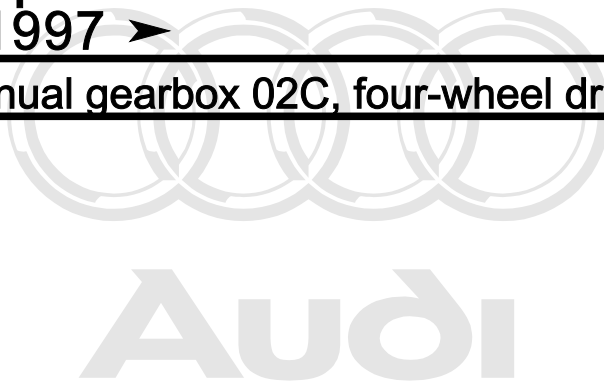


Workshop Manual

Audi A3 1997 ➤

5-speed manual gearbox 02C, four-wheel drive

Edition 07.2005



Audi

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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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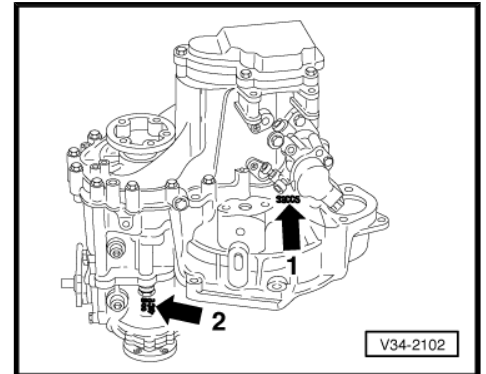
00 – Technical data

1 Gearbox identification

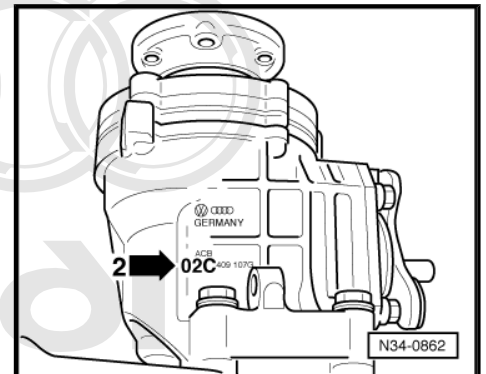
The manual gearbox 02C, four-wheel drive is installed as a 5-speed gearbox in the Audi A3 1997 ▶. Allocation ⇒ [page 2](#).

Location on gearbox

- ◆ Code letters and date of manufacture of gearbox -arrow 1-
- ◆ Manual gearbox 02C, four wheel drive -arrow 2-



Manual gearbox 02C, four wheel drive -arrow 2-



Code letters and date of manufacture of gearbox

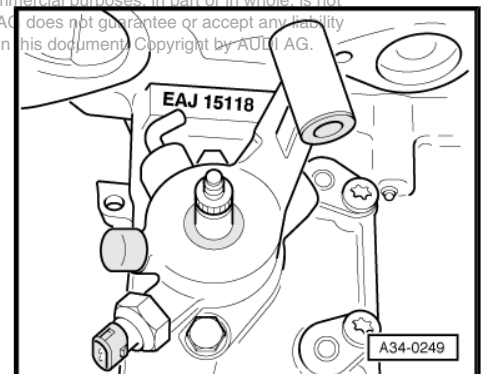
Example:	EAJ	15	11	8
	Code letters	Day	Month	Year "1998" of manufacture

Additional data are production-related.



Note

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





2 Code letters, allocation, transmission ratios, capacities

5-speed manual gearbox, four-wheel drive		02C.M	02C.M	02C.R
Gearbox Allocation	Code letters	DPU	EAJ	FEW
	Model	Audi A3 1997 ▶	Audi A3 1997 ▶	Audi A3 1997 ▶
	Engine	1.8 ltr. - 110 kW	1.8 ltr. - 110 kW	1.8 ltr. - 110 kW
Ratios Z ₂ : Z ₁	Final drive	63 : 16 = 3.938	63 : 16 = 3.938	63 : 16 = 3.938
	1st gear	33 : 10 = 3.300	33 : 10 = 3.300	34 : 9 = 3.778
	2nd gear	35 : 18 = 1.944	35 : 18 = 1.944	33 : 16 = 2.063
	3rd gear	34 : 25 = 1.360	34 : 25 = 1.360	34 : 25 = 1.360
	4th gear	35 : 34 = 1.029	35 : 34 = 1.029	35 : 34 = 1.029
	5th gear	36 : 43 = 0.837	36 : 43 = 0.837	36 : 43 = 0.837
	Reverse gear	17 : 10 x 36 : 20 = 3.060	17 : 10 x 36 : 20 = 3.060	17 : 10 x 36 : 20 = 3.060
Capacity		2.4 ltr.		
Clutch actuation		Hydraulic		
Drive shaft flange Ø		100 mm	100 mm	100 mm
Overall ratio i _{OV} in top gear		3.297	3.297	3.297
Refer to ⇒ Parts catalogue for the following information:				
◆ Date of manufacture				
◆ Gear oil specification				
◆ Clutch type identification				
◆ Rear final drive identification				

5-speed manual gearbox, four-wheel drive		02C.R		
Gearbox Allocation	Code letters	FEX		
	Model	Audi A3 1997 ▶		
	Engine	1.8 ltr. - 110 kW		
Ratios Z ₂ : Z ₁	Final drive	63 : 16 = 3.938		
	1st gear	34 : 9 = 3.778		
	2nd gear	33 : 16 = 2.063		
	3rd gear	34 : 25 = 1.360		
	4th gear	35 : 34 = 1.029		
	5th gear	36 : 43 = 0.837		
	Reverse gear	17 : 10 x 36 : 20 = 3.060		
Capacity		2.4 ltr.		
Clutch actuation		Hydraulic		
Drive shaft flange Ø		100 mm		
Overall ratio i _{OV} in top gear		3.297		

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5-speed manual gearbox, four-wheel drive	02C.R		
Refer to ⇒ Parts catalogue for the following information: ♦ Date of manufacture ♦ Gear oil specification ♦ Clutch type identification ♦ Rear final drive identification			

2.1 Calculating ratio "i"

Example:	5th gear	Final drive
Drive gear	$ZG_1 = 36$	$ZA_1 = 16$
Driven gear	$ZG_2 = 43$	$ZA_2 = 63$

$i = Z_2 : Z_1$ (Z_1 = number of teeth on drive gear, Z_2 = number of teeth on driven gear)

$i_G = \text{Gear ratio} = ZG_2 : ZG_1 = 36 : 43 = 0.837$

$i_A = \text{Axle ratio} = ZA_2 : ZA_1 = 63 : 16 = 3.938$

$i_{ov} = \text{Overall ratio} = i_G \times i_A = 0.837 \times 3.938 = 3.297$

3 Transmission layout



Note

-Arrows- point in direction of travel.

1 - Engine

2 - Clutch

3 - Manual gearbox

4 - Input shaft

5 - Output shaft / pinion shaft

6 - Differential

7 - Bevel box

8 - Propshaft

- ☐ Removing and installing
⇒ Rear final drive 02D;
Rep. Gr. 39

9 - Haldex coupling

- ☐ Dismantling and assembling
⇒ Rear final drive 02D;
Rep. Gr. 39

10 - Rear final drive

- ☐ Dismantling and assembling
⇒ Rear final drive 02D;
Rep. Gr. 39

11 - Differential

- ☐ Dismantling and assembling
⇒ Rear final drive 02D;
Rep. Gr. 39

I - 1st gear

II - 2nd gear

III - 3rd gear

IV - 4th gear

R - Reverse gear

V - 5th gear

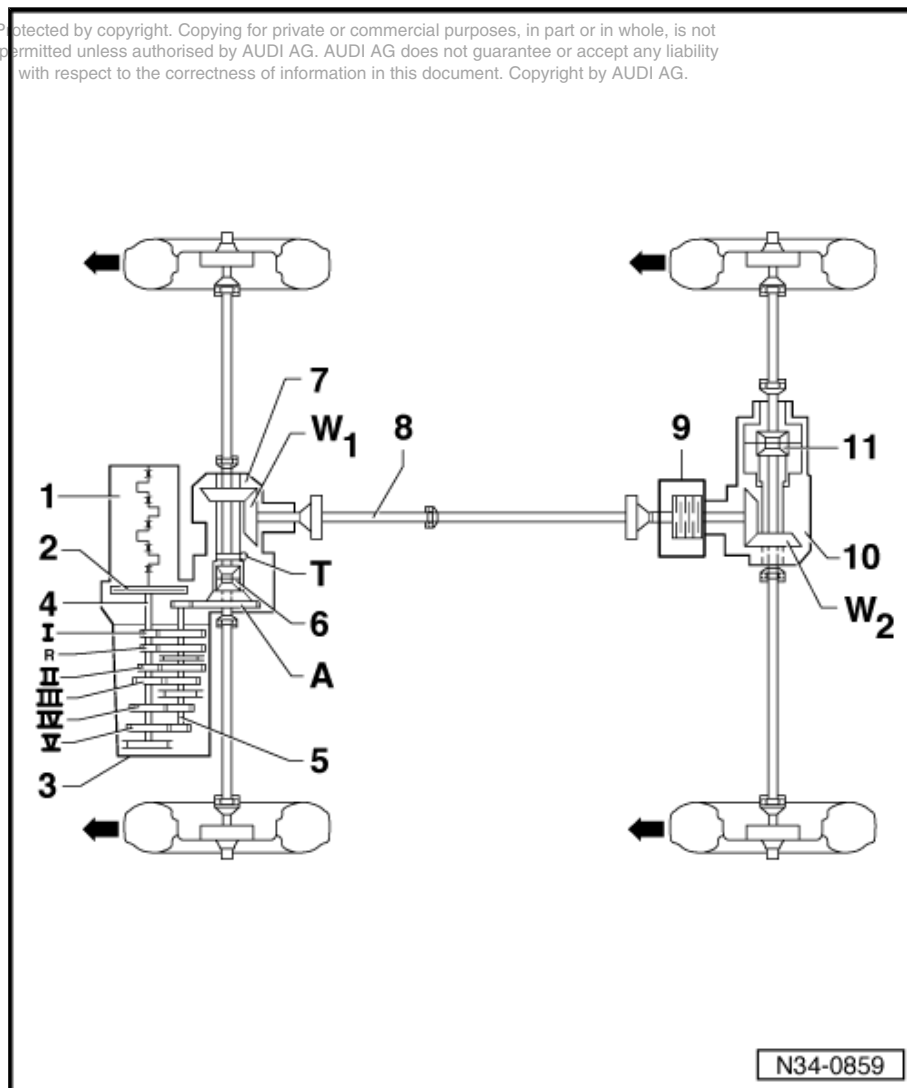
A - Final drive

T - Speedometer drive

W - Front bevel gears

W2 - Rear bevel gears

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4 General repair instructions

- ◆ Proper tools and the maximum possible care and cleanliness are essential for satisfactory gearbox repairs. The usual basic safety precautions also naturally apply when carrying out repair work.
- ◆ A number of generally applicable instructions for the various repair procedures - which were previously repeated at numerous places in the Workshop Manual - are summarised here. They apply to the work described in this Manual.

4.1 Special tools

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

4.2 Components

Gearbox

- ◆ When installing, ensure that the dowel sleeves between the engine and gearbox are correctly located.
- ◆ When assembling mounting brackets as well as other waxed components, the contact surfaces must be cleaned. The contact surfaces must be free of wax and grease.
- ◆ When installing a new gearbox or bevel box fill with gear oil.
- ◆ Capacities and specifications ⇒ [page 2](#) .

O-rings, oil seals, gaskets

- ◆ Always install new O-rings, oil seals and gaskets.
- ◆ After removing gaskets and seals, always inspect the contact surface on the housing or shaft for burrs resulting from removal or for other signs of damage.
- ◆ Clean joints thoroughly and apply sealant -AMV 188 200 03- .
- ◆ Apply sealant evenly and not too thickly.

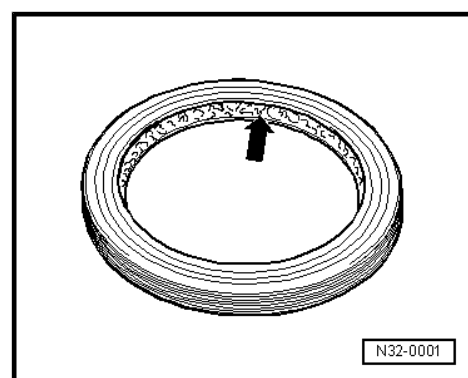
Before installing:

- ◆ Lightly oil the outer circumference of oil seals and fill the space between the sealing lips -arrow- about half full with grease -G 052 128 A1- .
- ◆ The open side of the oil seals faces toward the side with fluid filling.
- ◆ When installing a new oil seal, position the seal in the housing so that sealing lip does not contact the shaft in the same place as the old seal (make use of insertion depth tolerances).

After installation:

- ◆ Check gear oil level in manual gearbox with bevel box
⇒ [page 60](#) .

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Locking elements

- ◆ Do not over-stretch circlips.
- ◆ Always renew circlips which have been damaged or over-stretched.
- ◆ Circlips must be properly seated in the base of the groove.
- ◆ Renew spring pins. Position: the slit -A- should be in line with the line of force -arrow-.

Nuts, bolts

- ◆ Nuts and bolts for securing covers and housings must be slackened and tightened in diagonal sequence.
- ◆ Parts which are particularly sensitive (e.g. clutch pressure plates) must be kept straight. Slacken and tighten them in stages and in diagonal sequence.
- ◆ The tightening torques stated apply to non-oiled nuts and bolts.
- ◆ Always renew self-locking bolts and nuts.
- ◆ For all threaded connections, ensure that (where applicable) the contact surfaces and the nuts and bolts are not coated with wax until after assembly is completed.

Bearings

- ◆ Install new tapered roller bearings as supplied; do not lubricate additionally with oil.
- ◆ Lubricate all bearings (except tapered roller bearings) with gear oil before installing in gearbox.
- ◆ Always renew the tapered roller bearings on one shaft together as a set and use new bearings from a single manufacturer.
- ◆ Heat inner races of tapered roller bearings to approx. 100°C before installing. Press in onto stop when installing so there is no axial clearance.
- ◆ Do not interchange the outer or inner races of bearings of the same size (the bearings are paired).
- ◆ Install needle bearings so the lettering (side with thicker metal) faces towards the installing tool.

Shims

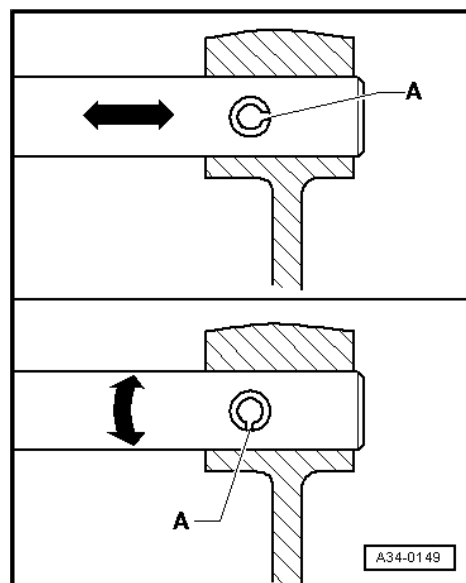
- ◆ Measure shims at several points with a micrometer. Tolerance variations make it possible to obtain the exact shim thickness required.
- ◆ Check for burrs and damage.
- ◆ Install only shims which are in perfect condition.

Synchroniser rings

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

Gear wheels

- ◆ Before installing, clean and heat on a hotplate to approx. 100°C.
- ◆ The temperature can be checked with Temperature tester - V.A.G 1558- .



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Selector gears

After installing, check 1st to 5th selector gears for minimal axial play and freedom of movement.

Clutch actuation

- ◆ When removing gearbox, remove clutch slave cylinder without disconnecting pipes.
- ◆ Do not depress the clutch pedal after removing the slave cylinder if the hydraulic pipe is still connected. Otherwise the piston will be pressed out of the slave cylinder.
- ◆ Ensure that the pressure plate is kept straight: loosen and tighten bolts in a diagonal sequence and in several gradual stages.
- ◆ If the clutch has burnt out, thoroughly clean the bell housing, flywheel and parts of the engine facing the gearbox in order to prevent odours.

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30 – Clutch

1 Servicing clutch mechanism

I - Pedal cluster - exploded view of components

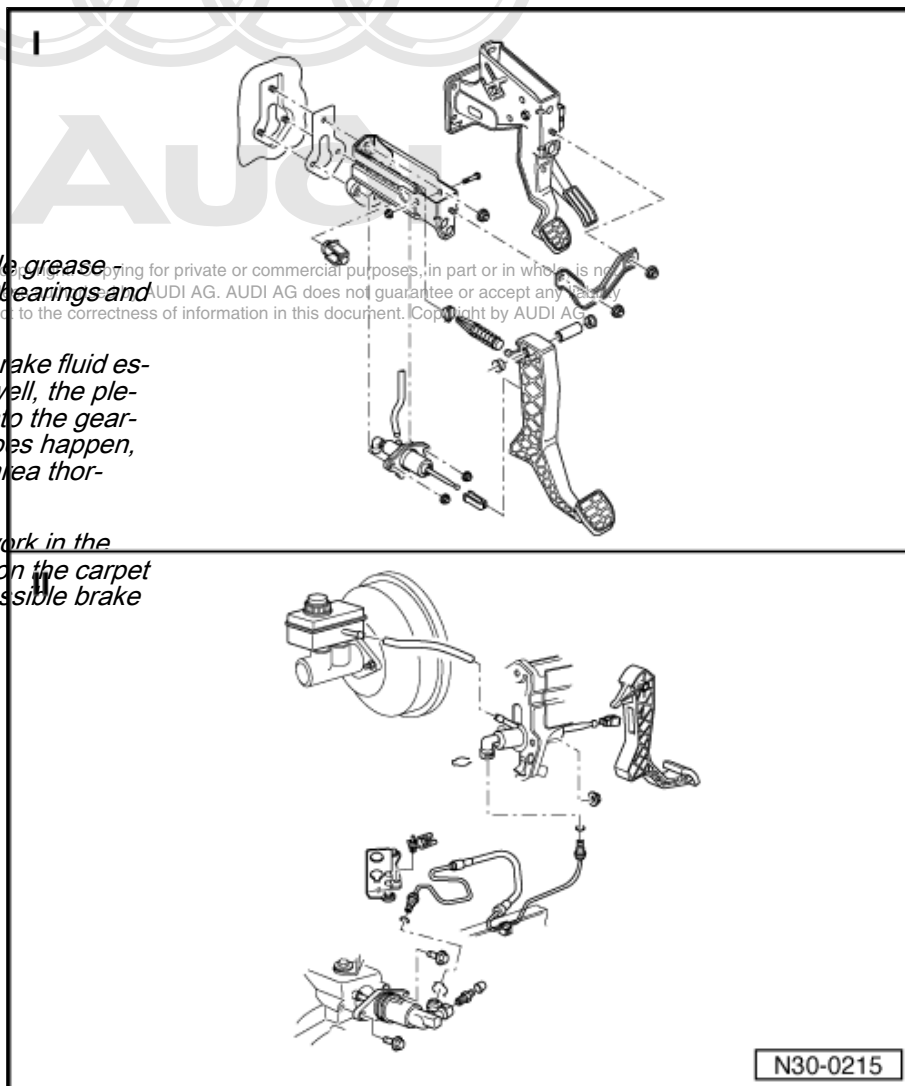
⇒ [page 9](#)

II - Hydraulics - exploded view of components ⇒ [page 13](#)



Note

- ◆ *Apply polycarbamide grease, G 052 142 A2, to all bearings and contact surfaces.*
- ◆ *Make sure that no brake fluid escapes into the footwell, the plenum chamber or onto the gear-box 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.*



N30-0215

1.1 Pedal cluster - exploded view of components

1 - Cross panel

- ☐ With mounting for mounting bracket and master cylinder

2 - Gasket

- ☐ Renew

3 - Mounting bracket

- ☐ For mounting clutch pedal

4 - Bolt

5 - Mounting bracket

- ☐ For mounting accelerator pedal and brake pedal

6 - Hexagon nut, 25 Nm

- ☐ Self-locking
- ☐ Renew

7 - Connecting plate

8 - Hexagon nut, 25 Nm

- ☐ Self-locking
- ☐ Renew

9 - Bearing bush

10 - Pivot pin

11 - Clutch pedal

- ☐ Removing and installing
⇒ [page 12](#)

12 - Retaining clip

- ☐ Removing and installing
⇒ [Item 4 \(page 13\)](#)

13 - Hexagon nut, 25 Nm

- ☐ Self-locking
- ☐ Renew

14 - Clutch master cylinder

- ☐ Removing and installing ⇒ [page 14](#)

15 - Supply hose

16 - Over-centre spring

- ☐ Removing and installing: LHD vehicles ⇒ [page 11](#) , RHD vehicles ⇒ [page 12](#)

17 - Mounting for over-centre spring

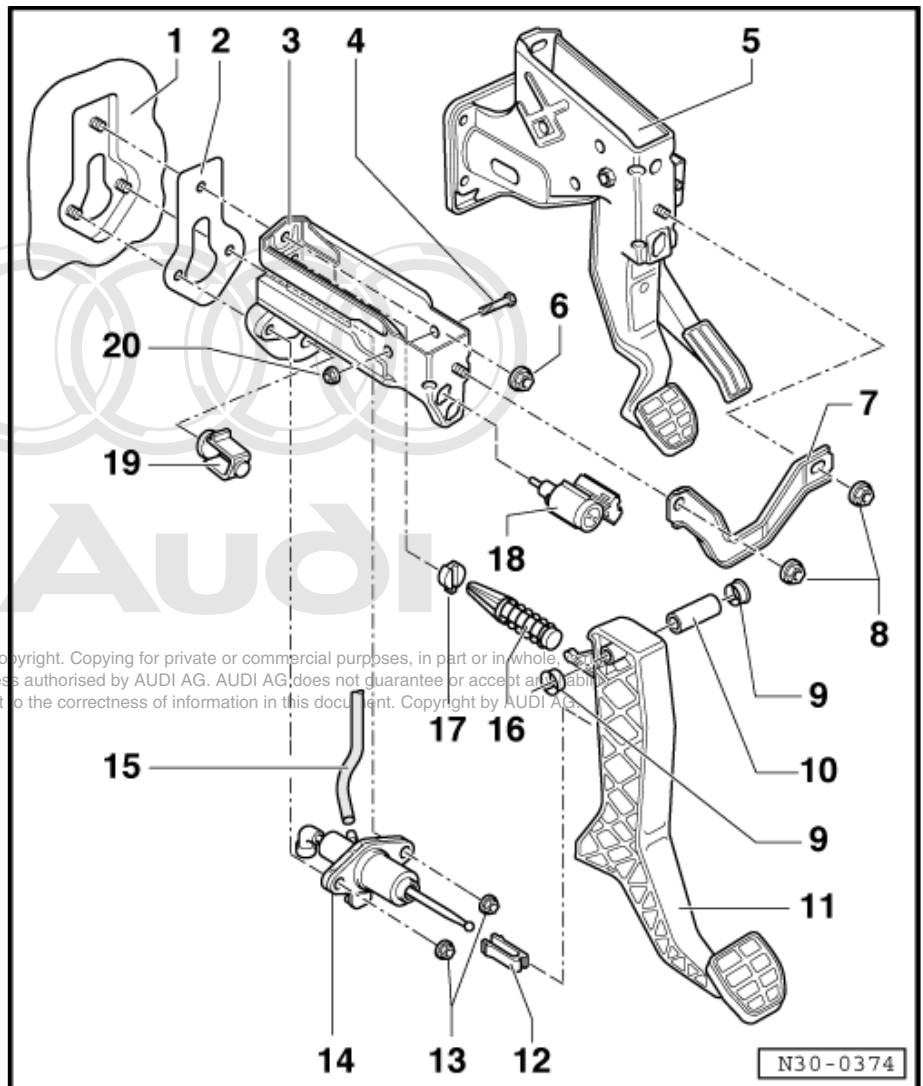
- ☐ Install in mounting bracket
- ☐ When renewing: remove and install clutch master cylinder ⇒ [page 14](#)

18 - Clutch pedal switch -F36-

- ☐ Removing and installing
⇒ ["1.2 Removing and installing clutch pedal switch F36 \(square housing\)", page 10](#) or
⇒ ["1.3 Removing and installing clutch pedal switch F36 \(round housing\)", page 10](#)

19 - Stop for clutch pedal

- ☐ Installation position ⇒ [page 16](#)



20 - Hexagon nut, 25 Nm

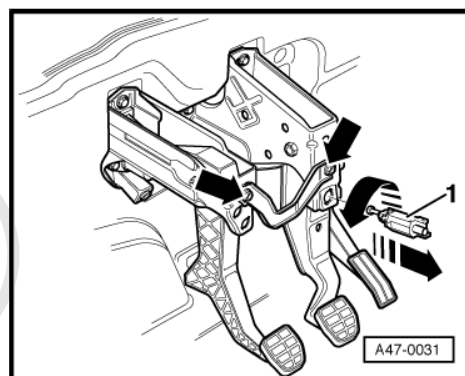
- ☐ Self-locking
- ☐ Renew

1.2 Removing and installing clutch pedal switch -F36- (square housing)**Note**

Switch may only be fitted once so as to ensure a firm fit.

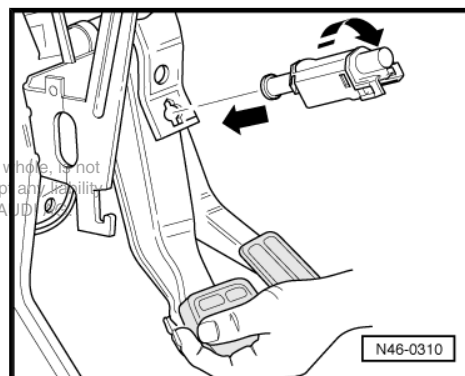
Removing

- Remove storage compartment on driver's side ⇒ Rep. Gr. 68 .
- Unplug electrical connector from clutch pedal switch.
- Remove clutch pedal switch -1- by turning 90° anti-clockwise.

**Installing**

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

- Pull operating rod of clutch pedal switch out onto stop.
- Push clutch pedal down by hand.
- Insert switch in mounting hole and secure by turning clockwise through 90° -arrows-.
- Release clutch pedal
- Install storage compartment on driver's side ⇒ Rep. Gr. 68 .

**1.3 Removing and installing clutch pedal switch -F36- (round housing)****Note**

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

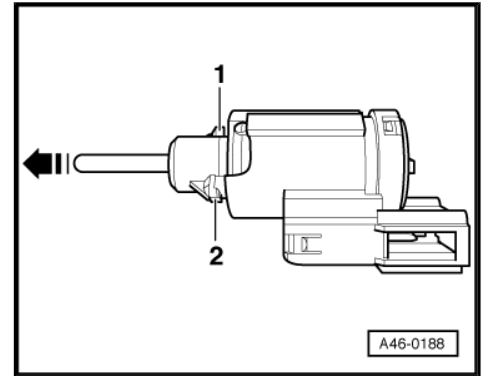
Removing

- Remove storage compartment on driver's side ⇒ Rep. Gr. 68 .
- Unplug electrical connector from clutch pedal switch.
- Remove clutch pedal switch by turning in anti-clockwise direction through 45°.

Installing

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

- Pull out operating rod -arrow- all the way before installing clutch pedal switch.
- The clutch pedal should be in the normal position (i.e. not pressed down).
- Guide clutch pedal switch through mounting hole, press operating rod against clutch pedal and attach switch by turning 45° clockwise.
- Install storage compartment on driver's side ⇒ Rep. Gr. 68 .

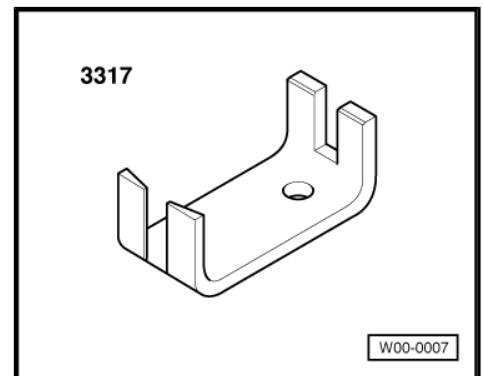


1.4 Removing and installing over-centre spring - LHD vehicles

Special tools and workshop equipment required

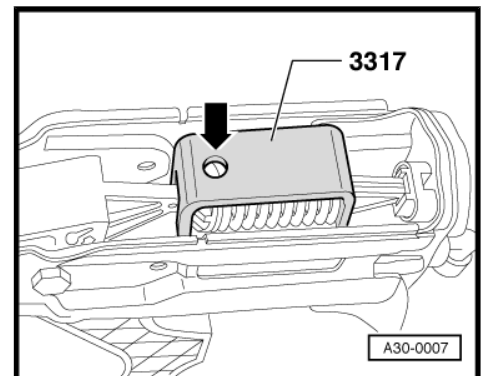
- ◆ Assembly clip -3317-

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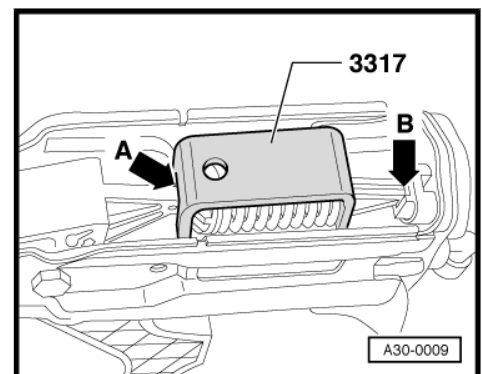
Removing

- Remove storage compartment on driver's side ⇒ Rep. Gr. 68 .
- Press down clutch pedal to compress over-centre spring and fit assembly clip -3317- from the top onto over-centre spring.
- The drilling -arrow- faces towards clutch pedal.
- Return clutch pedal to normal position and remove over-centre spring together with assembly clip -3317- .



Installing

- Pull clutch pedal into passenger compartment.
- Insert over-centre spring into rear mounting -arrow B- first, then operate clutch pedal until the assembly clip -3317- seats against the mounting lug -arrow A- of the clutch pedal.
- Return clutch pedal to normal position and remove assembly clip -3317- .



1.5 Removing and installing over-centre spring - RHD vehicles

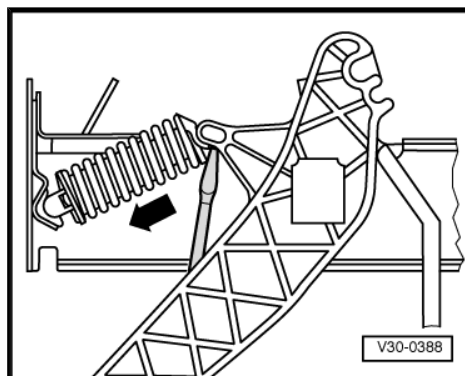
Removing

- Remove storage compartment on driver's side ⇒ Rep. Gr. 68 .
- Insert a screwdriver between clutch pedal and over-centre spring.
- Operate clutch pedal and lever off over-centre spring from clutch pedal in direction of -arrow-.

Installing

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

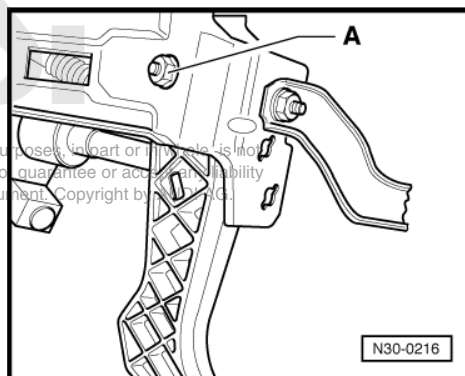
- Press clutch pedal.
- Insert over-centre spring in over-centre spring mounting and press into position on locating lug on clutch pedal.



1.6 Removing and installing clutch pedal

Removing

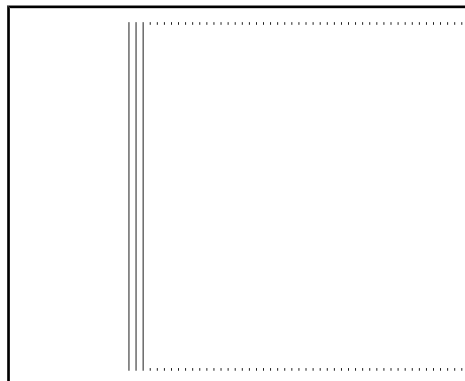
- Remove over-centre spring: LHD vehicles ⇒ [page 11](#) , RHD vehicles ⇒ [page 12](#) .
- Remove clutch pedal switch
⇒ ["1.2 Removing and installing clutch pedal switch F36 \(square housing\)", page 10](#) or
⇒ ["1.3 Removing and installing clutch pedal switch F36 \(round housing\)", page 10](#) .
- Separate clutch pedal from master cylinder ⇒ [page 14](#) and push operating rod towards bulkhead onto stop.
- Remove nut -A-.
- Pull bolt out until the clutch pedal can be removed.



Installing

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

- Install over-centre spring ⇒ [page 11](#) .
- The retaining clip -A- must be fitted on the master cylinder operating rod -B-.
- Press clutch pedal in direction of -arrow- to engage. Ensure that pedal is correctly located.
- Install clutch pedal switch
⇒ ["1.2 Removing and installing clutch pedal switch F36 \(square housing\)", page 10](#) or
⇒ ["1.3 Removing and installing clutch pedal switch F36 \(round housing\)", page 10](#) .



1.7 Hydraulics - exploded view of components

1 - Brake fluid reservoir

2 - Supply hose

3 - Clutch master cylinder

- ☐ Removing and installing
⇒ [page 14](#)

4 - Retaining clip

- ☐ Only renew when clutch master cylinder has been removed
- ☐ Lever off to remove
⇒ [page 14](#)
- ☐ Pressing on
⇒ [page 14](#)

5 - Clutch pedal

- ☐ Removing and installing
⇒ [page 12](#)

6 - Hexagon nut, 25 Nm

- ☐ 2 x
- ☐ Self-locking
- ☐ Renew

7 - O-ring

- ☐ Renew
- ☐ Lubricate with brake fluid before installing
- ☐ Push onto pipe connection

8 - Pipe/hose assembly

- ☐ Disconnecting from clutch master cylinder and installing
⇒ [page 15](#)

- ☐ Disconnecting from clutch slave cylinder ⇒ [page 19](#)

- ☐ For correct version refer to ⇒ [Parts catalogue](#)

9 - Retainer

- ☐ Attached to body

10 - Dust cap

11 - Bleeder valve

- ☐ Bleeding clutch system ⇒ [page 19](#)

12 - Clutch slave cylinder

- ☐ Removing and installing ⇒ [page 17](#)

13 - Flange bolt, 25 Nm

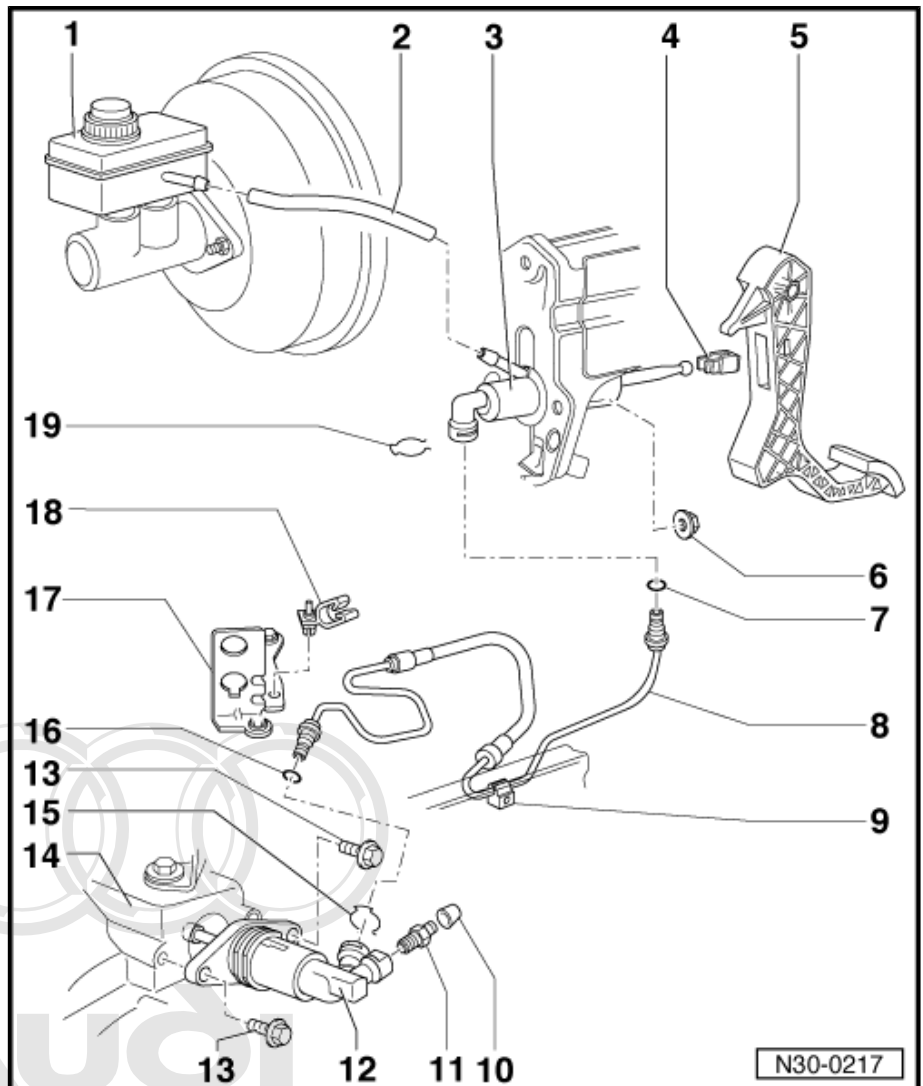
14 - Gearbox

15 - Clip

- ☐ To remove pipe, pull out clip as far as limit stop ⇒ [page 15](#)

16 - O-ring

- ☐ Renew
- ☐ Lubricate with brake fluid before installing



- ☐ Push onto pipe connection

17 - Support bracket

18 - Retainer

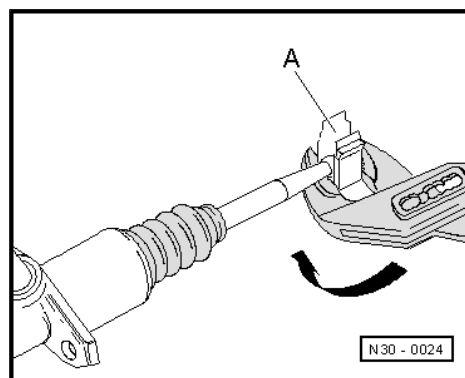
- ☐ Secure to support bracket for selector cables

19 - Clip

- ☐ To remove pipe, pull out clip as far as limit stop ⇒ [page 15](#)

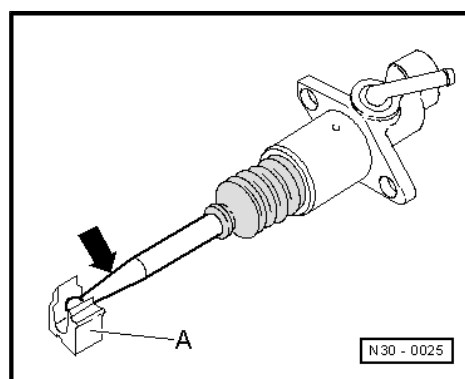
Levering off retaining clip

- Lever retaining clip -A- off in direction of -arrow- using pliers.



Pressing master cylinder operating rod into retaining clip

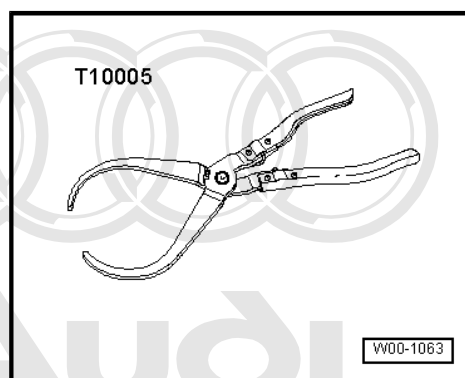
- Press master cylinder operating rod into retaining clip -A- -arrow-.



1.8 Removing and installing clutch master cylinder

Special tools and workshop equipment required

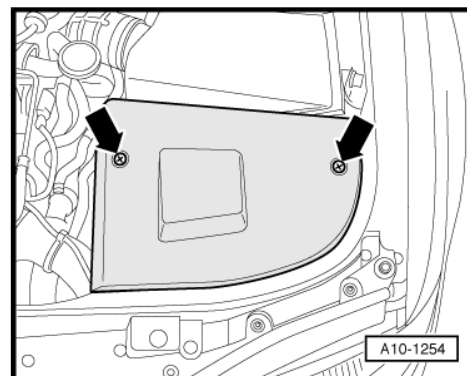
- ◆ Pliers -T10005-



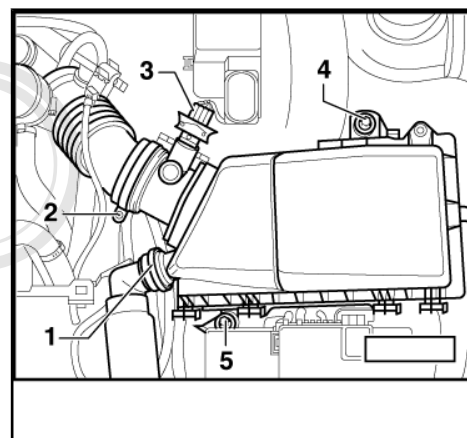
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Removing

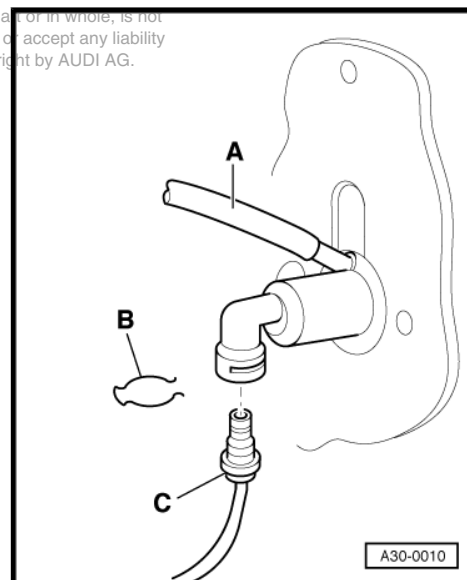
- Remove cover panel (front left) -arrows-.



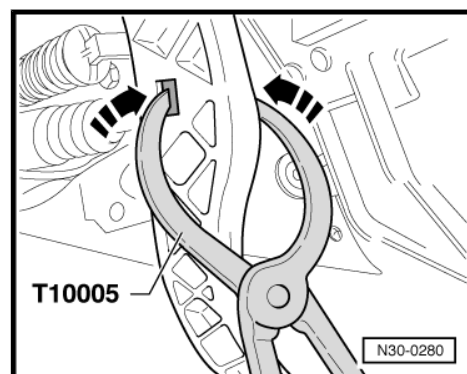
- If fitted, detach hose -1- for secondary air pump.
- Detach air intake hose at air mass meter -G70- (slacken hose clip -2-).
- Unplug electrical connector for air mass meter -G70- -3-.
- Remove bolts -4- and -5- and detach air cleaner housing.



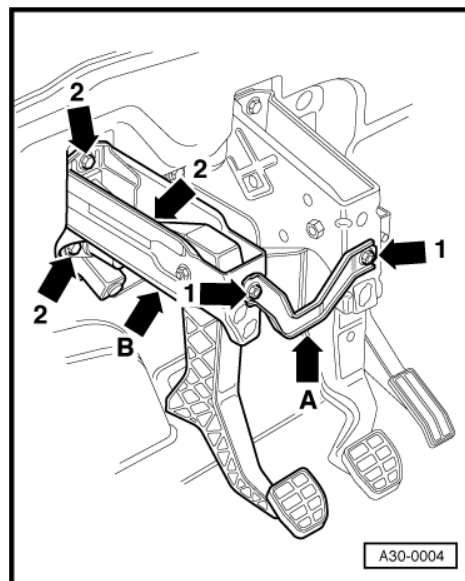
- Disconnect supply hose -A- going to brake fluid reservoir and seal off hose.
- Pull out clip -B- for pipe/hose assembly as far as stop.
- Pull pipe/hose assembly -C- out from master cylinder and seal.
- Remove storage compartment on driver's side ⇒ Rep. Gr. 68 .
- Remove clutch pedal switch
⇒ ["1.2 Removing and installing clutch pedal switch F36 \(square housing\)", page 10](#) or
⇒ ["1.3 Removing and installing clutch pedal switch F36 \(round housing\)", page 10](#) .



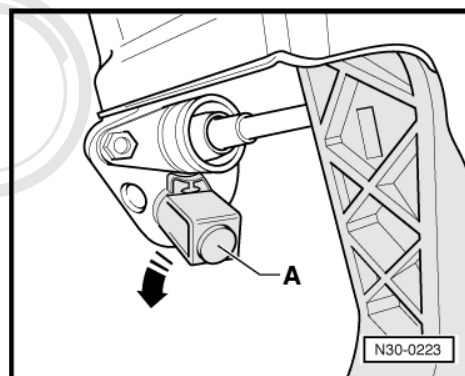
- Pull clutch pedal lightly towards the passenger compartment to separate master cylinder operating rod from clutch pedal and press both sides of retaining clip inwards -arrows- using pliers -T10005- .



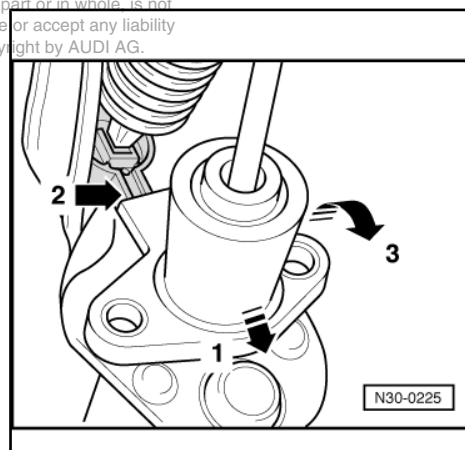
- Remove connecting plate -A- -arrows 1-.
- Remove nuts -arrows 2- and take off mounting bracket -B-.



- Turn stop -A- for clutch pedal in direction of -arrow- and remove.



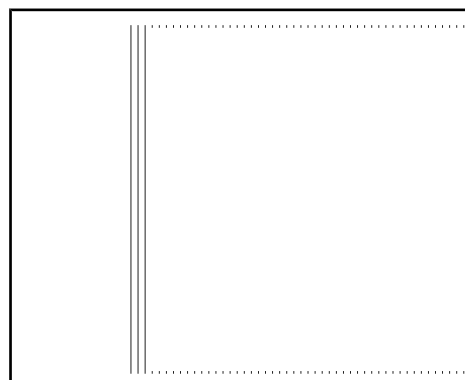
- Then push master cylinder in the direction of -arrow 1- onto stop.
- It must not be covered in upper area by over-centre spring mounting -arrow 2-.
- Then swing master cylinder in direction of -arrow 3- out of mounting bracket.



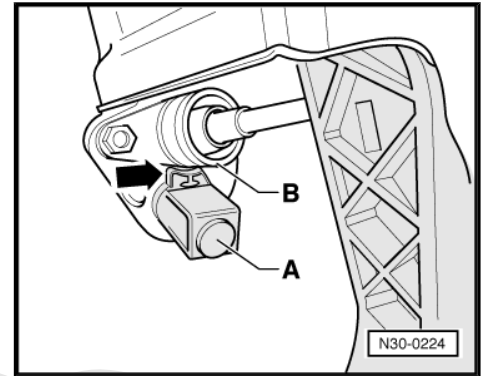
Installing

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

- The retaining clip -A- must be fitted on the master cylinder operating rod -B-.
- Press clutch pedal in direction of -arrow- to engage. Ensure that pedal is correctly located.



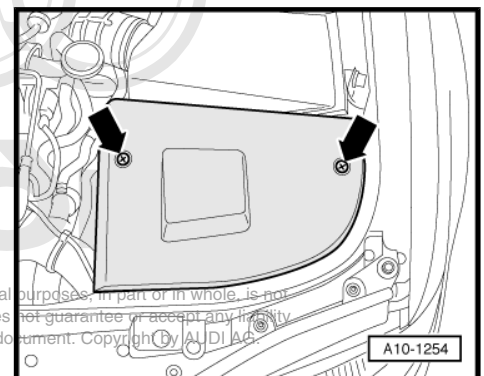
- Fit stop -A- for clutch pedal again.
- Installation position: the angled tabs -arrow- point towards the master cylinder -B-.
- Install clutch pedal switch
⇒ ["1.2 Removing and installing clutch pedal switch F36 \(square housing\)", page 10](#) or
⇒ ["1.3 Removing and installing clutch pedal switch F36 \(round housing\)", page 10](#).
- Bleed clutch system ⇒ [page 19](#).



1.9 Removing and installing clutch slave cylinder

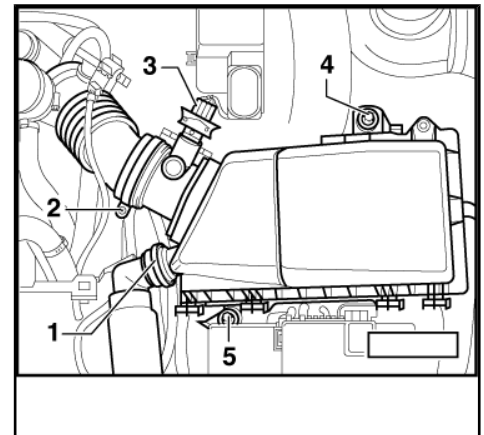
Removing

- Remove cover panel (front left) -arrows-.

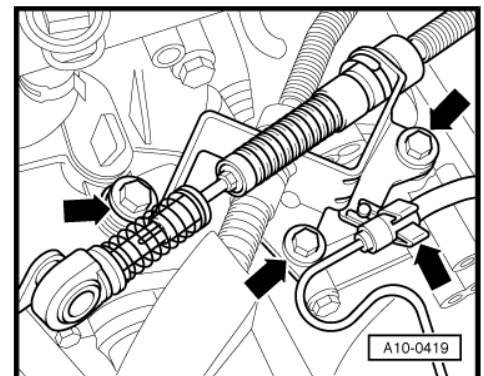


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- If fitted, detach hose -1- for secondary air pump.
- Detach air intake hose at air mass meter -G70- (slacken hose clip -2-).
- Unplug electrical connector for air mass meter -G70- -3-.
- Remove bolts -4- and -5- and detach air cleaner housing.



- Detach cable support bracket from gearbox -arrows-, if necessary unclip pipe/hose assembly.



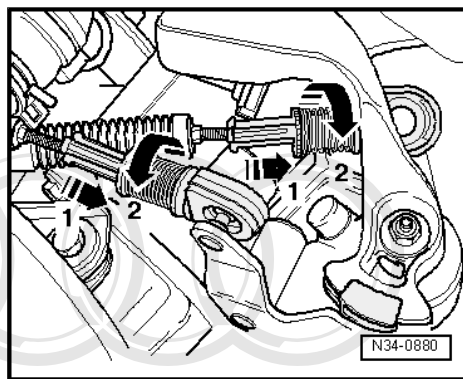
Vehicles to 06.2001:



Caution

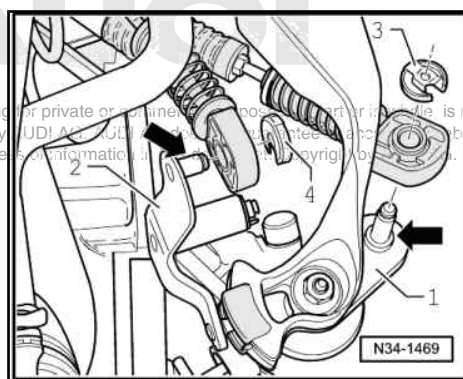
Do not remove cable end-pieces from selector shaft lever or relay lever on vehicles up to 06.2001. Cable end-pieces must be renewed after removal.

- Release cable end-pieces for gate selector cable and gear selector cable; push back collar as far as it will go in direction of -arrow 1-, then turn anti-clockwise in direction of -arrow 2- so that it engages.
- Pull selector cables out of cable end-pieces



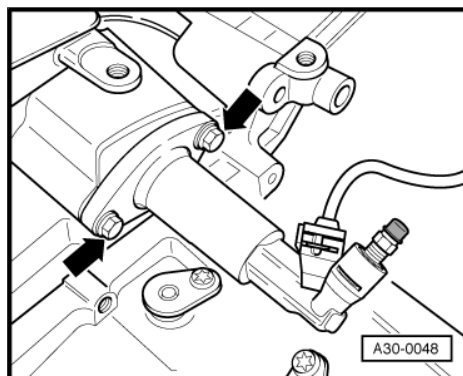
Vehicles from 07.2001:

- Pull off circlips -3- and -4-.
- Detach gear selector cable from stud on selector shaft lever -1- and gate selector cable from stud on relay lever -2-.



All models:

- Unscrew bolts -arrows- and pull out clutch slave cylinder.

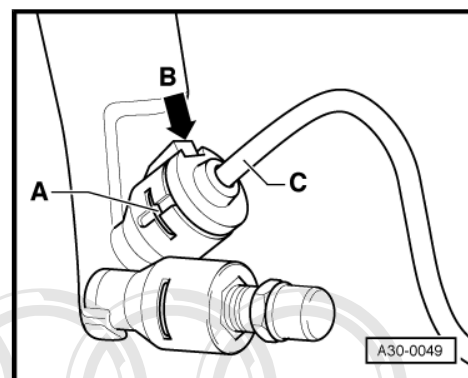


- Pull out clip -A- as far as stop and detach pipe/hose assembly -C- from clutch slave cylinder.
- Seal off pipe/hose assembly with a plug.

Installing

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

- Press in clip -A- onto stop.
- Position recess on pipe so that it faces lug on clutch slave cylinder -arrow B-.
- Push pipe -C- into clutch slave cylinder until it engages audibly.
- Lubricate end of operating rod with MoS₂ grease before installing clutch slave cylinder.
- Bleed clutch system ⇒ [page 19](#) .
- Install cable support bracket, if necessary push hose onto cable support bracket.



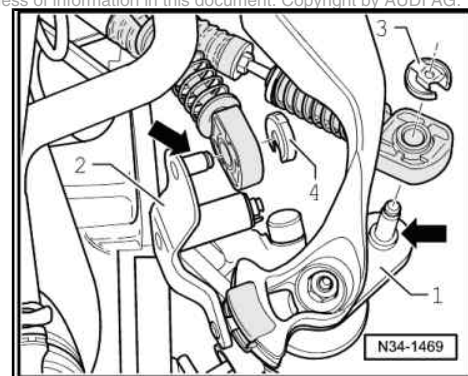
Vehicles to 06.2001:

- Insert Bowden cables in unlocked cable end-pieces.
- Adjust selector mechanism ⇒ [page 37](#) .

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Vehicles from 07.2001:

- Spread small amount of polycarbamide grease -G 052 142 A2- onto studs -arrows- of selector shaft lever -1- and relay lever -2-.
- Always renew circlips -3- for gear selector cable and -4- for gate selector cable after removing.



All models:

- Install air cleaner housing.

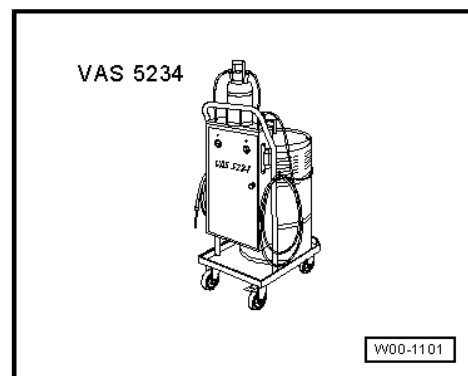
Tightening torques

Component	Nm
Clutch slave cylinder to gearbox	25
Selector cable support bracket to gearbox	25
Air cleaner housing to body	10

1.10 Bleeding clutch system

Special tools and workshop equipment required

- ◆ Brake charge and bleed equipment -VAS 5234-



Brake fluid specification ⇒ Rep. Gr. 47 .

Procedure



Note

- ◆ *The clutch system must be bled after performing work on the hydraulic clutch mechanism.*
- ◆ *It is not necessary to pre-fill the system.*
- ◆ *When performing the following steps, make sure that no brake fluid escapes onto the gearbox.*

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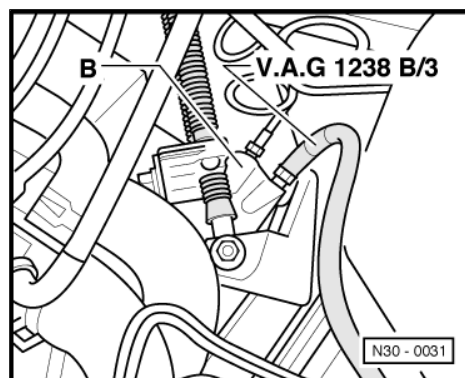
- Pull clutch pedal back to its normal rest position.
- Connect brake charge and bleed equipment -VAS 5234- to brake fluid reservoir (do not switch on at this stage).
- If necessary, use bleed hose -V.A.G 1238 B/3- (670 mm) to bleed system.
- Connect bleed hose to collector bottle of brake charge and bleed equipment -VAS 5234- .
- Connect bleed hose -V.A.G 1238 B/3- to bleeder valve on clutch slave cylinder -B-.



Note

Ensure that bleed hose is correctly fitted during bleeding operation.

- Open bleeder valve.
- Switch on bleeding equipment.
- Operating pressure 2.0 bar
- Bleed off about 100 cm³ of brake fluid.
- Close bleeder valve.
- Rapidly operate clutch pedal from stop to stop 15 times.
- Bleed off an additional 50 cm³ of brake fluid.
- Close bleeder valve. Tightening torque 4.5 Nm.
- Depress clutch pedal several times after bleeding process is completed.
- Bleed system once again if necessary.
- Remove bleed hose and fit protective cap.
- Remove brake charge and bleed equipment -VAS 5234- from brake fluid reservoir.



2 Servicing clutch release mechanism

1 - Gearbox

2 - Ball head stud, 25 Nm

- ☐ Lubricate with MoS₂ grease

3 - Input shaft oil seal

- ☐ Renewing
⇒ [Item 13 \(page 79\)](#)

4 - Guide sleeve

- ☐ With vulcanised O-ring for sealing at clutch housing
- ☐ If O-ring is damaged, renew guide sleeve together with O-ring
- ☐ Lubricate guide sleeve in area of release bearing with MoS₂ grease

5 - Retaining spring

- ☐ Secure to clutch release lever

6 - Socket head bolt, 20 Nm

- ☐ Self-locking
- ☐ Renew

7 - Clutch release lever

8 - Release bearing

- ☐ Do not wash out bearing; wipe clean only
- ☐ Renew bearings if noisy
- ☐ Lubricate surfaces which contact release lever with MoS₂ grease

9 - Flange bolt, 20 Nm

10 - Clutch slave cylinder

- ☐ Removing and installing ⇒ [page 17](#)

11 - Operating rod

- ☐ Lubricate end of operating rod with MoS₂ grease

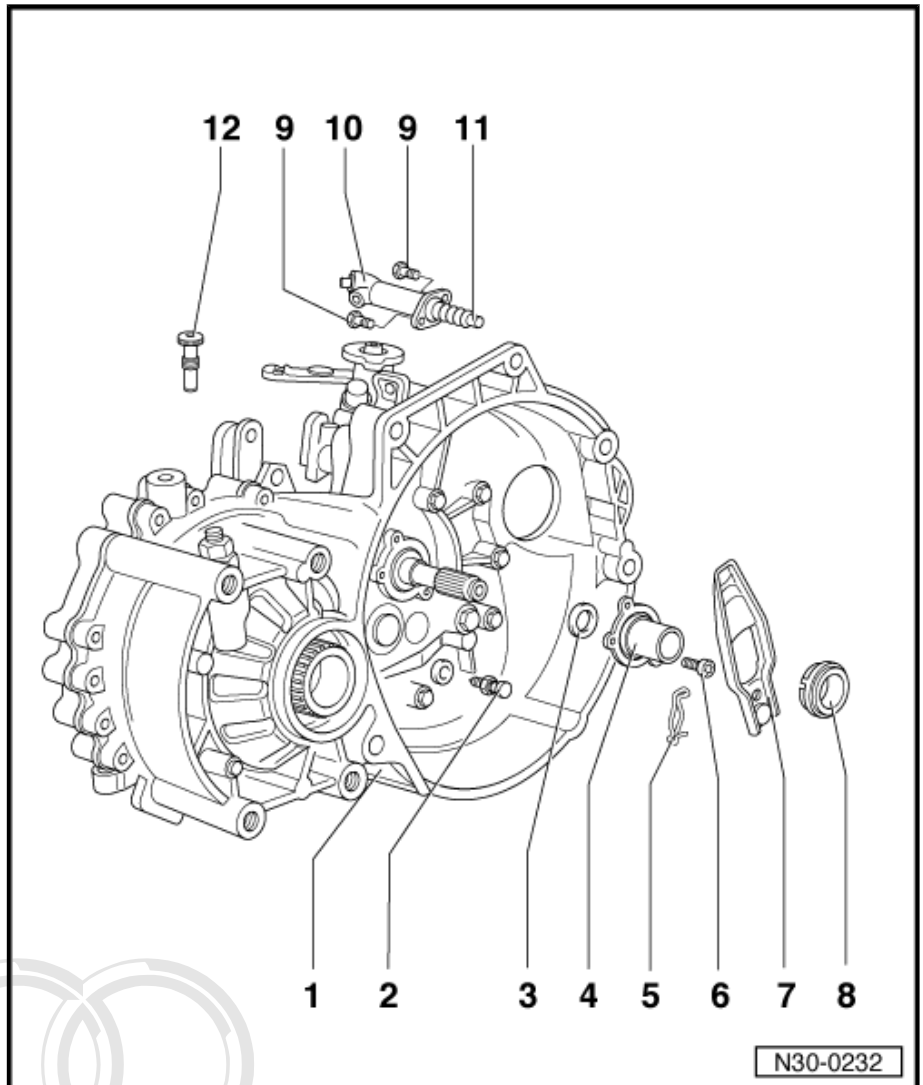
12 - Assembly bolt

- ☐ Secures clutch release lever while installing gearbox
- ☐ Unscrew after gearbox has been installed



Note

If the assembly bolt is not available, an M 8 x 35 bolt can be used instead.



3 Servicing clutch

3.1 Clutch - exploded view of components

1 - Dual-mass flywheel

- ☐ Observe instructions for removal ⇒ [page 23](#)
- ☐ Removing and installing ⇒ Rep. Gr. 13
- ☐ Ensure that dowel pins fit tightly
- ☐ Contact surface for clutch lining must be free of grooves, oil and grease

2 - Clutch plate

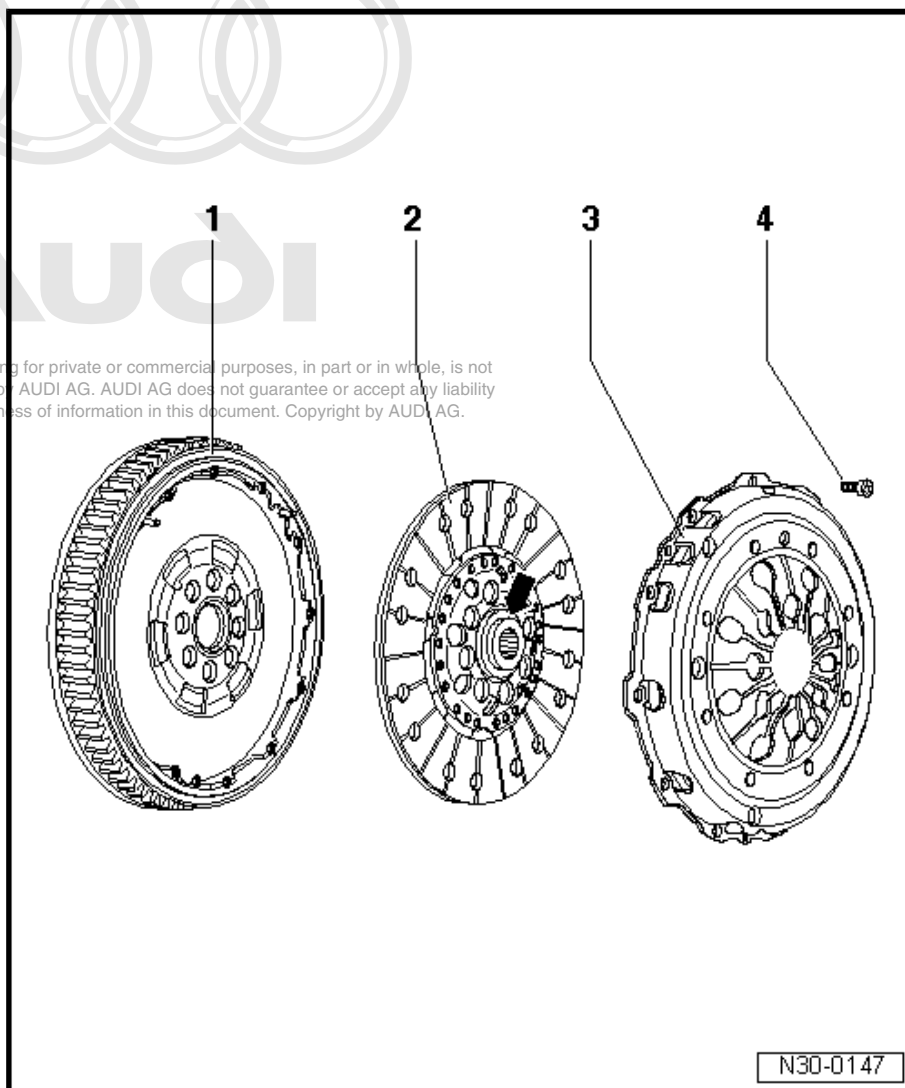
- ☐ Removing and installing ⇒ [page 23](#)
- ☐ Installation position with dual-mass flywheel: Shorter end of hub -arrow- faces towards pressure plate
- ☐ Installation position with one-piece flywheel: spring cage faces towards pressure plate
- ☐ Clutch plate diameter ⇒ [page 2](#)

3 - Pressure plate

- ☐ Removing and installing ⇒ [page 23](#)
- ☐ Check ends of diaphragm spring ⇒ [page 23](#)
- ☐ Check spring connections and rivets ⇒ [page 23](#)

4 - M6 = 13 Nm; M7 = 20 Nm; M8 = 22 Nm

- ☐ Working clockwise, slacken all bolts one after the other in steps of 90° (1/4 turn) until the pressure plate is free
- ☐ Observe instructions for installation ⇒ [page 25](#)
- ☐ For correct version check engine code and refer to ⇒ Parts catalogue



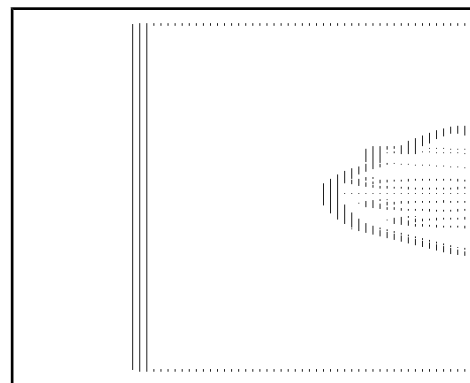
Checking ends of diaphragm spring

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



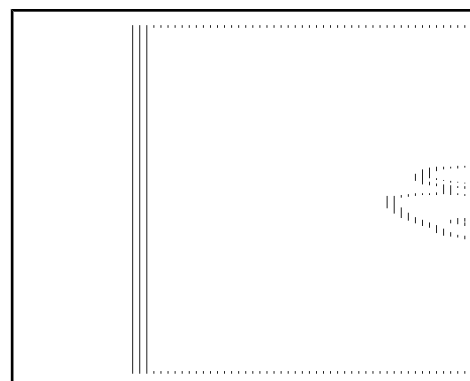
Note

Select the correct pressure plate and clutch plate according to engine code ⇒ Parts catalogue.



Checking spring connections and rivets

- Check spring connections between pressure plate and cover for cracks and make sure rivets are seated tightly.
- Renew pressure plate if spring connections are damaged or rivets are loose -arrows-.



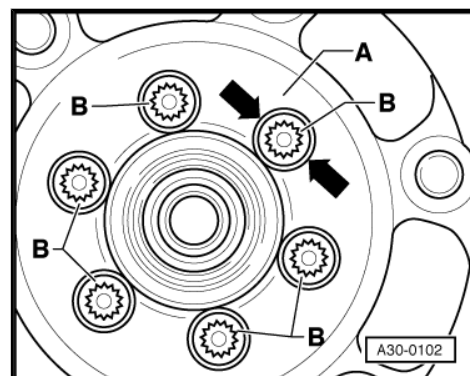
Instructions for removing dual-mass flywheel



Note

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

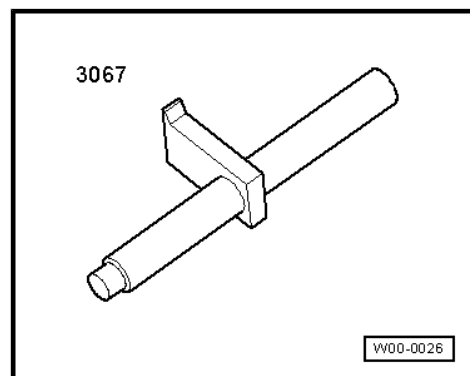
- Rotate dual-mass flywheel -A- so that the bolts are aligned centrally behind the holes -arrows-.
- When removing the bolts, make sure that none of the bolt heads contacts the dual-mass flywheel, as this would damage the flywheel when the bolts are unscrewed further.



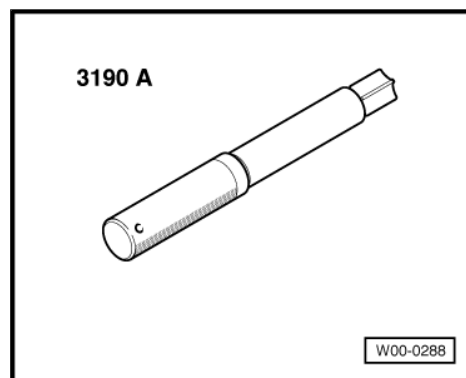
3.2 Removing and installing clutch

Special tools and workshop equipment required

- ◆ Counterhold tool -3067-



- ◆ Centring mandrel -3190 A-



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

Removing

- Remove gearbox ⇒ [page 40](#) .
- Apply counter-hold tool -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:

- Working clockwise, loosen all six bolts consecutively in steps of 90° (1/4 turn) until the pressure plate is released.
- Take off pressure plate and clutch plate.

Installing

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



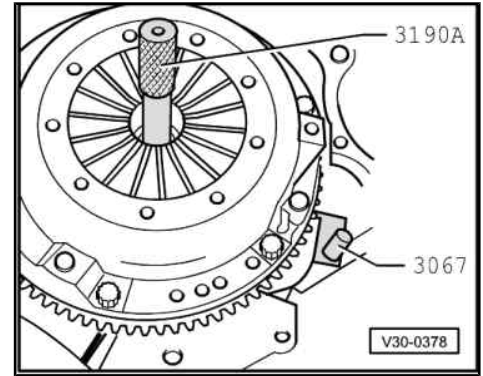
Note

- ◆ **Select the correct clutch plate and pressure plate according to engine code: ⇒ [Parts catalogue](#)**
- ◆ *If the clutch has burnt out, thoroughly clean the bell housing, flywheel and parts of the engine facing the gearbox in order to prevent odours.*
- ◆ *Clean input shaft splines and (in the case of a used clutch plate) the hub splines. Remove corrosion and apply only a very thin coating of grease for clutch plate splines -G 000 100- to the splines. Then move clutch plate backwards and forwards on input shaft until hub moves freely on shaft. It is important to remove excess grease.*
- ◆ *Pressure plates have an anti-corrosion coating and are greased. Only the contact surface may be cleaned, otherwise the service life of the clutch will be considerably reduced.*
- ◆ *Pressure plate contact surface and clutch plate lining must make full contact with flywheel. Only then insert bolts.*
- Note correct installation position of clutch plate:
 - With dual-mass flywheel: Shorter end of hub faces towards pressure plate.
 - With one-piece flywheel: spring cage faces towards pressure plate.

- Reverse position of counter-hold tool -3067- when installing.
- Use centring mandrel -3190 A- 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:

- Fit pressure plate onto dowel pins.
- Screw in all 6 bolts evenly by hand until bolt heads make contact with pressure plate.
- Working clockwise, tighten all six bolts consecutively in steps of 90° (1/4 turn) until the housing makes contact with the flywheel.
- Working clockwise, tighten all 6 bolts to final torque consecutively.
- Install gearbox ⇒ [page 49](#) .



Tightening torque

Component		Nm
Pressure plate to dual-mass flywheel	M6	13
	M7	20
	M8	22



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34 – Controls, housing

1 Servicing selector mechanism

1.1 Installation position of selector mechanism



Note

- ◆ -Double-ended arrow A = gear selection movement.
- ◆ -Double-ended arrow B = gate selection movement.

A - Gear selector cable (gear selection movement)

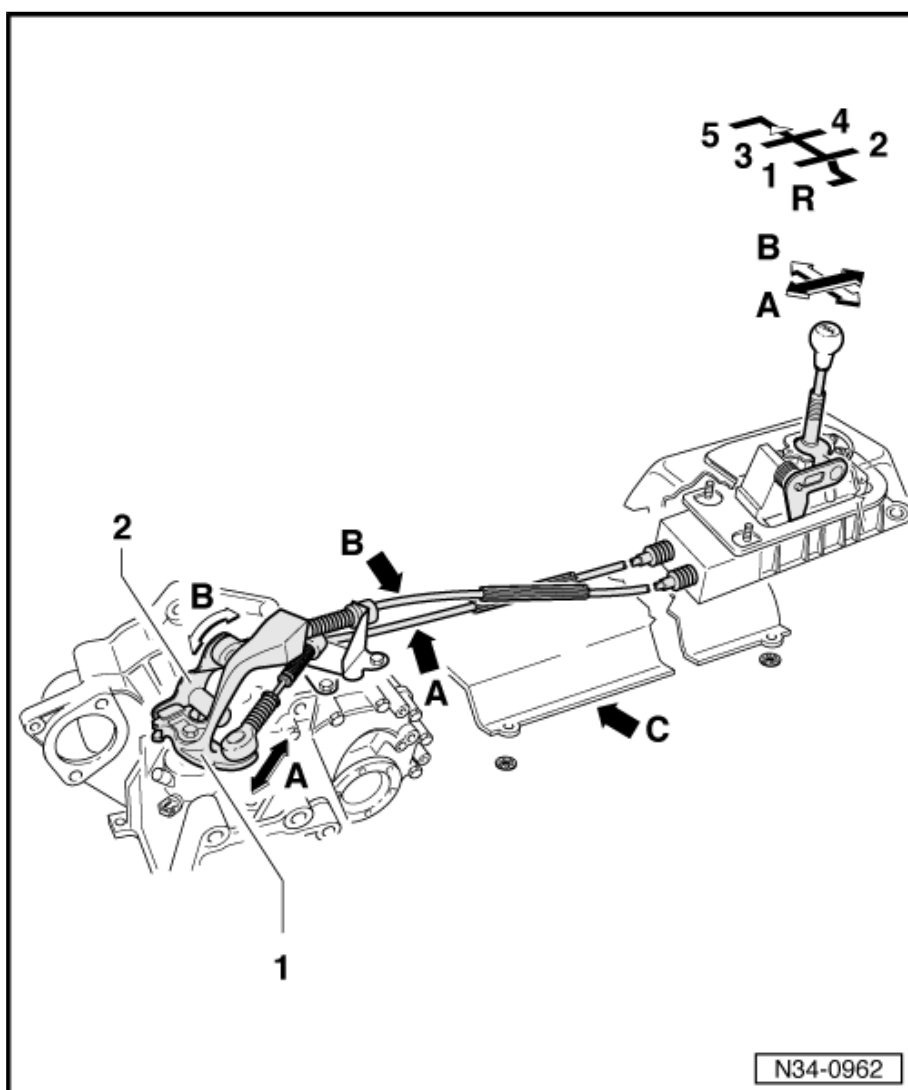
B - Gate selector cable (gate selection movement)

C - Heat shield

- ☐ Detach before removing selector mechanism.

1 - Selector shaft lever

2 - Relay lever



I - Gear knob and boot

⇒ [page 28](#)

- ❑ Removing and installing gear knob with boot
⇒ [page 29](#)

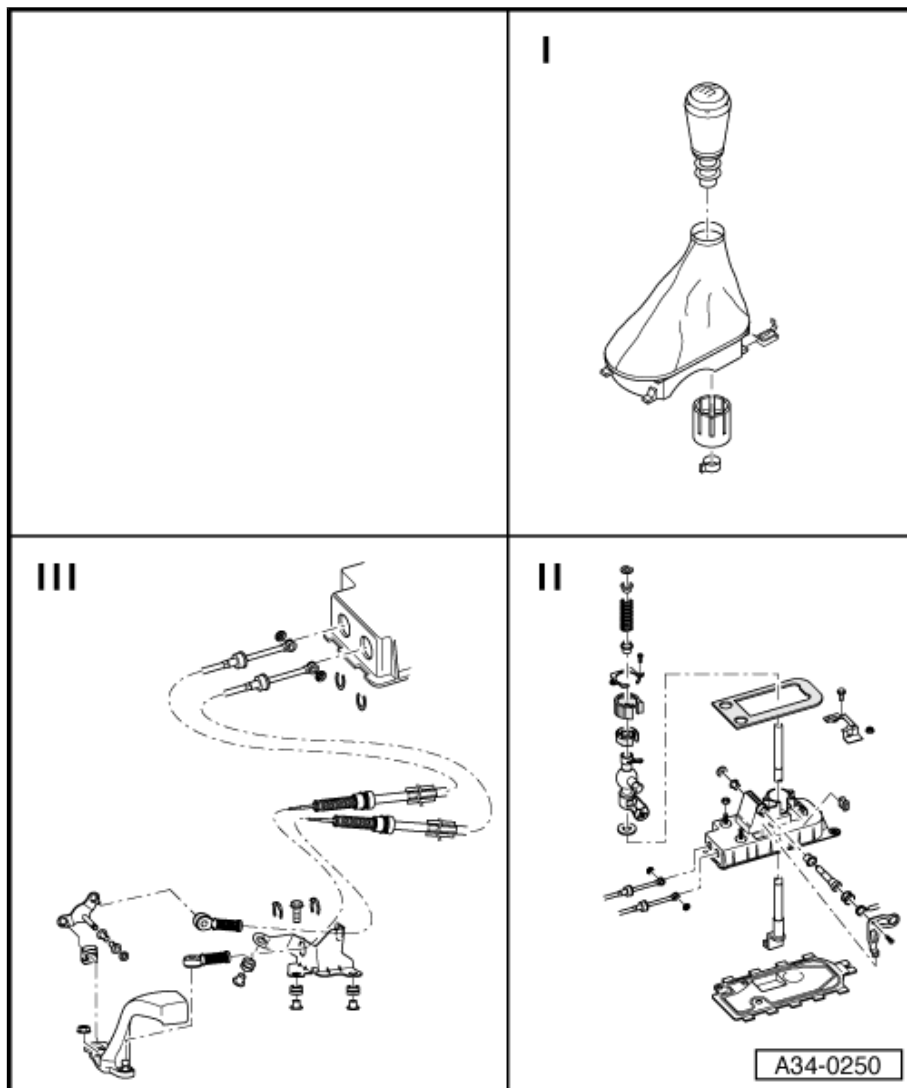
II - Gear lever and selector housing

⇒ [page 29](#) .

III - Selector cables

⇒ [page 32](#) .

- ❑ Removing and installing selector mechanism
⇒ [page 35](#)
- ❑ Adjusting selector mechanism
⇒ [page 37](#)



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1.2 Gear knob and boot - exploded view of components

1 - Gear knob

- ☐ Remove and install together with gear lever boot ⇒ [page 29](#)

2 - Boot with mounting frame

- ☐ Remove and install together with gear knob ⇒ [page 29](#)

- ☐ Separating from gear knob ⇒ [page 28](#)

- ☐ Connect to gear knob before installing ⇒ [page 28](#)

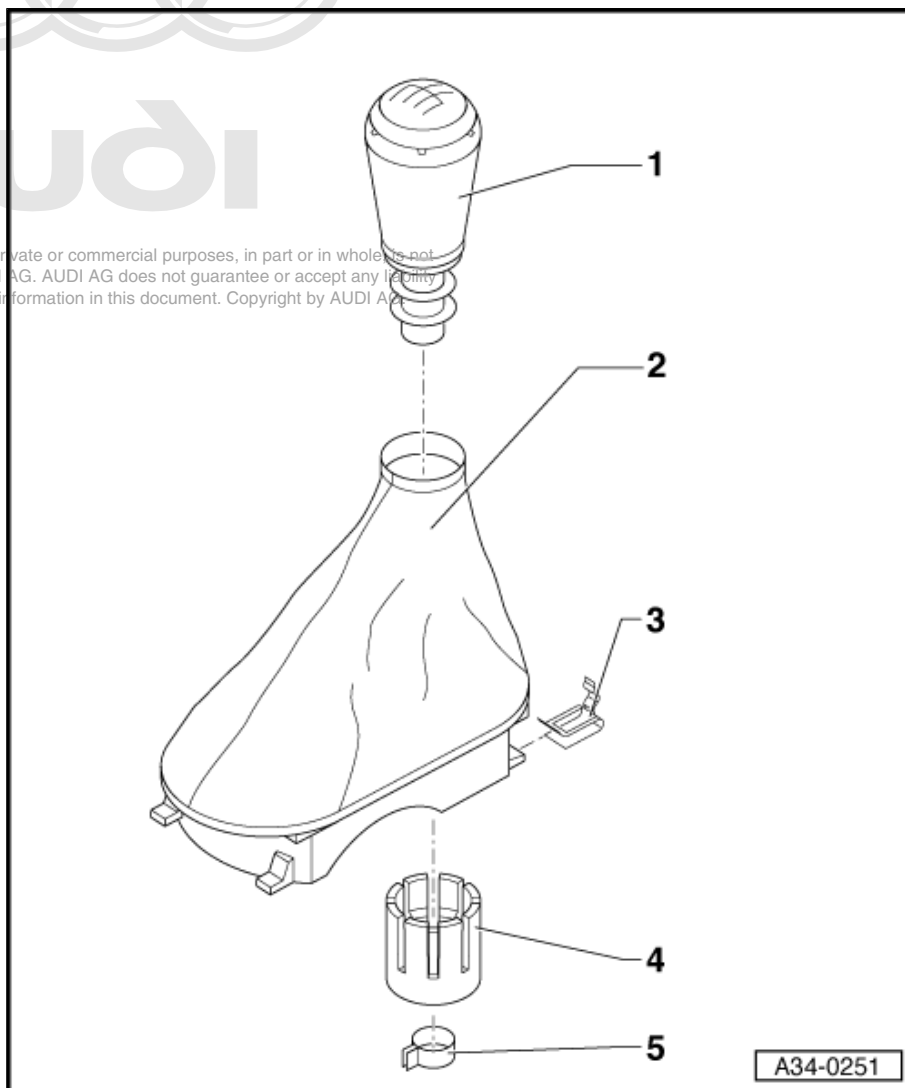
3 - Retaining clips

4 - Connecting piece

- ☐ Connects boot with gear knob
- ☐ Removing ⇒ [page 28](#)

5 - Clip

- ☐ For securing gear knob to gear lever

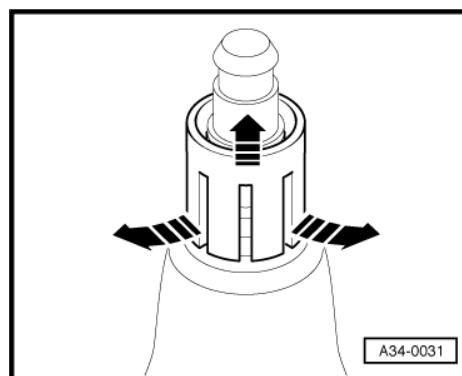


Detaching boot from gear knob and assembling

- Turn boot inside out.
- Using a screwdriver, lever the prongs -bottom arrows- on the connecting piece outwards and detach connecting piece from gear lever.
- Detach gear knob from boot.

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

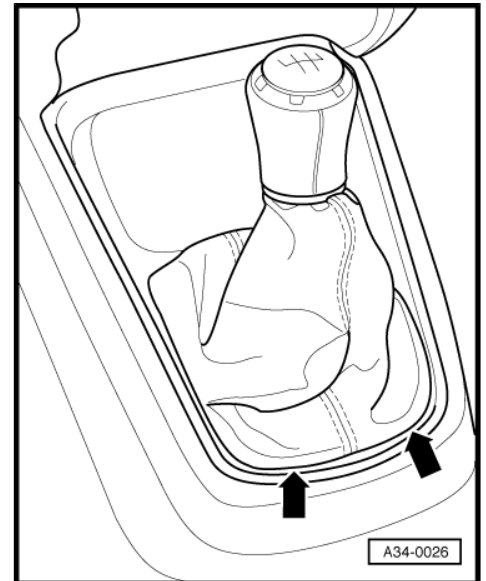
- Turn boot inside out.
- Insert gear knob in boot.
- Press connecting piece onto gear knob and boot unit so that it snaps into place on gear knob.



1.3 Removing and installing gear knob with gear lever boot

Removing

- Carefully pry gear lever boot off centre console -arrows-.
- Pull gear lever boot off centre console towards rear.
- Pull boot up and over gear knob.



- Open clip -arrow- and detach gear knob together with boot.

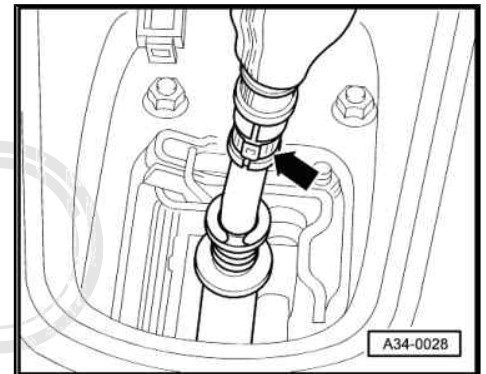
Installing

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



Note

Renew clip for securing gear knob.



1.4 Gear lever and selector housing - exploded view of components



Note

Lubricate all bearings and moving surfaces with polycarbamide grease -G 052 142 A2-.

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1 - Securing clip

- ☐ Removing and installing
⇒ [page 31](#)

2 - Bush
3 - Spring
4 - Bush
5 - Torx socket head bolt, 6 Nm
6 - Cover
7 - Damper
8 - Bearing cup

- ☐ Insert in damper
⇒ [Item 7 \(page 30\)](#)

9 - Gear lever guide
10 - Damping washer
11 - Gasket

- ☐ Between selector housing and floor
- ☐ Self-adhesive
- ☐ Bond to selector housing

12 - Bolt, 25 Nm
13 - Bracket

- ☐ Attached to body

14 - Hexagon nut, 25 Nm
15 - Gear lever
16 - Damper

- ☐ Press onto selector housing

17 - Selector housing
18 - Bearing bush

- ☐ Only fits in one position.

19 - Pivot pin
20 - Guide bush

- ☐ Press onto selector housing

21 - Spring

- ☐ Installing ⇒ [page 31](#)

22 - Gate selector bracket

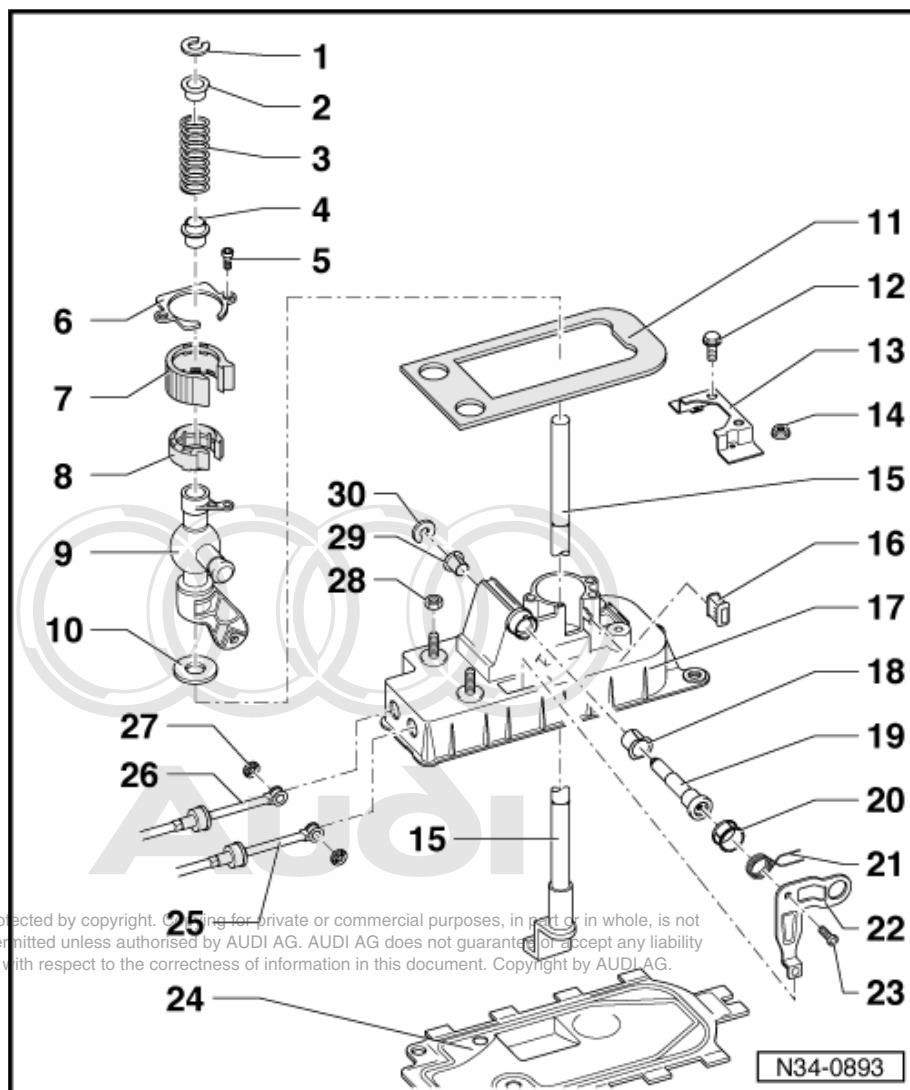
- ☐ Removing securing clip ⇒ [page 31](#)

23 - Torx socket head bolt, 6 Nm
24 - Floor plate

- ☐ Bend tabs open to remove
- ☐ Renew

25 - Gear selector cable
26 - Gate selector cable

- ☐ On gate selector bracket ⇒ [Item 22 \(page 30\)](#)
- ☐ Installation position ⇒ [page 26](#)



27 - Securing clip

- ☐ Press onto gear lever guide
- ☐ Installation position ⇒ [page 26](#)

28 - Hexagon nut, 25 Nm

29 - Bearing bush

- ☐ Only fits in one position.

30 - Securing clip

Removing and installing securing clip

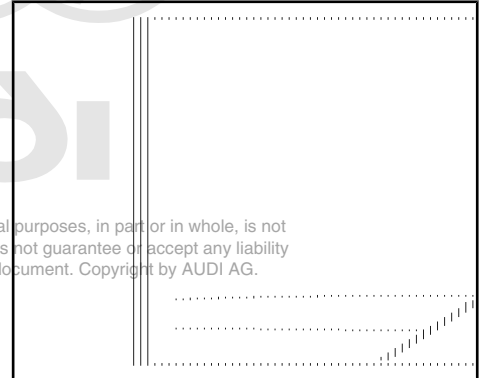
- To remove and install securing clip, pull gear lever in direction of -arrow A- and at the same time push down spacer bush onto stop with a screwdriver in direction of -arrow B-.



Note

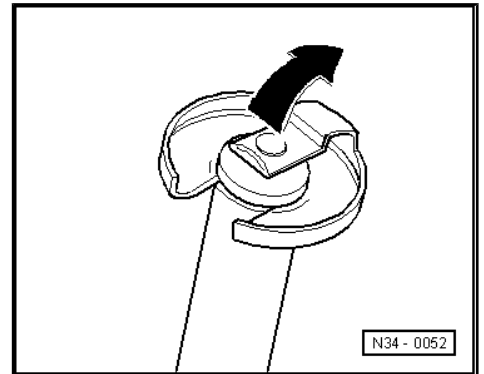
Do not tilt spacer bush when pushing down. Carefully release pressure at groove in gear lever for securing clip.

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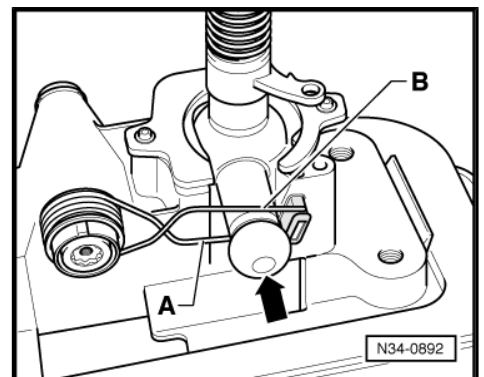
Removing securing clip for gate selector bracket

- Lift tab in direction of -arrow-.



Installing spring

- Insert spring so that the spring extension -A- is under the pin -arrow-.
- Then pull spring extension -B- up towards gear lever until it lies on upper section of pin -arrow-.



1.5 Selector cables - exploded view of components



Note

Lubricate all bearings and moving surfaces with polycarbamide grease -G 052 142 A2-.

1 - Gear selector cable

- ☐ Press onto gear lever guide
- ☐ Installation position
⇒ [page 26](#)

2 - Gate selector cable

- ☐ On gate selector bracket
- ☐ Installation position
⇒ [page 26](#)

3 - Securing clip

4 - Securing clip

- ☐ Take care not to damage selector cables when removing.

5 - Selector housing

6 - Support bracket

7 - Grommet

- ☐ For support bracket mounting on gearbox

8 - Distance piece

9 - Hexagon bolt, 25 Nm

10 - Cable end-piece

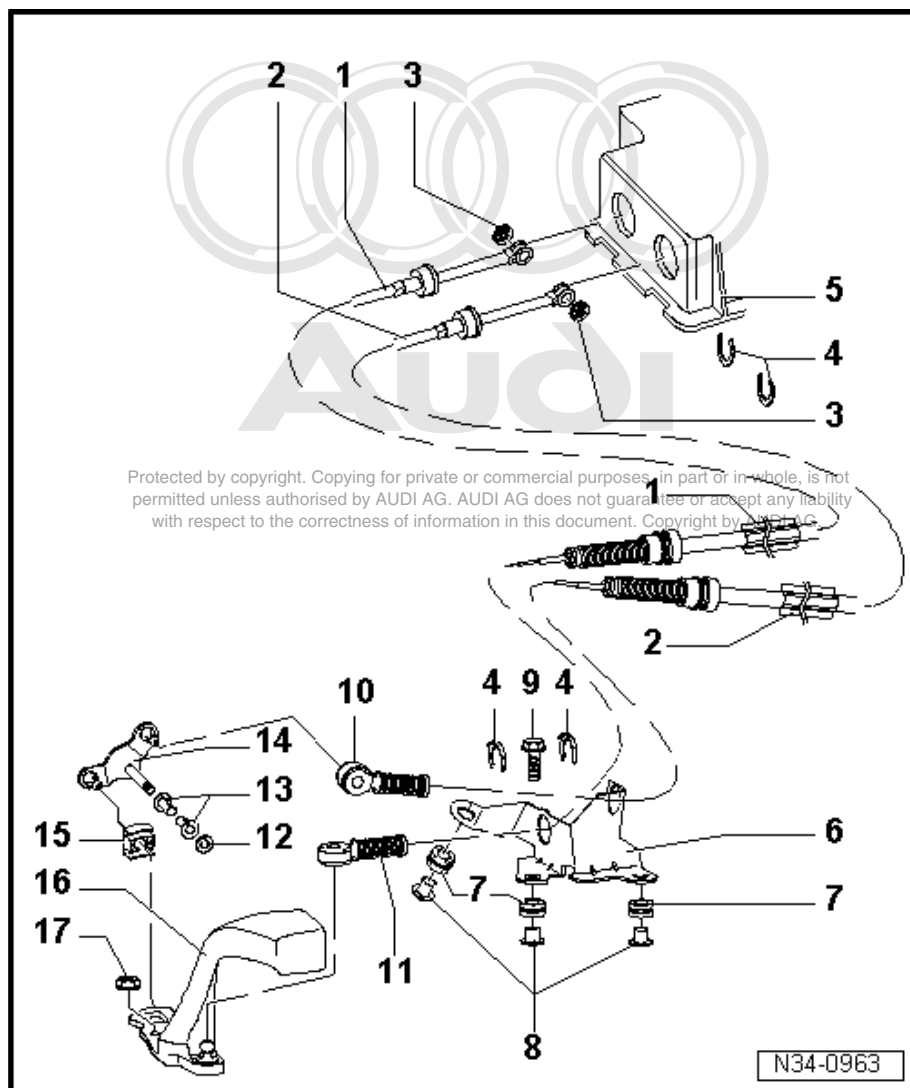
- ☐ Gate selector cable to relay lever
- ☐ Renewing on vehicles up to 06.2001
⇒ [page 33](#)
- ☐ Installing on vehicles up to 06.2001 ⇒ [page 34](#)
- ☐ On vehicles up to 06.2001: release to install and adjust selector mechanism ⇒ [page 35](#)
- ☐ On vehicles from 07.2001: different version, do not interchange ⇒ [page 34](#)
- ☐ Installing on vehicles from 07.2001 ⇒ [page 34](#)

11 - Cable end-piece

- ☐ Gear selector cable to selector shaft lever
- ☐ Renewing on vehicles up to 06.2001 ⇒ [page 33](#)
- ☐ Installing on vehicles up to 06.2001 ⇒ [page 34](#)
- ☐ On vehicles up to 06.2001: release to install and adjust selector mechanism ⇒ [page 35](#)
- ☐ On vehicles from 07.2001: different version, do not interchange ⇒ [page 34](#)
- ☐ Installing on vehicles from 07.2001 ⇒ [page 34](#)

12 - Securing clip

- ☐ Removing ⇒ [page 34](#)



13 - Bearing bush

14 - Relay lever

- ☐ Installation position ⇒ [page 33](#)

15 - Slide block

16 - Selector shaft lever with damper weight

- ☐ Installation position ⇒ [page 33](#)
- ☐ Install so that gap in splines aligns with selector shaft
- ☐ After installing, adjust selector mechanism ⇒ [page 37](#)
- ☐ Installation position ⇒ [page 33](#)

17 - Hexagon nut, 20 Nm

- ☐ Self-locking
- ☐ Renew

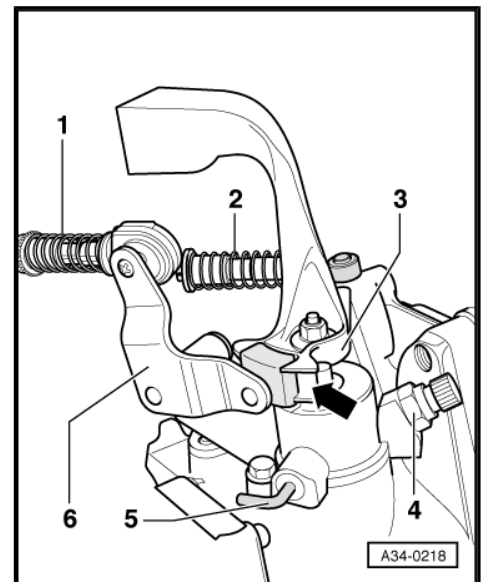
Installation positions of selector shaft lever, relay lever and locking pin

- 1 - End piece (locking mechanism) for gate selector cable
- 2 - End piece (locking mechanism) for gear selector cable
- 3 - Selector shaft lever with damper weight
- 4 - Reversing light switch -F4-
- 5 - Locking pin - turn vertically upwards to adjust selector mechanism
- 6 - Relay lever - locates in guide rail -arrow- of selector shaft lever via slide block



Note

Lubricate relay lever with MoS₂ grease.



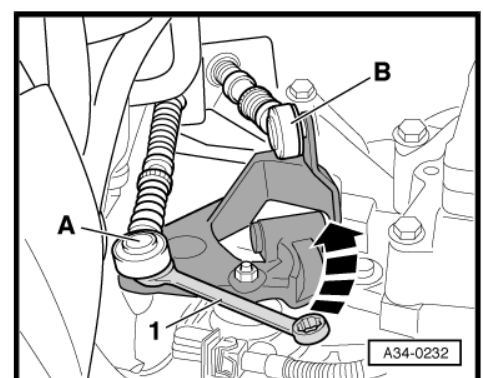
Renewing cable end-pieces - vehicles up to 06.2001



Note

Cable end-pieces must be renewed after being removed. Cable end-pieces are damaged upon removal.

- Lever off gear selector cable -A- and gate selector cable -B- using an open-ended spanner (13 mm) -1-.



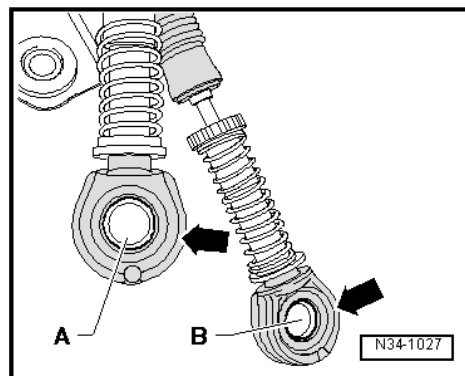
Fitting new cable end-pieces - vehicles up to 06.2001

- Apply a small amount of polycarbamide grease -G 052 142 A2- in ball sockets of end pieces on gear selector cable -A- and gate selector cable -B-.



Note

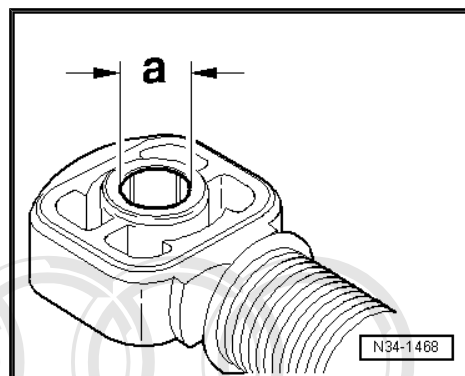
The seals -arrows- outside the ball socket must be grease-free.



Allocation of cable end-pieces - vehicles from 07.2001

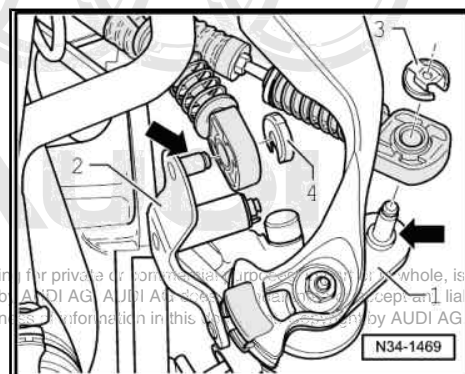
The holes in the cable end-pieces have different diameters:

- ◆ Cable end-piece securing gear selector cable to selector shaft lever: diameter -a- = 10 mm.
- ◆ Cable end-piece for gate selector cable to relay lever: diameter -a- = 8 mm.



Fitting new cable end-pieces - vehicles from 07.2001

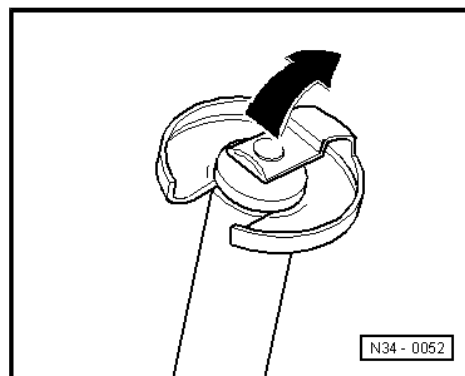
- Spread a small amount of polycarbamide grease -G 052 142 A2- onto studs -arrows- of selector shaft lever -1- and relay lever -2-.
- Always renew securing clips -3- for gear selector cable and -4- for gate selector cable after removing.



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Removing securing clip for gear lever guide/gate selector housing

- Lift tab in direction of -arrow-.



1.6 Removing and installing selector mechanism

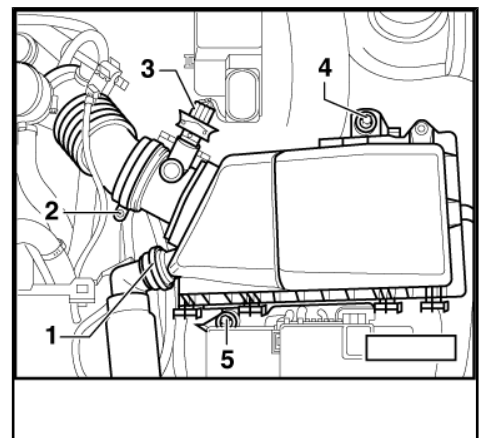
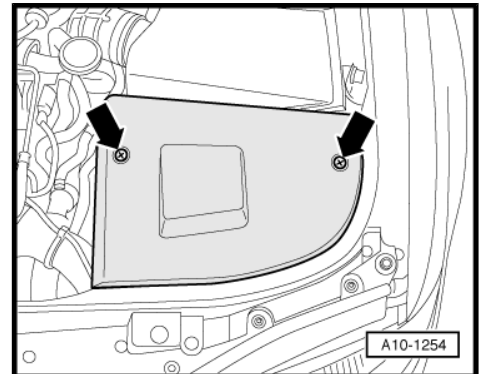
Removing

- Remove cover panel (front left) -arrows-.

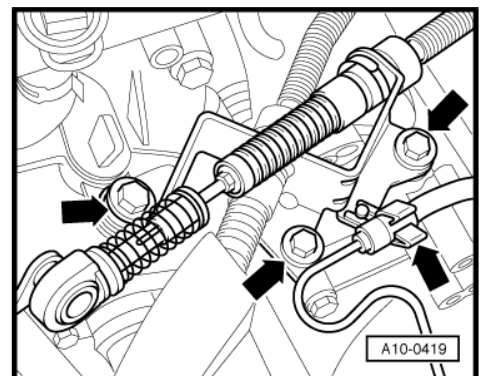


- If fitted, detach hose -1- for secondary air pump.
- Detach air intake hose at air mass meter -G70- (slacken hose clip -2-).
- Unplug electrical connector for air mass meter -G70- -3-.
- Remove bolts -4- and -5- and detach air cleaner housing.

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- Detach cable support bracket from gearbox -arrows-, if necessary unclip hose.



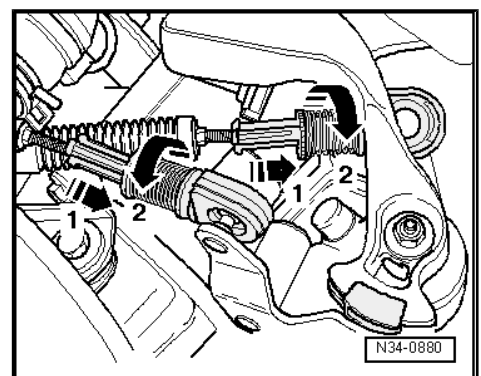
Vehicles to 06.2001:



Caution

Do not remove cable end-pieces from selector shaft lever or relay lever on vehicles up to 06.2001. Cable end-pieces must be renewed after removal.

- Release cable end-pieces for gate selector cable and gear selector cable; push back collar as far as it will go in direction of -arrow 1-, then turn anti-clockwise in direction of -arrow 2- so that it engages.
- Pull selector cables out of cable end-pieces

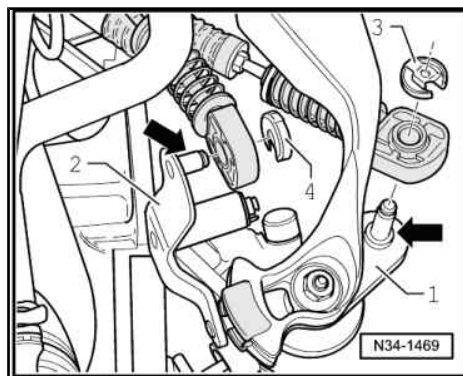


Vehicles from 07.2001:

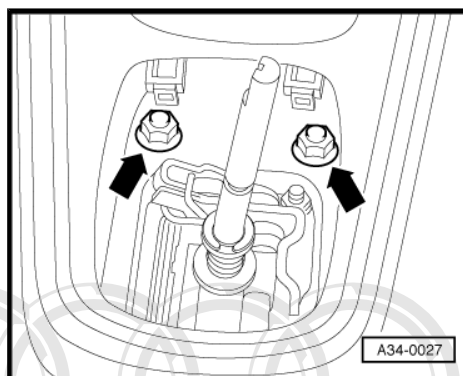
- Pull off securing clips -3- and -4-.
- Detach gear selector cable from stud on selector shaft lever -1- and gate selector cable from stud on relay lever -2-.

All models:

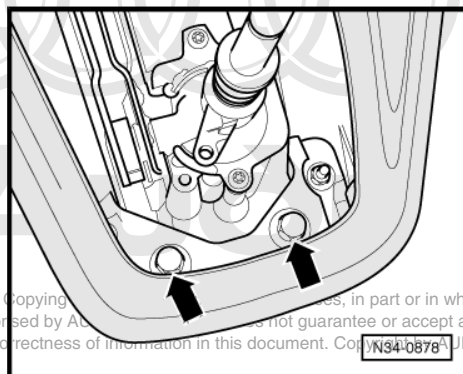
- Remove gear knob together with boot ⇒ [page 29](#) .
- If fitted, remove noise insulation.
- Remove centre console ⇒ Rep. Gr. 68 .



- Remove front nuts -arrows- securing selector housing.



- Remove rear bolts -arrows- securing selector housing.
- Disconnect exhaust system behind front exhaust pipe and remove catalytic converter (2nd mechanic required) ⇒ Rep. Gr. 26 .
- Remove propshaft ⇒ Rear final drive 02D; Rep. Gr. 39 .
- Remove heat shield (front).
- Pivot selector housing downwards and remove together with selector cables.



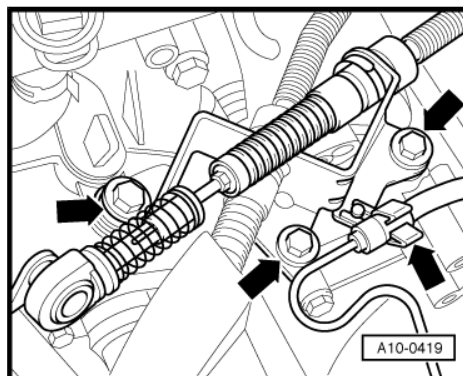
Installing

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

- Install cable support bracket -arrows-.
- Align selector housing parallel to body.
 - Distance to body must then be the same on both sides.
- Clip in hose if necessary.

Vehicles to 06.2001:

- Insert Bowden cables in unlocked cable end-pieces.



Vehicles from 07.2001:

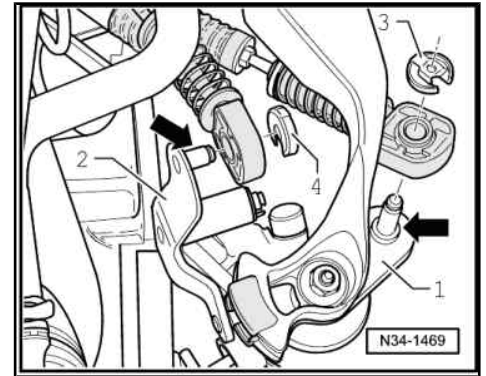
- Spread a small amount of polycarbamide grease -G 052 142 A2- onto studs -arrows- of selector shaft lever -1- and relay lever -2-.
- Always renew securing clips -3- for gear selector cable and -4- for gate selector cable after removing.

All models:

- Install propshaft ⇒ Rear final drive 02D; Rep. Gr. 39 .
- Install exhaust system free of stress ⇒ Rep. Gr. 26 .
- Adjust selector mechanism ⇒ [page 37](#) .
- Install air cleaner housing.

Tightening torques

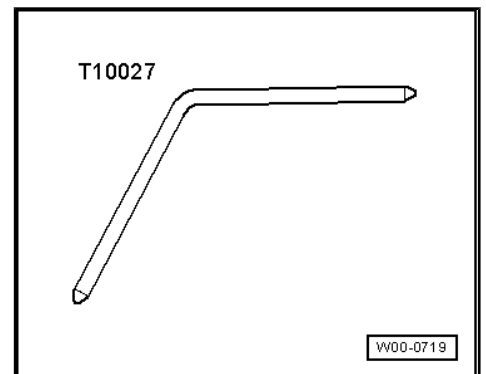
Component	Nm
Selector housing to body	25
Selector cable support bracket to gearbox	25
Air cleaner housing to body	10



1.7 Adjusting selector mechanism

Special tools and workshop equipment required

- ♦ Locking pin -T10027-

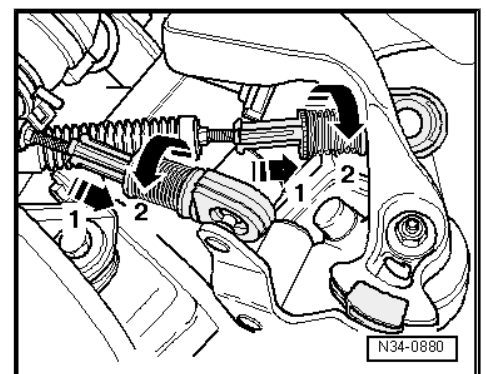


Requirements for adjustment

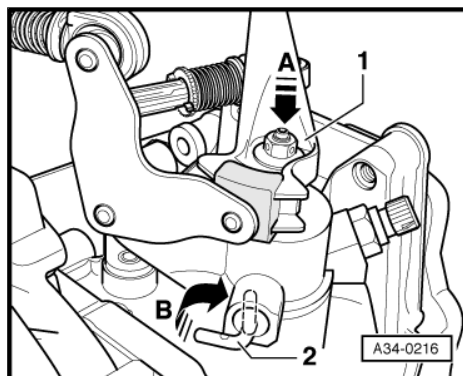
- Gear selector linkage must be in proper condition and undamaged.
- Selector mechanism must move freely.
- Gearbox, clutch and clutch mechanism must be in proper condition.
- Gearbox in neutral.

Procedure

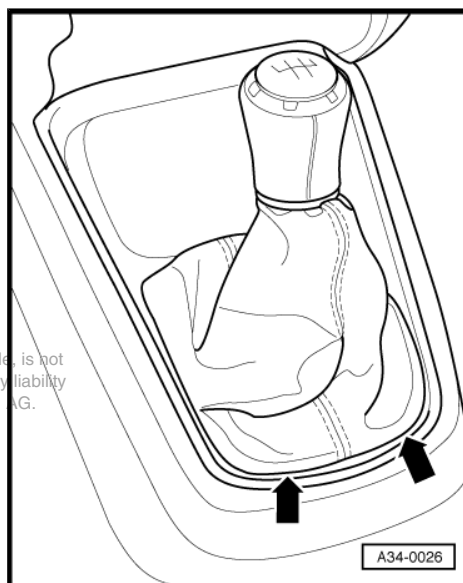
- Release cable end-pieces for gate selector cable and gear selector cable; push back collar as far as it will go in direction of -arrow 1-, then turn anti-clockwise in direction of -arrow 2- so that it engages.



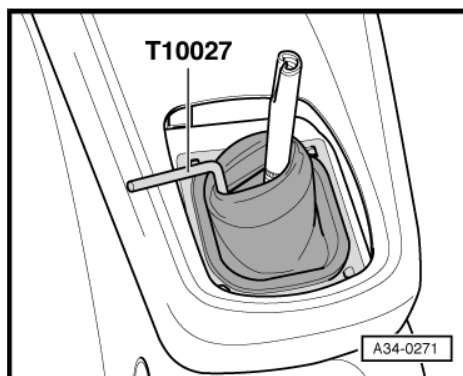
- Lock selector shaft by pressing selector shaft lever -1- in direction of arrow -A- downwards into selector gate for 1st/2nd gear.
- At the same time press locking pin -2- in direction of -arrow B- upwards until it engages.
- The selector shaft is then locked and can no longer be moved.



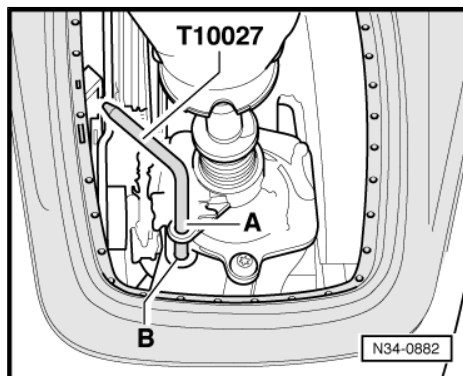
- Carefully pry gear lever boot off centre console -arrows-.
- Pull gear lever boot off centre console towards rear.
- Pull boot up and over gear knob.



- Pull rubber boot away from gear lever so that locking pin -T10027- can be inserted (if rubber boot is fitted).

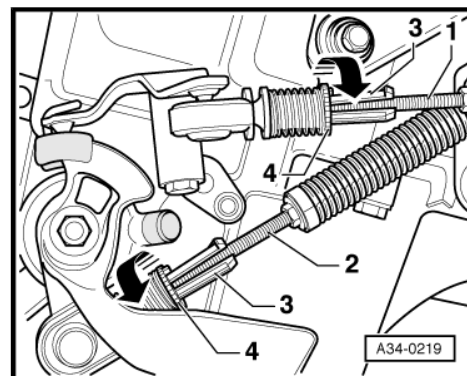


- Press gear lever from neutral position into 1st/2nd gear gate in order to lock gear lever.
- Then guide locking pin -T10027- through hole -A- and into hole -B-.

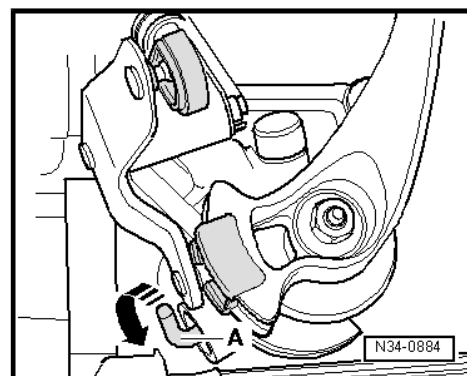


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- Make sure that gate selector cable -1- and gear selector cable -2- are located free of tension in the cable end-pieces -3-.
- Turn collars -4- as far as they will go in direction of -arrow- and release.



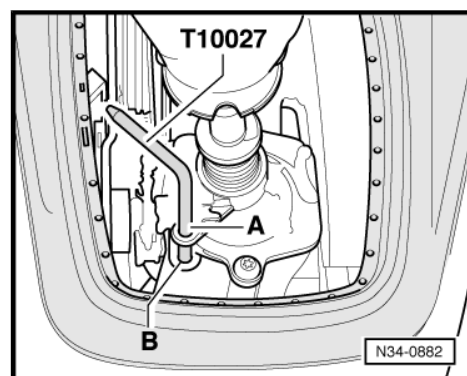
- Now turn locking pin -A- back to original position (direction of -arrow-).
- The locking pin should be horizontal.



- Pull pin -T10027- out of holes -A- and -B-.
- Install gear lever boot.

Checking gear lever setting

- The gear lever should rest in the 3rd/4th gear gate when the gearbox is in neutral.
- Press clutch pedal.
- Select all gears several times.
- Check operation of reverse gear lock
- The gear lever should return by itself from the reverse gear gate to the 3rd / 4th gear gate.

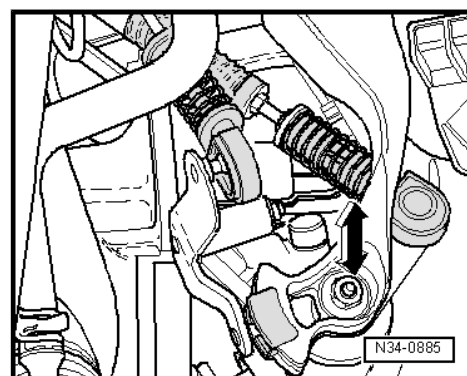


Should a gear fail to engage smoothly after repeated selection, check the play (lift movement) of the selector shaft as follows:

- Engage 1st gear.
- Press gear lever to the left onto stop and then release while a second mechanic watches the gearbox selector shaft movement.
- The lift movement of the selector shaft should be approx. 1 mm when the gear lever is moved -double-ended arrow-.

If this is not the case:

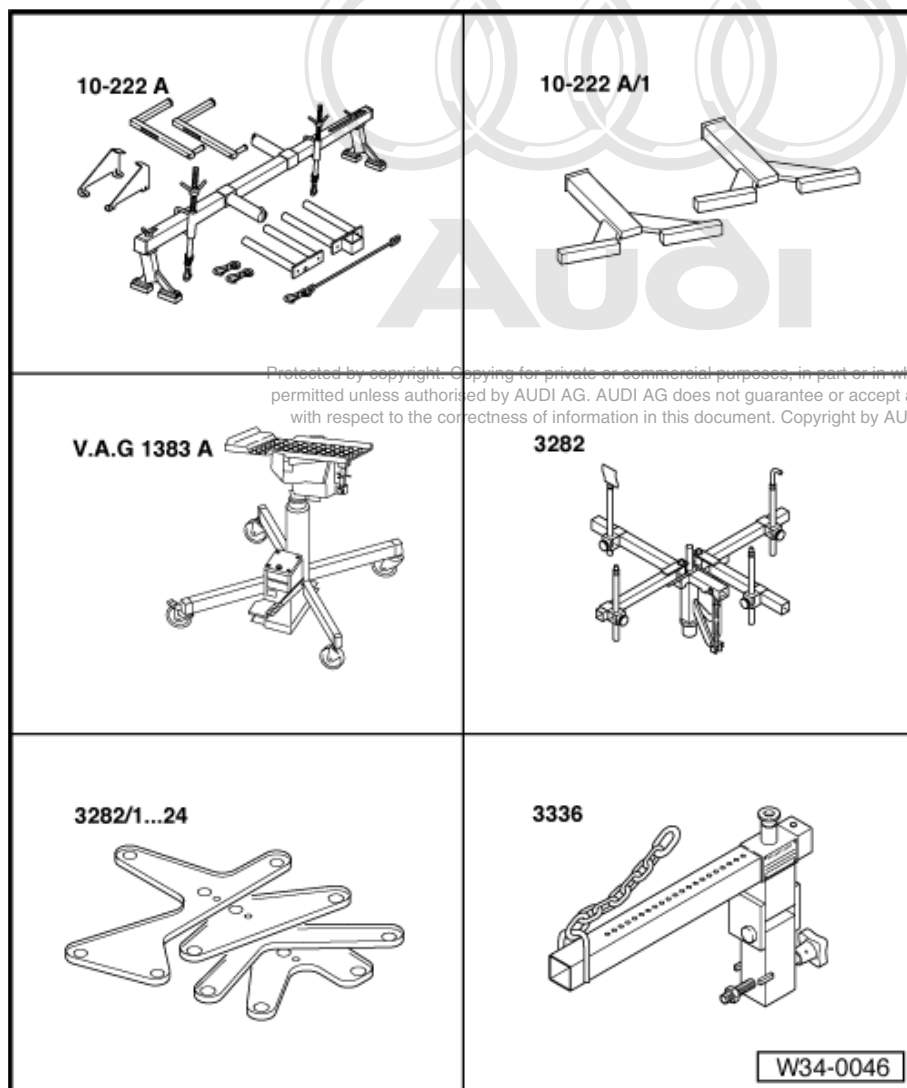
- Repeat gear lever adjustment.



2 Removing and installing gearbox

Special tools and workshop equipment required

- ◆ Support bracket -10-222 A-
- ◆ Rack -10-222 A/1-
- ◆ Engine and gearbox jack - V.A.G 1383 A-
- ◆ Gearbox support -3282-
- ◆ Adjustment plate -3282/18- with bolt -3282/48- , bolt -3282/49- and safety support -3282/59-
- ◆ Gearbox lifting tackle -3336-



2.1 Removing gearbox

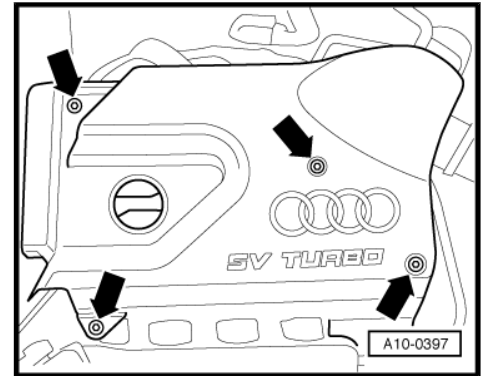


Note

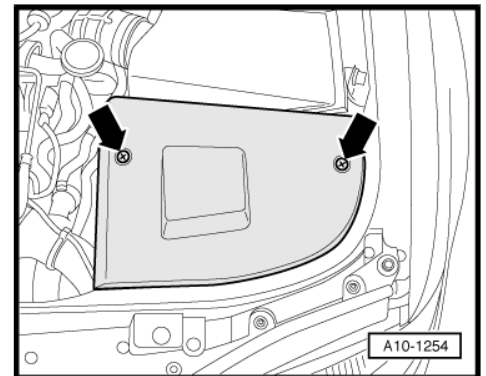
All cable ties which are released or cut open during removal must be fitted in the same position when installing.

- Move gear lever to neutral.
- Refer to coding on vehicles with encoded radio/radio navigation system (RNS); obtain coding if necessary.
- With ignition switched off, disconnect earth wire at battery.

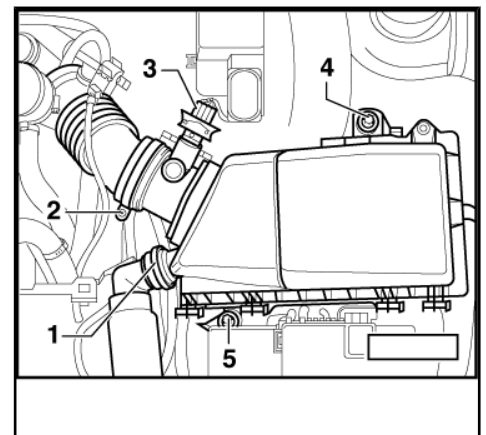
- Remove engine cover panel above cylinder head cover -arrows-.



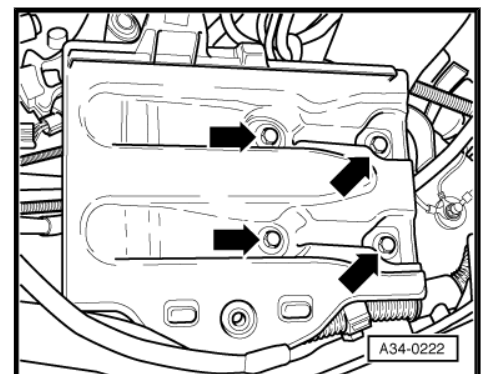
- Remove cover panel (front left) -arrows-.



- If fitted, detach hose -1- for secondary air pump.
- Detach air intake hose at air mass meter -G70- (slacken hose clip -2-).
- Unplug electrical connector for air mass meter -G70- -3-.
- Remove bolts -4- and -5- and detach air cleaner housing.

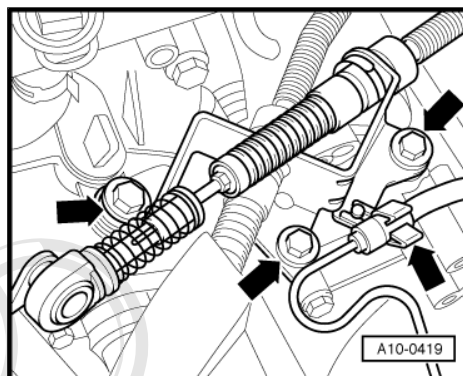


- Remove battery and battery tray -arrows-.



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- Detach cable support bracket from gearbox -arrows-, if necessary unclip pipe/hose assembly.



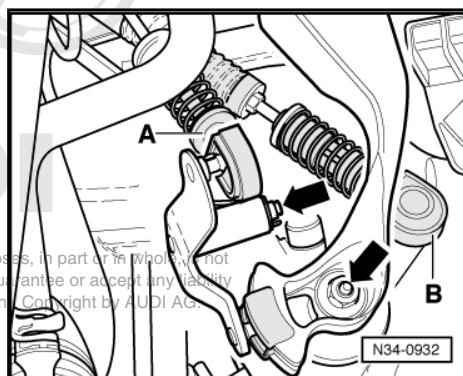
Vehicles to 06.2001:



Caution

Do not remove cable end-pieces from selector shaft lever or relay lever on vehicles up to 06.2001. Cable end-pieces must be renewed after removal.

- Detach securing clip -arrow 2- and remove gate selector cable -A- with relay lever.
- Unscrew nut -arrow- and detach gear selector cable -B- with selector shaft lever.

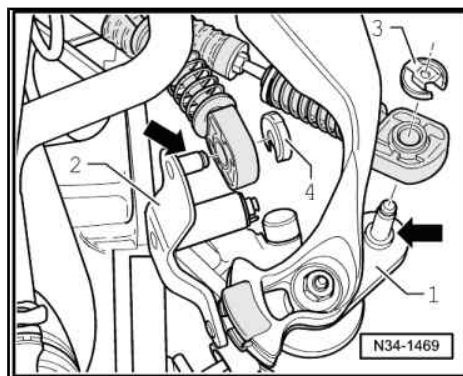


Vehicles from 07.2001:

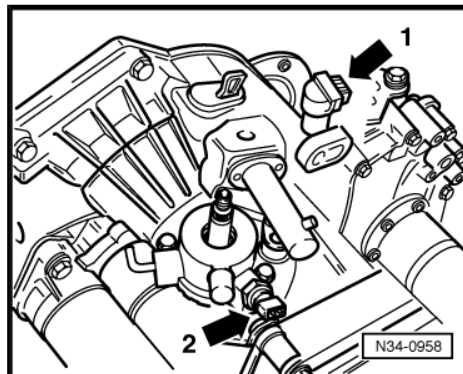
- Pull off securing clips -3- and -4-.
- Detach gear selector cable from stud on selector shaft lever -1- and gate selector cable from stud on relay lever -2-.

All models:

- Tie back gear selector cable and gate selector cable.



- Unplug electrical connector at speedometer sender -G22- -arrow 1-.
- Unplug electrical connector at reversing light switch -F4- -arrow 2-.

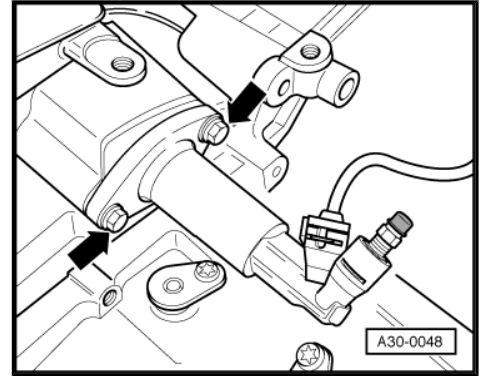


- Unscrew bolts -arrows- and pull out clutch slave cylinder.
- Move clutch slave cylinder clear to one side and secure with wire, do not disconnect pipe.

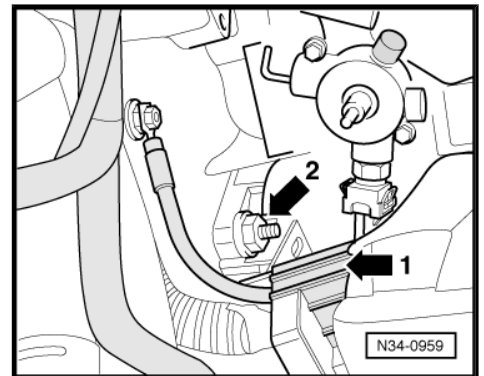


Caution

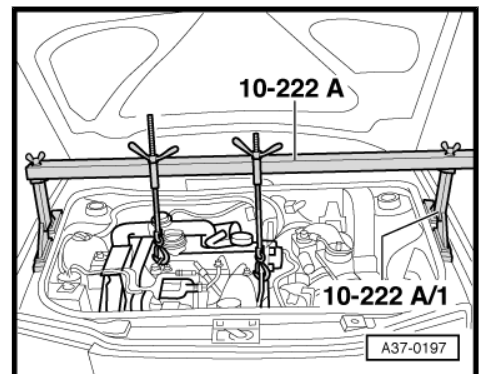
Do not depress clutch pedal after removing slave cylinder.



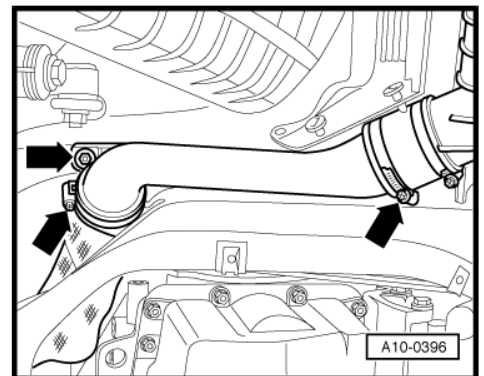
- Remove wiring retainer -arrow 1- from starter.
- Detach electrical connector from starter.
- Detach earth strap from top bolt securing engine to gearbox.
- Remove top bolt -arrow 2- securing starter.
- Unscrew engine/gearbox securing bolts which are accessible from above.
- If there are hoses or wiring in vicinity of engine lifting eyes for support bracket, detach these now.



- Fit support bracket -10-222 A- with -10-222 A/1- as shown in the illustration.
- Take up weight of engine/gearbox assembly via the spindles.
- Detach wiring and pipes/hoses from gearbox as required.



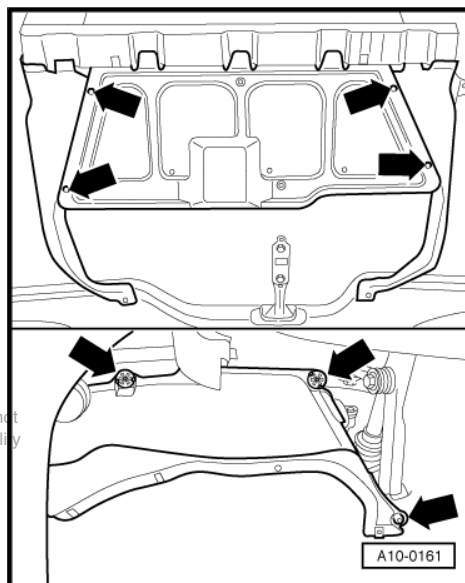
- Detach air pipe leading to charge air cooler at longitudinal member (bottom right) -arrows-.



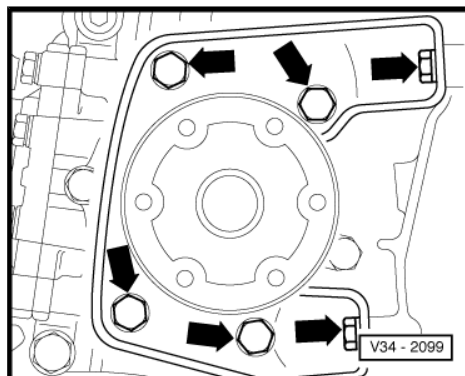
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- Remove noise insulation (centre, left and right) -arrows-.
- Turn front wheels to the left.
- Unbolt drive shafts from gearbox flanges.

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- Remove bracket for bevel box with heat shield from engine and bevel box -arrows-.
- Unbolt exhaust pipe from turbocharger.



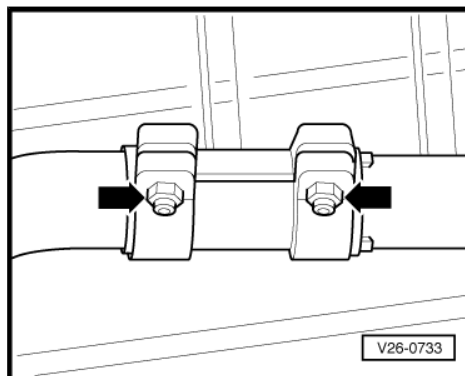
- Disconnect exhaust system at clamp -arrows-.
- Push clamp towards the rear.



Note

The flexible joint (de-coupling element) in the exhaust system must not be bent more than 10° – otherwise it can be damaged.

- Detach catalytic converter with front exhaust pipe from turbo-charger and pull towards the rear as far as possible.
- Tie exhaust pipe behind catalytic converter up to body and leave it suspended.
- Tie up drive shafts as far as possible.



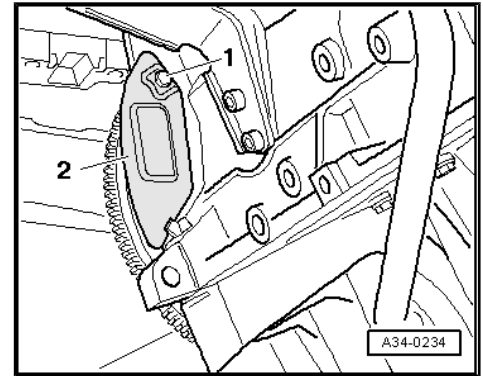
Note

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

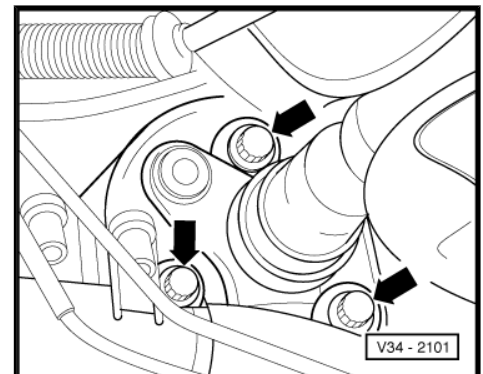
- If fitted, remove bolt -1- and remove small flywheel cover plate -2- behind bevel box.

 Note

Shown in illustration with gearbox removed.



- Mark position of propshaft with flexible coupling on bevel box flange.
- Unscrew propshaft with flexible coupling from bevel box flange -arrows-.
- Press front propshaft pipe slightly towards the rear.



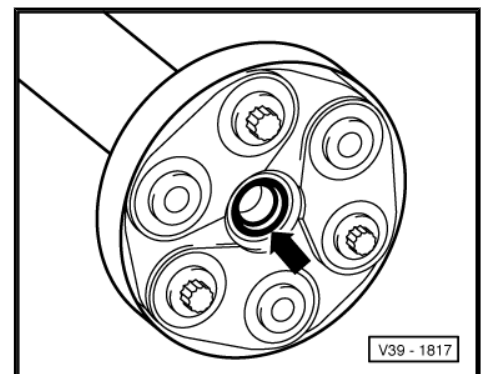
 Note

After loosening bolts -A- (⇒ following illustration N34-0712) the engine/gearbox assembly will swing slightly to the front.

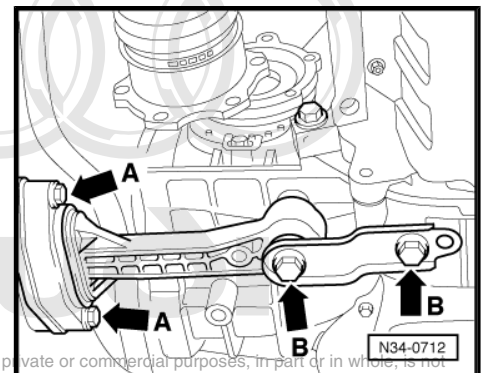


Caution

Make sure that the seal -arrow- in the flange of the propshaft is not damaged when removing and installing. If seals are damaged, the propshaft must be renewed.

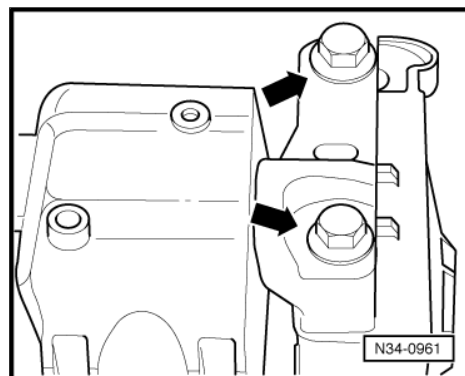


- First unscrew bolts -A- and then bolts -B- and remove pendulum support.

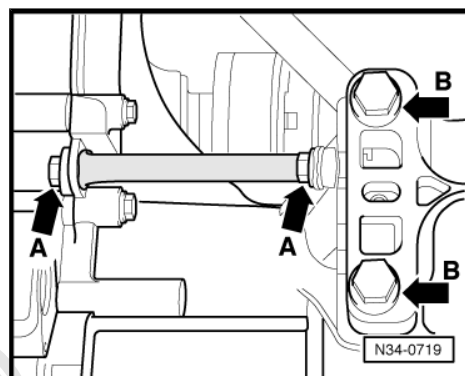


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- Detach power steering reservoir above assembly mounting (right-side).
- Remove bolts -arrows- securing assembly mounting (right-side) from engine mounting.



- Unscrew gearbox strut from gearbox -arrows A-.
- Remove bolts -arrows B- securing assembly mounting (left-side) from gearbox mounting.



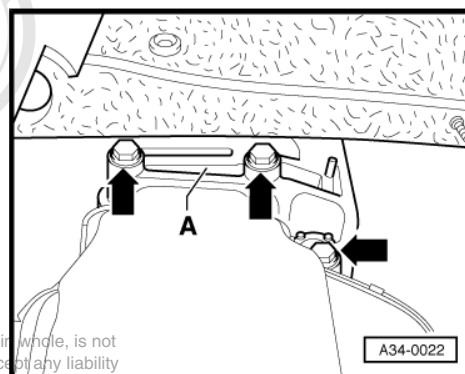
- Incline the engine/gearbox assembly by lowering it via the left spindle of support bracket -10-222 A- until the securing bolts -arrows- for gearbox support -A- are accessible.
- Remove gearbox support -A-.



Note

The illustration shows the gearbox support as seen from the wheel housing (left-side).

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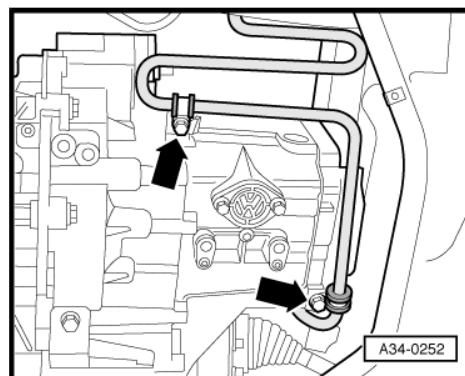


- Detach power steering pipe from gearbox -arrows- and remove speed nuts from gearbox.
- Guide pipe upwards.
- Carefully press engine/gearbox assembly forwards.

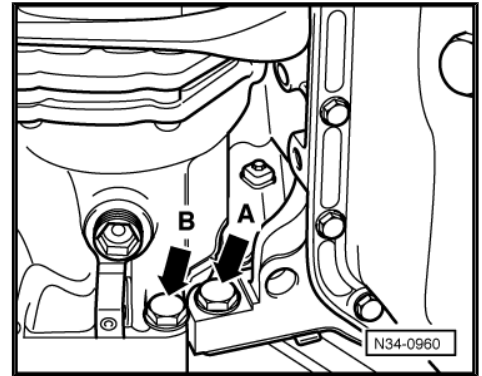


Note

Do not damage any of the connecting pipes and hoses when moving engine/gearbox assembly.



- Unscrew rear bottom engine/gearbox securing bolt -arrow A-.
- Unscrew bevel box bolt -arrow B- prior to inserting bolt -3282/49- of gearbox support -3282- .



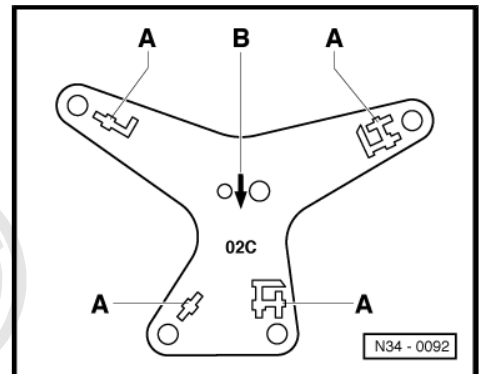
To remove manual gearbox 02C, set up gearbox support -3282- with adjustment plate -3282/18- .

A - Support elements

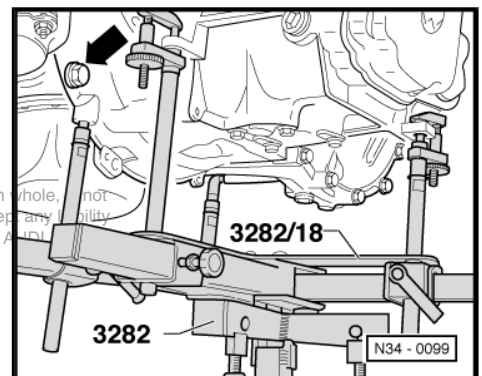
B - Arrow points in direction of travel

Assemble engine and gearbox jack -V.A.G 1383 A- as follows:

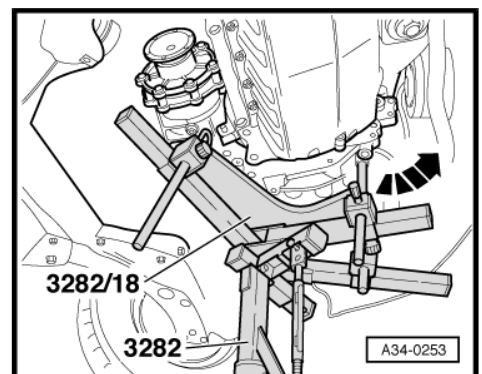
- Place adjustment plate -3282/18- on gearbox support -3282- .
- Attach support elements as illustrated on adjustment plate.



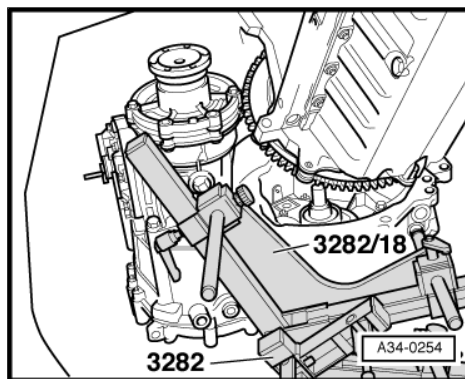
- Align arms of gearbox support to coincide with holes in adjustment plate -3282/18- .
- Place engine and gearbox jack -V.A.G 1383 A- underneath vehicle.
- The arrow symbol on the adjustment plate points in the direction of travel. Protected by copyright. Copying for private or commercial purposes, in part or in whole, not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for errors or omissions in this document. Copyright by Audi AG.
- Align the adjustment plate parallel to the gearbox.
- Unscrew engine/gearbox securing bolts which are accessible from below -arrow-.
- Remove starter.
- Pull gearbox off dowel sleeves.



- Now swing gearbox forwards -arrow-, lower slightly and incline using gearbox support -3282- so as to maintain clearance to body and subframe.



- Lower gearbox carefully.

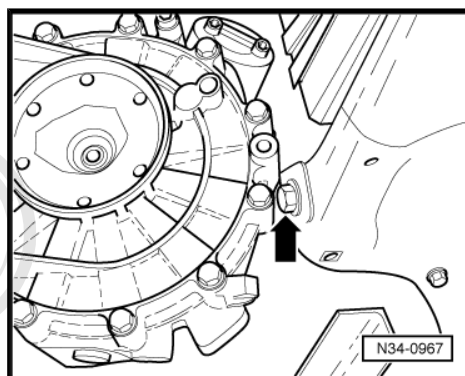


- When lowering gearbox make sure there is sufficient clearance to subframe -arrow-.
- When lowering the gearbox, change position of gearbox using the spindles on gearbox support -3282-.



Note

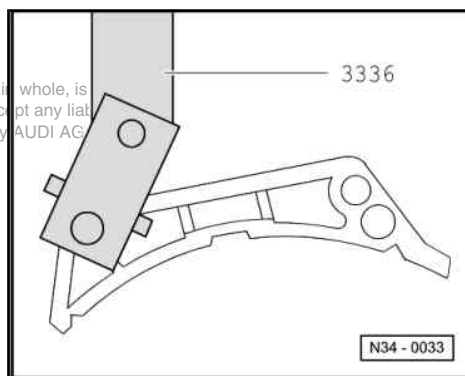
When lowering gearbox, do not damage power steering pipe.



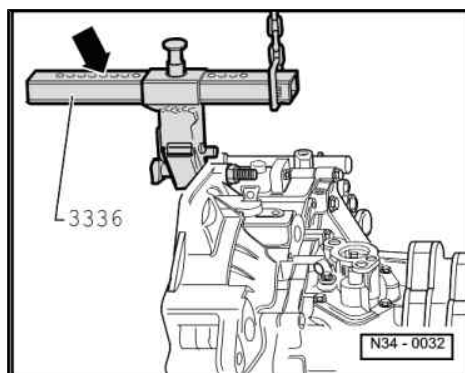
2.2 Transporting gearbox

- Bolt gearbox lifting tackle -3336- onto clutch housing.

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- Set support arm on sliding bracket by means of locking pin -arrow-.
- Number of holes visible = 10
- Lift gearbox with workshop hoist -VAS 6100- and gearbox lifting tackle -3336-.

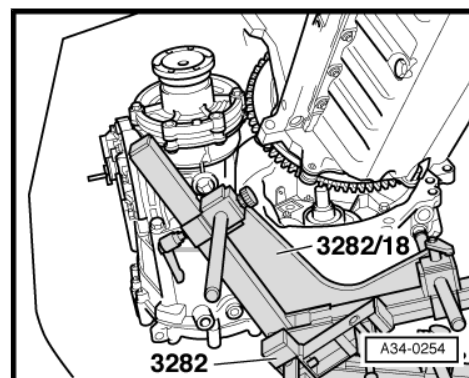
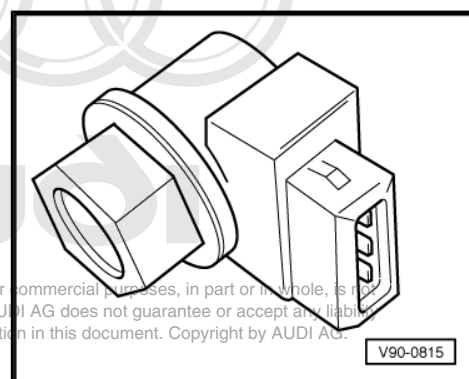
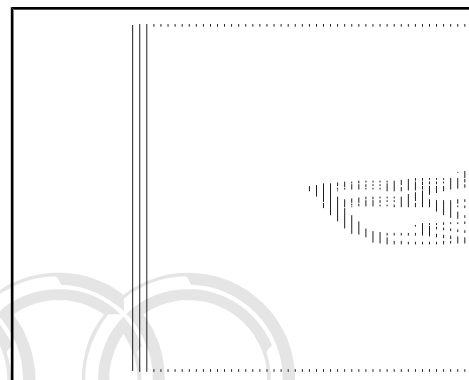


2.3 Installing gearbox



Note

- ◆ *Before installing gearbox, press clutch release lever towards gearbox housing and secure with assembly bolt or M 8 x 35 bolt. Unscrew bolt after gearbox has been installed. The hole will then be sealed by the 3rd securing bolt for gear selector cable support bracket.*
- ◆ *When renewing gearbox, speedometer sender (illustration) selector shaft lever and relay lever must be transferred to new assembly.*
- ◆ *Secure all hose connections with the correct hose clips (as original equipment); refer to ⇒ Parts catalogue .*
- ◆ *Renew gaskets and seals.*
- 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. It is important to remove excess grease.
- It should be possible to push the clutch plate back and forth slightly on the input shaft.
- Check that dowel sleeves for centralising engine/gearbox are in the cylinder block; install if necessary.
- Check that intermediate plate is correctly positioned on engine.
- Tilt gearbox to the left by turning spindles of gearbox support -3282- .



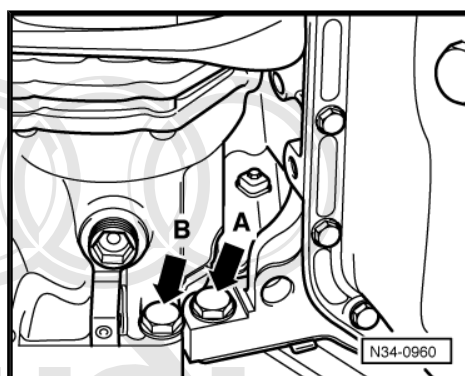
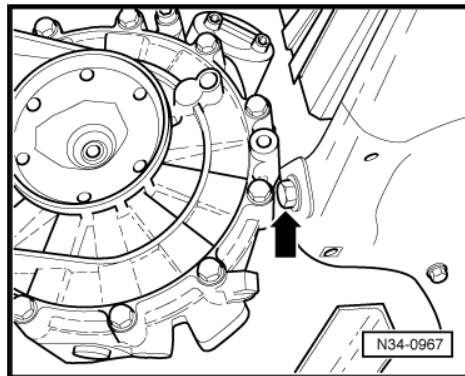
- Carefully lift gearbox and guide past subframe -arrow- onto engine.
- Swing gearbox to rear and bring to installation position using gearbox support -3282- .
- Install gearbox.



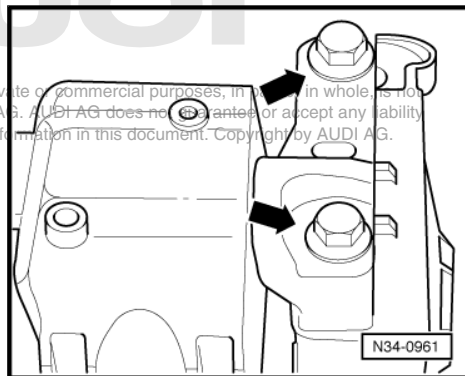
Note

When installing gearbox, do not damage power steering pipe.

- Fit engine/gearbox securing bolts which are accessible from below.
- Install starter and fit bottom bolt. Tightening torque
⇒ [page 50](#) .
- Fit rear engine/gearbox securing bolt -arrow A-.
- Fit bevel box bolt -arrow B-.
- Align engine/gearbox assembly so that it is in proper position.



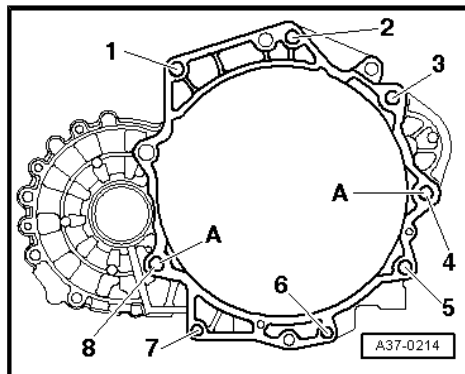
- Renew hexagon bolts -arrows- securing assembly mounting (right-side) on engine mounting ⇒ Rep. Gr. 10 .
- Fit power steering reservoir above assembly mounting (right-side).



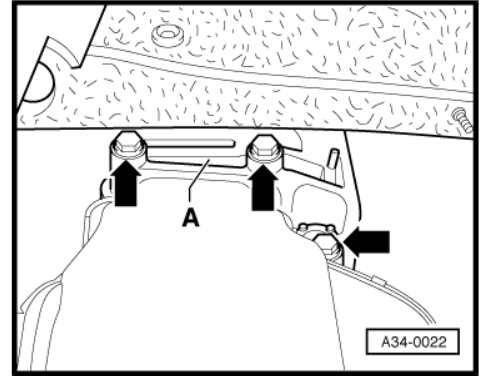
- Fit engine/gearbox securing bolts which are accessible from above.

Engine/gearbox securing bolts

Item	Bolt	Nm
1, 2 ¹⁾ , 8	M12x55	80
3 ¹⁾ , 4	M12x150	80
5 ... 7	M10x50	45
A	Dowel sleeves for centralising	
• ¹⁾ Bolt with stud M8.		



- Install gearbox support -A- with new bolts -arrows-.

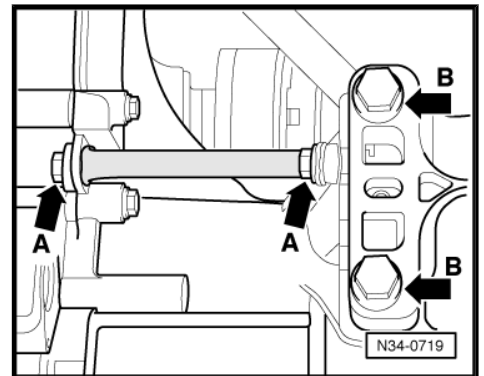


- Renew hexagon bolts -arrows B- securing assembly mounting (left-side) on gearbox mounting.
- Fit gearbox strut to gearbox -arrows A-.

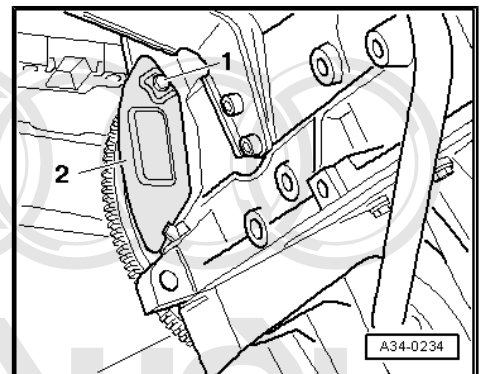


WARNING

Support bracket -10-222 A- must not be removed until all bolts on left and right assembly mountings have been tightened to specified torque.

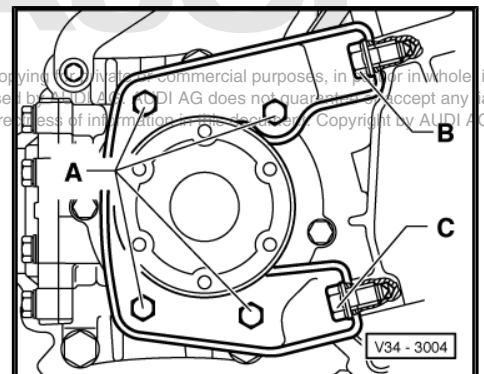


- Remove support bracket.
- If fitted, install small flywheel cover plate -2- at rear of bevel box and secure with bolt -1-.



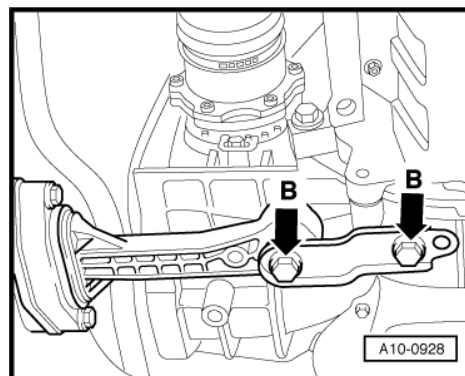
- Secure bracket for bevel box with heat shield to engine and bevel box as follows:

1. Screw in all bolts finger-tight.
2. Pre-tighten bolts -B- and -C- to 8 Nm.
3. Tighten bolts -A- to 25 Nm.
4. Tighten bolts -B- and -C- to 40 Nm.



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- Secure pendulum support to gearbox with new bolts -arrows B-.
- Press engine/gearbox assembly towards bulkhead; the bevel box pin must be guided carefully into the propshaft flange when doing this.

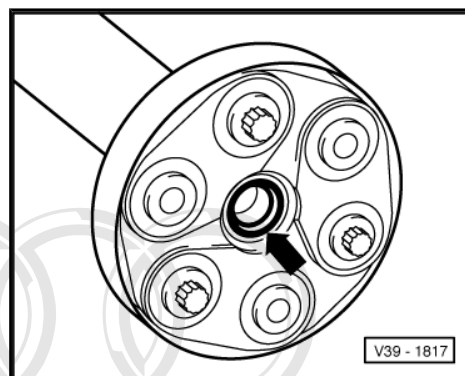


- Slide propshaft onto guide pin without tilting.

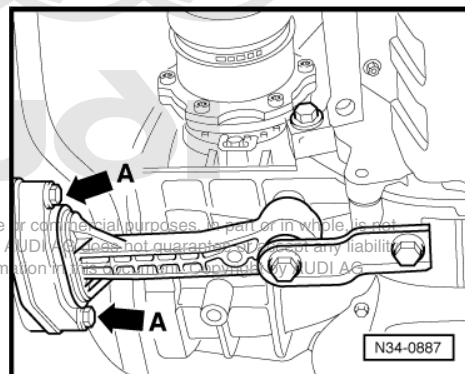


Caution

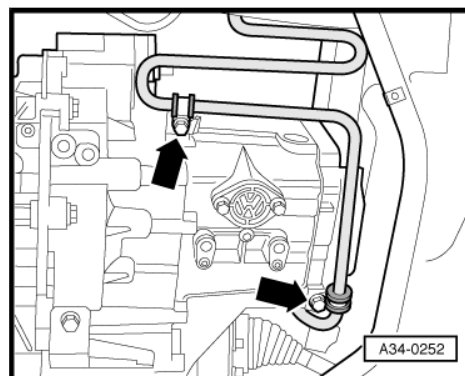
Make sure that the seal -arrow- in the flange of the propshaft is not damaged when removing and installing. If seals are damaged, the propshaft must be renewed.



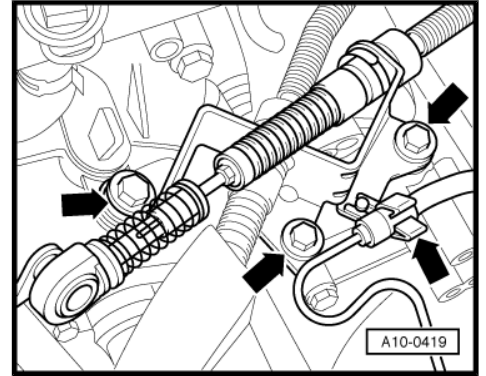
- Secure pendulum support to subframe with new bolts -arrows A-.
- Bolt flexible coupling on propshaft onto bevel box flange ⇒ Rear final drive 02D; Rep. Gr. 39 .
- Bolt drive shafts to gearbox flanges ⇒ Rep. Gr. 40 .
- Install exhaust system free of stress ⇒ Rep. Gr. 26 .



- Fit power steering pipe to gearbox -arrows-.
- Install clutch slave cylinder ⇒ [page 17](#) .



- Attach cable support bracket -arrows-, if necessary clip in hose.

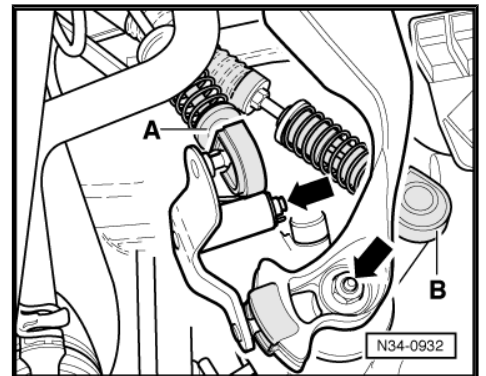


Vehicles to 06.2001:

- Install selector shaft lever with gear selector cable -B- -bottom arrow-.
- Install relay lever with gate selector cable -A- and secure relay lever -top arrow-.

Vehicles from 07.2001:

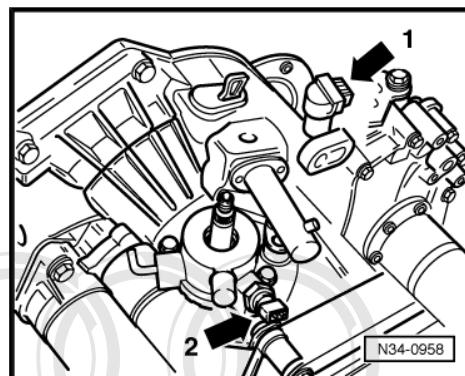
- Spread a small amount of polycarbamide grease -G 052 142 A2- onto studs -arrows- of selector shaft lever -1- and relay lever -2-.
- Always renew securing clips -3- for gear selector cable and -4- for gate selector cable after removing.



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All models:

- Plug in electrical connector at reversing light switch -F4-
-arrow 2-.
- Plug in electrical connector at speedometer sender -G22-
-arrow 1-.
- Connect all remaining electrical connectors.
- Secure earth wires to gearbox and to engine/gearbox securing bolts.
- Make sure that mountings of engine/gearbox assembly are free of tension ⇒ Rep. Gr. 10 .
- Adjust selector mechanism ⇒ [page 37](#) .
- Install battery tray and battery ⇒ Rep. Gr. 27 .



Note

- ◆ *When reconnecting battery, remember to activate vehicle equipment (radio/navigation system, clock, electric window) according to Owner's Manual.*
- ◆ *For further procedures after reconnecting voltage supply ⇒*

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- Install air cleaner housing.
- Attach engine cover panel.
- Check gear oil in manual gearbox with bevel box
⇒ [page 60](#) .
- Install noise insulation panels ⇒ Rep. Gr. 50 .
- Attach air pipe leading to charge air cooler at longitudinal member (bottom right).

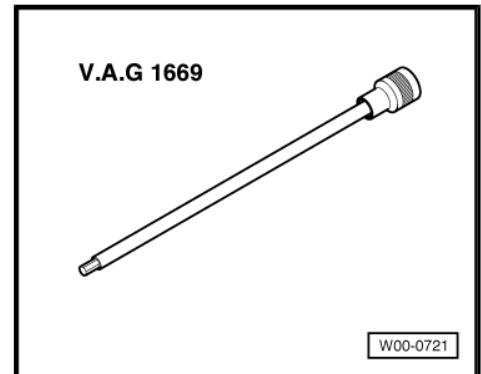
Tightening torques

Component	Nm
Flywheel cover plate to gearbox	10
Bevel box to gearbox	40 + 45° ¹⁾²⁾
Gearbox support to gearbox	40 + 90° ¹⁾³⁾
Gearbox support to gearbox mounting	60 + 90° ¹⁾³⁾
Pendulum support to gearbox	40 + 90° ¹⁾³⁾
subframe	20 + 90° ¹⁾³⁾
Gearbox strut	25
Selector cable support bracket to gearbox	25
Selector shaft lever to selector shaft	20 ⁴⁾
Air cleaner housing to body	10
Air pipe to longitudinal member	10
• ¹⁾ Renew bolts. • ²⁾ 45° is equivalent to an eighth turn. • ³⁾ 90° is equivalent to a quarter turn • ⁴⁾ Renew nut.	

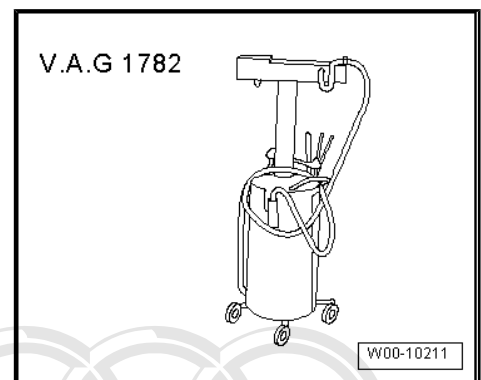
3 Removing and installing bevel box

Special tools and workshop equipment required

- ◆ Hexagon key -V.A.G 1669-

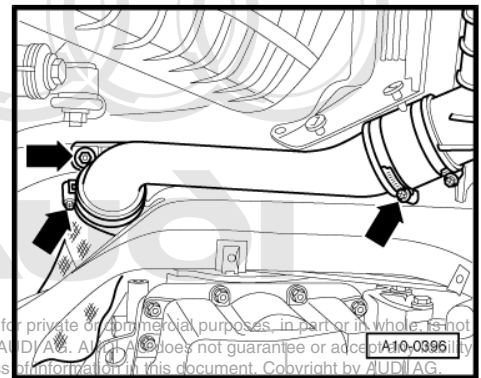


- ◆ Used oil collection and extraction unit -V.A.G 1782-



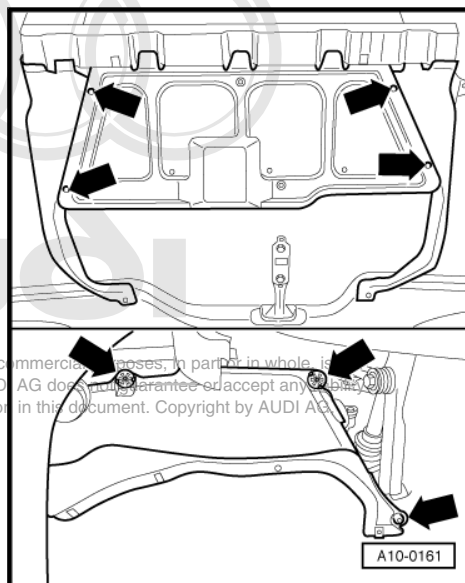
Removing

- Detach air pipe leading to charge air cooler at longitudinal member (bottom right) -arrows-.
- Remove hose going to turbocharger.



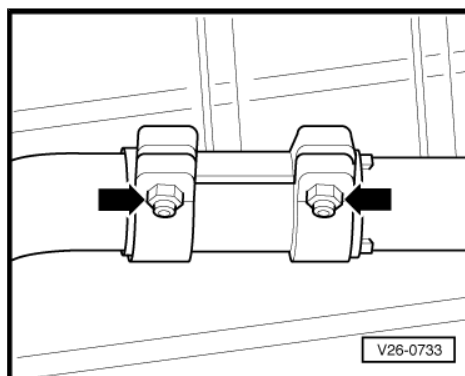
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- Remove noise insulation (centre and right) -arrows-.

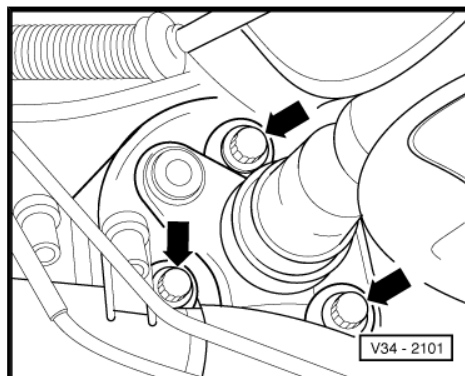


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- Disconnect exhaust system at clamp -arrows-.
- Tie up pipe at rear of catalytic converter to propshaft.



- Mark position of propshaft with flexible coupling on bevel box flange.
- Unscrew propshaft with flexible coupling from bevel box flange -arrows-.
- Press front propshaft pipe slightly towards the rear.



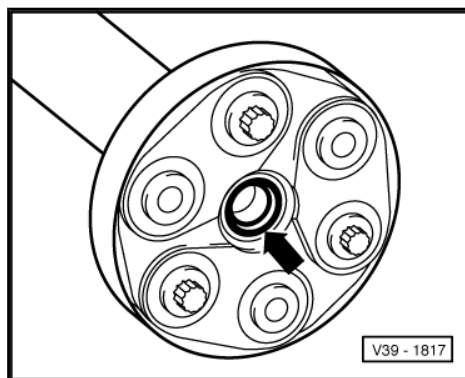
Note

After loosening bolts -A- (⇒ following illustration N34-0712) the engine/gearbox assembly will swing slightly to the front.

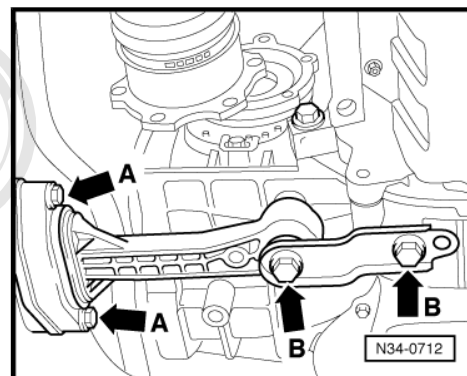


Caution

Make sure that the seal -arrow- in the flange of the propshaft is not damaged when removing and installing. If seals are damaged, the propshaft must be renewed.

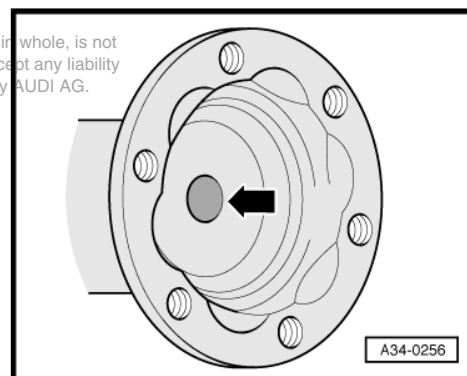


- First unscrew bolts -A- and then bolts -B- and remove pendulum support.
- Carefully press engine/gearbox assembly forwards.
- Unbolt drive shaft (right side) from gearbox flange shaft.
- If fitted, unbolt heat shield for drive shaft (right-side).
- If drive flange cap is fitted, pierce a hole in centre of cap using a screwdriver and lever out cap.



- Unscrew bolt -arrow- for flange shaft (right-side) or output shaft with drive flange using hexagon key -V.A.G 1669-

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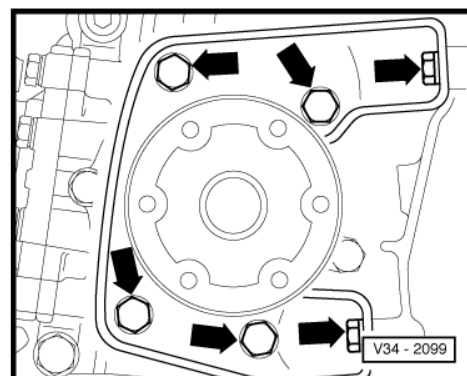
- Remove bracket for bevel box from engine and bevel box -arrows-.



Note

On vehicles with heat shield for drive shaft (right-side), three of the securing bolts are unfastened when removing heat shield.

- Place used oil collection and extraction unit -V.A.G 1782- under the vehicle.
- Tie up the drive shaft.



Note

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

- Remove bolts securing bevel box to gearbox.
- Detach bevel box from manual gearbox and remove bevel box.

Installing

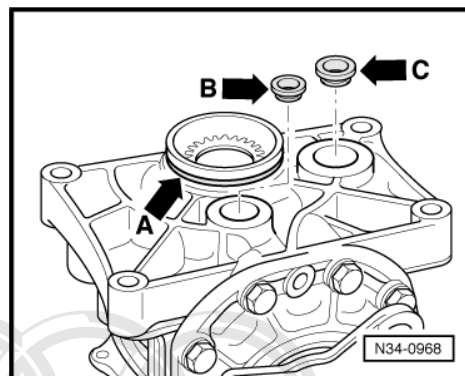
Installation is carried out in reverse sequence; note the following:



Note

Always renew O-ring between bevel box and gearbox -arrow A- and seals on oil supply drillings -arrow B- and -arrow C-. Lightly oil O-ring and seals before installing.

- Push bevel box completely onto gearbox, at the same time ensuring that the bevel box input shaft splines are guided centrally onto the differential connecting piece.
- If the splines are correctly positioned and the components are located centrally, the bevel box will slide against the gearbox onto the stop.



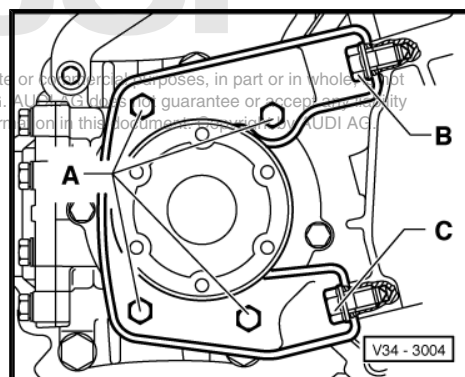
Note

Do not use the securing bolts to pull the bevel box onto the gearbox. This could cause the bevel box to tilt and the securing eyes may break off.

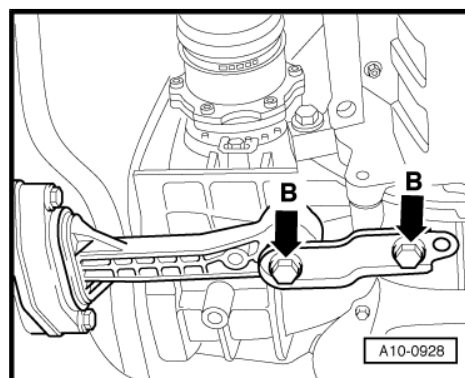
- Secure bracket for bevel box with heat shield to engine and bevel box as follows:

1. Screw in all bolts finger-tight.
2. Pre-tighten bolts -B- and -C- to 8 Nm.
3. Tighten bolts -A- to 25 Nm.
4. Tighten bolts -B- and -C- to 40 Nm.

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- Secure pendulum support to gearbox with new bolts -arrows B-.
- Press engine/gearbox assembly towards bulkhead; the bevel box pin must be guided carefully into the propshaft flange when doing this.

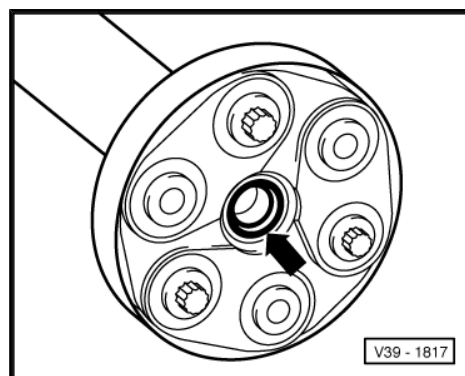


- Slide propshaft onto guide pin without tilting.

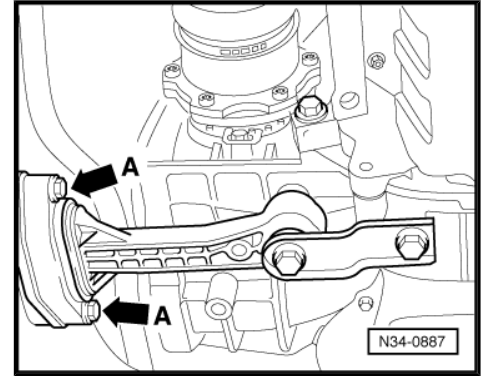


Caution

Make sure that the seal -arrow- in the flange of the propshaft is not damaged when removing and installing. If seals are damaged, the propshaft must be renewed.



- Secure pendulum support to subframe with new bolts -arrows A-.
- Bolt flexible coupling on propshaft onto bevel box flange ⇒ Rear final drive 02D; Rep. Gr. 39 .
- Bolt drive shaft (right-side) to gearbox flange ⇒ Rep. Gr. 40 .
- Install exhaust system free of stress ⇒ Rep. Gr. 26 .
- Fill up gear oil in manual gearbox with bevel box ⇒ [page 60](#) .
- Install noise insulation panels ⇒ Rep. Gr. 50 .



Tightening torques

Component	Nm
Bevel box to gearbox	40 + 45° ¹⁾²⁾
Pendulum support to	gearbox 40 + 90° ¹⁾³⁾
	subframe 20 + 90° ¹⁾³⁾
Air pipe to longitudinal member	10
• ¹⁾ Renew bolts. • ²⁾ 45° is equivalent to an eighth turn. • ³⁾ 90° is equivalent to a quarter turn	

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4 Gear oil in manual gearbox with bevel box



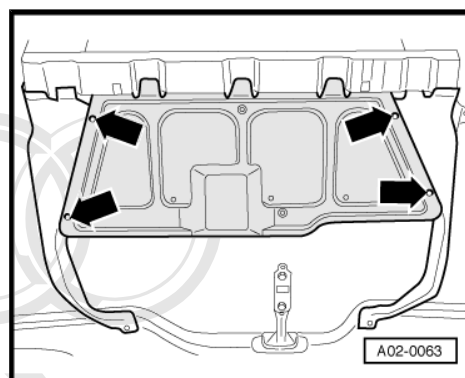
Note

Gearbox and bevel box are filled together through the oil filler hole in the gearbox.

4.1 Checking gear oil level in manual gearbox with bevel box and filling up.

Procedure

- Remove centre noise insulation -arrows-.



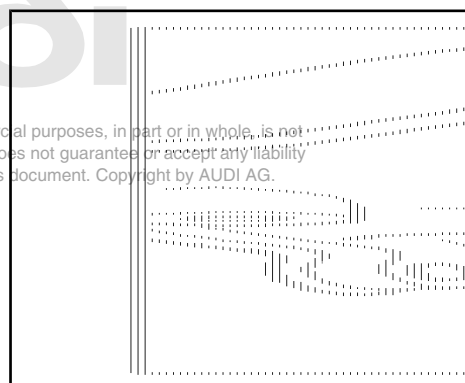
- Remove screw plug -arrow-.
- Specification: oil level up to lower edge of filler hole
- Top up gear oil if necessary. Specification ⇒ [page 2](#).
- Tighten screw plug.
- Install noise insulation ⇒ Rep. Gr. 50.

Adhere to the following procedure when filling new bevel box with gear oil or when re-filling bevel box after removing and installing.

- Remove screw plug -arrow-.
- Fill gear oil up to lower edge of filler hole.
- Install screw plug.
- Start engine, engage a gear and allow gearbox to turn for approx. 2 minutes.
- Turn off engine and remove screw plug.
- Fill gear oil up to lower edge of filler hole once again.
- Tighten screw plug.

Tightening torque

Component	Nm
Screw plug for oil filler hole	30



5 Dismantling and assembling gearbox

5.1 General layout of gearbox

1 - 1st gear

2 - 2nd gear

3 - 3rd gear

4 - 4th gear

5 - 5th gear

6 - Gearbox housing

☐ Servicing ⇒ [page 77](#)

7 - Selector forks

☐ Dismantling and assembling ⇒ [page 87](#)

8 - Selector mechanism

☐ Dismantling and assembling ⇒ [page 83](#)

9 - Input gear for 1st speed selector gear and reverse gear

10 - Clutch housing

☐ Servicing ⇒ [page 77](#)

11 - Input shaft

☐ Dismantling and assembling ⇒ [page 92](#)

12 - Output shaft

☐ Dismantling and assembling ⇒ [page 103](#)

13 - Differential

☐ Dismantling and assembling ⇒ [page 133](#)

14 - Bevel box

☐ Removing and installing ⇒ [page 55](#)

☐ Dismantling and assembling ⇒ [page 147](#)

15 - Shaft bevel gear

☐ Is paired with bevel gear

16 - Bevel gear with input shaft

☐ Is paired with shaft bevel gear

17 - Output shaft

☐ Lever out of bevel box housing together with drive flange

18 - Drive flange

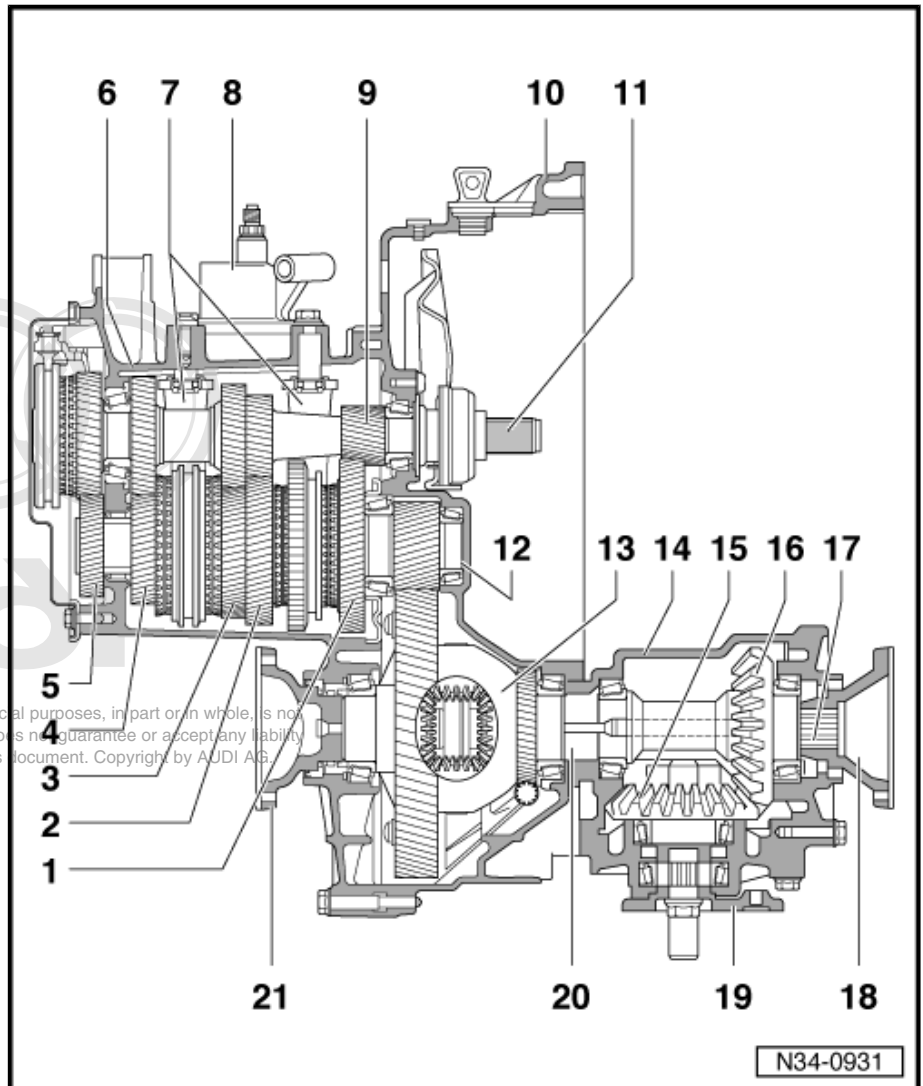
☐ Lever out together with output shaft

19 - Output flange

20 - Bevel box connecting piece

☐ Pulling off ⇒ [page 140](#)

☐ Pressing on ⇒ [page 140](#)



21 - Flange shaft

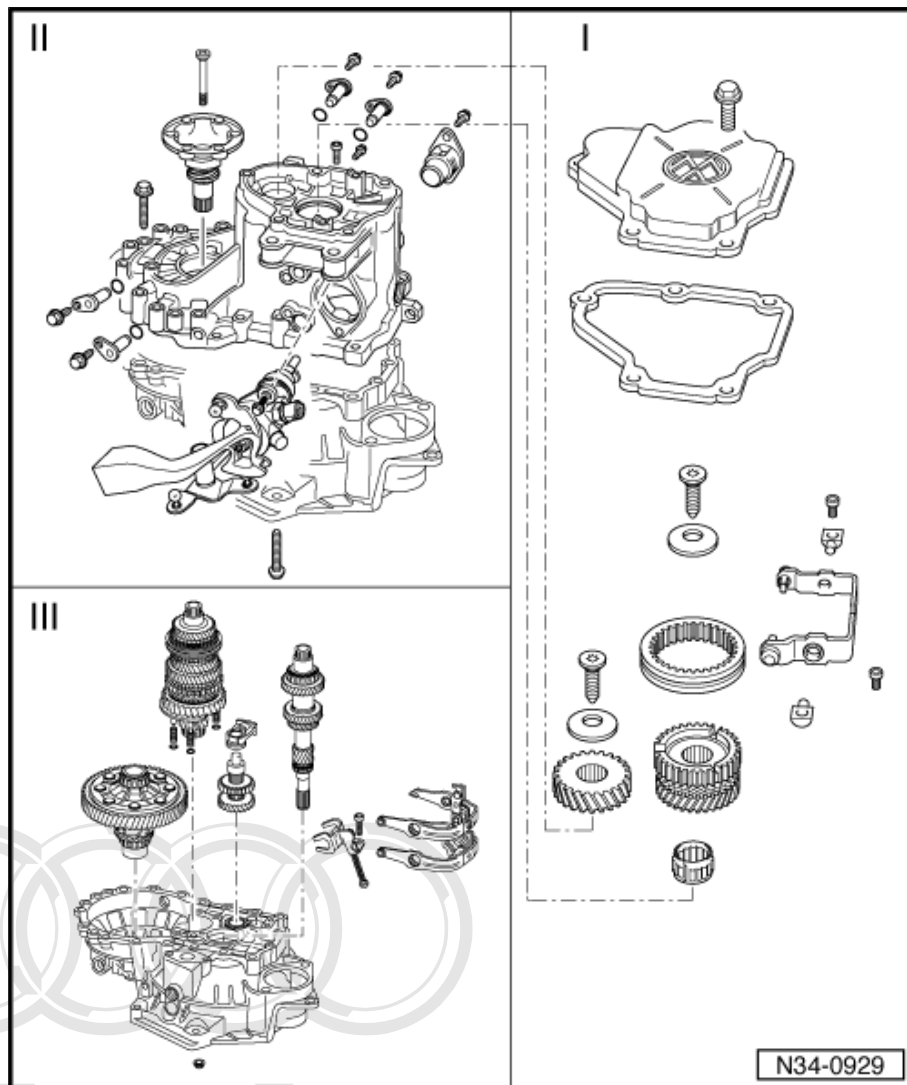
5.2 Exploded view

I - Removing and installing gearbox housing cover and 5th gear ⇒ [page 63](#)

II - Dismantling and assembling gearbox housing and selector mechanism ⇒ [page 64](#)

III - Removing and installing input shaft, output shaft, differential and selector forks ⇒ [page 65](#)

- Removing and installing gearbox housing cover, gearbox housing, selector mechanism, input shaft, output shaft (pinion shaft), differential and selector forks ⇒ [page 66](#)



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5.3 Removing and installing gearbox housing cover and 5th gear

1 - Hexagon bolt, 10 Nm

2 - Gearbox housing cover



Note

If the gearbox housing cover is removed and installed with the gearbox in the vehicle, check and top up oil level in manual gearbox and bevel box ⇒ [page 60](#).

3 - Gasket

4 - Torx socket head bolt, 80 Nm

- ☐ Fitted piece on bolt head holds dished spring ⇒ [Item 5 \(page 63\)](#) in position

5 - Dished spring

- ☐ Installing ⇒ [page 75](#)

6 - Socket head bolt, 25 Nm

- ☐ For pivot pin to gearbox housing

7 - Pivot pin

8 - 5th gear selector fork

- ☐ Dismantling and assembling ⇒ [page 87](#)
- ☐ Adjusting ⇒ [page 75](#)

9 - 5th gear locking collar

- ☐ Installation position ⇒ [page 74](#)
- ☐ Adjusting ⇒ [page 75](#)

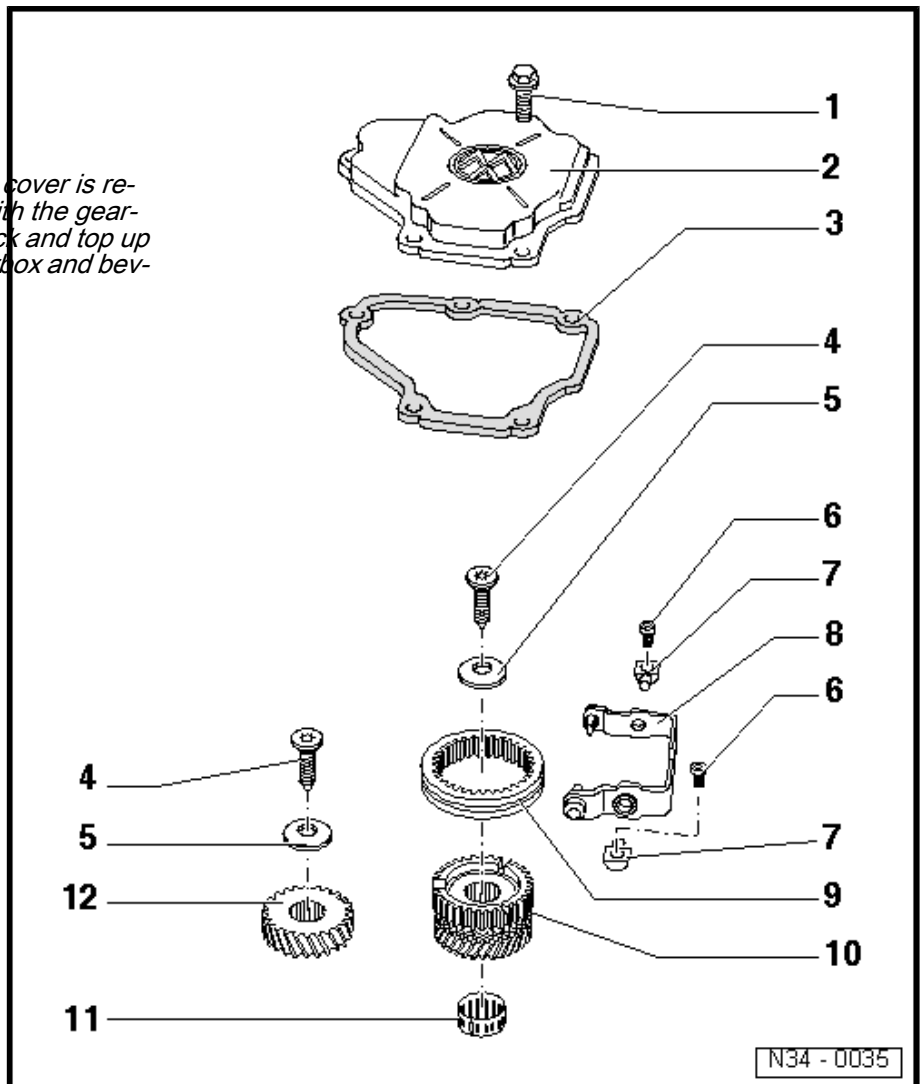
10 - Synchronising hub with 5th speed selector gear and synchro-ring

- ☐ Dismantling and assembling ⇒ [page 98](#)

11 - Needle bearing

12 - 5th gear wheel

- ☐ Installation position ⇒ [page 73](#)



5.4 Dismantling and assembling gearbox housing and selector mechanism

1 - Countersunk bolt, 25 Nm

2 - Flange shaft with spring

- ☐ Removing and installing
⇒ [page 124](#)

3 - Torx socket head bolt, 30 Nm

- ☐ For reverse shaft support
- ☐ Self-locking
- ☐ Renew

4 - O-ring

- ☐ Renew

5 - Pivot pin

6 - Bolt, 25 Nm

7 - Bolt, 25 Nm

8 - Cover plate

9 - Gearbox housing

- ☐ Servicing ⇒ [page 77](#)

10 - Clutch housing

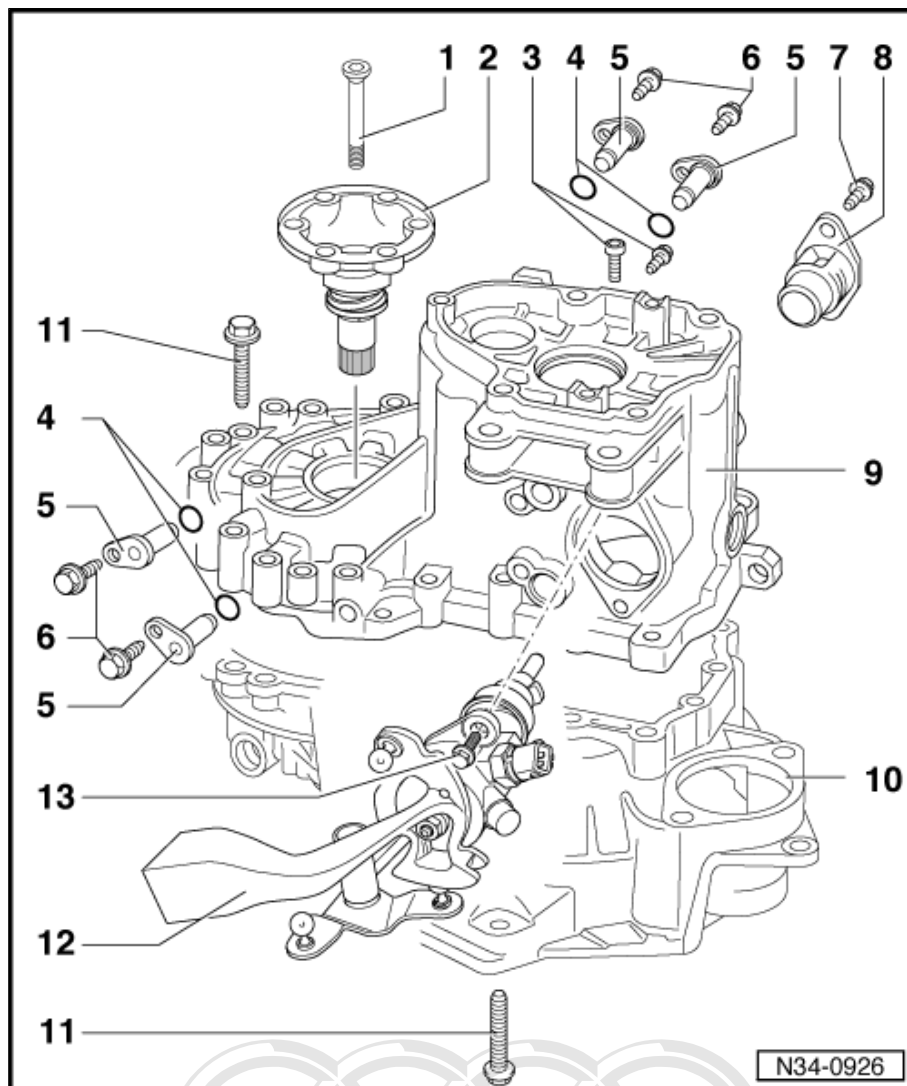
- ☐ Servicing ⇒ [page 77](#)

11 - Hexagon bolt, 25 Nm +
tighten 90° (1/4 turn) further

12 - Selector mechanism

- ☐ Dismantling and assembling
⇒ [page 83](#)

13 - Hexagon bolt, 25 Nm



5.5 Removing and installing input shaft, output shaft (pinion shaft), differential and selector forks

1 - Differential

- ☐ Dismantling and assembling ⇒ [page 133](#)

2 - Seal

- ☐ 4 x
- ☐ Renew

3 - Output shaft

- ☐ Dismantling and assembling ⇒ [page 103](#)

4 - Reverse shaft support

- ☐ Dismantling and assembling
⇒ [Item 8 \(page 122\)](#)

5 - Reverse shaft

- ☐ Dismantling and assembling ⇒ [page 121](#)

6 - Input shaft

- ☐ Dismantling and assembling ⇒ [page 92](#)

7 - Reverse gear selector fork

- ☐ Dismantling and assembling ⇒ [page 87](#)
- ☐ Installation position
⇒ [page 72](#)

8 - Torx socket head bolt, 25 Nm

9 - Selector forks

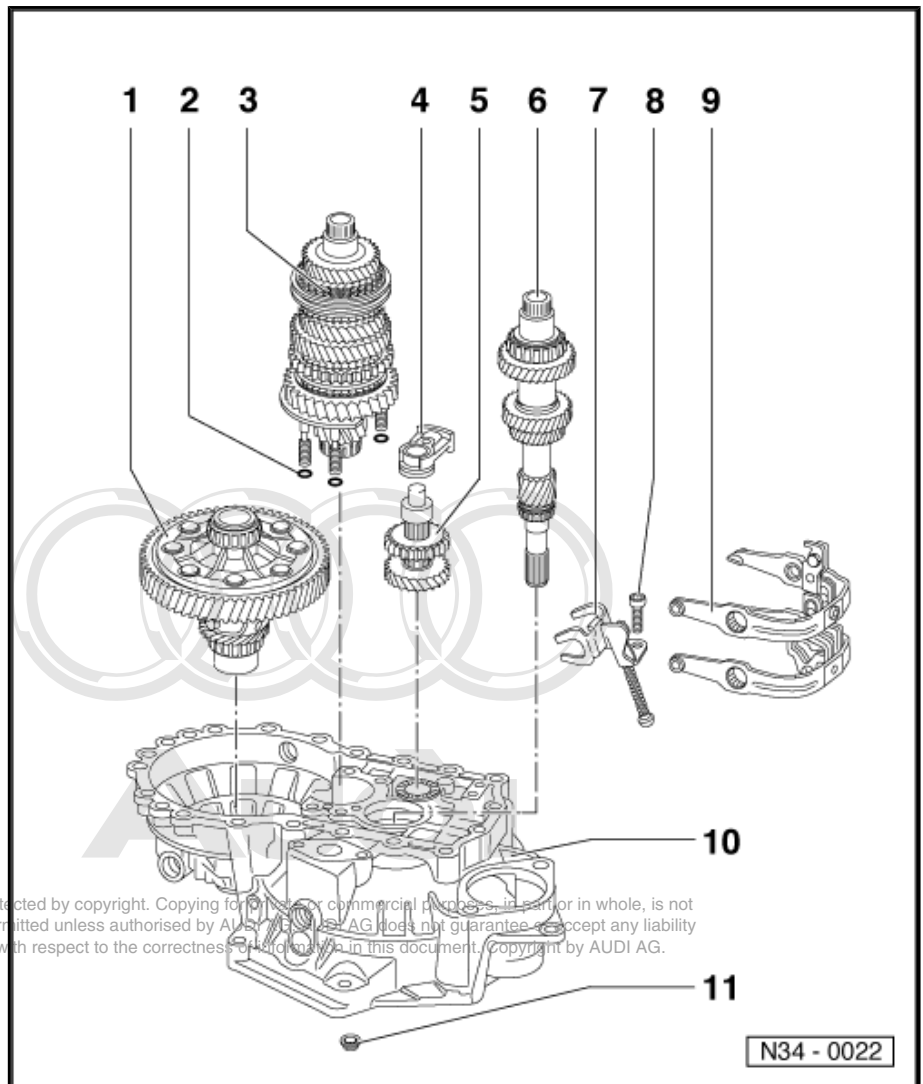
- ☐ Dismantling and assembling ⇒ [page 87](#)

10 - Clutch housing

- ☐ Servicing ⇒ [page 77](#)

11 - Hexagon nut, 25 Nm + tighten 90° (1/4 turn) further

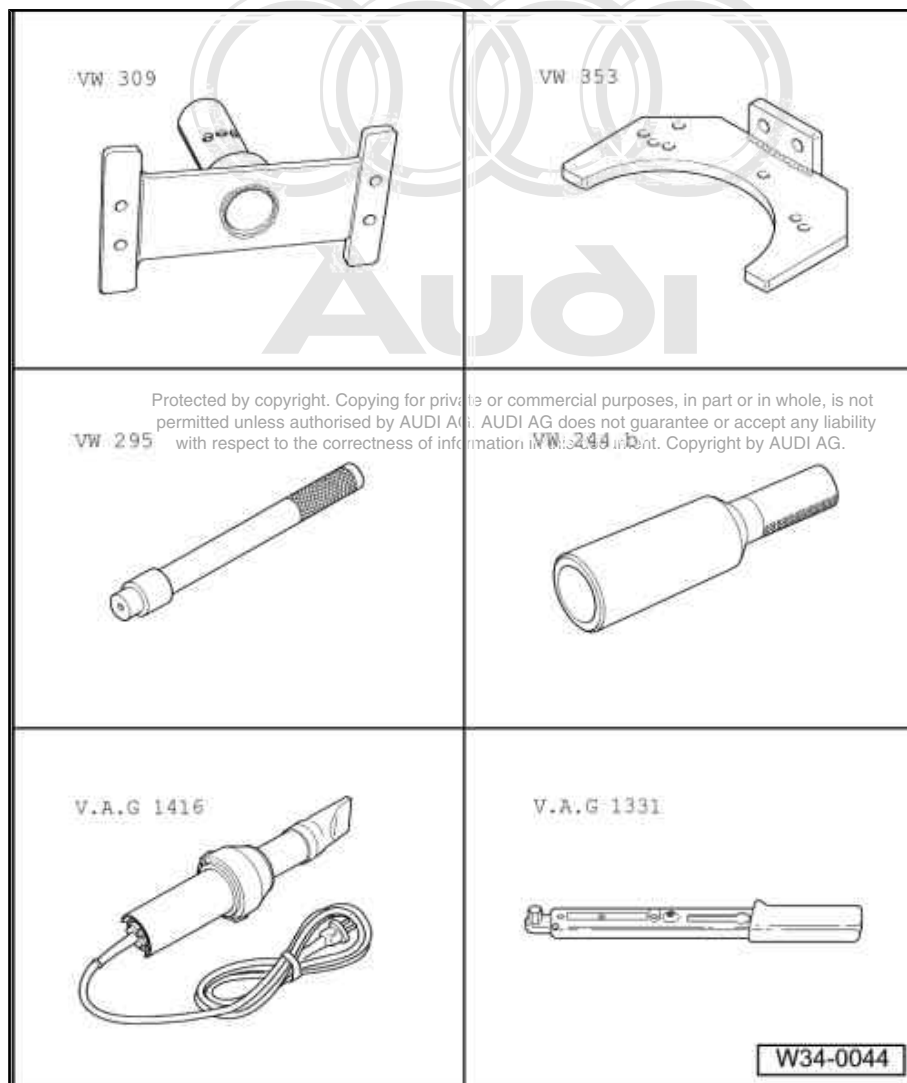
- ☐ 4x for bearing mounting



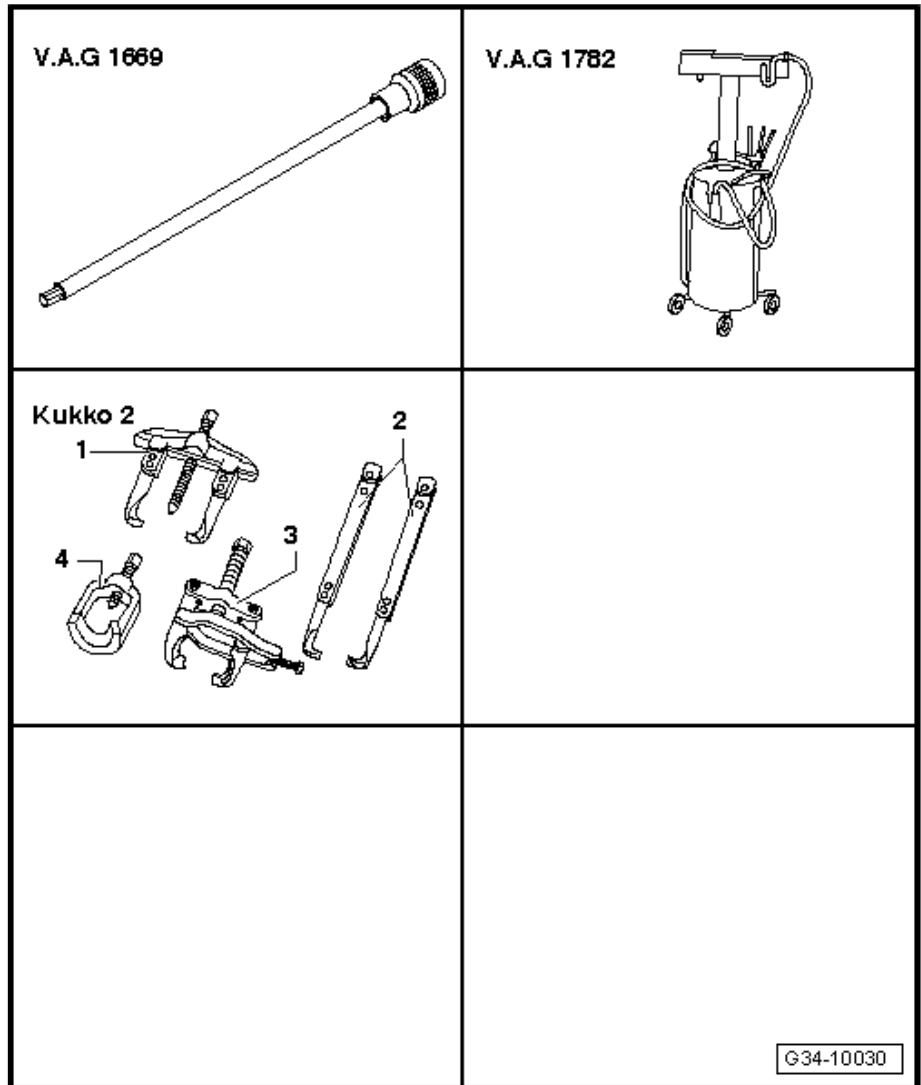
5.6 Dismantling and assembling gearbox housing cover, gearbox housing, selector mechanism, input shaft, output shaft (pinion shaft), differential and selector forks

Special tools and workshop equipment required

- ◆ Support plate -VW 309-
- ◆ Gearbox support -VW 353-
- ◆ Drift -VW 295-
- ◆ Drift sleeve -VW 244 B-
- ◆ Hot air blower -V.A.G 1416-
- ◆ Torque wrench - V.A.G 1331-

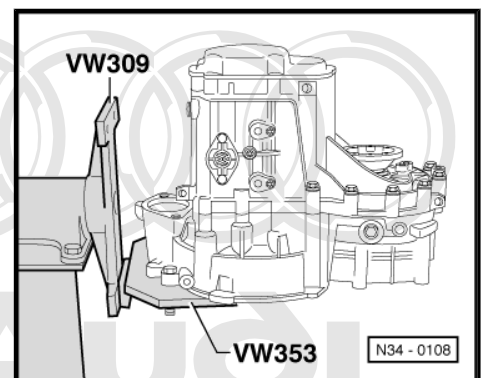


- ◆ Hexagon key -V.A.G 1669-
- ◆ Used oil collection and extraction unit -V.A.G 1782-
- ◆ -1- Two-arm puller -Kukko 20/10- with hook -Matra V170-
- ◆ Stud M8x100 mm



Dismantling

- Secure gearbox to assembly stand.
- Turn gearbox on assembly stand with oil drain plug downwards.
- Place used oil collection and extraction unit -V.A.G 1782- below gearbox.
- Remove oil drain plug and allow gear oil to drain off.
- If drive flange cap is fitted, pierce a hole in centre of cap using a screwdriver and lever out cap.



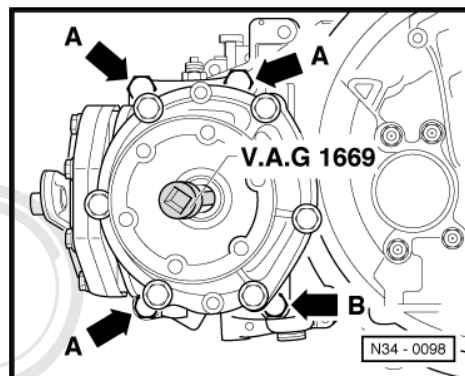
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- Unscrew bolt for flange shaft (right-side)/output shaft with drive flange using hexagon key -V.A.G 1669- (counterhold with drift to prevent shaft from turning).

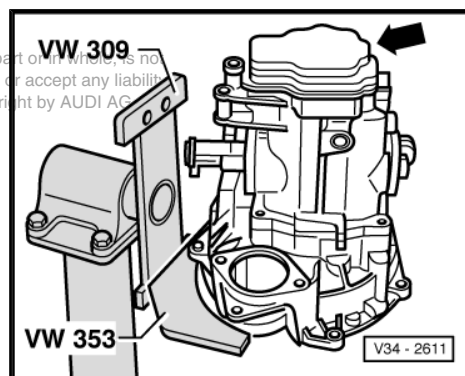

Note

The flange shaft (right-side)/output shaft with drive flange remains in the bevel box.

- Unscrew bolts securing bevel box to manual gearbox -arrows A- and -arrow B-.
- Detach bevel box from manual gearbox and remove bevel box.
- Remove clutch release lever and release bearing ⇒ [page 21](#) .
- Unbolt guide sleeve ⇒ [page 21](#) .
- Unbolt cover -arrow- from gearbox housing.



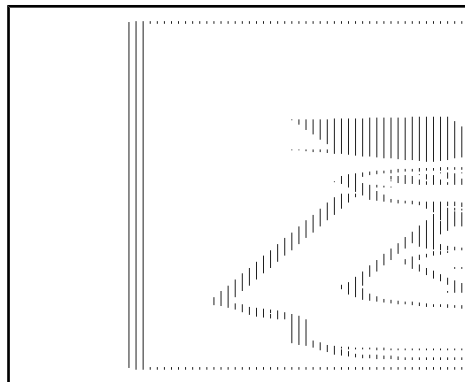
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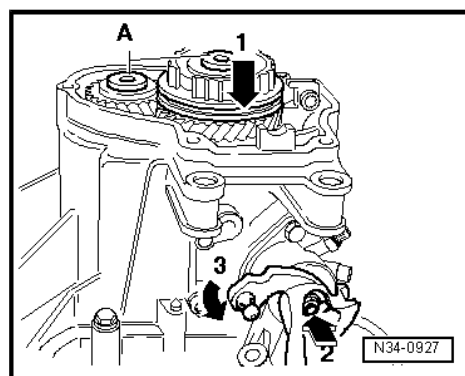
- Remove selector fork for 5th gear -arrows-.


Note

Before lifting the locking collar, take off spring and locking pieces. Then replace locking collar on synchronising hub again, but without selector fork.



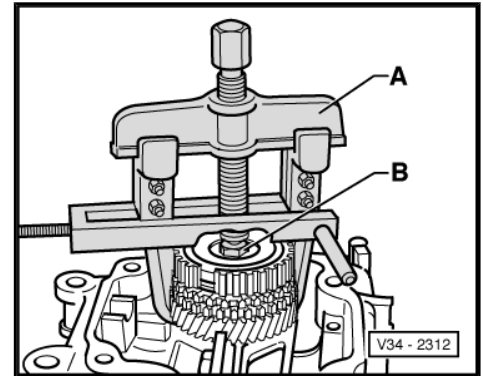
- Remove bolts -A- for synchronising hub and 5th gear wheel, to do this select 1st gear -arrows 2 and 3- and 5th gear -arrow 1-.



- Pull off synchronising hub with selector gear for 5th gear and remove needle bearing.

A - Two-arm puller -Kukko 20/10- with hooks -Matra V170-

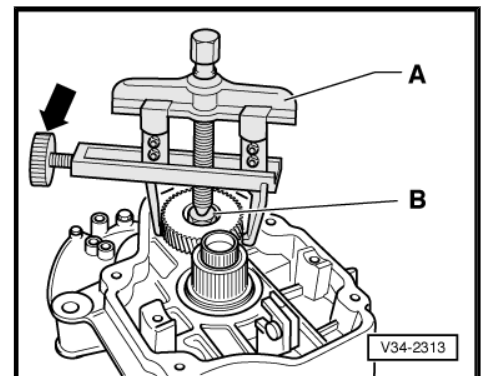
B - Hexagon bolt M10x20



- Assemble two-arm puller -Kukko 20/10- with hooks -Matra V170- -item A- and align centrally by turning screw -arrow- to pull off 5th gear wheel.

B - Hexagon bolt M10x20

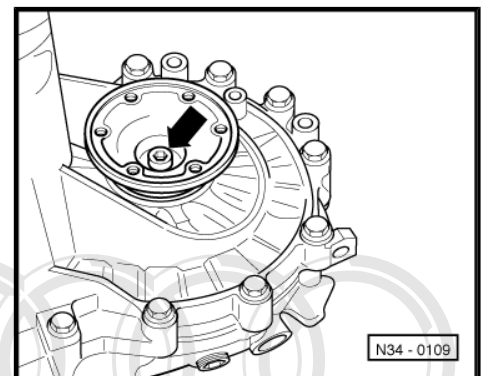
- Pull off gear wheel using two-arm puller; if necessary, heat gear wheel using hot air blower -V.A.G 1416- prior to pulling off.



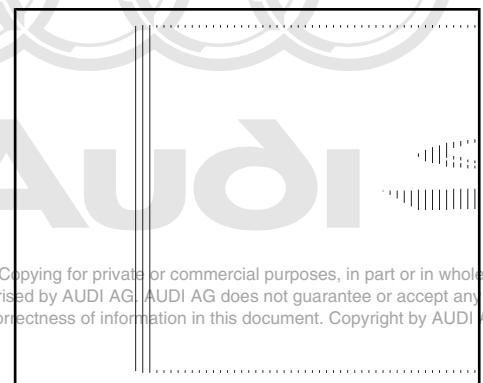
Note

- ◆ *When pulling off the gear wheel ensure that the hooks do not bend outwards, if necessary tighten screw -arrow-.*
- ◆ *Check 5th gear wheel for damage after pulling off.*

- Unscrew countersunk bolt -arrow- for flange shaft (left-side) (counterhold flange shaft with drift to prevent it from turning).

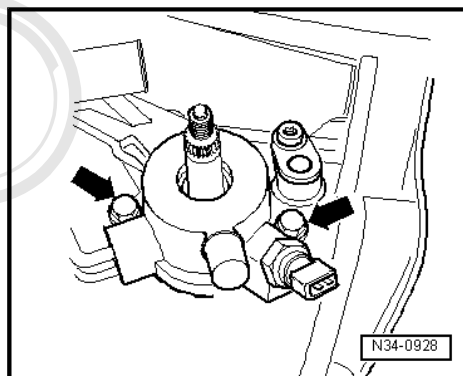


- Remove bolts -arrows- for reverse shaft support.



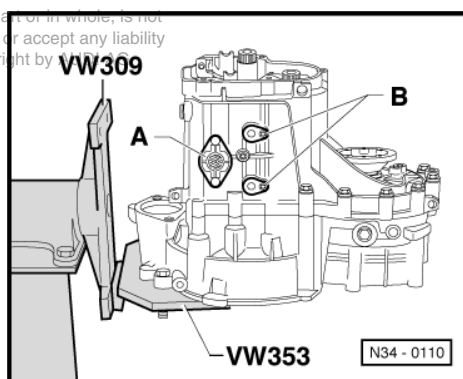
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- Remove selector shaft with selector mechanism cover. To do this, set selector shaft in neutral position.
- Unscrew bolts -arrows- and pull selector shaft out of gearbox housing.

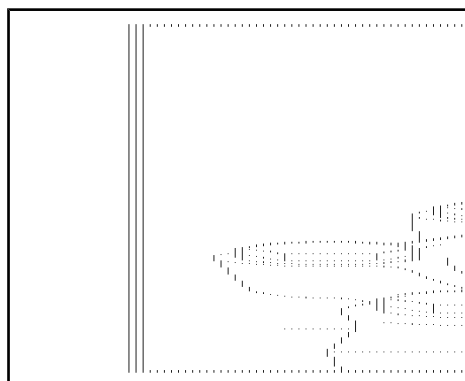


- Remove cover plate -A- and pivot pin -B- from underside of gearbox.

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- Remove pivot pins -A- from top of gearbox.
- Remove bolts -B- connecting gearbox housing to clutch housing near differential.

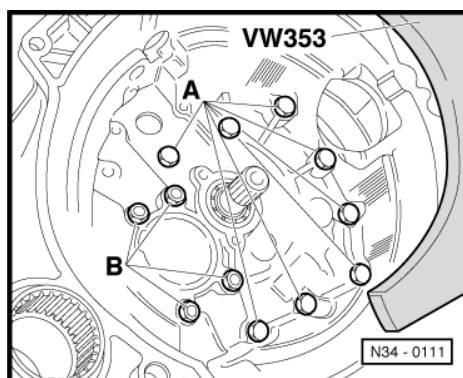


- Unscrew bolts -A- securing gearbox housing from inside clutch housing.



Note

Do not remove nuts -B- for output shaft bearing mounting at this stage.

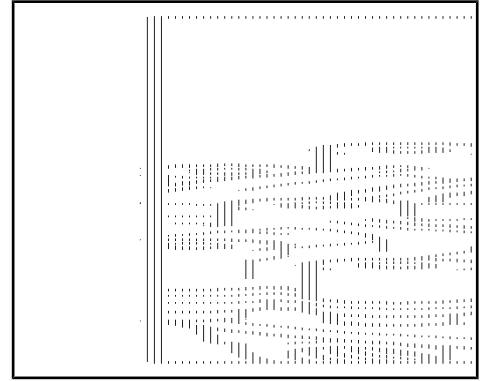


- Take off gearbox housing.

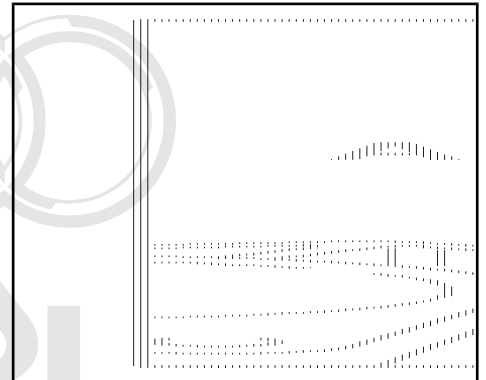


Note

If necessary, use a lever to carefully lift the gearbox housing all round and alternating between sides at the protruding flange -arrows-, taking care not to damage sealing surfaces.



- Remove selector forks -A- together with gear selector plates.
- Remove selector mechanism for reverse gear -B-.



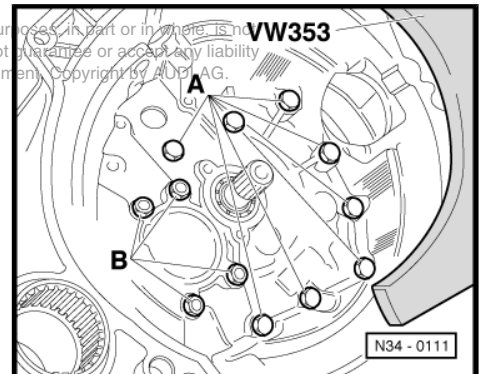
- Remove nuts -B- for output shaft bearing mounting.



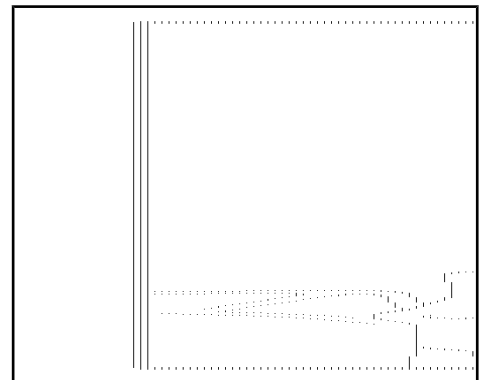
Note

Bolts -A- were removed at an earlier stage.

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- Remove reverse gear -A-, input shaft -B- and output shaft -C- one after the other from clutch housing.
- Remove differential.



Assembling

- Install differential.
- Renew seals -arrows- for output shaft bearing mounting.



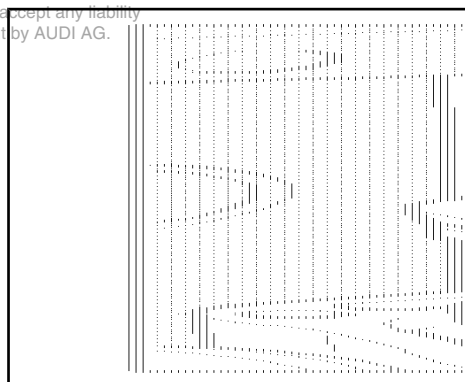
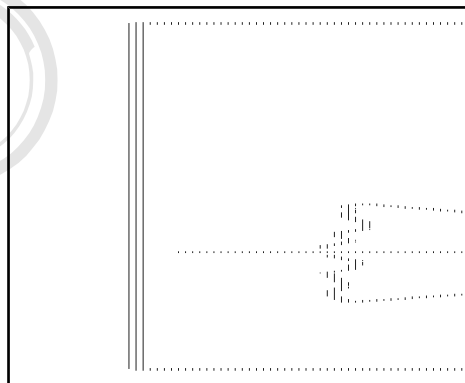
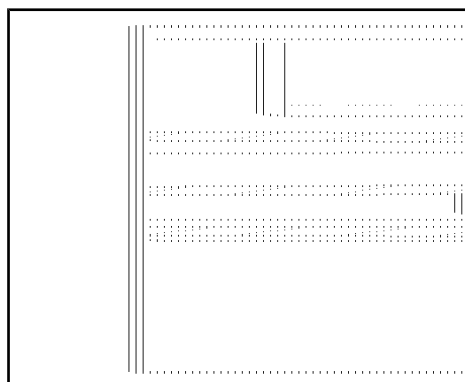
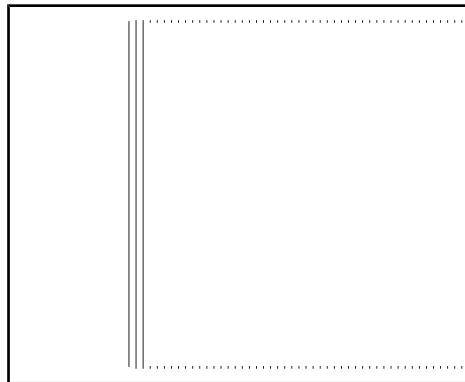
Note

The illustration only shows 3 of the 4 seals.

- Install input shaft, output shaft and reverse shaft together.
- Tighten nuts for output shaft bearing mounting to 25 Nm and then turn 90° further.
- Remove locking fluid on thread in reverse shaft support -arrow- using thread tap or similar.
- Fit reverse shaft support.

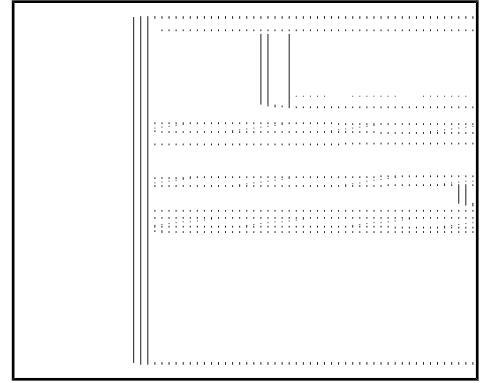
- Install selector mechanism for reverse gear.
- Installation position: reverse gear.
- Install selector forks together with gear selector plates.

- Fit stud M8x100 mm -item A- into reverse shaft support so that support is aligned when gearbox housing is fitted.
- Align gear selector plates.
- The detent segments must be positioned in the grooves on the locking collars.
- Put gearbox housing in position.

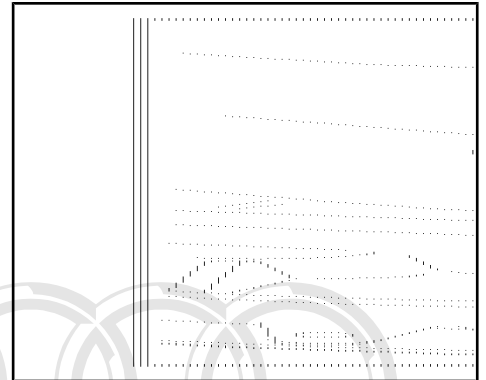


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- Install reverse shaft support -arrow- as follows:
 1. Screw in bolt -a- hand-tight.
 2. Then unscrew stud M8x100 mm fitted some steps earlier.
 3. Screw in bolt -b- hand-tight.
 4. Tighten bolt -a- to 30 Nm.
 5. Tighten bolt -b- to 30 Nm.

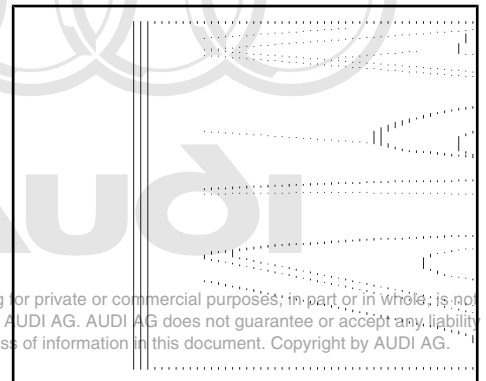


- Install pivot pin -arrow- for selector forks; to do this align selector mechanism using a screwdriver so that the relevant pivot pin can be inserted.
- Install cover plate for selector shaft.



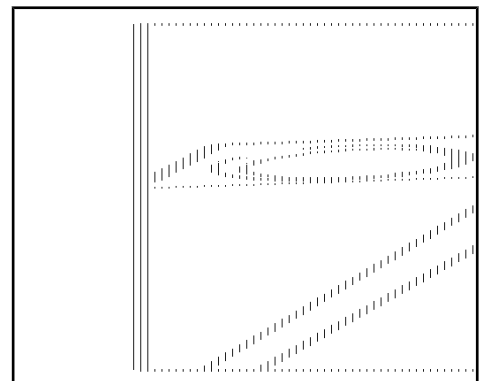
Install selector shaft as follows:

- Move gear selector plates to neutral.
- Engage the lug -arrow 1- into the cut-out on the gearbox housing. Position selector shaft so that selector finger -arrow 2- is engaged in selector plates.
- Install selector mechanism cover for selector shaft.

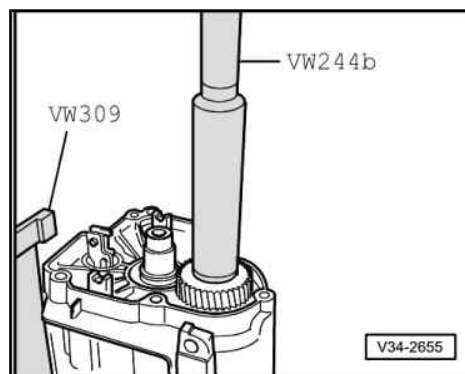


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- Fit 5th gear wheel.
 - Installation position: the groove running round the gear wheel -arrow- faces to the gearbox housing.

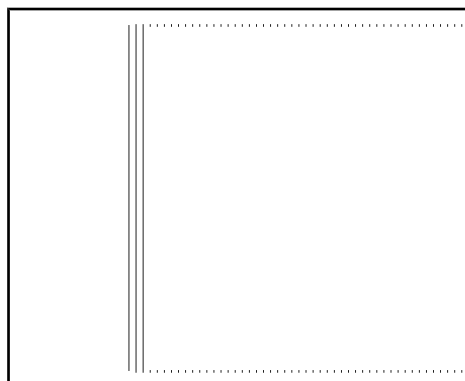


- Drive on 5th gear wheel.



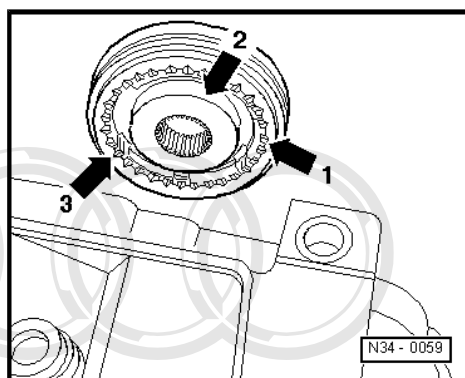
Checking 5th gear synchro-ring for wear:

- Press 5th gear synchro-ring against tapered seat on selector gear and measure gap -a- using a feeler gauge.
- Specified gap: 1.1 ... 1.7 mm.
- Wear limit 0.5 mm.
- Install 5th speed selector gear with needle bearing.
- Fit 5th gear synchro-ring on selector gear.
- Assemble 5th gear synchronising hub/locking collar before installing ➔ [page 98](#) .

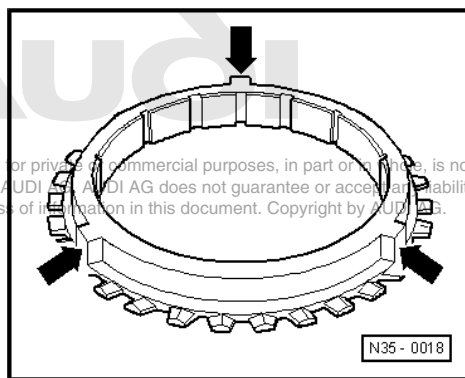


Installation position of 5th gear synchronising hub/locking collar

- The pointed teeth of the locking collar -arrow 1- and the high shoulder of the synchronising hub -arrow 2- face the gearbox housing.
- Retainers in synchronising hub -arrow 3- align with cast locking pieces on 5th gear synchro-ring.



5th gear synchro-ring with cast locking pieces -arrows-.



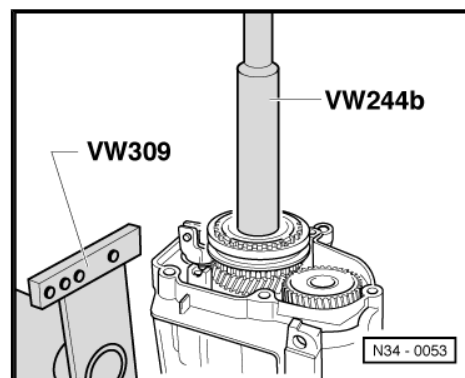
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- Drive on 5th gear synchronising hub.



Note

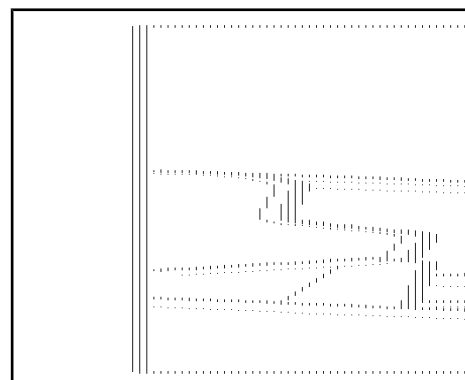
When driving on, ensure clearance for synchro-ring.



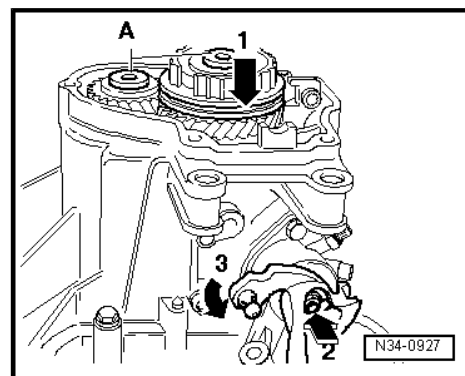
- Fit securing bolts for 5th gear synchronising hub and gear wheel.

Installation position of dished springs for securing bolts for 5th gear wheel and synchronising hub:

- The outer diameter (concave side -arrows-) faces 5th gear.

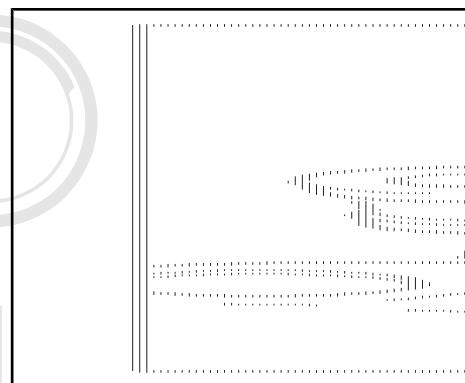


- Tighten bolts -A- for synchronising hub and 5th gear wheel, to do this select 1st gear -arrows 2 and 3- and 5th gear -arrow 1-.
- Install selector fork for 5th gear.



Adjust 5th gear as follows:

- Engage 5th gear.
- Slacken bolt -1-.
- Press locking collar and selector jaw in direction of -arrow- and tighten bolt -1- to 25 Nm.
- Check adjustment: It should not be possible to slide a 0.2 mm feeler gauge between locking collar and selector gear.
- Repeat adjustment if necessary.
- Disengage 5th gear.
- The locking collar should now be in neutral position and the synchro-ring should move freely.



- Secure gearbox housing cover.

- Install complete flange shaft (left-side) ⇒ [Item 2 \(page 64\)](#) .
- Install guide sleeve for release bearing ⇒ [page 21](#) .
- Install clutch release lever and release bearing ⇒ [page 21](#) .

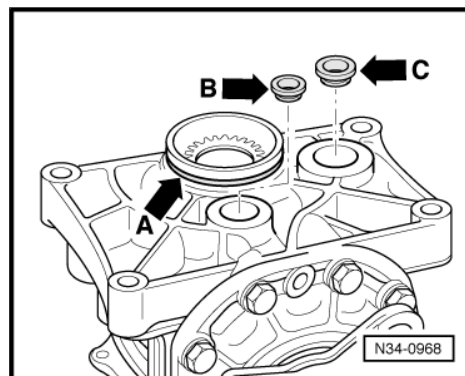
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Note

Always renew O-ring between bevel box and gearbox -arrow A- and seals on oil supply drillings -arrow B- and -arrow C-. Lightly oil O-ring and seals before installing.

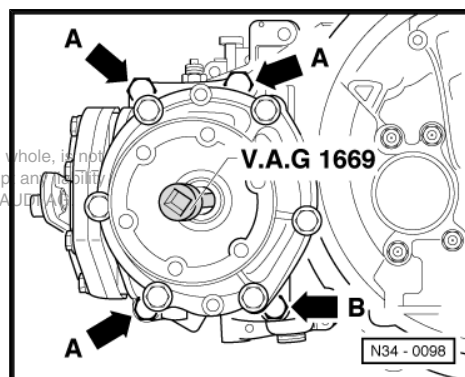
- Push bevel box completely onto gearbox, at the same time ensuring that the bevel box input shaft splines are guided centrally onto the differential connecting piece.
- If the splines are correctly positioned and the components are located centrally, the bevel box will slide against the gearbox onto the stop.



Note

Do not use the securing bolts to pull the bevel box onto the gearbox. This could cause the bevel box to tilt and the securing eyes may break off.

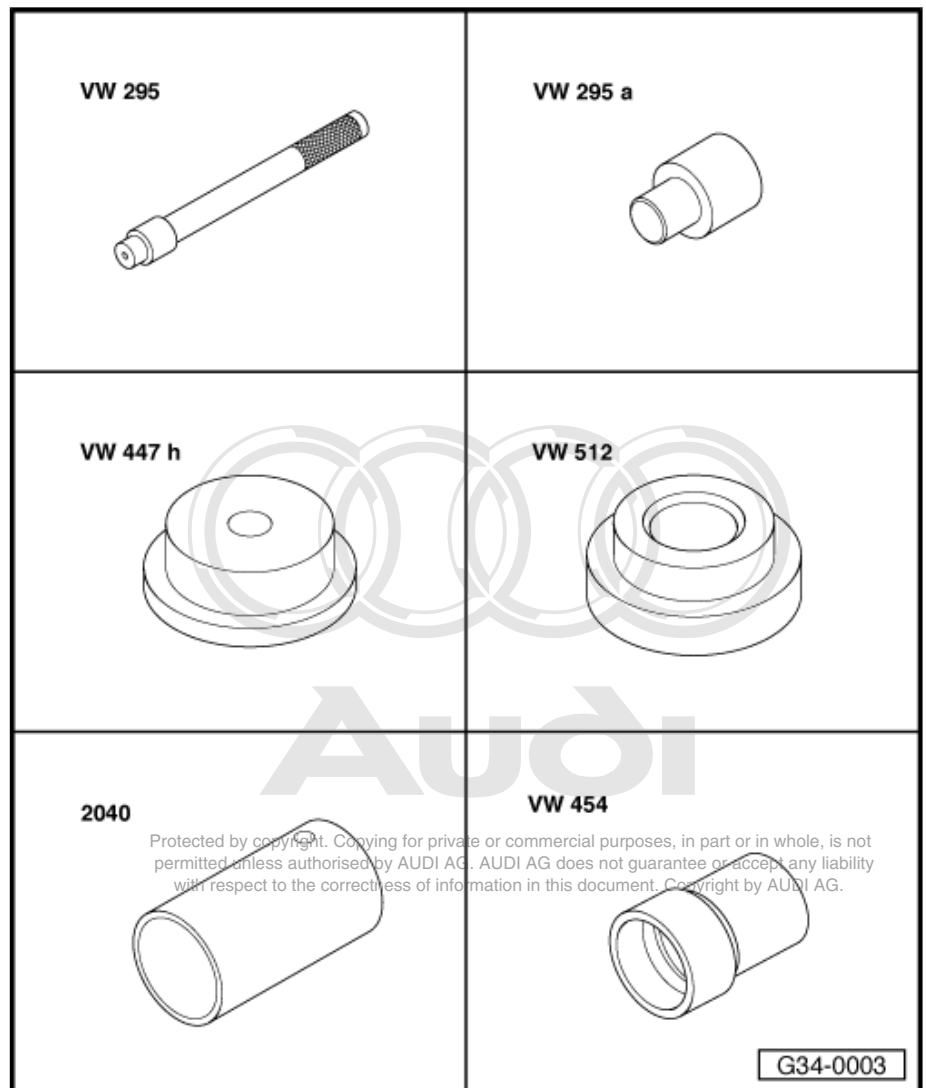
- Tighten bolts securing bevel box to manual gearbox -arrows A- and -arrow B-.
- Tighten bolt for flange shaft (right-side) or drive flange with output shaft using hexagon key -V.A.G 1669- (counterhold flange shaft with drift to prevent it from turning).
- Renew drive flange cap, if fitted.



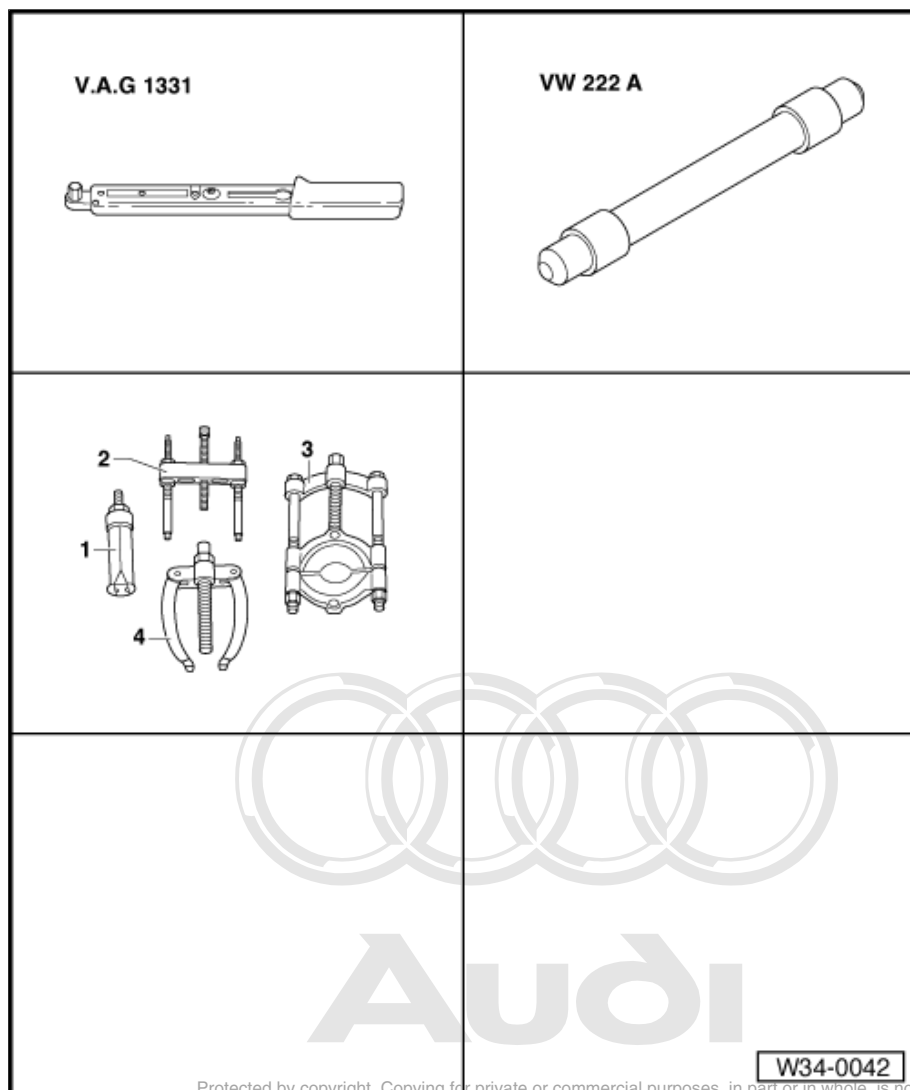
6 Servicing gearbox housing and clutch housing

Special tools and workshop equipment required

- ◆ Drift -VW 295-
- ◆ Adapter -VW 295 A-
- ◆ Thrust plate -VW 447 H-
- ◆ Thrust pad -VW 512-
- ◆ Tube -2040-
- ◆ Press tool -VW 454-



- ◆ Torque wrench -
V.A.G 1331-
- ◆ Drift -VW 222 A-
- ◆ -1- Internal puller -Kukko
21/1-
- ◆ -4- Counter-support -Kukko
22/1-



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Gearbox housing and clutch housing - exploded view of components

1 - Gearbox housing

- ☐ If renewed: Adjust input shaft ⇒ [page 99](#) and differential ⇒ [page 141](#)

2 - Needle bearing

- ☐ For output shaft
- ☐ Removing ⇒ [page 80](#)
- ☐ Installing and securing ⇒ [page 81](#)

3 - Oil filler plug, 30 Nm

- ☐ Without magnet

4 - Shim

- ☐ For input shaft
- ☐ Table of adjustments ⇒ [page 160](#)

5 - Tapered roller bearing outer race

- ☐ For input shaft
- ☐ Removing and installing ⇒ [page 98](#)
- ☐ If renewed: Adjust input shaft ⇒ [page 99](#)

6 - Tapered roller bearing outer race

- ☐ For output shaft
- ☐ Removing and installing ⇒ [page 109](#)
- ☐ If renewed: Adjust output shaft ⇒ [page 117](#)

7 - Shim

- ☐ For output shaft
- ☐ Table of adjustments ⇒ [page 160](#)

8 - Tapered roller bearing outer race

- ☐ For input shaft
- ☐ Removing and installing ⇒ [page 95](#)
- ☐ If renewed: Adjust input shaft ⇒ [page 99](#)

9 - Needle bearing

- ☐ Removing and installing ⇒ [page 123](#)

10 - Dowel sleeve

- ☐ 2 x

11 - Starter bush

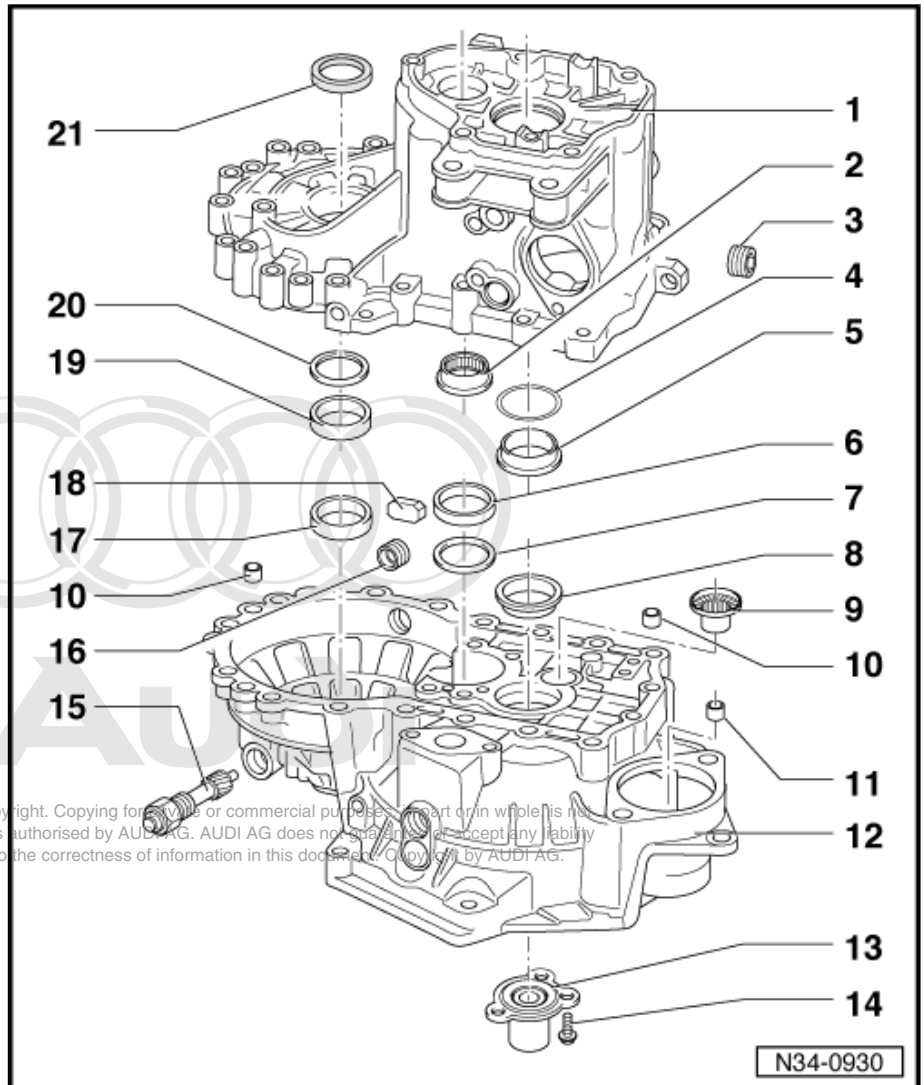
- ☐ Can be renewed with gearbox in vehicle
- ☐ Pulling out ⇒ [page 81](#)
- ☐ Driving in ⇒ [page 82](#)

12 - Clutch housing

- ☐ If renewed: table of adjustments ⇒ [page 160](#)

13 - Guide sleeve

- ☐ With input shaft oil seal and vulcanised O-ring
- ☐ Knocking out oil seal ⇒ [page 81](#)
- ☐ Driving in oil seal ⇒ [page 81](#)



- ☐ Remove guide sleeve in order to renew oil seal
- ☐ If O-ring is damaged, renew guide sleeve together with O-ring

14 - Socket head bolt, 20 Nm

- ☐ Self-locking
- ☐ Renew

15 - Speedometer drive

- ☐ Tighten aluminium version to 30 Nm
- ☐ Tighten plastic version to 10 Nm

16 - Oil drain plug, 30 Nm

- ☐ Without magnet

17 - Tapered roller bearing outer race

- ☐ For differential
- ☐ Pressing out ⇒ [page 137](#)
- ☐ Pressing in ⇒ [page 137](#)
- ☐ If renewed: Adjust differential ⇒ [page 141](#)

18 - Magnet

- ☐ Held in place by joint surface of housing

19 - Tapered roller bearing outer race

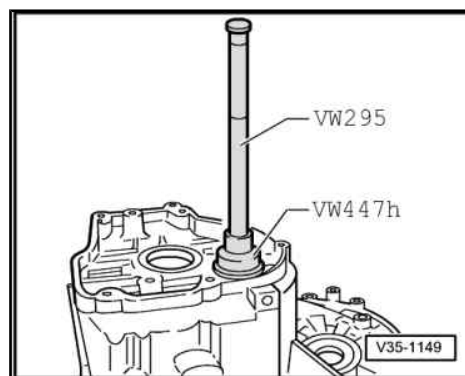
- ☐ For differential
- ☐ Pulling out ⇒ [page 138](#)
- ☐ Pressing in ⇒ [page 138](#)
- ☐ If renewed: Adjust differential ⇒ [page 141](#)

20 - Shim

- ☐ For differential
- ☐ Table of adjustments ⇒ [page 160](#)

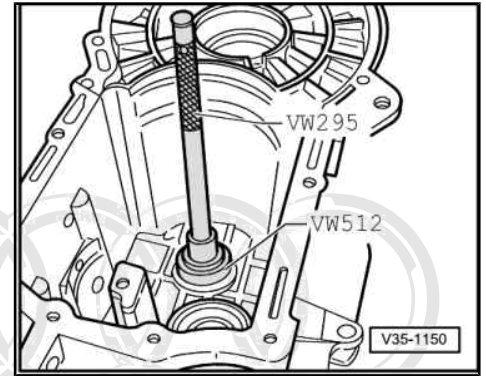
21 - Oil seal

- ☐ Renewing ⇒ [page 124](#)

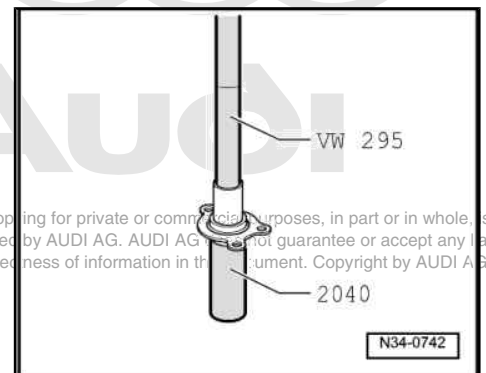
Driving out needle bearing

Installing and securing needle bearing

- Drive in needle bearing as far as stop and secure in gearbox housing at three points (120° offset) with a punch.

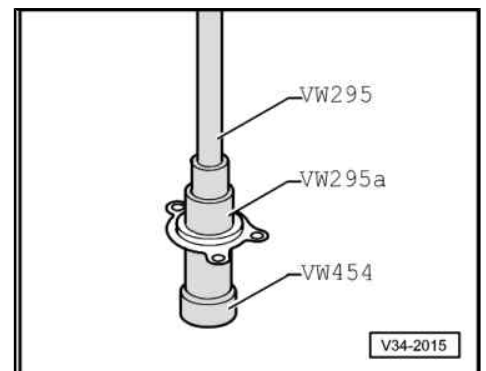


Driving oil seal out of guide sleeve



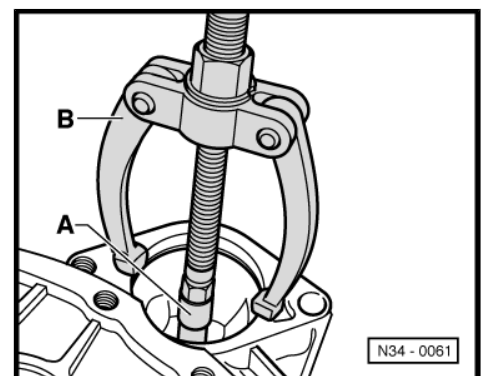
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Driving oil seal into guide sleeve onto stop



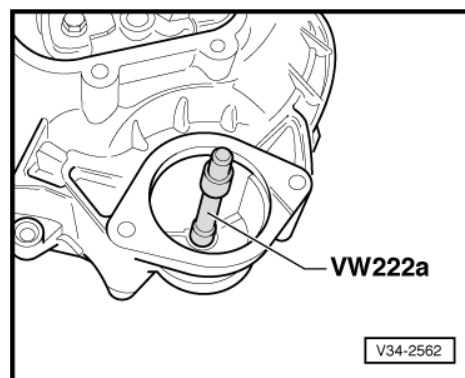
Pulling out starter bush

- A - Internal puller 12 ... 14.5 mm -Kukko 21/1-
- B - Counter-support -Kukko 22/1-





Driving in starter bush

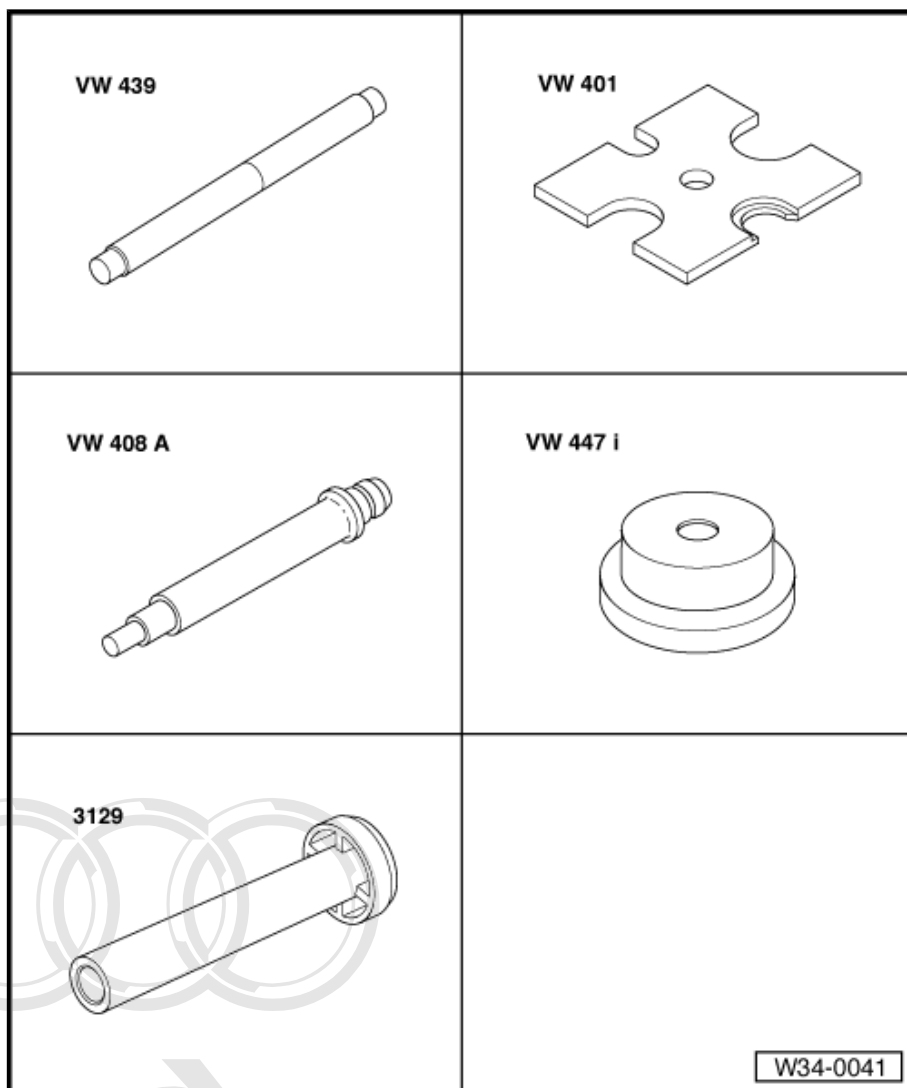


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7 Dismantling and assembling selector mechanism in gearbox

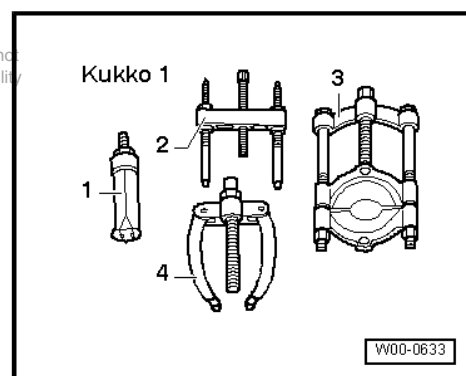
Special tools and workshop equipment required

- ◆ Guide pin -VW 439-
- ◆ Thrust plate -VW 401-
- ◆ Press tool -VW 408 A-
- ◆ Thrust plate -VW 447 i-
- ◆ Thrust piece -3129-



- ◆ -1- Internal puller -Kukko 21/3-

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Selector mechanism in gearbox - exploded view of components

1 - Selector shaft

- ☐ From gearbox build date 04 09 0, detent sleeve modified so that when shifting down from 5th gear to 4th gear the selector shaft is guided into the 4th gear selector gate ⇒ [page 85](#)

2 - Check ring

3 - Ball sleeve

- ☐ Removing ⇒ [page 85](#)
- ☐ Pressing in ⇒ [page 85](#)

4 - Selector mechanism cover

- ☐ Additional bolt fitted from gearbox build date 04 09 0 so that when shifting down from 5th gear to 4th gear the selector shaft is guided into the 4th gear selector gate ⇒ [page 85](#)

5 - Reversing light switch -F4-

- ☐ Lightly coat lug with MoS₂ grease
- ☐ Tighten to 20 Nm

6 - Cap

- ☐ For gearbox breather

7 - Relay lever

- ☐ Installation position ⇒ [page 33](#)

8 - Bearing bush

9 - Oil seal

- ☐ Lever out with screwdriver
- ☐ Installing ⇒ [page 85](#)

10 - Securing clip

11 - Hexagon nut, 20 Nm

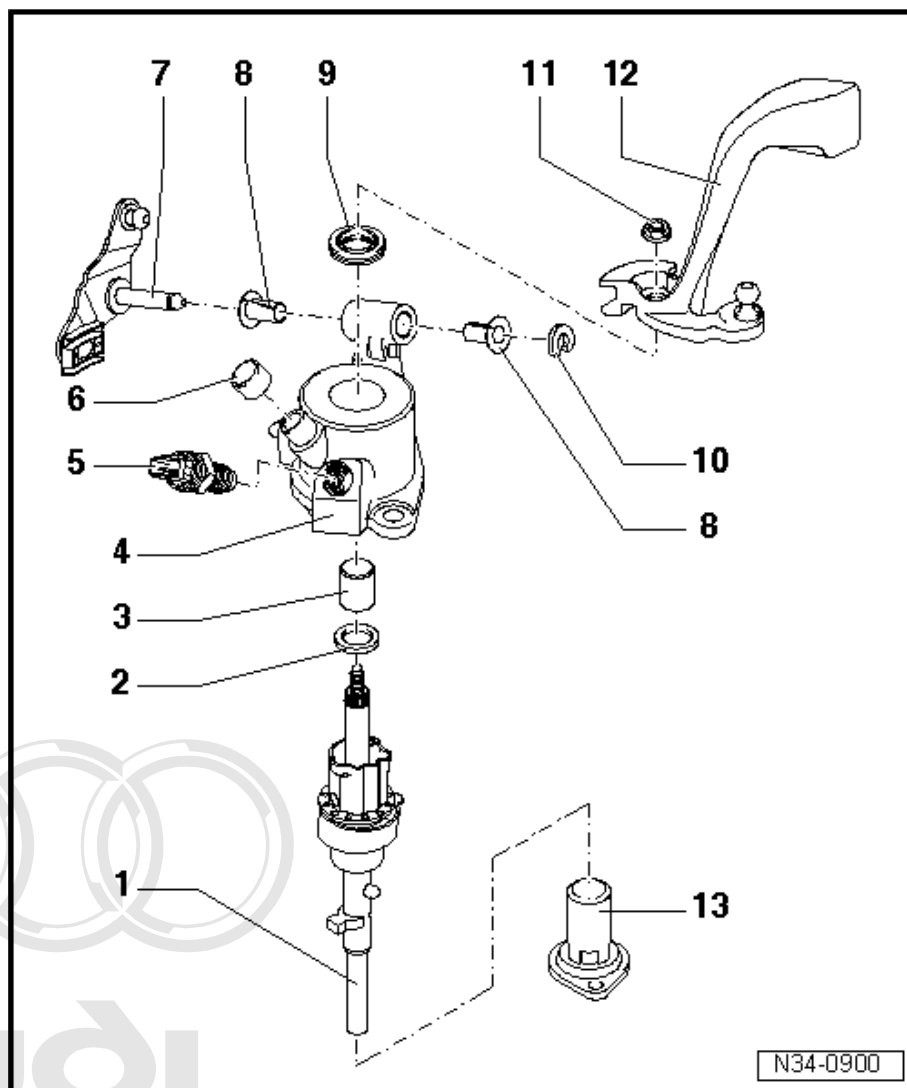
- ☐ Self-locking
- ☐ Renew

12 - Selector shaft lever

- ☐ Install so that gap in splines aligns with selector shaft
- ☐ Can be renewed with selector mechanism installed
- ☐ Installation position ⇒ [page 33](#)

13 - Cover plate

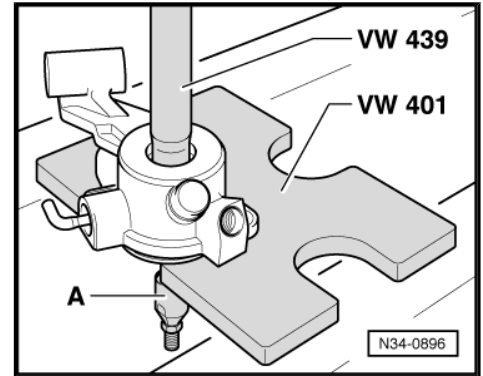
- ☐ From gearbox date 06 08 1 with retainer for selector shaft ⇒ [page 86](#)



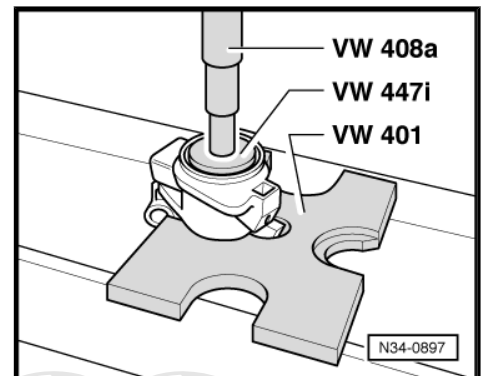
Pulling ball sleeve out of selector mechanism cover

- Before pulling out ball sleeve, destroy plastic cage and remove balls.

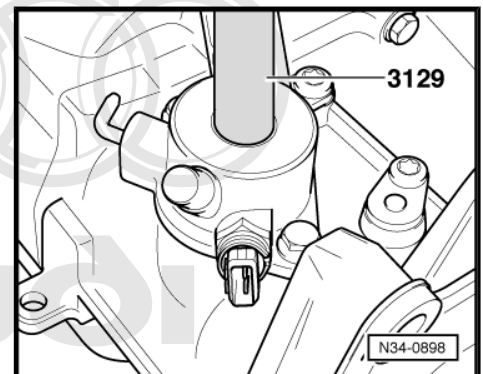
A - Internal puller 18.5 ... 23.5 mm -Kukko 21/3-



Driving ball sleeve into selector mechanism cover

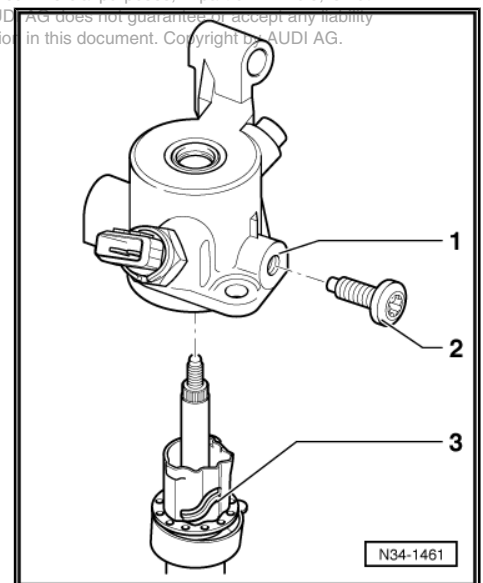


Installing oil seal (insert onto stop)



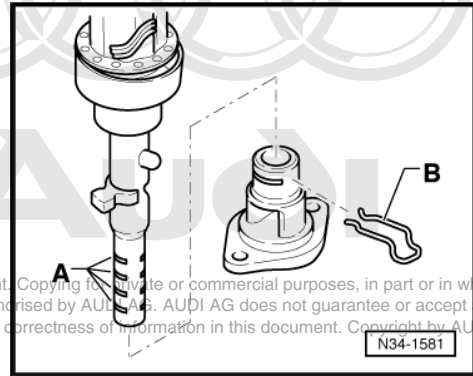
Modified selector mechanism cover and selector shaft

- ◆ From gearbox build date 04 09 0, bolt -2- is fitted in selector mechanism cover -1- (tightening torque 15 Nm).
- ◆ The detent sleeve on the selector shaft has been fitted with a ramp -3- for this purpose.
- ◆ When shifting down from 5th gear to 4th gear, bolt -2- guides the selector shaft by means of ramp -3- into 4th gear selector gate.



Selector shaft and cover plate modified

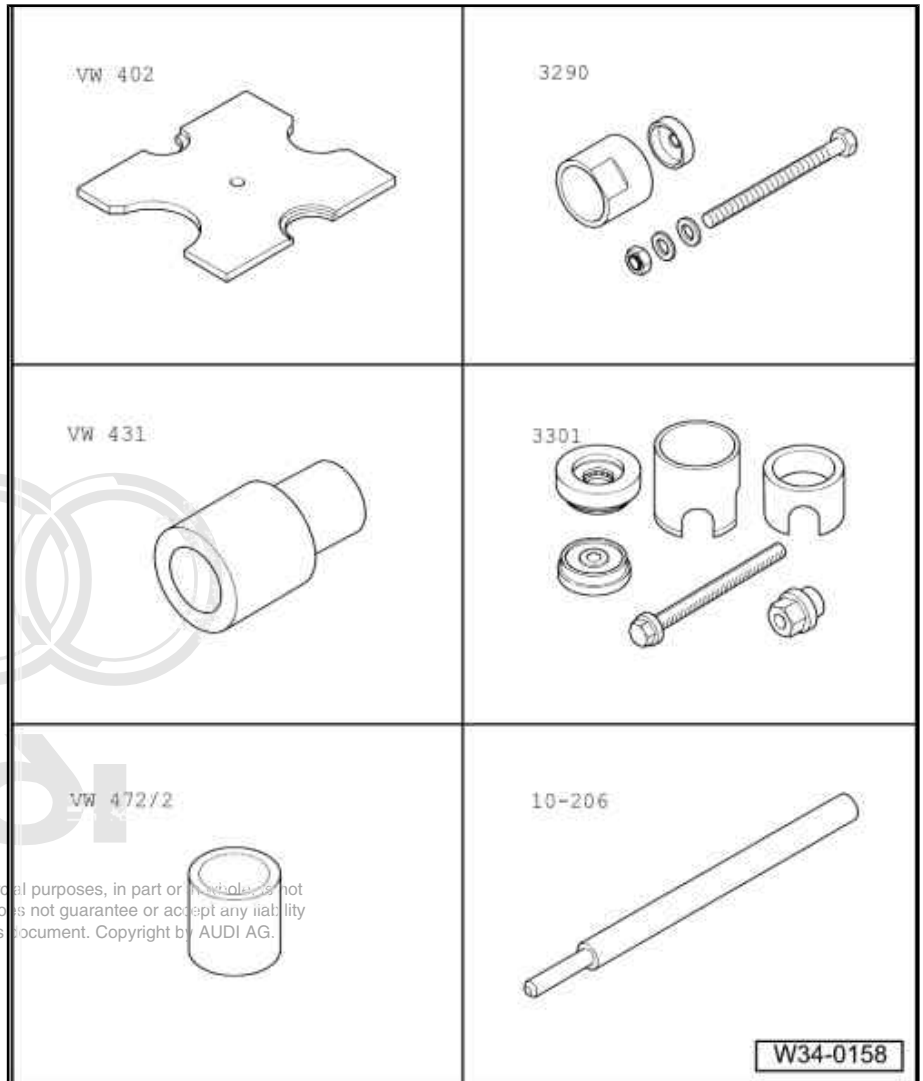
- ◆ From gearbox build date 06 08 1 with recesses on selector shaft -A-.
- ◆ Cover plate is fitted with spring -B-.
- ◆ The spring -B- in the cover plate engages into one of the recesses in the selector shaft -A- when a forward gear is engaged.



8 Dismantling and assembling selector forks

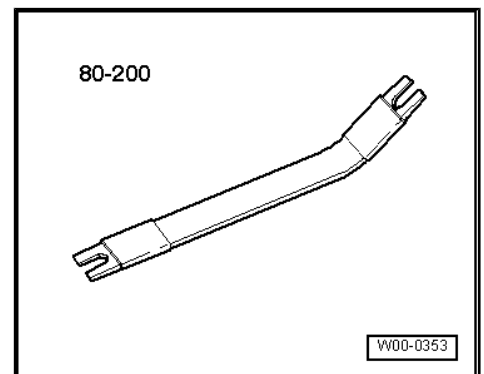
Special tools and workshop equipment required

- ◆ Thrust plate -VW 402-
- ◆ Thrust piece -3290/1- from assembly tool -3290-
- ◆ Press tool -VW 431-
- ◆ Assembly tool -3301-
- ◆ Spacer sleeve -VW 472/2-
- ◆ Drift -10-206-

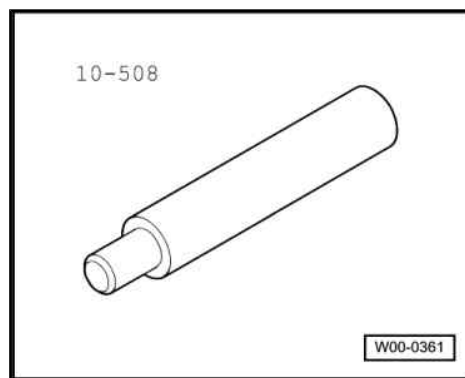


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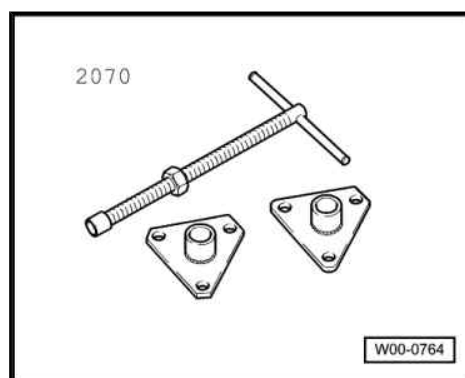
- ◆ Removal lever -80-200-



◆ Assembly drift -10-508-



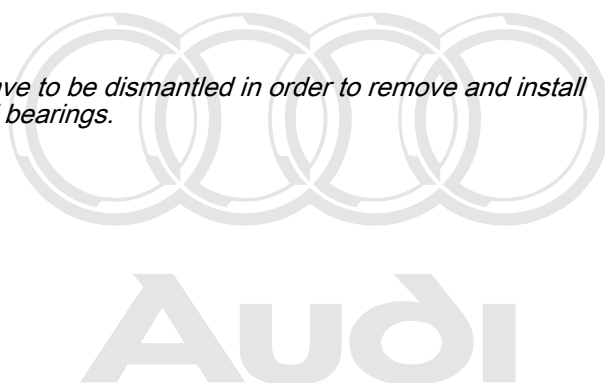
◆ Tensioning device -2070-



Selector forks - exploded view of components

**Note**

The selector fork cluster ⇒ [Item 7 \(page 89\)](#) does not have to be dismantled in order to remove and install detent segments, lock washers and angular contact ball bearings.



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1 - 5th gear detent segment

- ☐ Identification
⇒ [page 90](#)
- ☐ Must rotate freely after lock washer is installed

2 - Lock washer

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

3 - 5th gear selector fork

- ☐ Adjusting ⇒ [page 75](#)

4 - Bolt, 25 Nm

5 - 5th gear selector jaw

6 - Angular contact ball bearing

- ☐ 4 x
- ☐ Removing ⇒ [page 91](#)
- ☐ Pressing inner race into outer race ⇒ [page 91](#)
- ☐ Installing ⇒ [page 91](#)

7 - Selector fork cluster with selector plates

- ☐ Dimensions
⇒ [page 90](#)

8 - 1st/2nd gear detent segment

- ☐ Identification
⇒ [page 90](#)
- ☐ The segment must rotate freely after installing the lock washer.

9 - 3rd/4th gear detent segment

- ☐ Identification ⇒ [page 90](#)
- ☐ The segment must rotate freely after installing the lock washer.

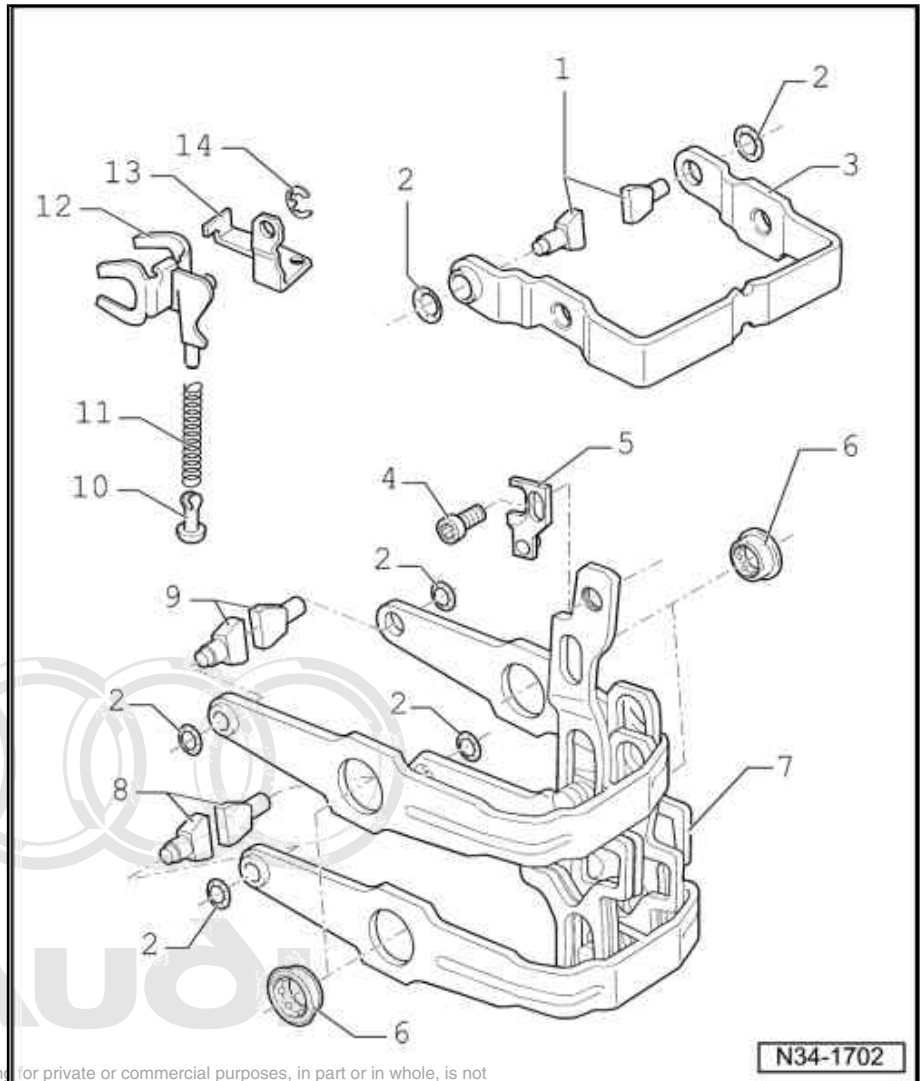
10 - Sliding piece

11 - Spring

12 - Reverse gear selector fork

13 - Support for reverse gear selector fork

14 - Circlip



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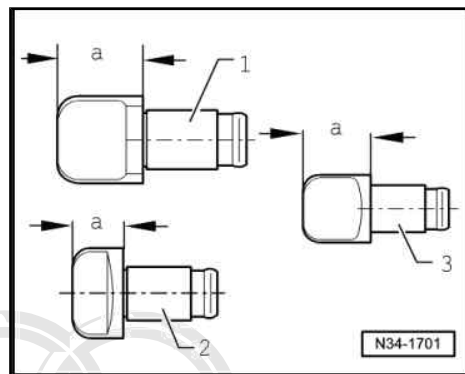
Identification of detent segments

- 1 - Detent segments, 1st/2nd gear: dimension -a- = 12.1 mm
- Detent segments, 1st/2nd gear in combination with modified synchromesh ([⇒ page 116](#)): dimension -a- = 11.4 mm
- 2 - Detent segments, 3rd/4th gear: dimension -a- = 7.7 mm
- 3 - Detent segments, 5th gear: dimension -a- = 12.1 mm



Note

The shorter detent segments for 1st/2nd gear can also be installed on gearboxes of the earlier type.

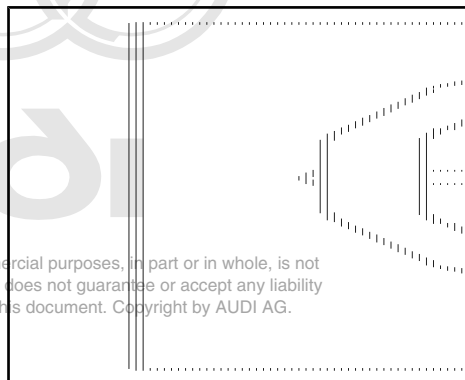


Selector forks with detent segments installed

- Detent segments, 1st/2nd gear: dimension -a- = 87.2 ... 87.9 mm
- Detent segments, 3rd/4th gear: dimension -a- = 96.0 ... 96.7 mm

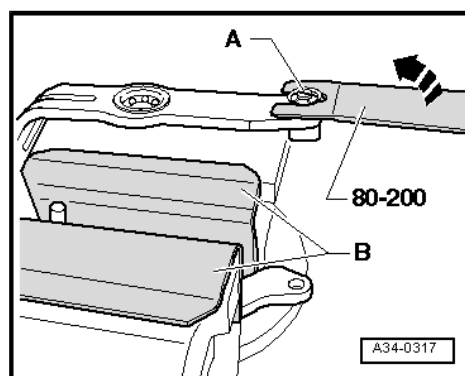
For identification of detent segments [⇒ page 90](#)

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Removing lock washer

- Clamp selector fork in vice, using jaw protectors -B-.
- Lever off lock washer -A- in direction of -arrow-.



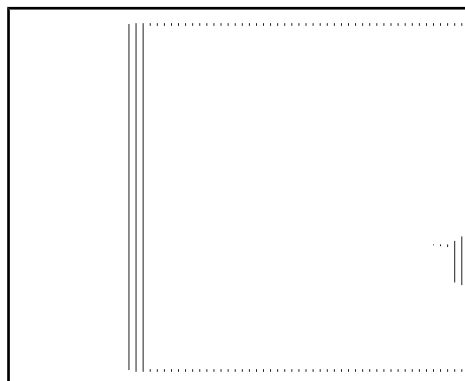
Installing lock washer

- Press lock washer into groove on detent segment using socket driver.

A - Socket driver (10 mm)

B - Jaw protectors

- Detent segment should turn freely after lock washer is installed.

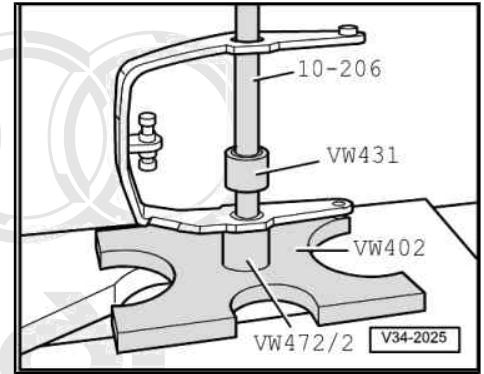


Removing angular contact ball bearing



Note

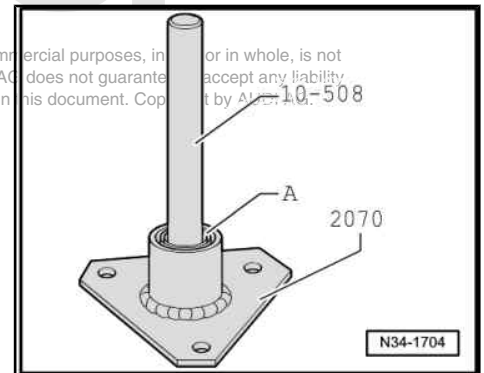
Do not bend selector fork when removing and installing the ball bearings.



Pressing inner race of angular contact ball bearing into outer race

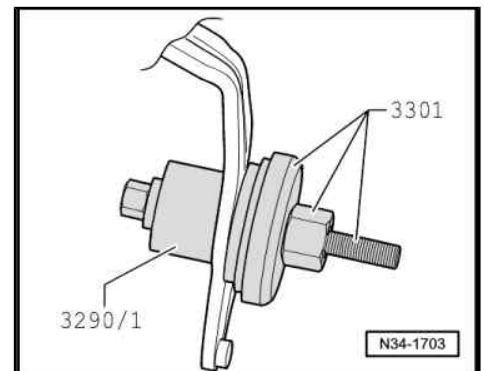
- Inner race -A- must engage positively in outer race.

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Pulling angular contact ball bearing into selector fork (insert onto stop)

- Recess in thrust piece -3290/1- points towards ball bearing.



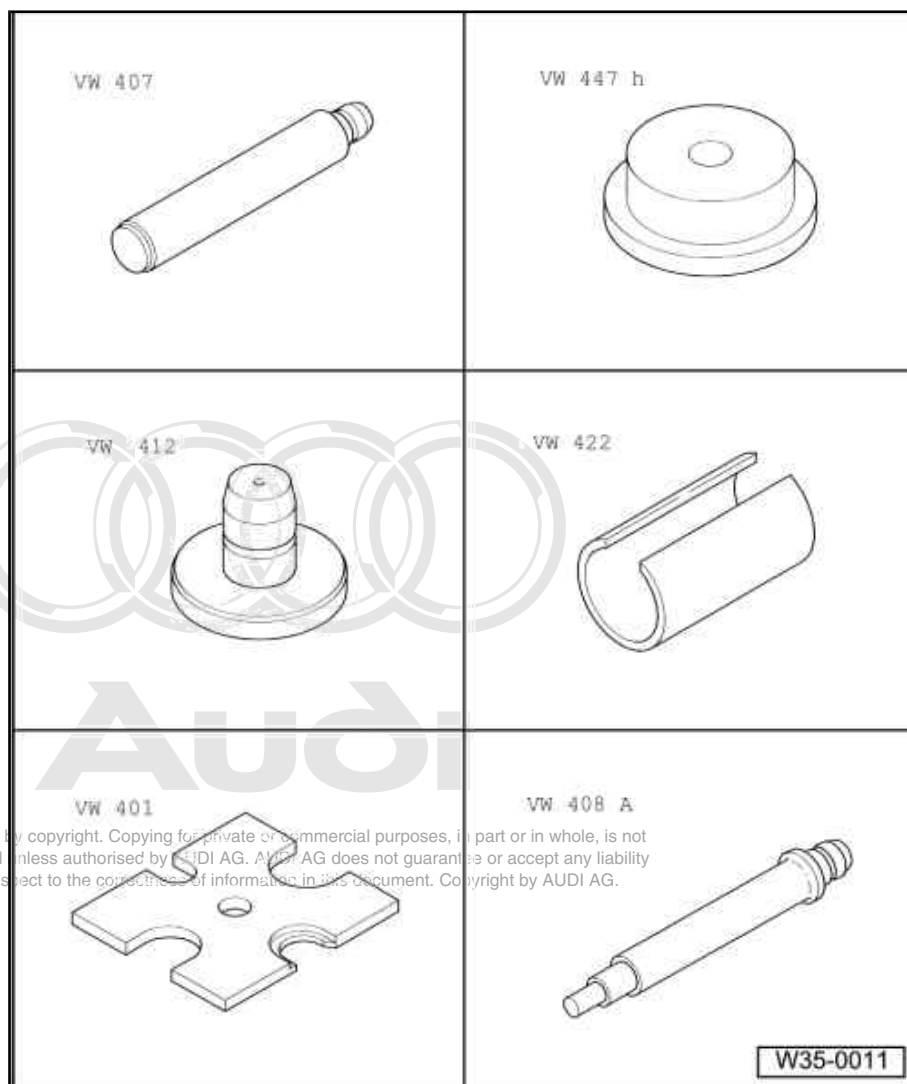
35 – Gears, shafts

1 Servicing input shaft

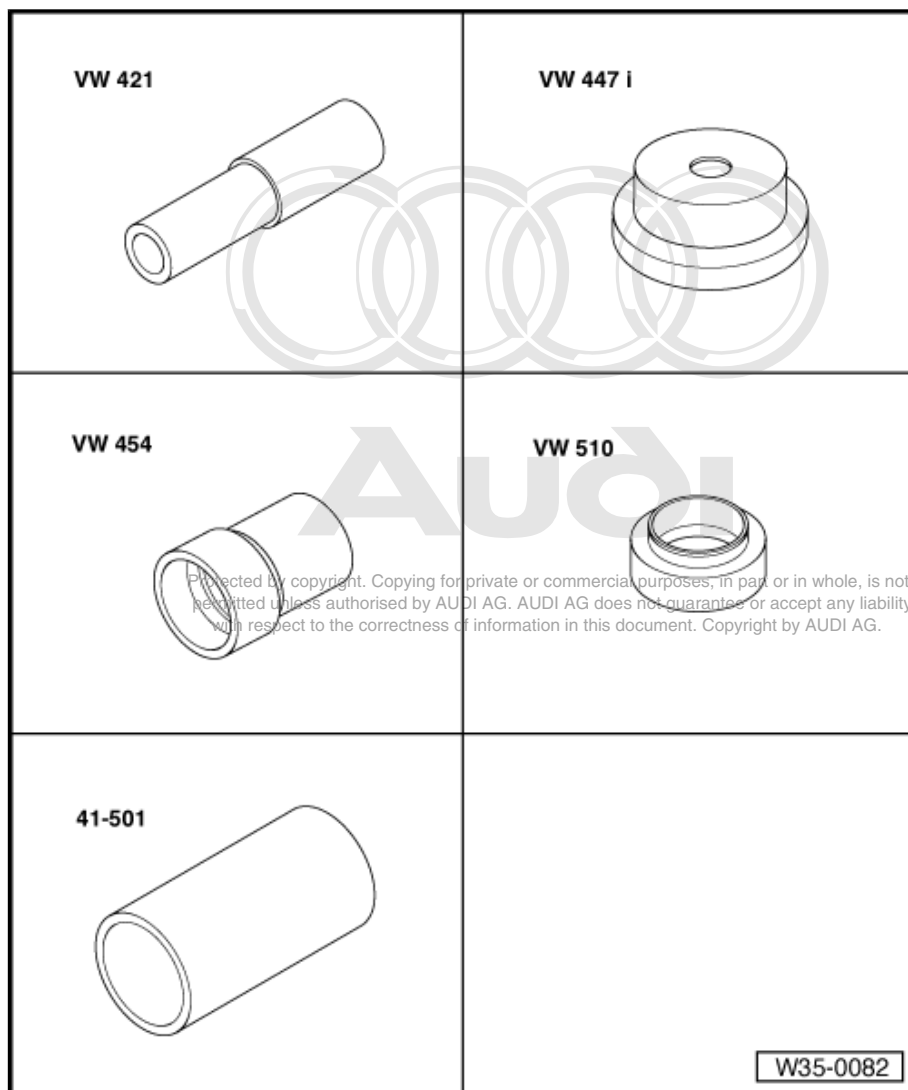
1.1 Dismantling and assembling input shaft

Special tools and workshop equipment required

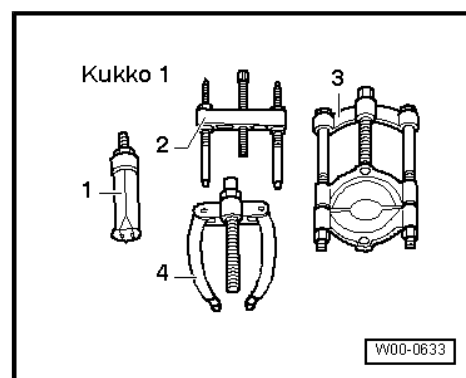
- ◆ Press tool -VW 407-
- ◆ Thrust plate -VW 447 H-
- ◆ Press tool -VW 412-
- ◆ Tube -VW 422-
- ◆ Thrust plate -VW 401-
- ◆ Press tool -VW 408 A-



- ◆ Tube -VW 421-
- ◆ Thrust plate -VW 447 i-
- ◆ Press tool -VW 454-
- ◆ Thrust pad -VW 510-
- ◆ Drift sleeve -41-501-



- ◆ -3- Splitter -Kukko 17/1-



Input shaft - exploded view of components



Note

- ◆ Refer to technical data when installing new gears ⇒ [page 2](#).
- ◆ The input shaft must be re-adjusted if the position of tapered roller bearings is affected when renewing parts. Table of adjustments ⇒ [page 160](#).

1 - Clutch housing

2 - Tapered roller bearing outer race

- ☐ Removing ⇒ [page 95](#)
- ☐ Pressing in ⇒ [page 95](#)

3 - Tapered roller bearing inner race

- ☐ Pressing off ⇒ [page 96](#)
- ☐ Pressing on ⇒ [page 96](#)

4 - Input shaft

- ☐ Adjusting ⇒ [page 99](#)

5 - 3rd gear wheel

- ☐ Shoulder faces towards 4th gear
- ☐ Pressing off ⇒ [page 96](#)
- ☐ Pressing on ⇒ [page 97](#)

6 - Circlip

- ☐ Renew

7 - 4th gear wheel

- ☐ Shoulder faces towards 3rd gear
- ☐ Pressing off with tapered roller bearing inner race and sleeve ⇒ [page 96](#)
- ☐ Pressing on ⇒ [page 97](#)

8 - Tapered roller bearing inner race

- ☐ Pressing off with 4th gear wheel and sleeve ⇒ [page 96](#)
- ☐ Pressing on ⇒ [page 97](#)

9 - Thrust washer

10 - Tapered roller bearing outer race

- ☐ Pressing out ⇒ [page 98](#)
- ☐ Pressing in ⇒ [page 98](#)

11 - Shim

- ☐ Determining thickness ⇒ ["1.2 Adjusting input shaft", page 99](#)

12 - Gearbox housing

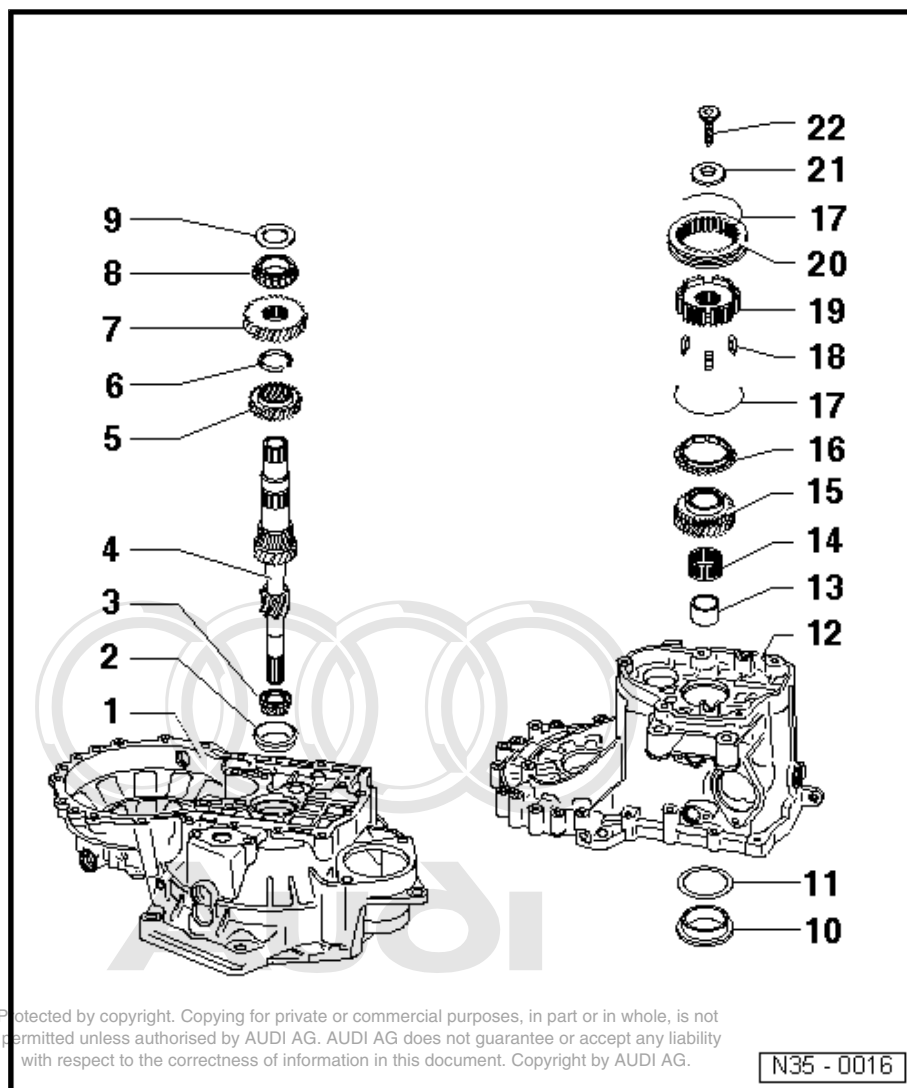
13 - Sleeve

- ☐ For needle bearing
- ☐ Pressing off with 4th gear wheel and tapered roller bearing inner race ⇒ [page 96](#)
- ☐ Pressing on ⇒ [page 97](#)
- ☐ Fit thrust washer ⇒ [Item 9 \(page 94\)](#) before installing

14 - Needle bearing

15 - 5th speed selector gear

- ☐ Pulling off together with 5th gear synchronising hub ⇒ [page 69](#)



16 - 5th gear synchro-ring

- ☐ With cast locking pieces ⇒ [page 74](#)
- ☐ Checking for wear ⇒ [page 74](#)

17 - Spring

- ☐ Installation position ⇒ [page 98](#)

18 - Locking pieces

- ☐ 3 x
- ☐ Installation position ⇒ [page 98](#)

19 - 5th gear synchronising hub

- ☐ Removing and installing ⇒ [page 66](#)

20 - 5th gear locking collar

- ☐ Removing and installing ⇒ [page 66](#)

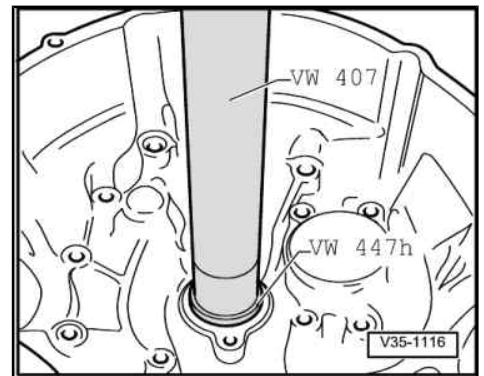
21 - Dished spring

- ☐ Installation position ⇒ [page 75](#)

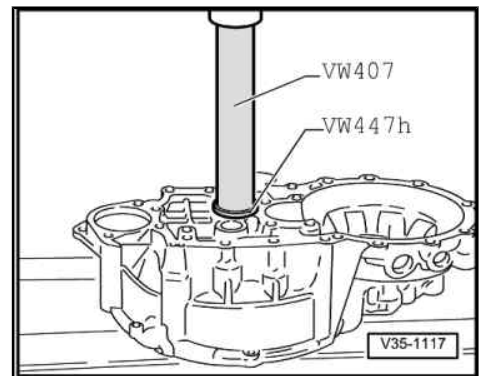
22 - Torx socket head bolt, 80 Nm

- ☐ Fitted piece on bolt head holds dished spring in position ⇒ [page 75](#)
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Pressing out tapered roller bearing outer race

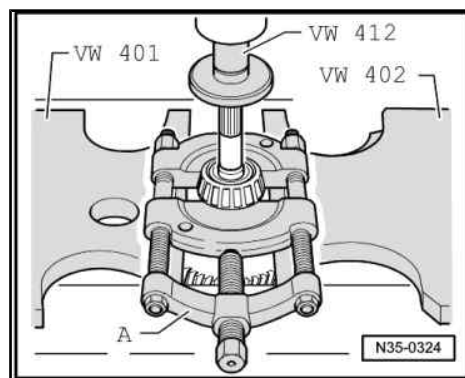


Pressing in tapered roller bearing outer race

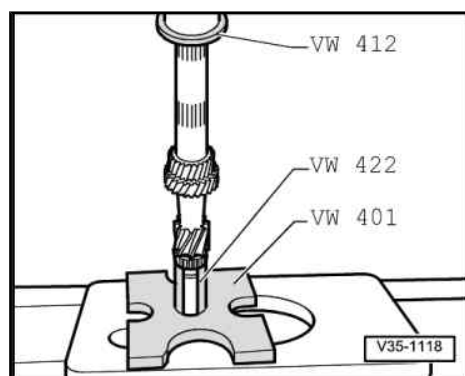


Pressing off tapered roller bearing inner race

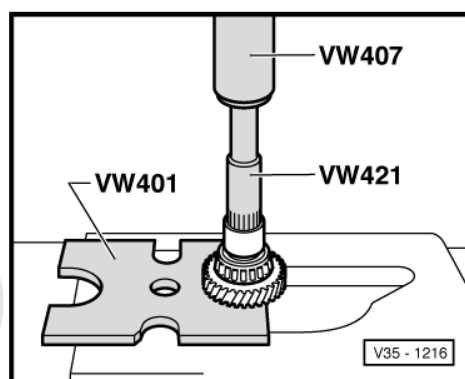
A - Splitter -Kukko 17/1-



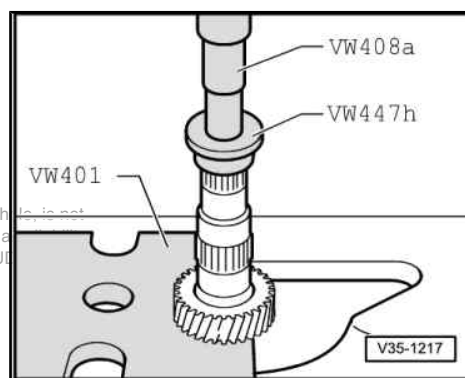
Pressing on tapered roller bearing inner race



Pressing off 4th gear wheel with tapered roller bearing and sleeve

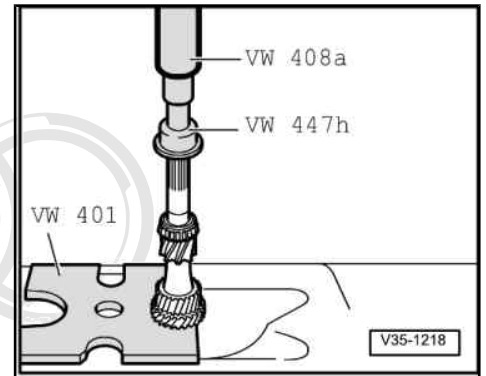


Pressing off 3rd gear wheel



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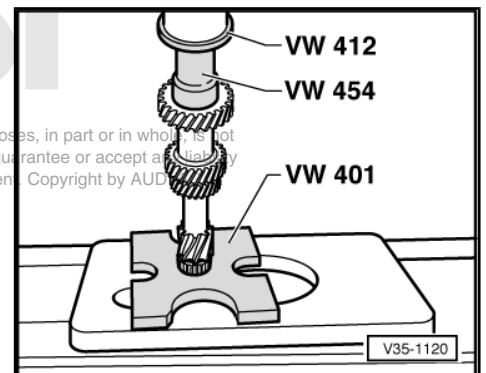
Pressing on 3rd gear wheel



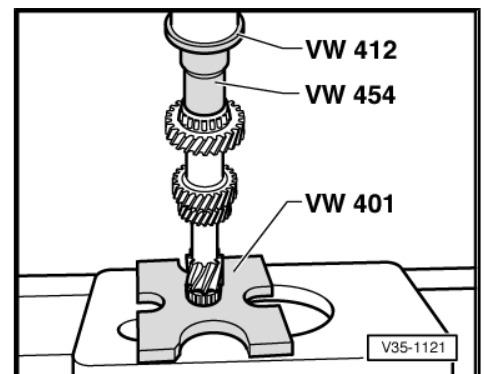
Pressing on 4th gear wheel

- Shoulder faces towards 3rd gear.

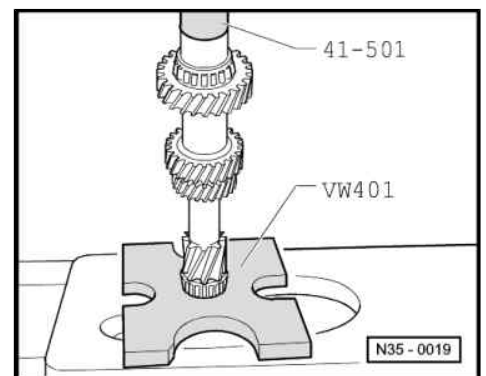
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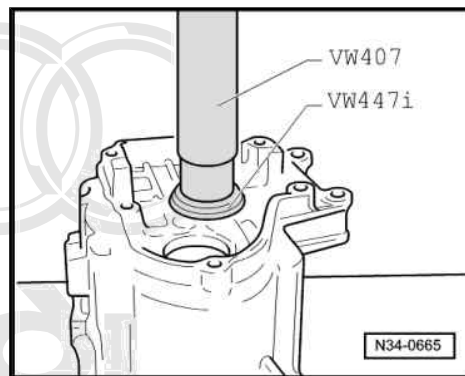
Pressing on tapered roller bearing inner race



Pressing on sleeve for needle bearing



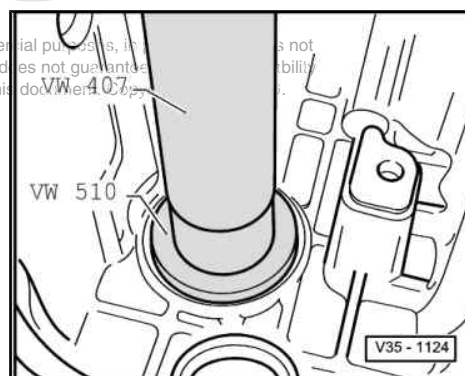
Pressing out tapered roller bearing outer race



Pressing in tapered roller bearing outer race

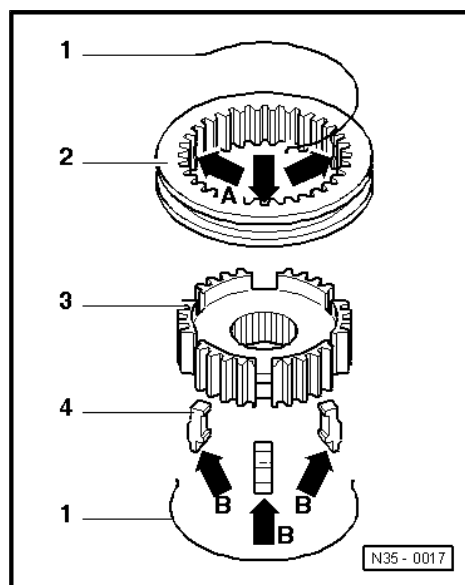
- Install with shim after adjusting input shaft.

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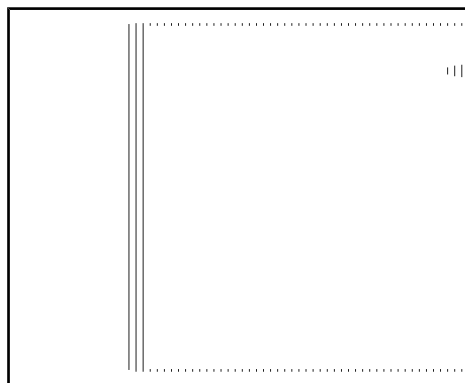
5th gear synchromesh

- 1 - Springs for locking pieces
- 2 - Locking collar with 3 recesses -arrows A- for locking pieces -item 4-
- 3 - Synchronising hub
- 4 - Locking pieces - Installation position: The thin extension -arrow B- faces the pointed teeth of the locking collar -item 2-



Assembling 5th gear locking collar/synchronising hub

- Slide locking collar onto synchro-hub.
- Pointed teeth -A- and shoulder -B- of synchronising hub face in same direction.
- The recesses for the locking pieces in the locking collar and synchronising hub must be aligned ⇒ [page 98](#) .
- Insert locking pieces.
- Installation position ⇒ [page 98](#)
- Insert springs offset by 120° underneath lug -C-.
- Angled ends of spring must be in front of locking pieces -arrows-.



Modified springs for 5th gear synchromesh from gearbox build date 05 11 1

Springs with angled ends -A- were introduced gradually from stated build date.

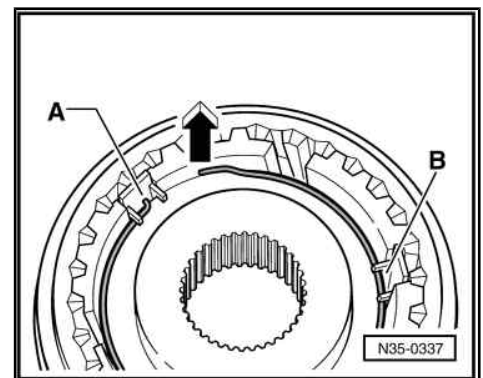
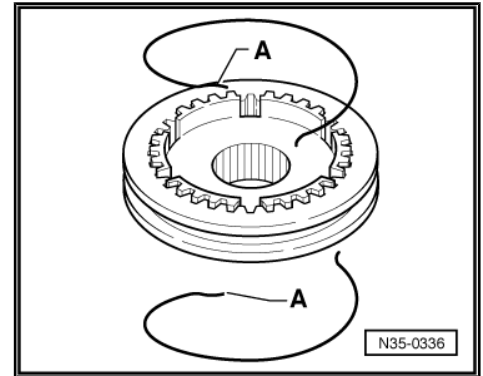


Note

- ◆ *The modified springs are fitted on both sides.*
- ◆ *On gearboxes of the earlier type, the modified springs can only be installed in combination with hollow locking pieces.*
- ◆ *Fitting locking pieces ⇒ [page 98](#).*

Installation position of springs:

- Insert springs offset by 120°.
- Angled end -A- of spring must locate in hollow locking piece.
- Spring must be fitted under lug -B- of locking pieces.
- The offset end must point away from the synchronising hub (in direction of -arrow-).



1.2 Adjusting input shaft

Determining thickness of shim for input shaft

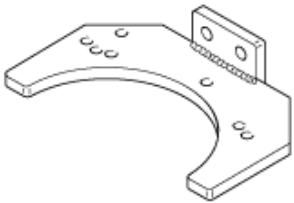
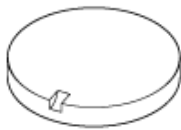
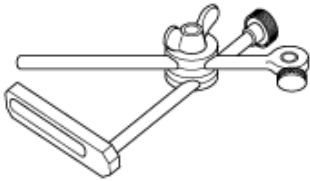
The input shaft must be re-adjusted when the following components are renewed:

- ◆ Gearbox housing
- ◆ Clutch housing
- ◆ Input shaft
- ◆ 4th gear wheel
- ◆ Tapered roller bearings

Table of adjustments ⇒ [page 160](#)

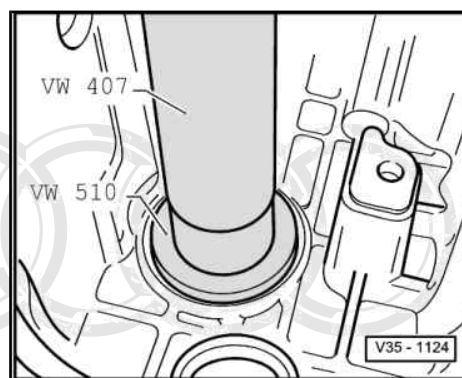
Special tools and workshop equipment required

- ◆ Gearbox support -VW 353-
- ◆ End measuring plate - VW 385/17-
- ◆ Universal dial gauge bracket -VW 387-
- ◆ Thrust plate -VW 447 i-
- ◆ Thrust pad -VW 510-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Dial gauge

VW 353 	VW 385/17 
VW 387 	VW 447 i 
VW 510 	V.A.G 1331  W35-0083

Procedure

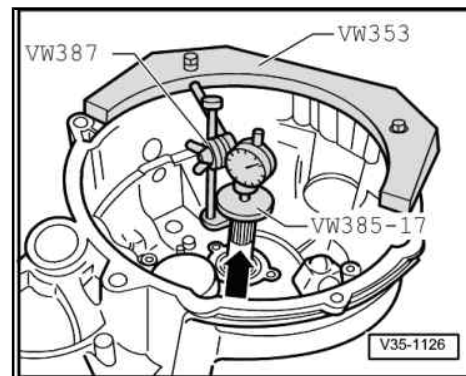
- Press tapered roller bearing outer race (without shim) into gearbox housing onto stop using thrust pad -VW 510- .
- Insert input shaft in clutch housing and fit gearbox housing.
- Tighten bolts to 25 Nm.



- Fit measuring appliance and dial gauge in clutch housing, as shown in illustration.
- Large tapered roller bearing in gearbox housing.
- Before measurement, rotate input shaft to allow tapered roller bearings to settle.
- Set dial gauge to “0” with a preload of 1 mm.

 Note

This procedure must be repeated for each subsequent measurement, as otherwise the dial gauge will not return to its original setting.



- Move input shaft towards dial gauge in direction of -arrow-.
- Read off bearing clearance on gauge and note reading (example: 1.21 mm).

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 Note

Dial gauge does not return to original setting by itself.

- Select required shim thickness from following table (example: 1.175 mm).

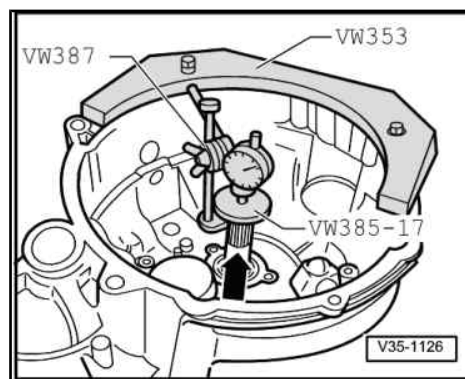
Bearing clearance Measured value (mm)	Available shims Thickness of shims in mm 1)	Bearing clearance Measured value (mm)	Available shims Thickness of shims in mm 1)
0.671 ... 0.699	0.650	1.250 ... 1.274	1.225
0.700 ... 0.724	0.675	1.275 ... 1.299	1.250
0.725 ... 0.749	0.700	1.300 ... 1.324	1.275
0.750 ... 0.774	0.725	1.325 ... 1.349	0.650 + 0.650
0.775 ... 0.799	0.750	1.350 ... 1.374	0.650 + 0.675
0.800 ... 0.824	0.775	1.375 ... 1.399	0.675 + 0.675
0.825 ... 0.849	0.800	1.400 ... 1.424	0.675 + 0.700
0.850 ... 0.874	0.825	1.425 ... 1.449	0.700 + 0.700
0.875 ... 0.899	0.850	1.450 ... 1.474	0.700 + 0.725
0.900 ... 0.924	0.875	1.475 ... 1.499	0.725 + 0.725
0.925 ... 0.949	0.900	1.500 ... 1.524	0.725 + 0.750
0.950 ... 0.974	0.925	1.525 ... 1.549	0.750 + 0.750
0.975 ... 0.999	0.950	1.550 ... 1.574	0.750 + 0.775
1.000 ... 1.024	0.975	1.575 ... 1.599	0.775 + 0.775
1.025 ... 1.049	1.000	1.600 ... 1.624	0.775 + 0.800
1.050 ... 1.074	1.025	1.625 ... 1.649	0.800 + 0.800
1.075 ... 1.099	1.050	1.650 ... 1.674	0.800 + 0.825
1.100 ... 1.124	1.075	1.675 ... 1.699	0.825 + 0.825
1.125 ... 1.149	1.100	1.700 ... 1.724	0.825 + 0.850
1.150 ... 1.174	1.125	1.725 ... 1.749	0.850 + 0.850
1.175 ... 1.199	1.150	1.750 ... 1.774	0.850 + 0.875
1.200 ... 1.224	1.175	1.775 ... 1.791	0.875 + 0.875
1.225 ... 1.249	1.200		

Bearing clearance Measured value (mm)	Available shims Thickness of shims in mm 1)	Bearing clearance Measured value (mm)	Available shims Thickness of shims in mm 1)
1) For Part No. refer to ⇒ Parts catalogue .			

- Remove input shaft and press tapered roller bearing outer race out of gearbox housing using thrust plate -VW 447 i- .
- Press tapered roller bearing outer race with determined shim into gearbox housing onto stop using thrust pad -VW 510- .
- Insert input shaft in clutch housing and fit gearbox housing.
- Tighten bolts to 25 Nm and turn 90° further.

Checking adjustment

- Fit measuring appliance and dial gauge in clutch housing.
- **Before measurement, rotate input shaft to allow tapered roller bearings to settle.**
- Set dial gauge to "0" with a preload of 1 mm.
- Move input shaft towards dial gauge in direction of -arrow-.
- Read off bearing clearance from dial gauge:
 - min.: 0.01 mm.
 - max. 0.09 mm.



Note

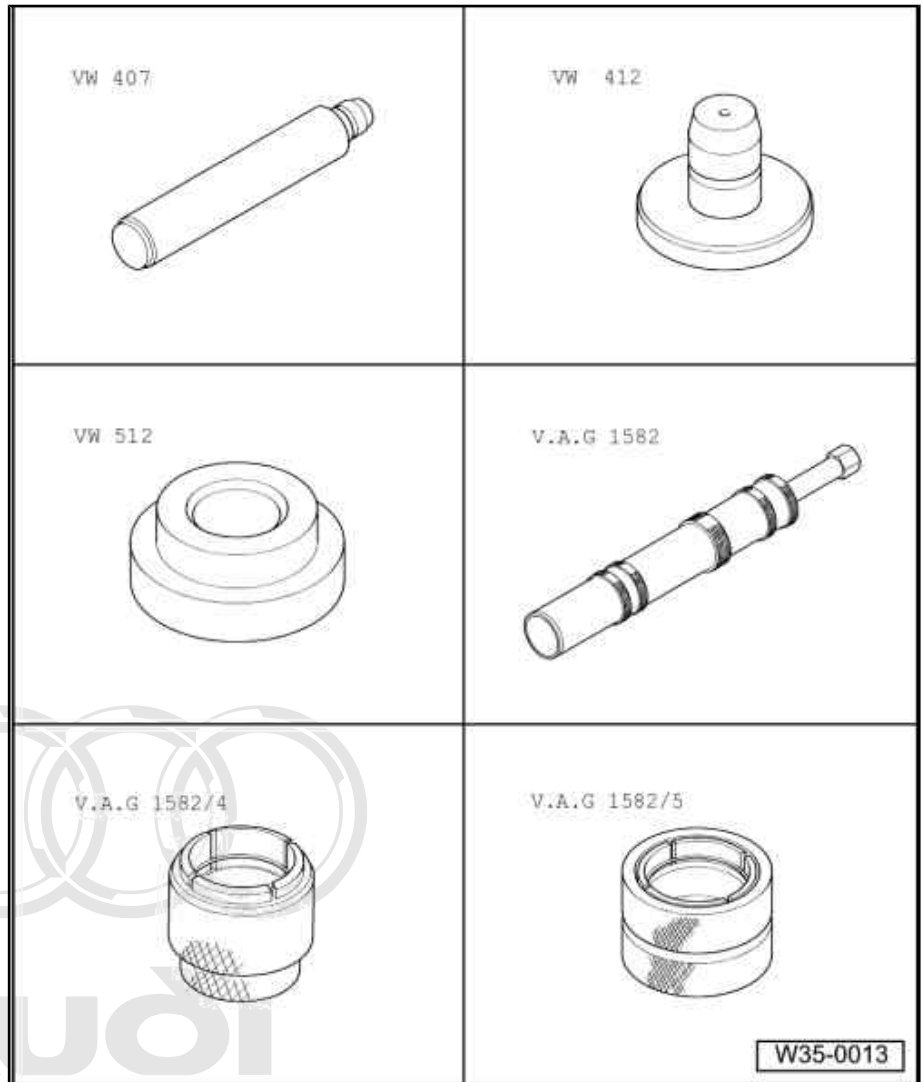
If the bearing clearance is not measurable, but input shaft play is perceptible and the input shaft turns freely, the adjustment is acceptable.

2 Servicing output shaft

2.1 Dismantling and assembling output shaft

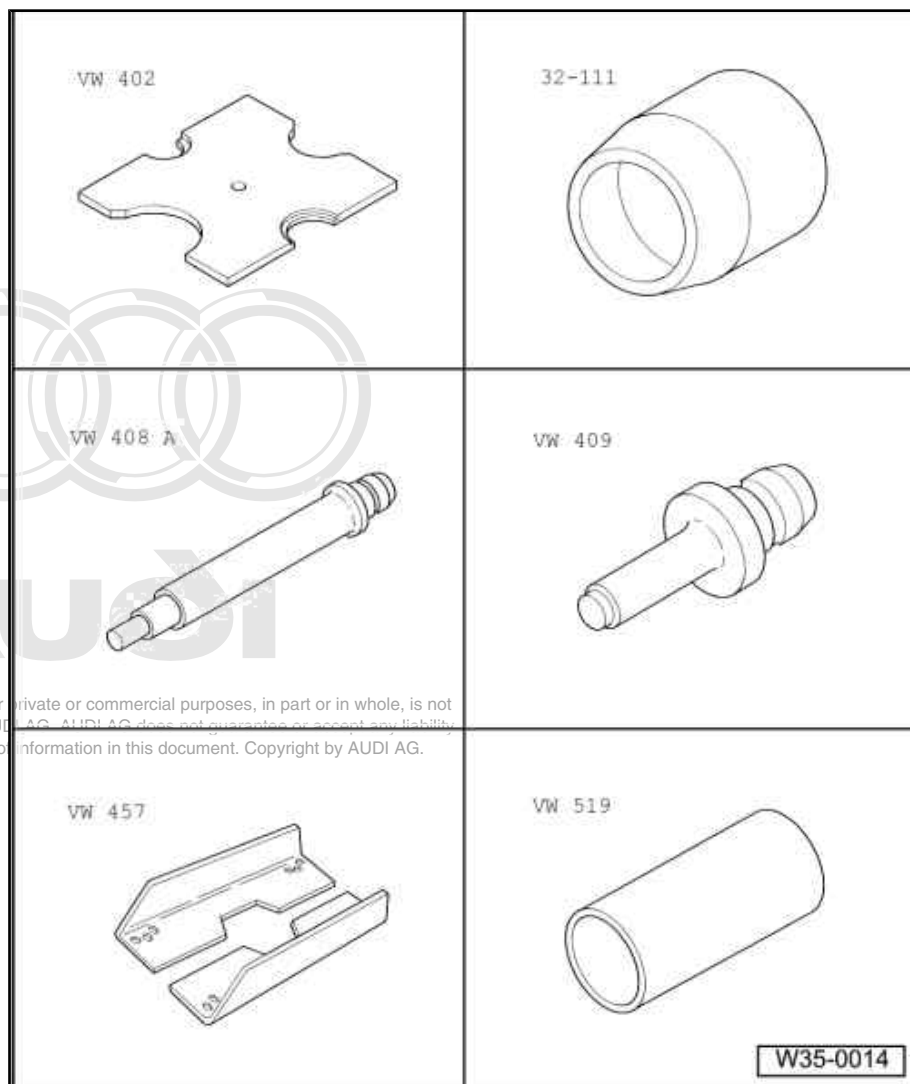
Special tools and workshop equipment required

- ◆ Press tool -VW 407-
- ◆ Press tool -VW 412-
- ◆ Thrust pad -VW 512-
- ◆ Puller -V.A.G 1582-
- ◆ Adapter -V.A.G 1582/4-
- ◆ Adapter -V.A.G 1582/5-



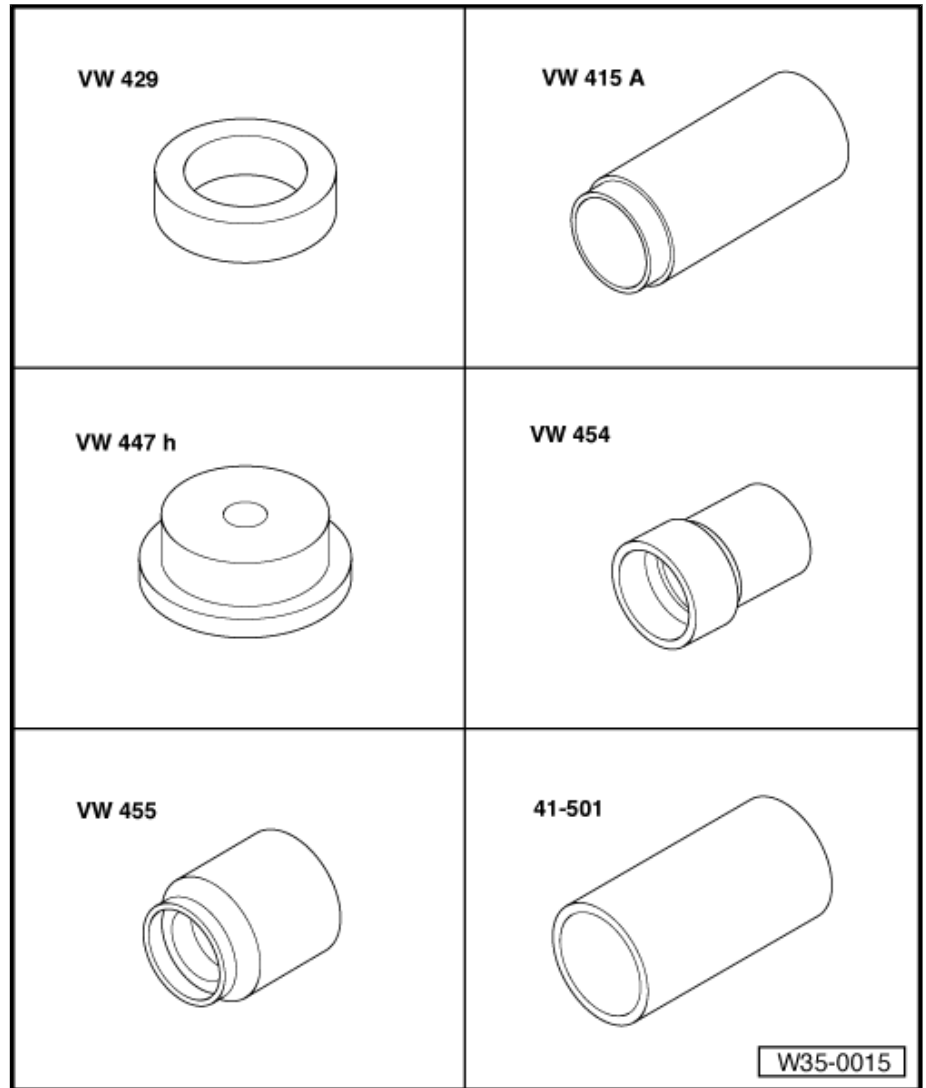
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- ◆ Thrust plate -VW 402-
- ◆ Thrust piece -32-111-
- ◆ Press tool -VW 408 A-
- ◆ Press tool -VW 409-
- ◆ Support rails -VW 457-
- ◆ Tube -VW 519-

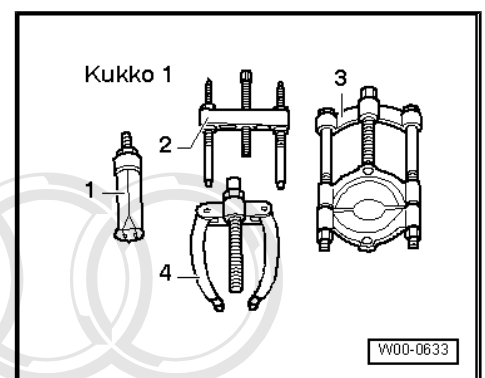


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- ◆ Thrust ring -VW 429-
- ◆ Tube -VW 415 A-
- ◆ Thrust plate -VW 447 H-
- ◆ Press tool -VW 454-
- ◆ Installing sleeve -VW 455-
- ◆ Drift sleeve -41-501-



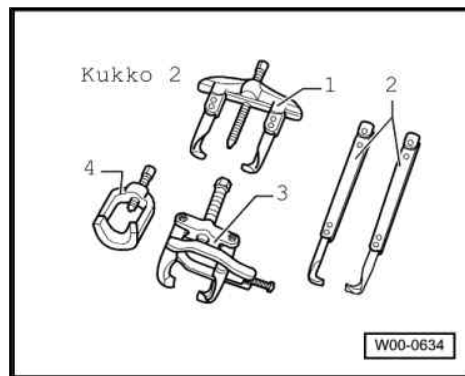
- ◆ -1- Internal puller -Kukko 21/6-



- ◆ -3- Splitter -Kukko 17/2-
- ◆ -4- Counter-support -Kukko 22/2-

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- ◆ -1- Two-arm puller -Kukko 20/10- with 250 mm long hooks



- ◆ Hexagon bolt M10x20

Output shaft - exploded view of components



Note

- ◆ Refer to technical data ⇒ [page 2](#) when installing new gears or a new output shaft.
- ◆ Always renew both tapered roller bearings together.
- ◆ The output shaft must be re-adjusted if the position of tapered roller bearings is affected when renewing parts. Table of adjustments ⇒ [page 160](#).



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1 - Hexagon nut, 25 Nm + tighten 90° (1/4 turn) further

- ☐ 4x for bearing mounting

2 - Clutch housing

3 - Shim

- ☐ For output shaft
- ☐ Table of adjustments
⇒ [page 160](#)

4 - Small tapered roller bearing outer race

- ☐ Removing ⇒ [page 109](#)
- ☐ Pressing in
⇒ [page 109](#)

5 - Small tapered roller bearing inner race

- ☐ Pulling off ⇒ [page 110](#)
- ☐ Pressing on
⇒ [page 110](#)

6 - Output shaft

- ☐ Paired with final drive gear wheel, always renew as a set
- ☐ Dismantling:
 - Position splitter under 2nd selector gear
⇒ [Item 19 \(page 108\)](#) and press off
⇒ [page 110](#) .
 - Remove circlip
⇒ [Item 15 \(page 108\)](#) .
 - Fit two-arm puller under bearing mounting ⇒ [Item 9 \(page 107\)](#) and pull off 1st and 2nd gear locking collar and synchronising hub ⇒ [page 110](#)
- ☐ Adjusting ⇒ [page 117](#)

7 - Large tapered roller bearing inner race

- ☐ Pulling off ⇒ [page 111](#)
- ☐ Pressing on ⇒ [page 111](#)

8 - Seal

- ☐ 4 x
- ☐ Fit onto bearing mounting bolts

9 - Bearing mounting

- ☐ With large tapered roller bearing outer race and bolts
- ☐ Only renew outer race together with large tapered roller bearing and bearing mounting

10 - Thrust washer

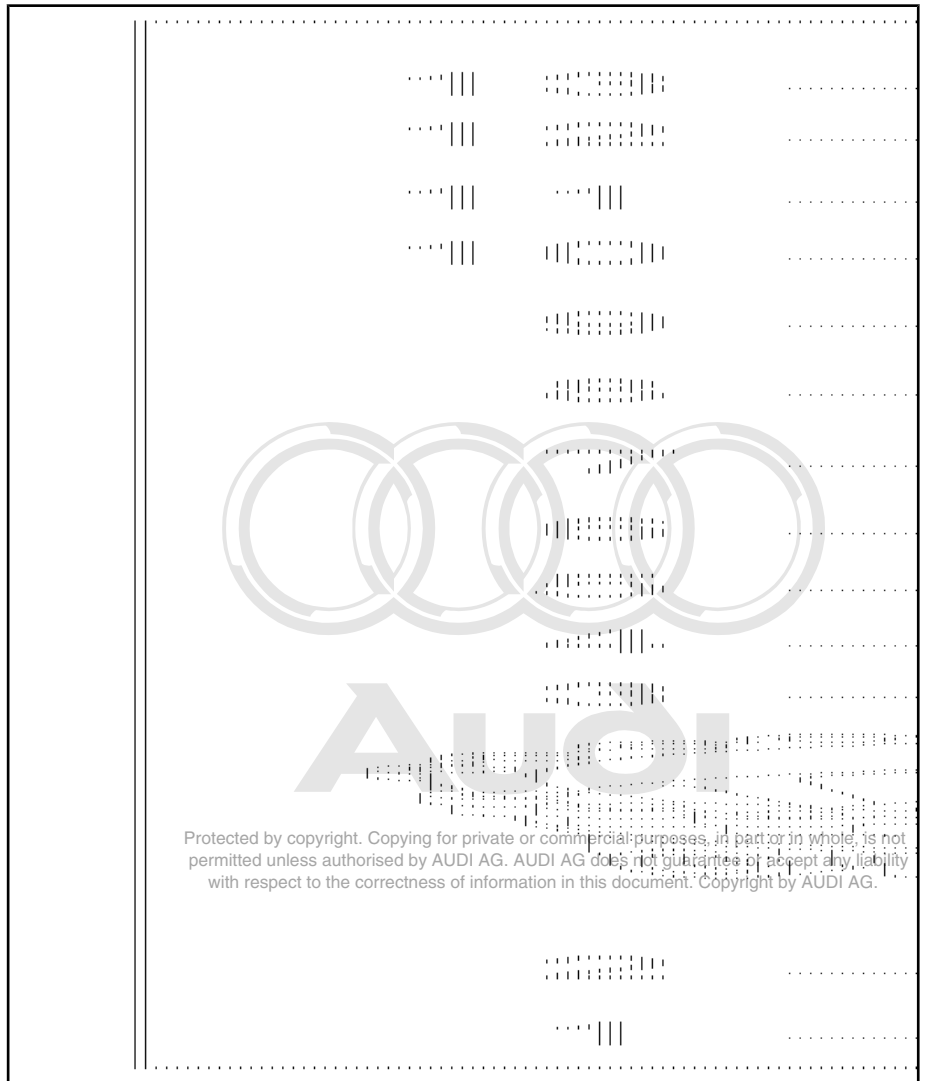
- ☐ Shoulder on thrust washer faces towards tapered roller bearing

11 - 1st speed selector gear

- ☐ Modified 1st gear synchromesh from gearbox build date 04 09 0 ⇒ [page 116](#)

12 - Needle bearing

- ☐ For 1st gear



13 - 1st gear synchro-ring

- ☐ Checking for wear ⇒ [page 111](#)
- ☐ Identification ⇒ [page 112](#)
- ☐ Modified 1st gear synchromesh from gearbox build date 04 09 0 ⇒ [page 116](#)

14 - Locking collar with synchronising hub for 1st and 2nd gear

- ☐ Pull off together with bearing mounting ⇒ [Item 15 \(page 108\)](#) after removing circlip ⇒ [page 110](#)
- ☐ Dismantling ⇒ [page 111](#)
- ☐ Assembling locking collar/synchronising hub ⇒ [page 111](#) and ⇒ [page 112](#)
- ☐ Installation position ⇒ [page 112](#)
- ☐ Pressing on ⇒ [page 112](#)
- ☐ Modified 1st gear synchromesh from gearbox build date 04 09 0 ⇒ [page 116](#)

15 - Circlip**16 - 2nd gear synchro-ring**

- ☐ Identification ⇒ [page 112](#)
- ☐ Checking for wear ⇒ [page 113](#)
- ☐ Assemble so that the recesses engage on the locking pieces on the locking collar ⇒ [Item 14 \(page 108\)](#)

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17 - Outer ring

- ☐ Insert in synchro-ring ⇒ [Item 16 \(page 108\)](#) ; installation position ⇒ [page 113](#)
- ☐ Renew if scored or if there are visible traces of wear

18 - Synchro-ring (inner ring)

- ☐ Checking for wear ⇒ [page 113](#)
- ☐ Check lugs for scoring
- ☐ Installation position ⇒ [page 114](#)

19 - 2nd speed selector gear

- ☐ Installation position ⇒ [page 114](#)

20 - Needle bearing

- ☐ For 2nd gear

21 - Thrust washer**22 - Sleeve for 3rd gear needle bearing**

- ☐ Pressing off with 2nd speed selector gear ⇒ [page 110](#)
- ☐ Pressing on ⇒ [page 114](#)

23 - Needle bearing

- ☐ For 3rd gear

24 - 3rd speed selector gear**25 - 3rd gear synchro-ring**

- ☐ Checking for wear ⇒ [page 111](#)

26 - Locking collar with synchronising hub for 3rd and 4th gear

- ☐ Pressing off with 2nd speed selector gear ⇒ [Item 19 \(page 108\)](#) and 3rd speed selector gear ⇒ [Item 24 \(page 108\)](#) ⇒ [page 110](#)
- ☐ Dismantling ⇒ [page 114](#)
- ☐ Installation position: Locking collar/synchronising hub ⇒ [page 115](#)
- ☐ Assembling locking collar/synchronising hub ⇒ [page 114](#) and ⇒ [page 115](#)
- ☐ Pressing on ⇒ [page 115](#)

27 - Sleeve

- ☐ For needle bearing
- ☐ Pressing off with locking collar and synchronising hub for 3rd and 4th gear ⇒ [Item 26 \(page 108\)](#) ⇒ [page 110](#)

- ☐ Pressing on ⇒ [page 115](#)

28 - Needle bearing

- ☐ For 4th gear

29 - 4th gear synchro-ring

- ☐ Checking for wear ⇒ [page 111](#)

30 - 4th speed selector gear

31 - Thrust washer

32 - Needle bearing

- ☐ For output shaft
- ☐ Removing and installing ⇒ [page 80](#)

33 - Gearbox housing

34 - Sleeve

- ☐ For needle bearing/input shaft
- ☐ Pressing off ⇒ [page 110](#)
- ☐ Pressing on ⇒ [page 116](#)

35 - 5th gear wheel

- ☐ Removing and installing ⇒ [page 66](#)

36 - Dished spring

- ☐ Installation position ⇒ [page 75](#)

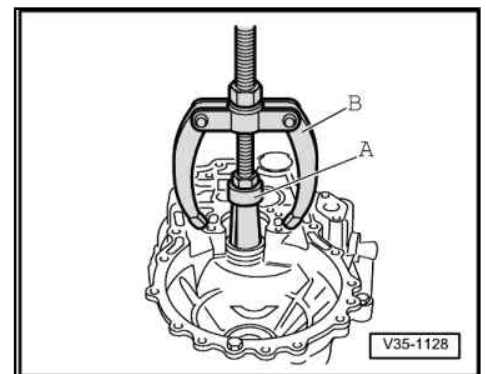
37 - Torx socket head bolt M10, 80 Nm

- ☐ Fitted piece on bolt head holds dished spring in position

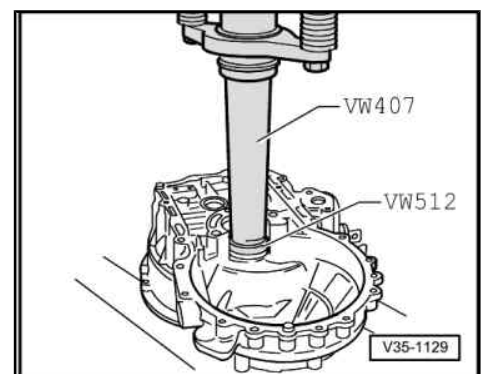
Pulling out outer race for small tapered roller bearing

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

B - Counter-support -Kukko 22/2-



Pressing in outer race for small tapered roller bearing

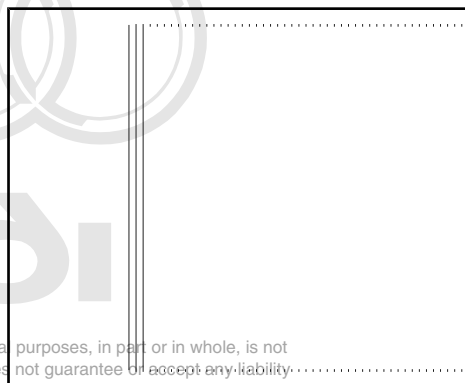


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Pulling off inner race for small tapered roller bearing

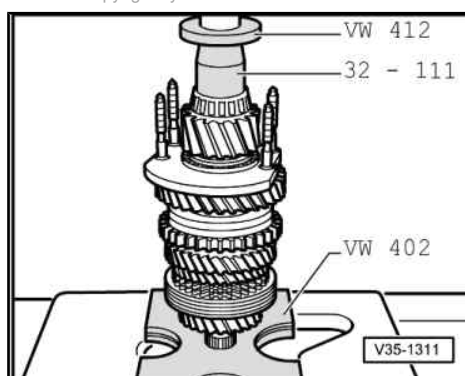
A - Soft jaws/vice

- Fit adapter and apply tension to it behind the bearing rollers, then turn bearing and re-tension adapter.



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Pressing on inner race for small tapered roller bearing



Pressing off 3rd and 4th gear synchronising hub/locking collar; 2nd, 3rd and 4th speed selector gears with needle bearing sleeve for gearbox housing

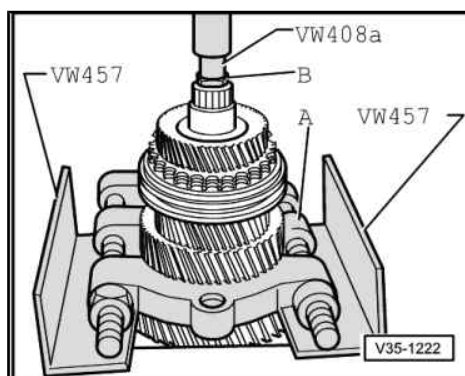
A - Splitter 22 ... 115 mm -Kukko 17/2-

B - Hexagon bolt M10x20



Note

Support splitter so that the 1st and 2nd gear locking collar is not pulled off at the same time.



Pulling off locking collar with synchronising hub via bearing mounting

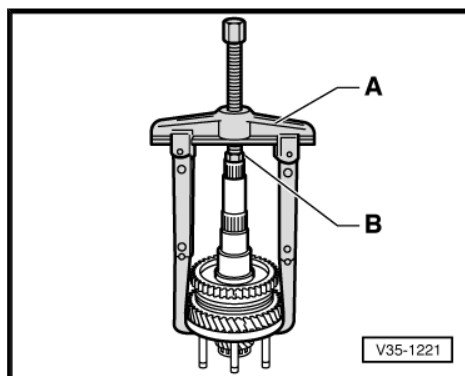
A - Two-arm puller -Kukko 20/10- with 250 mm long hooks

B - Hexagon bolt M10x20



Note

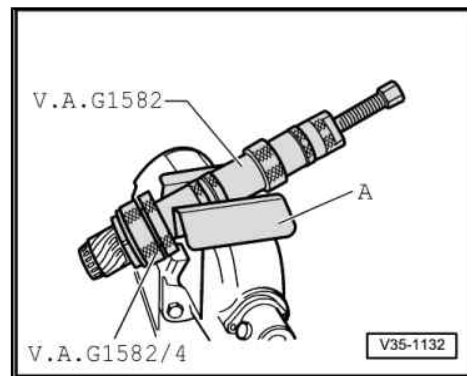
Remove circlip before pulling out individual components.



Pulling off inner race for large tapered roller bearing

A - Jaw protectors

- Before applying puller, insert an M10 x 20 hexagon bolt in hole in output shaft.

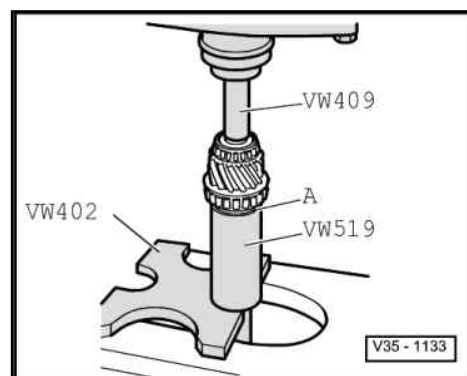


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Pressing on inner race for large tapered roller bearing

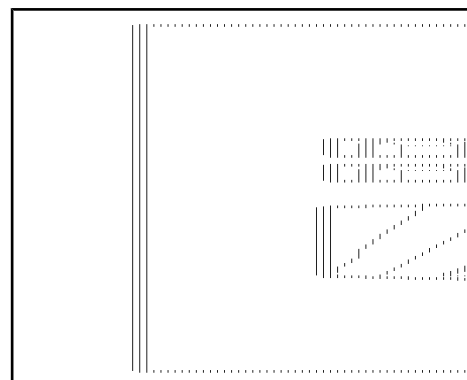
A - Thrust washer

- Fit thrust washer before pressing on inner race.
- Shoulder faces towards inner race.



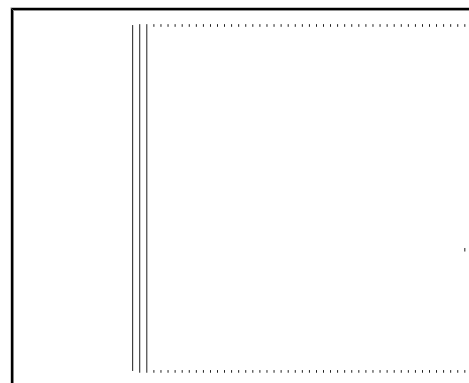
Checking 1st, 3rd and 4th gear synchro-rings for wear

- Press synchro-ring against tapered seat on selector gear and measure gap -a- using a feeler gauge.
- Specified gap: 1.0 ... 1.7 mm.
- Wear limit 0.5 mm.



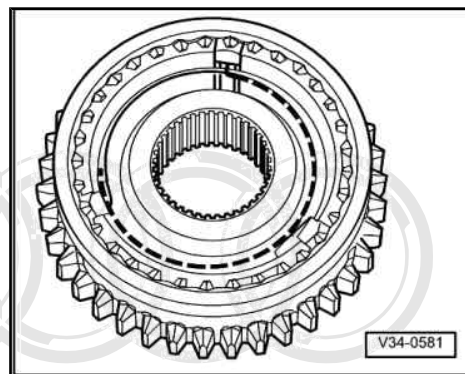
Dismantling and assembling 1st and 2nd gear locking collar and synchronising hub

- 1 - Spring
 - 2 - Locking collar
 - 3 - Synchronising hub
 - 4 - Locking piece
- Slide locking collar onto synchro-hub.
 - The wider shoulder of the synchronising hub -arrow A- and the outer splines of the locking collar -arrow B- face in opposite directions after assembly.
 - Recesses for locking pieces on synchronising hub and locking collar must align.



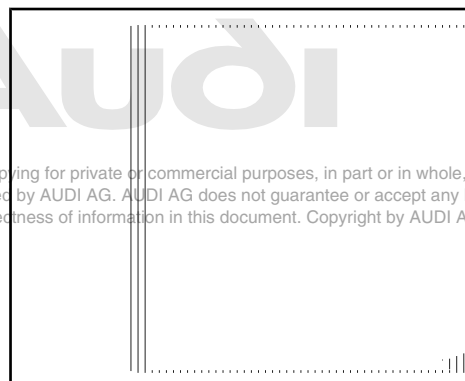
Assembling 1st and 2nd gear locking collar/synchronising hub

- Locking collar is pushed over synchronising hub.
- Insert locking pieces and install springs 120° off-set.
- Angled end of spring must locate in hollow locking piece.



Installation position of 1st and 2nd gear locking collar/synchronising hub

- Splines on locking collar -arrow 1- point to splines for 3rd/4th gear synchronising hub -A-.
- The wide shoulder of the synchronising hub -arrow 2- then faces to 1st gear -B-.

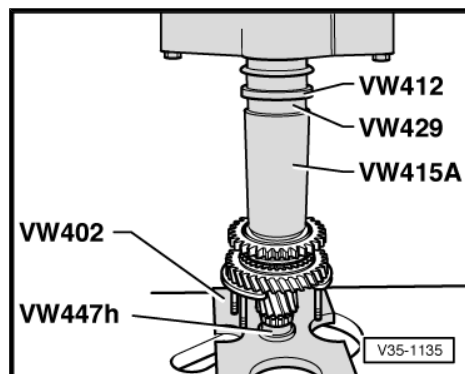


Pressing on 1st and 2nd gear locking collar/synchronising hub



Note

Position 1st gear synchro-ring onto 1st speed selector gear before pressing on.



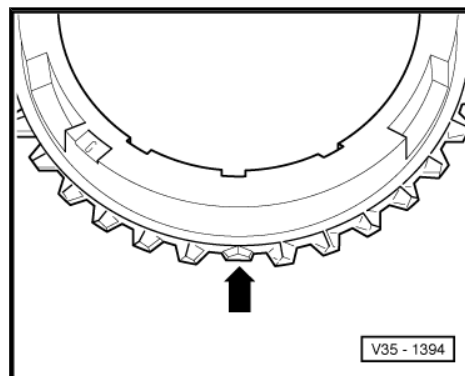
Identification of 1st and 2nd gear synchro-rings

- ◆ 1st gear synchro-ring: 3 x 1/2 teeth -arrow- ground down.
- ◆ 2nd gear synchro-ring: 3 x 1/2 teeth -arrow- or 2 x 1/2 teeth ground down.



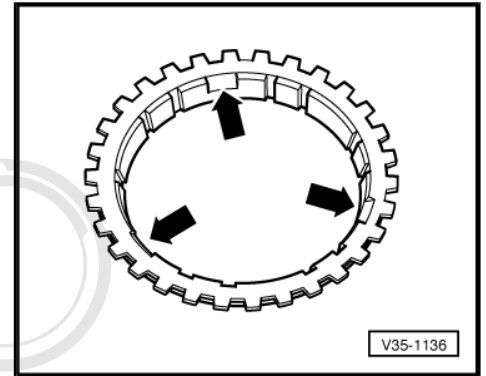
Note

Only the version with "2 x ground-down 1/2 teeth" is available as a spare part for the 2nd gear synchro-ring.



Distinguishing 1st and 2nd gear synchro-rings

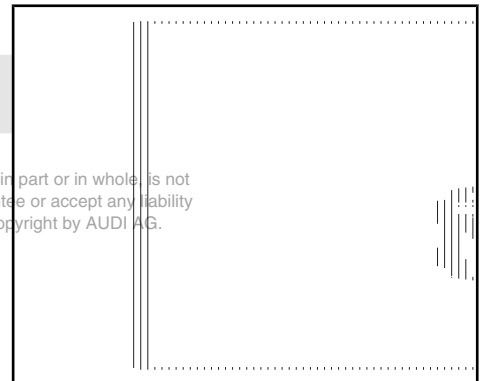
- ◆ 1st gear synchro-ring: no recesses.
- ◆ 2nd gear synchro-ring: 3 recesses -arrows-.



Checking 2nd gear synchro-ring for wear

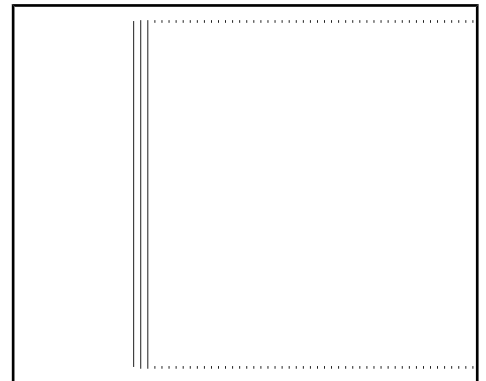
- Press synchro-ring, outer ring and inner ring against tapered seat on selector gear and measure gap -a- using a feeler gauge.
- Specified gap: 1.2 ... 1.8 mm.
- Wear limit 0.5 mm.

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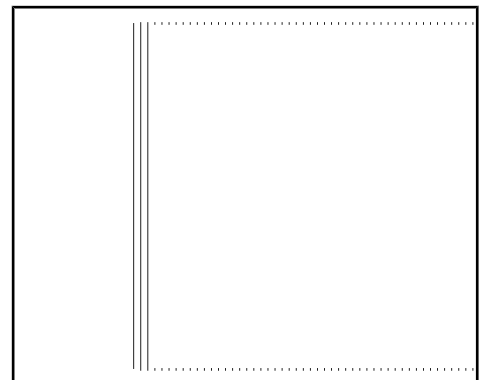
Installation position of outer ring

- The lugs -arrows- face towards 1st gear -A-.



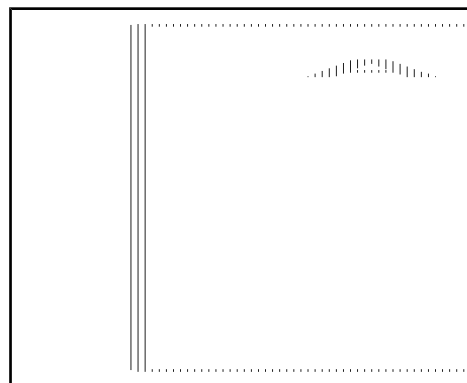
Checking inner ring for 2nd gear for wear

- Press inner ring onto tapered seat on selector gear for 2nd gear and measure gap -a- using a feeler gauge.
- Specified gap: 0.75 ... 1.25 mm.
- Wear limit 0.3 mm.



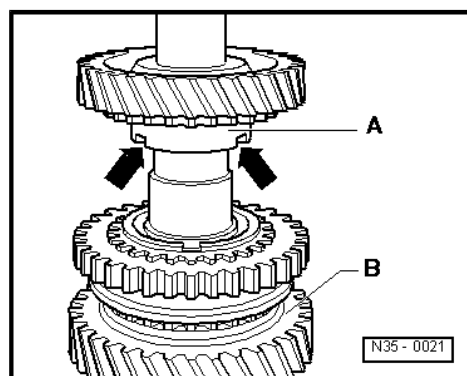
Installation position of synchro-ring (inner ring) -A-

- The lugs -arrow 1- locate in the recesses -arrow 2- in the synchro-ring -B-.

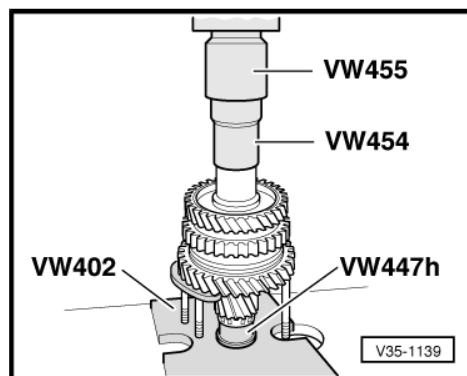


Installation position of 2nd speed selector gear

- The higher shoulder -A- faces towards 1st gear -B-.
- The recesses in the shoulder -arrows- engage on the lugs on the outer ring → [page 113](#) .



Pressing on sleeve for 3rd gear needle bearing



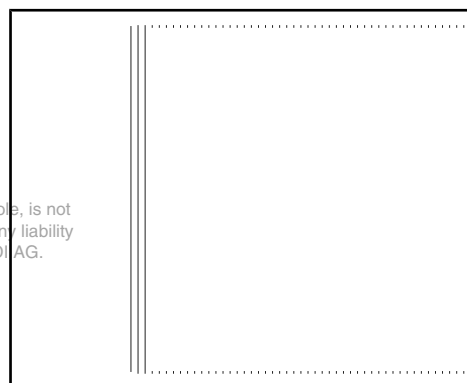
Dismantling and assembling 3rd and 4th gear locking collar and synchronising hub

- 1 - Spring
- 2 - Locking piece
- 3 - Locking collar

- 4 - Synchronising hub
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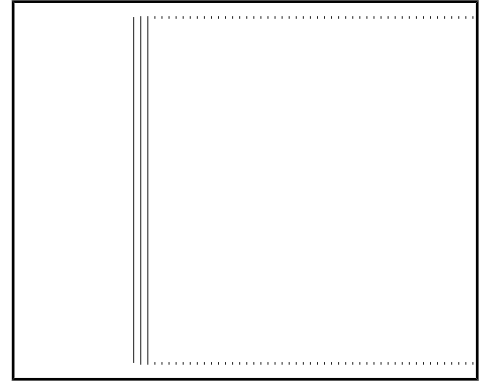
– Slide locking collar onto synchro-hub.

- Recesses for locking pieces in synchronising hub and locking collar must align.



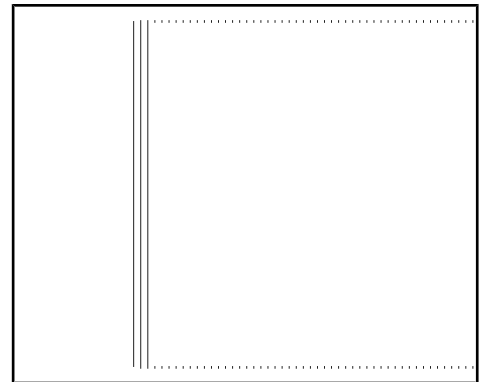
Assembling 3rd and 4th gear locking collar/synchronising hub

- Locking collar is pushed over synchronising hub.
- Insert locking pieces and install springs 120° off-set.
- Angled end of spring must locate in hollow locking piece.

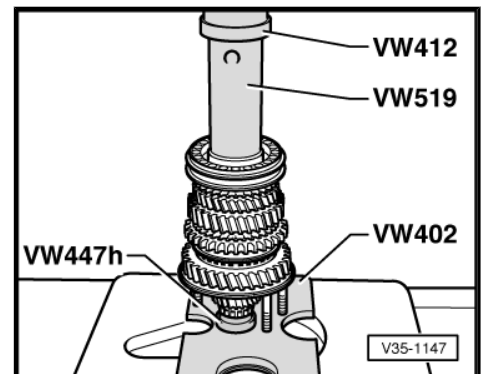


Installation position of 3rd and 4th gear locking collar/synchronising hub

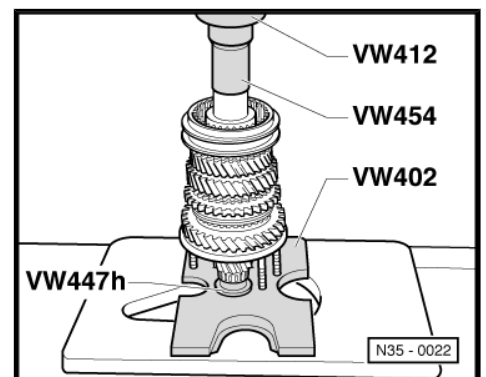
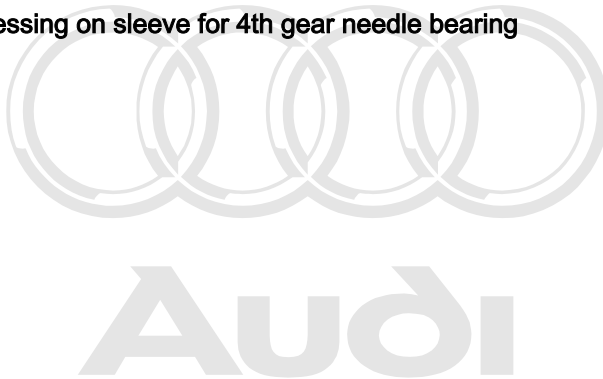
- Chamfer -arrow- faces towards 4th gear.



Pressing on 3rd and 4th gear synchronising hub with locking collar

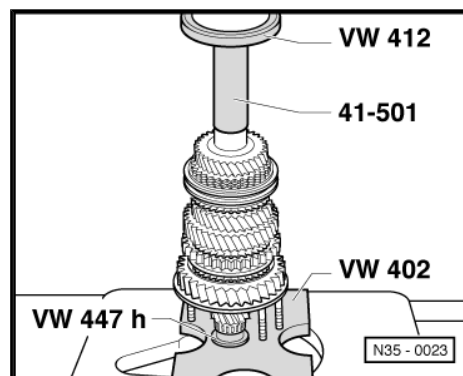


Pressing on sleeve for 4th gear needle bearing



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Pressing on sleeve for needle bearing/output shaft



2.1.1 Modified 1st gear synchromesh from gearbox build date 04 09 0

- ◆ Synchro-ring -C- with additional recesses -4- for tabs -1- on inner ring -A-.
- ◆ 1st speed selector gear with additional recesses -3- for lugs -2- on outer ring -B-.

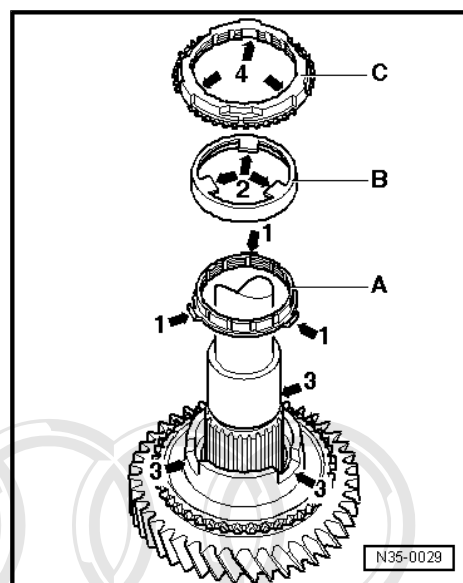


Note

- ◆ The same inner ring, outer ring and synchro-ring are also installed on 2nd gear.
- ◆ If components are not being renewed, make sure they are re-installed on the same gear.

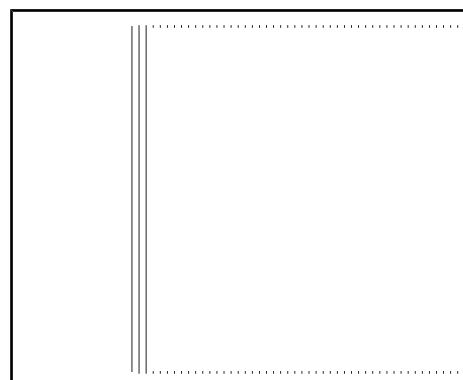
Installing:

- Place inner ring -A- on 1st speed selector gear.
- The angled tabs -arrows 1- point towards the outer ring -B-.
- Position outer ring -B- on gear.
- The tabs -arrows 2- lock in the recesses -arrows 3- of the selector gear.
- Position synchro-ring -C- on gear.
- The recesses -arrows 4- locate on the tabs -arrows 1- of the inner ring -A-.



Checking inner ring for 1st gear for wear

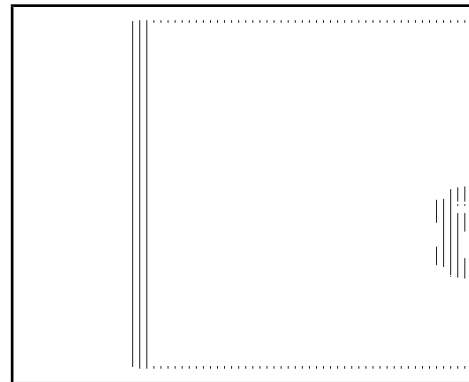
- Press inner ring onto tapered seat on selector gear and measure gap -a- using a feeler gauge.
- Specified gap: 0.75 ... 1.25 mm.
- Wear limit 0.3 mm.



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Checking 1st gear synchro-ring and outer ring for wear

- Press synchro-ring, outer ring and inner ring against tapered seat on selector gear and measure gap -a- using a feeler gauge.
- Specified gap: 1.2 ... 1.8 mm.
- Wear limit 0.5 mm.



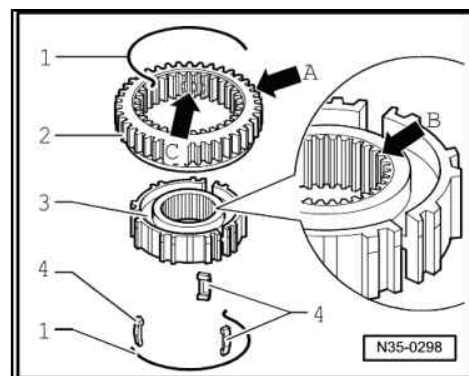
Assembling locking collar and locking pieces with synchronising hub for 1st and 2nd gear

- 1 - Spring
- 2 - Locking collar
- 3 - Synchronising hub
- 4 - Locking piece



Note

- ◆ After introduction of the modified 1st gear synchromesh, the collar is the same width on both sides of the synchronising hub.
- ◆ The shoulder on one side is chamfered -arrow B-.
- ◆ When assembled, the chamfer on the shoulder of the synchronising hub and the external teeth on the locking collar -arrow A- face in the same direction.
- ◆ The recesses for the locking pieces on synchronising hub and locking collar -arrow C- must align.



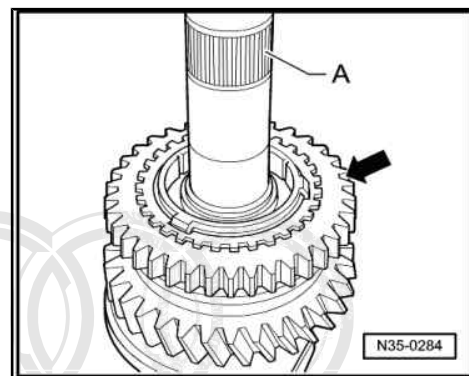
Installation position of 1st and 2nd gear locking collar/synchronising hub

- Splines on locking collar -arrow- point to splines for 3rd/4th gear synchronising hub -A-.



Note

Removing and installing 1st/2nd gear synchronising hub is the same procedure as before.



2.2 Adjusting output shaft

Determining thickness of output shaft shim

The output shaft must be re-adjusted when the following components are renewed:

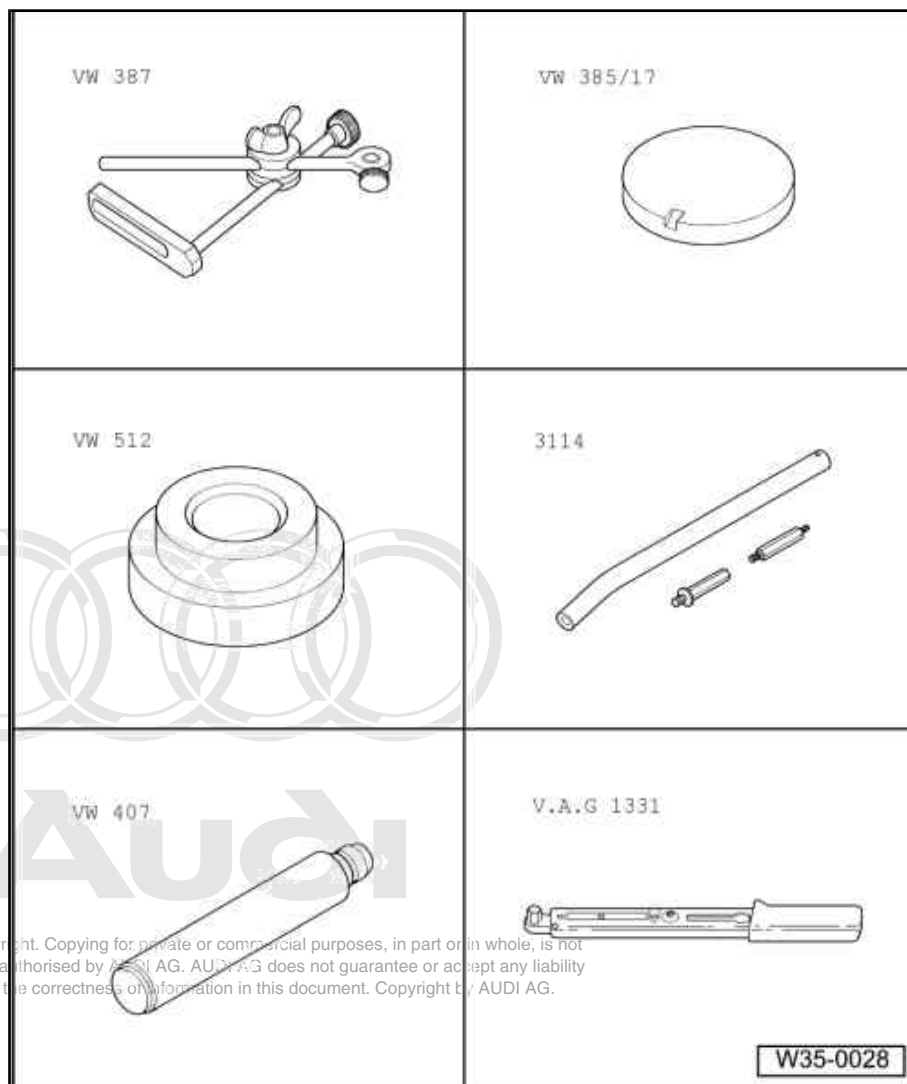
- ◆ Final drive gear set
- ◆ Clutch housing
- ◆ Tapered roller bearings

Table of adjustments ⇒ [page 160](#)

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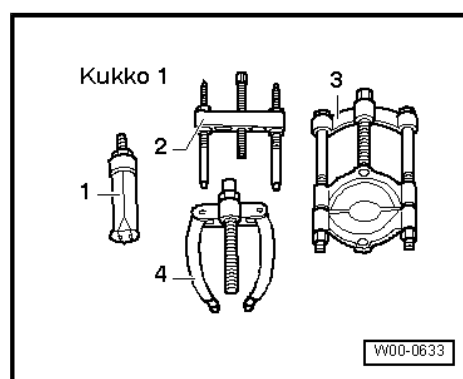
Special tools and workshop equipment required

- ◆ Universal dial gauge bracket -VW 387-
- ◆ End measuring plate - VW 385/17-
- ◆ Thrust pad -VW 512-
- ◆ Straightening tool -3114/2-
- ◆ Press tool -VW 407-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Dial gauge



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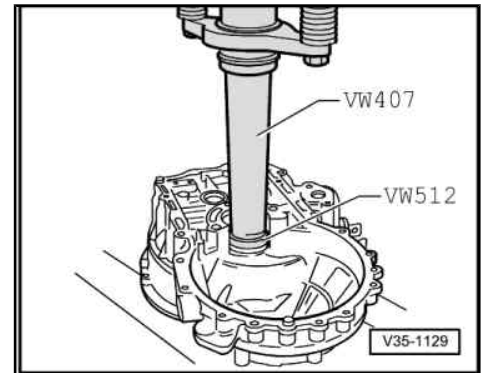
- ◆ -1- Internal puller -Kukko 21/6-



- ◆ -4- Counter-support -Kukko 22/2-

Procedure

- Press small tapered roller bearing outer race with shim (thickness: 0.65 mm) into clutch housing as far as stop.
- Insert output shaft and tighten bearing mounting nuts to 25 Nm.

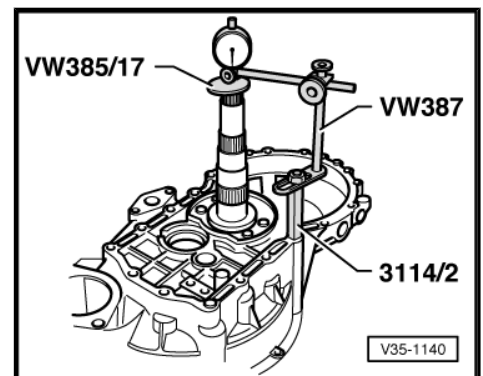


- Mount dial gauge (3 mm measuring range) and set to "0" with 1 mm preload.
- Move output shaft up and down; read off and note play indicated on dial gauge (in this example 0.30 mm).

Specified bearing preload = fitted shim + measured value + preload (constant value).

Example:

Inserted shim	0.65 mm
Dial gauge reading (example)	+ 0.30 mm
Preload (constant value)	+ 0.20 mm
Thickness of shim	= 1.15 mm

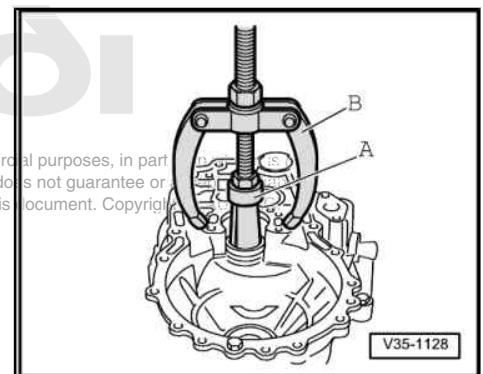


- Select required shim thickness from following table:

Available shims - Thickness of shims in mm ¹⁾²⁾		
0.65	0.95	1.25
0.70	1.00	1.30
0.75	1.05	1.35
0.80	1.10	1.40
0.85	1.15	
0.90	1.20	

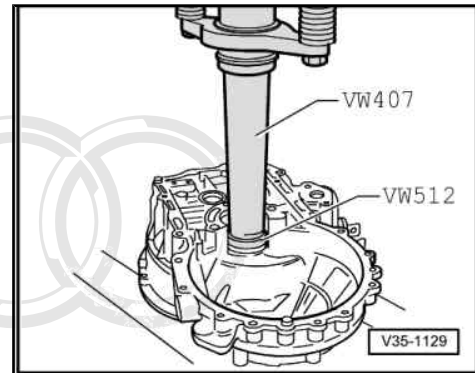
- ¹⁾ For Part No. refer to ⇒ Parts catalogue .
- ²⁾ Tolerance variations make it possible to obtain the exact shim thickness required.

- Remove output shaft and pull out small tapered roller bearing outer race.



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- Press in small tapered roller bearing outer race with determined shim.
- Install output shaft.
- Tighten bearing mounting nuts in clutch housing to 25 Nm and then turn 90° further.

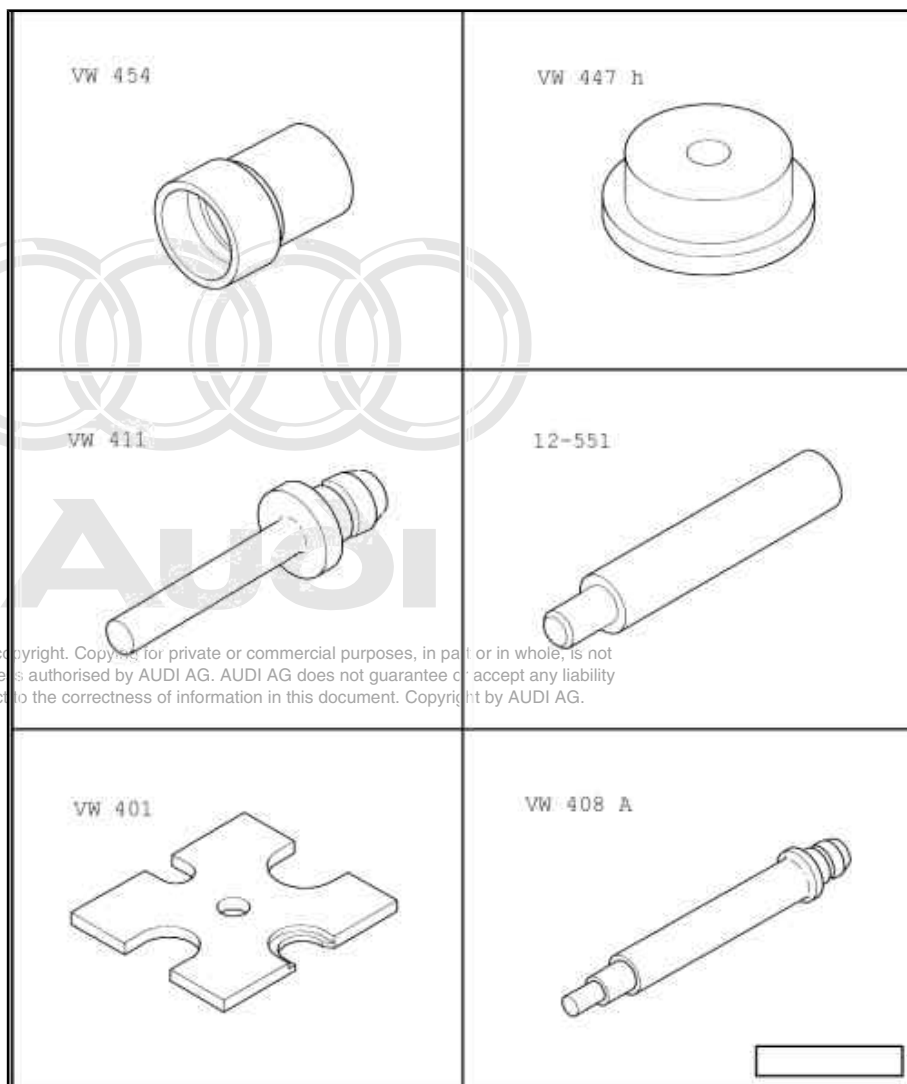


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3 Dismantling and assembling reverse shaft

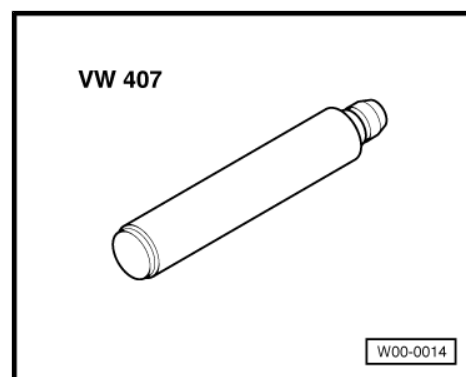
Special tools and workshop equipment required

- ◆ Press tool -VW 454-
- ◆ Thrust plate -VW 447 H-
- ◆ Press tool -VW 411-
- ◆ Centring mandrel -12-551-
- ◆ Thrust plate -VW 401-
- ◆ Press tool -VW 408 A-

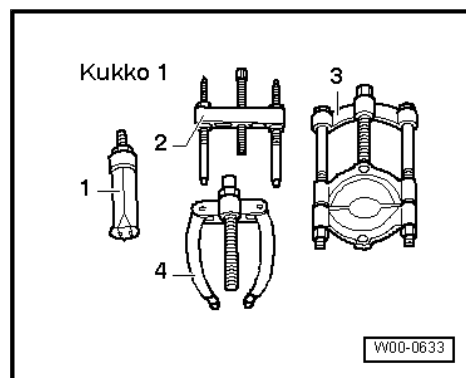


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- ◆ Press tool -VW 407-



◆ -1- Internal puller -Kukko 21/2-



◆ -4- Counter-support -Kukko 22/1-

Reverse shaft - exploded view of components

1 - Clutch housing

2 - Needle bearing

- ☐ Pulling out ⇒ [page 123](#)
- ☐ Renew after removing
- ☐ Pressing in
⇒ [page 123](#)

3 - Reverse gear wheel

4 - Circlip

- ☐ Renew after removing

5 - Reverse selector gear

- ☐ Remove circlip before renewing
- ☐ Shoulder faces towards reverse gear wheel

6 - Reverse shaft

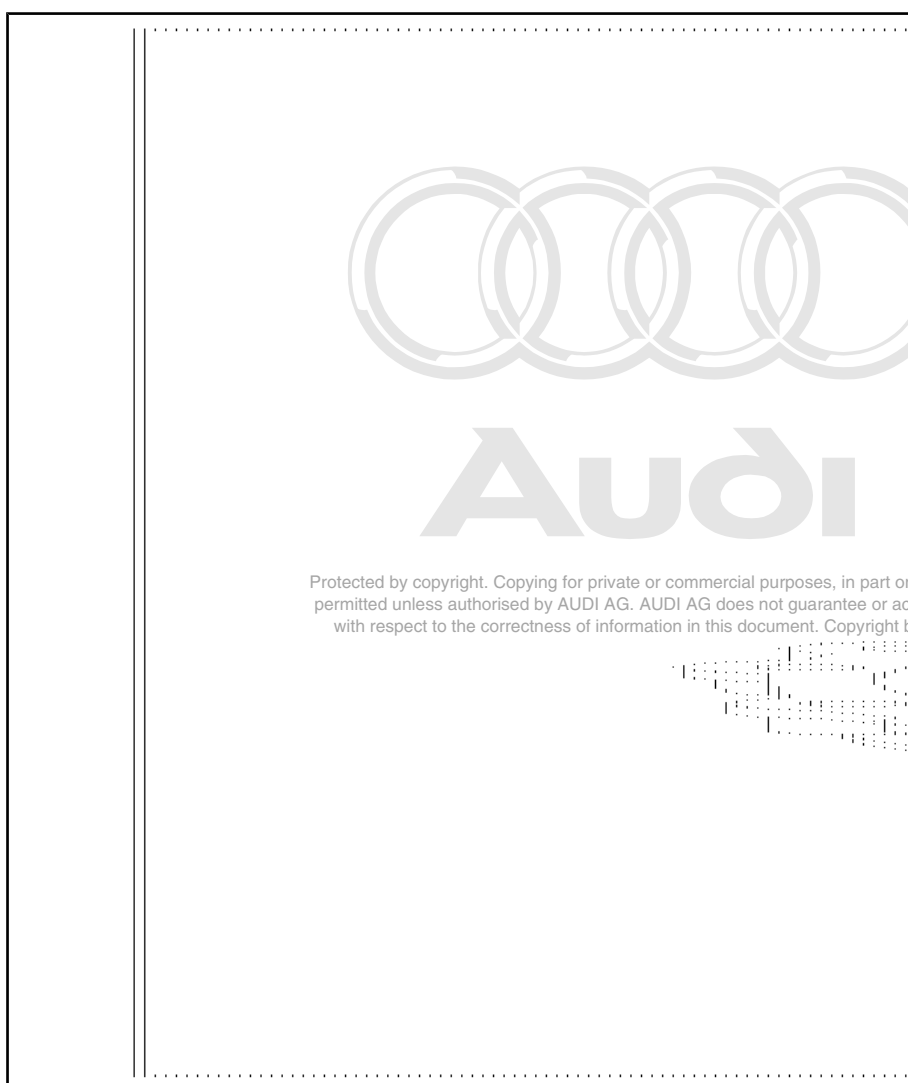
- ☐ Removing ⇒ [page 66](#)

7 - Needle bearing

- ☐ Pressing out
⇒ [page 123](#)
- ☐ Pressing in
⇒ [page 123](#)

8 - Reverse shaft support

- ☐ Removing and installing
⇒ [page 66](#)



Pulling needle bearing out of clutch housing

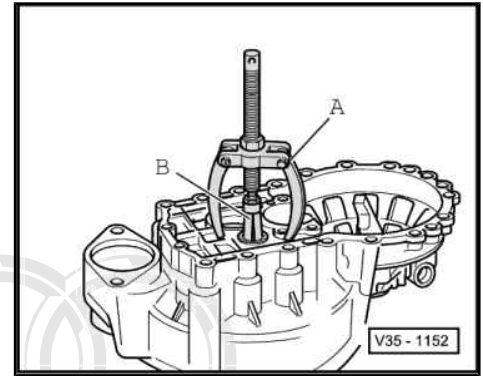
A - Counter-support -Kukko 22/1-

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



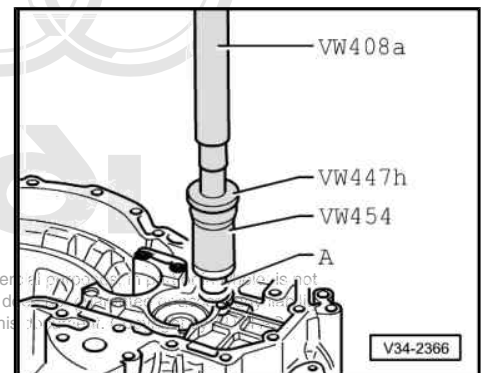
Note

Needle bearing cannot be removed without being damaged.



Pressing needle bearing into clutch housing

A - Needle bearing

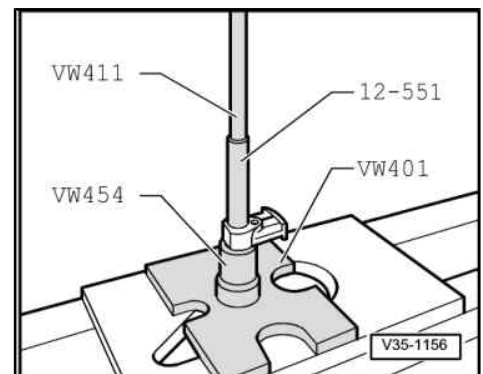


Pressing needle bearing out of reverse shaft support

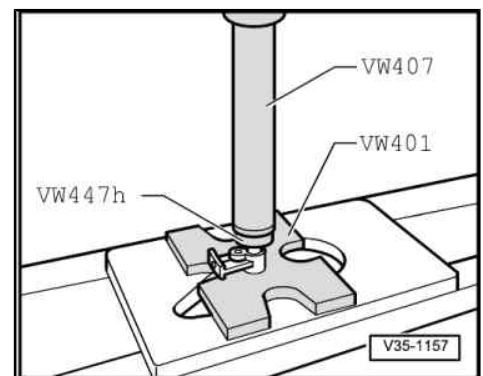


Note

Needle bearing cannot be removed without being damaged.



Pressing needle bearing into reverse shaft support



39 – Final drive - front differential

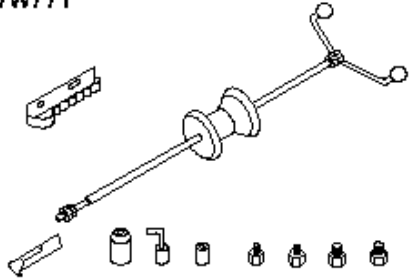
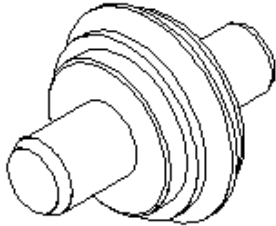
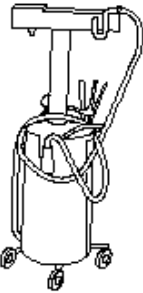
1 Renewing oil seals and needle bearings

– Observe the general repair instructions ⇒ [page 5](#) .

1.1 Renewing flange shaft oil seal (left-side) (with gearbox installed)

Special tools and workshop equipment required

- ◆ Multi-purpose tool - VW 771-
- ◆ Extractor tool -VW 771/37-
- ◆ Drift -3106-
- ◆ Used oil collection and extraction unit -V.A.G 1782-

VW771 	3106 
V.A.G 1782 	
	G39-10023

Procedure

- Remove noise insulation (centre and left) -arrows-.
- Unbolt drive shaft (left-side) from gearbox flange shaft.
- Tie up drive shaft as far as possible.



Note

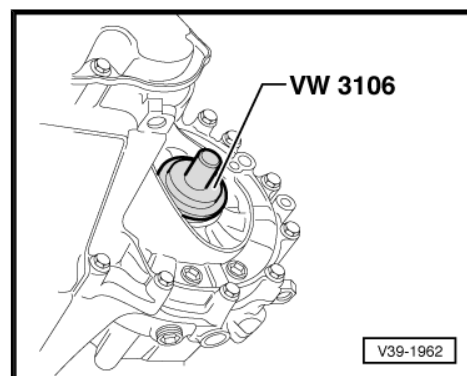
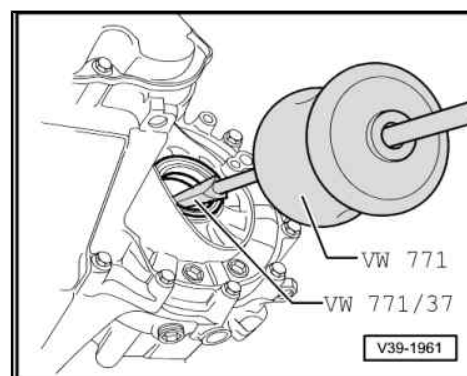
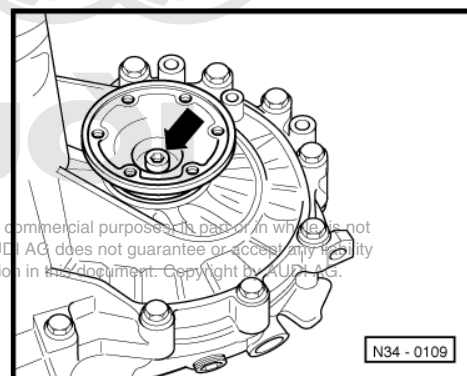
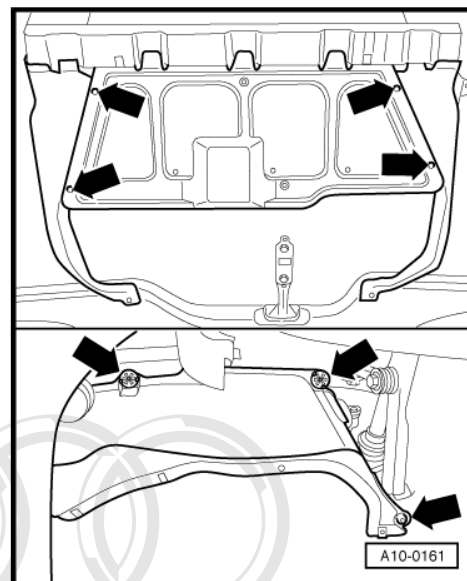
Make sure you do not damage surface coating on drive shaft.

- Place used oil collection and extraction unit -V.A.G 1782- below gearbox.
- Unscrew countersunk bolt -arrow- for flange shaft (left-side) (counterhold flange shaft with drift to prevent it from turning).
- Pull out flange shaft with spring.

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- Remove seal.

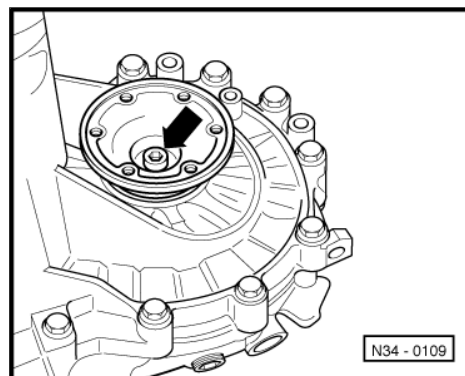
- Drive in new oil seal as far as stop (keep oil seal straight while installing).
- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1- .



- Insert flange shaft and secure -arrow- (counterhold flange shaft with drift).
- Bolt drive shaft (left-side) to gearbox flange ⇒ Rep. Gr. 40 .
- Check gear oil in manual gearbox with bevel box ⇒ [page 60](#) .

Tightening torque

Component	Nm
Flange shaft to differential	25

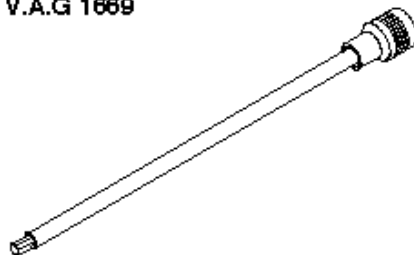


1.2 Removing and installing flange shaft (right-side)/drive flange with output shaft

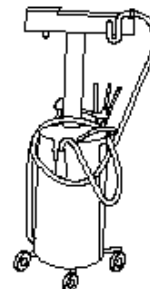
Special tools and workshop equipment required

- ◆ Hexagon key -V.A.G 1669-
- ◆ Used oil collection and extraction unit -V.A.G 1782-
- ◆ Puller -T10037-

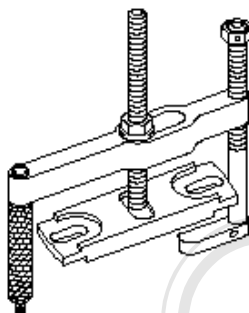
V.A.G 1669



V.A.G 1782



T10037

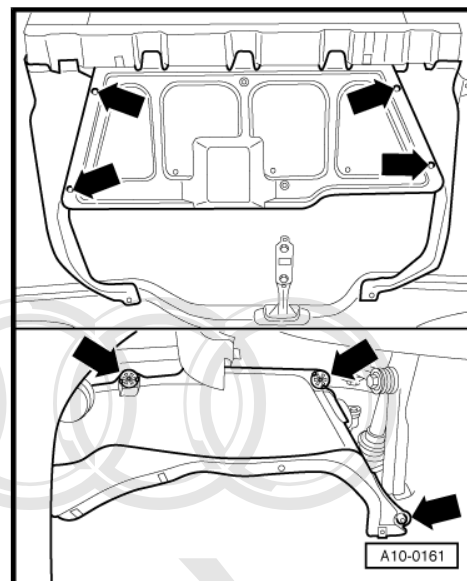


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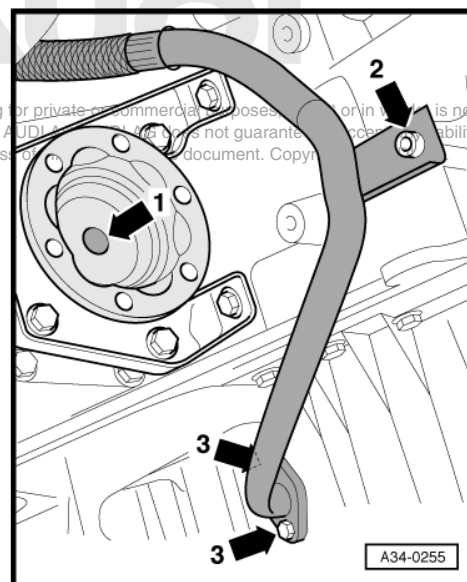
G39-10024

Removing

- Remove noise insulation (centre and right) -arrows-.
- Remove drive shaft (right-side) ⇒ Rep. Gr. 40 .



- Place used oil collection and extraction unit -V.A.G 1782- under the vehicle.
- Unscrew oil return line for turbocharger from sump and cylinder block -arrow 2- and -arrow 3-.
- If drive flange cap is fitted, pierce a hole in centre of cap using a screwdriver and lever out cap.
- Unscrew bolt for flange shaft/drive flange -arrow 1- using hex-agon key -V.A.G 1669- .



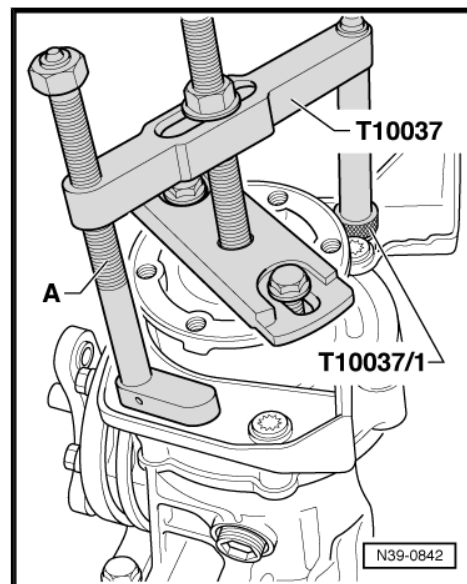
- Bolt puller -T10037- to flange shaft (right-side)/drive flange with output shaft.
- Use knurled nut -T10037/1- and lower support -A- to align puller parallel with flange shaft/drive flange.
- Pull out flange shaft/drive flange.

Installing

- Carefully drive in flange shaft/drive flange (while turning) and secure.
- Renew drive flange cap, if fitted.
- Install drive shaft (right-side) ⇒ Rep. Gr. 40 .
- Check gear oil in manual gearbox with bevel box ⇒ [page 60](#) .

Tightening torque

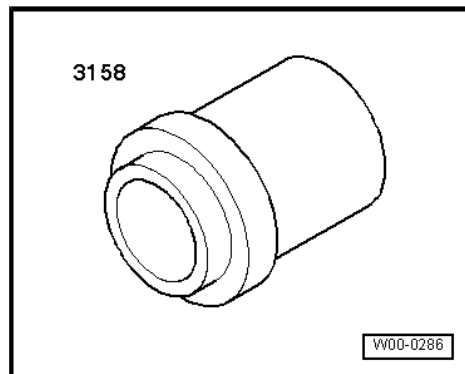
Component	Nm
Flange shaft/drive flange with output shaft to differential	25



1.3 Renewing oil seal for flange shaft (right-side)/drive flange with output shaft (with gearbox installed)

Special tools and workshop equipment required

- ◆ Drift sleeve -3158-



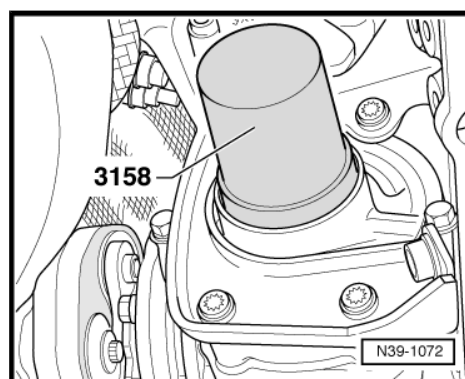
Procedure

- Remove flange shaft (right-side)/drive flange with output shaft
⇒ [page 126](#) .
- Pry out oil seal using lever.
- Drive in new oil seal onto stop.



Note

Shown in illustration with bevel box removed.



- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1- .
- Install flange shaft (right-side)/drive flange with output shaft
⇒ [page 126](#) .

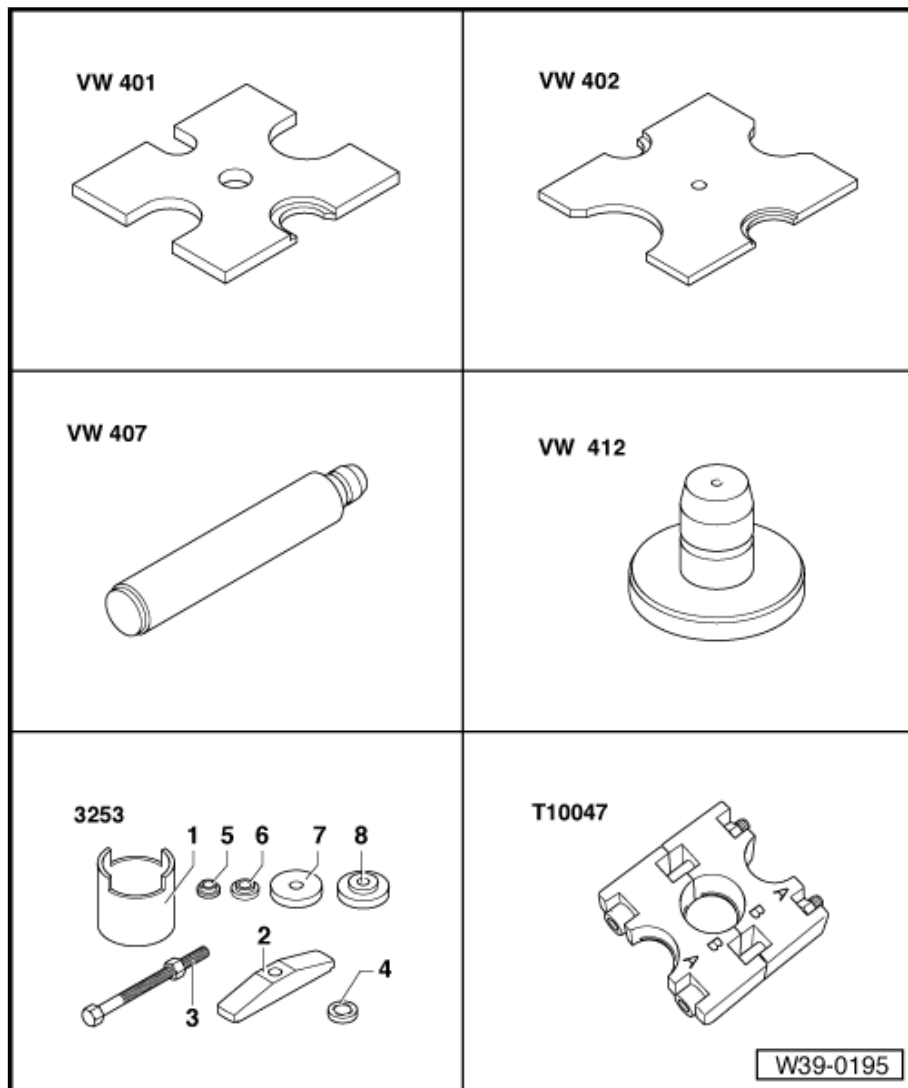
1.4 Renewing needle bearings (polygon bearings) for flange shaft/drive flange (right-side) with gearbox installed



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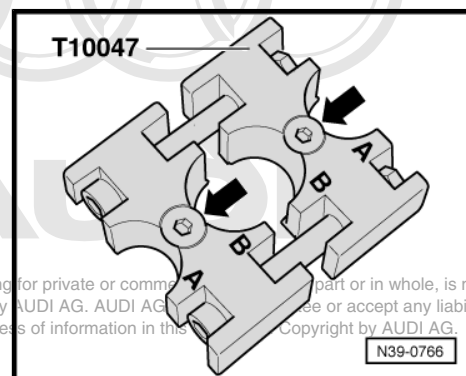
Special tools and workshop equipment required

- ◆ Thrust plate -VW 401-
- ◆ Thrust plate -VW 402-
- ◆ Press tool -VW 407-
- ◆ Press tool -VW 412-
- ◆ Assembly tool -3253/5-
- ◆ Assembly tool -T10047-



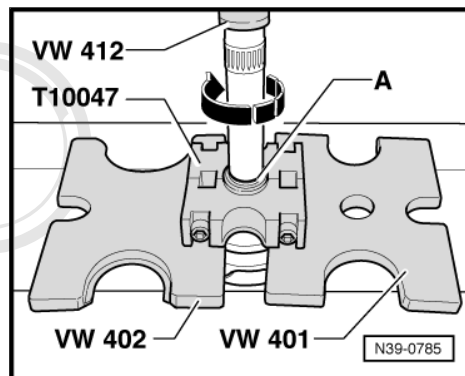
Procedure

- Remove flange shaft (right-side)/drive flange with output shaft
⇒ [page 126](#) .
- Fit tensioning tool -T10047- so that markings "A" on both sections of tensioning tool point towards each other.
- The stepped shoulders -arrows- must then be below the bearing.
- Screw both sections together as far as stop.

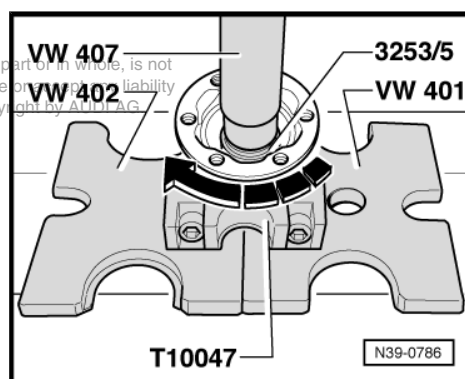


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- Remove circlip -A- securing bearing/bearings.
- Rotate shaft when pressing off -arrow- to prevent contact surface of bearings on shaft from being damaged.



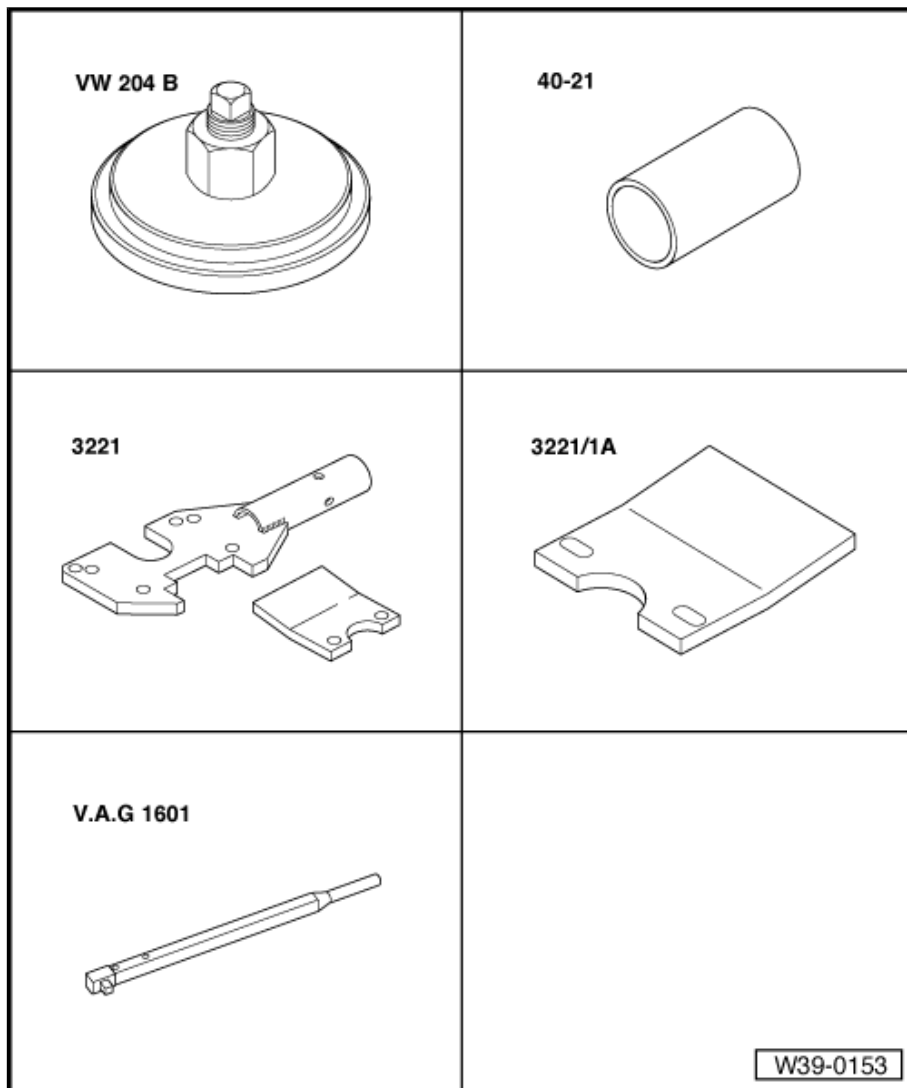
- Rotate shaft when pressing on -arrow- to prevent contact surface of bearings on shaft from being damaged.
- Secure bearing/bearings with a new circlip.
- Install flange shaft (right-side)/drive flange with output shaft
⇒ [page 126](#) .



1.5 Renewing output flange oil seal on bevel box (bevel box removed)

Special tools and workshop equipment required

- ◆ Fitting tool -VW 204 B-
- ◆ Press tool -40-21-
- ◆ Gearbox support -3221-
- ◆ Support plate -3221/1 A-
- ◆ Torque wrench - V.A.G 1601-



Procedure

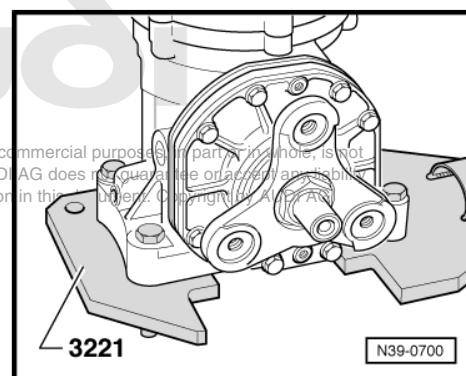


Note

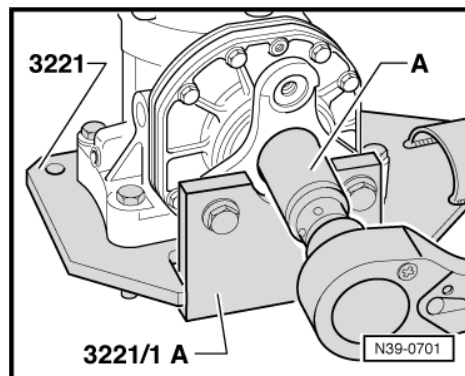
The oil seal for the bevel box output flange (to propshaft) can only be renewed with the bevel box removed.

- Remove bevel box ⇒ [page 55](#) .
- Secure bevel box in gearbox support.

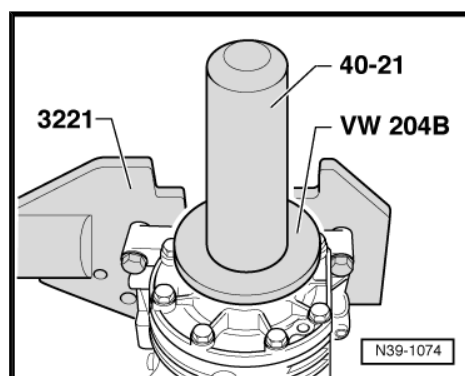
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- Remove hexagon nut for output flange.
- A - Socket attachment with $\frac{3}{4}$ " drive
- Swing bevel box so that output flange points upwards.
- Remove output flange.
- Pry out oil seal using screwdriver.



- Drive in new oil seal until flush.

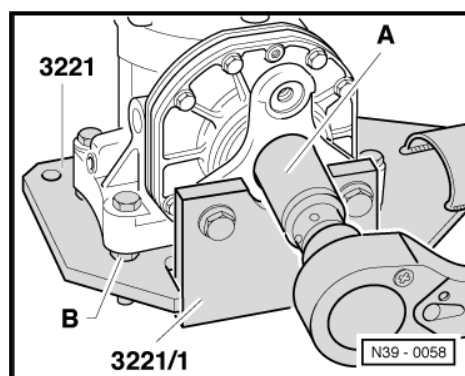


- Tighten nut for output flange.
- A - Socket attachment with $\frac{3}{4}$ " drive

- Install bevel box ⇒ [page 55](#)
- Check gear oil in manual gearbox with bevel box ⇒ [page 60](#).

Tightening torque

Component	Nm
Output flange to bevel box	350

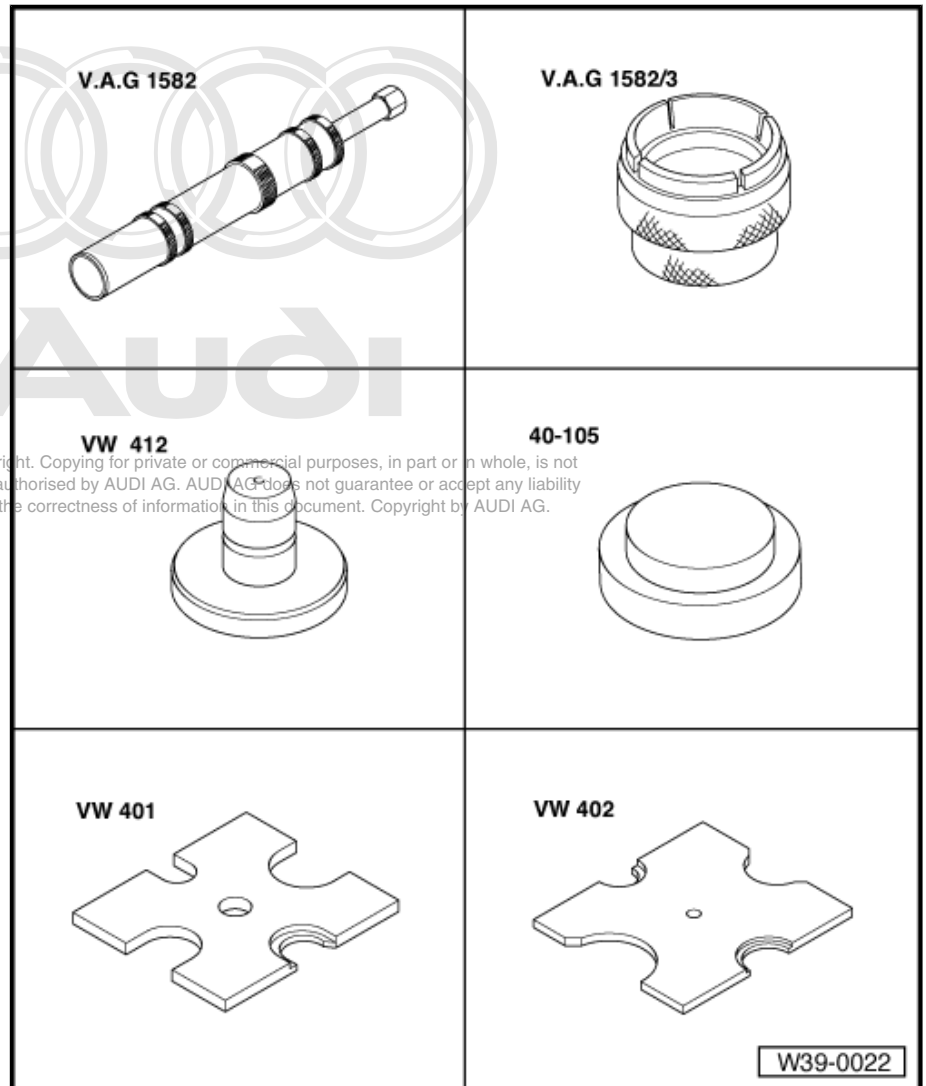


2 Servicing differential

2.1 Dismantling and assembling differential

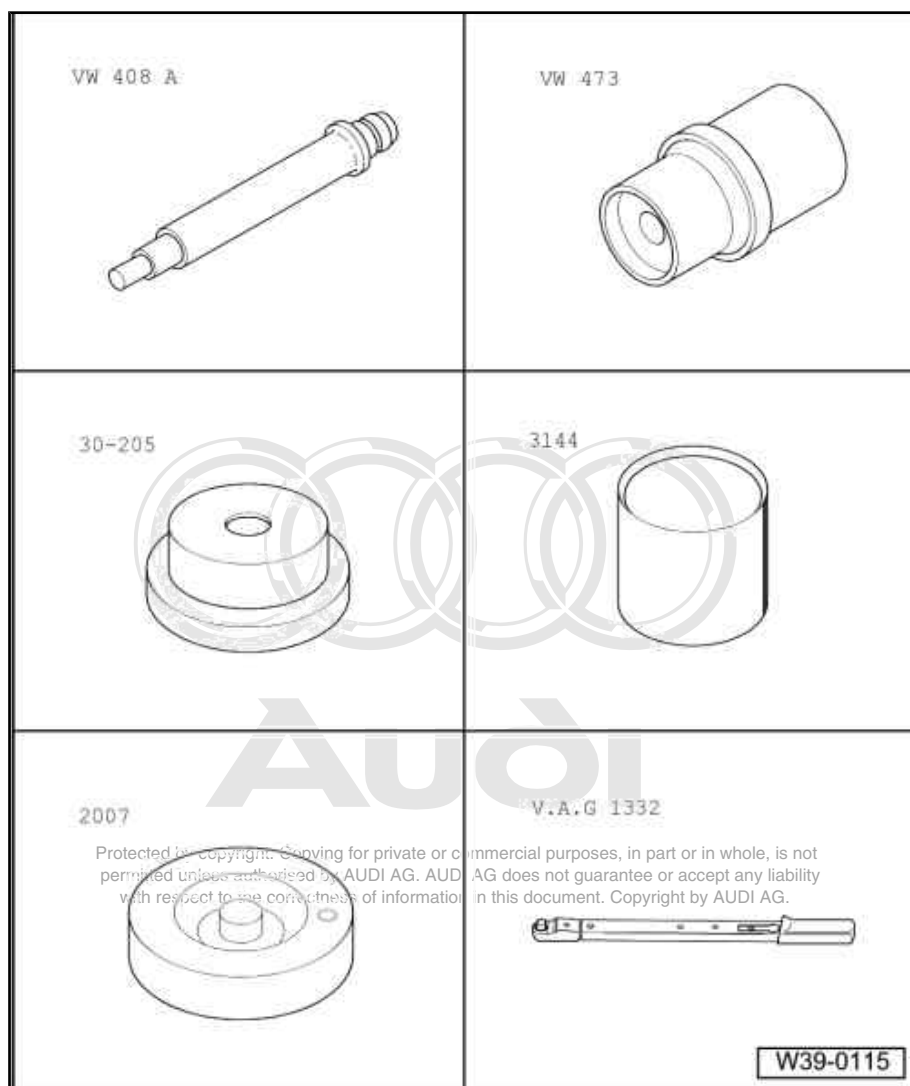
Special tools and workshop equipment required

- ◆ Puller -V.A.G 1582-
- ◆ Adapter -V.A.G 1582/3-
- ◆ Press tool -VW 412-
- ◆ Thrust plate -40-105-
- ◆ Thrust plate -VW 401-
- ◆ Thrust plate -VW 402-

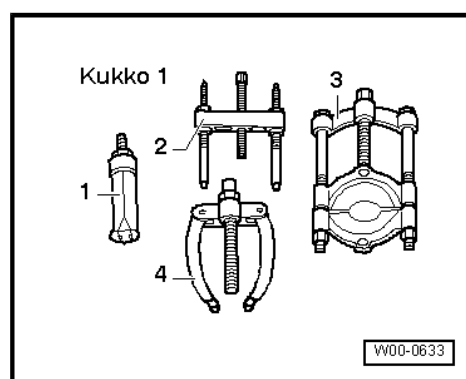


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- ◆ Press tool -VW 408 A-
- ◆ Press tool -VW 473-
- ◆ Thrust plate -30-205-
- ◆ Sleeve -3144-
- ◆ Press tool -2007-
- ◆ Torque wrench - V.A.G 1332-



- ◆ -1- Internal puller -Kukko 21/7-



- ◆ -2- Puller -Kukko 18/1-
- ◆ -3- Splitter -Kukko 17/1-
- ◆ -4- Counter-support -Kukko 22/2-

Differential - exploded view of components



Note

- ◆ Heat tapered roller bearing inner race to 100°C before installing.
- ◆ Always renew both tapered roller bearings together.
- ◆ Adjust differential ⇒ [page 141](#) if tapered roller bearings, differential cage, gearbox housing or clutch housing are being renewed.

1 - Countersunk bolt, 25 Nm

- ☐ Screws into threaded piece
⇒ [Item 20 \(page 136\)](#)

2 - Flange shaft

- ☐ Removing and installing
⇒ [page 124](#)

3 - Spring for flange shaft

4 - Thrust washer

- ☐ Installation position:
Shoulder towards
spring, lugs towards
taper ring

5 - Taper ring

- ☐ With grooves to engage
on thrust washer
- ☐ Installation position:
Taper towards differential
cage

6 - Circlip

- ☐ Holds taper ring, thrust
washer and spring in po-
sition when flange shaft
is removed

7 - Gearbox housing

8 - Clutch housing

9 - Differential cage

- ☐ With riveted final drive
gear
- ☐ Drill out rivet heads
when renewing final
drive gear ⇒ [page 138](#)
- ☐ Attaching final drive gear with bolts ⇒ [page 139](#)

10 - Bevel box connecting piece

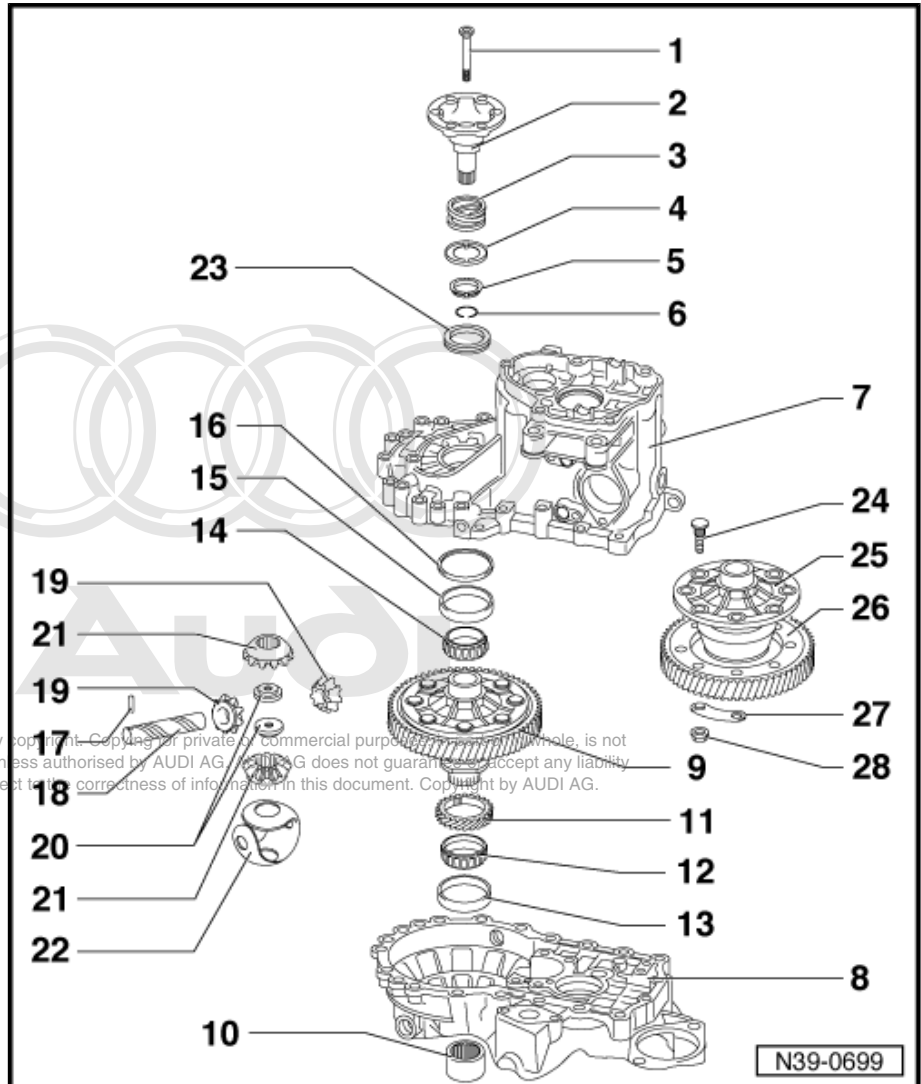
- ☐ Pressed onto differential cage
- ☐ Only press on and off when differential cage has been removed
- ☐ Pulling off ⇒ [page 140](#)
- ☐ Pressing on ⇒ [page 140](#)

11 - Speedometer drive wheel

- ☐ Fit on differential cage up to stop before pressing on inner race

12 - Tapered roller bearing inner race

- ☐ Before removing pull connecting piece off ⇒ [Item 10 \(page 135\)](#)





- ☐ Pulling off ⇒ [page 137](#)
- ☐ Pressing on ⇒ [page 137](#)

13 - Tapered roller bearing outer race

- ☐ Pressing out ⇒ [page 137](#)
- ☐ Pressing in ⇒ [page 137](#)

14 - Tapered roller bearing inner race

- ☐ Pulling off ⇒ [page 137](#)
- ☐ Pressing on ⇒ [page 137](#)

15 - Tapered roller bearing outer race

- ☐ Pulling out ⇒ [page 138](#)
- ☐ Pressing in ⇒ [page 138](#)

16 - Shim

- ☐ For differential
- ☐ Determining thickness ⇒ [page 141](#)

17 - Spring pin

- ☐ For securing differential pinion pin
- ☐ Removing and installing ⇒ [page 139](#)

18 - Differential pinion pin

- ☐ Drive out with drift

19 - Planet pinion

- ☐ Installing ⇒ [page 140](#)

20 - Threaded piece

21 - Sun wheel

- ☐ Installing ⇒ [page 140](#)

22 - One-piece thrust washer

- ☐ Lubricate with gear oil before installing

23 - Oil seal

- ☐ Renewing ⇒ [page 124](#)

24 - Bolt

25 - Differential cage

- ☐ Bolt to final drive gear ⇒ [page 139](#)

26 - Final drive gear

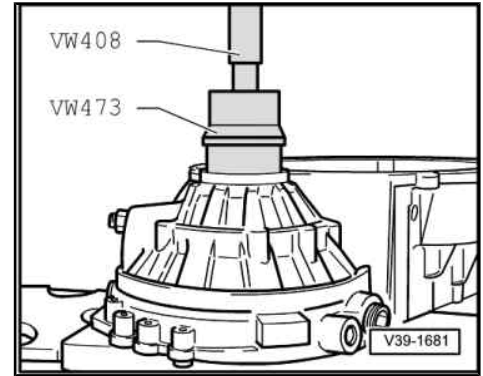
- ☐ Riveted in production
- ☐ Bolted ⇒ [page 139](#)
- ☐ Heat to 100° C before installing.
- ☐ Pressing off ⇒ [page 138](#)
- ☐ Installation position ⇒ [page 139](#)
- ☐ Fit to differential cage ⇒ [page 139](#)
- ☐ Is paired with output shaft, only renew as a set

27 - Locking plate

28 - Nut, 70 Nm

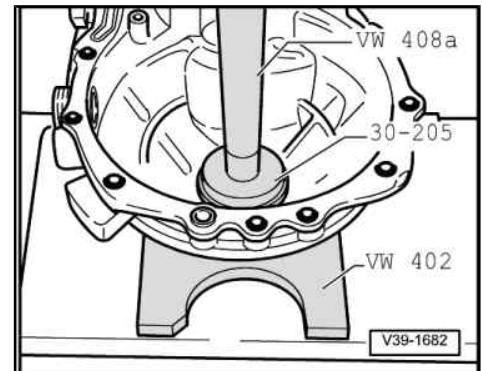
Pressing tapered roller bearing outer race out of clutch housing

- First remove mounting sleeve for flange shaft oil seal.



Pressing tapered roller bearing outer race into clutch housing

- No shim is installed on the clutch housing side.



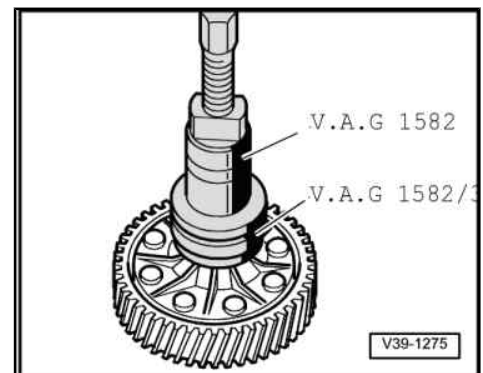
Pulling off tapered roller bearing inner races

- Before applying puller, place thrust plate -40-105- on differential cage.



Note

- ♦ The procedure for pulling tapered roller bearing inner races off differential cage is the same for both bearings.
- ♦ Pull off connecting piece before pulling off taper roller bearing inner race at speedometer drive wheel ⇒ [page 140](#).

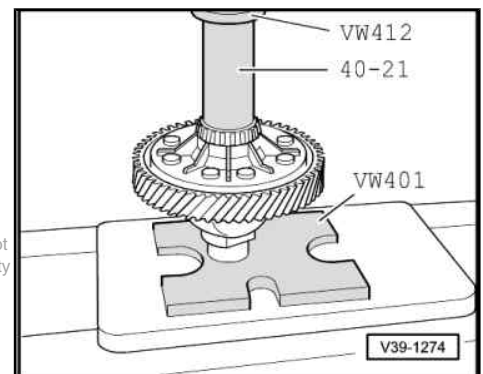


Pressing on tapered roller bearing inner races



Note

Use the same tools for pressing on tapered roller bearing inner race for gearbox housing and clutch housing.

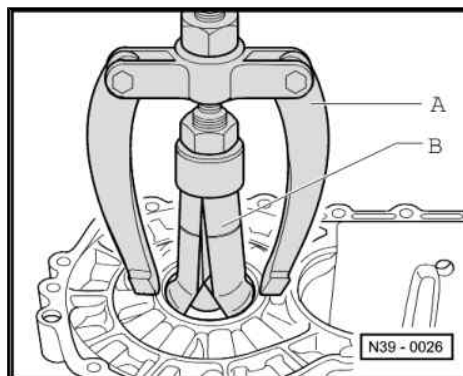


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Pulling tapered roller bearing outer race out of gearbox housing

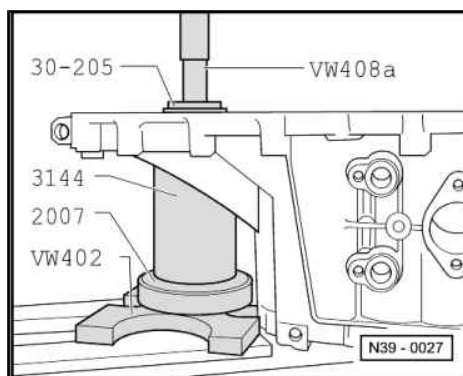
A - Counter-support -Kukko 22/2-

B - Internal puller 46 ... 58 mm -Kukko 21/7-



Pressing tapered roller bearing outer race into gearbox housing

- Fit shim under outer race.
- Place sleeve -3144- directly under bearing seat to support gearbox housing.



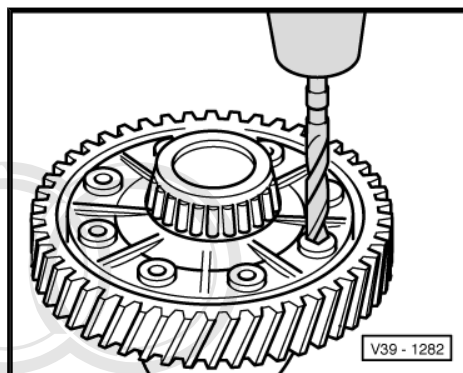
Drilling out rivet heads

- Drill out rivet heads from countersunk side using a $\varnothing$ 12 mm drill and drive out rivets with a drift.



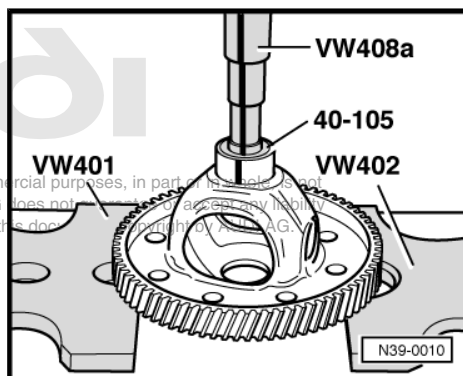
Note

Clean differential before and after drilling and keep metal particles out of tapered roller bearings.



Pressing off final drive gear

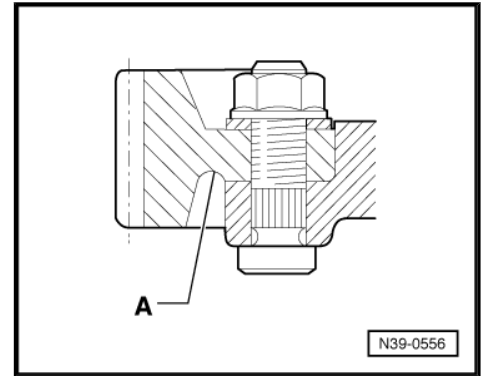
- Place thrust plate -40-105- on differential cage.



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Installation position of final drive gear

- Circular groove -A- faces joint surface on differential cage.



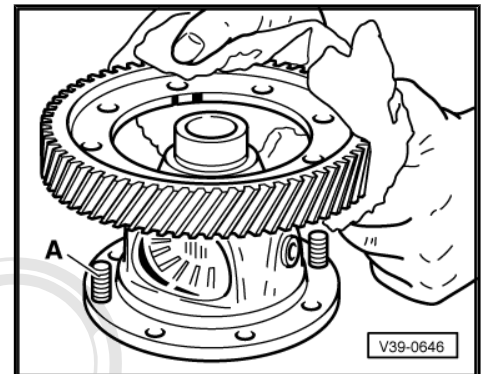
Heating final drive gear wheel to approx. 100 °C and installing



WARNING

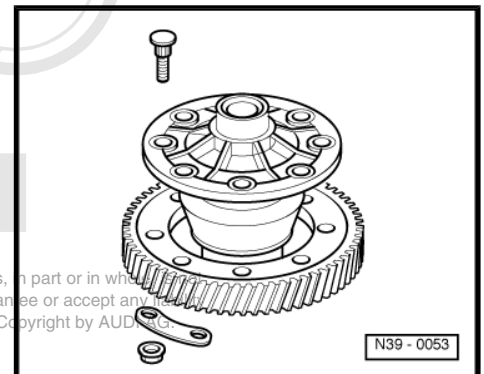
Wear protective gloves.

- Position final drive gear via bolts -A- from repair kit when installing.



Bolting final drive gear and differential cage together

- Use special bolts with locking plates and nuts ⇒ Parts catalogue .



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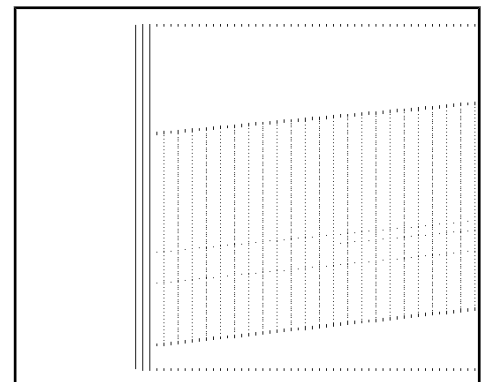
Removing and installing spring pin for differential pinion pin

Removing

- Cover up tapered roller bearing inner race and speedometer drive gear to keep out metal particles and to prevent damage.
- Drive out spring pin using chisel (apply chisel in circular groove).

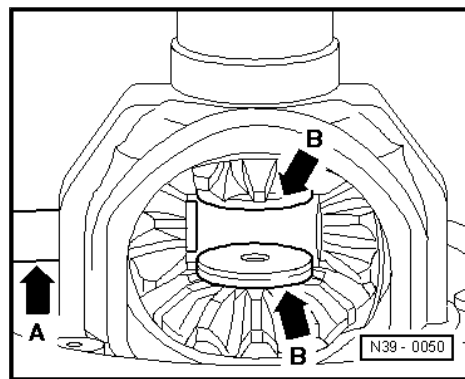
Installing

- Drive spring pin onto stop in differential cage.



Installing differential bevel gears

- Lubricate one-piece thrust washer with gear oil and install.
- Install both sun wheels and secure (e.g. with flange shaft).
- Insert planet pinions (180° apart) and pivot into position.
- Push differential pinion pin -arrow A- in as far as first planet pinion.
- Place threaded pieces -arrows B- into large differential bevel gears.
- Installation position: Stepped shoulder towards sun wheel
- Drive differential pinion pin into final position and secure with spring pin.

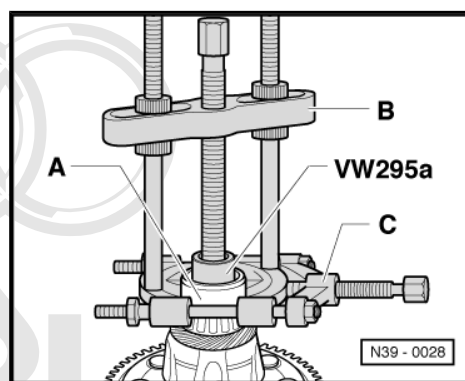


Pulling connecting piece off

A - Connecting piece

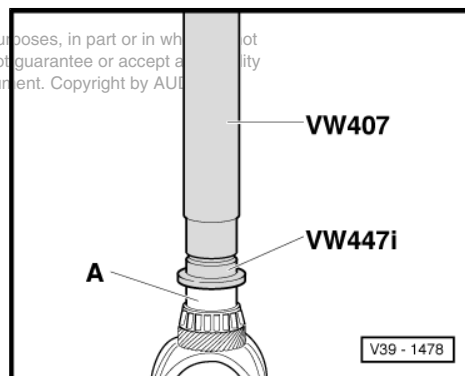
B - Puller -Kukko 18/1-

C - Splitter 12 ... 75 mm -Kukko 17/1-



Pressing on connecting piece -A- for bevel box

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3 Adjusting differential

It is necessary to readjust the differential when the following components have been renewed:

- ◆ Gearbox housing
- ◆ Clutch housing
- ◆ Differential cage
- ◆ Differential tapered roller bearings

Table of adjustments ⇒ [page 141](#) .

3.1 Table of adjustments



Note

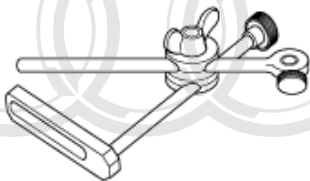
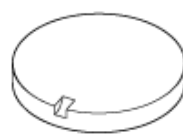
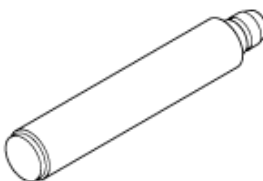
When performing repairs on the gearbox it is only necessary to re-adjust the input shaft, output shaft or differential if components have been renewed which have a direct effect on the adjustment of the gearbox. Refer to the following table to avoid unnecessary adjustment work:

Components renewed:	Components requiring adjustment:		
	Input shaft ⇒ page 99	Output shaft ⇒ page 117	Differential ⇒ page 141
Gearbox housing	x		x
Clutch housing	x	x	x
Input shaft	x		
Output shaft (final drive set)		x	
Differential cage			x
Tapered roller bearing for input shaft	x		
Tapered roller bearing for output shaft		x	
Tapered roller bearings for differential			x
4th gear wheel	x		

3.2 Adjusting differential

Special tools and workshop equipment required

- ◆ Universal dial gauge bracket -VW 387-
- ◆ End measuring plate - VW 385/17-
- ◆ Thrust plate -30-205-
- ◆ Press tool -VW 407-
- ◆ Dial gauge

VW 387 	VW 385/17 
30-205 	VW 407 
	W39-0002

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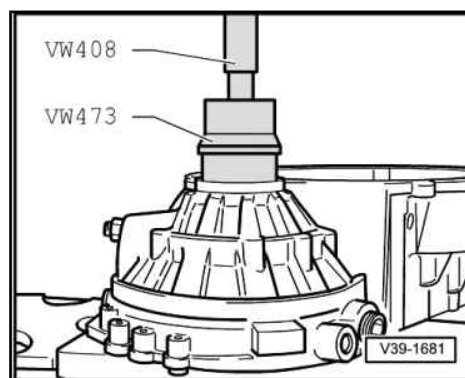
Procedure

- Press tapered roller bearing outer race into clutch housing (without shim) using thrust plate -30-205- .

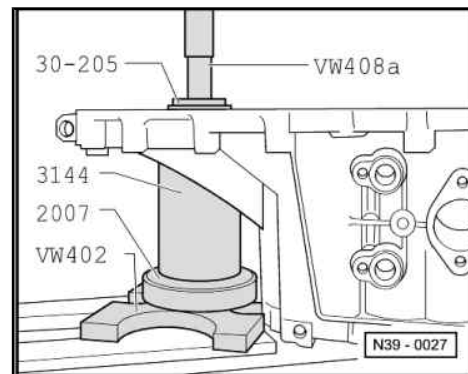


Note

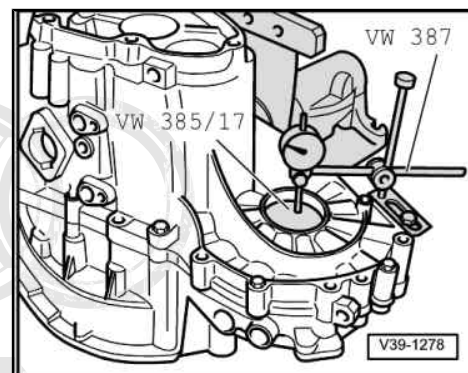
The tapered roller bearing inner and outer races are paired. Do not interchange.



- Press tapered roller bearing outer race into gearbox housing (without shim) using thrust plate -30-205- .
- Place sleeve -3144- directly under bearing seat to support gearbox housing.
- Install differential in clutch housing.
- Fit gearbox housing and tighten 5 bolts to 25 Nm.
- Press differential towards clutch housing; hold in this position and turn eight times.
- Press differential towards gearbox housing; hold in this position and turn eight times.



- Attach dial gauge and set to "0" with a preload of 1 mm.
- Move differential up and down and note play indicated on dial gauge (in this example: 0.70 mm).



Determining thickness of shim

Formula: Thickness of shim = measured value + preload

Example:

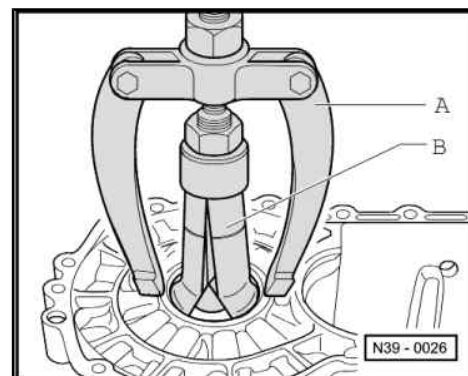
Dial gauge reading (example)	0.70 mm
Preload (constant value)	+ 0.40 mm
Thickness of shim	= 1.10 mm

- Select required shim thickness from following table:

Available shims - Thickness of shims in mm ¹⁾²⁾³⁾		
0.65	0.90	1.20
0.70	0.95	1.15
0.75	1.00	1.25
0.80	1.05	
0.85	1.10	

- ¹⁾ For Part No. refer to ⇒ Parts catalogue .
- ²⁾ Tolerance variations make it possible to obtain the exact shim thickness required.
- ³⁾ If the size of the shim required is larger than those listed in the table, install two shims amounting to the correct value.

- Remove gearbox housing and pull taper roller bearing outer race out of gearbox housing, or press out using thrust piece -VW 473- .
- Install shim(s) of the required thickness (thicker shim first).
- Press outer race back in.
- Tighten bolts to 25 Nm and turn 90° further.



3.3 Servicing bevel box

3.3.1 Bevel box - exploded view



Note

- ◆ There are two different bevel box types fitted: bevel boxes with output shaft ⇒ [Item 8 \(page 144\)](#) and drive flange ⇒ [Item 7 \(page 144\)](#) or bevel boxes with flange shaft ⇒ [Item 5 \(page 144\)](#). These components must not be interchanged. Allocate to the corresponding type of bevel box when renewing.
- ◆ Adjust bevel gear or shaft bevel gear (final drive gear set) when renewing tapered roller bearings, cover, output flange, final drive housing, bevel gear with input shaft, shaft bevel gear or the pinion housing ⇒ [page 160](#).

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1 - Cap

- ☐ Destroyed during removal
- ☐ Renew

2 - Circlip

- ☐ Renew

3 - Dished spring

- ☐ Taper faces circlip

4 - Countersunk bolt, 25 Nm

5 - Flange shaft

6 - Needle bearing (polygon bearing)

- ☐ 2 x
- ☐ Only for flange shaft ⇒ [Item 5 \(page 144\)](#)
- ☐ Renewing ⇒ [page 128](#)

7 - Drive flange

- ☐ Pulling out ⇒ [page 153](#) with output shaft ⇒ [Item 8 \(page 144\)](#)
- ☐ Pressing off ⇒ [page 154](#)
- ☐ Pressing on ⇒ [page 158](#)

8 - Output shaft

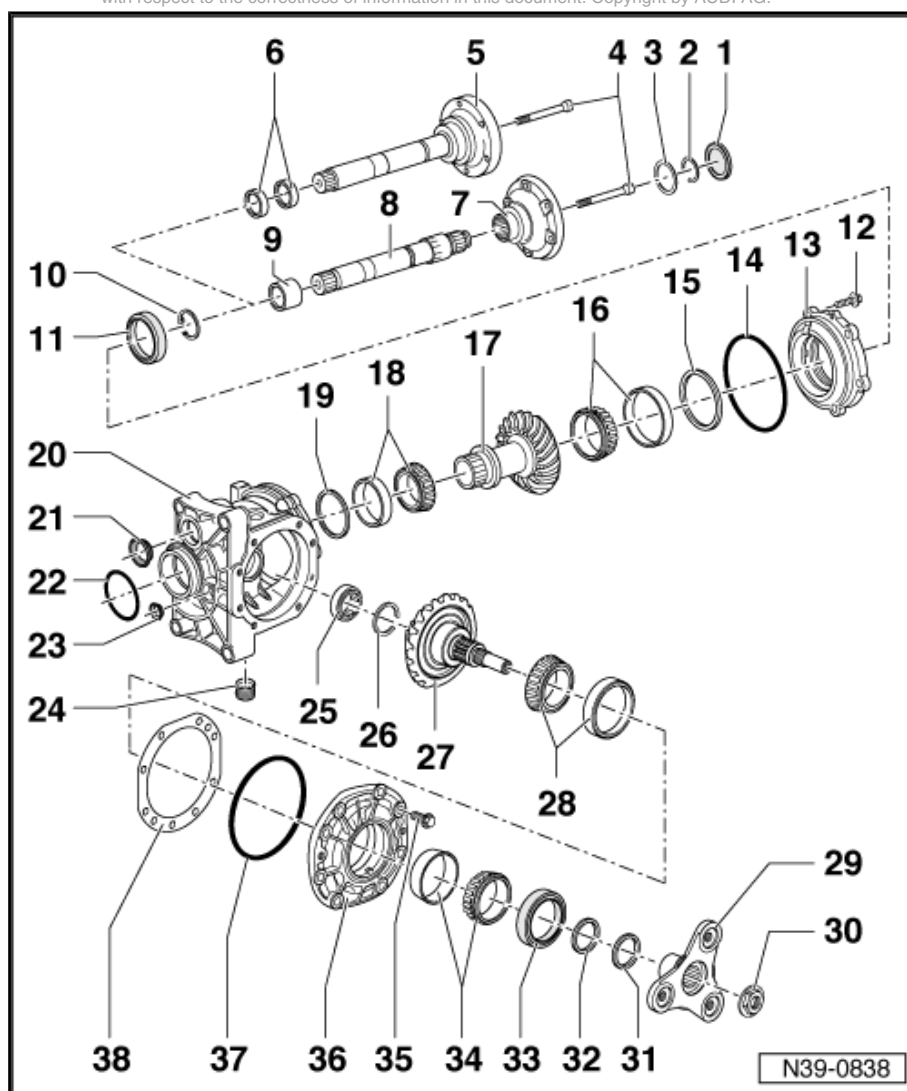
- ☐ Pull out of bevel box housing ⇒ [page 153](#) with drive flange ⇒ [Item 7 \(page 144\)](#)

9 - Needle bearing (polygon bearing)

- ☐ Only for output shaft
- ☐ Renewing ⇒ [page 128](#)

10 - Circlip

- ☐ Renew



N39-0838

11 - Oil seal

- ☐ Renewing ➔ [page 128](#)

12 - Bolt, 25 Nm

13 - Cover

- ☐ Removing ➔ [page 154](#)
- ☐ Keep straight when installing, tighten securing bolts diagonally and in stages

14 - O-ring

- ☐ Renew
- ☐ Must be seated in circumferential groove

15 - Shim "S1"

- ☐ Note thickness
- ☐ Table of adjustments ➔ [page 160](#)

16 - Large tapered roller bearing for bevel gear

- ☐ Pulling off inner race ➔ [page 154](#)
- ☐ Pressing on inner race ➔ [page 156](#)
- ☐ Pressing out outer race ➔ [page 154](#)
- ☐ Pressing in outer race ➔ [page 157](#)

17 - Bevel gear with input shaft

- ☐ Is paired with shaft bevel gear ➔ [Item 27 \(page 146\)](#)
- ☐ Cannot be pressed off input shaft
- ☐ Adjusting ➔ [page 167](#)

18 - Small tapered roller bearing for bevel gear

- ☐ Pressing off inner race ➔ [page 155](#)
- ☐ Pressing on inner race ➔ [page 156](#)
- ☐ Pressing out outer race ➔ [page 155](#)
- ☐ Pressing in outer race ➔ [page 156](#)

19 - Shim "S2"

- ☐ Note thickness
- ☐ Table of adjustments ➔ [page 160](#)

20 - Final drive housing

21 - Oil seal

- ☐ Renew
- ☐ Insert stepped side into final drive housing

22 - O-ring

- ☐ Renew

23 - Oil seal

- ☐ Renew
- ☐ Insert stepped side into final drive housing

24 - Oil drain plug, 25 Nm

- ☐ With magnet

25 - Roller bearing

- ☐ Pulling out ➔ [page 155](#)
- ☐ Pressing in ➔ [page 156](#)

26 - Circlip

- ☐ Renew
- ☐ Removing ➔ [page 155](#)

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27 - Shaft bevel gear

- ☐ Is paired with bevel gear
- ☐ Clean thread
- ☐ Adjusting ⇒ [page 162](#)

28 - Large tapered roller bearing for shaft bevel gear

- ☐ Pulling off inner race ⇒ [page 153](#)
- ☐ Pressing on inner race ⇒ [page 157](#)
- ☐ Pulling out outer race ⇒ [page 153](#)
- ☐ Pressing in outer race ⇒ [page 157](#)

29 - Output flange**30 - Hexagon nut, 350 Nm**

- ☐ Slackening ⇒ [page 152](#)
- ☐ Renew
- ☐ Lubricate with gear oil before installing
- ☐ Tightening sequence ⇒ [page 158](#)

31 - Shim "S4"

- ☐ Note thickness
- ☐ Table of adjustments ⇒ [page 160](#)
- ☐ Fit onto spacer ring ⇒ [Item 32 \(page 146\)](#) before installing oil seal ⇒ [Item 33 \(page 146\)](#) and small tapered roller bearing inner race ⇒ [Item 34 \(page 146\)](#)

32 - Spacer ring

- ☐ Installation position: chamfer faces shaft bevel gear ⇒ [Item 27 \(page 146\)](#)
- ☐ Fit onto shaft bevel gear ⇒ [Item 27 \(page 146\)](#) before installing oil seal ⇒ [Item 33 \(page 146\)](#) , shim "S4" and small tapered roller bearing inner race ⇒ [Item 34 \(page 146\)](#)

33 - Oil seal

- ☐ Renew only with bevel box removed ⇒ [page 130](#)
- ☐ Pinion housing ⇒ [Item 36 \(page 146\)](#) does not have to be detached

34 - Small tapered roller bearing for shaft bevel gear

- ☐ Pressing out outer race ⇒ [page 152](#)
- ☐ Pressing in outer race ⇒ [page 157](#)
- ☐ Insert inner race in outer race

35 - Bolt, 25 Nm**36 - Pinion housing**

- ☐ Removing ⇒ [page 152](#)
- ☐ Installing ⇒ [page 157](#)
- ☐ Keep straight when installing, tighten securing bolts diagonally and in stages

37 - O-ring

- ☐ Renew
- ☐ Must rest in circumferential groove

38 - Shim "S3"

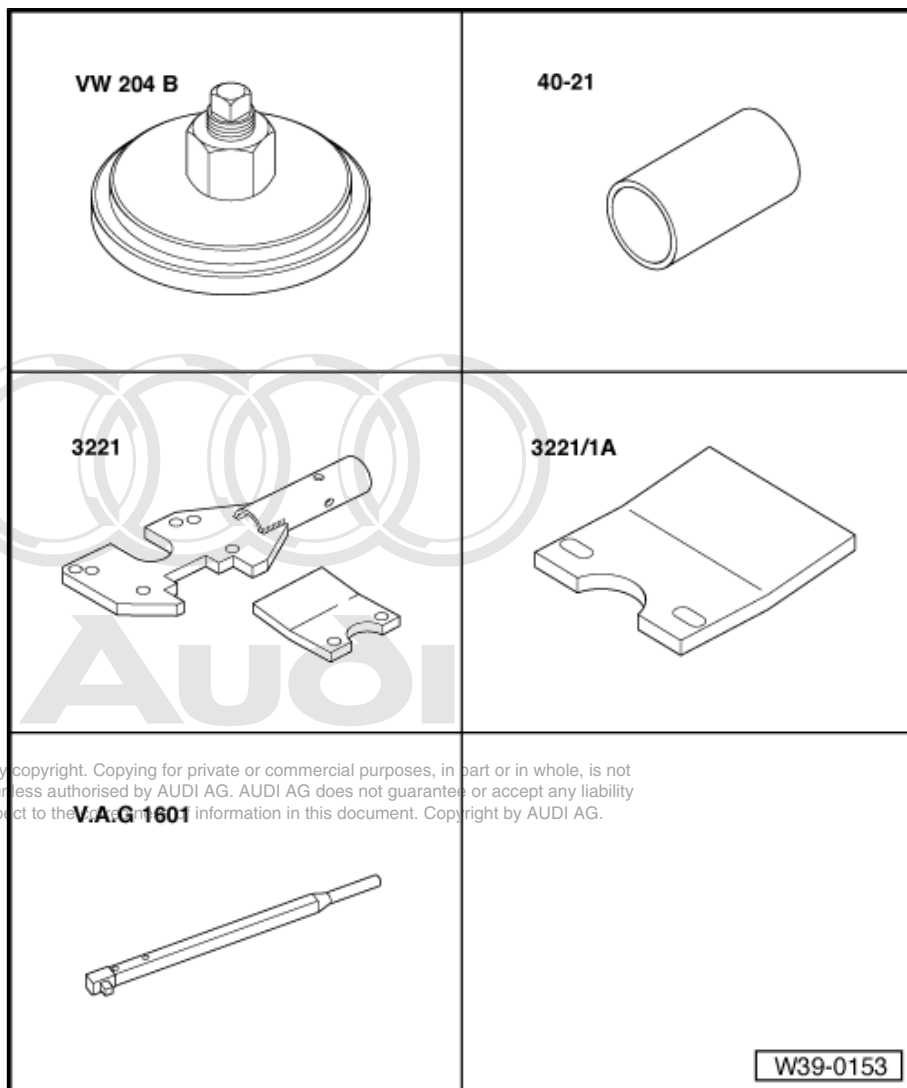
- ☐ Note thickness
- ☐ Table of adjustments ⇒ [page 160](#)

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3.3.2 Dismantling and assembling bevel box

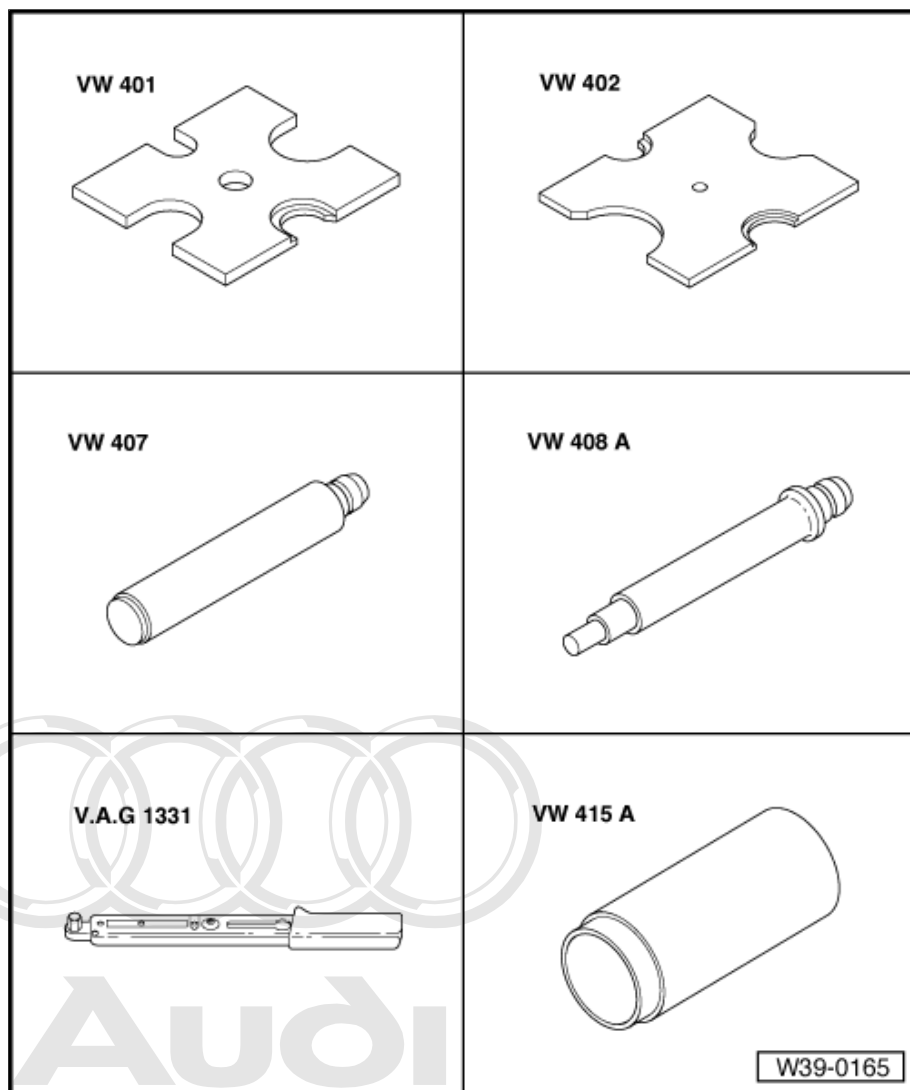
Special tools and workshop equipment required

- ◆ Fitting tool -VW 204 B-
- ◆ Press tool -40-21-
- ◆ Gearbox support -3221-
- ◆ Support plate -3221/1 A -
- ◆ Torque wrench - V.A.G 1601-



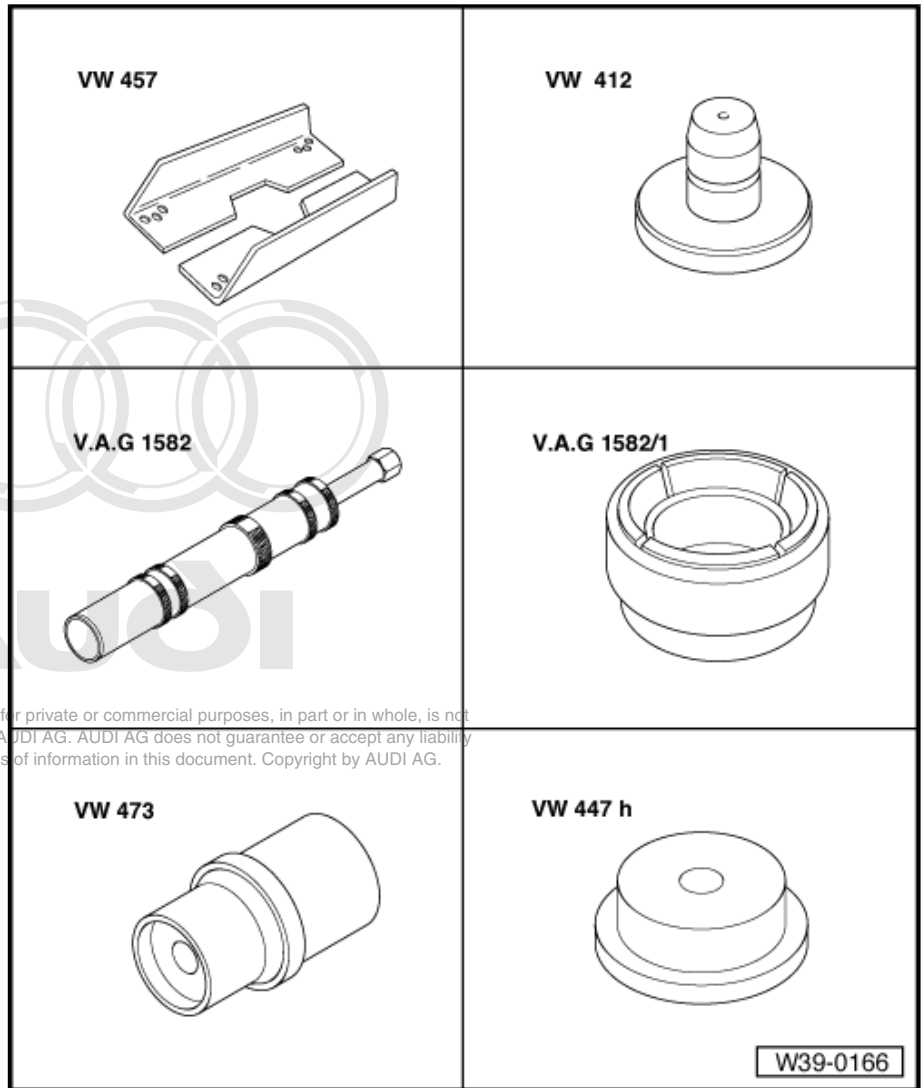
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- ◆ Thrust plate -VW 401-
- ◆ Thrust plate -VW 402-
- ◆ Press tool -VW 407-
- ◆ Press tool -VW 408 A-
- ◆ Tube -VW 415 A-
- ◆ Torque wrench - V.A.G 1331-



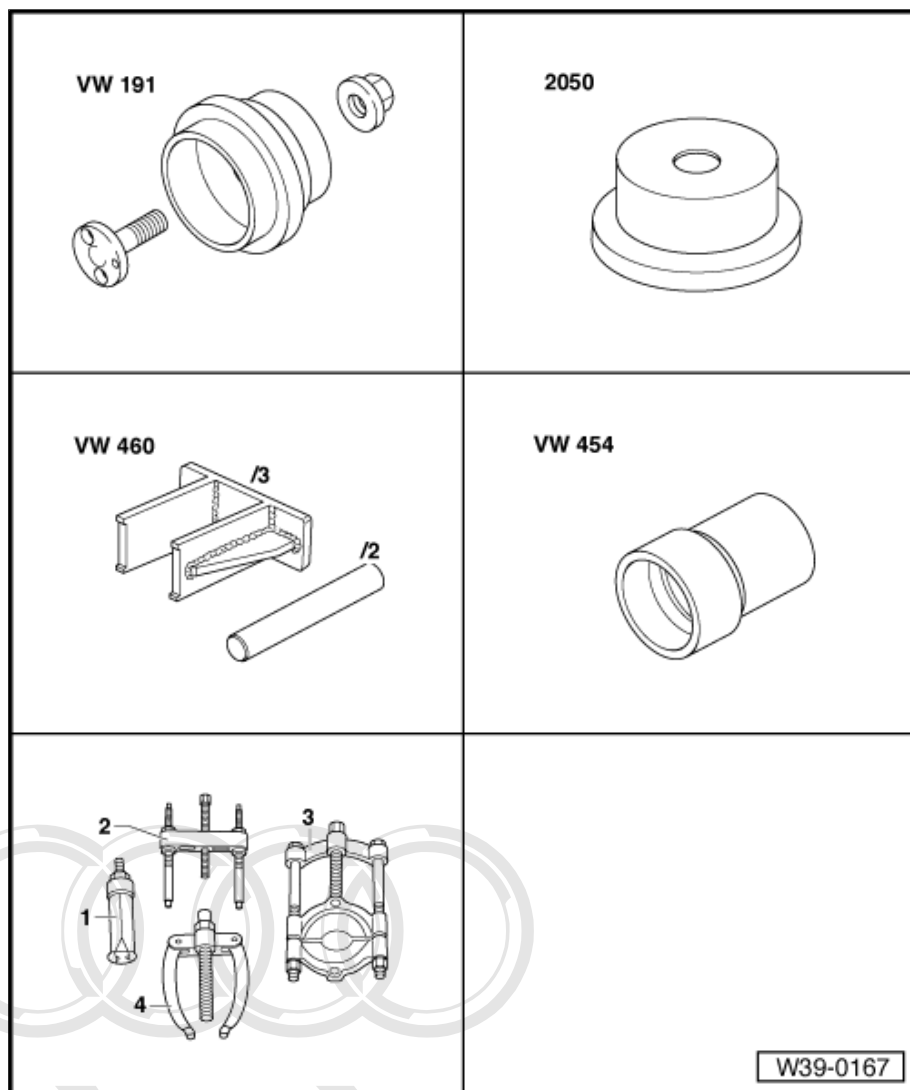
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- ◆ Support rails -VW 457-
- ◆ Press tool -VW 412-
- ◆ Puller -V.A.G 1582-
- ◆ Adapter -V.A.G 1582/1-
- ◆ Press tool -VW 473-
- ◆ Thrust plate -VW 447 H-



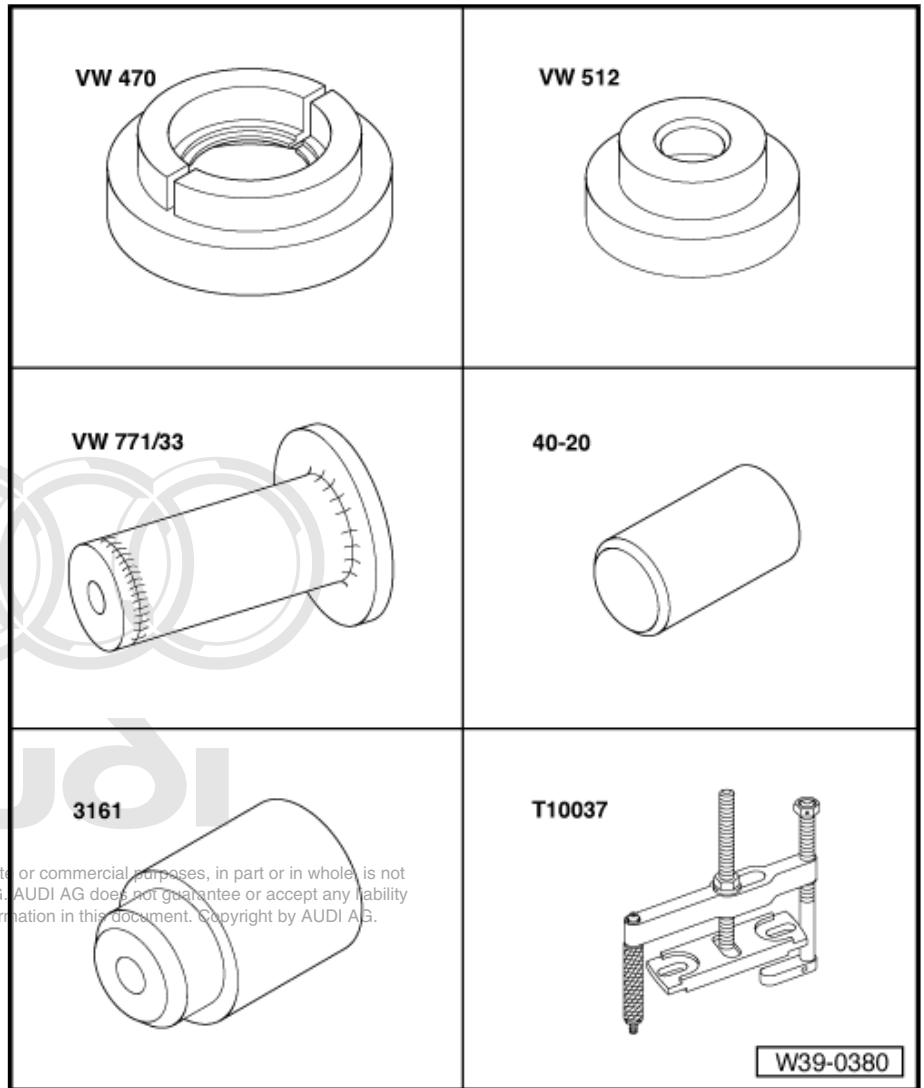
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- ◆ Fitting tool -VW 191-
- ◆ Thrust piece -2050-
- ◆ Tube -VW 460/2-
- ◆ Press tool -VW 454-
- ◆ -1- Internal puller -Kukko 21/3- , -Kukko 21/7- , -Kukko 21/8-
- ◆ -3- Splitter -Kukko 17/2-
- ◆ -4- Counter-support -Kukko 22/1- , -Kukko 22/2-



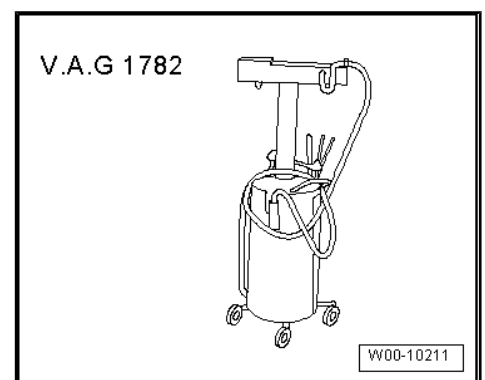
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- ◆ Thrust pieces for pinion shaft bearing -VW 470-
- ◆ Thrust pad -VW 512-
- ◆ Tube -VW 771/33-
- ◆ Drift sleeve -40-20-
- ◆ Extension -3161-
- ◆ Puller -T10037-



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



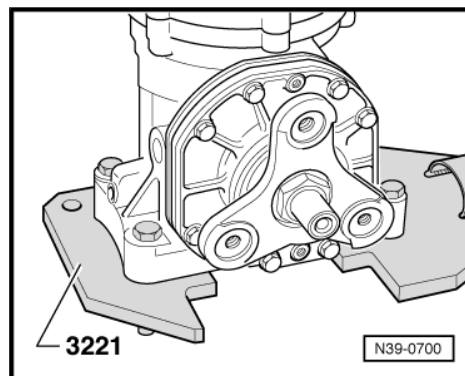
Dismantling

- Place used oil collection and extraction unit -V.A.G 1782- below gearbox.
- Drain gear oil.
- Secure bevel box in gearbox support.

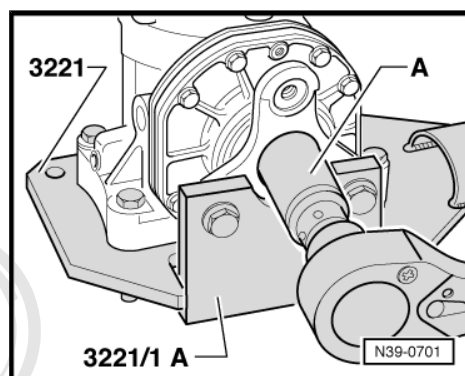


Note

If the output flange hexagon nut is not to be loosened, then the bevel box can be held in gearbox support -2004- for dismantling and assembling.



- Remove hexagon nut for output flange.
- A - Socket attachment with $\frac{3}{4}$ " drive
- Remove output flange.
- Pry out oil seal using screwdriver.
- Remove small tapered roller bearing inner race for shaft bevel gear.



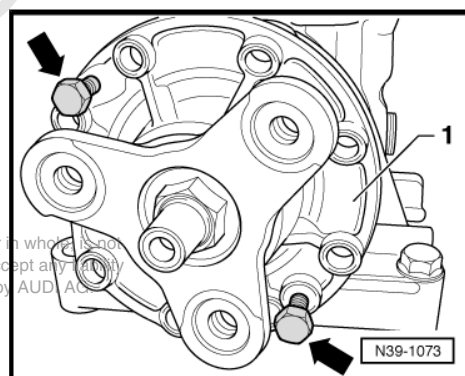
- Remove pinion housing -1-; to do so, screw hexagon bolts -arrows- in evenly so that pinion housing does not cant.



Note

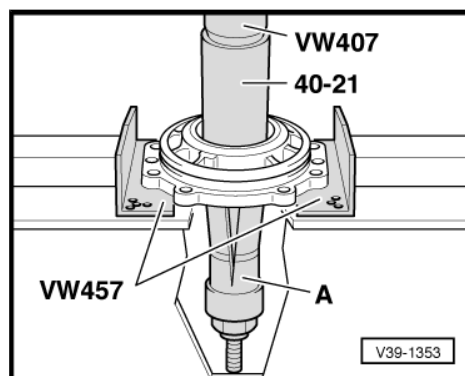
The pinion housing can also be removed and installed with the output flange fitted.

- Remove shim "S3".



- Press small tapered roller bearing outer race out of pinion housing.

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

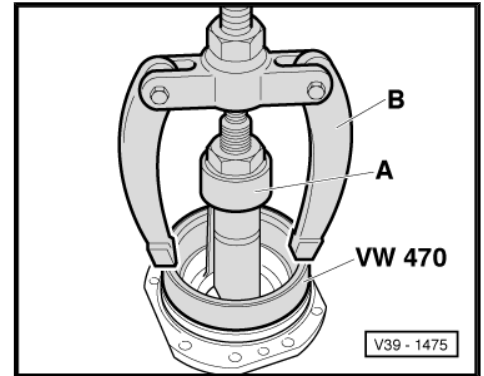


- Pull large tapered roller bearing outer race out of pinion housing.

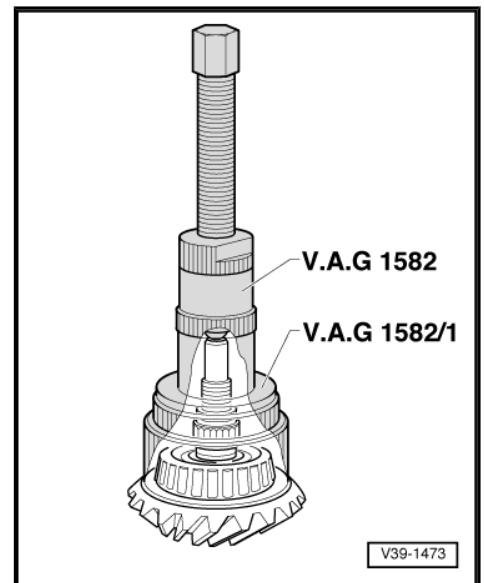
A - Internal puller 46 ... 58 mm -Kukko 21/7-

B - Counter-support -Kukko 22/2-

- Remove shaft bevel gear with shim "S4" and spacer ring.

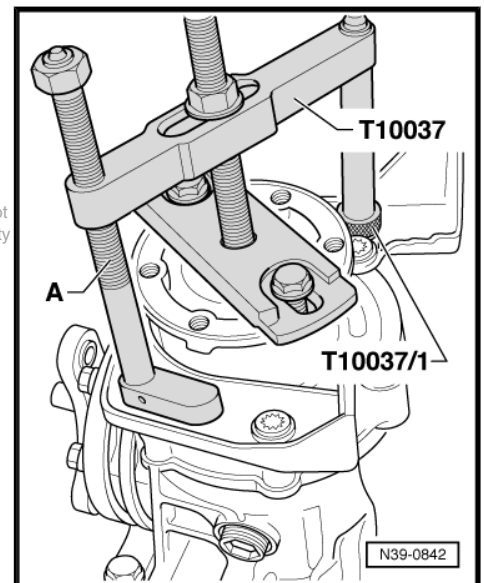


- Pull off large tapered roller bearing inner race from shaft bevel gear; to do so, fit adapter and apply tension behind the bearing rollers.
- Then turn bearing and retighten adapter.

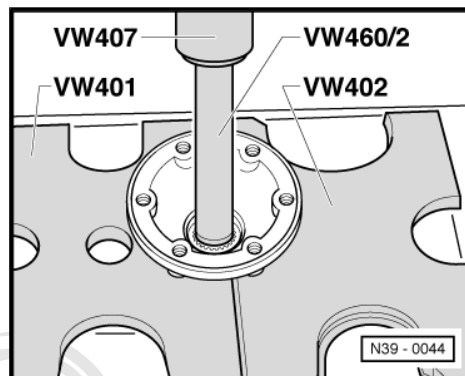


- Bolt puller -T10037- to flange shaft (right-side)/drive flange (right-side).
- Use knurled nut -T10037/1- and lower support -A- to align puller parallel with flange shaft/drive flange.
- Pull out flange shaft/drive flange.

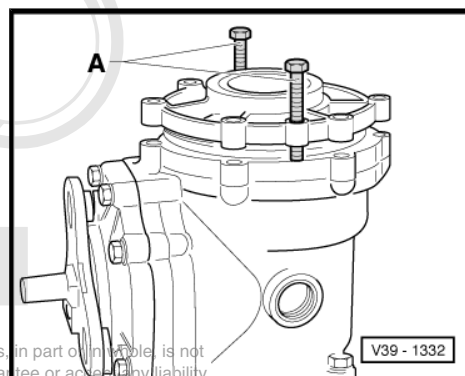
- If the oil seal has to be renewed then it must be levered out now.



- Press off drive flange from output shaft.



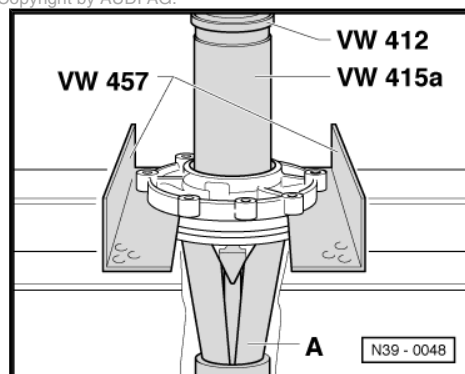
- Remove cover, when doing this screw hexagon bolts -A- in evenly so that the cover does not cant.



- Press large tapered roller bearing outer race out of cover.

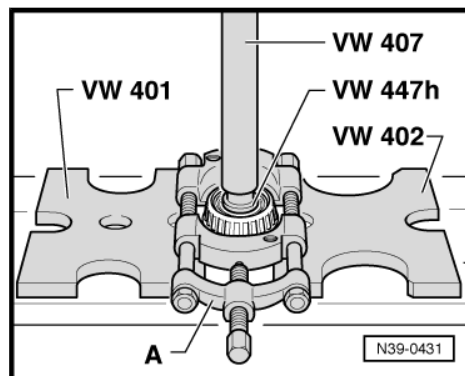
A - Internal puller 56 ... 70 mm -Kukko 21/8-

- Remove bevel gear with input shaft.



- Press off large tapered roller bearing inner race from bevel gear.

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



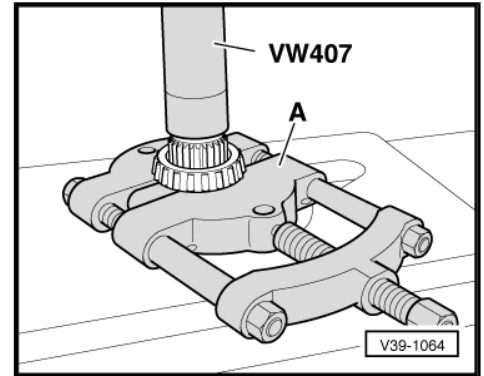
- Press off small tapered roller bearing inner race from input shaft.

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



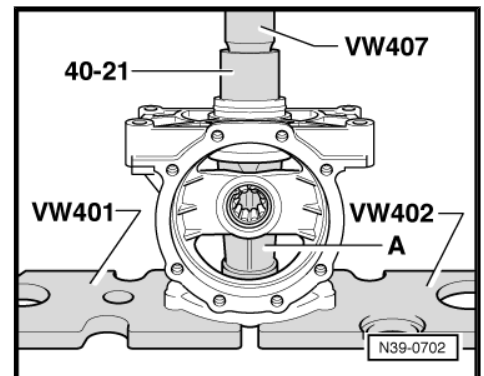
Note

Inner race can also be pulled off using tapered roller bearing puller -V.A.G 1582- and adapter -V.A.G 1582/3- but first place thrust plate -40-105- on input shaft.

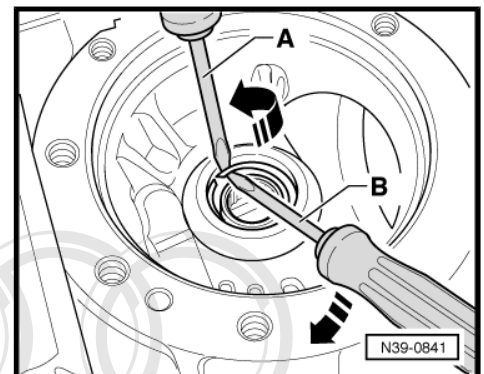


- Press small tapered roller bearing outer race out of final drive housing.

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



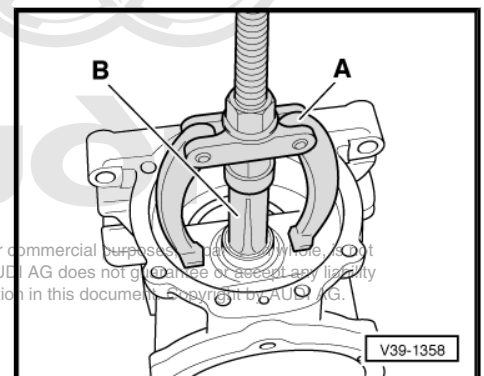
- Remove circlip for roller bearing from final drive housing: lever one end of circlip out of groove by turning screwdriver -A- .
- Lift this end of circlip using screwdriver -B- and lever out circlip further by re-applying screwdriver.



- Pull roller sleeve out of final drive housing.

A - Counter-support -Kukko 22/1-

B - Internal puller 13 ... 23 mm -Kukko 21/3-



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Assembling



Note

Table of adjustments ⇒ [page 160](#).

- Carefully press roller bearing into final drive housing as far as stop.
- The marking faces towards press tool.
- Fit new circlip in final drive housing.
- Fit shim “S2” and press small tapered roller bearing outer race into final drive housing.

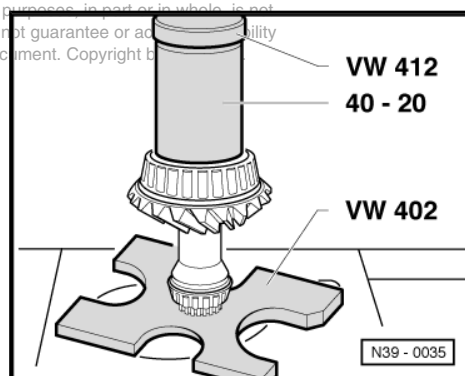
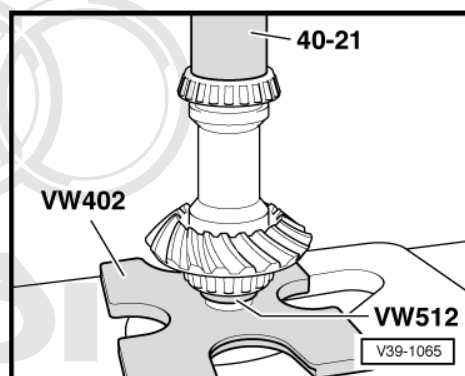
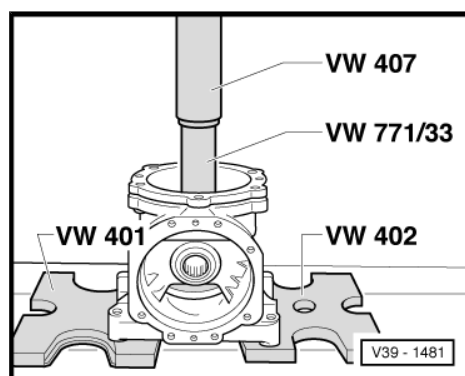
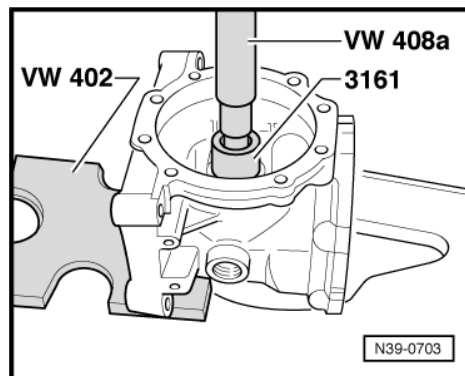


Note

Interrupt pressing operation as soon as possible to allow the tube -VW 771/33- to be seated over the complete circumference of the outer race.

- Press small tapered roller bearing inner race onto input shaft.

- Press large tapered roller bearing inner race onto bevel gear.
- Insert bevel gear with input shaft into final drive housing.

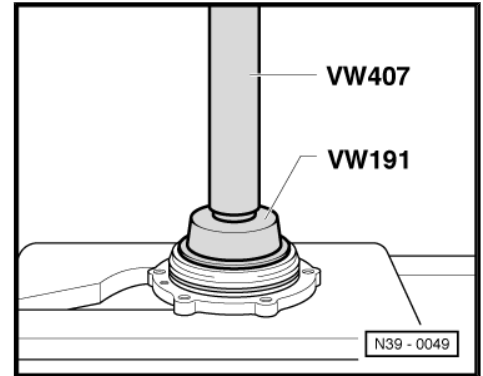


- Fit shim “S1” into cover and press in large tapered roller bearing outer race.
- Install cover with new O-ring.

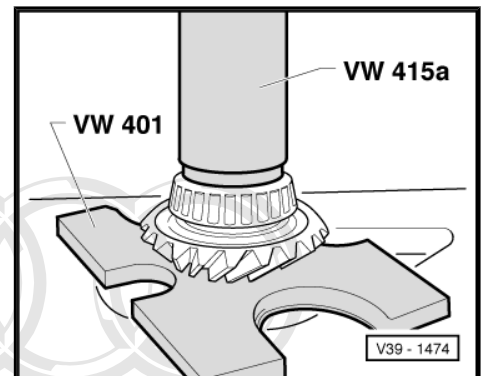


Note

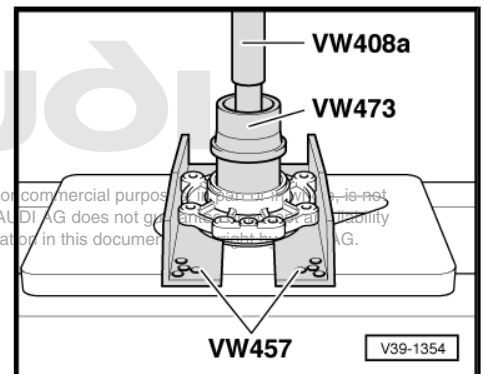
Keep straight when installing, tighten securing bolts diagonally and in stages



- Press large tapered roller bearing inner race onto shaft bevel gear.
- Insert shaft bevel gear with shim “S4” and spacer ring into final drive housing.
- Chamfer on spacer ring faces shaft bevel gear.



- Press small tapered roller bearing outer race into pinion housing.

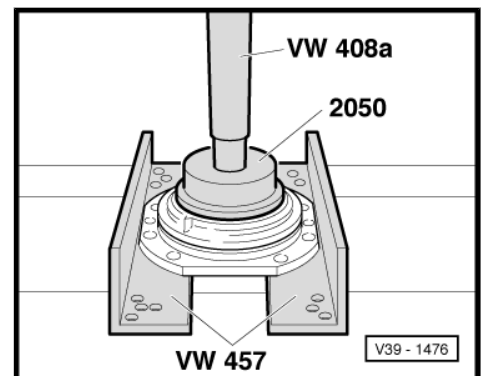


- Press large tapered roller bearing outer race into pinion housing.
- Fit shim “S3” onto final drive housing.
- Install pinion housing with new O-ring.

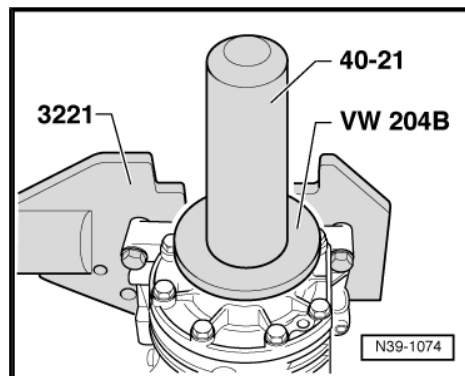


Note

- ◆ *Keep straight when installing, screw in and tighten securing bolts diagonally and in stages*
- ◆ *The pinion housing can also be removed and installed with the output flange fitted.*
- Insert small tapered roller bearing inner race for shaft bevel gear.



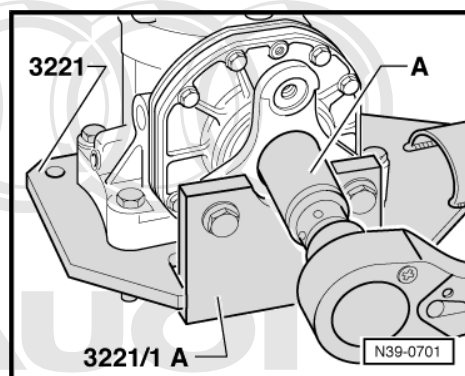
- Drive in new oil seal for output flange until flush.
- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1- .
- Install output flange.
- The threads of the hexagon nut for the output flange and the shaft bevel gear must be clean.



- Tighten hexagon nut for output flange.

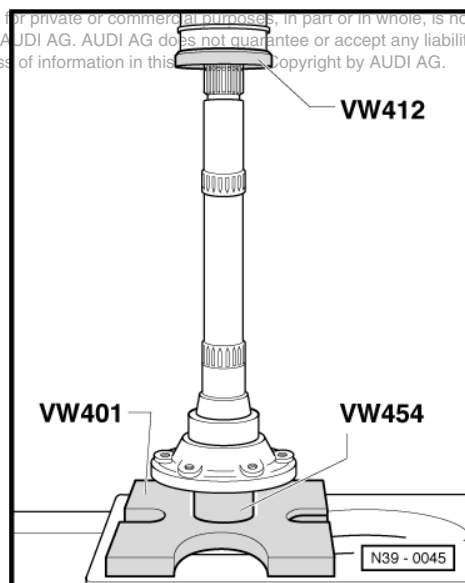
A - Socket attachment with $\frac{3}{4}$ " drive

- Drive in new oil seal for flange shaft/drive flange with output shaft as far as stop ⇒ [page 128](#) .
- Pack space between sealing lip and dust lip half-full with sealing grease -G 052 128 A1- .



- Press drive flange onto output shaft.
- Carefully drive in flange shaft/drive flange with output shaft (while turning).
- Secure flange shaft/drive flange with output shaft ⇒ [page 126](#) .
- Renew drive flange cap, if fitted.

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4 Adjusting bevel box

Adjusting shaft bevel gear and bevel gear (final drive gear set)

- ◆ Careful adjustment of the shaft bevel gear and bevel gear is essential to ensure that the final drive gear set gives long service and runs silently. During manufacture the bevel gear and shaft bevel gear are therefore matched and checked on testing machines to ensure correct mesh pattern and silent running. The position for quietest running is obtained by moving the shaft bevel gear axially and, at the same time, maintaining the backlash within the specified tolerance.
- ◆ The deviation "r" from the master gauge "Ro" is marked on the bevel gear. If required, the shaft bevel gear and bevel gear (final drive gear set) must always be renewed together.

Adjustment and marking of final drive gear set

A - Bevel gear

B - Shaft bevel gear

1 - Gear set pairing number "8033".

2 - Tolerance of shaft bevel gear "D = 3"

- Value for adjustment in production

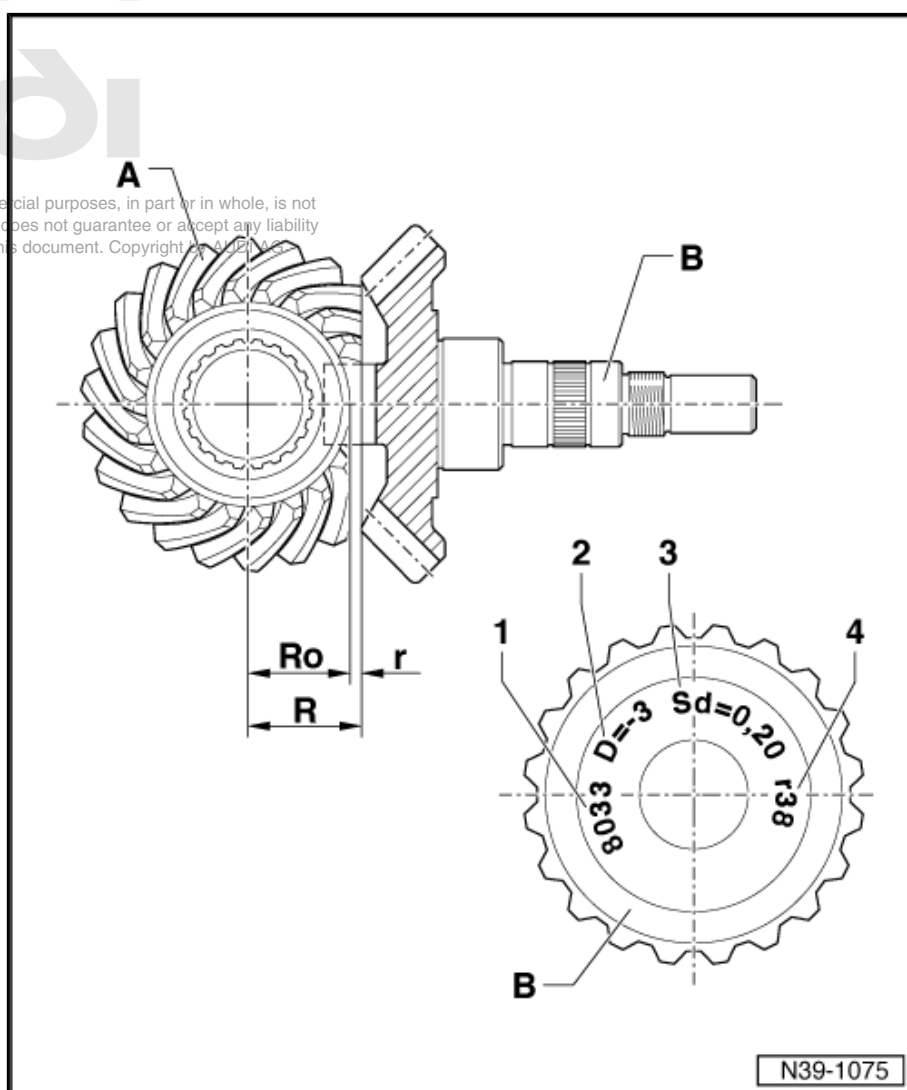
3 - Backlash "Sd = 0.20"

- Specification when checking adjustment

4 - Deviation (tolerance) "r" is based on the master gauge used on the test machine in production. Deviation "r" is always stated in $\frac{1}{100}$ mm. For example: "38" indicates $r = 0.38$ mm

Ro - Length of master gauge used on test machine "Ro" = 36.20 mm

R - Actual distance between bevel gear axis and face of shaft bevel gear in position of quietest running for this gear set.



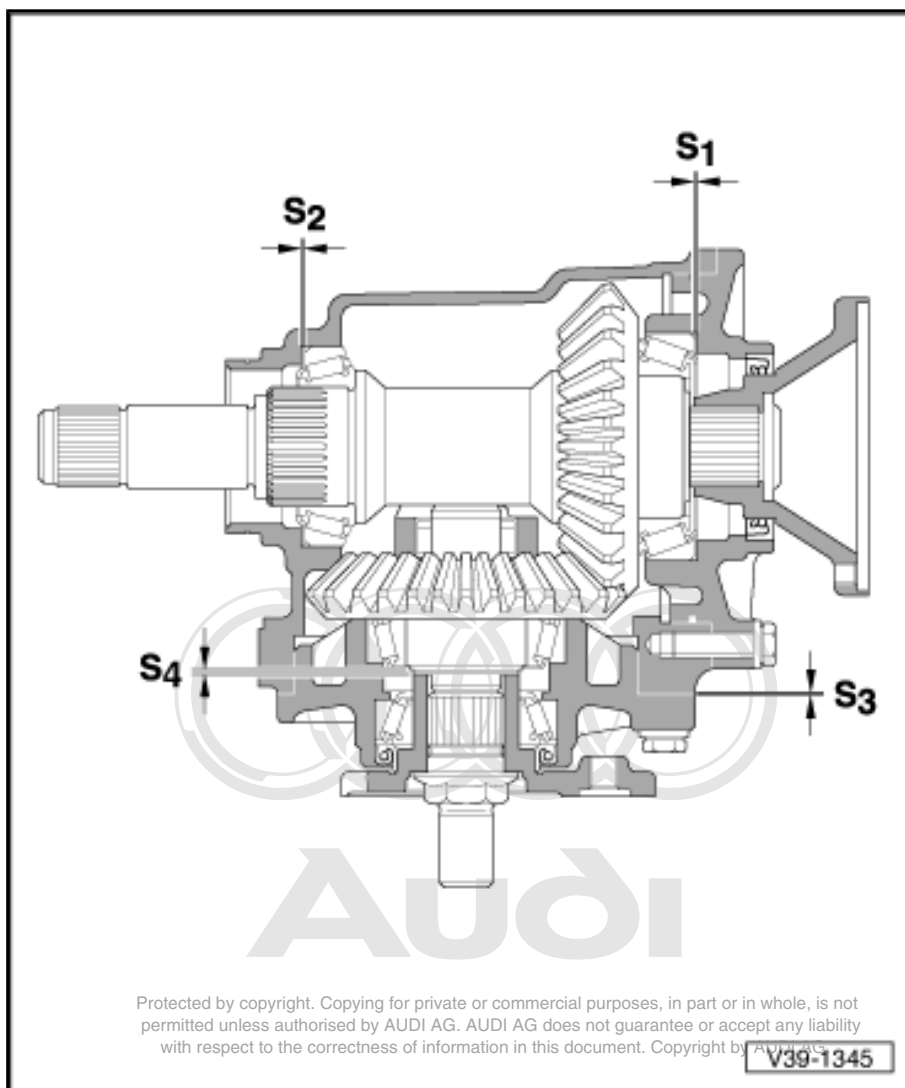
Position of shims

S1 - Shim for friction torque of bevel gear tapered roller bearing

S2 - Shim for friction torque and positioning of bevel gear

S3 - Shim for shaft bevel gear

S4 - Shim for friction torque of shaft bevel gear tapered roller bearing



Adjustment overview (bevel box)



Note

If repairs have been carried out on the bevel box it is only necessary to adjust the shaft bevel gear, bevel gear or the complete final drive gear set when parts are renewed which directly influence the adjustment of the final drive. Refer to the following table to avoid unnecessary adjustment work:

Components renewed:	Components requiring adjustment:	
	Shaft bevel gear "S3" + "S4" via deviation "r" ⇒ page 162	Bevel gear "S1" + "S2" ⇒ page 167
Final drive housing	x ¹⁾	x
Cover		x ²⁾
Final drive gear set (shaft bevel gear and bevel gear with input shaft)	x	x
Tapered roller bearings for shaft bevel gear	x	
Tapered roller bearings for bevel gear		x
Pinion housing	x	

Components renewed:	Components requiring adjustment:	
Output flange	x ³⁾	
1) "S3" only ⇒ page 166 . The shaft bevel gear is removed together with the pinion housing. Therefore the shim "S4" remains in place and is unchanged. 2) "S1" only (via previously measured total friction torque). 3) "S4" only (calculated from difference between measurements ⇒ page 161).		

Re-adjustment sequence for final drive gear set

To avoid unnecessary work, keep to the following sequence when adjusting the shaft bevel gear and bevel gear.

1. Adjust shaft bevel gear "S3"+"S4".
 - Determine thickness of shim "S4" and install shim. This sets the preload of the tapered roller bearings for the shaft bevel gear.
 - Determine thickness of shim "S3" and install shim. The shaft bevel gear is thus fixed axially such that the distance from the centre of the bevel gear to the face of the shaft bevel gear corresponds to the locating distance "R" calculated during production.
 - Check adjustment of "S3".
2. Adjust bevel gear "S1"+"S2".
 - Adjust preload of tapered roller bearings for bevel gear via "S_{total}" and friction torque.
 - Adjust backlash. Select shims "S1" and "S" so that the required backlash between shaft bevel gear and bevel gear is obtained.
 - Check backlash.

The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production. For good results, maximum care and cleanliness are very important when performing repairs and taking measurements.

4.1 Determining thickness of shim "S4" when renewing output flange

This adjustment is only necessary when renewing the output flange. It serves to re-set the required preload of the tapered roller bearings for the shaft bevel gear.

- Measure length of shaft on removed output flange and new output flange and calculate the difference.

Example:

Removed output flange	25.80 mm
New output flange	25.60 mm
Difference	0.20 mm

If new output flange is longer:

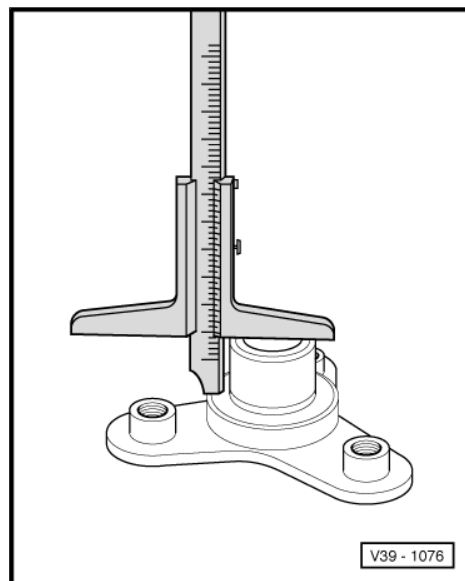
- Install a thinner shim for “S4” (thickness reduced by the difference calculated above).

If “old” output flange is longer:

- Install a thicker shim for “S4” (thickness increased by the difference calculated above).


Note

- ◆ Available shims for “S4” ⇒ [page 165](#).
- ◆ Tolerance variations make it possible to obtain the exact shim thickness required.



4.2 Adjusting shaft bevel gear

It is necessary to readjust the shaft bevel gear when the following components have been renewed:

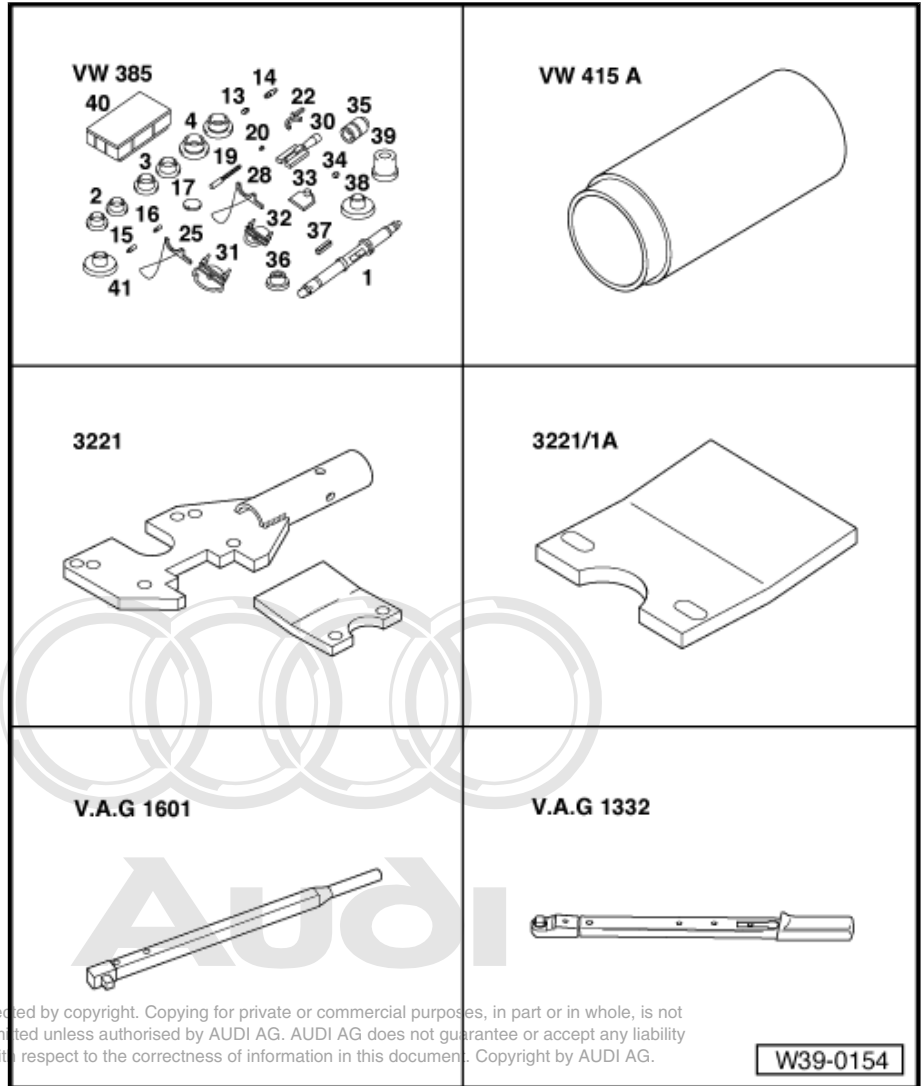
- ◆ Final drive housing
- ◆ Tapered roller bearings for shaft bevel gear
- ◆ Final drive gear set
- ◆ Pinion housing

Table of adjustments ⇒ [page 160](#)

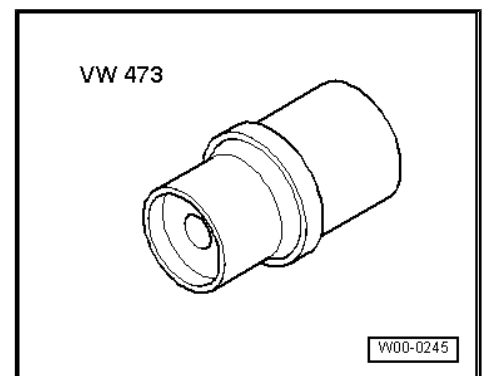
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Special tools and workshop equipment required

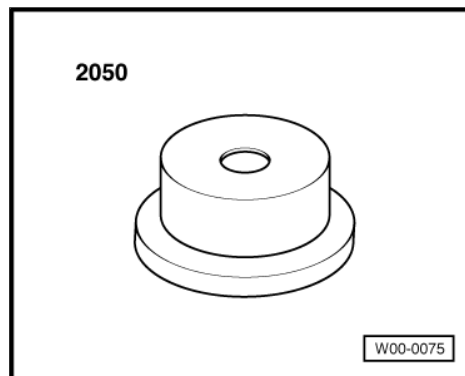
- ◆ Universal measuring tool - VW 385-
- ◆ Tube -VW 415 A-
- ◆ Gearbox support -3221-
- ◆ Support plate -3221/1 A -
- ◆ Torque wrench - V.A.G 1601-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-



- ◆ Press tool -VW 473-



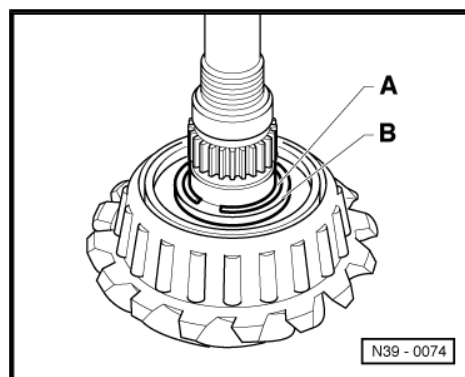
◆ Thrust piece -2050-



- ◆ Torque gauge, commercially available, 0 ... 600 Ncm
- ◆ Dial gauge
- ◆ Soldering wire $\varnothing$ 1.5 mm

Determining thickness of shim "S4"

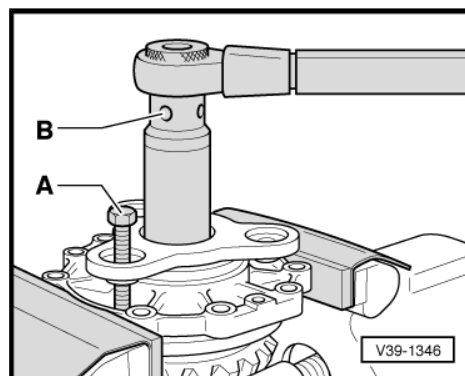
- Press large tapered roller bearing outer race for shaft bevel gear into pinion housing with thrust piece -2050- .
- Press small tapered roller bearing outer race for shaft bevel gear into pinion housing with press tool -VW 473- .
- Press large tapered roller bearing inner race onto shaft bevel gear using tube -VW 415 A- .
- Insert a piece of soldering wire $\varnothing$ 1.5 mm -item A- instead of shim "S4".
- Fit spacer ring -B- with chamfer facing tapered roller bearing inner race.
- Install shaft bevel gear.



- Fit small taper roller bearing inner race and output flange and attach hexagon nut.
- Screw in a hexagon bolt M10 -item A- to lock flange.

B - Socket

- Tighten hexagon nut to 20 Nm and unscrew hexagon bolt -A- a few turns or remove completely.



- Measure friction torque.

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

B - Socket

- If necessary, increase tightening torque until the specified friction torque is attained.



Note

- ◆ Only increase tightening torque slowly. Stop and check friction torque several times.
- ◆ If the specified friction torque is exceeded, the soldering wire must be renewed and the adjustment procedure repeated.

- Adjust the following friction torques:

- New bearing: 100 ... 240 Ncm.
- Used bearing: 30 ... 50 Ncm (run at least 50 km).

- Remove shaft bevel gear and carefully remove crushed soldering wire.

- Measure thickness of soldering wire at a point where it is well crushed and where there is no lip.

- Select required shim thickness(es) "S4" from following table:

Available shims - Thickness of shims in mm ¹⁾²⁾		
0.65	0.95	1.25
0.70	1.00	1.30
0.75	1.05	1.35
0.80	1.10	1.40
0.85	1.15	
0.90	1.20	

• ¹⁾ For Part No. refer to ⇒ Parts catalogue .

• ²⁾ Tolerance variations make it possible to obtain the exact shim thickness required.

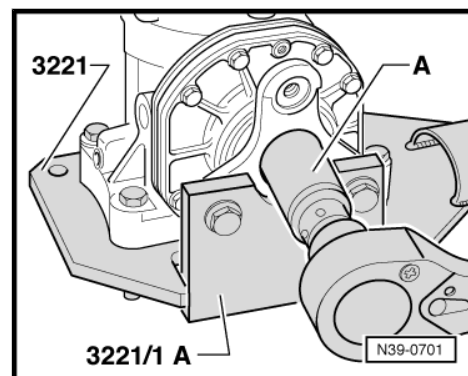
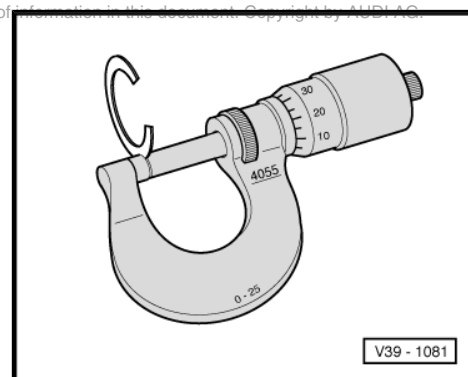
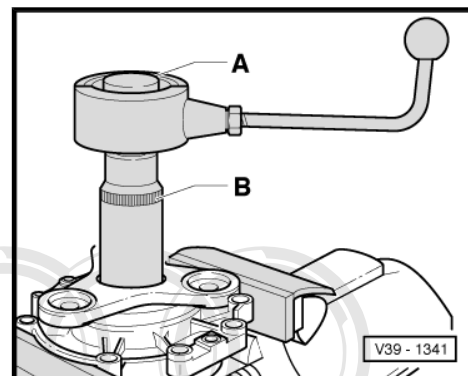
- Fit shim(s) "S4" and install shaft bevel gear.

- Tighten hexagon nut for output flange.

A - Socket attachment with $\frac{3}{4}$ " drive

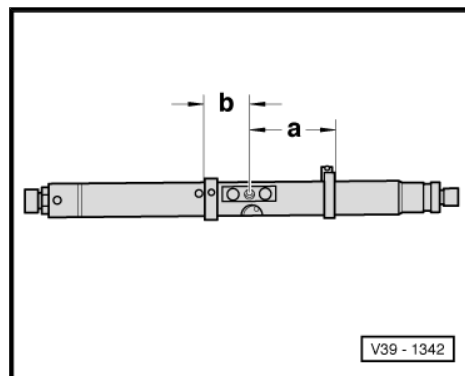
Checking adjustment (checking friction torque)

- Measure friction torque ⇒ [page 165](#) .
- Correct adjustment if necessary by fitting a thinner shim "S4" (to give more friction torque) or a thicker shim "S4" (to give less friction torque).

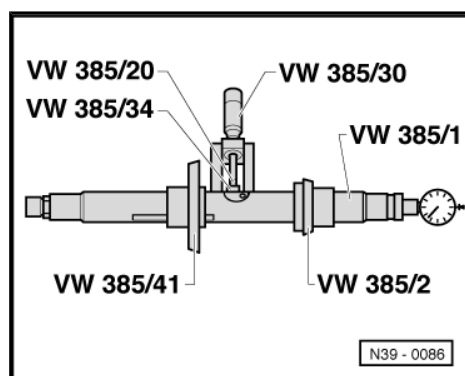


Determining thickness of shim "S3"

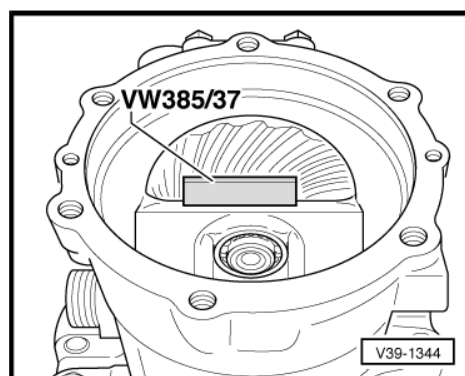
- Install pinion housing with shaft bevel gear and fitted shim "S4".
- Do not install O-ring.
- Adjust setting ring of universal measuring tool -VW 385/1- to dimension -a- = 75 mm.
- Set adjustable ring to dimension -b- = 32 mm.



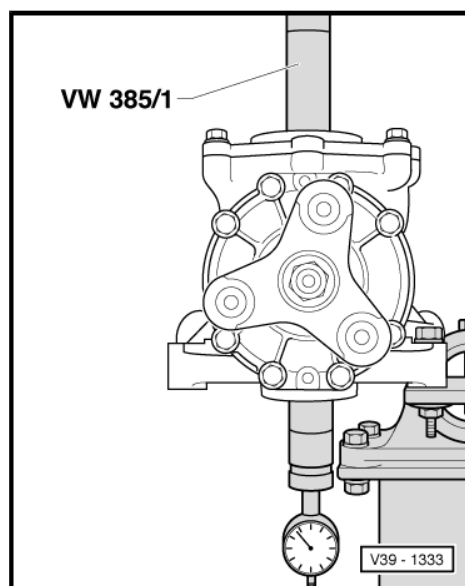
- Assemble universal measuring tool as shown in illustration; use dial gauge extension -VW 385/20- (length 3 mm).
- Set universal master gauge -VW 385/30- to "Ro" = 36.20.
- Set dial gauge to "0" with a preload of 3 mm.



- Place end measuring plate on face of shaft bevel gear.



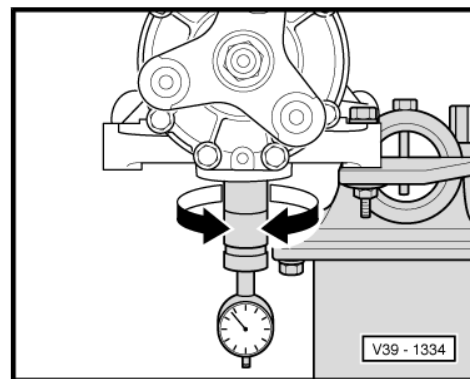
- Insert universal measuring tool.
- Attach cover and tighten hexagon bolts.
- Using the adjustable ring, move the centring disc outwards as far as possible so that the measuring tool can still just be turned by hand.



- Turn measuring tool until tip of dial gauge contacts end measuring plate and gauge indicates maximum deflection (return point). The measured value is dimension “e” (in red scale) (in example: 0.47 mm).
- Remove universal measuring tool.

 Note

Finally, check again whether dial gauge returns to “0” with master gauge -VW 385/30- set to 3 mm preload, otherwise repeat measurement.



Determining shim thickness “S3”

Formula: “S3” = “e” + “r”

e - Measured value (maximum deflection)

r - Deviation (indicated on bevel gear in $\frac{1}{100}$ mm)

Example:

Dial gauge reading: dimension “e” (example)	0.47 mm
Dimension “r” marked on bevel gear	+ 0.38 mm
Thickness of shim “S3”	= 0.85 mm

- Select required shim thickness(es) “S3” from following table:

Available shims - Thickness of shims in mm ¹⁾²⁾		
0.65	0.90	1.15
0.70	0.95	1.20
0.75	1.00	1.25
0.80	1.05	
0.85	1.10	
• ¹⁾ For Part No. refer to ⇒ Parts catalogue . • ²⁾ Tolerance variations make it possible to obtain the exact shim thickness required.		

- Remove pinion housing with shaft bevel gear.
- Install determined shim(s) “S3”.

Checking adjustment (checking dimension “R”)

- Insert universal measuring tool and measure dimension “R”.
- If the correct shims have been selected, the dial gauge (reading anti-clockwise in the red range), should now show the value of the noted deviation “r” on the bevel gear within a tolerance of ± 0.04 mm

4.3 Adjusting bevel gear

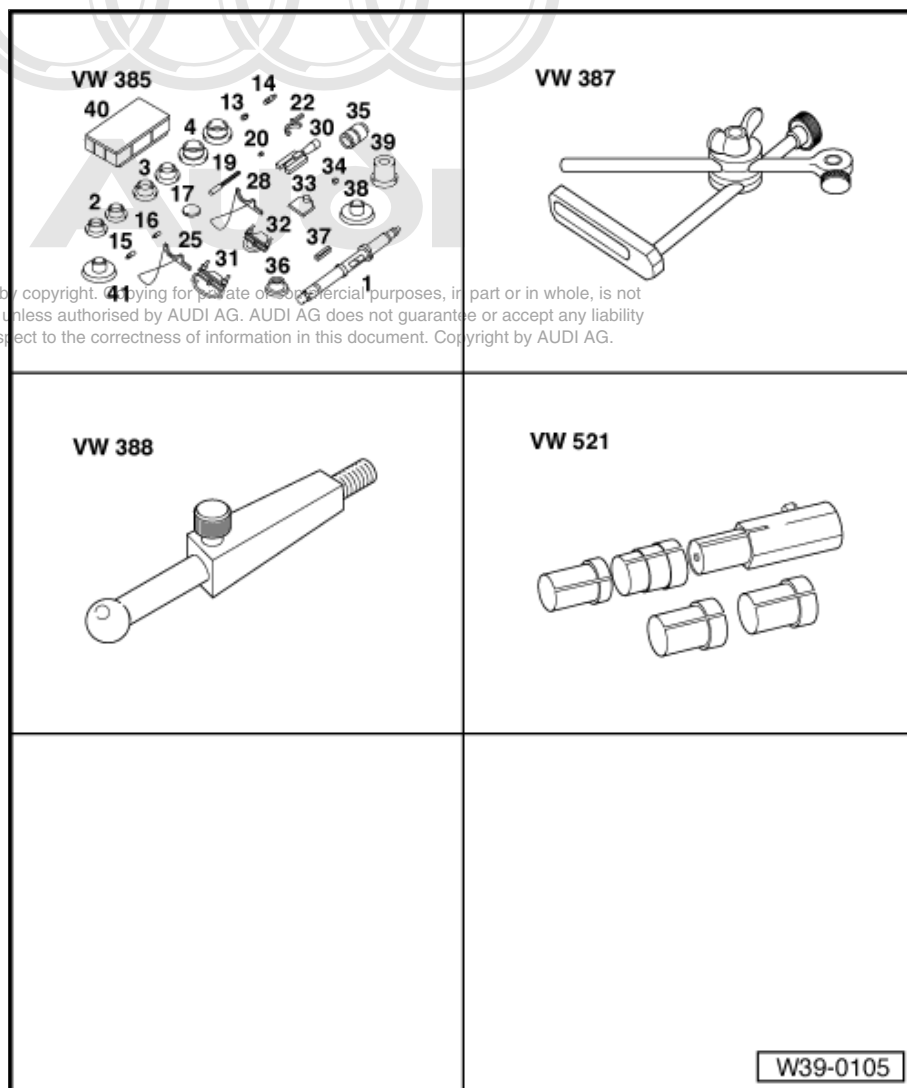
It is necessary to readjust the bevel gear when the following components have been renewed:

- ◆ Final drive housing
- ◆ Cover
- ◆ Tapered roller bearings for bevel gear with input shaft
- ◆ Final drive gear set

Table of adjustments ⇒ [page 160](#) .

Special tools and workshop equipment required

- ◆ End measuring plate - VW 385/17-
- ◆ Universal dial gauge bracket -VW 387-
- ◆ Adjustable measuring lever -VW 388-
- ◆ Crown wheel adjusting tool -VW 521/4-
- ◆ Crown wheel adjusting tool -VW 521/13-
- ◆ Dial gauge



Adjusting preload of tapered roller bearings for bevel gear (friction torque)

- Shaft bevel gear removed.
- Insert 1.2 mm shim in seat of small tapered roller bearing outer race ("S2" side).



Note

For measurement purposes a shim "S2" with a thickness of 1.20 mm is fitted provisionally. It is referred to below as "S2*". After determining the backlash "S2*" will be replaced by the correct shim "S2".

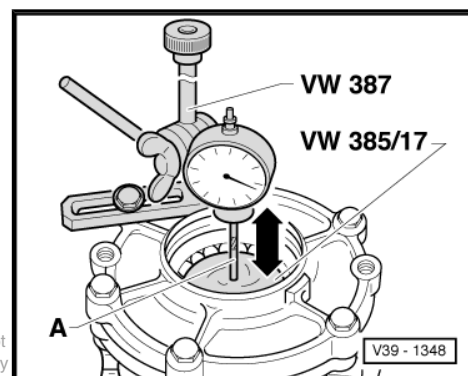
- Press in outer race ⇒ [page 156](#) .
- Fit bevel gear with input shaft together with taper roller bearing.
- Install cover with large tapered roller bearing outer race but without O-ring, drive flange oil seal and without shim "S1".
- Press bevel gear with input shaft towards cover and turn eight times.

- Press bevel gear with input shaft towards small tapered roller bearing outer race and turn eight times.
- Fit dial gauge with 30 mm dial gauge extension -item A-.
- Set dial gauge to “0” with a preload of 2 mm.
- Move bevel gear with input shaft up and down -double-ended arrow-.
- Read off and note play indicated on dial gauge (in this example: 0.45 mm) and calculate “ S_{total} ”.

Formula: “ S_{total} ” = “ $S2^*$ ” + measured value + preload

Example:

Installed shim(s) “ $S2^*$ ”	1.20 mm
Dial gauge reading (example)	+ 0.45 mm
Preload (constant value)	+ 0.30 mm
“ S_{total} ”	= 1.95 mm



Determining thickness of provisional shim “ $S1^*$ ”



Note

- ◆ The provisional adjustment shim “ $S1^*$ ” will be replaced with the final shim “ $S1$ ” after determining the backlash.
- ◆ Total shim thickness “ S_{total} ” remains unchanged.

Formula: “ $S1^*$ ” = “ S_{total} ” – “ $S2^*$ ”

Example:

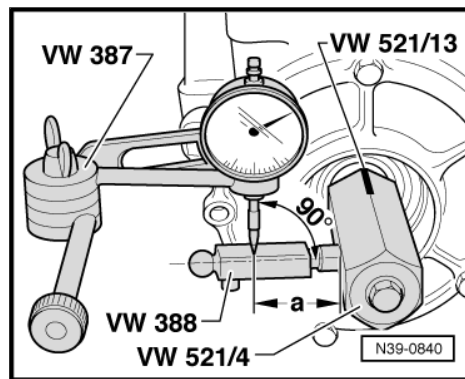
Total shim thickness “ S_{total} ”	1.95 mm
Installed shim(s) “ $S2^*$ ”	– 1.20 mm
Thickness of shim “ $S1^*$ ”	= 0.75 mm

The following shims are available for “ $S1$ ” ⇒ [page 171](#) .

Measuring backlash

- Pinion housing with shaft bevel gear and “ $S3$ ” installed
- Install bevel gear with input shaft: “ $S1^*$ ” is fitted on cover side, “ $S2^*$ ” in final drive housing.

- Fit measuring tools with dial gauge extension, approx. 25 mm as shown in the illustration.
- Dimension -a- = 39 mm
- Screw in measuring lever -VW 388- so that the dial gauge extension is at right angles to the measuring face.
- Rotate bevel gear with input shaft until stop. Set dial gauge to “0”, turn bevel gear with input shaft back and read off backlash. Note this value.
- Loosen locking screw on clamping sleeve and turn bevel gear with input shaft through a further 90°. Then repeat complete measuring process a further 3 times. Add up the four measured values and calculate the average backlash.



Calculating average backlash

Example:

1st measured value	0.45 mm
+ 2nd measured value	0.44 mm
+ 3rd measured value	0.45 mm
+ 4th measured value	0.46 mm
Total	1.80 mm

Average backlash = 1.80 mm : 4 = 0.45 mm.

Determining thickness of shim “S2”

Formula: “S2” = “S2*” – average backlash + lift (constant value)

Example:

Installed shim(s) “S2*”	1.20 mm
Average backlash	– 0.45 mm
Lift (constant value)	+ 0.20 mm
Shim “S2”	= 0.95 mm

- Select required shim thickness from following table:

Available shims - Thickness of shims in mm ¹⁾²⁾		
0.15	0.50	0.90
0.20	0.60	1.20
0.30	0.70	
0.40	0.80	
• 1) For Part No. refer to ⇒ Parts catalogue . • 2) Tolerance variations make it possible to obtain the exact shim thickness required.		

- Install determined shim(s) “S2” instead of “S2*”.
- Press outer race in again and install bevel gear with input shaft.

Determining thickness of shim “S1”

Formula: “S1” = “S2” + “S2*”

Example:

Total shim thickness “S2”	1.95 mm
Installed shim(s) “S2”	– 0.95 mm
Thickness of shim “S1”	= 1.00 mm

- Select required shim thickness from following table:

Available shims - Thickness of shims in mm ¹⁾²⁾		
0.70	0.95	1.20
0.75	1.00	1.25
0.80	1.05	1.30
0.85	1.10	1.35
0.90	1.15	
• ¹⁾ For Part No. refer to ⇒ Parts catalogue . • ²⁾ Tolerance variations make it possible to obtain the exact shim thickness required.		

- Install determined shim(s) "S1".
- Press outer race back in.
- Install cover.

Checking adjustment - measuring backlash

- Measure backlash.
- Specification: 0.15 ... 0.20 mm



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