .

Tightening torques

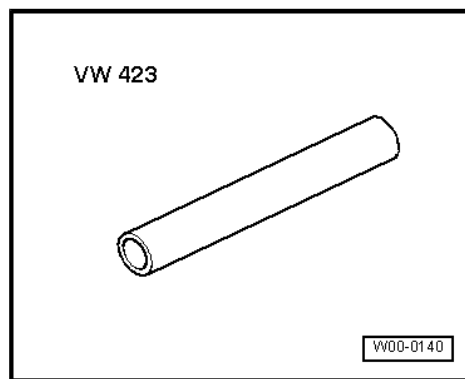
Component	Nm
Locking bolts for selector shaft	45
Selector shaft cover	24
Gearbox selector lever to selector shaft	20
Connecting rod to selector rod	20



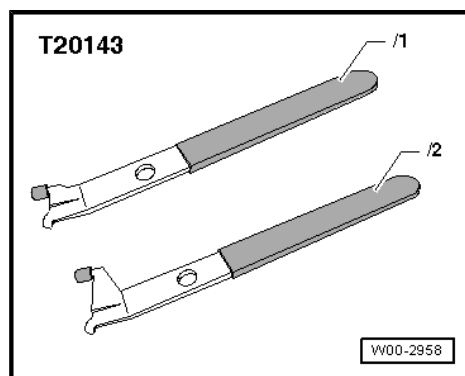
11.2 Renewing oil seal for selector shaft with gearbox installed

Special tools and workshop equipment required

- ◆ Tube - VW 423-



- ◆ Extractor tool - T20143/1-



- ◆ 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.

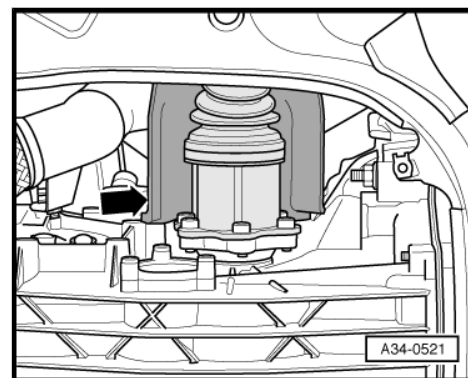
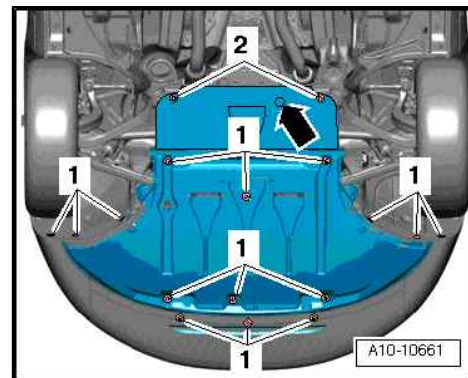
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Note

Secure brake disc with one wheel bolt.

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

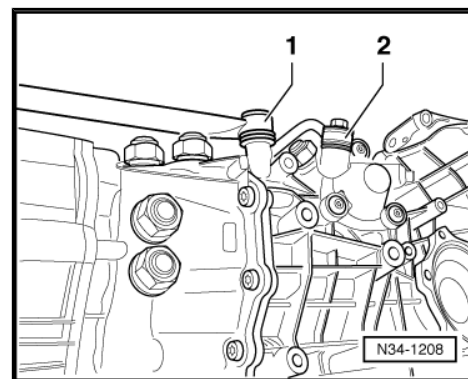


- Unscrew connecting rod -2- for selector rod.

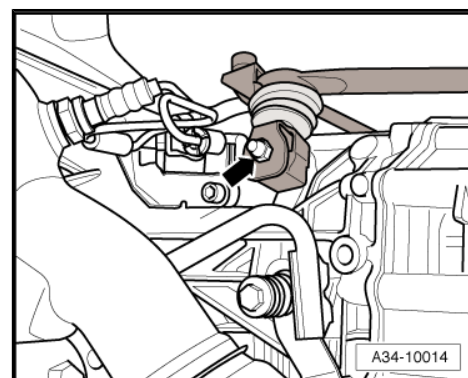


Note

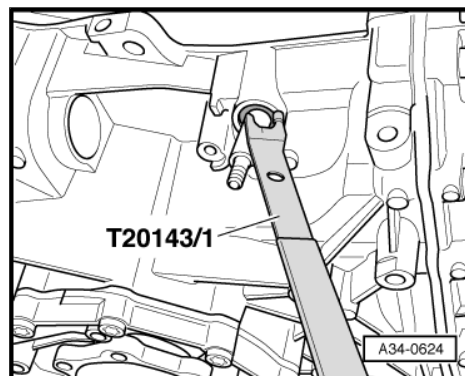
-Item 1- can be disregarded.



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

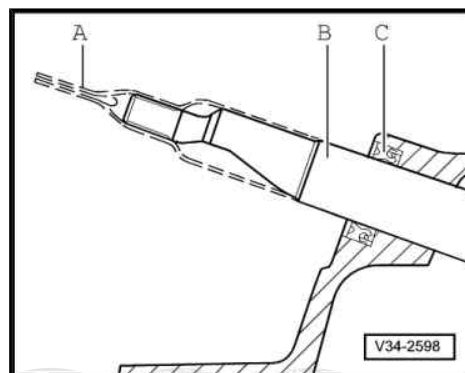


- Carefully lever out oil seal, taking care not to damage shaft.

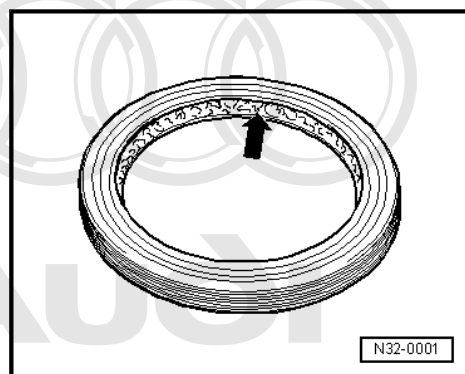


Note

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 -arrow- half full with sealing grease - G 052 128 A1- .
- Lightly oil outer circumference of oil seal.



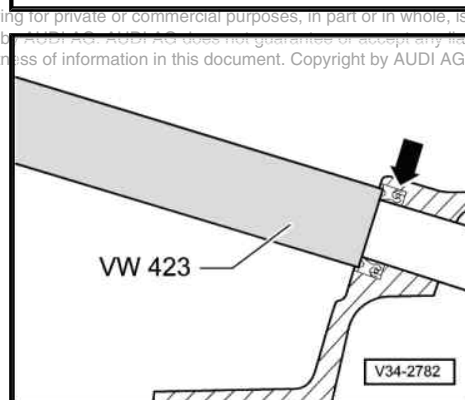
- Drive oil seal -arrow- into housing as far as stop using tube - VW 423- .

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

- Install front exhaust pipe (left side) ⇒ Rep. gr. 26 .
- Check gear oil level in gearbox ⇒ [page 77](#) .

Tightening torques

Component	Nm
Gearbox selector lever to selector shaft	20
Connecting rod to selector rod	20
Heat shield above drive shaft to gearbox	23



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

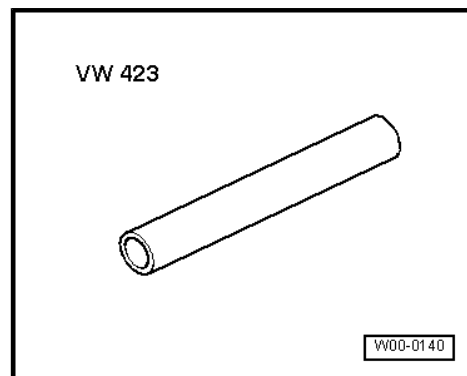


Note

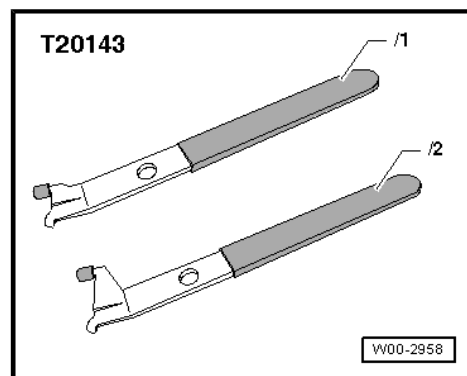
Removal is also possible with gearbox installed in vehicle
⇒ [page 146](#).

Special tools and workshop equipment required

- ◆ Tube - VW 423-



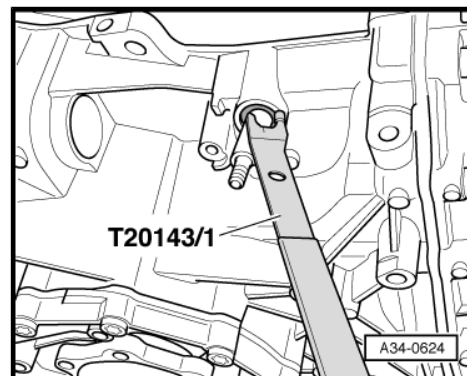
- ◆ Extractor tool - T20143/1-



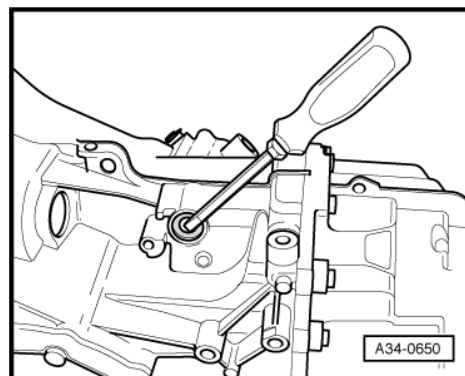
- ◆ Assembly sleeve - 01E 311 120-
- ◆ Sealing grease - G 052 128 A1-

Removing

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

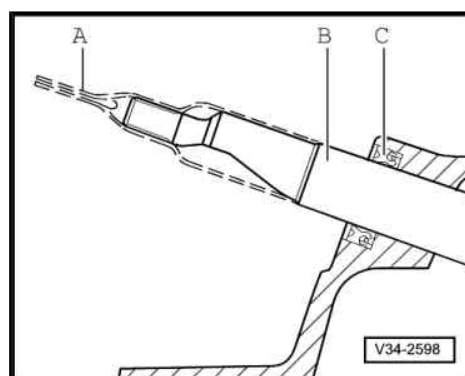


- With selector shaft removed
- Carefully lever out oil seal using a screwdriver or oil seal extractor lever - VW 681- .

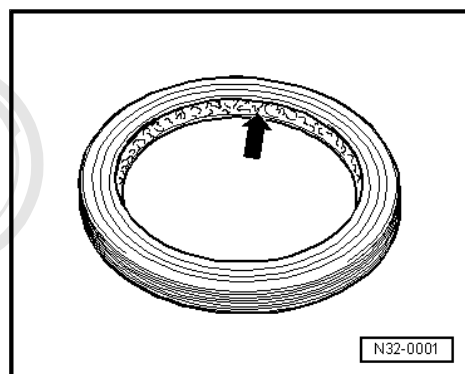


Installing

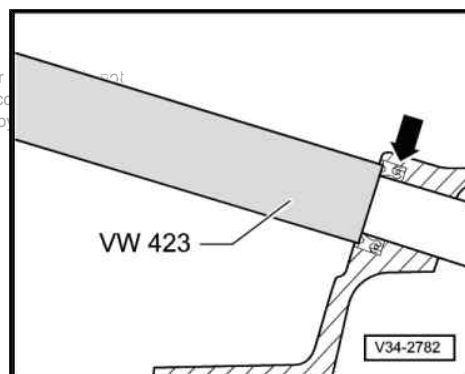
- To avoid damaging oil seal -C-, always use assembly sleeve - 01E 311 120- -A- when installing oil seal and selector shaft.



- 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.



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



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11.4 Removing and installing reversing light switch - F4-

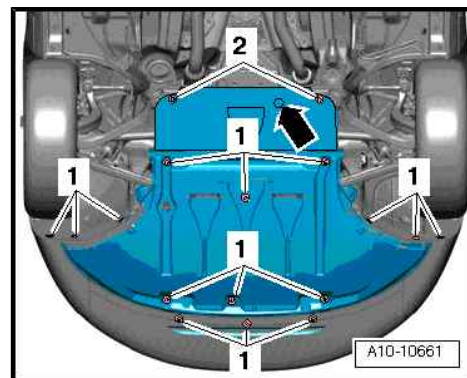
Removing

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

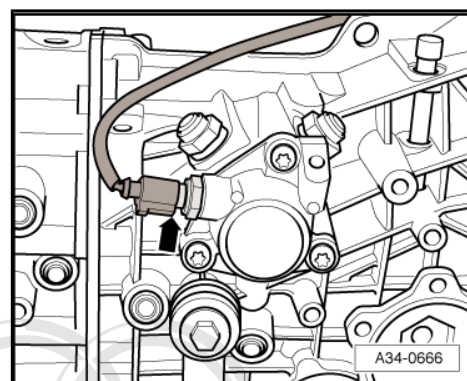


Note

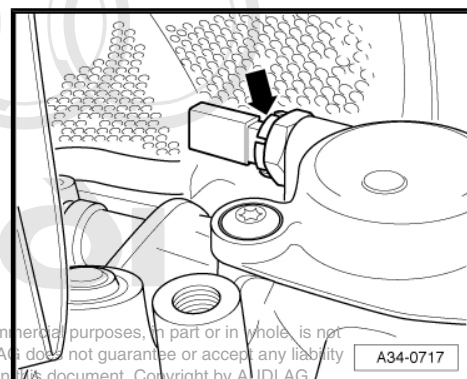
Items marked -1- and -arrow- can be disregarded.



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



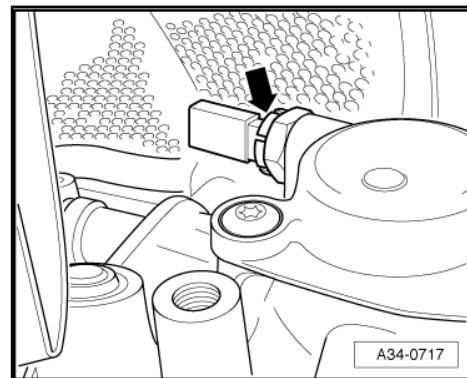
- Unscrew reversing light switch - F4- from selector shaft cover -arrow-.



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Installing

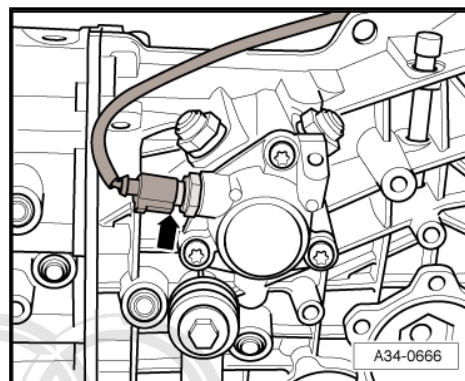
- Screw reversing light switch - F4- into selector shaft cover -arrow-.





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

Component	Nm
Reversing light switch - F4-	20



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35 – Gears, shafts

1 Input shaft

⇒ “1.1 Exploded view - input shaft”, page 153

⇒ “1.2 Dismantling and assembling input shaft”, page 155

⇒ “1.3 Adjusting input shaft”, page 157

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 \(page 153\)](#) will be affected if components ⇒ [Item 4 \(page 153\)](#) or ⇒ [Item 7 \(page 153\)](#) are renewed. In this case the input shaft must be re-adjusted ⇒ [page 157](#).

1 - Circlip

- ☐ Mark
- ☐ Installation position
⇒ [page 157](#), -item 1-
- ☐ Determining thickness
⇒ “1.3 Adjusting input shaft”, page 157

2 - Ball bearing

- ☐ Removing and installing
⇒ “6.7 Assembly sequence - dismantling and assembling gear-box”, page 90

3 - Circlip

- ☐ Mark
- ☐ Installation position
⇒ [page 157](#), -item 2-
- ☐ Determining thickness
⇒ “1.3 Adjusting input shaft”, page 157

4 - Gearbox housing

5 - Needle bearing

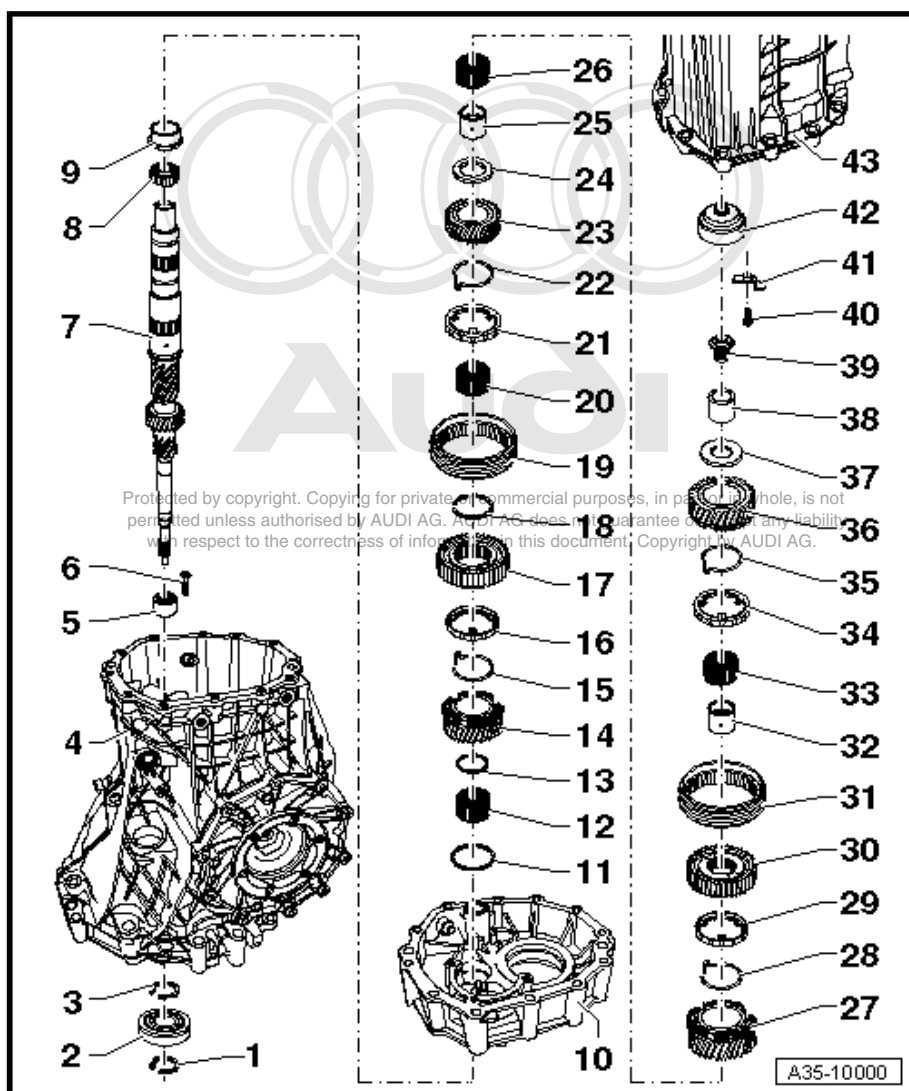
- ☐ For input shaft
- ☐ Secured with bolt
⇒ [Item 6 \(page 153\)](#)
- ☐ Removing and installing
⇒ [Item 17 \(page 139\)](#)

6 - Bolt

- ☐ 24 Nm
- ☐ Secures needle bearing
⇒ [Item 5 \(page 153\)](#) for input shaft

7 - Input shaft

- ☐ Adjusting ⇒ [page 157](#)



8 - Roller bearing

- ☐ Detaching and fitting ⇒ [page 156](#)
- ☐ Installation position: collar faces splines for 2nd gear

9 - Outer race

- ☐ For roller bearing
- ☐ Removing and installing ⇒ [Item 2 \(page 132\)](#)

10 - Bearing housing**11 - Thrust washer**

- ☐ For 3rd speed selector gear

12 - Needle bearing

- ☐ For 3rd gear

13 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 157](#) , -item 3-

14 - 3rd speed selector gear**15 - Spring**

- ☐ Insert in 3rd speed selector gear ⇒ [page 156](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

16 - 3rd gear synchro-ring

- ☐ Checking for wear ⇒ [page 156](#)

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

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

18 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 157](#) , -item 4-
- ☐ Do not interchange with other circlip ⇒ [Item 13 \(page 154\)](#)
- ☐ Re-determining thickness ⇒ [page 157](#)

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 156](#)

22 - Spring

- ☐ Insert in 4th speed selector gear ⇒ [page 156](#)
- ☐ 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

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27 - 5th speed selector gear

28 - Spring

- ☐ Insert in 5th speed selector gear ⇒ [page 156](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

29 - 5th gear synchro-ring

- ☐ Checking for wear ⇒ [page 156](#)

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

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 156](#)

35 - Spring

- ☐ Insert in 6th speed selector gear ⇒ [page 156](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

36 - 6th speed selector gear

37 - Thrust washer

- ☐ For 6th speed selector gear

38 - Inner race

- ☐ For roller bearing ⇒ [Item 42 \(page 155\)](#)

39 - Multi-point socket head bolt

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

40 - Multi-point socket head bolt

- ☐ 24 Nm

41 - Retaining plate

- ☐ Secures roller bearing ⇒ [Item 42 \(page 155\)](#) in gearbox cover

42 - Roller bearing

- ☐ Bearing for input shaft in gearbox cover
- ☐ With oil guide
- ☐ Always renew
- ☐ Removing and installing ⇒ [Item 4 \(page 126\)](#)

43 - Gearbox cover

1.2 Dismantling and assembling input shaft



Note

Removing and installing 3rd to 6th speed selector gears is described in chapter on dismantling and assembling gearbox ⇒ ["6.7 Assembly sequence - dismantling and assembling gearbox", page 90](#).

Special tools and workshop equipment required

- ◆ Depth gauge

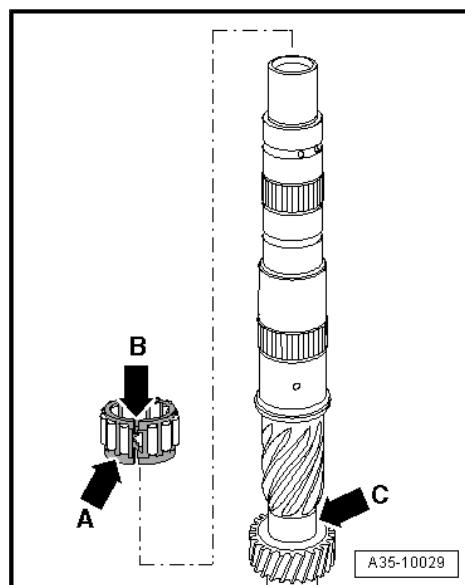
Detaching roller bearing from input shaft and fitting roller bearing onto input shaft

Detaching roller bearing:

- Bend open 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).

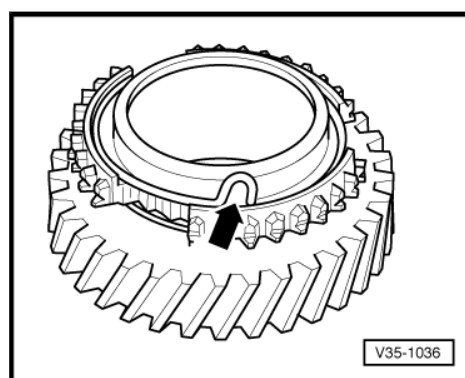
Fitting roller bearing:

- The shoulder -arrow A- faces towards splines for 2nd gear.
- Bend open 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-.



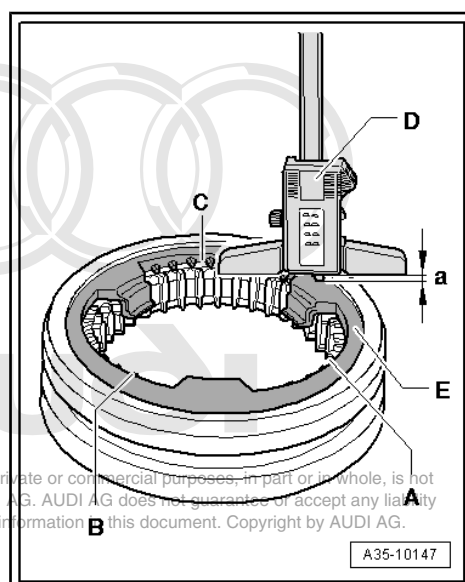
Inserting spring in selector gear

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.



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Installation position of circlips

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

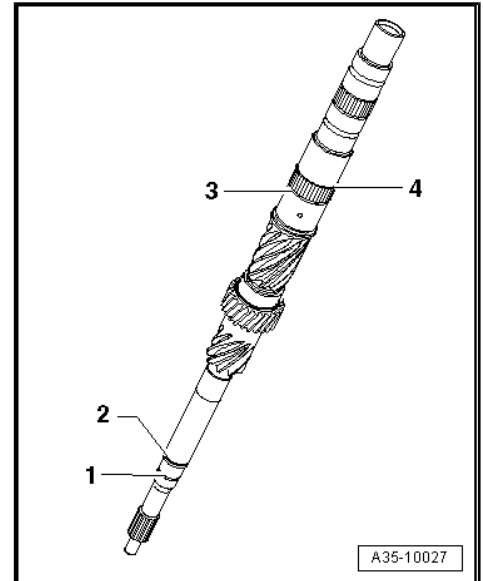
Determining thickness ⇒ [page 157](#) .

- ◆ 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 157](#) .

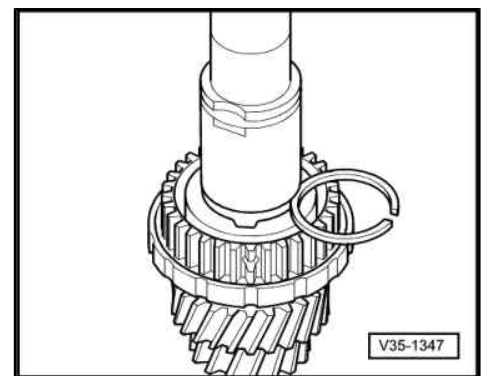


Determining thickness of circlip for synchro-hub for 3rd and 4th gear

- 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

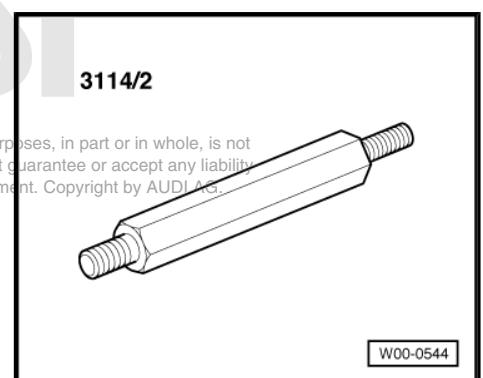
Determining circlips for input shaft ball bearing

It is necessary to readjust the input shaft when the:

- ◆ Gearbox housing
- or the
- ◆ Input shaft
- are renewed.

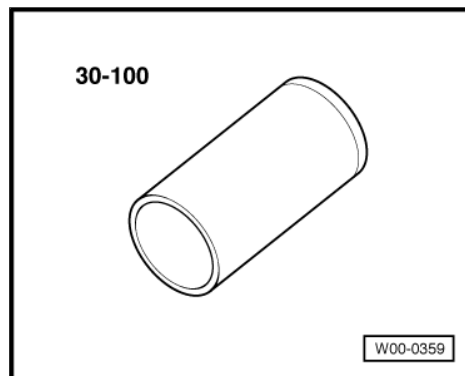
Special tools and workshop equipment required

- ◆ Pin (M8 and M10) - 3114/2-

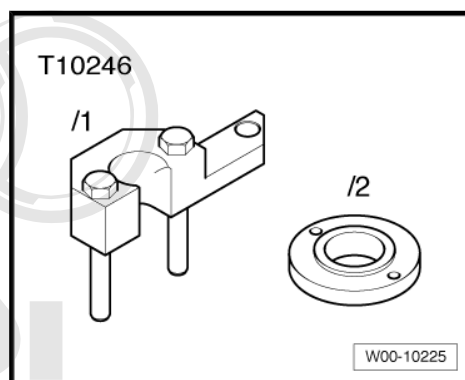


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◆ Drift sleeve - 30 - 100-



◆ Fitting tool - T10246-



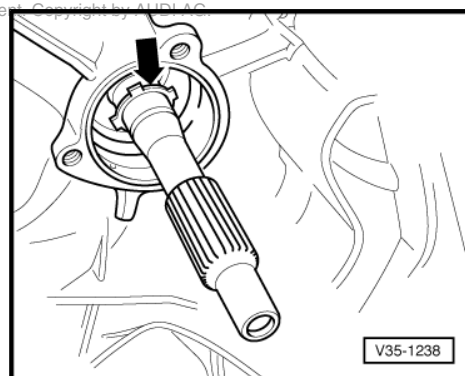
◆ Digital depth gauge , e.g. -VAS 6087-

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.



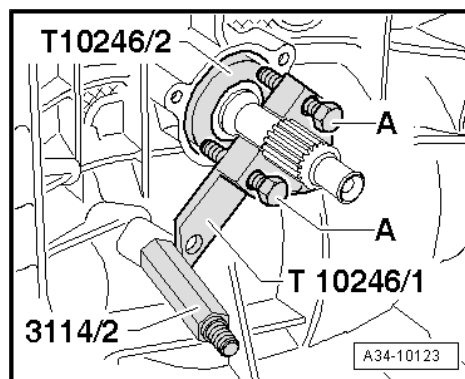
– Pressing in ball bearing:

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 the stop by tightening the bolts alternately (1/2 turn at a time).

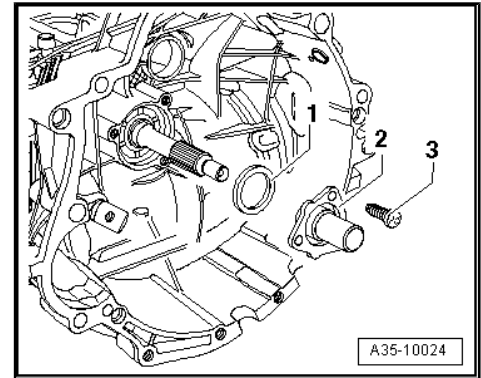


- Then fit dished spring -1-.

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 .



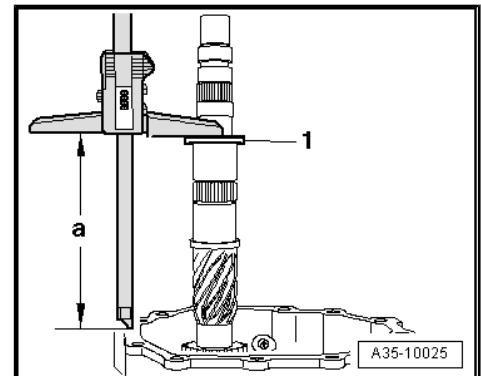
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- Place thrust washer -1- for 4th and 5th speed selector gears onto input shaft.
- Apply digital depth gauge (e.g. -VAS 6087-) to thrust washer -1- and measure distance to contact surface of housing. The measuring point on the housing contact surface must be as close to the input shaft as possible.



Note

When measuring, lift the input shaft with e.g. support bridge - 30 - 211 A- 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 .

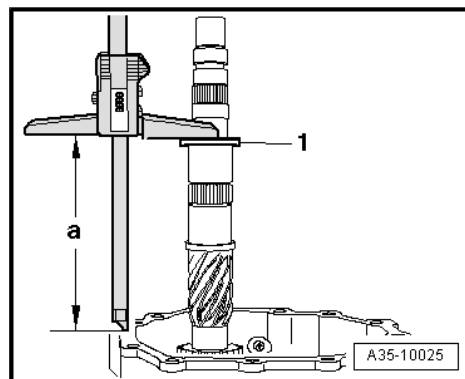
Checking adjustment and checking distance "a":

- Determined circlip is installed.

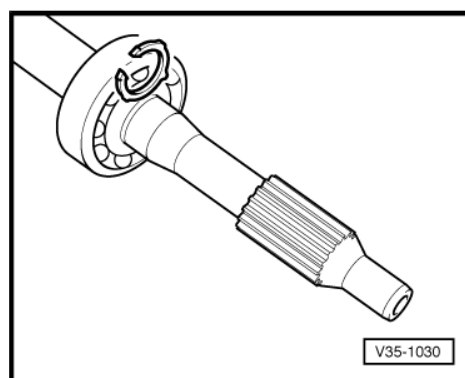
The distance "a" should be $164.14 \text{ mm} \pm 0.04 \text{ mm}$ if the correct circlip has been selected.

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 159](#) to determine correct circlip. For part number, refer to ⇒ Electronic parts catalogue .



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2 Pinion shaft and hollow shaft

⇒ "2.1 Exploded view - pinion shaft and hollow shaft", page 161

⇒ "2.2 Dismantling and assembling pinion shaft and hollow shaft", page 165

2.1 Exploded view - pinion shaft and hollow shaft



- ◆ When installing new gear wheels or the final drive set consult technical data ⇒ [page 1](#).
- ◆ Lubricate all needle bearings on hollow shaft with gear oil before installing.
- ◆ Adjustment work is required when renewing the parts marked with ¹⁾. Table of adjustments ⇒ [page 194](#)

1 - Gearbox housing ¹⁾

2 - Shim "S3"

- ☐ Table of adjustments

⇒ [page 194](#)

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3 - Double tapered roller bearing outer race ¹⁾

- ☐ Pulling out ⇒ [page 168](#)
- ☐ Pressing in
⇒ [page 169](#) and
⇒ [page 169](#)

4 - Pinion shaft ¹⁾

- ☐ Is mated with crown wheel, always renew together as a set
- ☐ Adjusting pinion shaft and crown wheel
⇒ [page 192](#)

5 - Double tapered roller bearing inner race ¹⁾

- ☐ Will be damaged during removal
- ☐ Renew
- ☐ Pressing off
⇒ [page 168](#)
- ☐ Pressing on
⇒ [page 169](#)

6 - Circlip

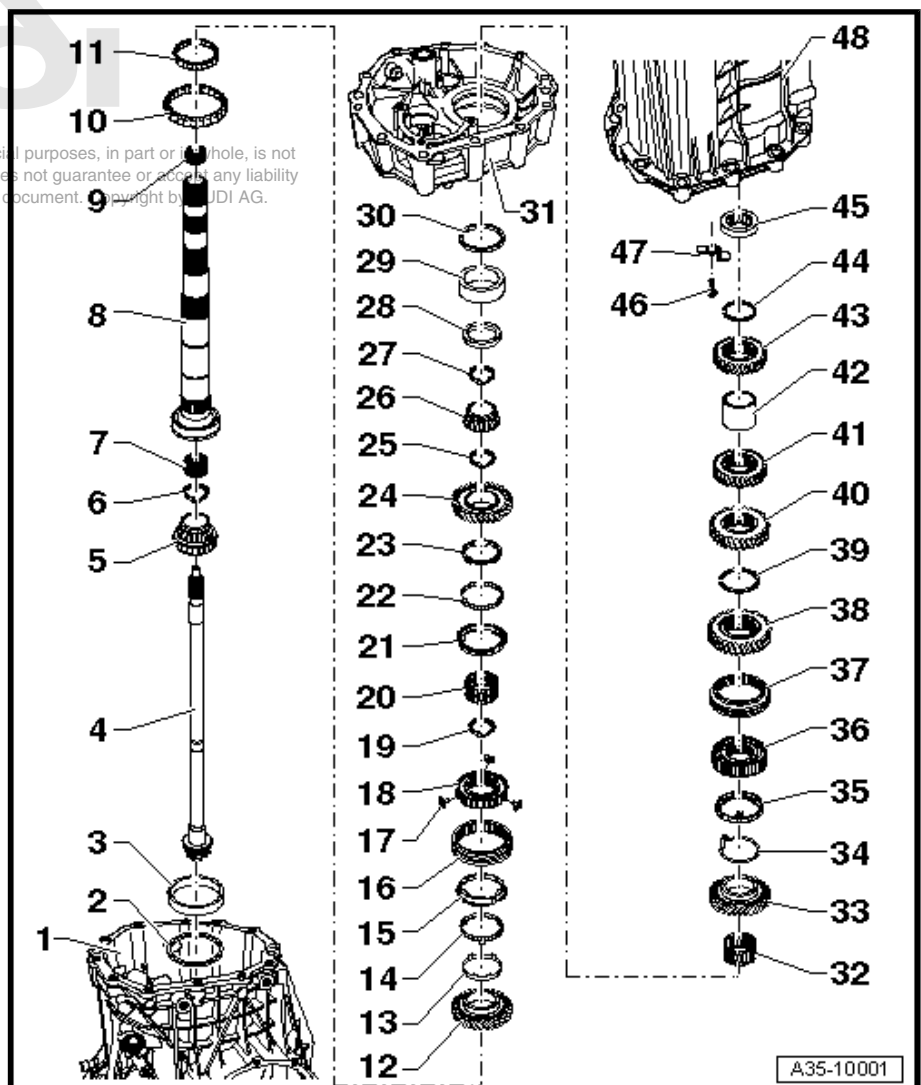
- ☐ Redetermine thickness if double tapered roller bearing is renewed
⇒ [page 169](#)

7 - Large needle bearing

- ☐ For pinion shaft in hollow shaft
- ☐ Lubricate with gear oil

8 - Hollow shaft

- ☐ Dismantling and assembling ⇒ [page 170](#)



9 - Small needle bearing

- ☐ For pinion shaft in hollow shaft
- ☐ Lubricate with gear oil

10 - Large needle bearing for 1st gear**11 - Small needle bearing for 1st gear****12 - 1st speed selector gear**

- ☐ Check axial clearance after installing using feeler gauge ⇒ [page 174](#) (0.20 ... 0.50 mm)

13 - Inner ring for 1st gear

- ☐ Installation position ⇒ [page 172](#)
- ☐ Checking for wear ⇒ [page 173](#)
- ☐ Renew if scored or if there are visible traces of wear

14 - Intermediate ring for 1st gear

- ☐ Installation position ⇒ [page 172](#)
- ☐ Checking for wear ⇒ [page 173](#)

15 - Synchro-ring for 1st gear

- ☐ Installation position ⇒ [page 172](#)
- ☐ Checking for wear ⇒ [page 173](#)
- ☐ Renew if scored or if there are visible traces of wear

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16 - Locking collar for 1st and 2nd gear

- ☐ Mark position in relation to synchro-hub prior to removing
- ☐ Assembling locking collar/synchro-hub ⇒ [page 173](#)

17 - Thrust block

- ☐ Installing thrust blocks (3x) ⇒ [page 173](#)

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

- ☐ Installation position: high inside collar faces 2nd speed selector gear
- ☐ Pressing off ⇒ [page 171](#)
- ☐ Pressing on ⇒ [page 173](#)
- ☐ Assembling locking collar/synchro-hub ⇒ [page 173](#)

19 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 172](#) , -item 1-
- ☐ Re-determine thickness when renewing 1st and 2nd gear synchro-hub or hollow shaft ⇒ [page 169](#)

20 - Needle bearing

- ☐ For 2nd gear

21 - Synchro-ring for 2nd gear

- ☐ Installation position ⇒ [page 172](#)
- ☐ Checking for wear ⇒ [page 173](#)
- ☐ Renew if scored or if there are visible traces of wear

22 - Intermediate ring for 2nd gear

- ☐ Installation position ⇒ [page 172](#)
- ☐ Checking for wear ⇒ [page 173](#)

23 - Inner ring for 2nd gear

- ☐ Installation position ⇒ [page 172](#)
- ☐ Checking for wear ⇒ [page 173](#)
- ☐ Renew if scored or if there are visible traces of wear

24 - 2nd speed selector gear

- ☐ Check axial clearance after installing using feeler gauge ⇒ [page 174](#) (0.20 ... 0.50 mm)

25 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 172](#) , -item 2-

26 - Tapered roller bearing inner race ¹⁾

- ☐ Pressing off ⇒ [page 170](#)
- ☐ Pressing on ⇒ [page 174](#)

27 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 172](#) , -item 3-

28 - Thrust washer

- ☐ For reverse selector gear
- ☐ Pressing off ⇒ [page 170](#)
- ☐ Pressing on ⇒ [page 174](#)

29 - Tapered roller bearing outer race ¹⁾

- ☐ Pulling out ⇒ [page 170](#)
- ☐ Pressing in ⇒ [page 170](#)

30 - Shim "S4"

- ☐ Table of adjustments ⇒ [page 194](#)

31 - Bearing housing ¹⁾

32 - Needle bearing

- ☐ For reverse selector gear

33 - Reverse selector gear

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

34 - Spring

- ☐ Insert into reverse selector gear ⇒ [page 164](#)
- ☐ Allocation to selector gear ⇒ Electronic parts catalogue

35 - Synchro-ring for reverse gear

- ☐ Checking for wear ⇒ [page 164](#)

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36 - Reverse gear synchro-hub

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

37 - Reverse gear locking collar

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

38 - 3rd gear wheel

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

39 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 172](#) , -item 5-
- ☐ Re-determine thickness when renewing 3rd gear wheel, reverse gear synchro-hub or hollow shaft ⇒ [page 169](#)

40 - 4th gear wheel

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

41 - 5th gear wheel

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

42 - Spacer sleeve

43 - 6th gear wheel

- ☐ Installation position: high inside collar faces spacer sleeve ⇒ [Item 42 \(page 164\)](#)

44 - Circlip

- ☐ Mark
- ☐ Installation position ⇒ [page 172](#) , -item 6-
- ☐ Re-determine thickness when renewing gear wheels for 4th ... 6th gear, the spacer sleeve or the hollow shaft ⇒ [page 169](#)

45 - Needle bearing

- ☐ Bearing for hollow shaft in gearbox cover
- ☐ Removing and installing ⇒ [Item 3 \(page 126\)](#)

46 - Multi-point socket head bolt, 24 Nm

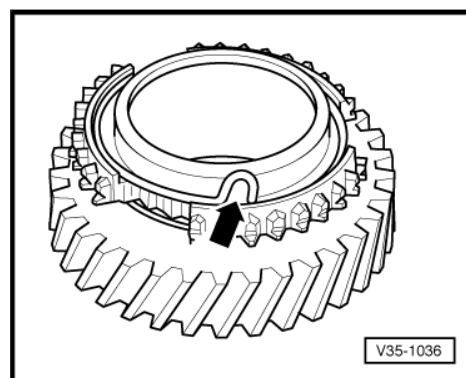
47 - Retaining plate

- ☐ Secures needle bearing ⇒ [Item 45 \(page 164\)](#) in gearbox cover

48 - Gearbox cover

Inserting spring in selector gear

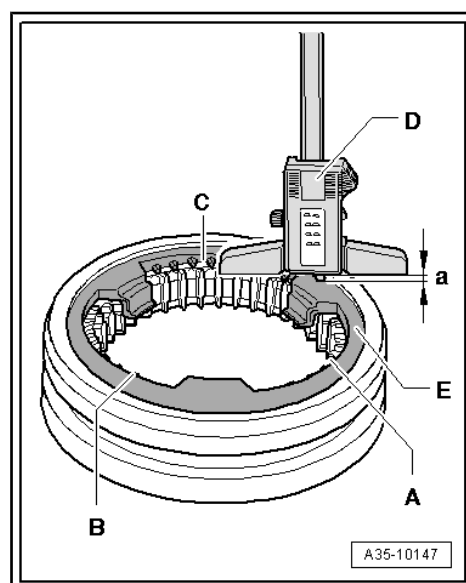
The bent end of the spring -arrow- must be hooked into the hole in the selector gear.



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.



2.2 Dismantling and assembling pinion shaft and hollow shaft

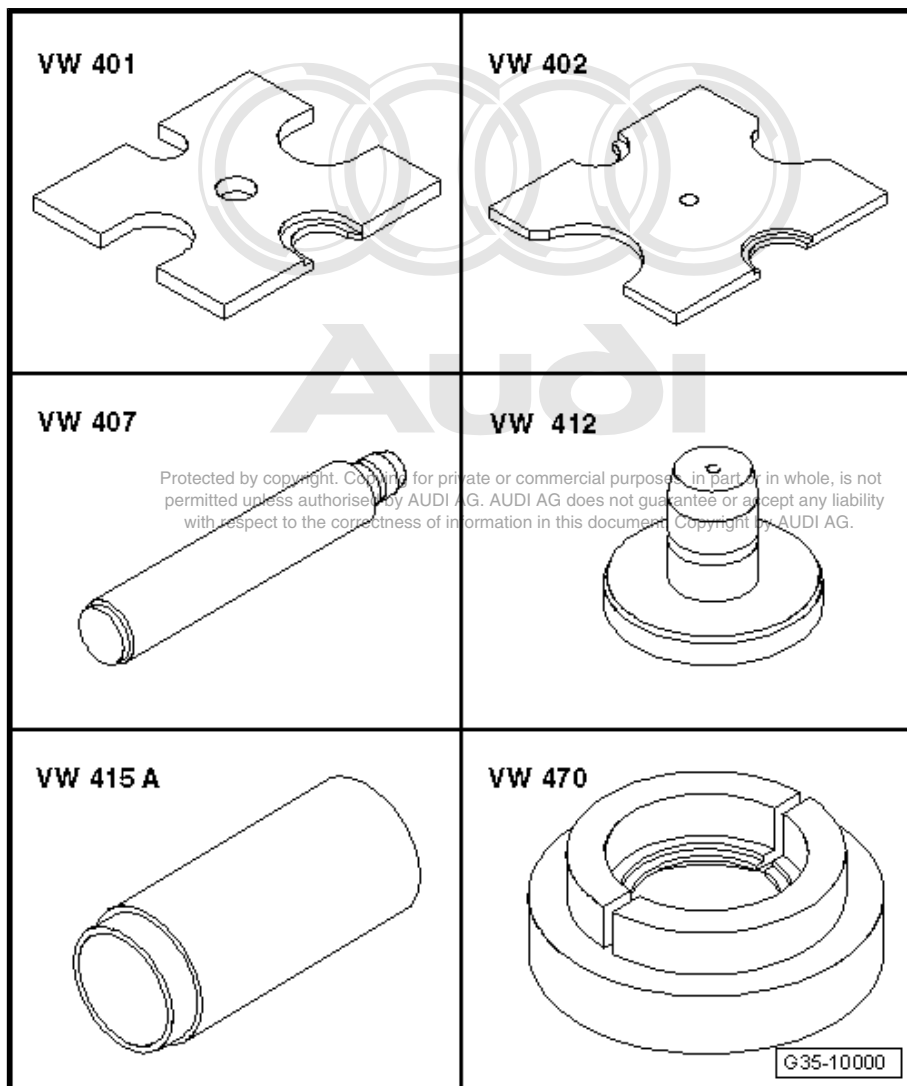


Note

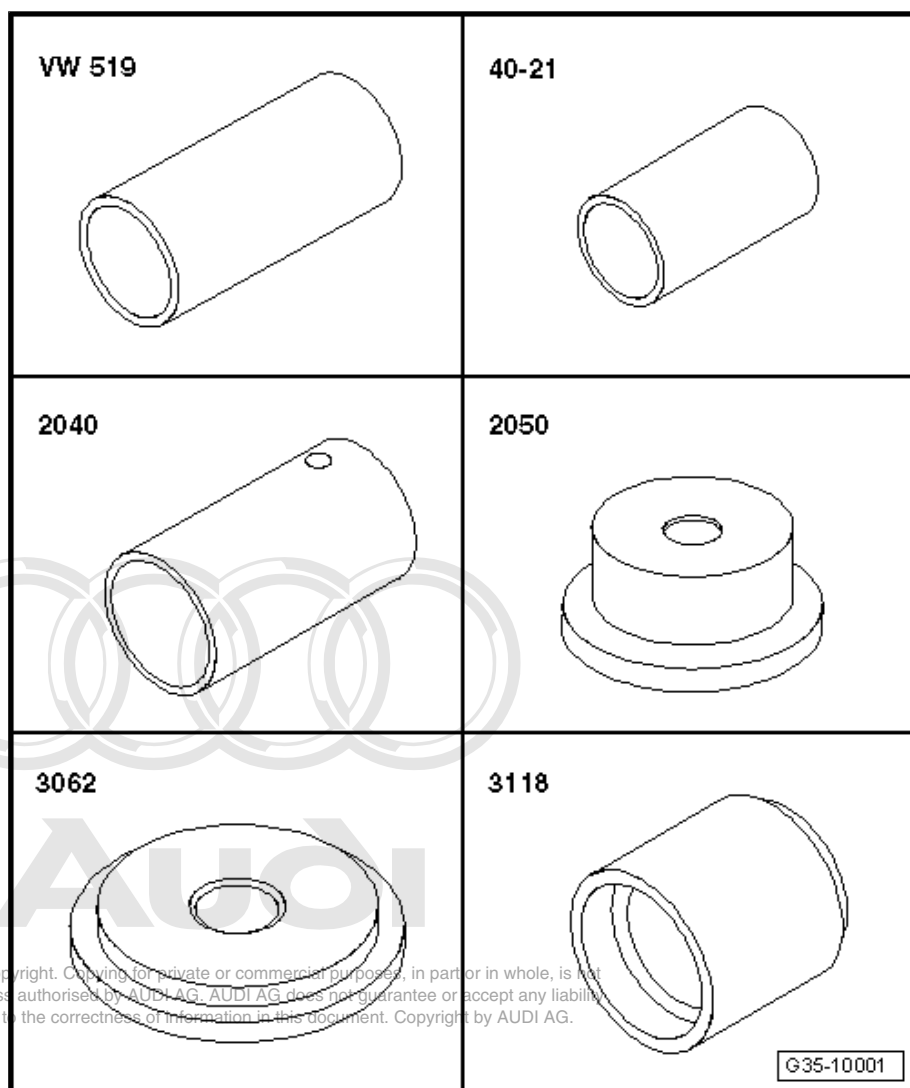
Removing and installing gear wheels for 3rd to 6th gear and the reverse selector gear is described in
⇒ ["6.7 Assembly sequence - dismantling and assembling gearbox", page 90](#).

Special tools and workshop equipment required

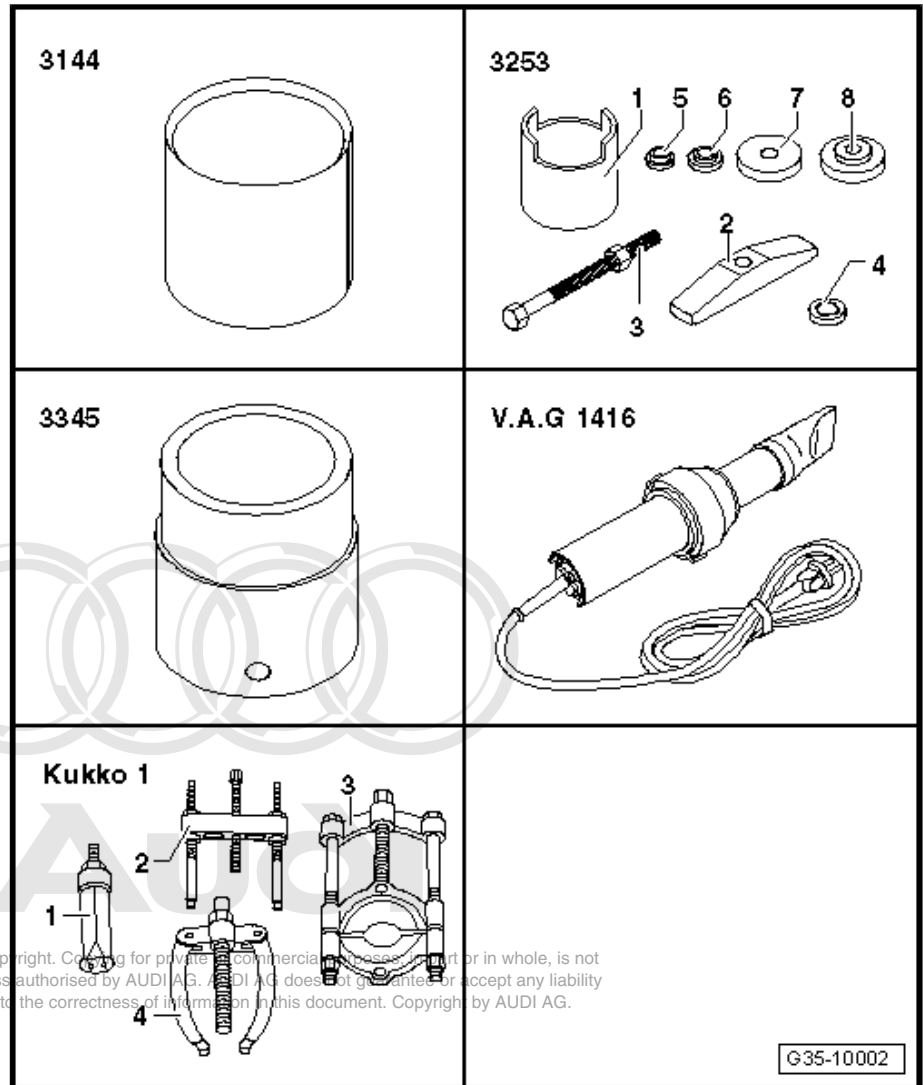
- ◆ Thrust plate - VW 401-
- ◆ Thrust plate - VW 402-
- ◆ Press tool - VW 407-
- ◆ Press tool - VW 412-
- ◆ Tube - VW 415 A-
- ◆ Thrust pieces for pinion shaft bearing - VW 470-



- ◆ Tube - VW 519-
- ◆ Press tool - 40 - 21-
- ◆ Tube - 2040-
- ◆ Thrust piece - 2050-
- ◆ Thrust pad - 3062-
- ◆ Press tool - 3118-

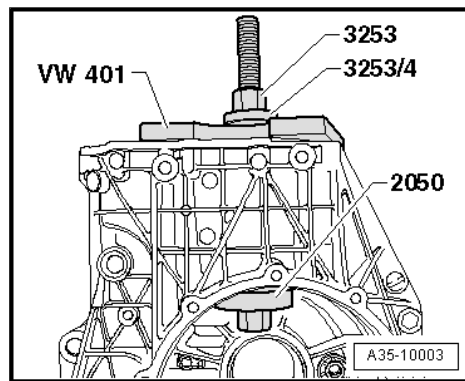
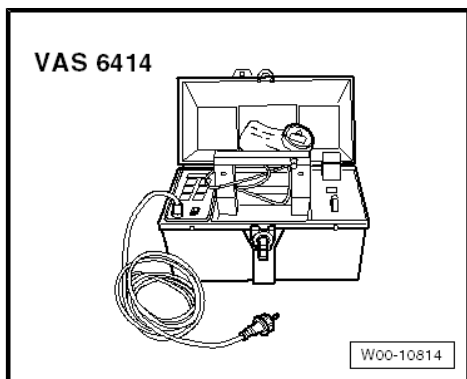


- ◆ Sleeve - 3144-
- ◆ Assembly tool - 3253-
- ◆ Wheel bearing tube - 3345-
- ◆ Hot air blower - V.A.G 1416-
- ◆ -1- Internal puller - Kukko 21/8-
- ◆ -3- Splitter - Kukko 17/2-
- ◆ -4- Counter-support - Kukko 22/2-



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- ◆ Inductive heater - VAS 6414-



- ◆ Feeler gauge

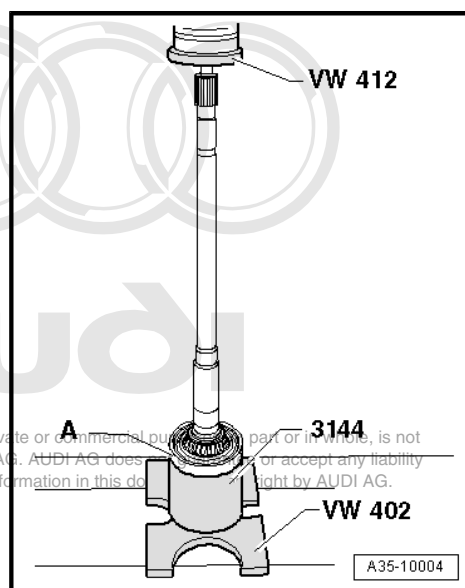
Pulling out double tapered roller bearing outer race

- Remove differential
⇒ [page 182](#) .
- 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.

Pressing off double tapered roller bearing inner race

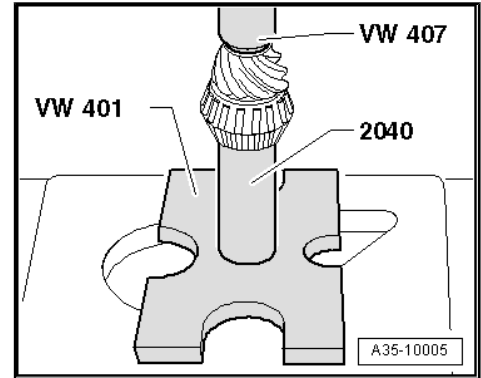
- Remove circlip before pressing off.
- The outer race of the double tapered roller bearing -A- must be fitted prior to pressing off the inner race.



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Pressing on double tapered roller bearing inner race

- Heat inner race to approx. 100 °C and press on.
- Determine thickness of required circlip ⇒ [page 169](#) 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 .



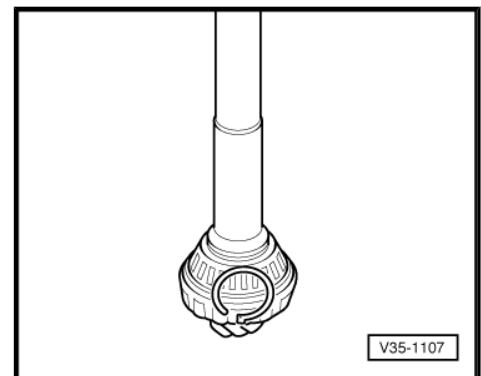
Note

The thickness of the circlips for the synchro-hubs and individual gear wheels must also be determined as shown for the double tapered roller bearing.

The following circlips are available:

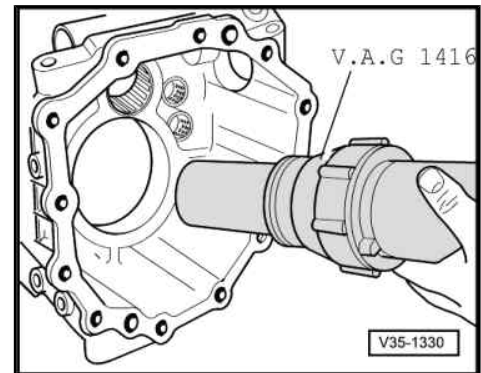
Circlip thickness (mm)		
2.00	2.06	2.12
2.03	2.09	2.15

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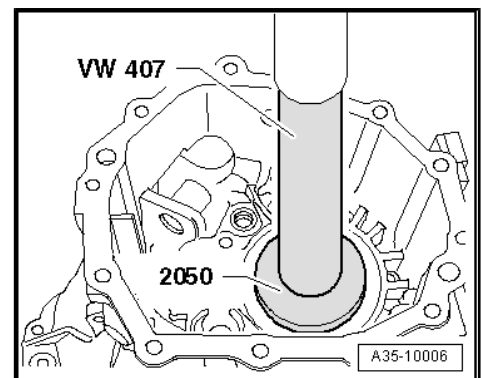
Heating gearbox housing in order to fit double tapered roller bearing outer race

- 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 in double tapered roller bearing outer race

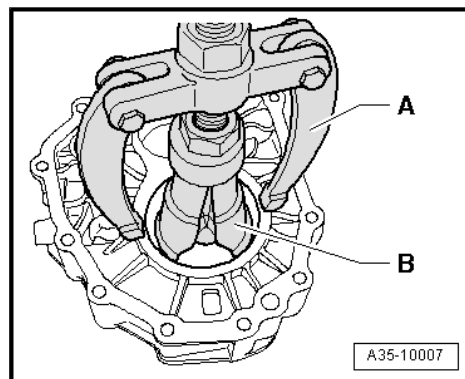
- Insert outer race only after heating gearbox housing and push into position under workshop press until heat exchange has taken place.



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-

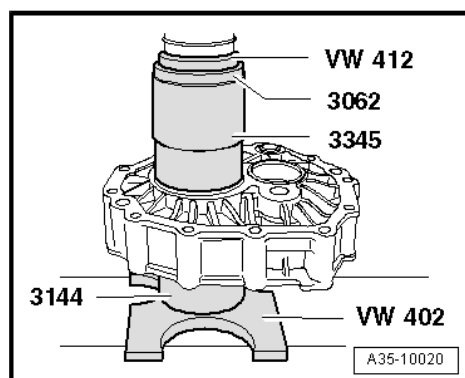


Pressing tapered roller bearing outer race into bearing housing

Support bearing housing with sleeve - 3144- directly below bearing mounting.

- Press in outer race until limit stop.

Dismantling and assembling hollow shaft



Pressing off thrust washer for reverse selector gear

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

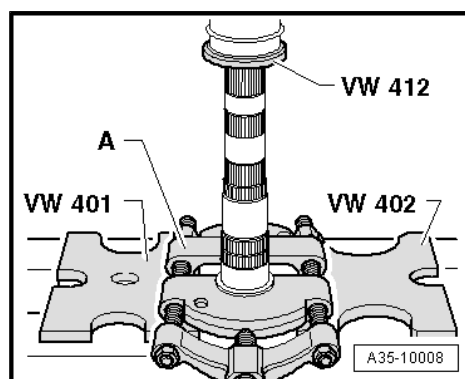
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Note

Fit splitter -A- below thrust washer, and not below circlip.

- Then detach circlip below thrust washer.



Pressing off tapered roller bearing inner race with 2nd speed selector gear

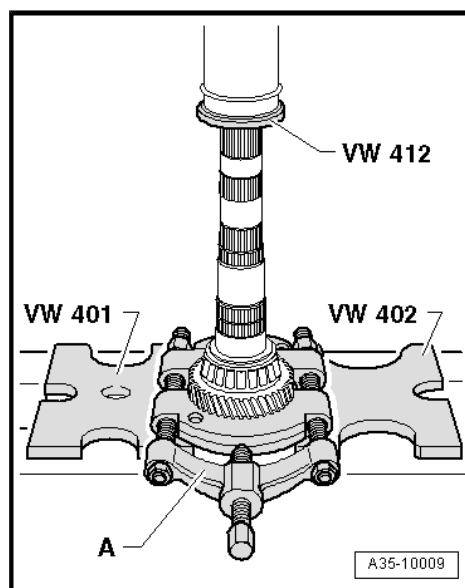
A - Splitter 22...115 mm , e.g. -Kukko 17/2-



Caution

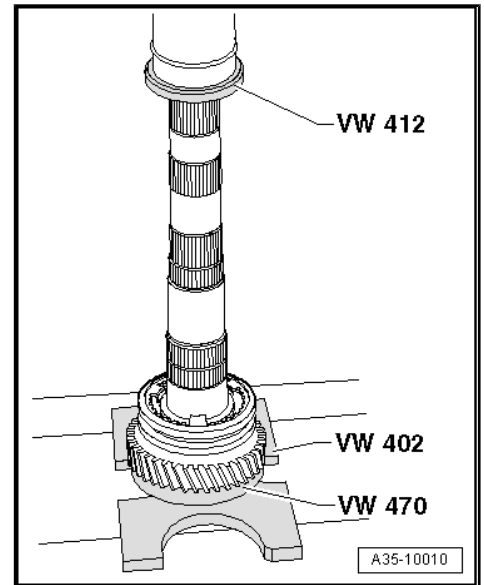
When pressing off, make sure that only the gear teeth (driving teeth) of the selector gear and not the dog teeth contact the splitter -A-. Otherwise the dog teeth will be damaged.

- Remove circlip for tapered roller bearing inner race.



Pressing off 1st and 2nd gear synchro-hub

- Remove circlip before pressing off.
- Place selector gear in the centre of ring on -VW 470- to press off synchro-hub with 1st speed selector gear.



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Installation position of circlips

- The required circlips for the synchro-hubs, needle bearings and individual gear wheels should be selected as shown in [⇒ page 169](#).

- ◆ Circlip -1- 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 -2- secures the tapered roller bearing inner race.

Circlip thickness (mm)		
3.50		

- ◆ Circlip -3- secures thrust washer for reverse selector gear.

Circlip thickness (mm)		
3.50		

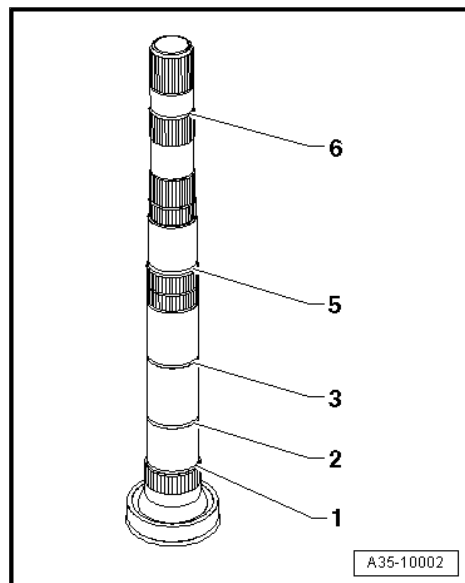
- ◆ Circlip -5- secures the 3rd gear wheel.

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](#).



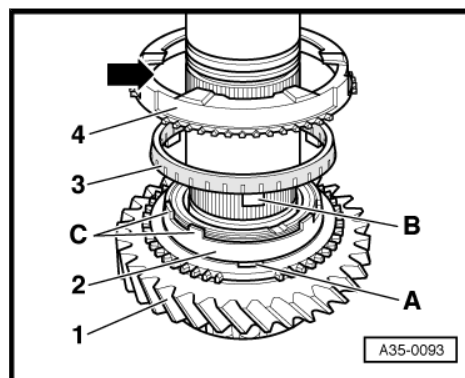
Installation position of synchro-rings for 1st and 2nd gear



Note

If components are not being renewed, make sure they are re-installed on the same gear.

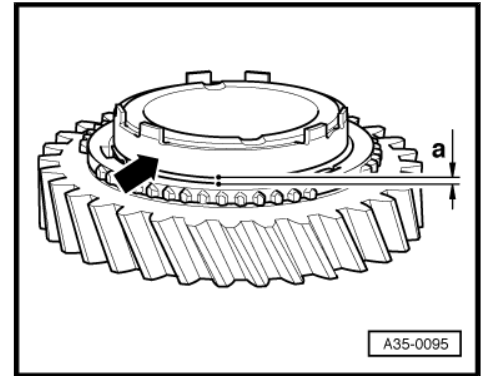
- Fit inner ring -2- onto selector gear -1-.
- Fit intermediate ring -3-. Lug -B- must be inserted into recess -A-.
- Fit synchro-ring -4-. Guide lugs -C- through recess -arrow-.



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 .

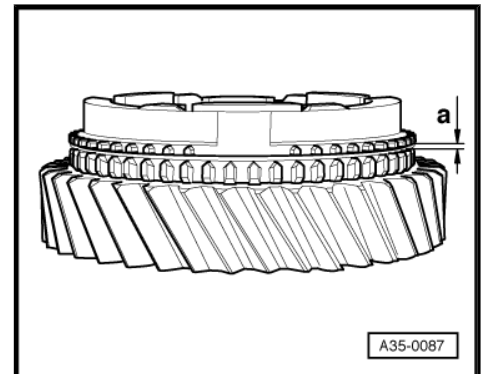
Gap -a-	As-new installation value	Wear limit
Inner ring for 1st gear	1.2...2.0 mm	0.6 mm



Checking 1st and 2nd gear intermediate ring for wear

- Check inner friction surface of synchro-ring for scoring or visible traces of wear 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

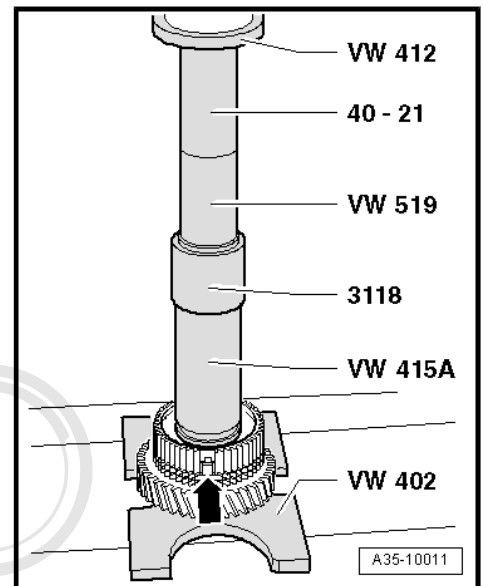


Pressing on 1st and 2nd gear synchro-hub

- ◆ Installation position:

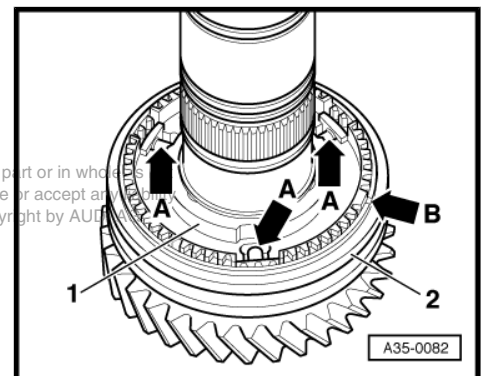
Higher inside collar faces 2nd gear.

- 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

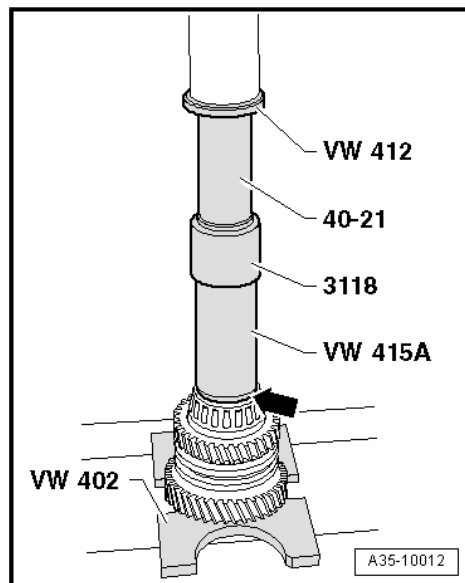
- Fit thrust blocks -arrows A- into mounted synchro-hub -1-.
- Fit locking collar -2- onto synchro-hub so that the wide teeth of locking collar and synchro-hub -arrow B- coincide.
- Install circlip for 1st and 2nd gear synchro-hub.
- Install 2nd speed selector gear with needle bearing and synchro-rings.
- Fit circlip for tapered roller bearing inner race onto hollow shaft.



Pressing on tapered roller bearing inner race

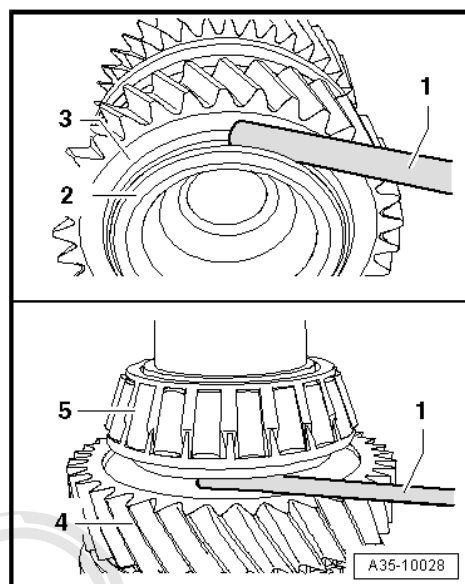
- Shoulder of tube - VW 415 A- faces inner race -arrow-.

Then check axial play of 1st speed and 2nd speed selector gears
⇒ [page 174](#) .



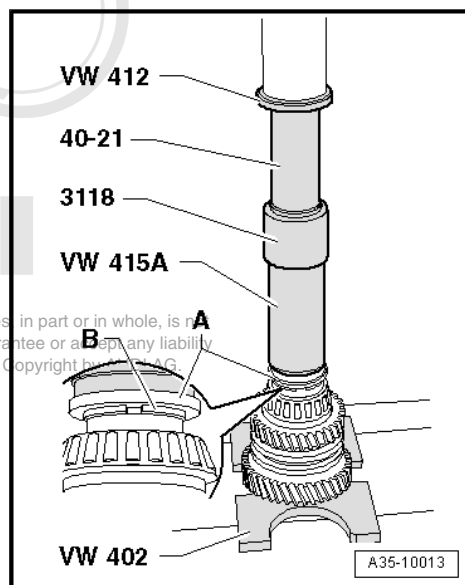
Checking axial play of selector gears

- Check axial play between hollow shaft -2- and 1st speed selector gear -3- and also between 2nd speed selector gear -4- and tapered roller bearing inner race -5- using feeler gauge -1-.
- The play must be 0.20 ... 0.50 mm.



Pressing on thrust washer for reverse selector gear

- Fit circlip -B- onto hollow shaft.
- Press on thrust washer -A- until it makes contact with circlip.



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39 – Final drive - front differential

1 Renewing oil seals for flange shafts

⇒ [“1.1 Renewing oil seal for flange shaft \(left-side\)”, page 175](#)

⇒ [“1.2 Renewing oil seal for flange shaft \(right-side\)”, page 178](#)

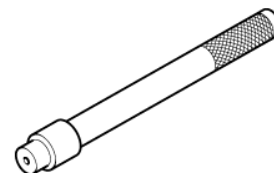
Renewing oil seal for flange shaft (rear) with gearbox installed
⇒ [page 120](#)

1.1 Renewing oil seal for flange shaft (left-side)

Special tools and workshop equipment required

◆ Drift - VW 295-

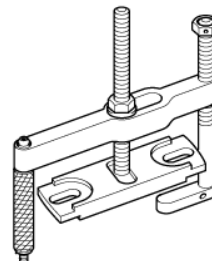
VW 295



W00-0125

◆ Puller - T10037-

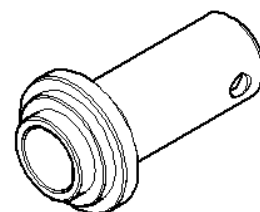
T10037



W00-0976

◆ Thrust piece - T10387-

T10387



W00-10683

◆ Sealing grease - G 052 128 A1-

◆ Drip tray

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Procedure

- Gearbox is installed.

Observe the general repair instructions ⇒ [page 9](#) .

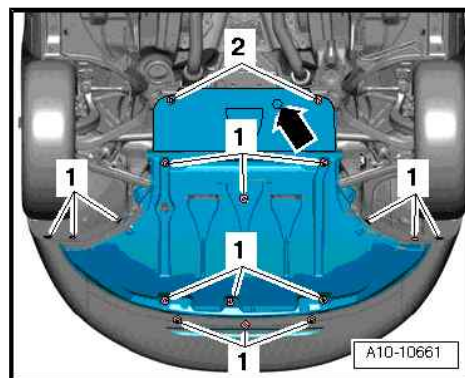
- Remove front left wheel.



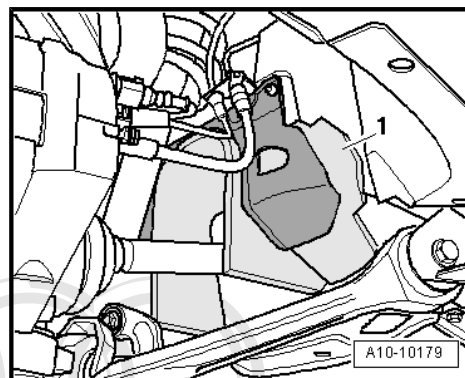
Note

Secure brake disc with one wheel bolt.

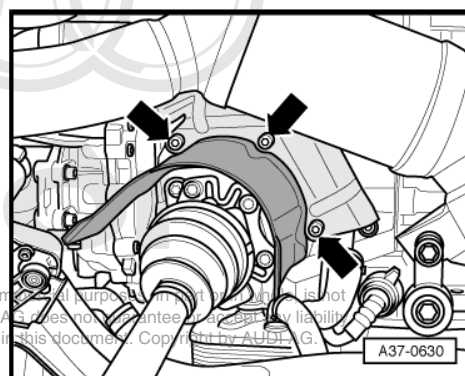
- Release fasteners marked -1-, -2- and -arrow- (if fitted) and remove noise insulation panels.



- If fitted, remove noise insulation -1- in wheel housing (left-side).

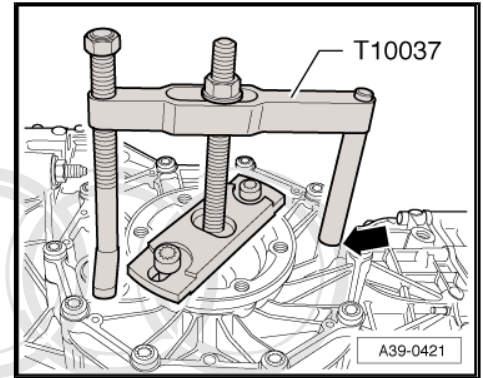


- If fitted, unscrew heat shield -arrows- for drive shaft (left side).
- Unbolt drive shaft (left-side) from gearbox flange shaft.
- Tie up drive shaft towards the front as far as possible. Make sure not to damage surface protection.

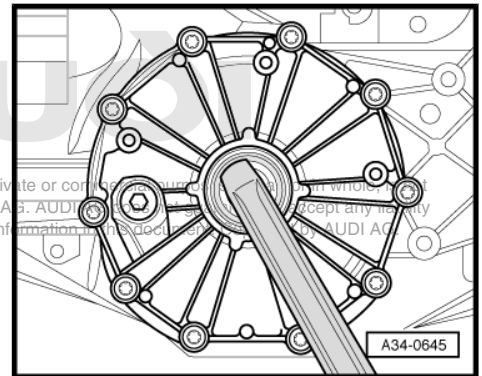


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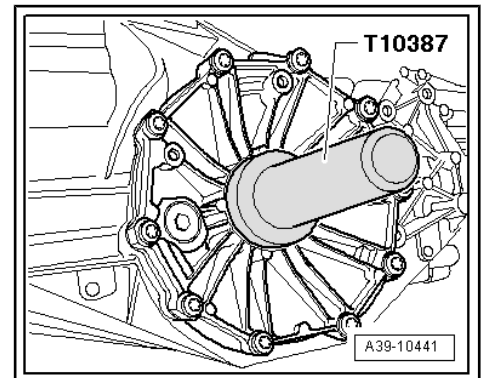
- Place drip tray underneath.
- Remove flange shaft (left-side); to do so, secure puller - T10037- to cover for final drive -arrow-.



- 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.



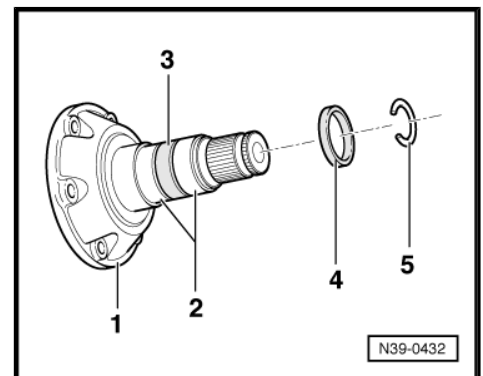
i Note

- ◆ *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- .

i 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-.*



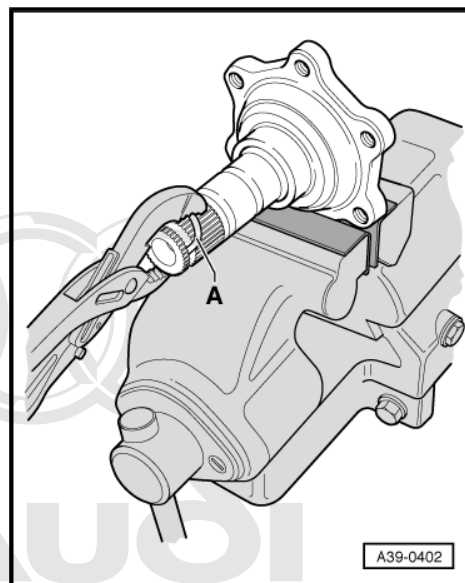
- Clamp flange shaft in vice, using jaw protectors. Use new circlip -A- to press old circlip out of groove in flange shaft.
- Knock flange shaft in with drift - VW 295- .

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

- Attach drive shaft to flange shaft ⇒ Rep. gr. 40 .
- If applicable, bolt on heat shield for drive shaft (left-side).
- Fill up oil in gearbox and check oil level ⇒ [page 77](#) .
- Bolt on heat shield for drive shaft (left-side).
- Fill up oil in gearbox and check oil level ⇒ [page 77](#) .
- Install noise insulation panels.

Tightening torque

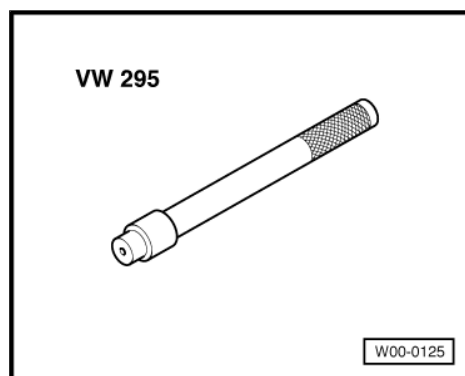
Component	Nm
Heat shield above drive shaft to gearbox	23



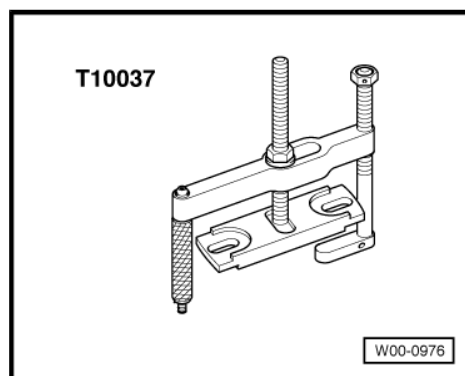
1.2 Renewing oil seal for flange shaft (right-side)

Special tools and workshop equipment required

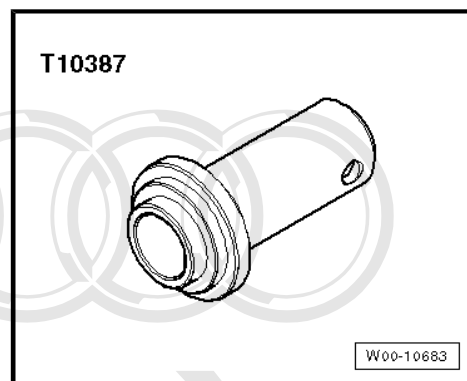
- ◆ Drift - VW 295-



- ◆ Puller - T10037-



- ◆ Thrust piece - T10387-



- ◆ Sealing grease - G 052 128 A1-
- ◆ Drip tray

Removing

- Gearbox is installed.

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Observe the general repair instructions [⇒ page 9](#).

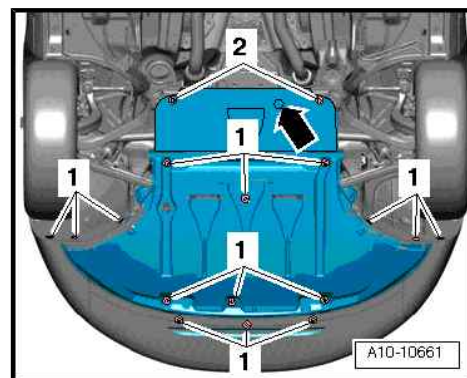
- Remove front right wheel.



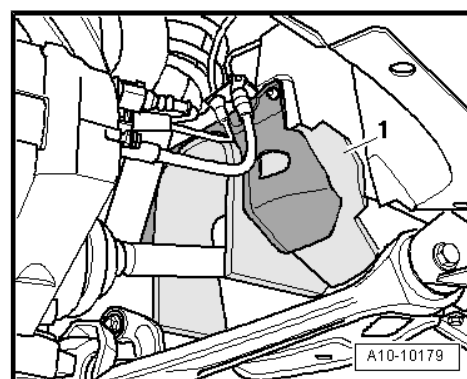
Note

Secure brake disc with one wheel bolt.

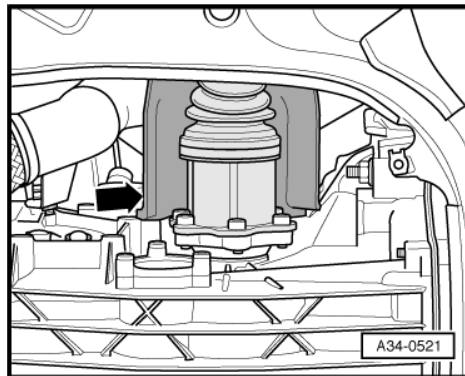
- Release fasteners marked -1-, -2- and -arrow- (if fitted) and remove noise insulation panels.



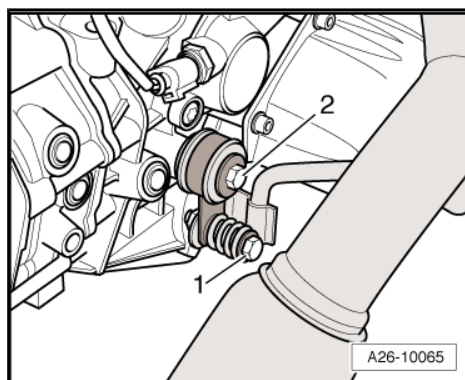
- If fitted, remove noise insulation -1- in wheel housing (right-side).



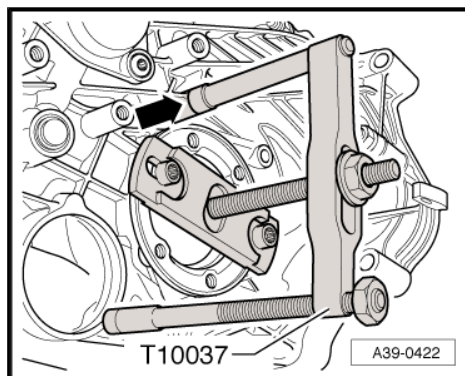
- Unbolt heat shield -arrow- for drive shaft (right-side).



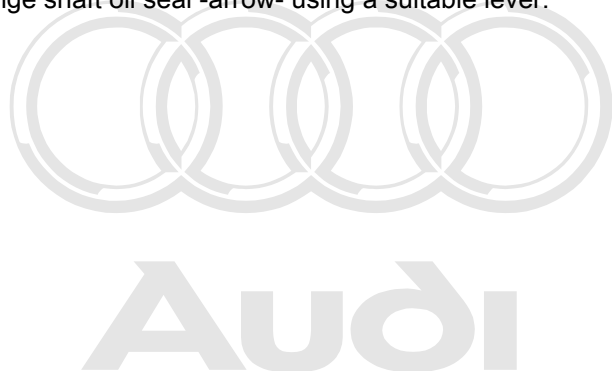
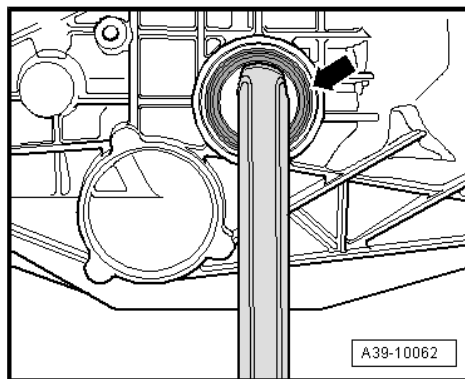
- Unscrew bolts -1- and -2- and remove front exhaust pipe bracket (right-side).
- Unbolt drive shaft (right side) from gearbox flange shaft.
- Push drive shaft towards the rear as far as possible. Make sure not to damage surface protection.



- Place drip tray in position.
- 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.

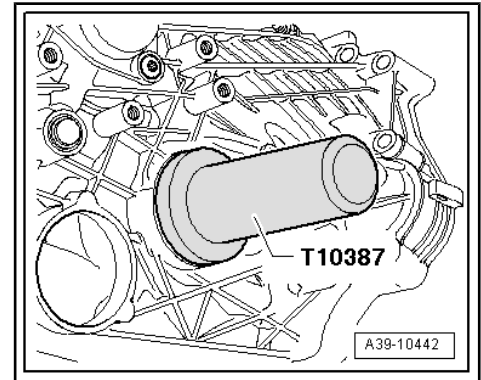


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- Lightly oil outer circumference of new oil seal.
- Drive in new flange shaft oil seal using thrust piece - T10387- until thrust piece reaches stop; keep seal straight when installing.

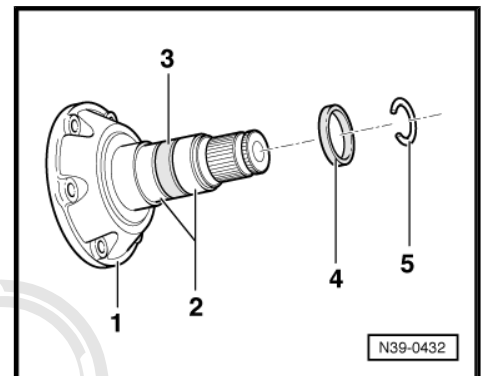
 Note

- ◆ *Driving-in depth (standard): 5.5 mm beneath surface of housing*
- ◆ *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-.*



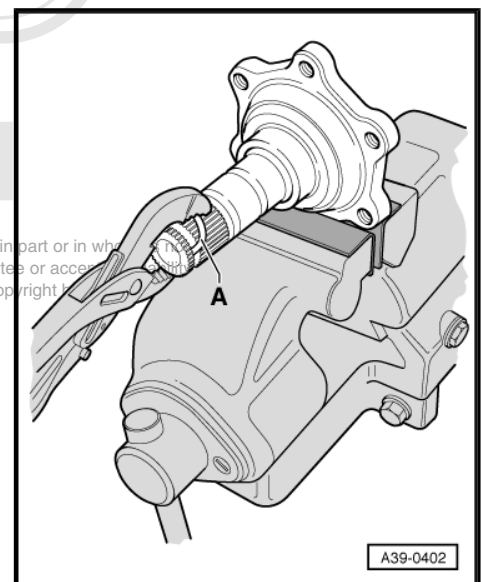
- Clamp flange shaft in vice, using jaw covers. Use new circlip -A- to press old circlip out of groove in flange shaft.
- Knock flange shaft in with drift - VW 295- .

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

- Bolt drive shaft to flange shaft ⇒ Rep. gr. 40 .
- Bolt on heat shield for drive shaft (right-side).
- Fill up oil in gearbox and check oil level ⇒ [page 77](#) .
- Install noise insulation panels.

Tightening torque

Component	Nm
Heat shield above drive shaft to gearbox	23



2 Differential

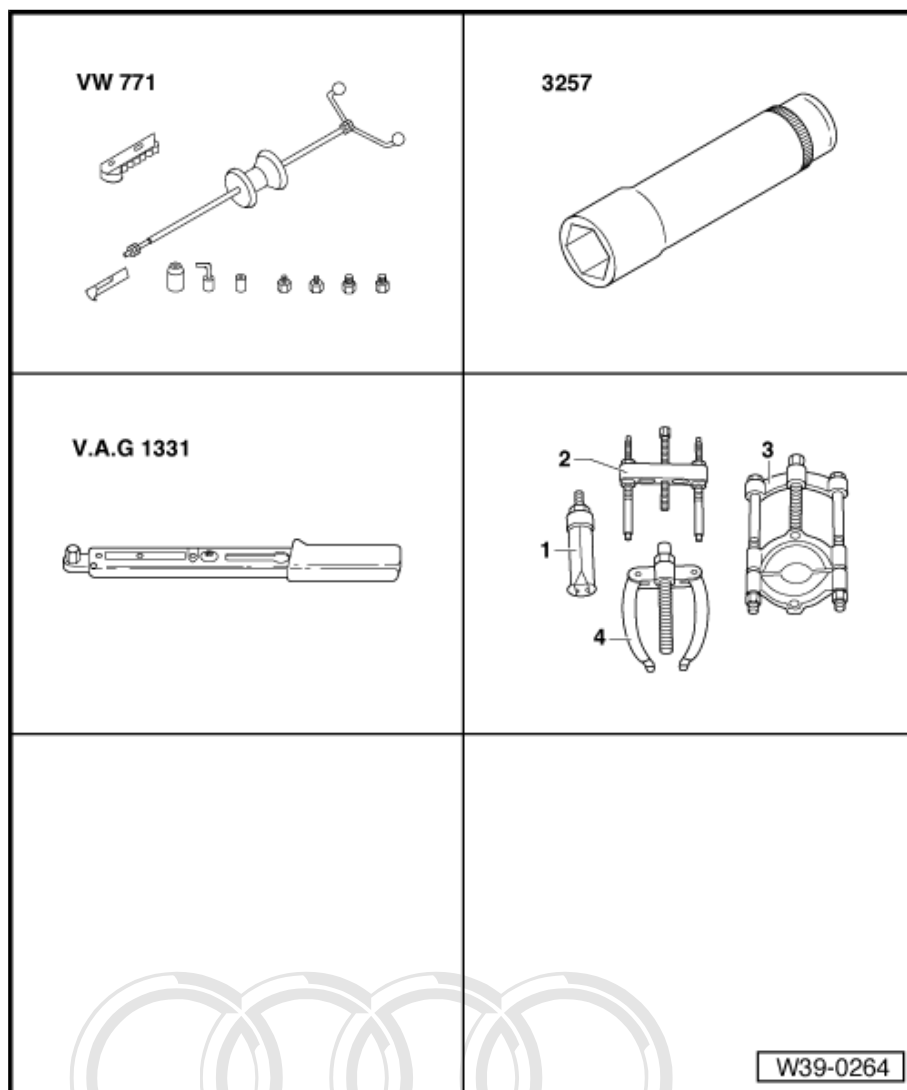
⇒ "2.1 Removing and installing differential", page 182

⇒ "2.2 Dismantling and assembling differential", page 185

2.1 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-



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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/hollow shaft or 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 184](#) , -item 4-.
- ◆ Adjustment work is required when renewing the parts marked with ¹⁾. Table of adjustments ⇒ [page 194](#)

1 - Gearbox housing ¹⁾

2 - Oil seal

- ☐ Renewing for flange shaft (left-side)
⇒ [page 175](#)
- ☐ Renewing for flange shaft (right-side)
⇒ [page 178](#)

3 - Circlip

- ☐ Renew
- ☐ Removing and installing
⇒ [page 181](#)

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 184](#)

5 - Flange shaft

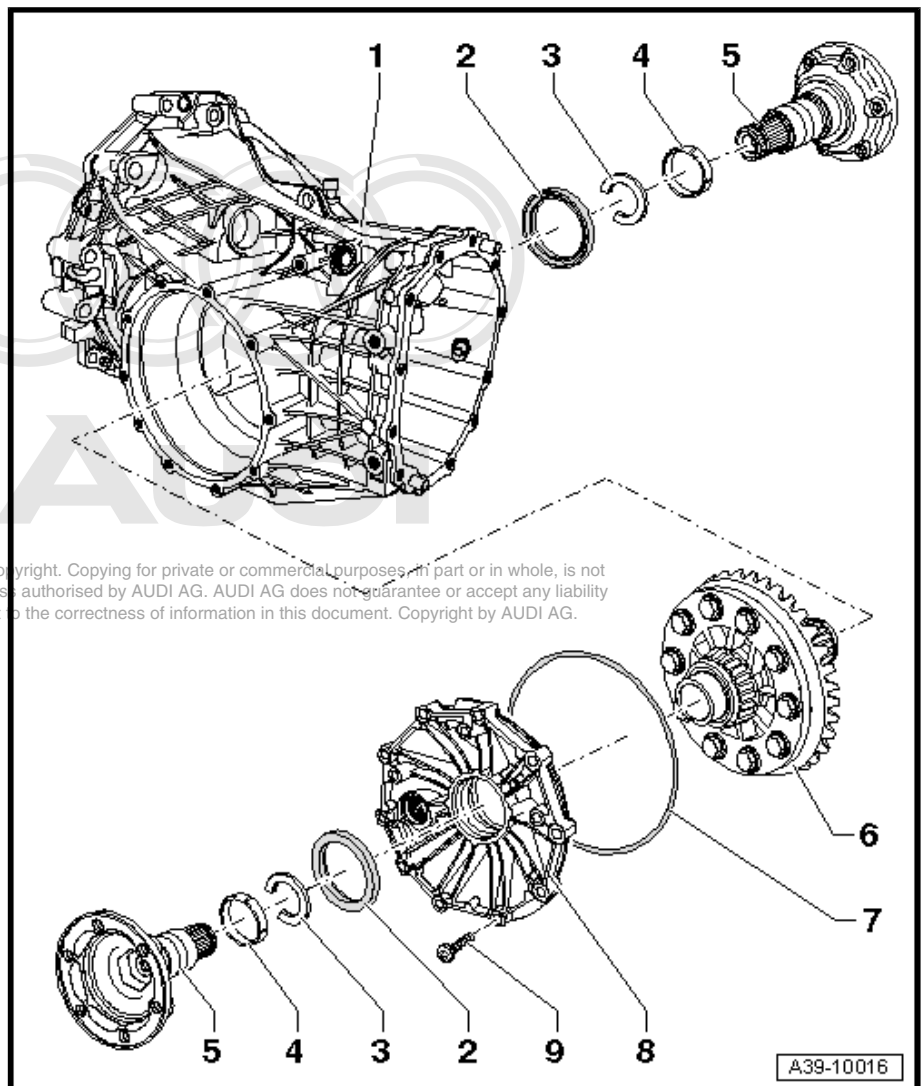
- ☐ Removing (left-side)
⇒ [page 184](#)
- ☐ Removing (right-side)
⇒ [page 184](#)
- ☐ Drive in with drift - VW 295- .
- ☐ Flange shaft assembly
⇒ [page 184](#)

6 - Differential with crown wheel ¹⁾

- ☐ Dismantling and assembling ⇒ [page 185](#)

7 - O-ring

- ☐ Always renew
- ☐ Lubricate with gear oil

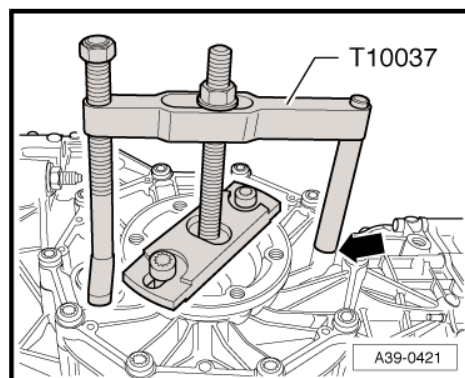


8 - Cover for final drive ¹⁾

9 - Torx bolt, 20 Nm + 90 ° further

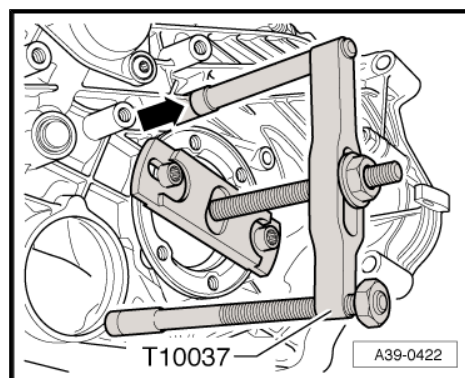
Removing flange shaft (left-side)

- Remove flange shaft (left-side); to do so, secure puller - T10037- to cover for final drive -arrow-.



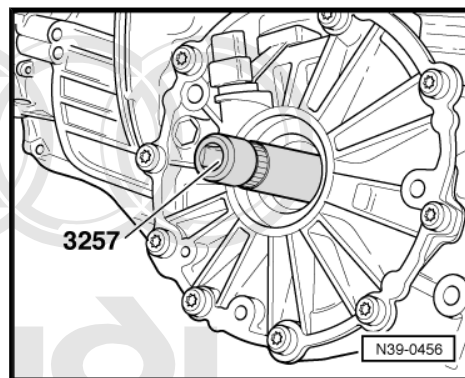
Removing flange shaft (right-side)

- 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.



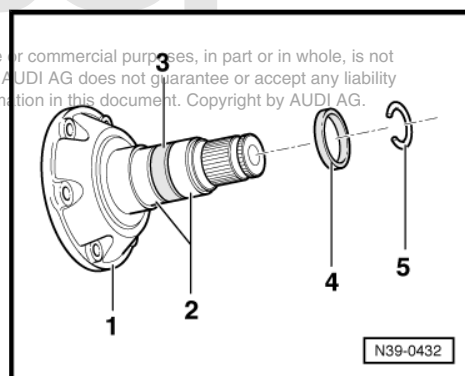
Flange shaft assembly

- 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.

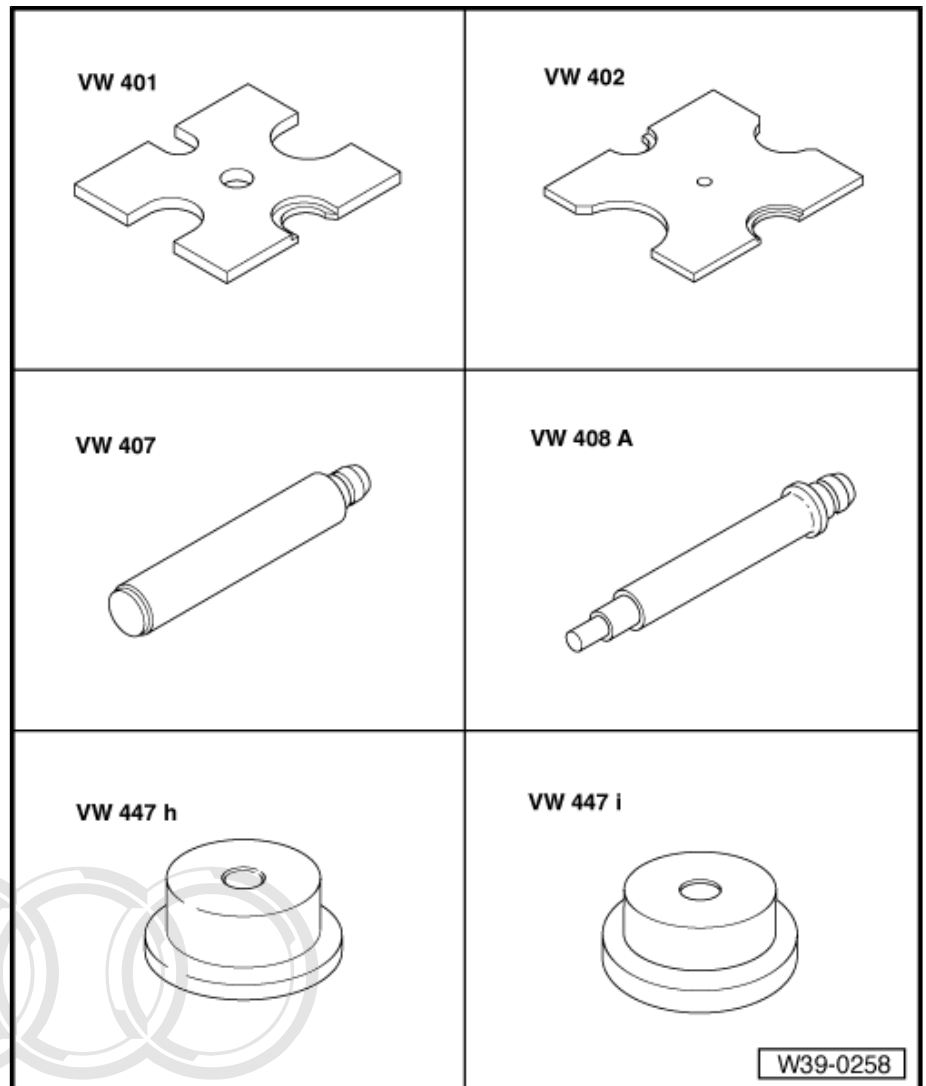


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2.2 Dismantling and assembling differential

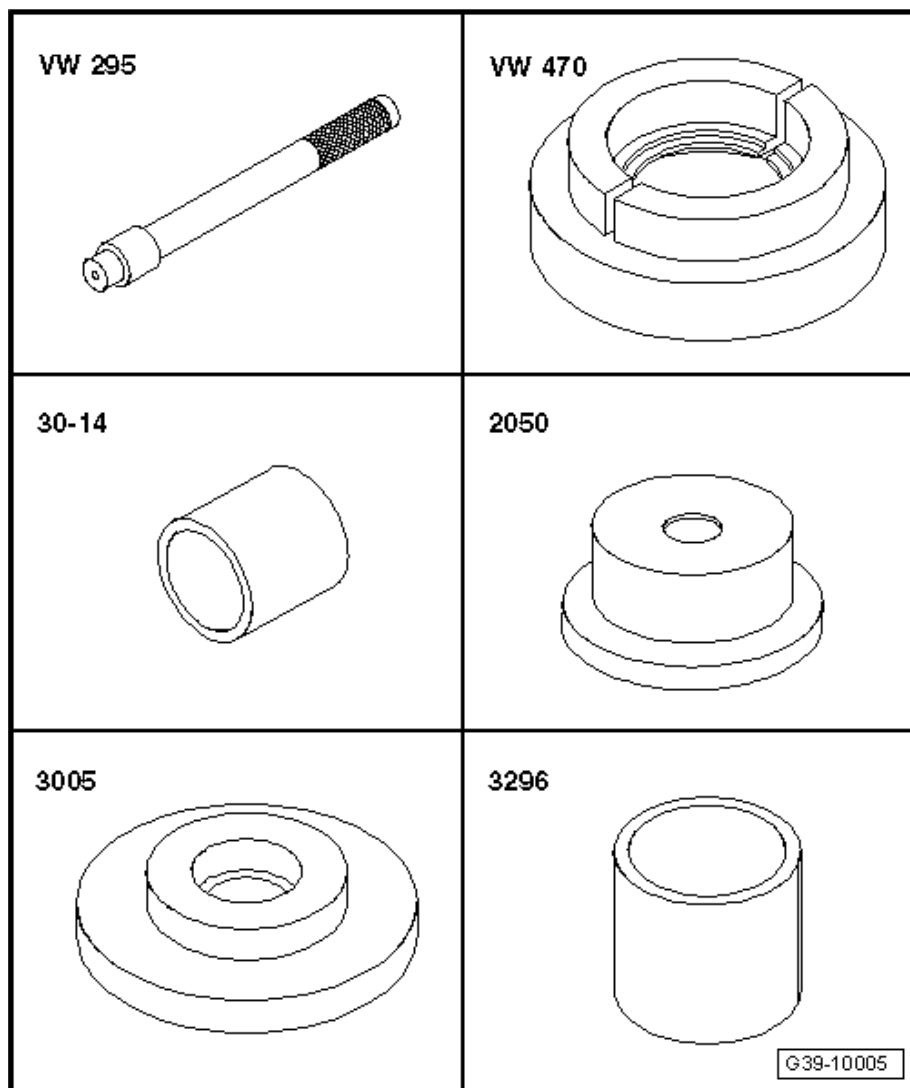
Special tools and workshop equipment required

- ◆ 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-



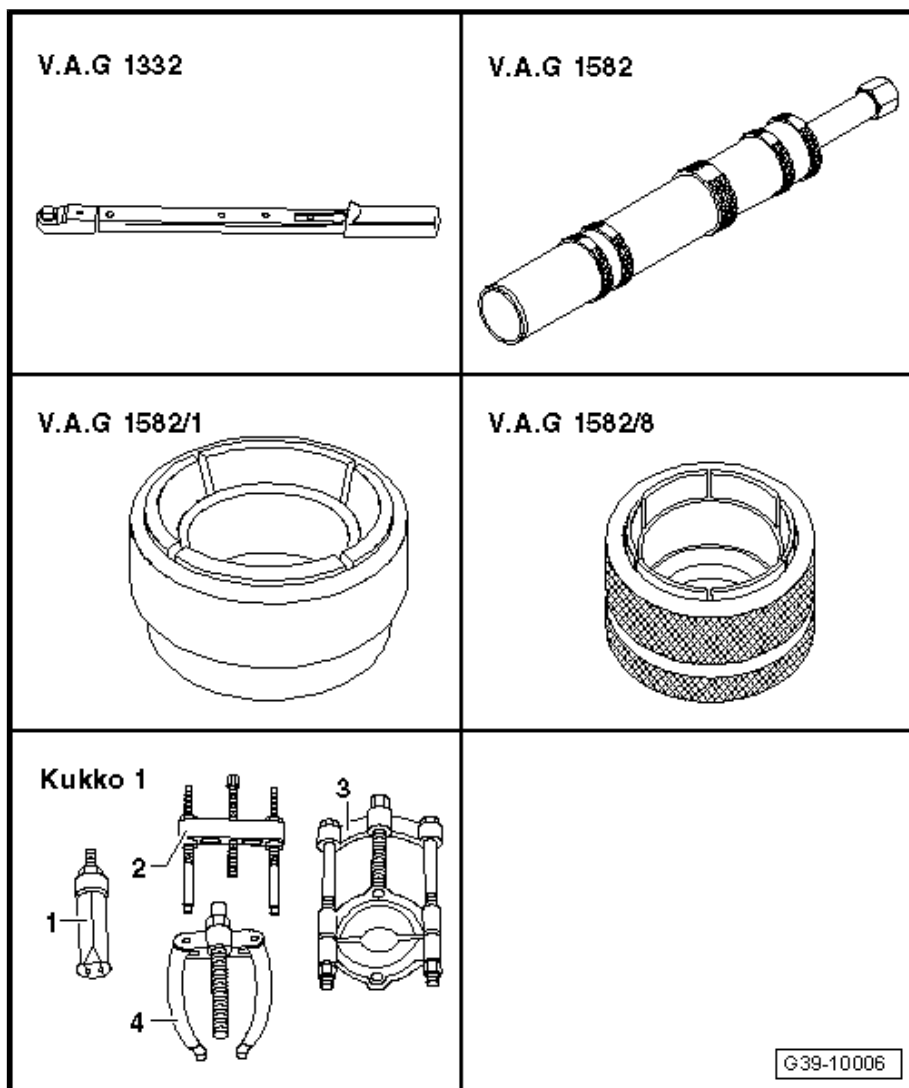
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- ◆ Drift - VW 295-
- ◆ Thrust pieces for pinion shaft bearing - VW 470-
- ◆ Tube - 30 - 14-
- ◆ Thrust piece - 2050-
- ◆ Thrust plate - 3005-
- ◆ Tube - 3296-

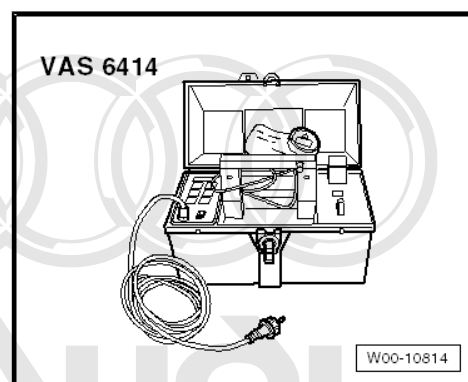


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- ◆ Torque wrench - V.A.G 1332-
- ◆ Tapered roller bearing puller - V.A.G 1582-
- ◆ Adapter - V.A.G 1582/1-
- ◆ Adapter - V.A.G 1582/8-
- ◆ -1- Internal puller - Kukko 21/8-
- ◆ -4- Counter-support - Kukko 22/2-



- ◆ Inductive heater - VAS 6414-



- ◆ Feeler gauge

Removing and installing differential ⇒ [page 182](#)

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Note

- ◆ Always renew both tapered roller bearings together.
- ◆ Adjustment work is required when renewing the parts marked with ¹⁾. Table of adjustments ⇒ [page 194](#)

1 - Gearbox housing ¹⁾

2 - Shim "S₂"

- ☐ Note thickness
- ☐ Table of adjustments
⇒ [page 194](#)

3 - Tapered roller bearing outer race (right-side) ¹⁾

- ☐ Pulling out ⇒ [page 189](#)
- ☐ Driving in ⇒ [page 189](#)

4 - Tapered roller bearing inner race (right-side) ¹⁾

- ☐ Pulling off ⇒ [page 189](#)
- ☐ Pressing on
⇒ [page 190](#)

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 191](#)
- ☐ Fitting on differential cage ⇒ [page 191](#)

6 - Differential cage¹⁾

7 - Bolt, 60 Nm + 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 190](#)
- ☐ Pressing on ⇒ [page 190](#)

9 - Tapered roller bearing outer race (left-side) ¹⁾

- ☐ Pulling out ⇒ [page 190](#)
- ☐ Pressing in ⇒ [page 191](#)

10 - Shim "S₁"

- ☐ Note thickness
- ☐ Table of adjustments ⇒ [page 194](#)

11 - Cover for final drive ¹⁾

- ☐ With O-ring

12 - One-piece thrust washer

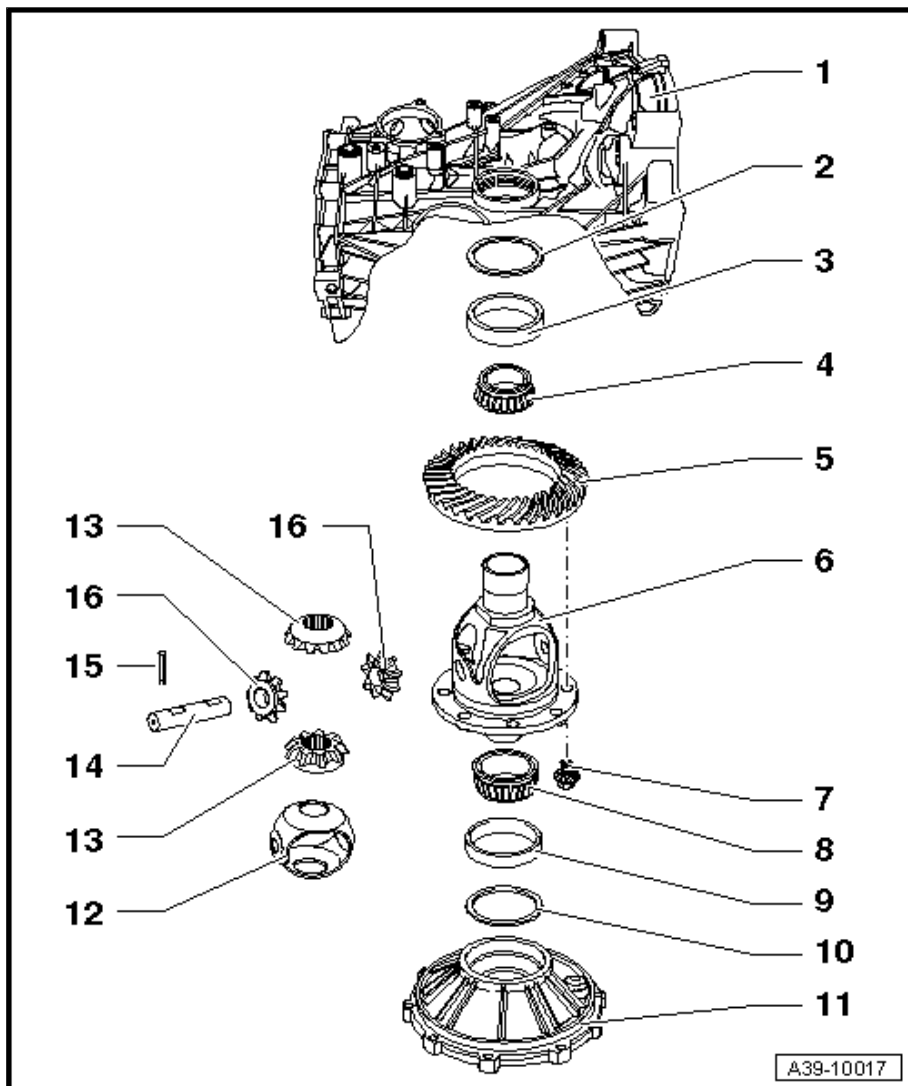
- ☐ Lubricate with gear oil before installing

13 - Sun wheel

- ☐ Installing ⇒ [page 191](#)

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

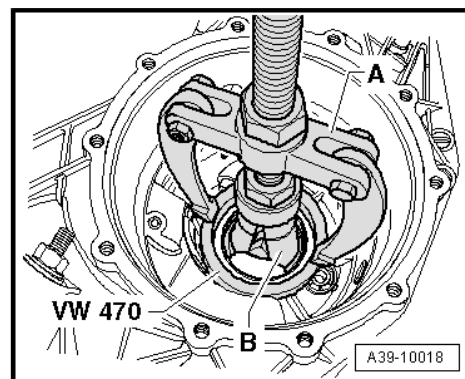
- ☐ Installing ⇒ [page 191](#)

Pulling tapered roller bearing outer race (right-side) out of gear-box housing

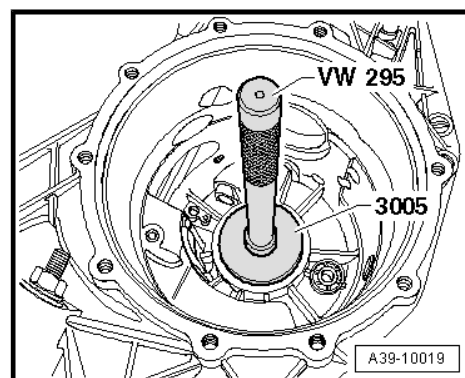
A - Counter-support , e.g. -Kukko 22/2-

B - Internal puller 56 ... 70 mm , e.g. -Kukko 21/8-

- After removing, check shims for damage.

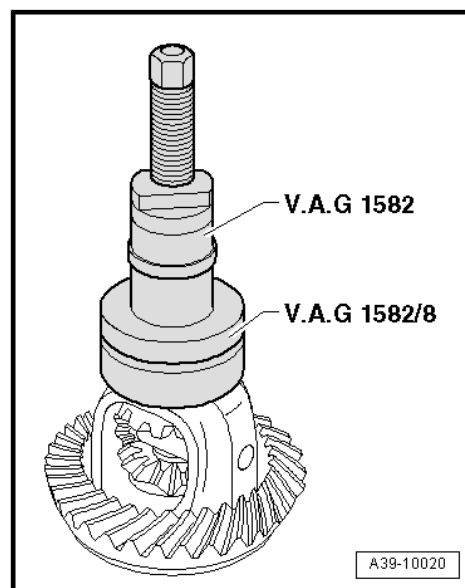


Driving outer race for tapered roller bearing (right-side) into gear-box housing



Pulling off tapered roller bearing inner race (right-side)

- Before setting up puller, place thrust pad - VW 447 H- on differential cage.



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.



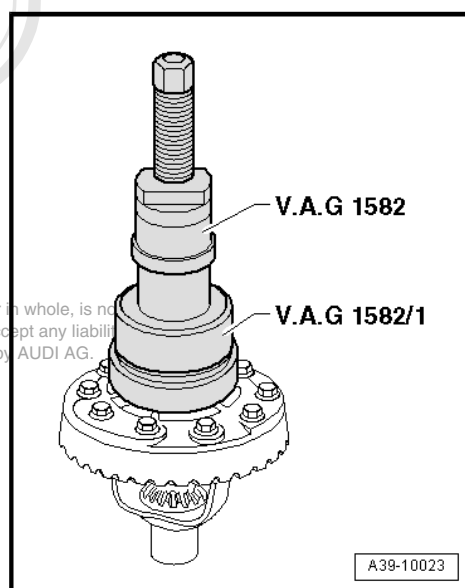
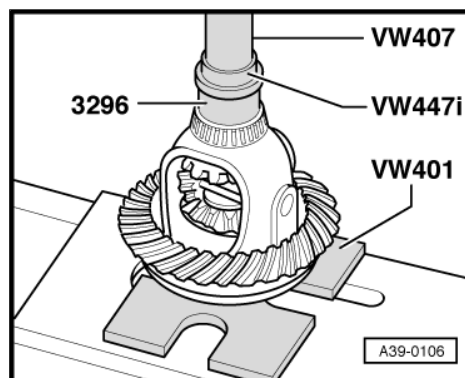
WARNING

Wear protective gloves.

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

Pulling off tapered roller bearing inner race (left-side)

- Before setting up puller, place thrust pad - VW 447 H- on differential cage.

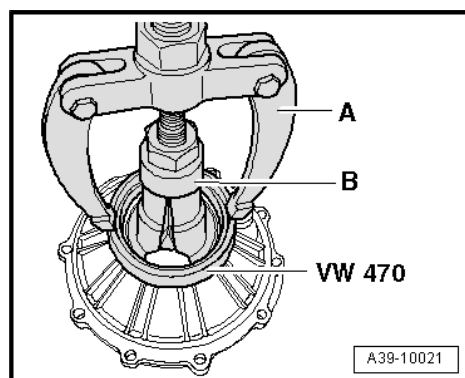


Pulling tapered roller bearing outer race (left-side) out of cover for final drive

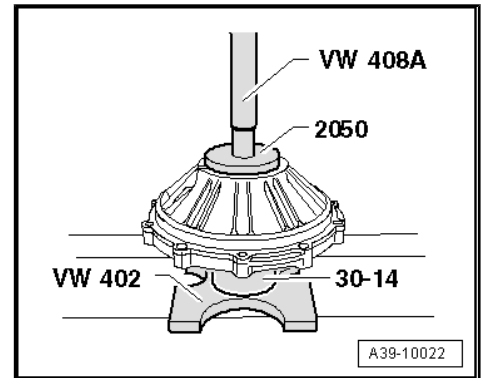
A - Counter-support , e.g. -Kukko 22/2-

B - Internal puller 56 ... 70 mm , e.g. -Kukko 21/8-

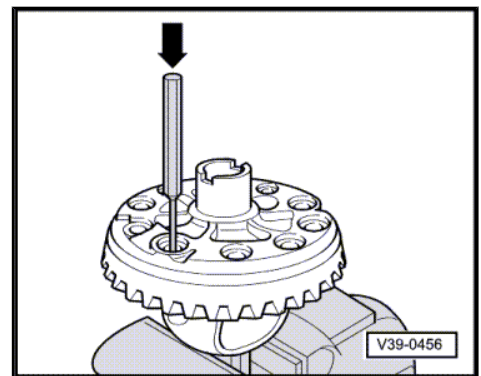
- After removing, check shims for damage.



Pressing tapered roller bearing outer race (left-side) into cover for final drive.



Driving crown wheel off cage



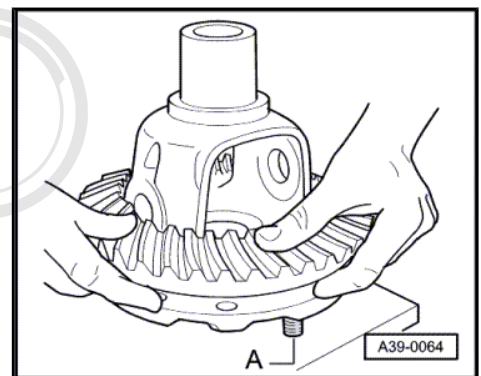
Heating crown wheel to approx. 100 °C and installing

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



WARNING

Wear protective gloves.

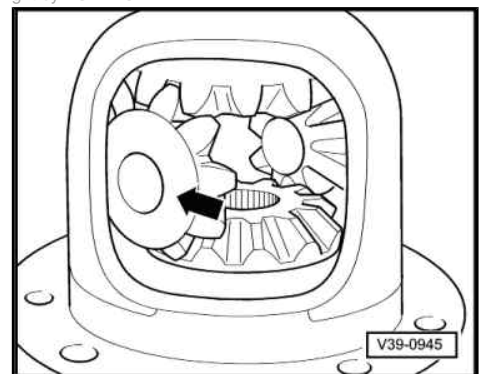


- Allow to cool slightly before screwing in new securing bolts.
- Then tighten bolts in stages and in diagonal sequence until crown wheel makes full contact with differential cage.
- Then tighten bolts to specified torque => Item 7 (page 188).

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Installing differential bevel gears

- Lubricate one-piece thrust washer with gear oil and install.
- Install sun wheels.
- Insert planet pinions (180° apart) and pivot into position -arrow-.
- Drive differential pinion pin into final position and secure.



3 Adjusting pinion shaft and crown wheel



Note

- ◆ *Careful adjustment of the crown wheel and pinion shaft is essential to ensure that the final drive gives long service and runs silently. For this reason, the pinion shaft and crown wheel are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions of rotation. The position of quietest running is found by moving the pinion shaft in an axial direction and at the same time lifting the crown wheel out of the zero-play mesh position by the amount necessary to maintain the backlash within the specified tolerance.*
- ◆ *The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.*
- ◆ *The allowance "r" in relation to the master gauge "Ro" is measured for the final drive gear sets supplied as replacement parts and marked on the outer circumference of the crown wheel. The final drive gear set (pinion shaft and crown wheel) may only be renewed together as a matched pair.*
- ◆ *Observe the general repair instructions for tapered roller bearings and shims ⇒ [page 9](#).*

3.1 Adjustment and marking of final drive gear set

1 - "30083" number of matched pair of gears

- In some cases identification number of matched pair only has four digits

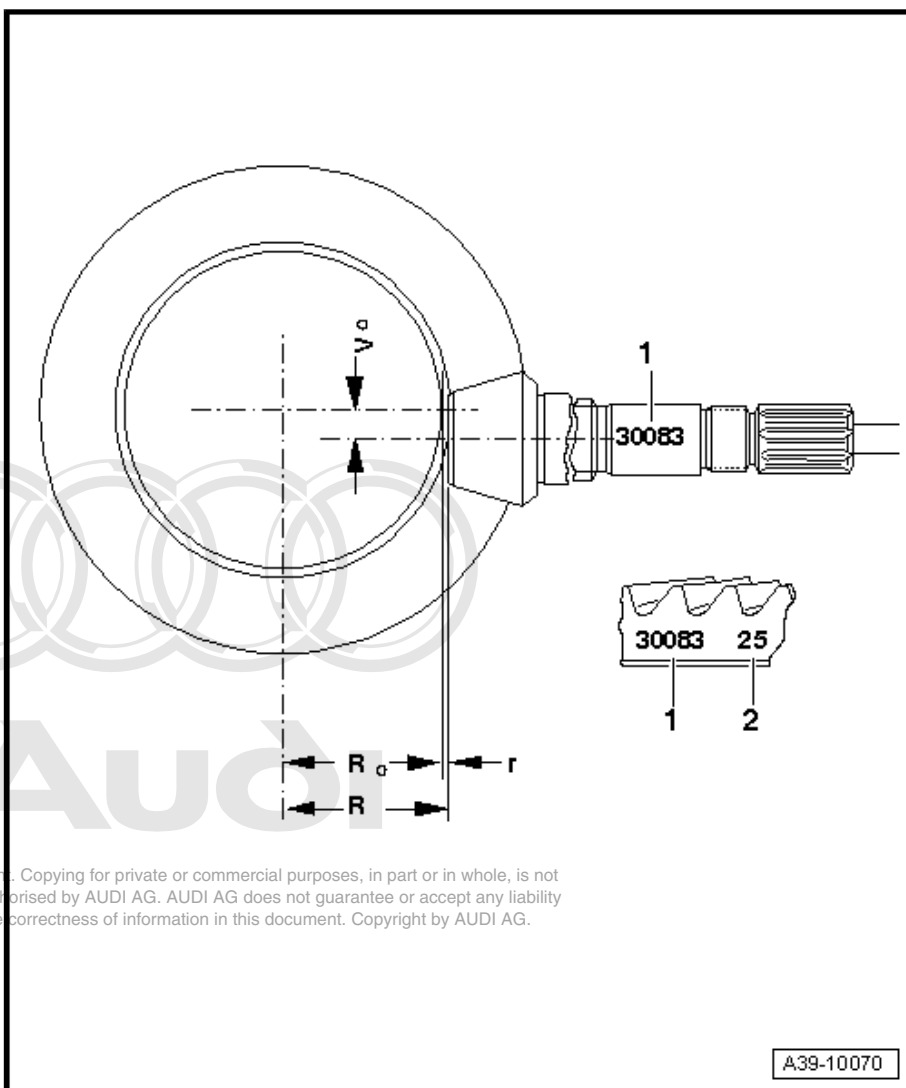
2 - Allowance "r" is based on the master gauge used on the test machine in production. The allowance "r" is always given in 1/100 mm. For example: "25" indicates $r = 0.25$ mm

R_o - Length of master gauge used on test machine

R_o - Crown wheel $\varnothing$ 182 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



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A39-10070

3.2 Position of shims



Note

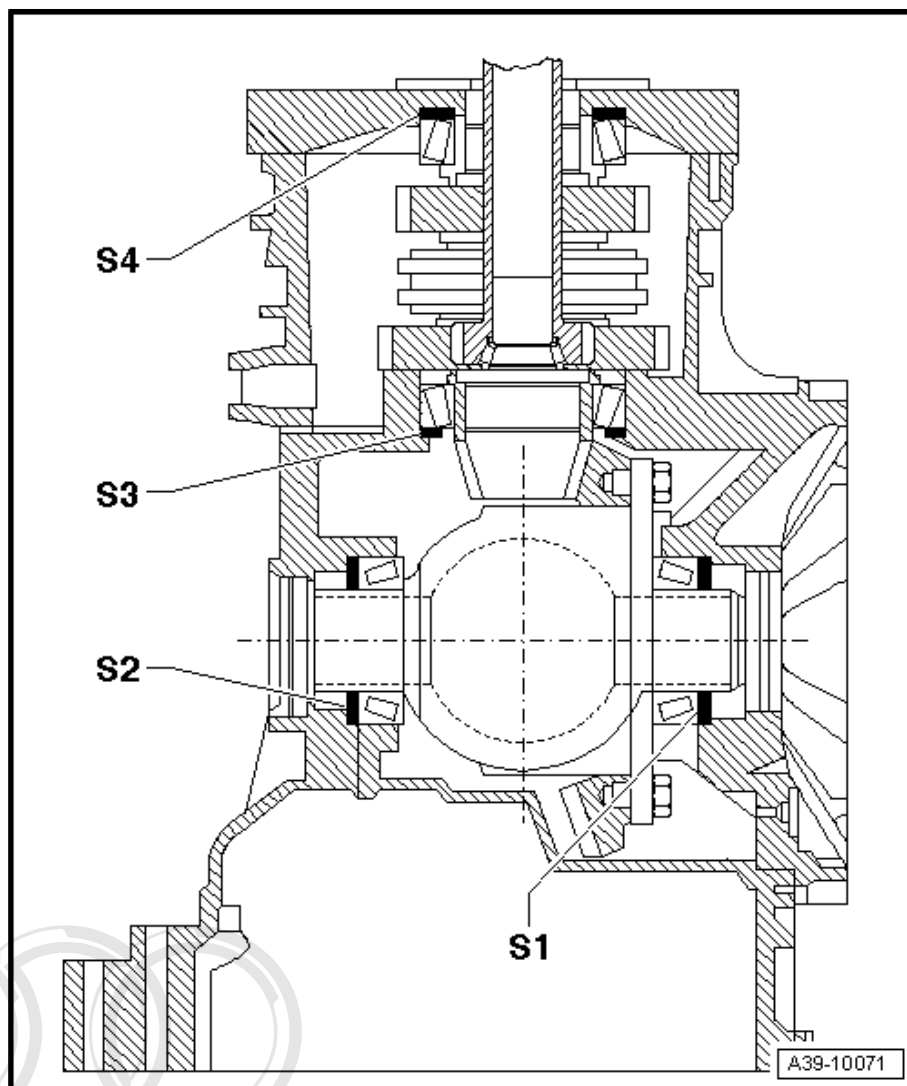
Table of adjustments when renewing individual components of gearbox ⇒ [page 194](#).

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



3.3 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:

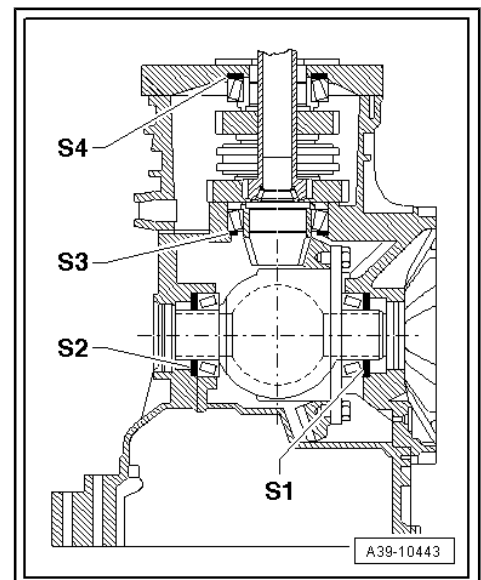
Components requiring adjustment:	Crown wheel ("S1" + "S2")	Pinion shaft ("S3" + "S4") via allowance "r"	Pinion shaft Shim "S4" only	Backlash 0.12 - 0.28
	⇒ page 206	⇒ page 195	⇒ page 204	⇒ page 210

Component renewed				
Gearbox housing ¹⁾	X	X		X
Bearing housing		X	X	
Differential cage	X			X
Tapered roller bearings for pinion shaft/hollow 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 157 . ²⁾ If necessary, pinion shaft and crown wheel must always be renewed together.				

3.4 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 dimension 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.

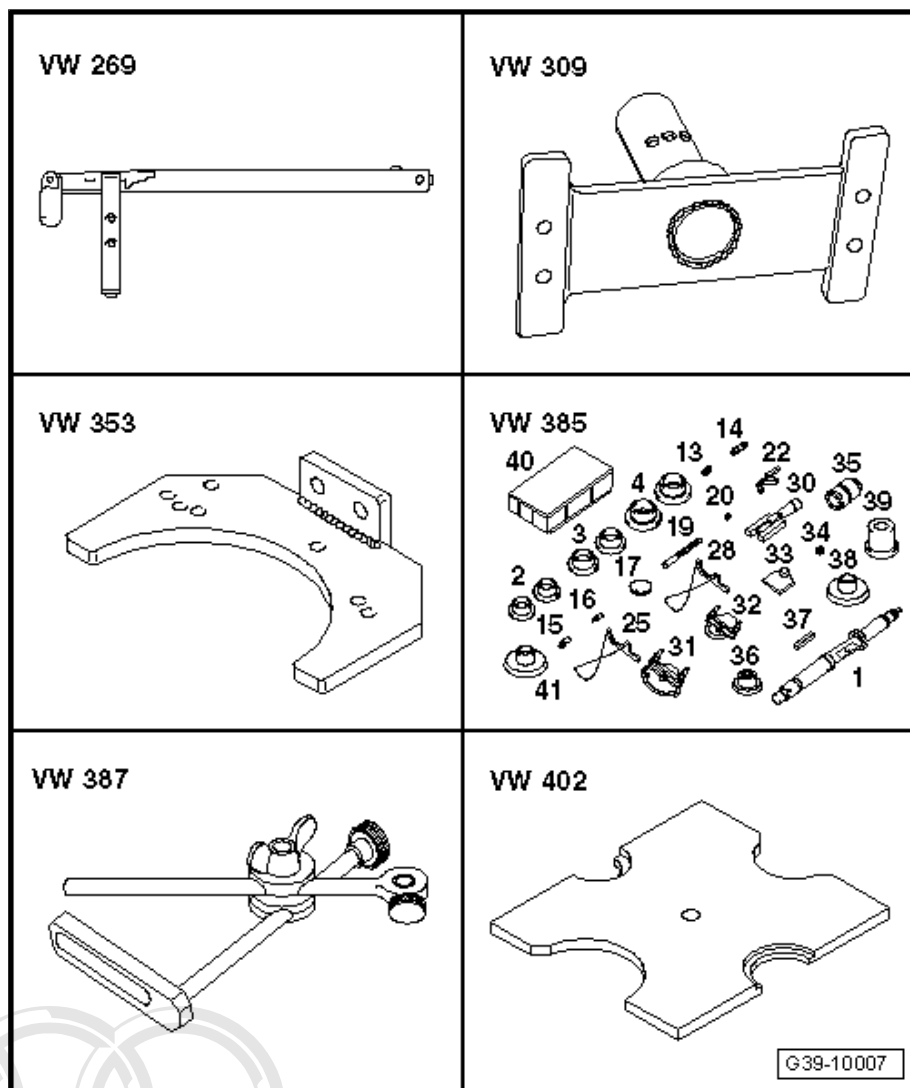


3.5 Adjusting pinion shaft (Adjusting pinion shaft with hollow shaft)

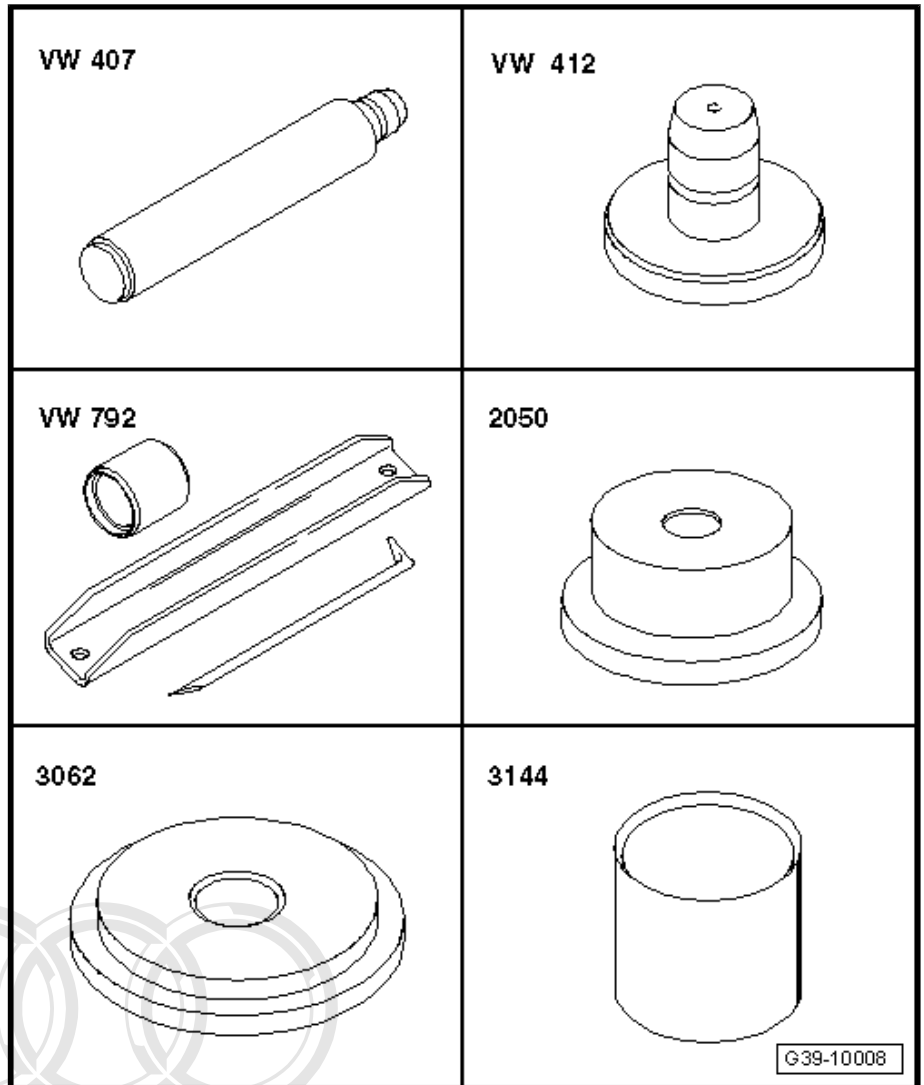
Repairs after which the pinion shaft must be adjusted
➔ [page 194](#) .

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-

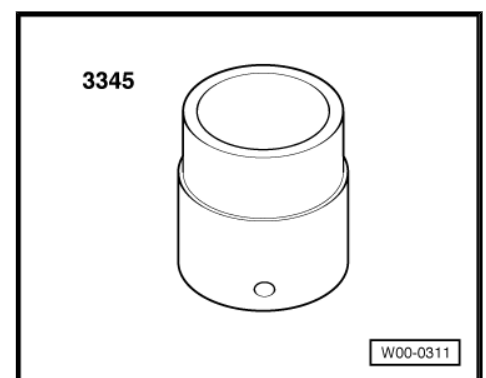


- ◆ Press tool - VW 407-
- ◆ Press tool - VW 412-
- ◆ Assembly device - VW 792-
- ◆ Thrust piece - 2050-
- ◆ Thrust pad - 3062-
- ◆ Sleeve - 3144-

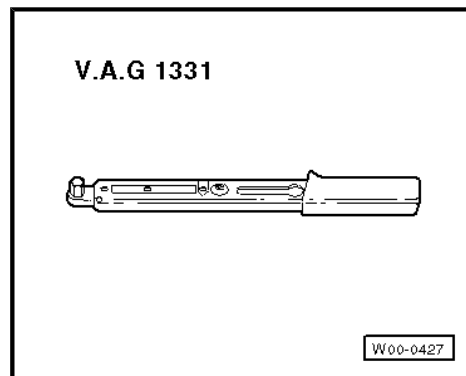


- ◆ Wheel bearing tube - 3345-

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- ◆ Torque wrench - V.A.G 1331-



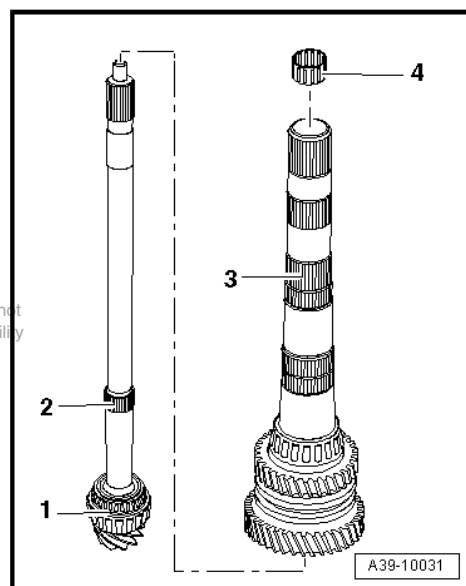
- ◆ Dial gauge
- ◆ Dial gauge extension, 30 mm
- ◆ Hose clip

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

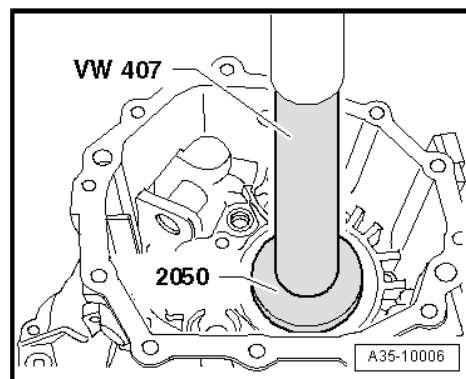
(Adjustment of preload of tapered roller bearings for pinion shaft with hollow shaft)

- Differential removed
- Press double tapered roller bearing inner race -1- onto pinion shaft and secure ⇒ [page 169](#).
- Fit large needle bearing -2-.
- Fit pinion shaft in hollow shaft -3-.
- Reassemble hollow shaft with selector gears and tapered roller bearing inner race.
- Fit small needle bearing -4-.

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- Press double tapered roller bearing outer race for pinion shaft into gearbox housing without shims.

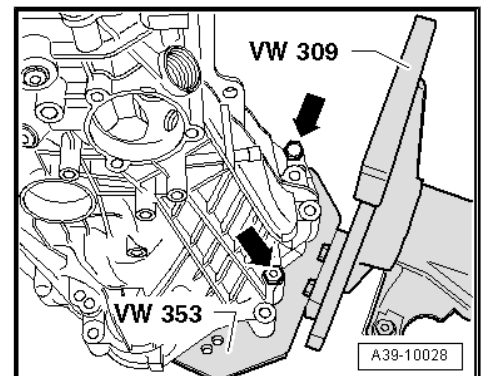
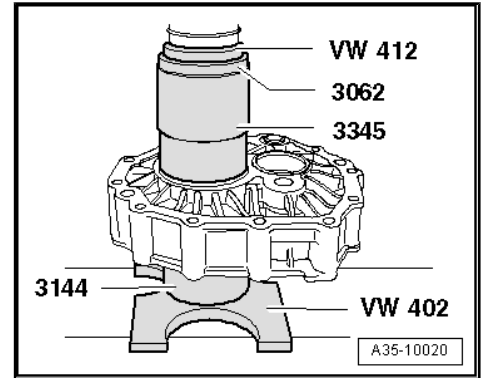


- Press in tapered roller bearing outer race for pinion shaft/hollow shaft with shim “S4*” (thickness 1.01 mm) into bearing housing.

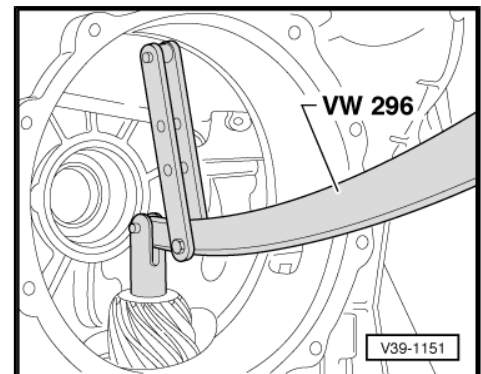
 Note

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”.*

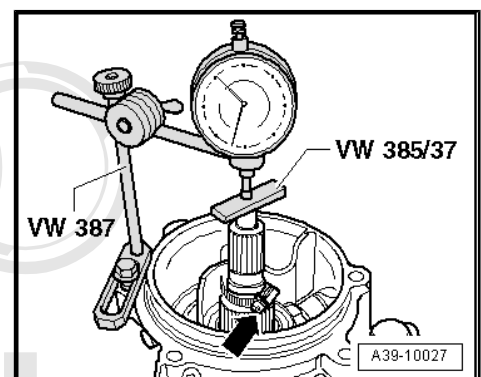
- Secure gearbox housing onto gearbox support - VW 353- with bolts -arrows-.
- Fit fully assembled pinion shaft with hollow shaft into gearbox housing.
- Fit bearing housing and gearbox cover with the 4 dowel sleeves and tighten bolts to 35 Nm.
- Turn gearbox so that the gearbox cover points downwards.



- Press down on face of pinion shaft with transmission removal lever - VW 296- until the tapered bearing outer race contacts the bearing housing.
- While still maintaining pressure, rotate the pinion shaft 5 turns in each direction in relation to the hollow shaft to settle the double tapered roller bearing.
- Then rotate the pinion shaft together with the hollow shaft 5 turns in each direction to settle the hollow shaft tapered roller bearing.
- Turn gearbox so that the gearbox cover points upwards.
- Turn pinion shaft with hollow shaft five turns in both directions so that the double tapered roller bearing settles. Otherwise the result of the measurement will be incorrect.



- Set up measuring tool.
- Clamp pinion shaft onto hollow shaft with a hose clip -arrow-.
- Set dial gauge (3 mm measuring range) to “0” with 1 mm pre-load.



- Then move pinion shaft -A- with hollow shaft up and down in -direction of arrow-.
- Read off play on dial gauge and note reading.
- ◆ Measurement in example: 0.46 mm



Note

If the measurement has to be repeated, pinion shaft with hollow shaft must first be rotated another 5 turns in each direction to settle the double tapered roller bearing. Preload dial gauge to 1 mm and set to "0" again.

Formula: "S_{total}" = "S₄" + measured value + bearing preload

Example:

Inserted shim "S ₄ "	1.01 mm
+ Measured value (example)	0.46 mm
+ Bearing preload (constant value)	0.15 mm
= Total shim thickness "S _{total} " for "S ₃ " + "S ₄ "	1.62 mm

Determining thickness of shim "S₃"

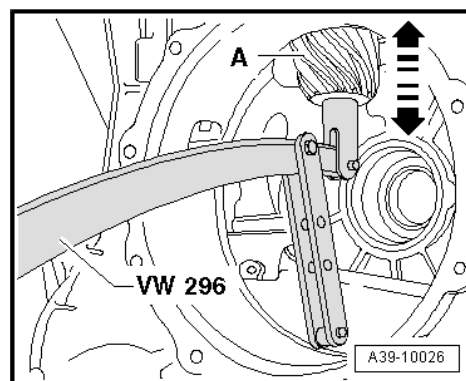
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Formula: "S₃" = "S_{total}" - "S₄"

Example:

Total shim thickness "S _{total} " for "S ₃ " + "S ₄ "	1.62 mm
- Inserted shim "S ₄ "	1.01 mm
= Thickness of shim "S ₃ "	0.61 mm

- Remove double tapered roller bearing outer race, fit shim "S₃" in gearbox housing and install outer race again
⇒ [Item 3 \(page 161\)](#) .
- Re-fit fully assembled pinion shaft with hollow shaft into gearbox housing.
- Fit bearing housing and gearbox cover with the 4 dowel sleeves and tighten bolts to 35 Nm.
- To settle the tapered roller bearings: rotate pinion shaft together with hollow shaft 5 turns in each direction, then rotate pinion shaft separately in relation to hollow shaft 5 turns in each direction.



- Set up measuring tools using 30 mm dial gauge extension -A-; place M12 nut between -VW 792- and gearbox housing when securing bolt -arrow- to gearbox housing.

 Note

Place dial gauge extension -A- onto web in gearbox cover.

- 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:
◆ 0.09...0.18 mm

- Tighten gearbox cover bolts again to 35 Nm.
- Take down measuring tools.
- To settle the tapered roller bearings: rotate pinion shaft together with hollow shaft 5 turns in each direction, then rotate pinion shaft separately in relation to hollow shaft 5 turns in each direction.

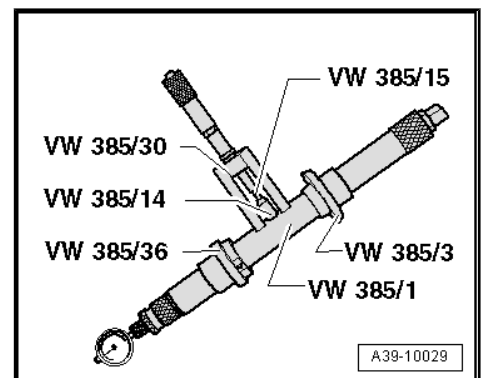
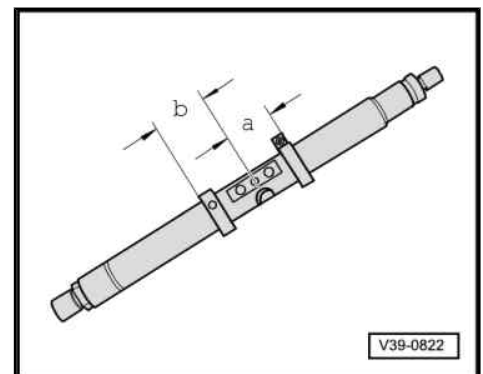
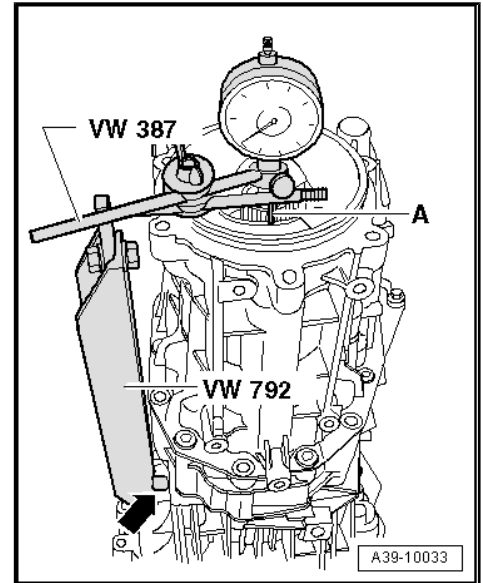
Determining dimension “e”

 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 measurements:
◆ Dimension -a- = 45 mm
◆ Dimension -b- = 75 mm

- Assemble universal measuring tool - VW 385/1- as illustrated:
◆ Dial gauge extension - VW 385/15-, 9.3 mm long
◆ Master gauge - VW 385/30-
– Set master gauge - VW 385/30- to Ro = 59.65 mm and fit onto measuring tool.
– Set dial gauge (3 mm measuring range) to “0” with 2 mm pre-load.

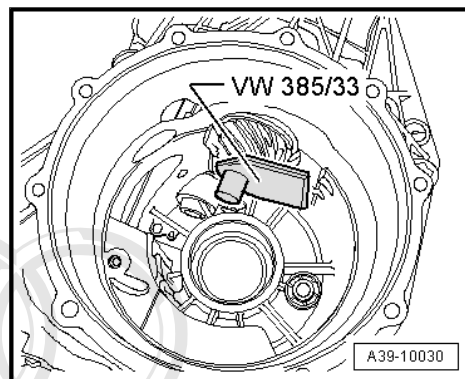


- Place end measuring plate - VW 385/33- on face of pinion gear.

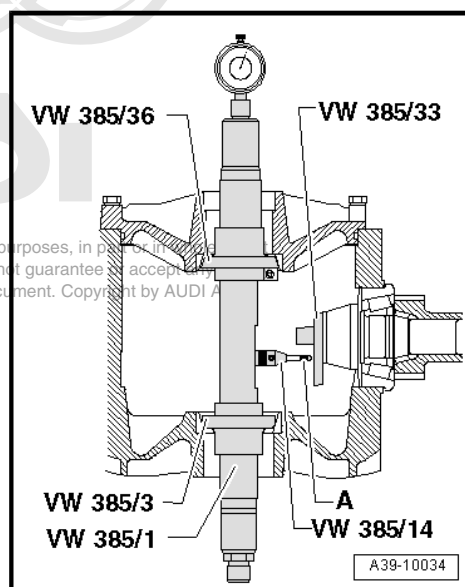


Note

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



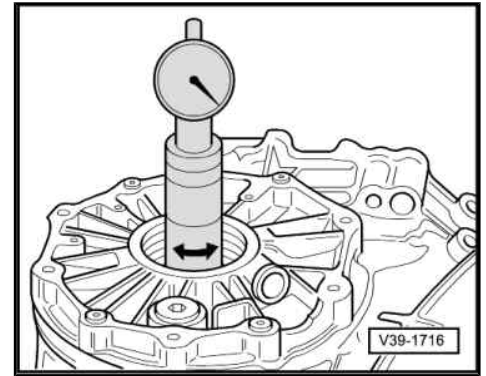
- Remove master gauge and insert measuring tool into housing.
- ◆ Dial gauge extension -A- (length = 9.3 mm) must be screwed in.
- ◆ The dial gauge faces towards the final drive cover.
- Fit cover for final drive and tighten 4 bolts to 20 Nm.
- Using the adjustable ring, pull 2nd centring disc - VW 385/36- out as far as possible so that the measuring tool can still just be turned by hand.



- Turn measuring tool until tip of dial gauge touches end measuring plate on face of pinion gear and gauge indicates maximum deflection (return point).
- ◆ Measurement in following example: "e" = 0.26 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:

$$S_3 = S_3^* + r + e \text{ ("e" on black scale)}$$

$$S_3 = S_3^* + r - e \text{ ("e" on red scale)}$$

Example:

Inserted shim "S ₃ [*] "	0.61 mm
+ Allowance "r"	0.38 mm
- Determined value "e" (in red scale)	0.26 mm
= Thickness of shim "S ₃ "	0.73 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"

$$S_4 = S_{\text{total}} - S_3$$

Example:

Total shim thickness "S _{total} " for "S ₃ " + "S ₄ "	1.62 mm
- Thickness of shim "S ₃ "	0.73 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"

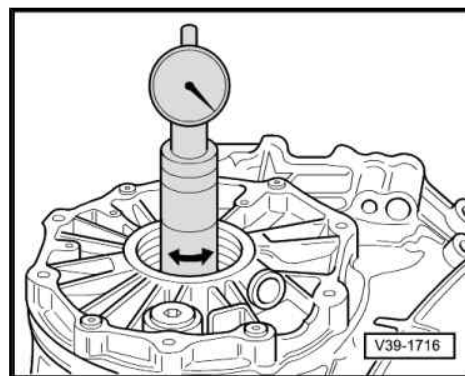
Shim thickness (mm) ¹⁾		
0.33	0.73	1.13
0.37	0.77	1.17
0.41	0.81	1.21
0.45	0.85	1.25
0.49	0.89	1.29
0.53	0.93	1.33
0.57	0.91	1.37
0.61	1.01	1.41
0.65	1.05	1.45
0.69	1.09	1.49

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"

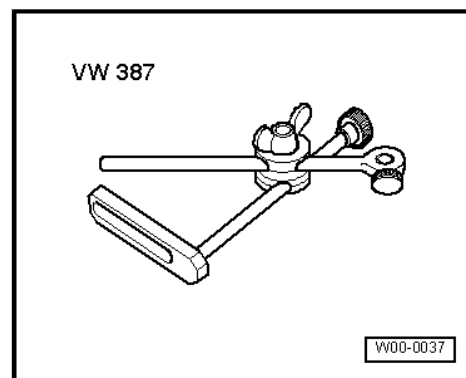
- Install pinion shaft and hollow shaft with determined shims "S₃" and "S₄".
- Turn hollow shaft against pinion shaft five turns in both directions so that the double tapered roller bearing settles.
- Turn pinion shaft with hollow shaft five turns in both directions so that the tapered roller bearings settle.
- Insert universal measuring tool and perform check measurement.
- 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.



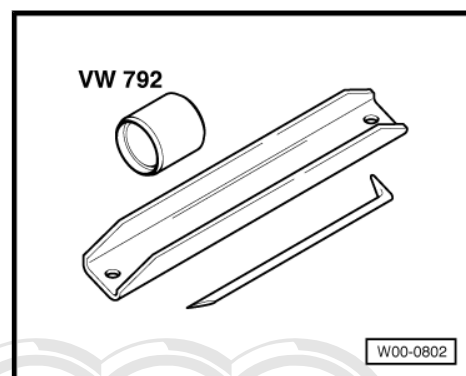
3.6 Re-determining shim "S₄" when renewing bearing housing

Special tools and workshop equipment required

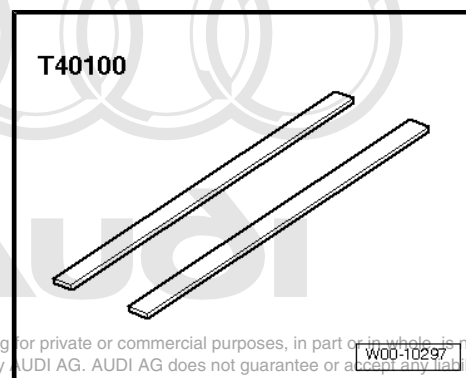
- ◆ Universal dial gauge bracket - VW 387-



- ◆ Assembly device - VW 792-

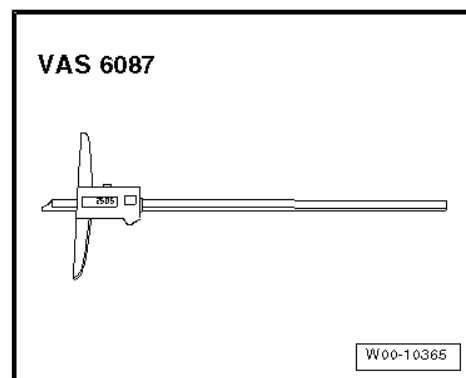


- ◆ Ruler - T40100-



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- ◆ Digital depth gauge , e.g. -VAS 6087-



- ◆ Dial gauge
- ◆ 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:

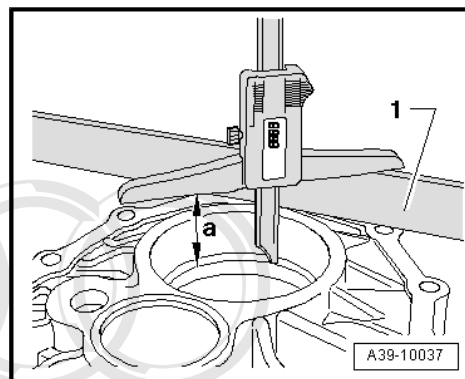
Depth -a- of previous bearing housing (with straightedge width)	46.50 mm
Depth -a- of new bearing housing (with straightedge width)	46.65 mm
= Difference	0.15 mm

- 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

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Shims available ⇒ [page 204](#) .

- Press tapered roller bearing outer race with shim “S4” into bearing housing ⇒ [page 170](#) .
- Re-fit fully assembled pinion shaft with hollow shaft into gearbox housing.
- Fit bearing housing and gearbox cover and tighten bolts to 35 Nm.
- To settle the tapered roller bearings: rotate pinion shaft together with hollow shaft 5 turns in each direction, then rotate pinion shaft separately in relation to hollow shaft 5 turns in each direction.
- Set up measuring tools using 30 mm dial gauge extension -A-; place M12 nut between -VW 792- and gearbox housing when securing bolt -arrow- to gearbox housing.

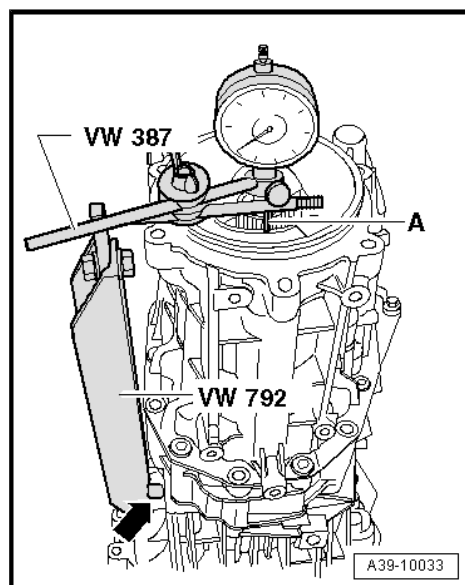


Note

Place dial gauge extension -A- onto web in gearbox cover.

- 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:
- ◆ 0.09...0.18 mm

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

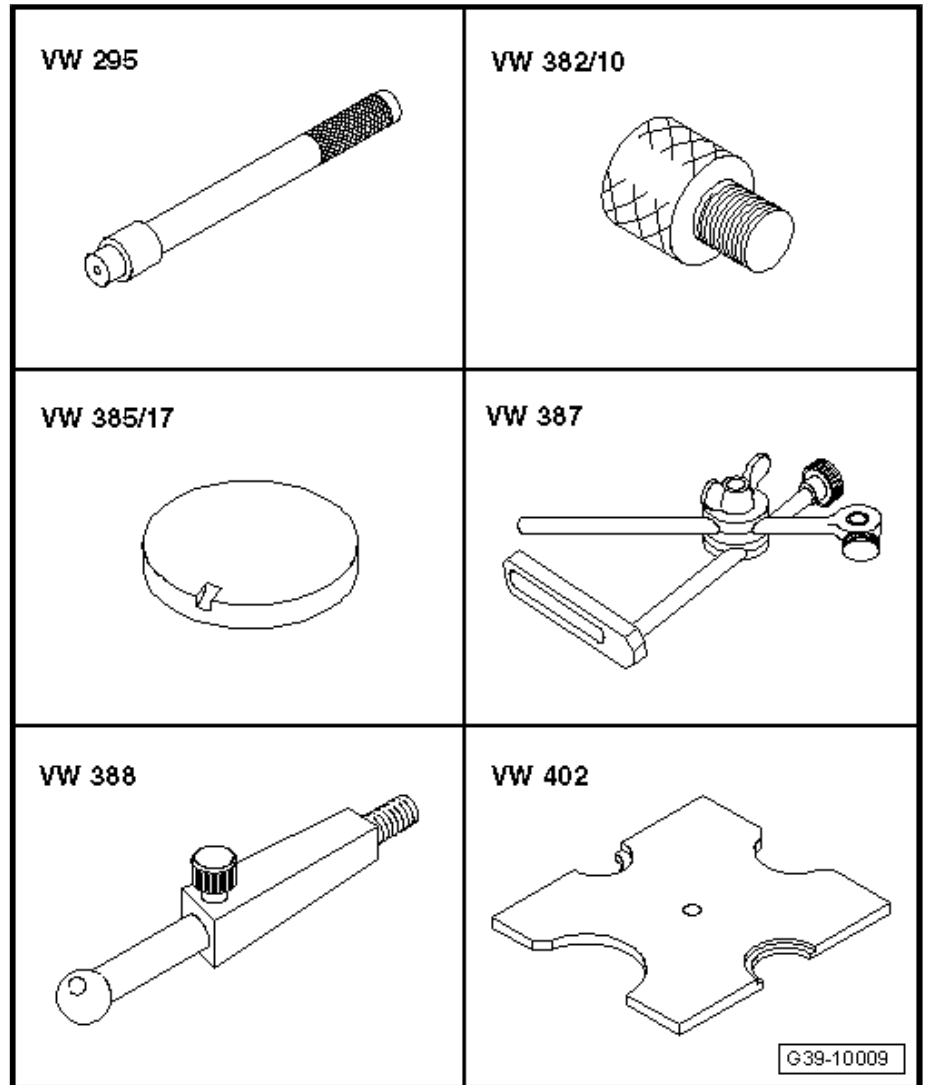


3.7 Adjusting crown wheel

(Adjusting differential)

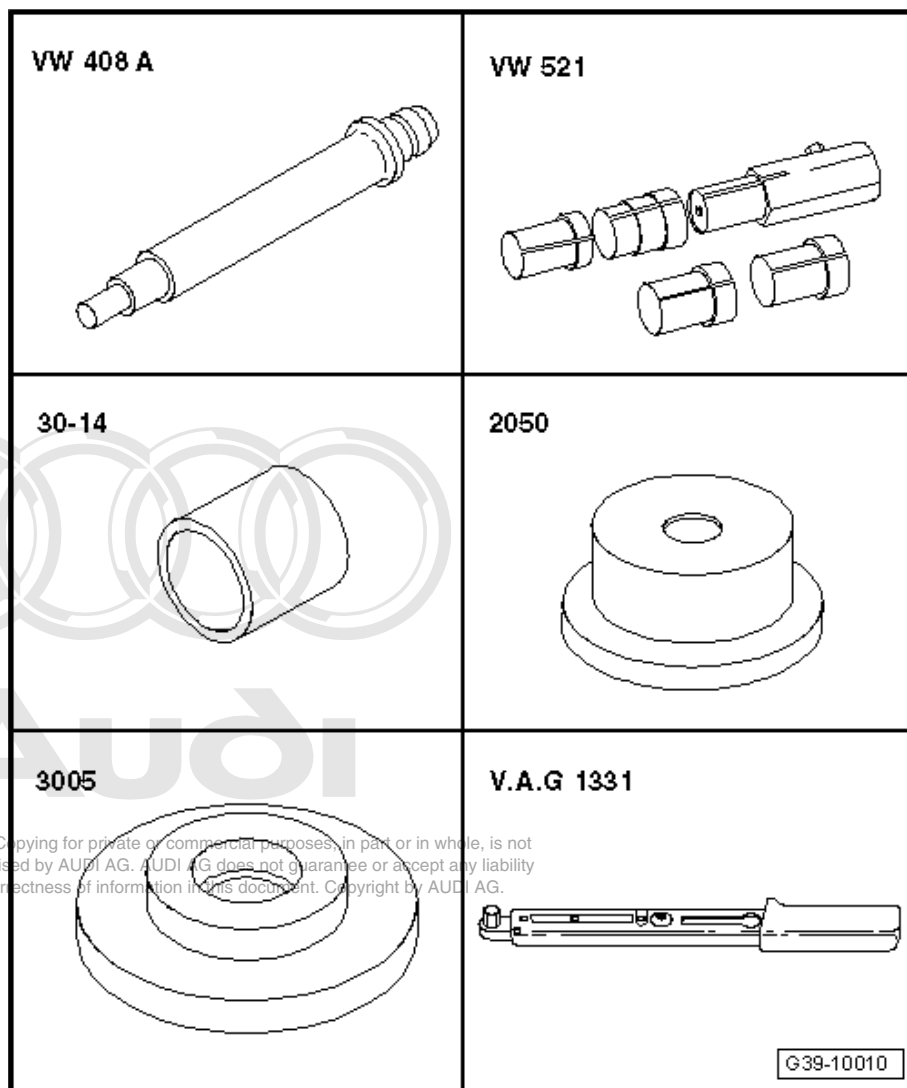
Special tools and workshop equipment required

- ◆ 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-



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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-
- ◆ Dial gauge
- ◆ Dial gauge extension, 30 mm



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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 194](#)

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

(Setting preload of tapered roller bearings for differential)

- Pinion shaft removed



Note

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

- Remove flange shaft oil seals.
- Remove tapered roller bearing outer races for differential and take out shims ⇒ [page 185](#).

- 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.

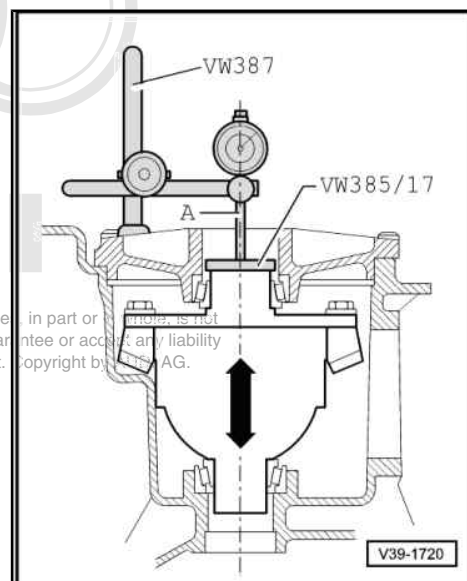
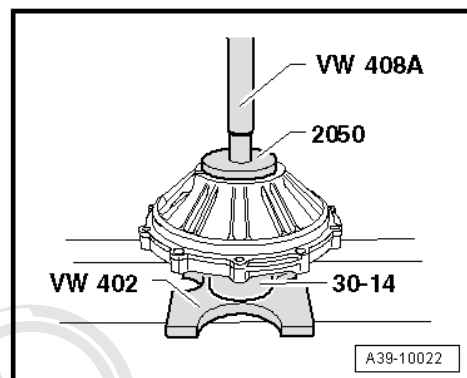
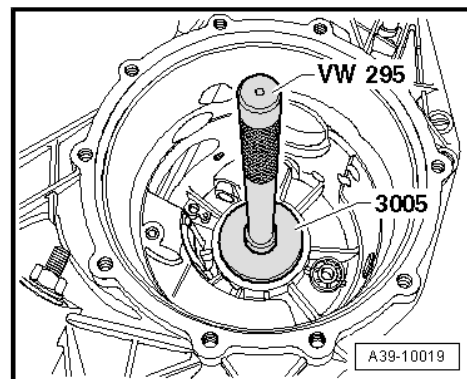
- Press outer race for tapered roller bearing (left-side) without shim “S₁” into cover for final drive.
- Install differential in gearbox housing. The crown wheel is positioned on the left-hand side (same side as cover for final drive).
- Fit cover for final drive with 4 bolts (20 Nm).
- Turn gearbox 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 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:

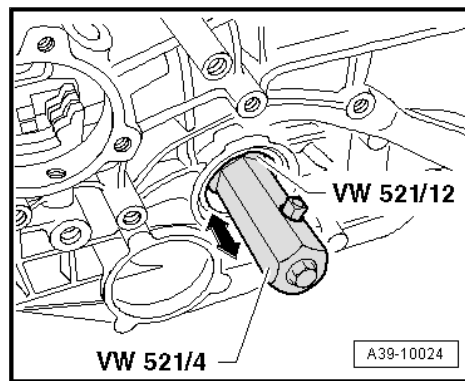
Total shim thickness S_{total} for S_1 + S_2	2.17 mm
- Inserted shim(s) S_2^{**}	1.30 mm
= Thickness of shim S_1^{**}	0.87 mm

Select correct shims from ⇒ Electronic parts catalogue .

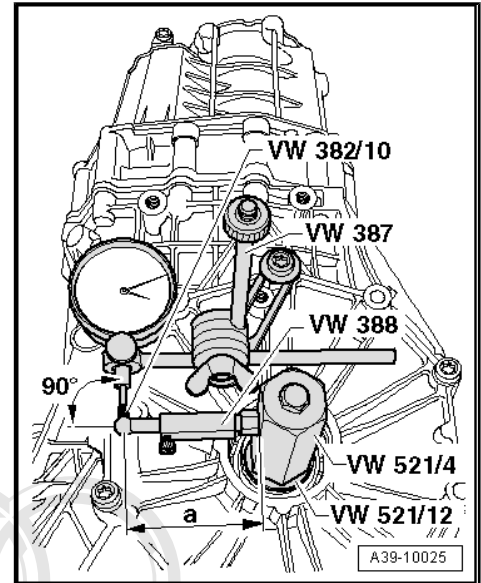
Measuring backlash

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- 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” = 73 mm (for $\varnothing$ 182 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 measurements a further 3 times.



 Note

If the pinion shaft rotates during the measurements, counter-hold pinion shaft to make sure that the measured value of the backlash is correct.

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 installation; renew final drive gear set if necessary.

Determining thickness of shim “S₂”

Formula: “S₂” = “S₂*” - measured backlash + specified backlash

Example:

Inserted shim “S ₂ *”	1.30 mm
- Measured average backlash	0.29 mm
+ Specified backlash (constant value)	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: "S₁" = "S_{total}" - "S₂"

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 "S₁"

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

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

Checking adjustment

- After installing shims "S₁" and "S₂", turn differential 5 turns in both directions so that the tapered roller bearings settle.
- Measure backlash four times **on circumference**.
- ◆ Specification: 0.12 ... 0.28 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.*

