

Audi A8 1994 ➤

Automatic gearbox 018 Four-wheel drive

Gearbox ID	CML							
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Edition 01.1999

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List of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

Audi A8 1994 ➤

Automatic gearbox 018 Four-wheel drive

Repair Group

00 - Technical data

32 - Torque converter

37 - Controls, Housing

38 - Gears, Hydraulic controls

39 - Final drive, Differential rear



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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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Audi Automatic gearbox 018 Four-wheel drive - Edition 01.1999

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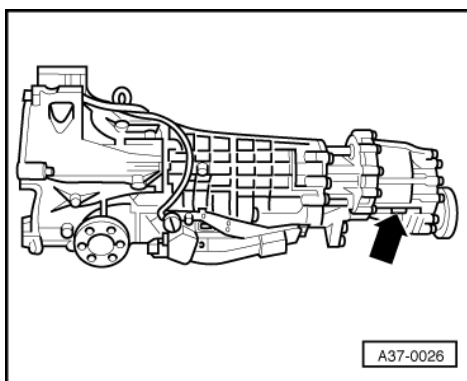
00 - Technical data

1 - Gearbox identification

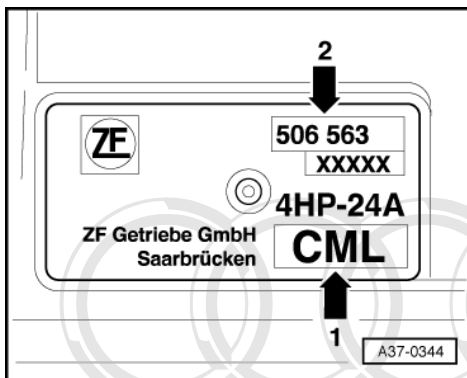
1.1 - Gearbox identification

The 4-speed automatic gearbox 018 (four-wheel drive) is installed in the Audi A8 1994 ä in combination with 8-cylinder engines.
Allocation=>Page 2.

Location on gearbox



-> Gearbox serial number -arrow-



-> Gearbox code letters and gearbox serial number

Code letters -arrow 1-
Gearbox serial No. -arrow 2-

Note:

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The gearbox code letters are also included on the vehicle data stickers.
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2 - Code letters, gearbox allocation, ratios, equipment

2.1 - Code letters, gearbox allocation, ratios, equipment

Automatic gearbox		018		
Gearbox	Code letters	CML		
	Manufactured from to	11.93		
Torque converter	Code letters	B21		
Allocation	Model	Audi A8 1994 ä		
	Engine	4.2 ltr. - 220kW		
Ratios	1st gear	2.479		
	2nd gear	1.479		
	3rd gear	1.000		
	4th gear	0.728		
	Reverse gear	2.086		

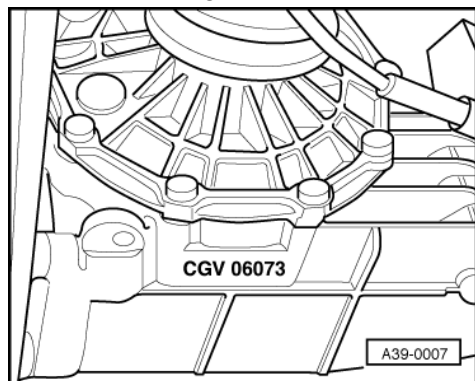
Gearbox	Code letters		CML		
Intermediate drive to front axle	No. of teeth	Input gear	27		
		Intermediate gear	59		
		Output gear	35		
	Ratio		1.30		
Intermediate drive to rear axle	No. of teeth	Input gear	39		
		Output gear	36		
	Ratio		0.923		
Front final drive	No. of teeth	Drive pinion	12		
		Crown wheel	35		
	Ratio		2.916		
Drive shaft flange dia.			108 mm		
Allocation: rear final drive	Code letters		CGV		

3 - Rear final drive identification

3.1 - Rear final drive identification

Final drive 01R is allocated to automatic gearbox 018 (four-wheel drive).

Allocation => Page **3**, Technical data



-> Code letters and manufacturing data for rear final drive

Example:	CGV	06	07	3
	Code letters		Day Month	Year (1993) of manufacture

Note:

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

4 - Code letters, gearbox allocation, ratios

4.1 - Code letters, gearbox allocation, ratios

Rear final drive		01R	
Code letters		CGV	
Manufactured	from to	11.93	
Allocation	Model Engine	Audi A8 1994 ä 4.2 ltr. - 220 kW	
Ratio	Final drive	37 : 9 = 4.111	
Drive shaft flange dia.		108 mm	
Allocation: Automatic gearbox 018 (four-wheel drive) Code letters		CML	

5 - Capacities

5.1 - Capacities

Planetary gearbox

Capacities	Planetary gearbox	Automatic gearbox
Initial filling	9.7 ltr.	018
Fluid change	approx. 3.0 ltr.1)	
Lubricant	VW ATF 2)	

1) ATF replacement intervals for planetary gearbox

=> Maintenance booklet

2) VW ATF G 052 162 .. is colourless or yellowish. It is available as a replacement part in the following container sizes:

- ◆ 0.5 ltr. - Part No. G 052 162 A1
- ◆ 1.0 ltr. - Part No. G 052 162 A2

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**Note:**

Use only VW ATF (available as a replacement part) for the planetary gearbox in automatic gearbox 018.

Front final drive

Capacities	Front final drive	Automatic gearbox
Initial filling	0.5 ltr.	018
Oil change	Filled for life No change	
Lubricant	Gear oil SAE 75 W 901) (synthetic oil)	

1) Gear oil SAE 75 W 90 (synthetic oil) is available as a replacement part in the following container sizes:

- ♦ 0.5 ltr. - Part No. G 052 145 A1
- ♦ 1.0 ltr. - Part No. G 052 145 S2

Checking oil level in front final drive=>page **75** .

Rear final drive

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Capacities	Rear final drive	Rear final drive unit
Initial filling	1.5 ltr.	01R
Oil change	Filled for life No change	
Lubricant	Hypoid gear oil GL5 SAE 90 (MIL-L 2105 B)	

Checking oil level in rear final drive => Page **117** .

6 - Repair instructions

6.1 - Repair instructions

6.2 - Contact corrosion

Contact corrosion can occur if non-approved fasteners are used on the vehicle (bolts, nuts, washers etc.).

For this reason, all the fastening components used in production are specially treated. These components can be identified by their greenish surface finish.

In addition to this, all rubber and plastic parts and all adhesives are made of non-electrically conductive materials.

If you are not sure whether used parts can be re-installed, always fit new parts.

Warning!

- ♦ **Use only Genuine Audi A8 Parts.**
- ♦ **Accessories must be approved by AUDI**
- ♦ **Damage resulting from contact corrosion is not covered by the warranty.**

6.3 - General repair instructions

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

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

Special tools

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

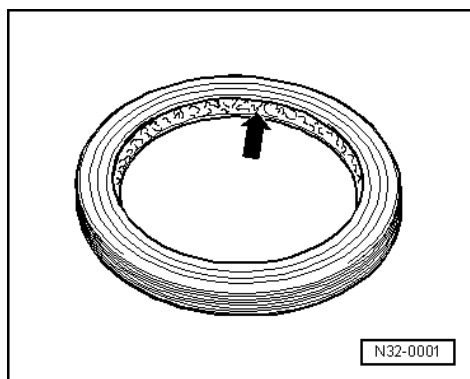
=> Booklet; Special tools, Workshop equipment

Gearbox

- ◆ Observe rules for cleanliness when working on automatic gearbox => Page 53 .
 - ◆ Do not run the engine or tow the vehicle if the oil pan is removed or if the ATF has been drained from the gearbox.
 - ◆ If the gearbox is removed from the vehicle, secure the torque converter to prevent it dropping out.
 - ◆ Thoroughly clean all connections and the surrounding area before disconnecting.
 - ◆ Before installing the gearbox, check the installed depth of the torque converter => Page 10 .
 - ◆ When installing gearbox, ensure that the dowel sleeves are fitted correctly.
 - ◆ Place removed parts on a clean surface and cover over. Use sheeting and paper. Do not use fluffing cloths!
 - ◆ If repairs cannot be completed immediately and components are left open, cover the components carefully or fit plugs as required.
 - ◆ Install only clean parts: do not remove replacement parts from their wrapping until you are ready to install them.
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- ◆ When fitting a replacement automatic gearbox, check the following fluid levels and top up as necessary:
ATF in planetary gearbox => Page 3
 - ◆ When fitting a replacement rear final drive, check the oil level in the rear final drive and top up if necessary => Page 4 .

O-rings, seals, gaskets

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



- ◆ Thoroughly clean housing joint surfaces before assembling.
- ◆ -> Before installing oil seals (radial shaft seals), pack space between sealing lips -arrow- with grease.
- ◆ The open side of the oil seals faces toward the side with fluid filling.
- ◆ Before installing, lightly lubricate outer circumference of seal and sealing lips with ATF or gear oil, depending on fitting location.
- ◆ Lightly lubricate O-rings with ATF before inserting to prevent them being trapped and damaged when assembling.
- ◆ Use only ATF in the parts of the gearbox where ATF is the specified lubricant; other lubricants will cause malfunctions in the gearbox hydraulics.



- ♦ When replacing oil seals, always vary the point at which the sealing lips make contact (use insertion depth tolerances).
- ♦ After installing, check the relevant fluid levels and top up if necessary:
ATF in planetary gearbox=>Page **3**.

Nuts, bolts

- ♦ Slacken the bolts in opposite sequence to the specified tightening sequence.
- ♦ Nuts and bolts which secure covers and housings should be slackened and tightened crosswise in stages if no tightening sequence is specified.
- ♦ Parts which are particularly sensitive to distortion (e.g. valve body) must be kept straight when removing and installing; loosen or tighten diagonally in stages.
- ♦ The tightening torques stated apply to non-oiled nuts and bolts.
- ♦ Renew self-locking bolts and nuts.
- ♦ The threads of bolts which are secured by a locking fluid should be cleaned with a wire brush. Then apply AMV 185 101 A1 when inserting.
- ♦ Threaded holes into which self-locking bolts or bolts coated with locking fluid are screwed, must be cleaned (e.g. tap). Otherwise there is a danger of bolts shearing when subsequently being removed.

Locking elements

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

Bearings

- ♦ Install needle bearings with the lettering on the bearing (the side with thicker metal) facing towards the drift or other tool used for installing.
- ♦ Lubricate bearings with gear oil or ATF, depending on fitting location.
- ♦ The taper roller bearings for the drive pinion and the differential in the rear final drive are of the low-friction type. Do not additionally oil new taper roller bearings before performing friction torque measurements. These bearings have already been lubricated with a special oil for this purpose by the manufacturer.
- ♦ Do not interchange the outer or inner races of bearings of the same size.
- ♦ Always replace the taper roller bearings on one shaft together and use new bearings from a single manufacturer.
- ♦ Heat inner races of taper roller bearings to approx. 100 °C before installing. Press in onto stop when installing so there is no axial clearance.

Shims

- ♦ Use a micrometer to measure the shims at several points. Different tolerances make it possible to obtain the exact shim thickness required.
- ♦ Inspect for burrs and signs of damage. Install only shims which are in perfect condition.
- ♦ Only install perfect, undamaged shims.

Valve body

- ♦ Renew the valve body if any of the selector elements are scorched.

Self-diagnosis

- ♦ Before performing repairs to the automatic gearbox, determine the cause of the fault as precisely as possible using the Self-diagnosis.

=> Automatic gearbox 018, Self-diagnosis; Repair group 01; Performing self-diagnosis Performing self-diagnosis

32 - Torque converter

1 - Torque converter

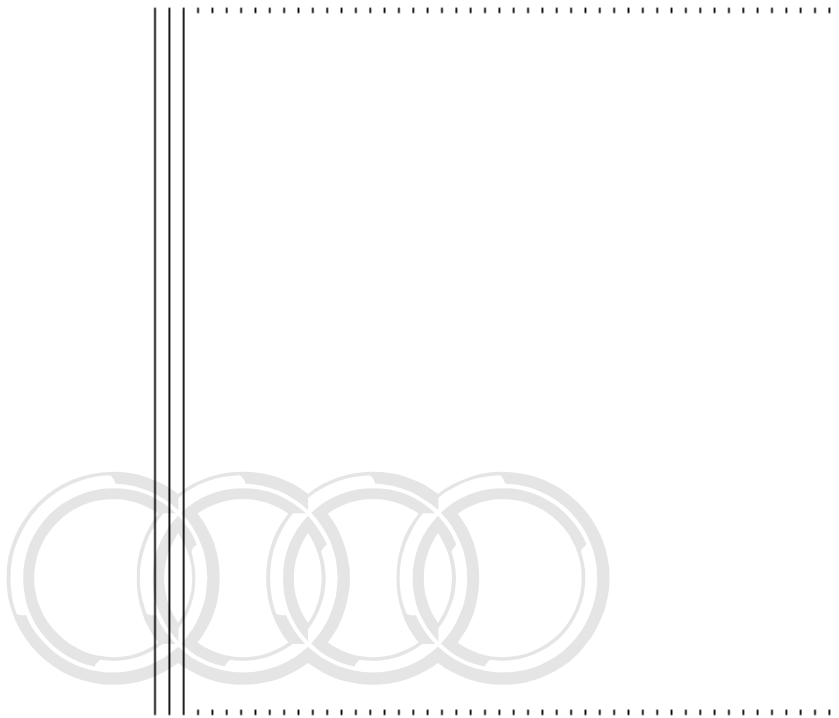
1.1 - Torque converter

Important
Before installing the gearbox, check the installed depth of the torque converter => Page 10 .

Notes:

- ◆ Observe rules for cleanliness when working on automatic gearbox => Page 53 .
- ◆ General repair instructions => Page 5 .
- ◆ Lubricate seals lightly with ATF. Other lubricants cause malfunctions in the gearbox hydraulics.

1.2 - Checking torque converter



- -> Check the hub of the torque converter for signs of wear -arrow-.

Note:

The torque converter is welded together and must be replaced as a complete unit if it is damaged or defective.

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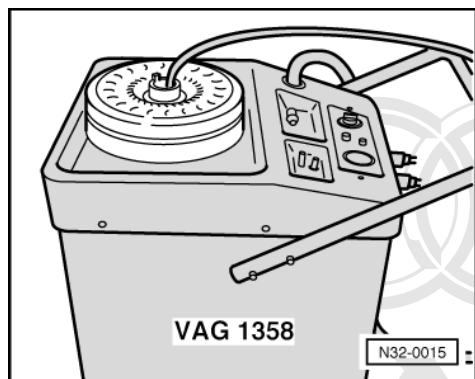


1.3 - Draining torque converter

Special tools and workshop equipment required

- ♦ Oil extractor V.A.G 1358 A
- ♦ Oil extractor probe V.A.G 1358 A/1

If there is dirt in the ATF resulting from internal wear, or if the gearbox is being overhauled, the torque converter must be drained.

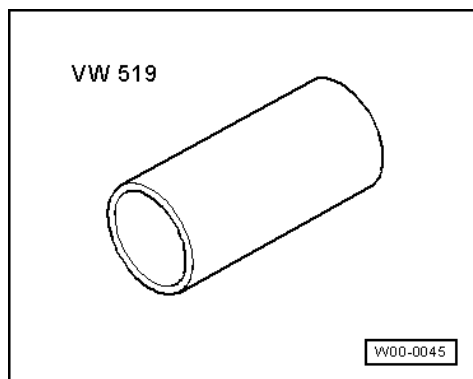


- -> Extract ATF from torque converter using V.A.G 1358 A and probe V.A.G 1358 A/1.

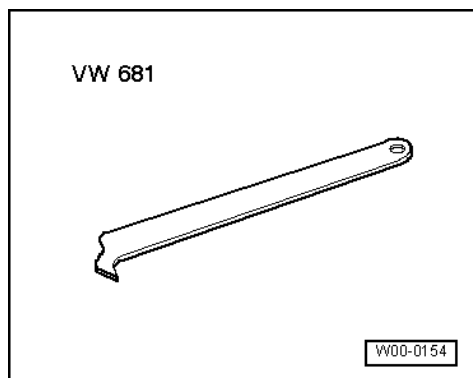
1.4 - Fitting a new torque converter oil seal

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Special tools and workshop equipment required



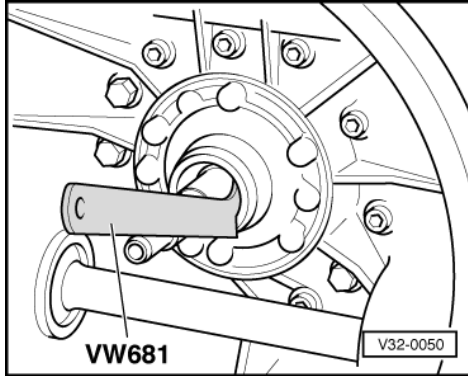
- ♦ Tube VW 519



- ♦ Extractor lever VW 681

Removing

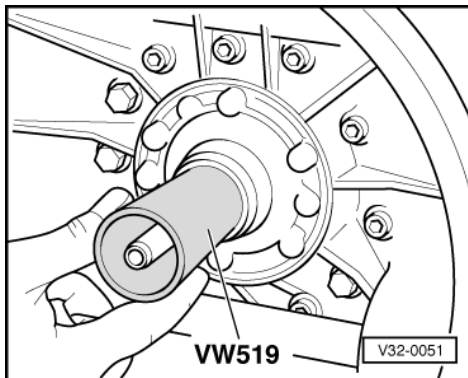
- Remove gearbox => Page 32.
- Secure gearbox to repair stand => Page 45 or place it on a level surface.



- -> Remove torque converter oil seal with oil seal extractor lever VW 681.

Installing

- Lubricate the outer circumference and the sealing lips of the oil seal with ATF.
 - Installation position: open side of oil seal towards gearbox



- -> Drive in torque converter oil seal using tube VW 519.

1.5 - Installing torque convertor

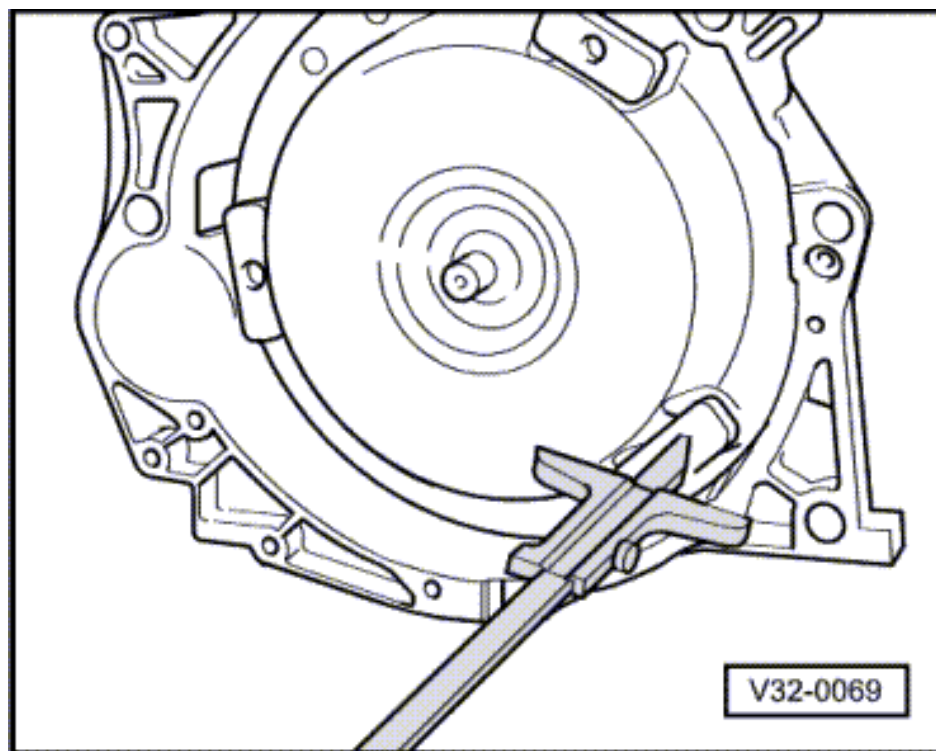
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Special tools and workshop equipment required

- ♦ Depth gauge
- Press torque converter hub through oil seal as far as first stop.
- Lightly press torque converter inwards and turn until slots on torque converter hub engage in drive lugs on ATF pump gear and torque converter slides in a noticeable distance.



Installed depth



-> The distance between the surface of the mounting lugs and the surface of the torque converter bellhousing should be at least 26 mm, if the torque converter has been installed properly.

If the torque converter has not been installed properly, the distance will be about 12 mm.

Important!

If the torque converter is incorrectly inserted, the driver of the torque converter or the ATF pump will be severely damaged when the gearbox is attached to the engine.



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37 - Controls, Housing

1 - Servicing shift mechanism

1.1 - Servicing shift mechanism

1.2 - Checking ignition key removal lock

- Turn ignition key to "ignition on" position.
- Press foot brake and hold.
- When button in selector lever handle is pressed it must be possible to move selector lever out of position "P" without "catching".
- It should not be possible to remove the ignition key when the selector lever is in any other position than "P".
- Move selector lever into position "P".
- It should be possible to move the ignition key to the removal position without "sticking".
- Pull out ignition key.
- It should only be possible to remove ignition key in selector lever position "P".
- Selector lever cannot be shifted out of "P" position with button pressed and foot brake depressed.

1.3 - Checking shift mechanism

Selector lever in "P" position and ignition switched on:

- Brake pedal not depressed:

Selector lever is locked and cannot be shifted out of "P" position when the button on the selector lever handle is pressed. Solenoid for selector lever lock blocks selector lever.
- Brake pedal depressed:

Solenoid for selector lever lock releases selector lever. It should be possible to shift into a driving gear smoothly and without any sticking when the button on the selector lever handle is pressed.
Shift selector lever from "P" through "R, N, D, 3, 2, 1" slowly and check that selector lever display in dash panel corresponds to selector lever position.

Selector lever in "N" position and ignition switched on:

- Brake pedal not depressed:

Selector lever is locked and cannot be shifted out of "N" position when the button in the selector lever handle is pressed. Solenoid for selector lever lock blocks selector lever.
- Brake pedal depressed:

Solenoid for selector lever lock releases selector lever. It should be possible to shift into a driving gear smoothly and without any sticking when the button on the selector lever handle is pressed.



Selector lever in "D" position, ignition and lights switched on:

Shift selector lever into Tiptronic gate. The illuminated "D" symbol should go out and the "+" and "-" symbols should light up.

Notes:

- ♦ The starter must not operate in the selector lever positions "1", "2", "3", "D" and "R".
- ♦ When travelling at speeds above 5 km/h and shifting into selector lever position "N", solenoid for selector lever lock must not engage and block selector lever. Selector lever can be shifted into a driving gear.
- ♦ When travelling at speeds below 2 km/h (almost stationary) and shifting into selector lever position "N", solenoid for selector lever lock should only engage after about 1 second. Selector lever cannot be shifted out of "N" position until brake pedal is depressed.

1.4 - Dismantling and assembling shift mechanism

Warning

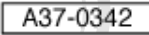
- ♦ **Contact corrosion => Page 4 .**
- ♦ **Move selector lever into position**

Notes:

- ♦ Lubricate bearings and moving surfaces with polycarbamide grease, Part No. G 052 142 A2.
- ♦ The centre console has to be removed to perform repairs

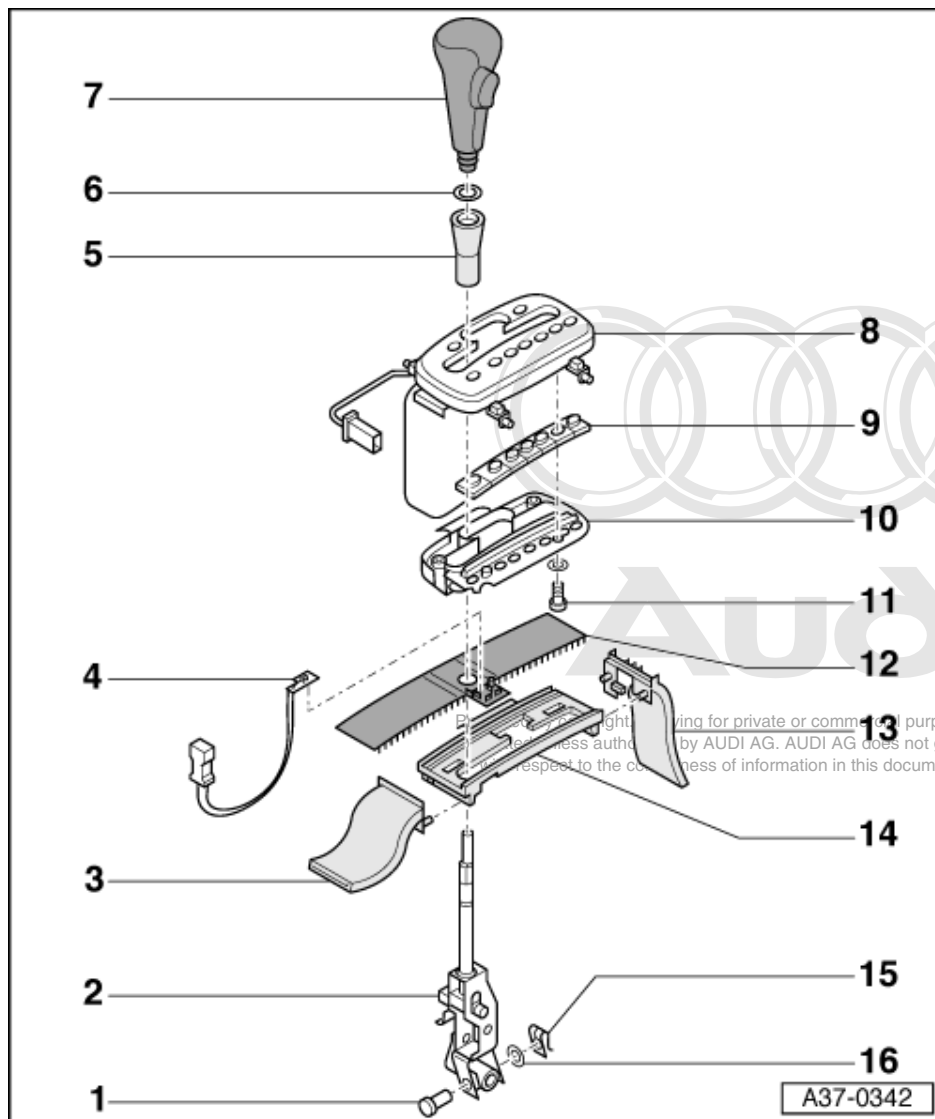
=> General body repairs, Interior; Repair group 68; Storage compartments, covers and trim panels; Removing and installing centre console Storage compartments, covers and trim panels Removing and installing centre console

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Remove upper selector housing -Item 18
 Push in position "2"

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6 Seal

- ♦ Check that seal is properly seated and not damaged

7 Selector lever handle

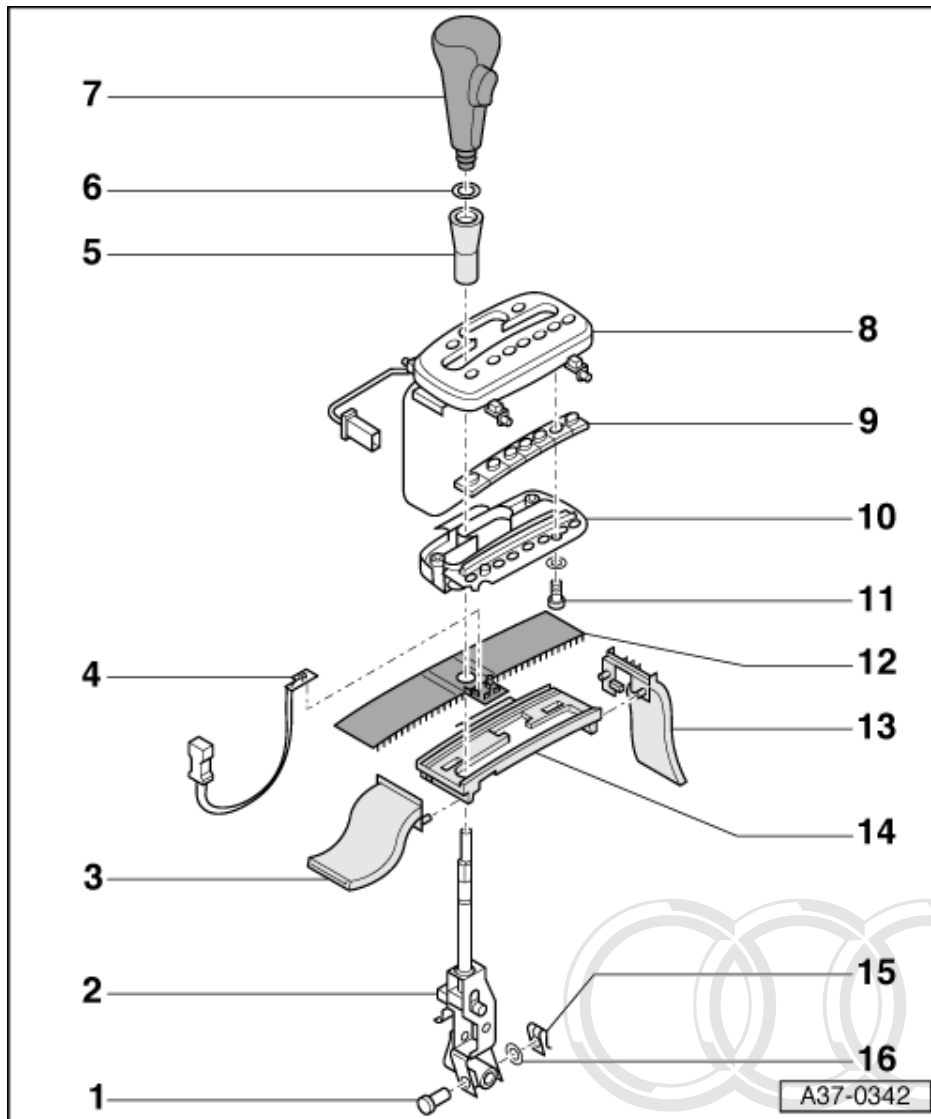
- ♦ To remove, press down shaft section for selector lever -Item **5** -, pull button on handle out as far as it will go and pull handle up and off
- ♦ To install, press handle onto selector lever and pull up shaft section to lock it into place

8 Cover

- ♦ With selector scale

9 Bulb holder

- ♦ With wiring harness
- ♦ Routing of wiring
=> Fig. **20**



10 Insert

11 Bolt

- ♦ Install with locking fluid D 000 600 A2

12 Masking panel

13 Rear guide

- ♦ For masking panel
- ♦ To remove, release from selector housing - item 18

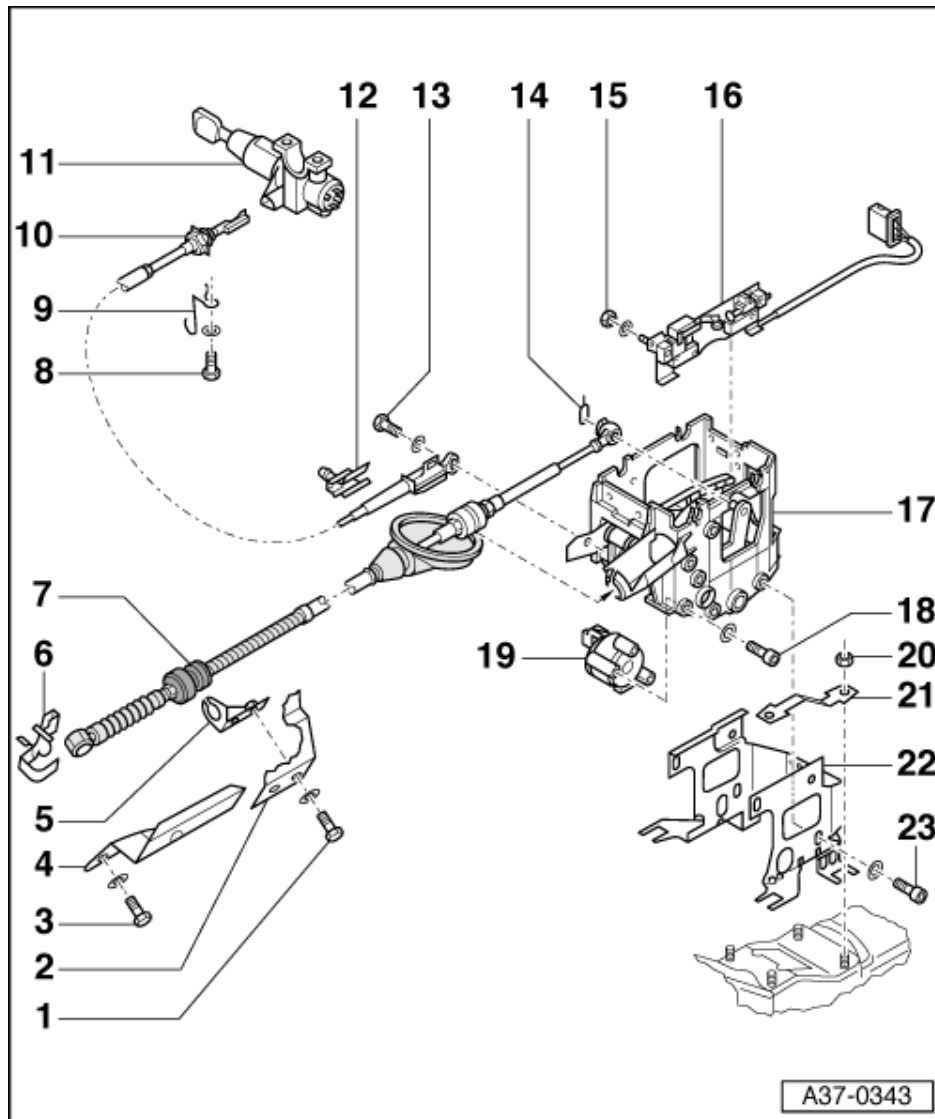
14 Centre guide

- ♦ For masking panel

15 Retaining clip

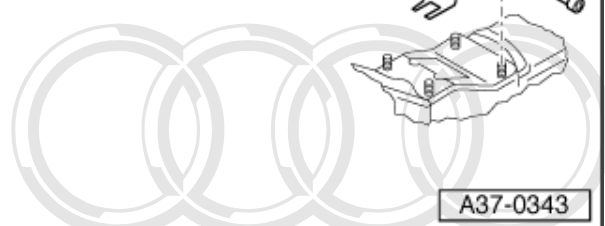
16 Washer

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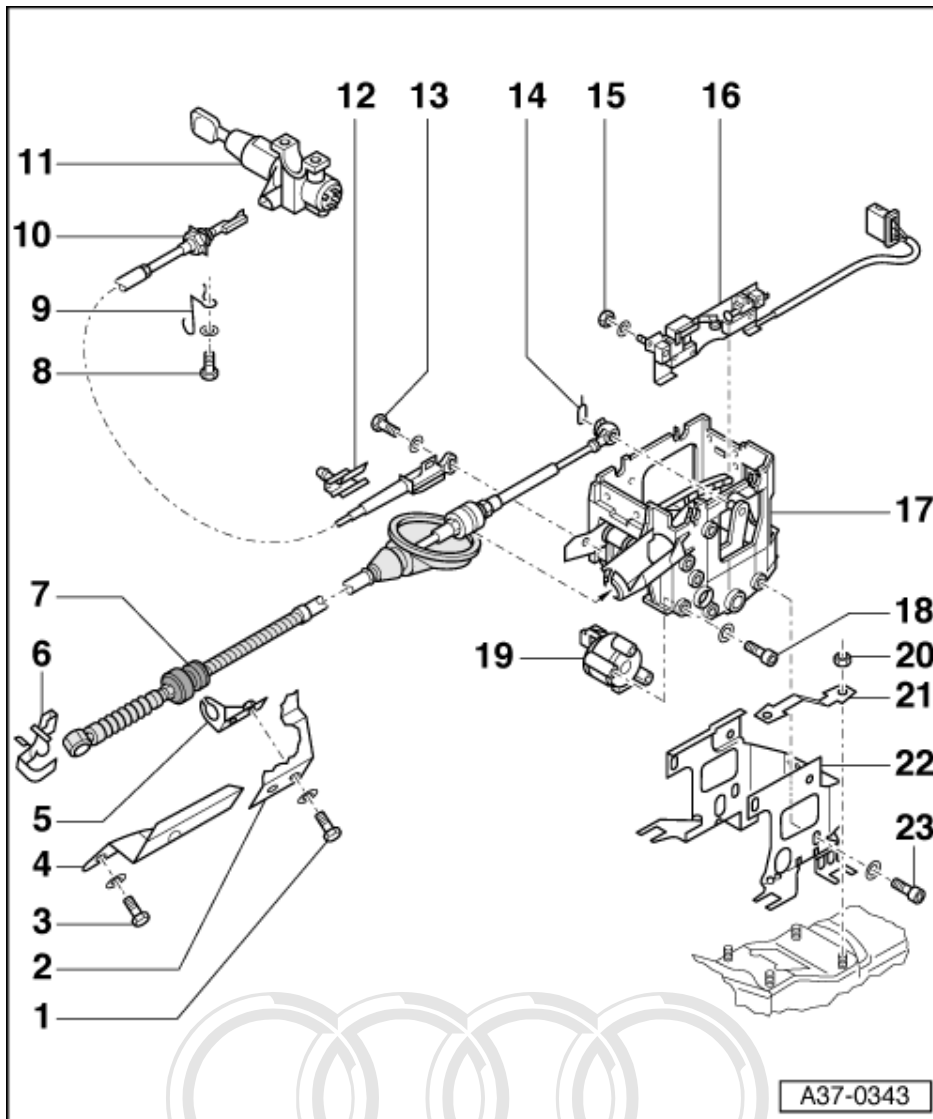
**Part II**

- 1 Bolt - 10 Nm**
- 2 Bracket**
- 3 Bolt - 10 Nm**
- 4 Heat shield**
- 5 Support bracket**
 - ◆ For selector lever cable
 - ◆ On gearbox
- 6 Retaining clip**
 - ◆ For selector lever cable
- 7 Selector lever cable**
 - ◆ With guide and bush
 - ◆ Removing and installing
=>Page 21
 - ◆ Ensure bellows and grommet are fitted correctly, otherwise moisture can enter cable
 - ◆ If bellows or grommet are damaged, renew selector lever cable

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15 Nut - 3 Nm

16 Tiptronic switch -F189

- ♦ To remove, remove selector lever -Item 13
- ♦ Routing of wiring
=> Fig. 20

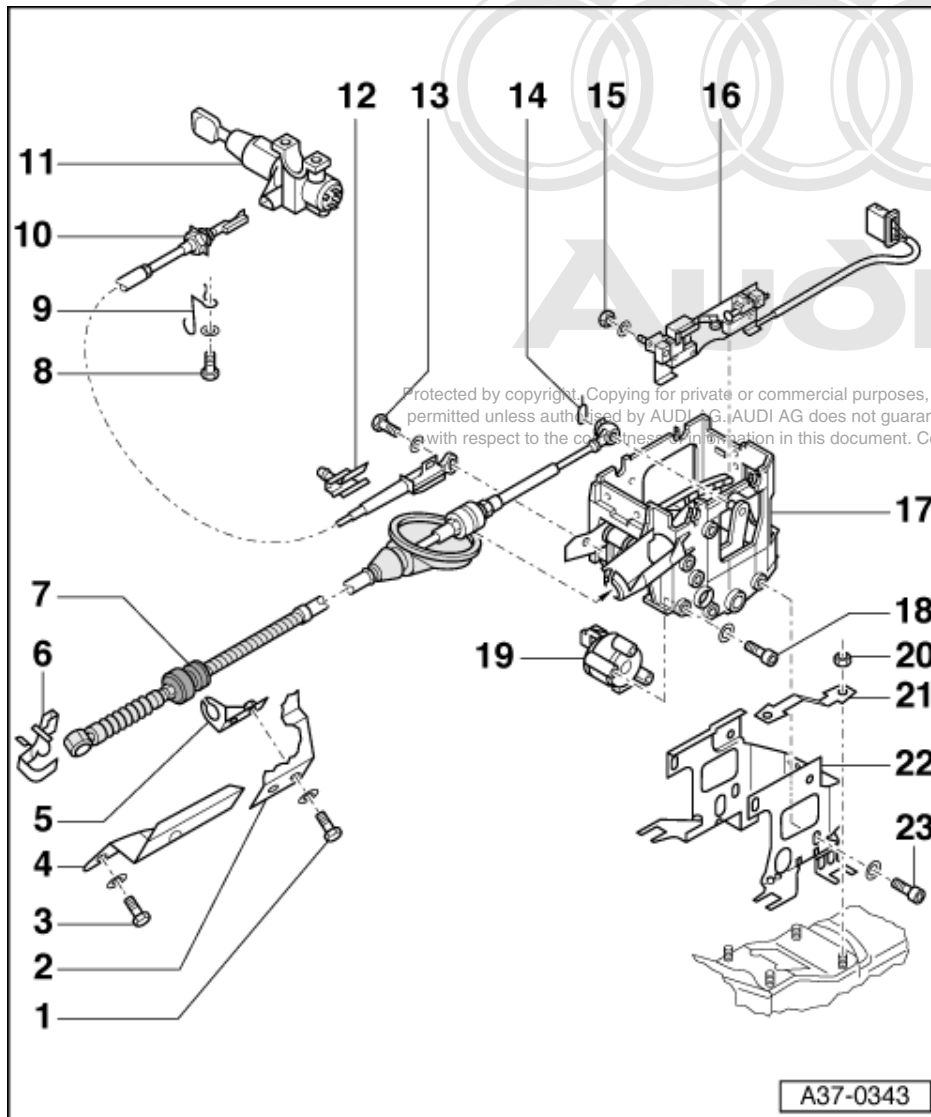
17 Selector housing (shift gate)

- ♦ Remove together with selector lever cable=>Page 21
- ♦ Do not route any wiring between selector housing and vehicle body

18 Hexagon socket head bolt,

-10Nm

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19 Selector lever lock solenoid -N110-

- ♦ To remove, remove selector housing -Item **17** -
- ♦ Installing:
 - After installing shift mechanism switch on ignition. The solenoid blocks the selector lever in position "P" and position "N". The selector lever can be moved out of positions "P" and "N" when the brake pedal is pressed

20 Nut - 10 Nm

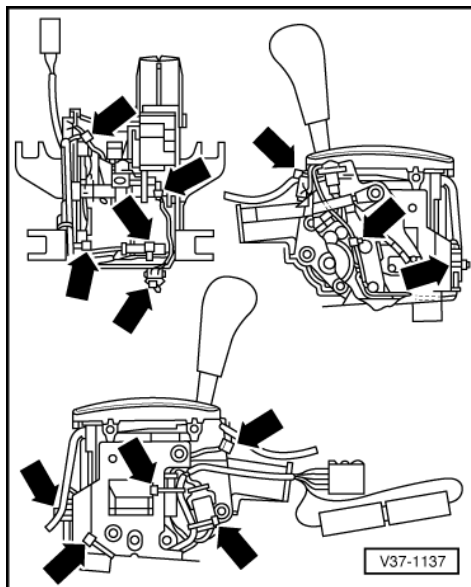
21 Packing plate

- ♦ Qty. 2 (left and right)

22 Retainer

- ♦ For selector housing -Item **17** -

23 Hexagon socket head bolt
- 17Nm



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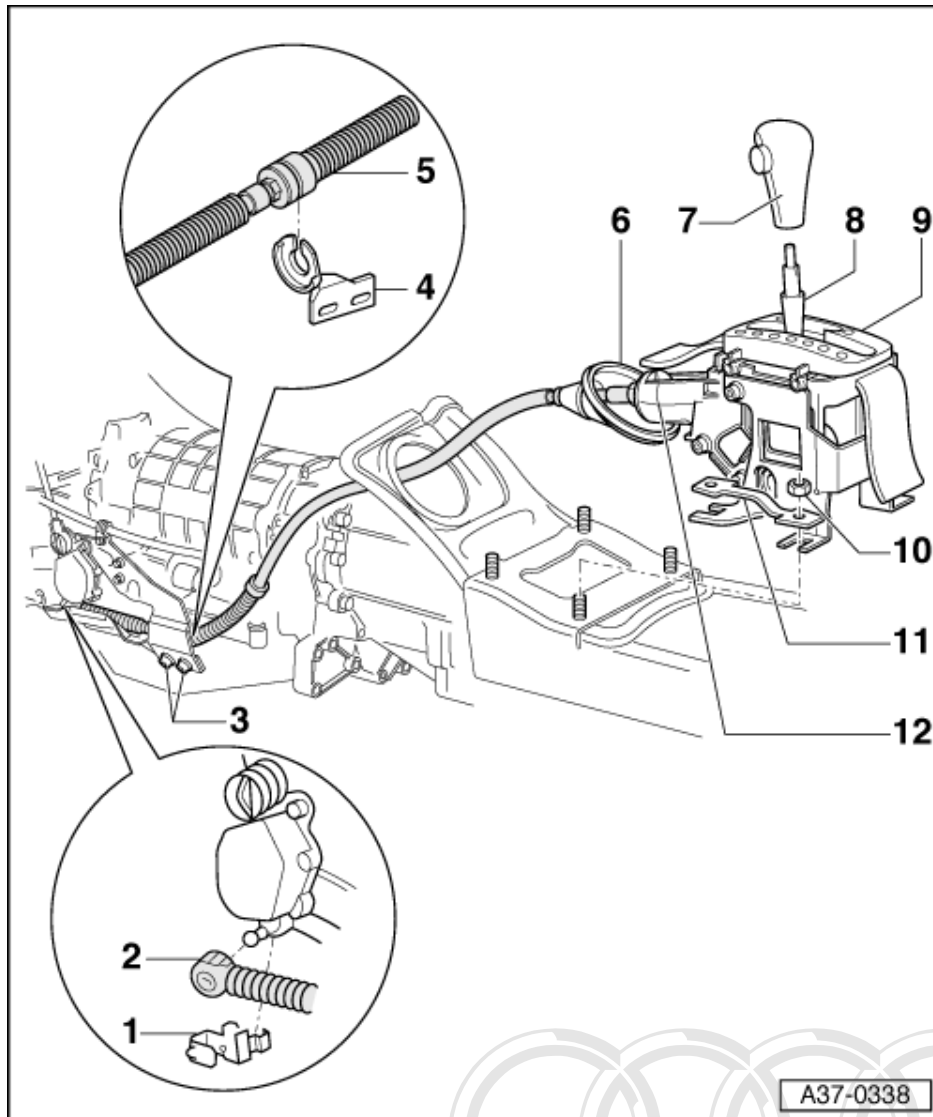
-> Fig.1 **Routing of wiring on selector lever mechanism**

- Secure electrical wiring to selector housing with cable ties at the points marked with arrows.

Note:

Do not route any wiring between body and selector housing.

1.5 - Removing and installing selector lever cable

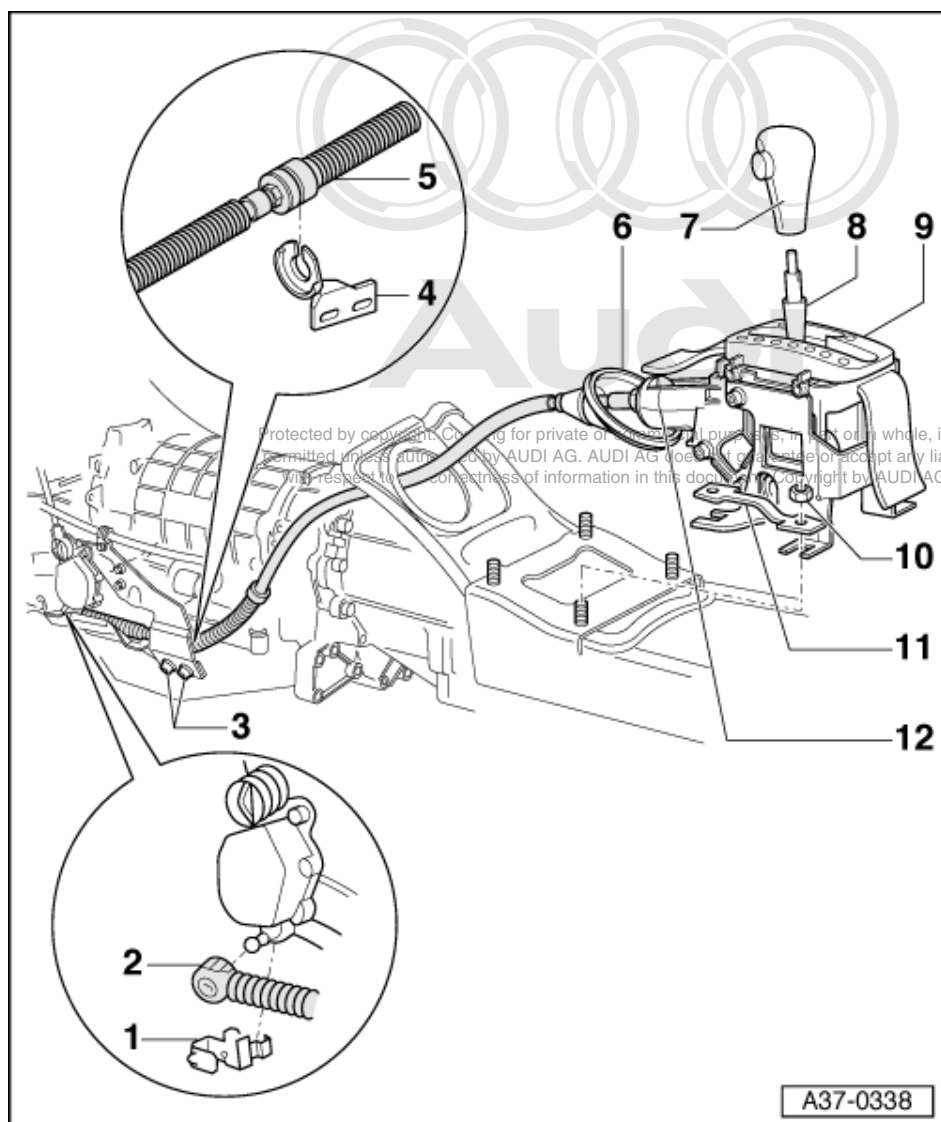


Removing

- Unbolt heat shield for selector lever cable at gearbox
- Release securing clip -1- and lever off ball socket -2- of selector lever cable using a screwdriver.
- Unscrew bolts -3- on support bracket and detach support bracket -4- from selector lever cable -5-.
- Remove centre console

=> General body repairs, Interior; Repair group 68; Storage compartments, covers and trim panels; Removing and installing centre console Storage compartments, covers and trim panels Removing and installing centre console

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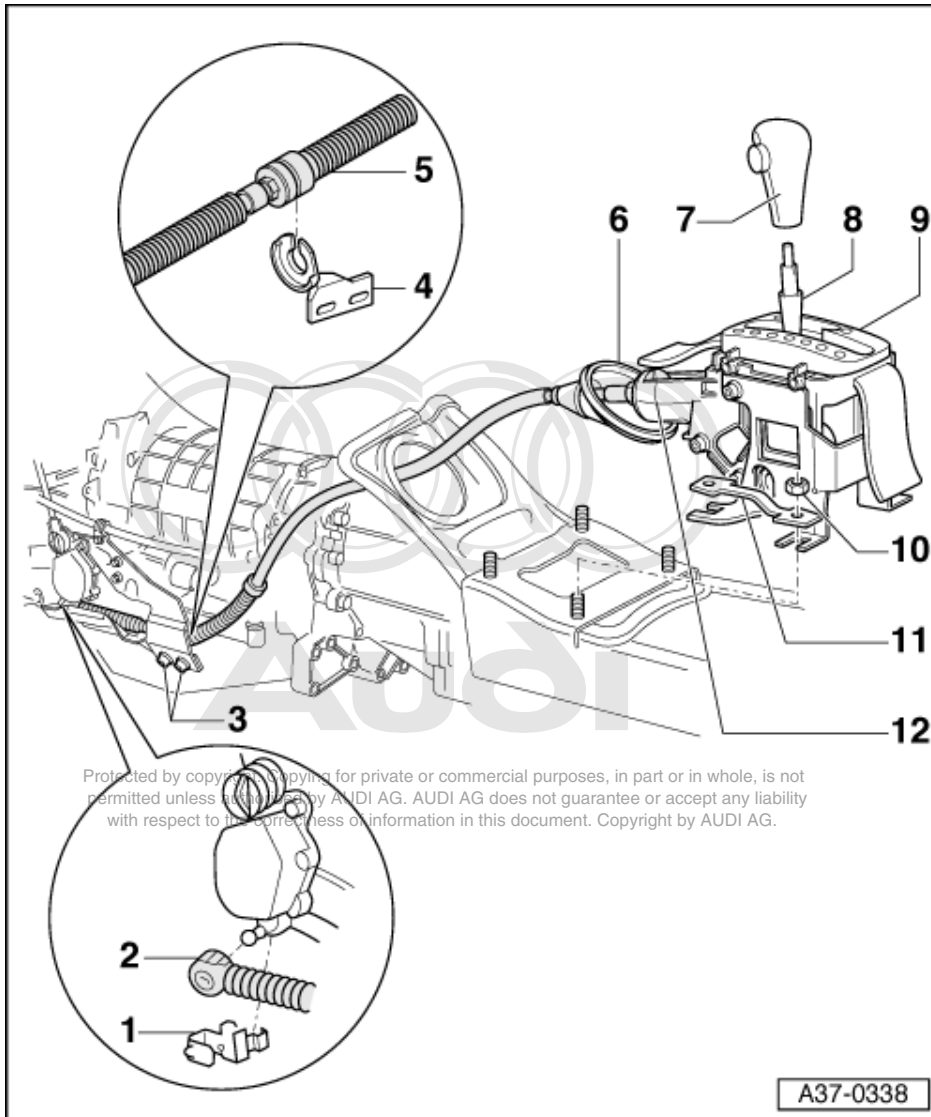


- Unscrew four nuts -10-, remove packing plates -11- and disengage grommet -6-.
- Carefully remove shift mechanism from vehicle together with selector lever cable.

Note:

A second mechanic is required for removal and installation.

- Detach selector lever cable from selector housing -12-.
- Press down shaft section for selector lever -8-, pull button on handle -7- out as far as it will go and pull handle up and off
- Take off cover -9-.
- Release securing clip for selector lever cable on selector lever and take off selector lever cable.



Installing

Perform installation in reverse sequence; note the following points:

- Make sure grommet -6- is installed in correct position.
- Checking and adjusting selector lever cable=>Page 24 .

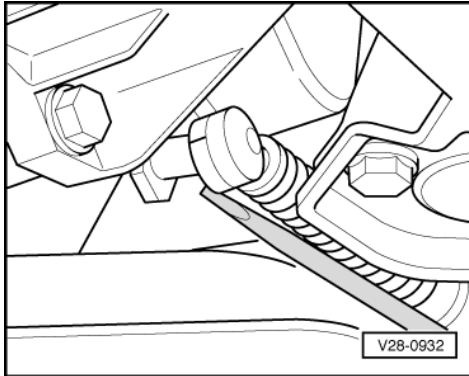
Tightening torques	Nm
Support bracket to gearbox	10
Selector lever cable to support bracket	10
Selector lever cable to selector housing	10
Selector housing to body	10
Heat shield to gearbox	10



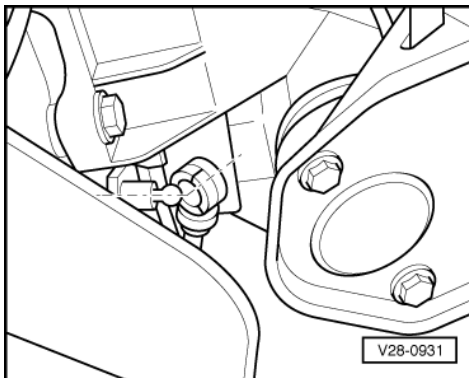
1.6 - Checking and adjusting selector lever cable

Checking

- Move selector lever into position "P".
- Unbolt heat shield for selector lever cable on gearbox.



- -> Release securing clip and lever off ball socket of selector lever cable using a screwdriver.
- Shift selector lever from "P" to "1".
 - The shift mechanism and selector lever cable should move smoothly and easily; if necessary, replace selector lever cable or service shift mechanism.
- Set ball joint on gearbox selector lever to position "N" as follows:
 - Press ball joint forwards to end stop (position "P").
 - Then allow ball joint to move through position "R" and engage in position "N".
- Move selector lever into position "N".

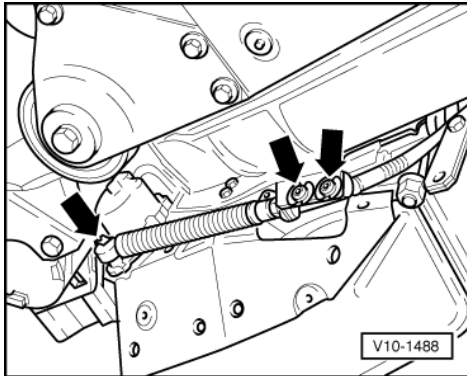


- -> Ball socket and ball joint should now be aligned accurately.
Attach selector lever cable to ball joint by hand; ball socket should engage.
Press on securing clip.

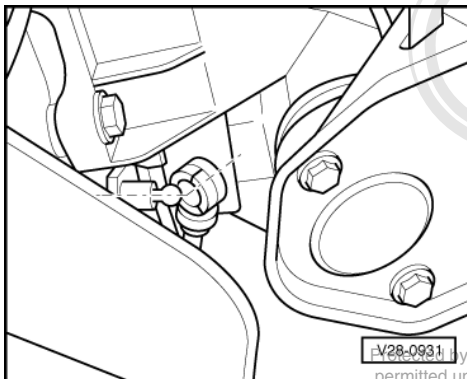
If ball socket and ball joint are not aligned accurately:

- Adjust selector lever cable.

Adjusting



- -> Slacken bolts -right arrows-.
- It should be possible to move support bracket for selector lever cable by hand.



- -> Move ball socket longitudinally until ball socket and ball joint are aligned accurately.
- Tighten support bracket bolts.
- Attach selector lever cable to ball joint by hand; ball socket should engage.
- Press on securing clip.
- Checking selector mechanism => page 11 .

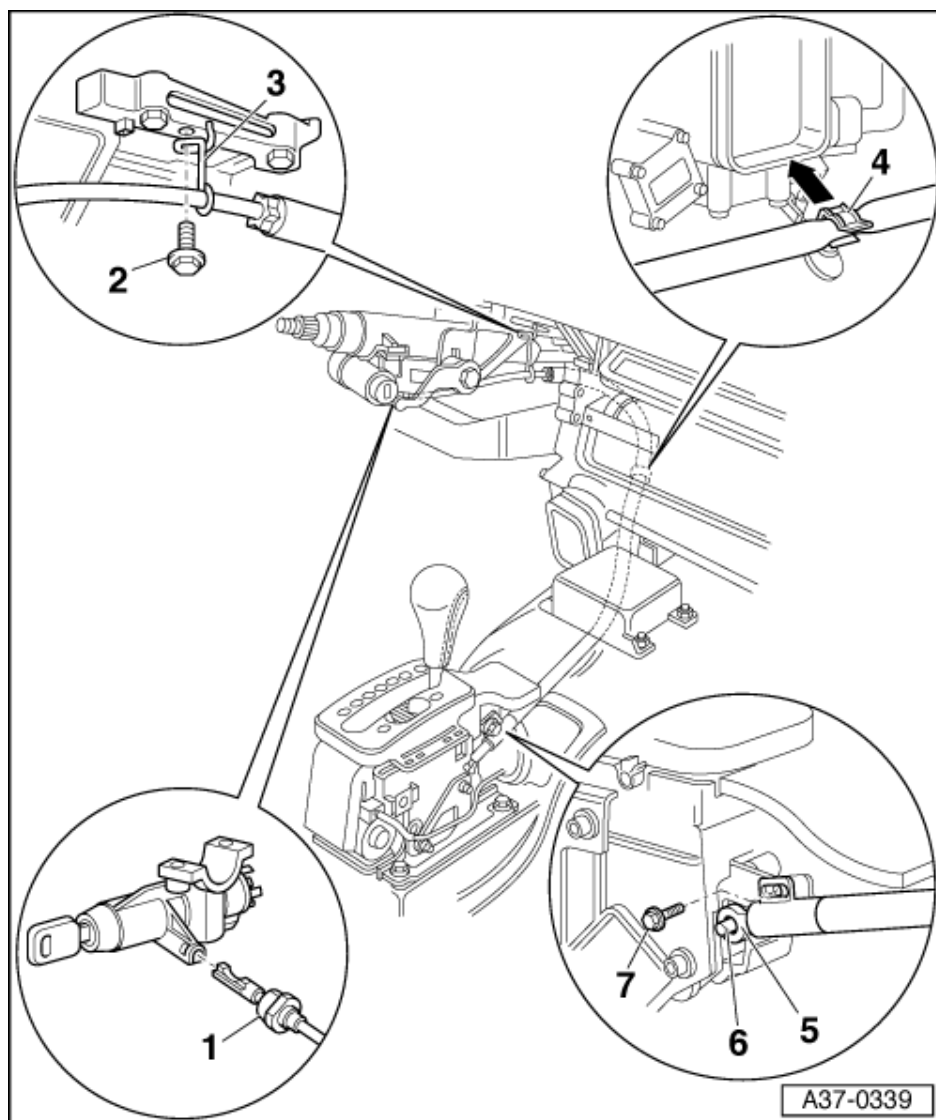
Note:

If gear display -G96 in dash panel insert does not correspond to selector lever position, repeat adjustment or adjust multi-function switch F125=>Page 59 .

Tightening torques

Component	Nm
Support bracket for selector lever cable to gearbox	10
Heat shield to gearbox	10

1.7 - Removing and installing locking cable



Note:

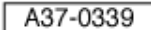
Do not kink locking cable.

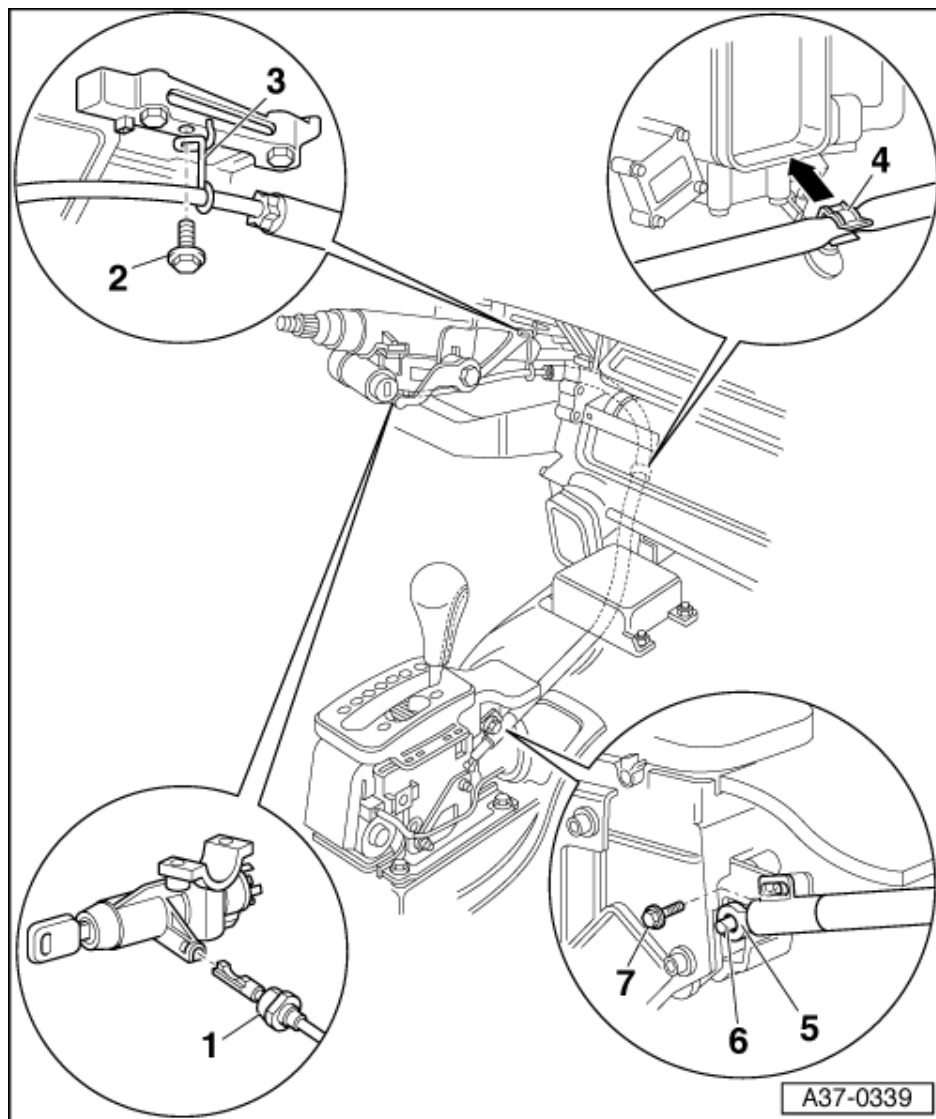
Removing

- Move selector lever to position "2".
- On vehicles with coded radio unit, note or obtain code.
- Disconnect earth strap on battery.
- Remove storage compartment on driver's side:

=> General body repairs, Interior; Repair group 68; Trays, compartments and trim; Removing and installing storage compartment on driver's side Trays, compartments and trim Removing and installing storage compartment on driver's side

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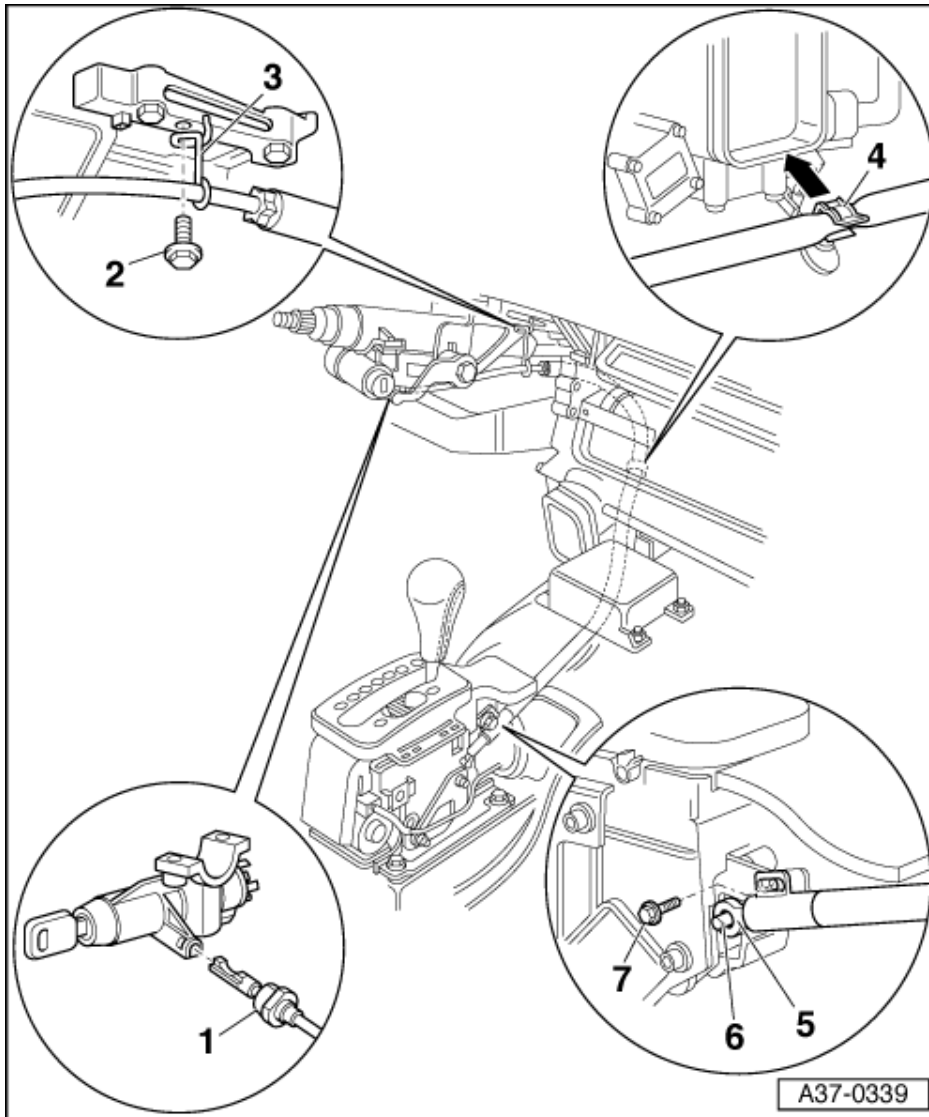
- Slacken bolt -2- at steering column and remove locking cable together with wire retainer -3-.
- Release locking cable from retaining clip -4- and take out.
- Unbolt airbag control unit.

Installing

- Move steering column to "bottom rear" position.
- Route locking cable free of kinks.
- Locate locking cable along groove in insulating material on gearbox tunnel, and secure airbag control unit (6 Nm).
- Turn ignition key to "ignition on" position.

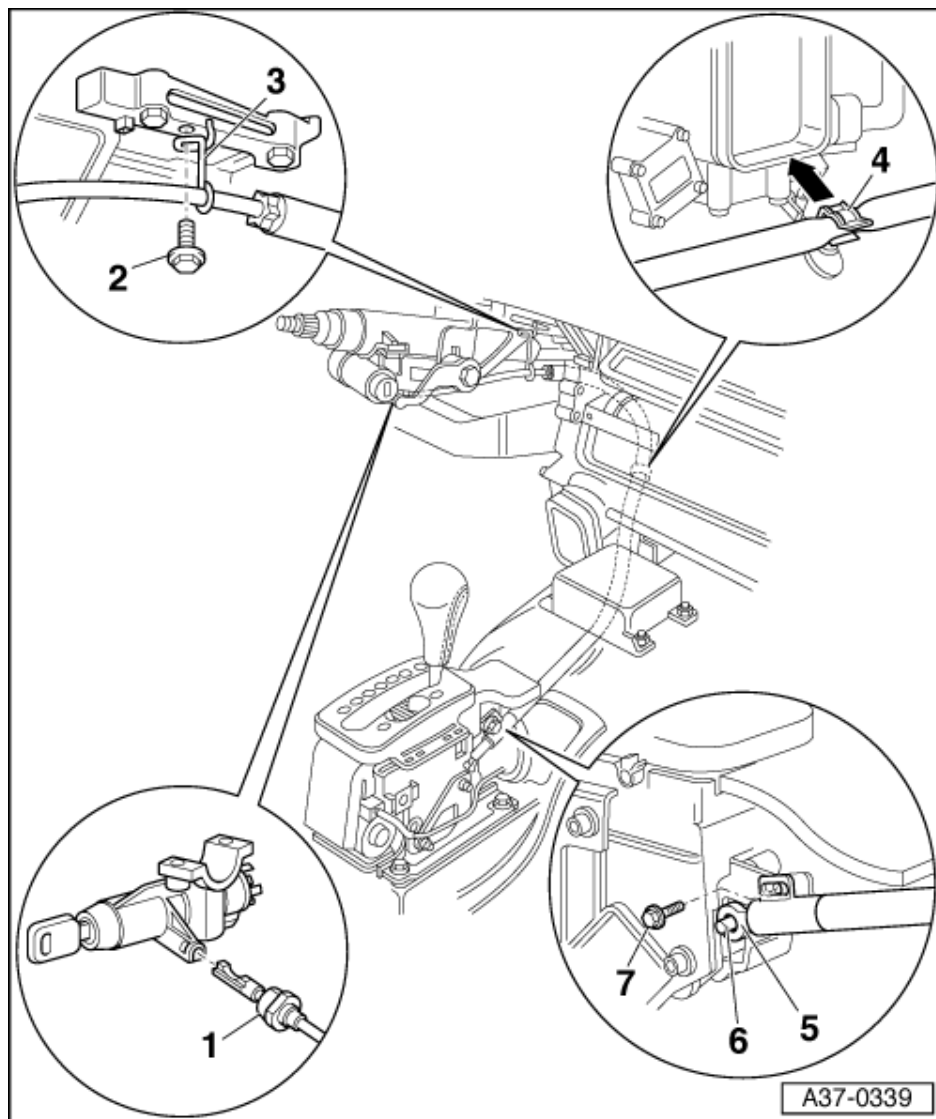


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- Insert locking cable in ignition/starter switch.
- Check that locking device -1- engages.
- Tighten bolt -2- for wire retainer -3- to 9 Nm.
- Turn ignition/starter switch to locked position ("ignition off").
- Move selector lever to position "P".
- Engage locking cable eye -5- onto pin -6-.
- Loosely tighten bolt -7- for locking cable support bracket at shift mechanism.
- Adjust locking cable => Page 30.

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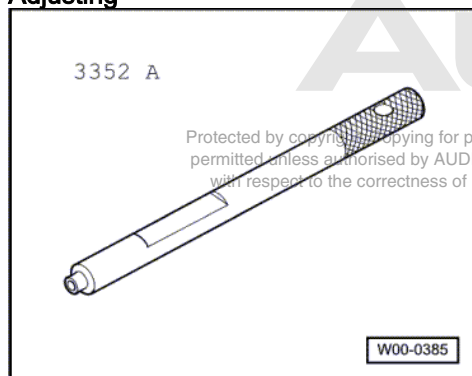
Continue installing in the reverse order, noting the following points:

- After reconnecting the battery, enter the radio code

=> Radio operating instructions

- Close windows fully using electric window switches.
- Then operate all electric window switches again for at least one second in the "close" direction to activate the automatic one-touch open and close function.
- Set clock to correct time.

Adjusting

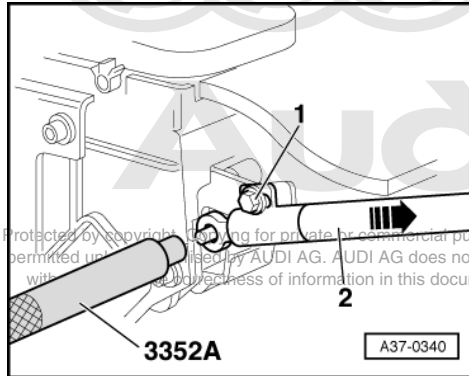


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Special tools and workshop equipment required

- ◆ Adjustment gauge for locking cable 3352 A

Work sequence



- -> Slacken bolt -1-.
- It should be possible to move support bracket -2- for locking cable by hand.
- Insert adjustment gauge 3352 A between the pin on the locking cable lever and the locking cable eye.
- Pull locking cable in direction indicated (arrow) and tighten bolt to 9 Nm.
- Take out adjustment gauge.
- Always test the ignition key removal lock after adjusting locking cable => Page 11 .

2 - Checking gearbox

2.1 - Checking gearbox

When tracing the cause of faults, always perform self-diagnosis as a first step.

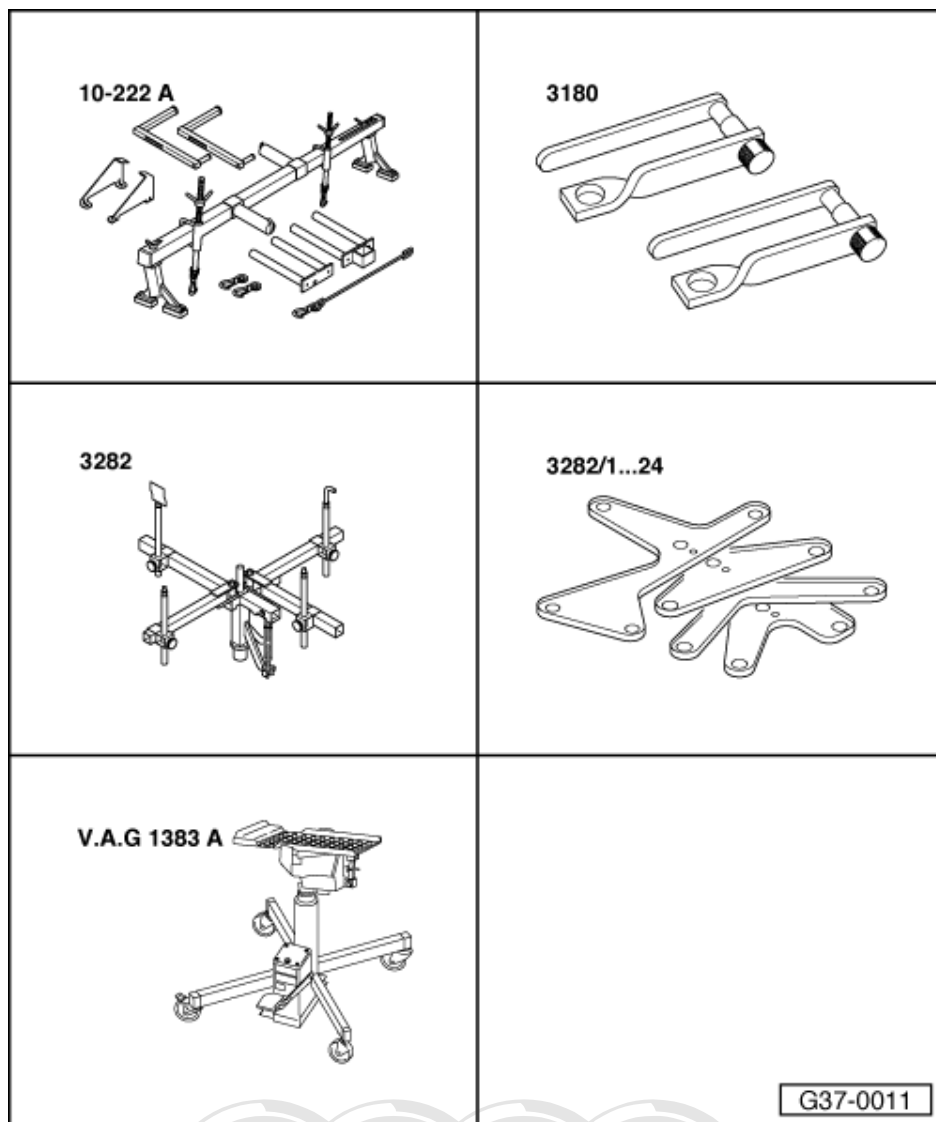
=> Automatic gearbox 018, Self-diagnosis; Repair group 01; Performing self diagnosis Performing self diagnosis

Only check the automatic gearbox according to the procedure described in the "Fault-finding, Transmission" binder if the fault cannot be traced and corrected via self-diagnosis.



3 - Removing and installing gearbox

3.1 - Removing and installing gearbox



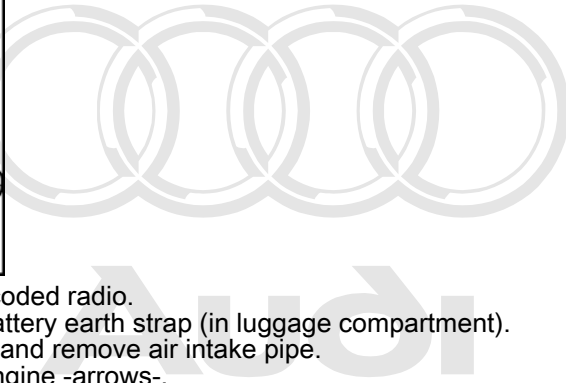
Special tools and workshop equipment required

- ♦ Support bar 10-222 A with 10-222 A/4
- ♦ Retainer 3180
- ♦ Gearbox support 3282
- ♦ Adjusting plate 3282/11
- ♦ Engine/gearbox jack V.A.G 1383 A
- ♦ Support (commercially available)

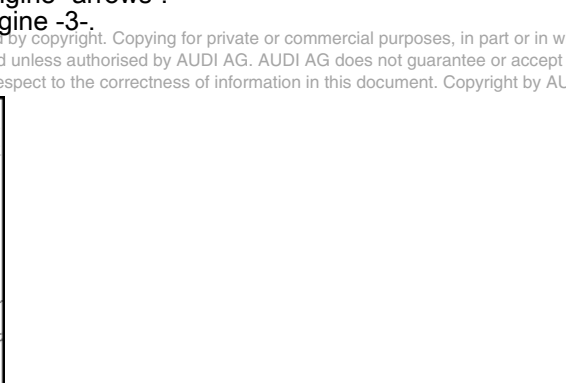
Removing

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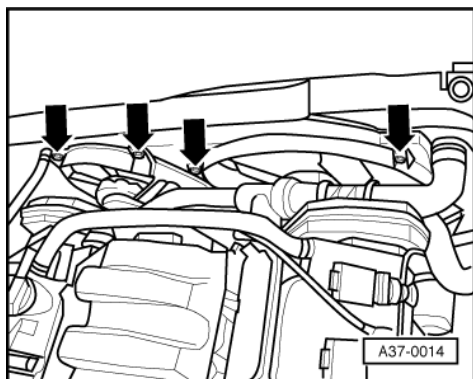
Contact corrosion Notes => Page 4



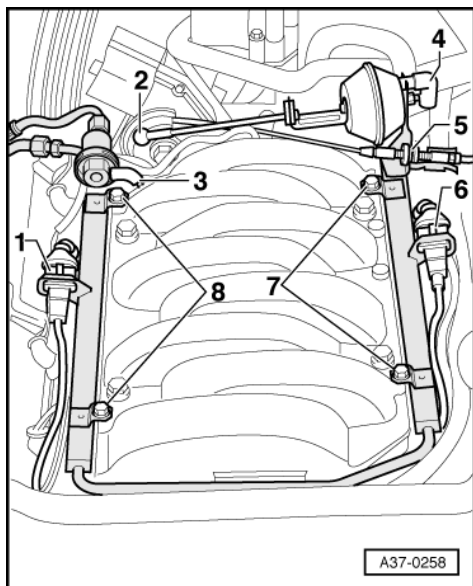
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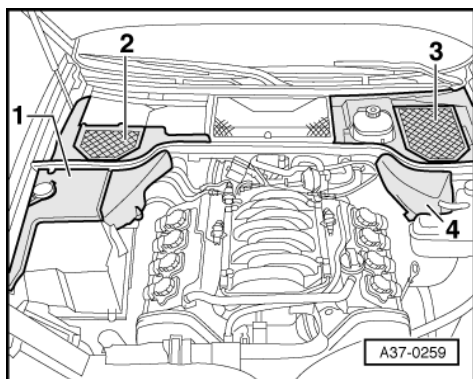
- bottle valve connection and pull off connector for c



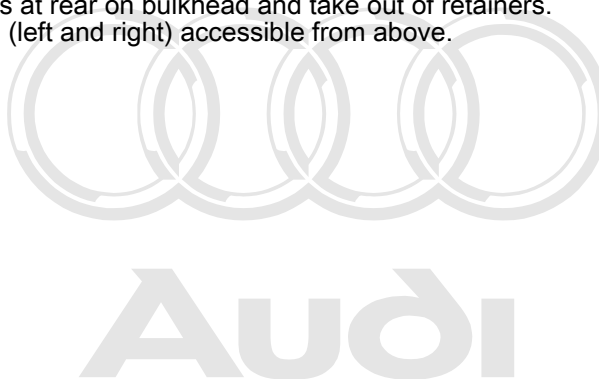
- -> Remove bolts -arrows- for radiator fan cowl and electric fan.
- Disengage radiator fan cowl at the bottom and allow cowl to rest on top of fan.
- Move electric fan clear to the side; do not disconnect wiring.
- Disconnect both connectors for lambda probes at rear on bulkhead and take out of retainers.
- Unscrew securing nuts on front exhaust pipes (left and right) accessible from above.



- -> Unplug both connectors on knock sensors -1- and -6-.
- Detach hose -3- at fuel pressure regulator.
- Disengage connecting rod -2- for cruise control system at throttle valve unit.
- Detach hose -4- at vacuum unit for cruise control system.
- Disengage accelerator cable at support bracket -5-.
- Pull connectors off injectors.
- Unbolt fuel manifold -7- and -8- and pull it off together with injectors.

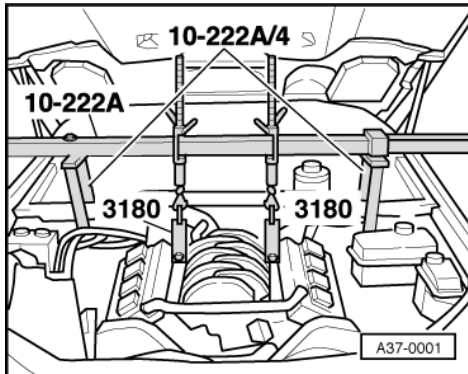


- Move fuel manifold clear to the rear.

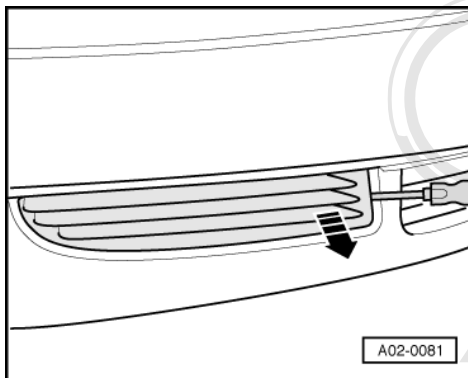


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- Close off openings for injectors with clean cloths.
- -> Remove covers 1 - 4.

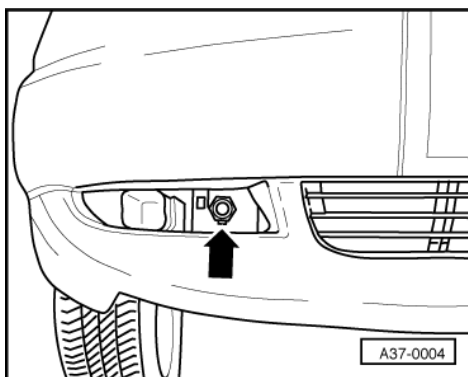


- -> Set up engine support bracket 10-222 A with adapters 10-222 A/4 and spindles.
 - Left spindle behind support bracket, right spindle in front of support bracket.
- Position engine support bracket 10-222 A onto bolts for suspension strut mountings and check stability.
- Fit retainers 3180.
 - Fit left-hand pin into eye from rear, fit right-hand pin into eye from front and secure.
- Tighten spindles slightly, but do not take weight of engine on them.
- Remove front wheels.

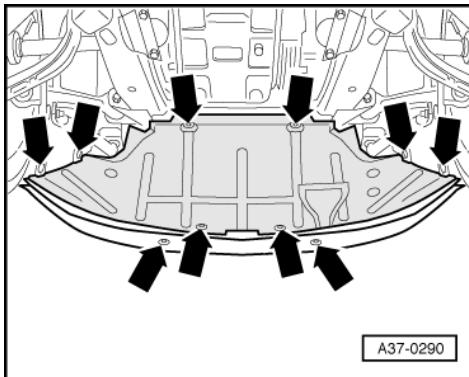


- -> Using a screwdriver, lever out air intake grille arrow, in lower part of bumper and pull grille off front of vehicle.

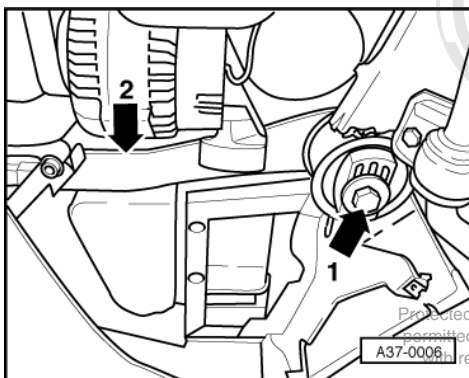
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- -> Bend open retainer plate and unscrew securing nut -arrow-.



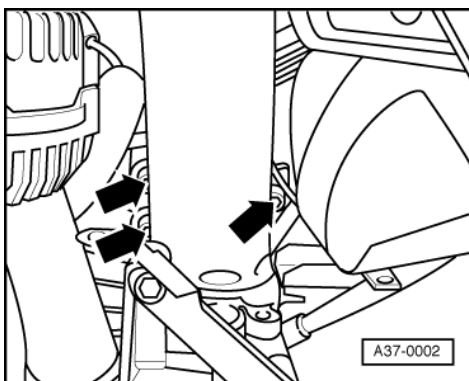
- -> Remove noise insulation -arrows-.
- Unscrew retainers for noise insulation.
- Unclip air duct for alternator.



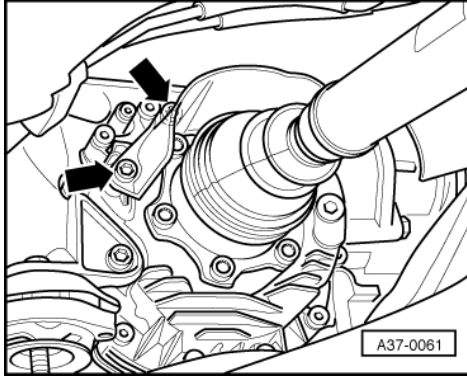
- -> Take out mounting for towing eye. Slacken bolt -arrow 1- on subframe and pivot towing eye reinforcement -arrow 2- to the right.
- Re-tighten bolt to 100 Nm.

Note:

The bolt on the subframe must be renewed when installing the gearbox.



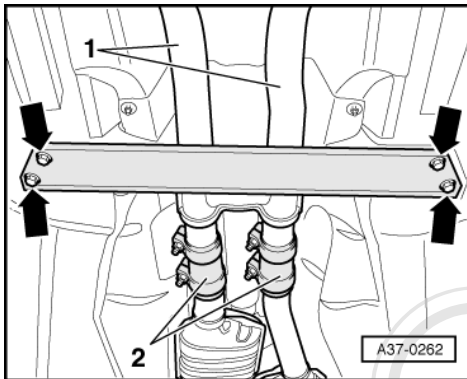
- -> Remove securing bolts -arrows- at torque reaction support (front, right).



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

=> Running gear, Front and four-wheel drive; Repair group 40; Removing and installing drive shaft Removing and installing drive shaft

- Unscrew securing nuts on front exhaust pipes (left and right) accessible from below.



- -> Loosen clamps -2-.
- Remove front exhaust pipes together with catalytic converters and lambda probes.

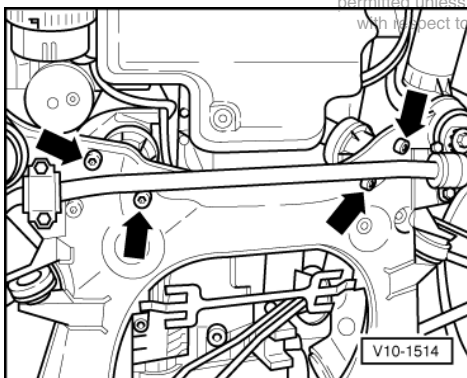
Note:

Ensure that connectors for lambda probes are clear.

- If fitted, remove cross member below exhaust system -arrows-.
- Detach rear section of exhaust system -1- and remove.

- Detach ATF pipes=>Page 54 and move clear to the side.

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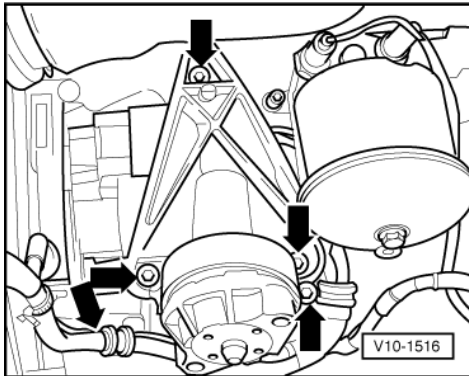
Note:

Observe rules for cleanliness when working on automatic gearbox => Page **53**.

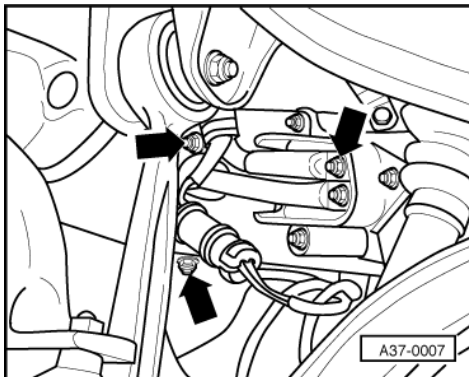
- Remove propshaft => Page **111**.
- -> Remove lower securing bolts -arrows- at engine mountings.
- Lift the engine on the spindles until the guide lugs of both engine mountings are clear of the subframe.

Note:

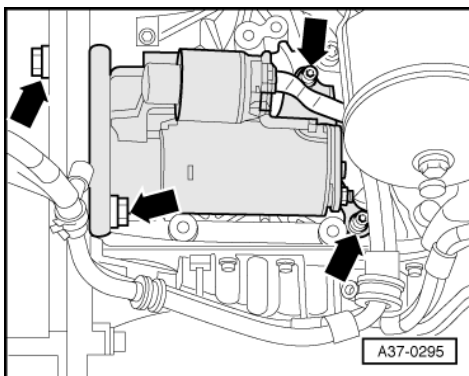
Make sure that the insulating material on the bulkhead is not damaged by the throttle valve unit.



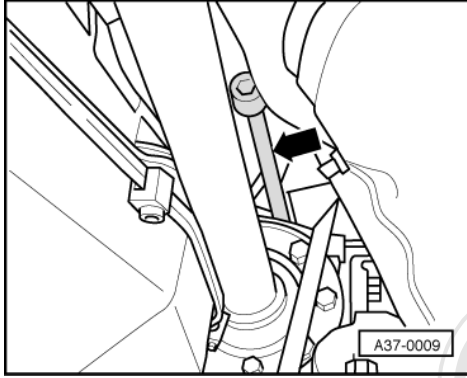
- -> Unbolt cable clamps and right-hand engine support -arrows-.
 - Take the engine support out between the two lower transverse links.
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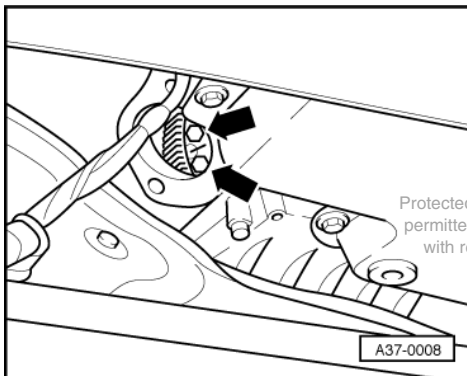
- -> Unclip and detach starter cable connector plug at junction box on longitudinal member (right side).
- Unclip junction box cover.
- Detach starter cable in junction box and on bracket.



- -> Unscrew bolts -arrows- securing starter and starter bracket.



- -> Unscrew top bolt on starter using an extension -arrow-.
- Lift starter out past drive shaft between transverse links.



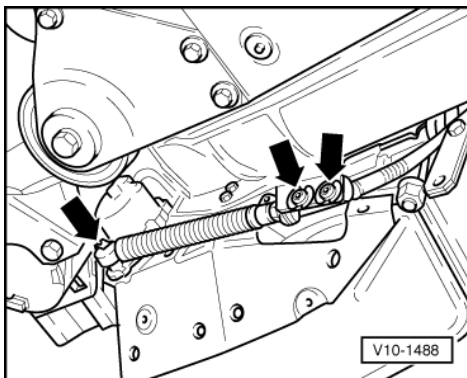
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- -> Unscrew 6 torque converter bolts through starter opening (turn crankshaft 1/3 turn each time).

Note:

To remove the torque converter bolts, counter-hold the main bolt on the vibration damper.

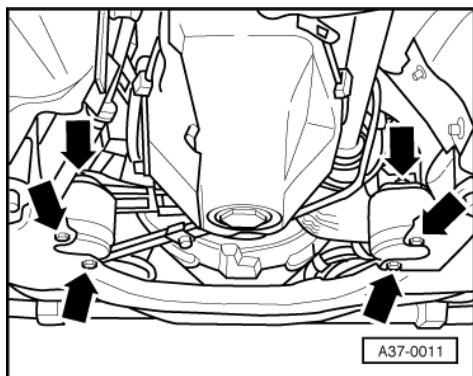
- Unbolt heat shield for selector lever cable on gearbox.



- -> Release securing clip and lever off ball socket of selector lever cable -left arrow- using a screwdriver.
- If necessary, mark position of selector lever cable support bracket on gearbox housing for later installation, and unbolt support bracket -right arrows-.
- Remove 3 lower bolts securing engine and gearbox.
- Lower the engine until it is possible to bolt on the left engine mounting. Only tighten the bolt loosely.

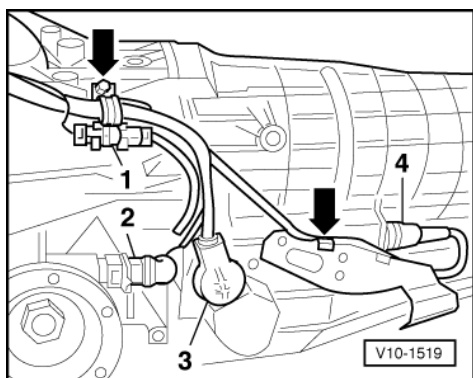


Note:



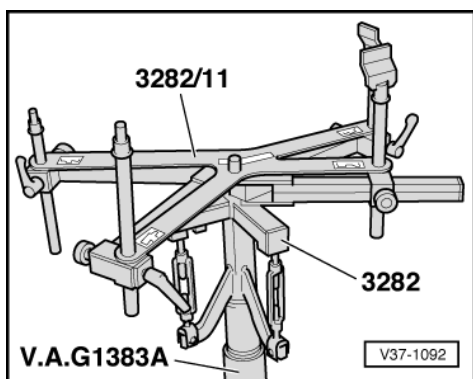
The torque reaction support can damage the headlight housing if the engine is lowered too far on the right side.

- Support rear of gearbox.
- -> Remove left gearbox support together with gearbox mounting -left arrows-.
- Remove right gearbox mounting -right arrows-.
- Lower the gearbox slightly at the rear.



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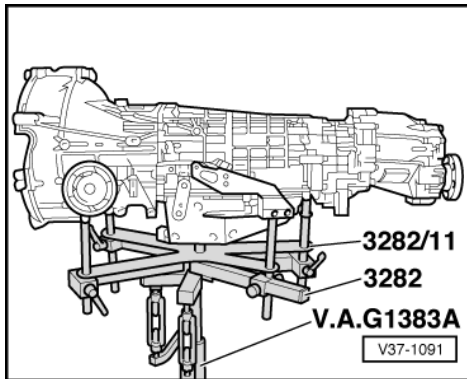
- -> Unbolt wiring retainer -left arrow-.
- Unplug connector -1- from reversing switch.
- Unplug connector -2- from speedometer sender.
- Press release catch down and unplug connector -3- for multi-function switch.
- Release bayonet catch -4- on 8-pin connector by turning anti-clockwise and unplug connector from gearbox.
- Unclip wiring -right arrow-.



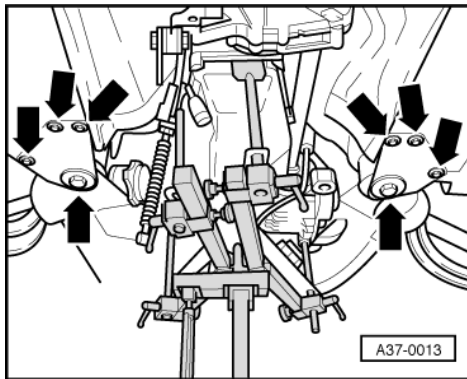
- -> Set up gearbox support 3282 with adjusting plate 3282/11 for removing automatic gearbox 018, and mount onto jack V.A.G 1383 A.

Note:

The symbols on the adjusting plate indicate the attachments required for automatic gearbox 018. The arrow points towards front of vehicle.



- -> Run gearbox jack V.A.G 1383 A with gearbox support 3282 in under the gearbox and take up the weight of the gearbox.

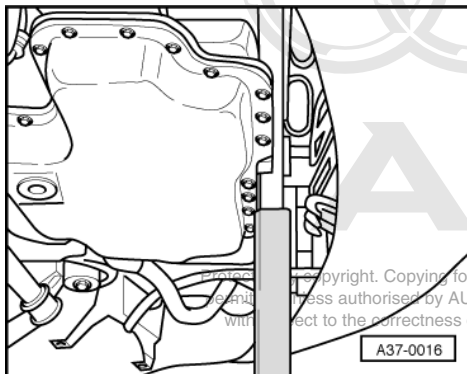


- -> Unscrew rear subframe bolts -arrows-.

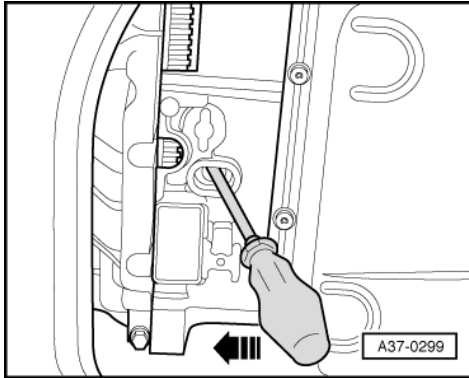
Note:

The subframe should be lowered by about 80 mm from the mounting point on the body. Slacken the engine support bracket a little further if necessary. Make sure that the torque reaction support does not damage the headlight housing.

- Lower the gearbox slightly at the rear.
- Move the drive shafts clear to the front.



- -> Support engine at front with commercially available support.
- Remove upper engine/gearbox connecting bolts.



- -> Press gearbox off engine and at the same time press torque converter out of drive plate.
- Lower rear of engine/gearbox assembly slightly with jack V A G 1383 A.
- Move the gearbox away down to the rear.

Notes:

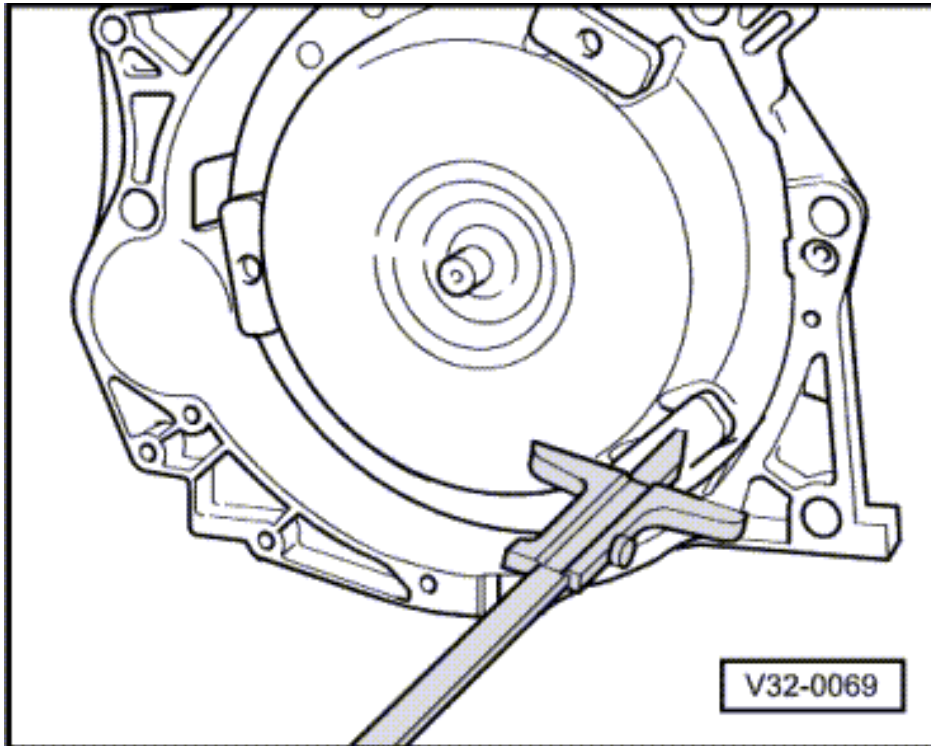
- ♦ If necessary, slacken spindle on support bracket 10-222 A.
- ♦ Ensure adequate clearance between bulkhead and engine.
- ♦ Secure the torque converter to prevent it from slipping out.

Installing

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

Notes:

- ♦ When performing repairs, renew seals, gaskets, self-locking nuts and bolts which have a specified tightening angle.
- ♦ Before installing a replacement gearbox, clean ATF pipes and ATF cooler.
=> Page 55 .
- Before installing the gearbox, ensure that the torque converter has been fitted correctly in the gearbox => Page 9 .



- -> If the torque converter has been fitted correctly, the distance between the surface of the mounting lugs and the surface of the torque converter bellhousing should be at least 26 mm.
Before installing gearbox, make sure that dowel sleeves are correctly seated on cylinder block.
Make sure that no wiring or pipes are trapped when bringing engine and gearbox together.
Install engine/gearbox connecting bolts
=> Table on Page 44 .

- First tighten all torque converter bolts by hand, and then tighten to specified torque.

Notes:

- ♦ The torque converter can only be attached to the drive plate in one position (different spacings between threads).
- ♦ When installing ATF pipes, fit new O-rings and lubricate O-rings with ATF.
- Renew all M14 subframe bolts which have been loosened, together with lock washers.

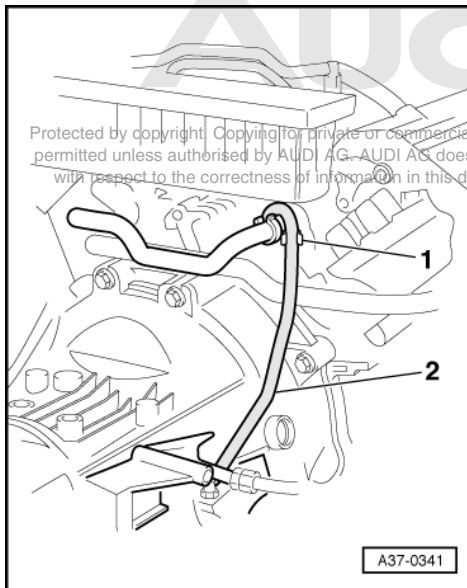
Note:

Do not loosen more than two M14 subframe bolts at the same time, otherwise it will be necessary to check and adjust wheel alignment.

- Install subframe, observing tightening sequence:

=> Running gear, Front-wheel drive and four-wheel drive; Repair group 40; Removing and installing subframe
Removing and installing subframe

- Check selector lever cable setting => Page 24 .
- Install propshaft => Page 114 .



- -> Secure differential breather hose -2- to engine with retaining clip -1-.
- Align exhaust system free of stress

=> 8-cylinder engine, Mechanics; Repair Group 26; Aligning exhaust system free of stress Aligning exhaust system free of stress

- Check oil level in front final drive of automatic gearbox=>Page 75 .
- Check ATF level => Page 47 .
- After connecting battery, enter anti-theft code for radio

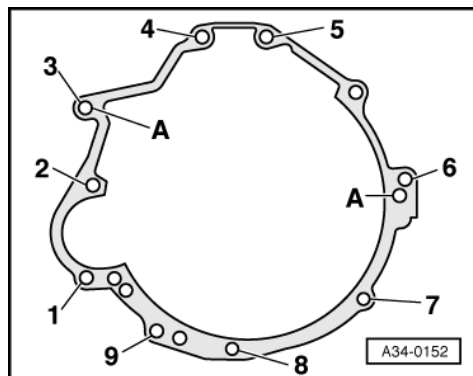
=> Radio operating instructions

- Close windows fully using electric window switches.
- Then operate all electric window switches again for at least one second in the "close" direction to activate the automatic one-touch function.



- Set clock to correct time.

Tightening torques



-> Engine/gearbox mountings

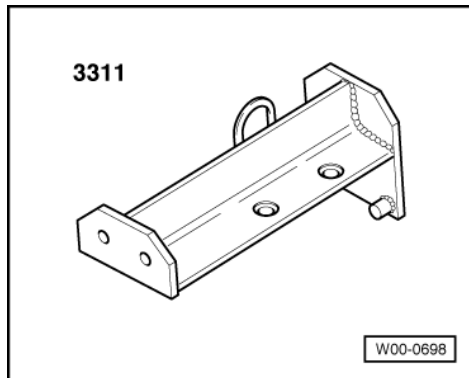
Item No.	Bolt	Nm
1	M10 x 80	45
2	M12 x 90	65
3, 4, 5	M12 x 75	65
6	M12 x 90	65
7, 8, 9	M10 x 45	45

A: centering sleeves

Component	Nm
Torque converter to drive plate	40
Engine mounting to subframe	40
Engine support to engine	42
Torque reaction support to longitudinal member	40

Component	Nm
Gearbox support to gearbox	42
Gearbox mountings to subframe	40
ATF pipe to gearbox	25
Bracket for ATF pipe to engine support/ oil pan	10
Drive shaft to flange shaft	77
Heat shield for drive shaft to gearbox	23
Multi-function switch to gearbox	10
Support bracket for selector lever cable to gearbox	10
Heat shield for selector lever cable to gearbox	10
Front cross-piece below exhaust system to body	25

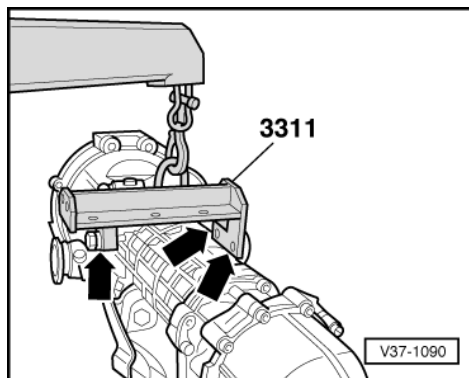
3.2 - Transporting the automatic gearbox



Special tools and workshop equipment required

- ◆ Attaching and holding appliance 3311

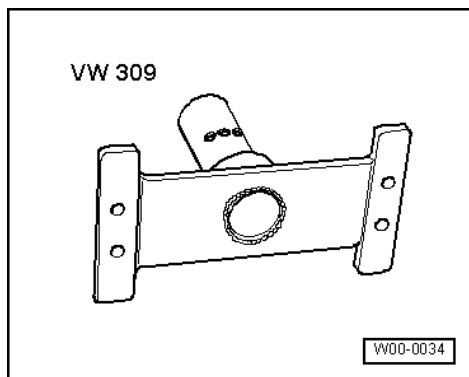
The automatic gearbox can be transported using attaching and holding appliance 3311.



- -> Fit attaching and holding appliance 3311 to attachment points on gearbox housing and secure in place - arrows-
- Secure torque converter in gearbox to prevent it falling out.

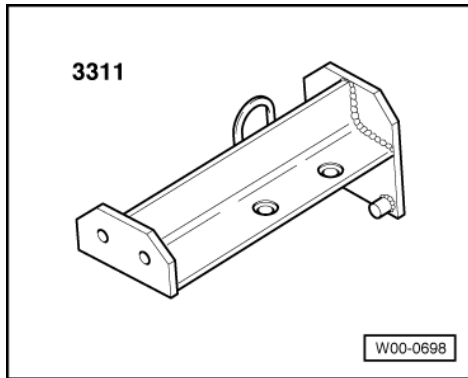
3.3 - Securing gearbox to repair stand

Special tools and workshop equipment required

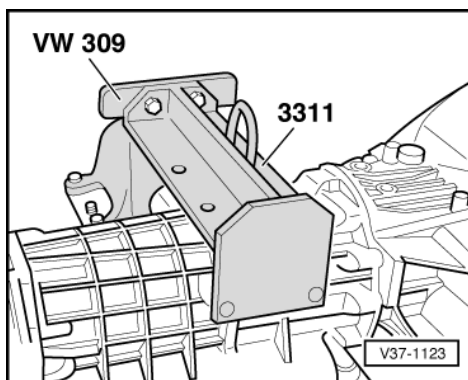


- ◆ Retaining plate VW 309

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- ♦ Attaching and holding appliance 3311
- Remove torque converter or secure it to prevent it dropping out.



- -> When performing repairs, secure gearbox to repair stand with attaching and holding appliance 3311 and holding plate VW 309.

3.4 - Removing and installing left gearbox support

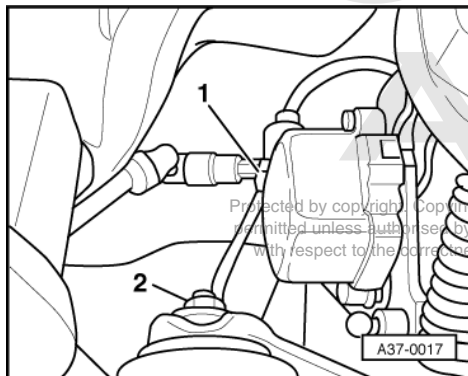
Special tools and workshop equipment required

- ♦ Support (commercially available)

Removing

- Unplug connector for lambda probe on left side.
- Remove front left exhaust pipe with lambda probe:

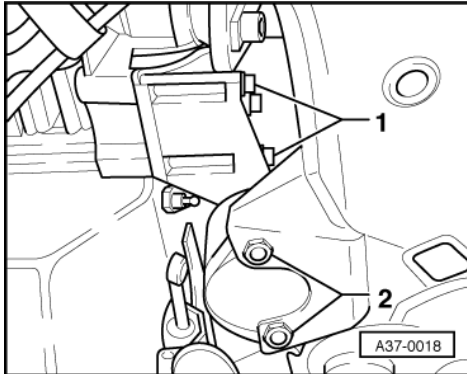
=> 8-Cylinder engine, Mechanics; Repair group 26; Removing and installing exhaust system, Engine codes ABZ, AHC Removing and installing exhaust system, Engine codes ABZ, AHC



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- Support gearbox at rear with commercially available support.
- -> Unscrew top bolt -1- for gearbox support, working through left wheel housing.
- Slacken nut -2- slightly.

- Unbolt heat shield on gearbox.



- -> Unscrew bolts -1- and -2-.

Installing

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

- Align exhaust system free of stress

=> 8-cylinder engine, Mechanics; Repair Group 26; Aligning exhaust system free of stress Aligning exhaust system free of stress

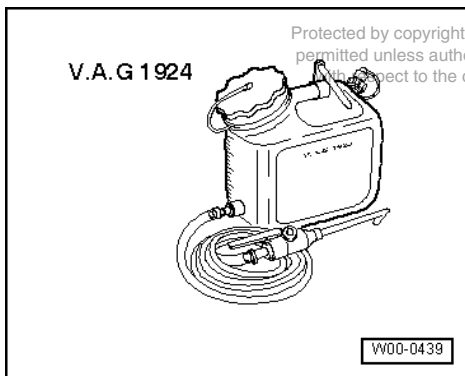
Tightening torques

Component	Nm
Gearbox support to gearbox	40
Gearbox support to bonded rubber mounting	40
Bonded rubber mounting to subframe	40
Heat shield to gearbox	25

4 - Checking ATF level; changing ATF

4.1 - Checking ATF level; changing ATF

Special tools and workshop equipment required



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- ♦ ATF filling system V.A.G 1924
- ♦ Drip tray
- ♦ Protective goggles

4.2 - Checking ATF level

Requirements for test:

- Gearbox not in emergency running mode; ATF temperature not higher than 30°C when starting the check.
- Vehicle must be level (horizontal)
- Selector lever in position P
- Air conditioner and heater switched off

Notes:

- ♦ The ATF level will vary according to the temperature of the ATF.
- ♦ If the ATF level is checked when the ATF temperature is too low, this will result in overfilling.
- ♦ If the ATF level is checked when the ATF temperature is too high, this will result in underfilling.
- ♦ Overfilling or underfilling will impair the function of the gearbox.

Note:

Use only VW ATF Part No. G 052 162 (transparent and slightly yellow). Do not use any additives.

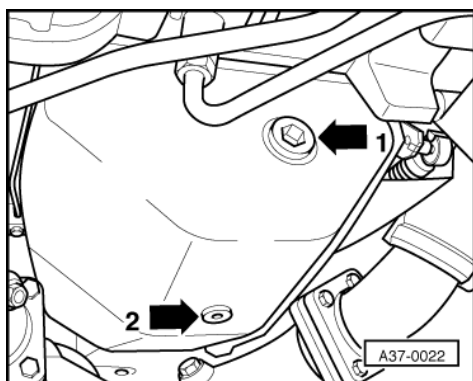
Container sizes:

- ♦ 0.5 ltr. - Part No. G 052 162 A1
- ♦ 1.0 ltr. - Part No. G 052 162 A2

- Start engine and allow to run at idling speed.

Notes:

- ♦ The ATF temperature must not be above 30°C when starting the check (gearbox oil pan just warm to the touch).
- ♦ Temperature tester V.A.G 1558 can be used for a more accurate measurement of the ATF temperature. Apply the tester probe to the outside of the oil pan.



- -> Unscrew ATF filler plug -arrow 1-

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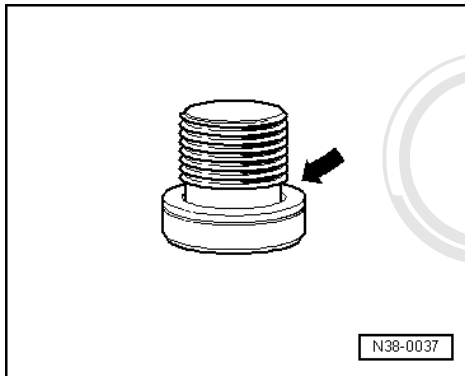
Warning!

Wear eye protection

- The ATF level is correct if a small quantity of fluid comes out at the hole when the ATF temperature is between 35 ° and 40 °C 1). (The fluid comes out because the ATF level rises as the temperature increases.)

1) 50°C for tropical countries

- If ATF flows out of the hole, the ATF level is okay.



- -> Always renew seal -arrow- for ATF inspection plug.
- Tighten ATF filler plug. This completes the ATF check.

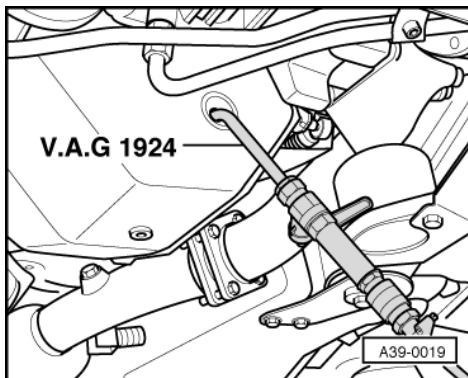
Tightening torque

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Component	Nm
ATF filler plug	60

Topping up ATF

- If no ATF comes out at the hole, top up with ATF as follows:



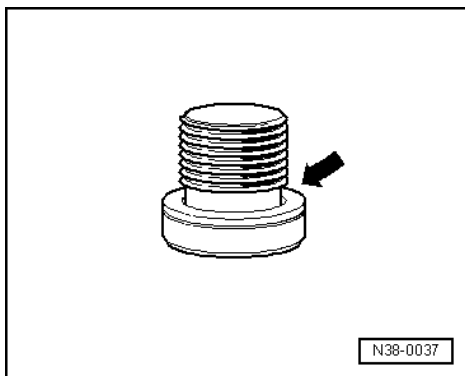
- -> Use V.A.G 1924 to add ATF until fluid level reaches lower edge of filler hole.

Note:

Use only ATF with Part No. G 052 162 A (colourless/yellow) for topping up. Do not use any additives.

Warning!

If the ATF level is too high or too low it will adversely affect the operation of the gearbox.





- -> Always renew seal -arrow- for ATF inspection plug.
- Tighten ATF filler plug -arrow 1-. This completes the ATF check.

Tightening torque

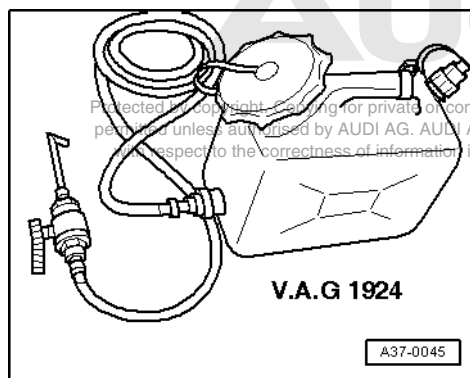
Component	Nm
ATF filler plug	60

4.3 - Changing ATF or filling up after repairs

- Engine not running

Notes:

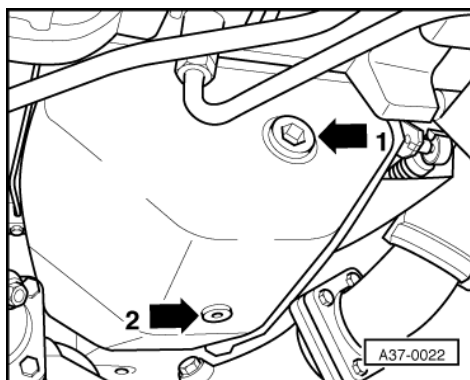
- ♦ Use only ATF G 052 162 A (yellowish colour). Do not use any additives.
- ♦ The engine must not be started without ATF and the vehicle must not be towed!
- ♦ The ATF temperature must not be above 30°C when starting the check (gearbox oil pan just warm to the touch).
- ♦ Temperature tester V.A.G 1558 can be used for a more accurate measurement of the ATF temperature. Apply the tester probe to the outside of the oil pan.



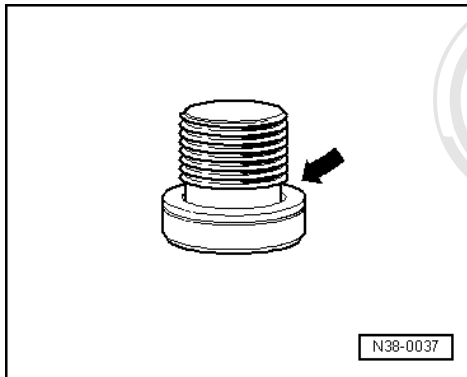
- ♦ Observe disposal regulations!

Work sequence

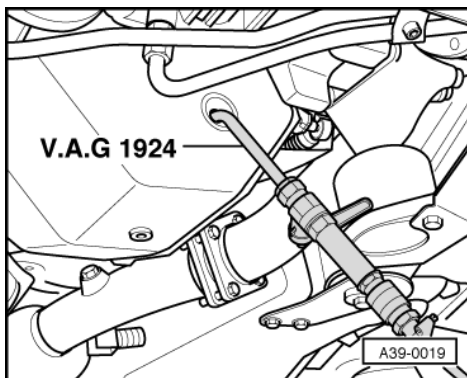
- -> Secure reservoir of ATF filling system V.A.G 1924 at the highest possible point on the vehicle.
- Raise vehicle.
- Place container under the gearbox.



- -> Unscrew ATF drain plug -arrow 2-.
- Drain ATF.
- Unscrew ATF filler plug -arrow 1-.



- -> Always renew seal -arrow- for ATF drain plug.
- Tighten ATF drain plug.



- -> Use V.A.G 1924 to add ATF until fluid level reaches lower edge of filler hole.
- Start engine and run at idling speed.

Warning!
Wear eye protection

- With the engine running, add more ATF until fluid level reaches lower edge of filler hole again.
- Fit ATF filler plug with new seal and screw in (hand-tight).
- With the brake pedal depressed and the engine running at idling speed, move the gear selector lever through all gear positions. The selector lever must be left in each position for 2 or 3 seconds.
- Switch off ignition.
- Check and top up ATF level =>from Page 48 .

Note:

Observe all notes and test requirements as for "Checking ATF level".

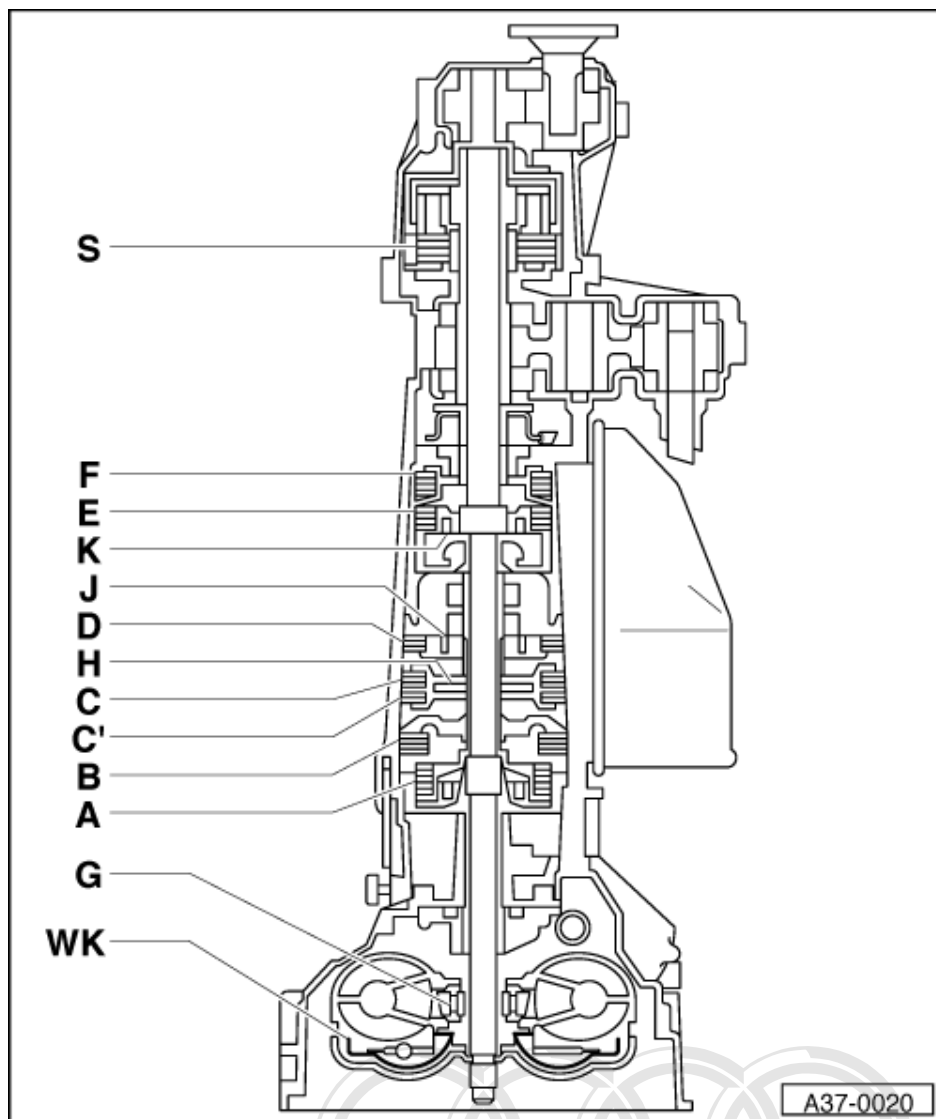
Tightening torque

Component	Nm
ATF drain plug	35



5 - Transmission layout

5.1 - Transmission layout



- A - Clutch A
- B - Clutch B
- E - Clutch E
- C' - Brake C'
- C - Brake C
- D - Brake D
- F - Brake F
- G - Freewheel G
- H - Freewheel H
- J - Freewheel J
- K - Freewheel K
- S - Clutch S

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WK - Torque converter lock-up clutch

5.2 - Actuation of selector elements

- ♦ When dealing with problems relating to poor acceleration and performance or general malfunctions, the following chart indicates which selector elements are actuated in the various gears. This should help to identify the selector elements which are not working properly.

Position / gear	Solenoid valves			Clutches							
	Solenoid valves			Clutches				Brakes			
	-N88	-N89	-N90	A	B	E	S	C'	C	D	F
P = park											
R = reverse					x	x	(x)			x	
N = neutral		x				x					
D, 1st gear		x		x		x	(x)			(x)	
D, 2nd gear	x	x	(x)	x		x	(x)	x	x		
D, 3rd gear	x		(x)	x	x	x	(x)		x		
D, 4th gear			(x)	x	x		(x)		x		x
Emergency running (backup) mode				x	x				x		

6 - Dismantling and assembling gearbox

6.1 - Dismantling and assembling gearbox

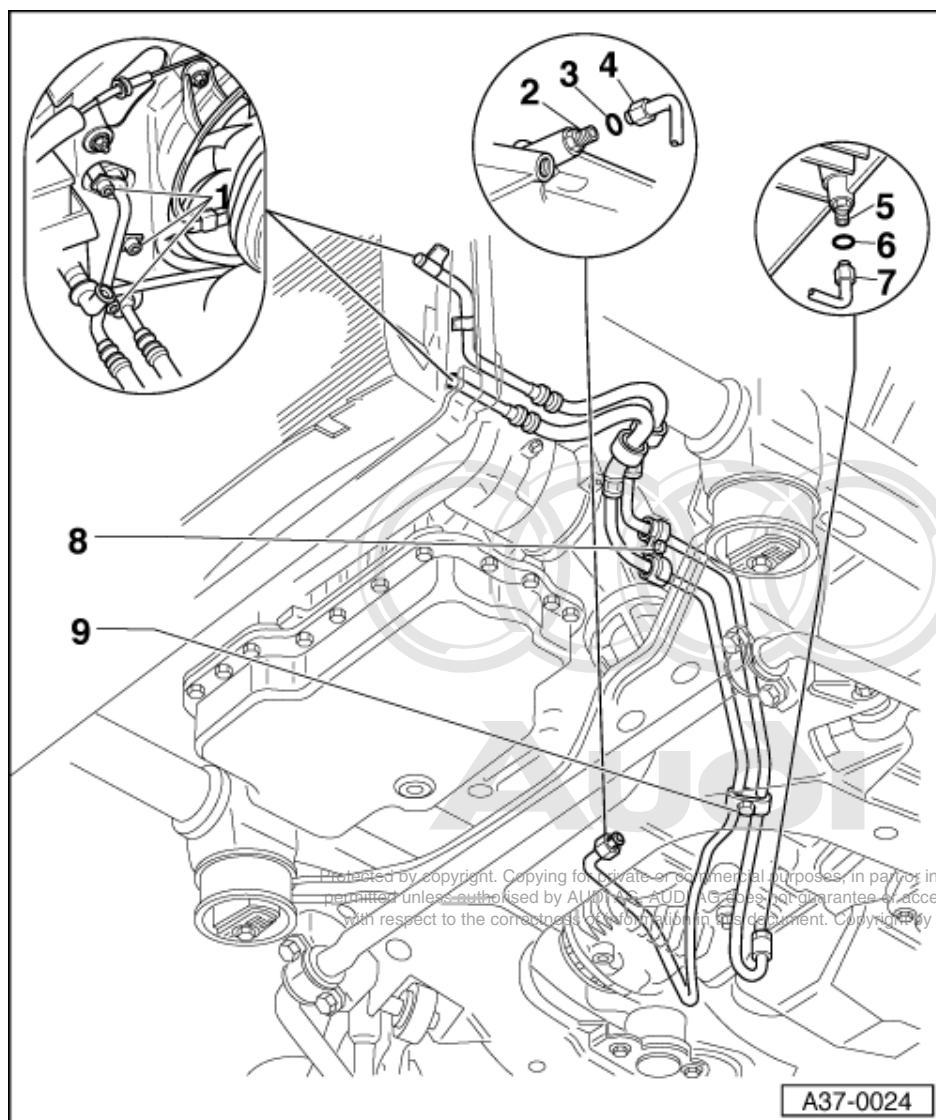
- Observe general repair instructions=> Page 5 .

6.2 - Rules for cleanliness when working on automatic gearbox

- ♦ Thoroughly clean the connection points and the surrounding area before disconnecting.
- ♦ Place removed parts on a clean surface and cover over. Use sheeting or paper. Do not use fluffing cloths.
- ♦ Carefully cover over or plug opened components if repairs are not carried out immediately.
- ♦ Install only clean parts: do not remove replacement parts from their wrapping until just before installing.
- ♦ Always replace O-rings, seals and gaskets.
- ♦ Lightly lubricate O-rings with ATF before fitting to prevent the rings being trapped and damaged when components are installed.
- ♦ Do not use any other lubricants in or on components that are lubricated with ATF. Otherwise, problems may occur with the hydraulic actuation of the gearbox.
- ♦ After completing installation, check the following fluid levels and top up as necessary:
ATF in planetary gearbox=>Page 3 .



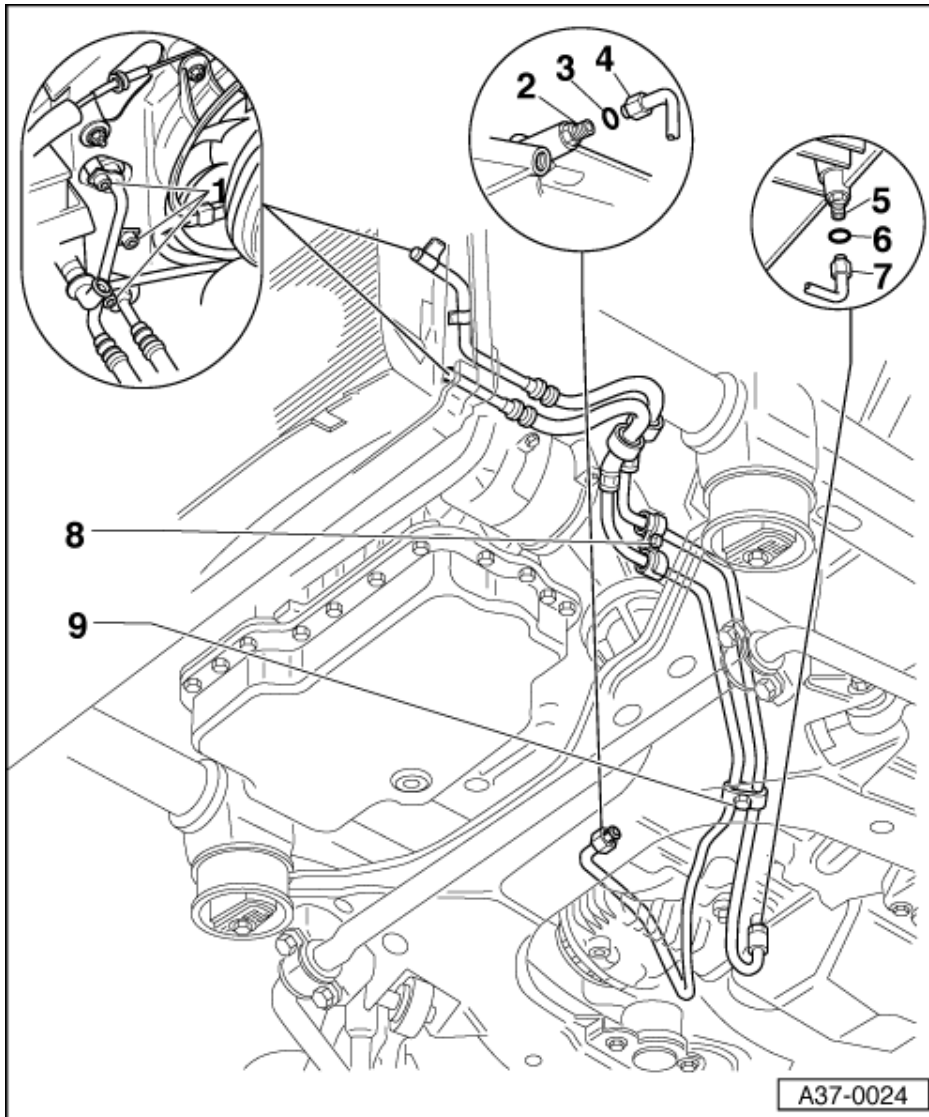
6.3 - Removing and installing ATF pipes



Notes:

- ♦ Place drip tray V.A.G 1306 underneath.
- ♦ To install, first insert ATF pipes into gearbox or cooler by hand as far as they will go, then bolt on.

- 1 Hexagon socket head bolt
- 5Nm
- 2 Screw connection - 40 Nm
- 3 O-ring
 - ♦ Renew
 - ♦ Insert with ATF
- 4 Union nut - 25 Nm



- 5 Screw connection - 40 Nm
- 6 O-ring
 - ◆ Renew
 - ◆ Insert with ATF
- 7 Union nut, 25 Nm
- 8 Bolt with washer - 10 Nm
- 9 Bolt with washer - 6 Nm

6.4 - Cleaning ATF pipes and ATF cooler

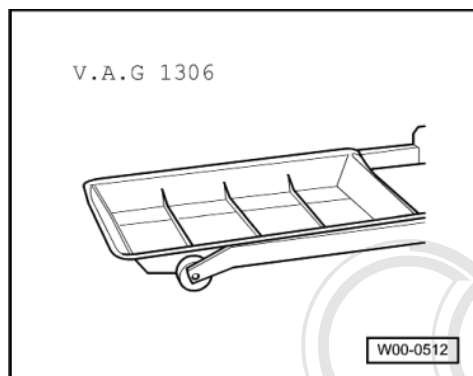
Notes:

- ◆ Before fitting a replacement gearbox, always blow through the ATF cooler and ATF pipes with compressed air (not more than 10 bar).
- ◆ To install, first insert ATF pipes into gearbox or cooler by hand as far as they will go, then bolt on.

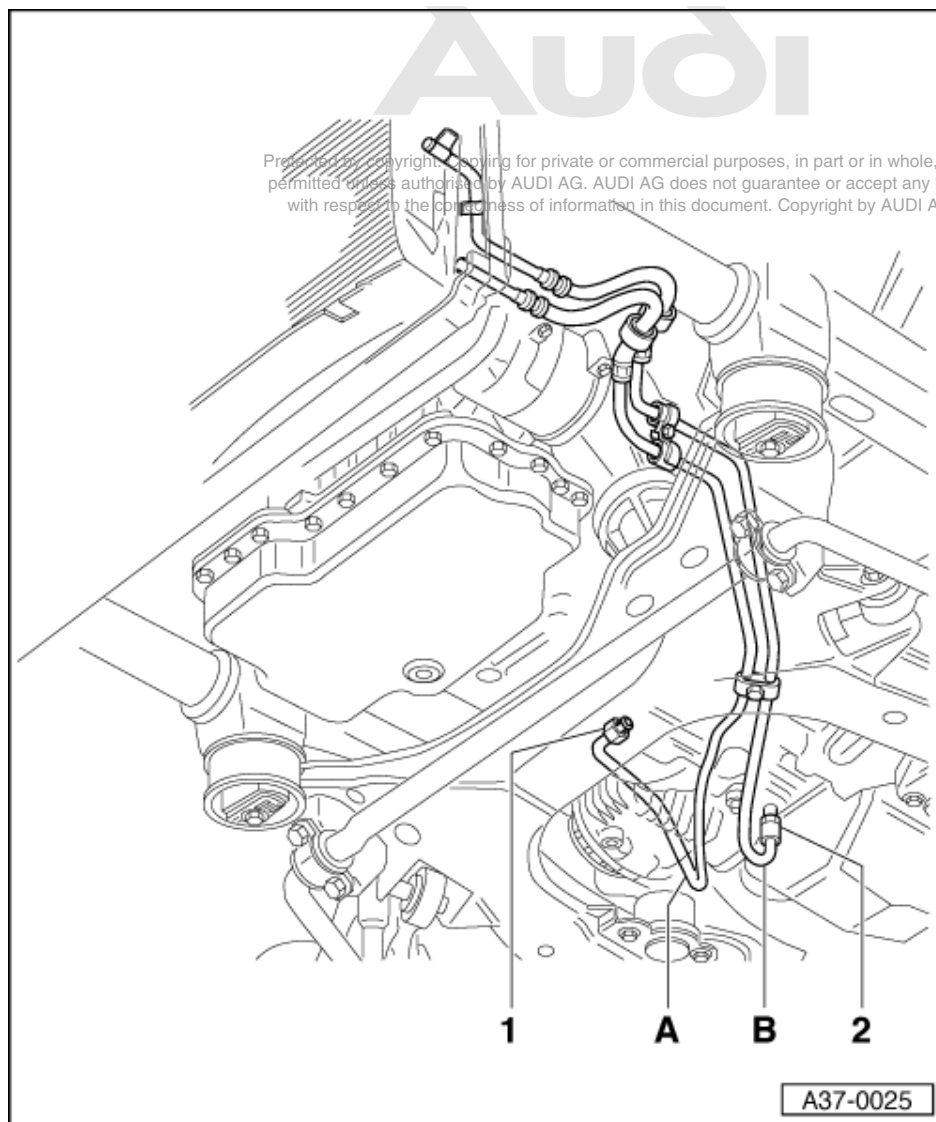
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Special tools and workshop equipment required



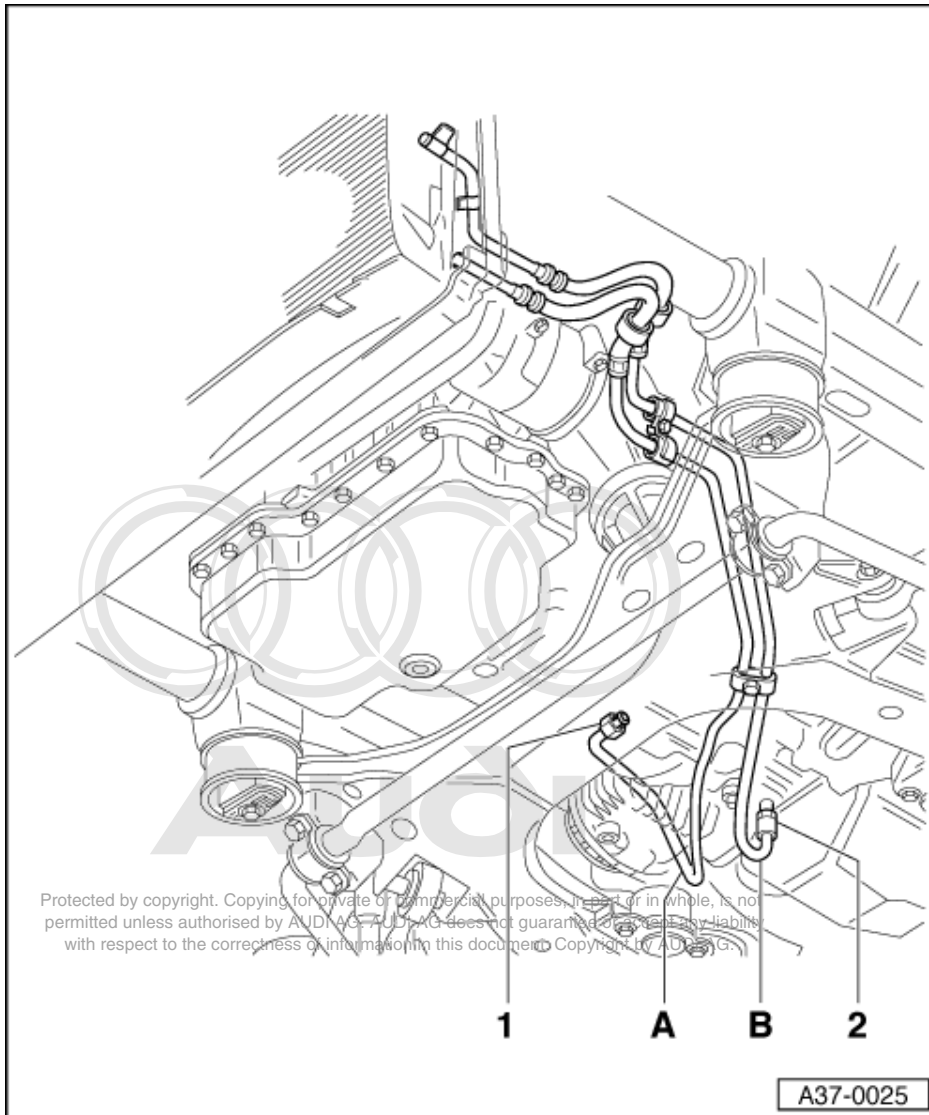
- ♦ Drip tray V.A.G 1306
- ♦ Hose, approx. 18 mm dia.
- ♦ Compressed air gun (commercially available)



Work sequence

Wear protective goggles.

- Place drip tray V.A.G 1306 under vehicle.
- Unscrew union nuts -1- and -2-.
- Pull out ATF pipes.
- Connect hose (approx. 18 mm dia) to ATF pipe -A- and secure with hose clamp. Put other end of hose in a suitable container.



- Blow through ATF pipe -B- with compressed air gun.
- Transfer hose from ATF pipe -A- to ATF pipe -B- and repeat the procedure.
- Reconnect ATF pipes.
- Then check ATF level and top up as necessary=>Page 48 onwards.

6.5 - Removing and installing multi-function switch -F125

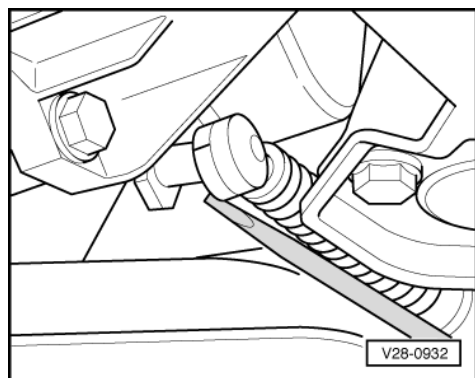
Removing

- Disconnect connection to lambda probe on left-hand side.
- Remove front left exhaust pipe together with lambda probe:

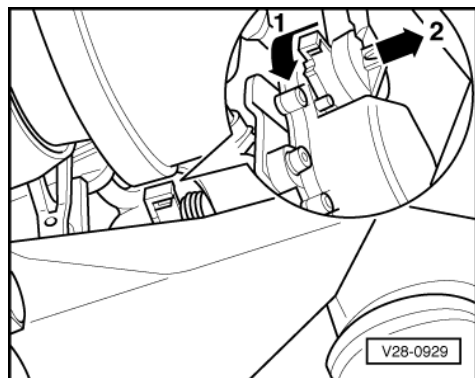


=> 8-Cylinder engine, Mechanics; Repair group 26; Removing and installing exhaust system, Engine codes ABZ, AHC Removing and installing exhaust system, Engine codes ABZ, AHC

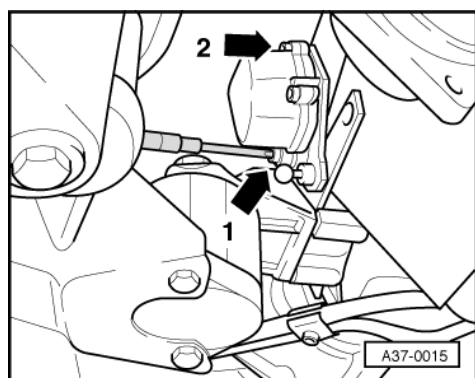
- Unbolt heat shield for selector lever cable on gearbox.



- -> Release securing clip and lever off ball socket of selector lever cable using a screwdriver.



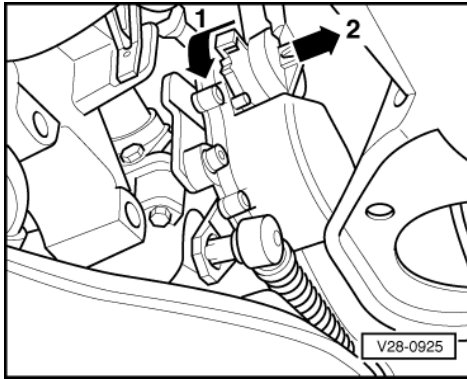
- -> Pull down retainer catch -arrow 1- of 8-pin connector on multi-function switch -F125.



- -> Unscrew bolts -arrow 1- and -arrow 2-.

Note:

To slacken bolts, use a 5mm socket with 1/4" drive and a 70 ... 80 mm long hexagon key for bolt -arrow 1-, and a 40 mm hexagon key for bolt -arrow 2-.



- -> Take off multi-function switch and then unplug connector -arrow 2-.

Note:

Illustration shows gearbox without left gearbox support.

Installing

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

- Fit retainer catch on multi-function switch and pull off protective cap.
- Plug in connector and press retainer catch upwards as far as it will go.

Note:

When plugging in the connector, take care not to damage any of the retaining tabs on the connector.

- Only screw in securing bolts so far that multi-function switch can still be moved within elongated holes.
- Adjusting multi-function switch =>page 59 .

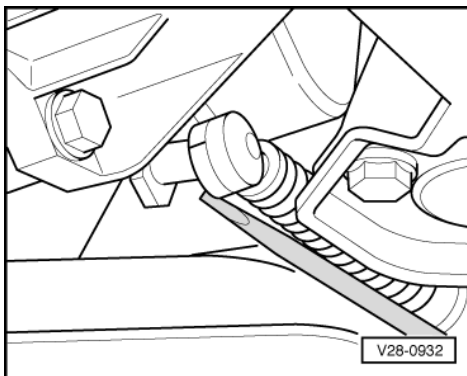
6.6 - Adjusting multi-function switch -F125

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- Front left exhaust pipe with lambda probe removed

=> 8-Cylinder engine, Mechanics; Repair group 26; Removing and installing exhaust system, Engine codes ABZ, AHC Removing and installing exhaust system, Engine codes ABZ, AHC

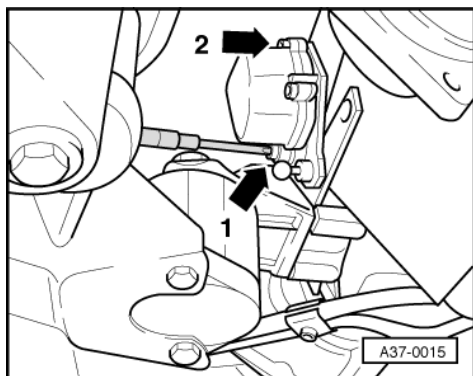
- Move selector lever into position "P".
- Unbolt heat shield for selector lever cable on gearbox.



- -> Release securing clip and lever off ball socket of selector lever cable using a screwdriver.
- Set ball joint on gearbox selector lever to position "N" as follows:
 - Press ball joint forwards to end stop (position "P").
 - Then allow ball joint to move through position "R" and engage in position "N".



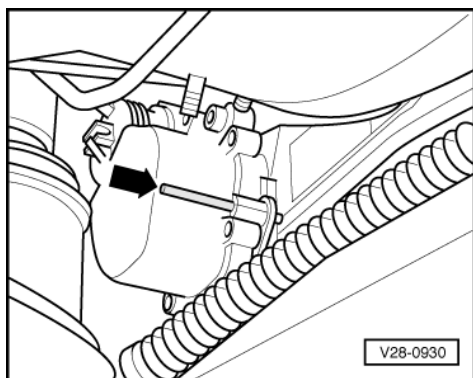
- Move selector lever into position "N".



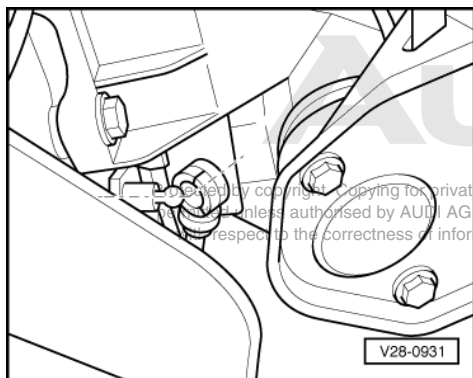
- -> Slacken securing bolts -arrow 1- and -arrow 2- far enough to allow multi-function switch to move in elongated holes.

Notes:

- ♦ To slacken bolts, use a 5mm socket with 1/4" drive and a 70 ... 80 mm long hexagon key for bolt -arrow 1-, and a 40 mm hexagon key for bolt -arrow 2-.
- ♦ The multi-function switch can be adjusted with an adjuster pin (which is only supplied together with the switch as a replacement part) or by using a 4 mm drill bit.



- -> Insert adjuster pin or drill bit through adjustment hole in multi-function switch.
- Turn multi-function switch until adjuster pin or 4 mm drill bit can be fixed in opposite adjustment hole.
- Tighten securing bolts for multi-function switch (10 Nm).
- Remove adjuster pin or drill bit
- Press ball joint forwards to end stop (position "P").
- Move selector lever into position "P".



- -> Ball socket and ball joint should be aligned accurately.
Attach selector lever cable to ball joint by hand; ball socket should engage.

Press on securing clip.

If ball socket and ball joint are not aligned accurately:

- Check selector lever cable setting => Page 24 .

Note:

If the selector lever display in the dash panel insert does not agree with the selector lever position after repeated adjustment to the selector lever cable and the multi-function switch, renew the multi-function switch=>Page 57 .

- Align exhaust system free of stress

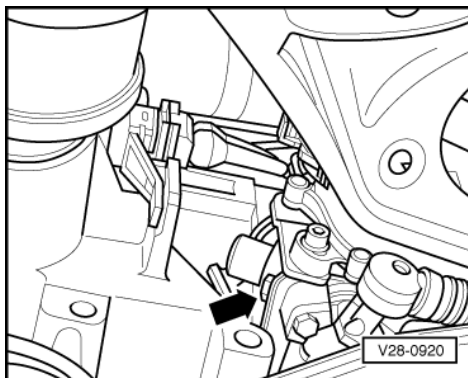
=> 8-cylinder engine, Mechanics; Repair Group 26; Aligning exhaust system free of stress Aligning exhaust system free of stress

Tightening torque

Component	Nm
Multi-function switch to gearbox	10
Heat shield to gearbox	10

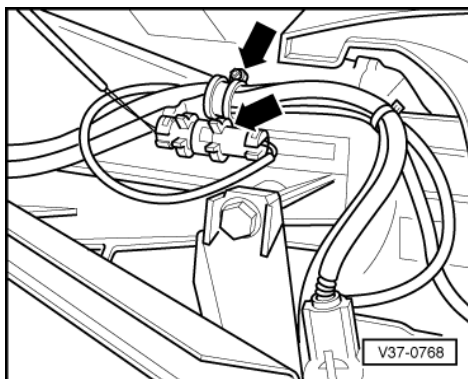
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6.7 - Removing and installing reversing switch -F41



Removing

- Remove left-hand gearbox support => Page 46 .
- -> Unscrew bolt -arrow- for retainer bracket.
- Pull switch out of gearbox.





- -> Unplug connector and open cable tie and clip -arrows-.

Installing

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

- Renew O-ring on switch.

Tightening torque

Component	Nm
Retainer bracket to gearbox	10

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38 - Gears, Hydraulic controls

1 - Removing and installing oil pan, ATF screen and valve body

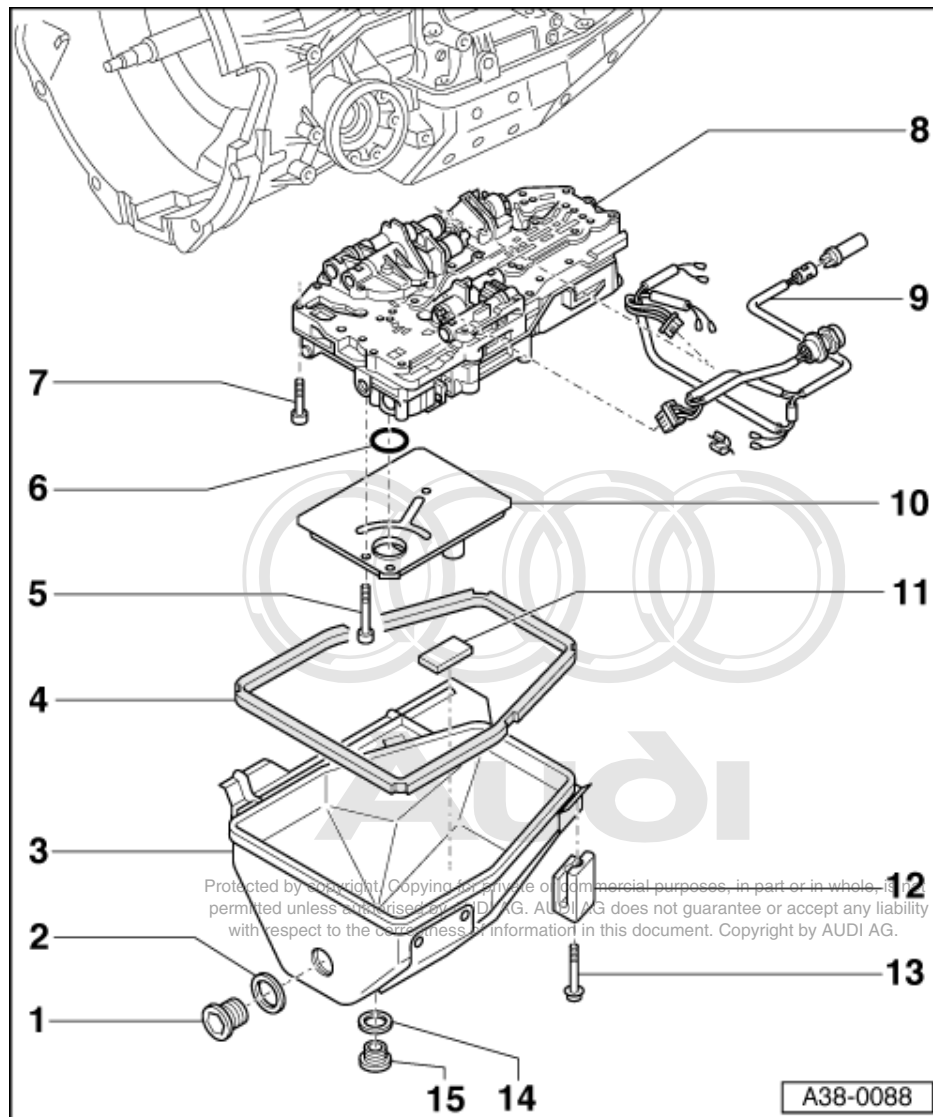
1.1 - Removing and installing oil pan, ATF screen and valve body

Warning

Do not run engine or tow vehicle with oil pan removed or when there is no ATF in the gearbox.

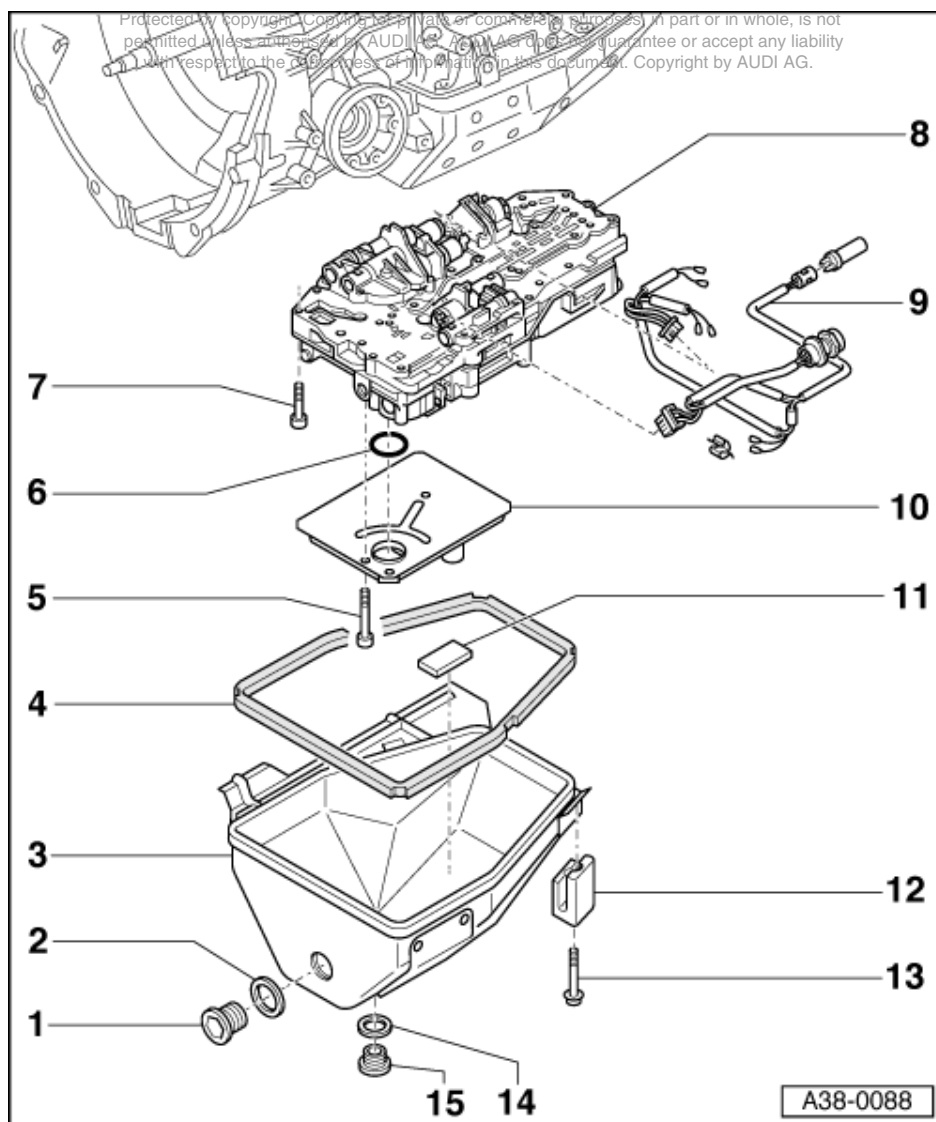
Notes:

- ◆ Always replace valve body if it has collected dirt or if it is defective.
- ◆ Observe rules for cleanliness when working on automatic gearbox => Page 53 .
- ◆ General repair instructions => Page 5 .
- ◆ Lubricate O-rings and oil seals lightly with ATF. Other types of lubricant can cause problems with the hydraulic actuation of the gearbox.





- 1 Plug - 60 Nm
- 2 Sealing ring
 - ♦ Renew
- 3 Oil pan
 - ♦ Removing and installing
 - => Page 66
- 4 Gasket
 - ♦ Renew
- 5 Bolt - 8 Nm
- 6 O-ring
 - ♦ Renew
- 7 Bolt - 8 Nm
 - ♦ Bolts securing valve body:
 - 7bolts M6 x 33;
 - 3 bolts M6 x 60,
 - 3 boltsM6 x 80
 - ♦ Note sequence when loosening
 - =>Page 68
 - ♦ Note sequence when tightening
 - =>Page 69



- 8 Valve body
 - ♦ Removing and installing

=> Page 68

9 Wiring harness

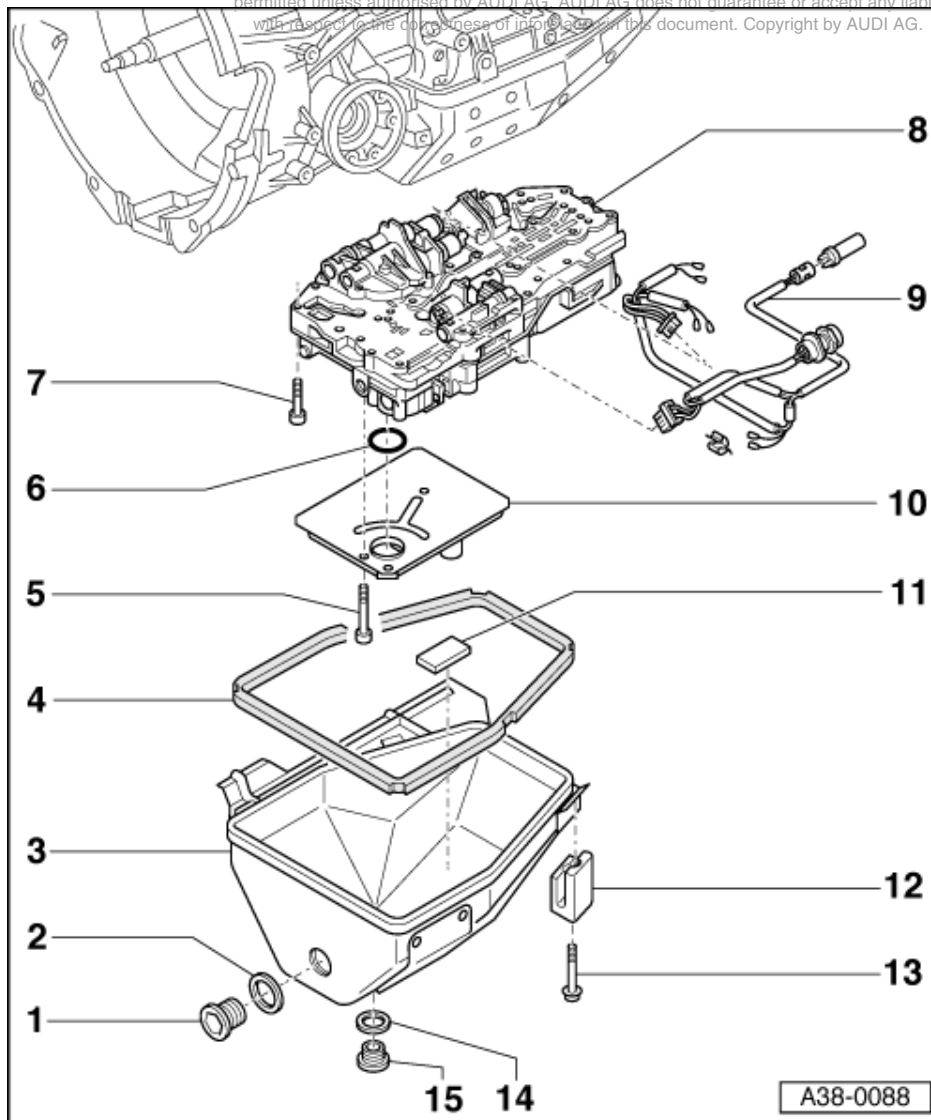
- ◆ Renewing => Page 70
- ◆ Remove and install valve body (=>Page 68) in order to renew wiring harness
- ◆ Renew O-ring on 8-pin connector
- ◆ Tighten coupling nut on 8-pin connector to 20 Nm

10 ATF screen

- ◆ Removing and installing
=> Page 67

11 Magnet

- ◆ Qty. 4
- ◆ Ensure correct positioning, otherwise noise can be caused



12 Retaining bracket

13 Bolt - 6 Nm

- ◆ Tighten oil pan bolts in several stages and in diagonal sequence

14 Sealing ring

- ◆ Renew

15 Drain plug - 35 Nm



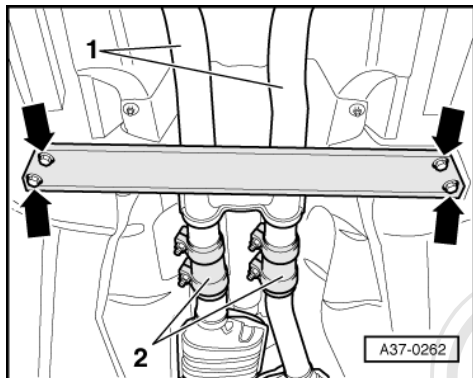
1.2 - Removing and installing oil pan

Special tools and workshop equipment required

- ♦ Drip tray

Removing

- Unbolt front exhaust pipes (left and right).

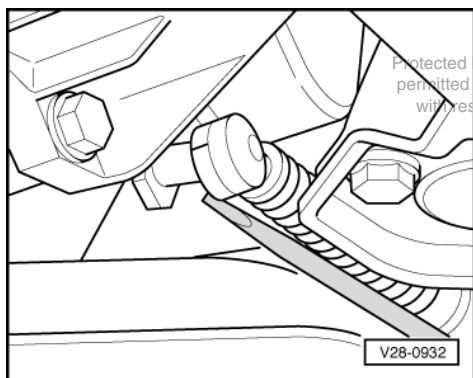


- -> Loosen clamps -2-.
- Remove front exhaust pipes together with catalytic converters and lambda probes.

Note:

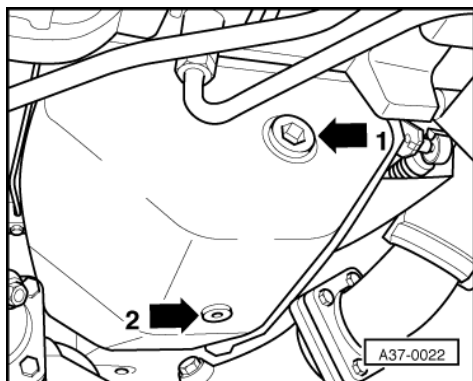
Ensure that connectors for lambda probes are clear.

- If fitted, remove cross member below exhaust system -arrows-.
- Unbolt heat shield for selector lever cable on gearbox.



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- -> Release securing clip and lever off ball socket of selector lever cable using a screwdriver.
- Place container under the gearbox.



- -> Unscrew ATF drain plug -arrow 2- and drain off ATF.
- Slacken bolts on oil pan.
- Take off retaining bracket (which is now loose).

Installing

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

- Clean magnets in oil pan. Ensure that the magnets are in full contact with the oil pan.
- Renew seals and gaskets.
- Always renew seal for ATF drain plug.
- Align exhaust system free of stress

=> 8-cylinder engine, Mechanics; Repair Group 26; Aligning exhaust system free of stress Aligning exhaust system free of stress

- Check selector lever cable setting => Page 24 .
- Fill up with ATF => Page 50 .

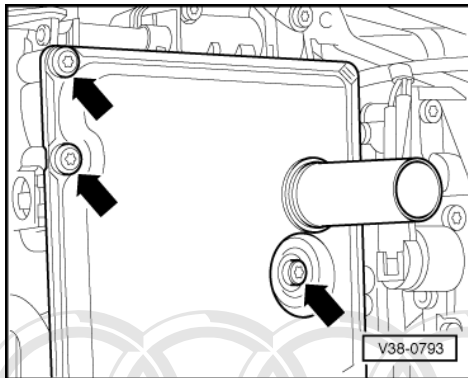
Tightening torques

Component	Nm
ATF drain plug	35
Oil pan to gearbox housing	6

1.3 - Removing and installing ATF screen

Removing

- Remove oil pan => Page 66 .



- -> Unscrew bolts on ATF screen -arrows-.
- Pull ATF screen off valve body.

Installing

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

- Renew O-ring on ATF screen.
- Install oil pan => Page 67 .
- Fill up with ATF => Page 50 .

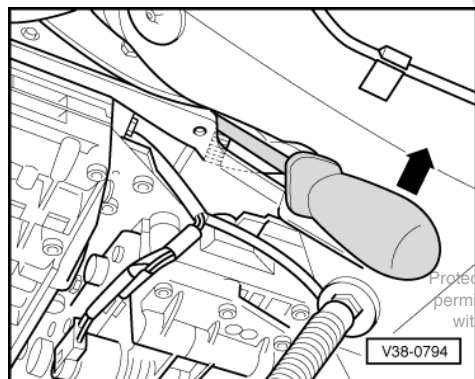


Tightening torque

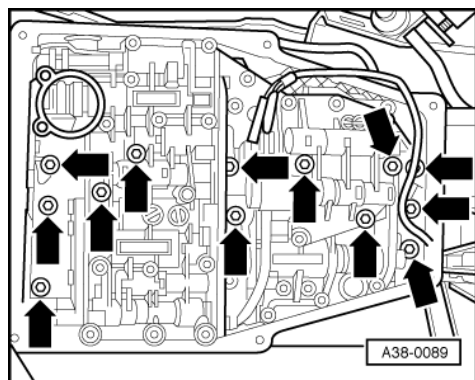
Component	Nm
ATF screen to valve body	8

1.4 - Removing and installing valve body

Removing



- Remove oil pan => Page 66 .
- Remove ATF screen=>Page 67 .
- -> Release bayonet catch on 8-pin connector by turning anti-clockwise with a screwdriver and unplug connector from gearbox.
- Slacken coupling nut (32 mm A/F).



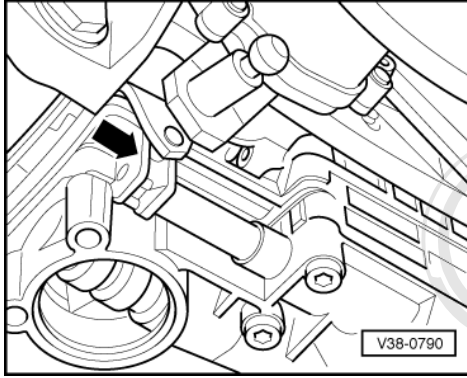
- -> Unscrew securing bolts -arrows- on valve body, working from outside to inside, and take out valve body together with wiring harness.

Notes:

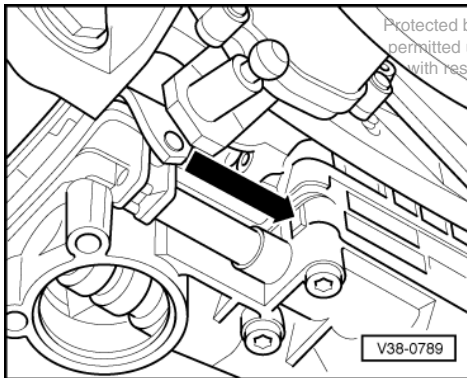
- ♦ Only slacken the securing bolts indicated in the illustration -arrows-.
- ♦ If other bolts are slackened, this can affect the functioning of the valve body.
- ♦ The bolts have different lengths; check that they are fitted correctly.

Installing

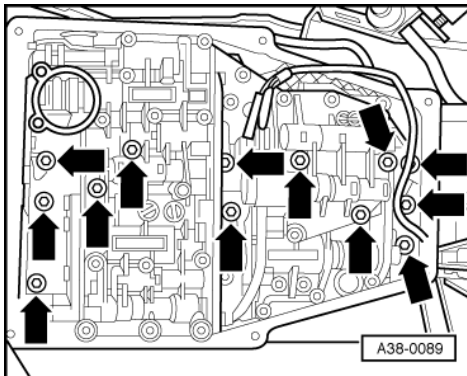
Installation is carried out in the reverse order, when doing this note the following:



- -> Engage selector slide -arrow- in detent plate.
- First tighten bolts securing valve body hand-tight.



- -> Set selector lever of multi-function switch to position "1" -arrow-.
- Move valve body until cast lug makes contact with detent plate -tip of arrow-.



- -> Then tighten bolts for valve body to specified torque, working from the inside outwards.
- Renew O-ring on 8-pin connector.
- Install ATF screen=>Page 67 .
- Install oil pan => Page 67 .
- Fill up with ATF => Page 50 .

Tightening torques

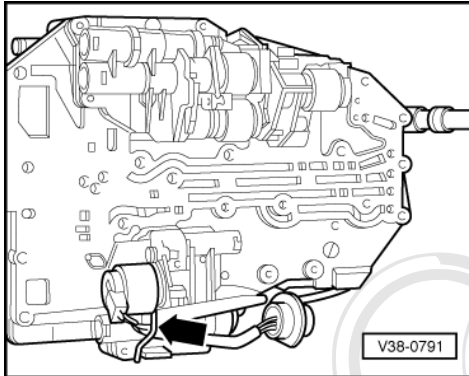
Component	Nm
Coupling nut for 8-pin connector on wiring harness	20
Valve body to gearbox housing (working from the inside outwards)	8



1.5 - Removing and installing wiring harness in gearbox

Removing

- Remove valve body => Page 68 .



- -> Unplug connectors at solenoid valves and pull wiring harness out of retainer -arrow-.

Installing

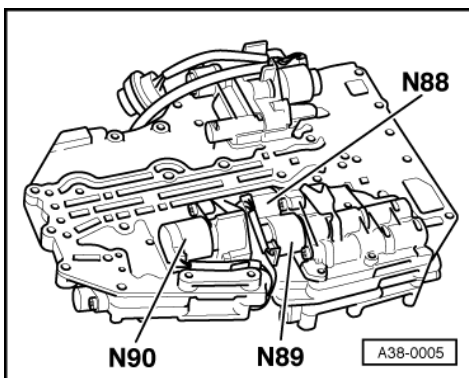
Installation is carried out in the reverse order, when doing this note the following:

- When fitting the harness, plug the connectors onto the respective solenoid valves.
- Renew O-ring on 8-pin connector.
- Install valve body => page 68 .
- Install ATF screen=>Page 67 .
- Install oil pan => Page 67 .
- Fill up with ATF => Page 50 .

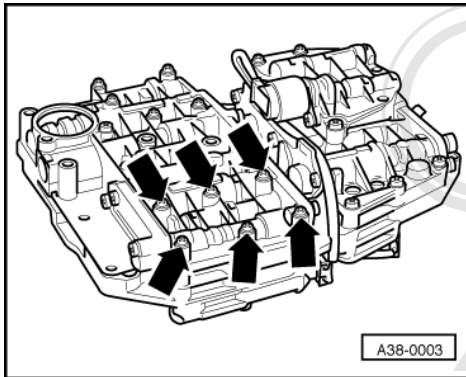
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1.6 - Removing and installing solenoid valves -N88 and -N89

Removing



- Remove valve body => Page 68 .
- -> Unplug connector on solenoid valve.

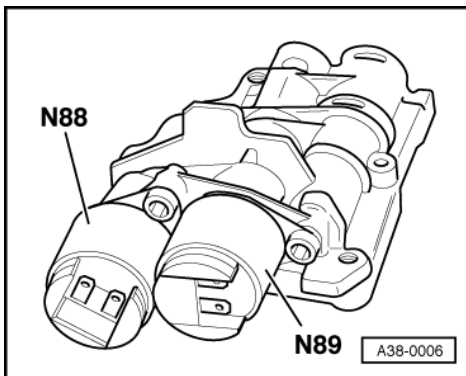


- -> Unscrew bolts -arrows-

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Notes:

- ◆ Only slacken the securing bolts indicated in the illustration -arrows-.
- ◆ If other bolts are slackened, this can affect the functioning of the valve body.



- -> Unbolt retainer at defective solenoid valve.

Installing

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

- Install the solenoid valve so that the connector terminal points in the same direction as before.
- Install valve body => page 68 .
- Install ATF screen=>Page 67 .
- Install oil pan => Page 67 .
- Fill up with ATF => Page 50 .

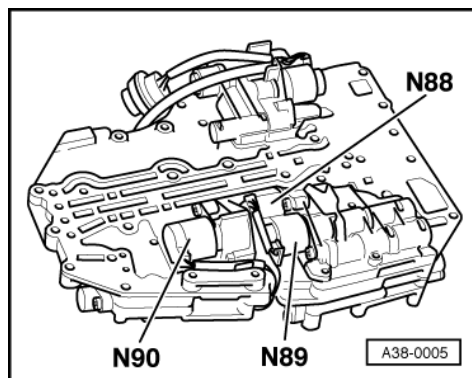
Tightening torques

Component	Nm
Retainer for solenoid valve	5
Housing to valve body	5

1.7 - Removing and installing solenoid valve -N90

Removing

- Remove valve body => Page 68 .



- -> Unplug connector on solenoid valve.
- Unbolt retainer.

Installing

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

- Install the solenoid valve so that the connector terminal points in the same direction as before.
- Install valve body => page 68 .
- Install ATF screen=>Page 67 .
- Install oil pan => Page 67 .
- Fill up with ATF => Page 50 .

Tightening torque

Component	Nm
Retainer for solenoid valve	5

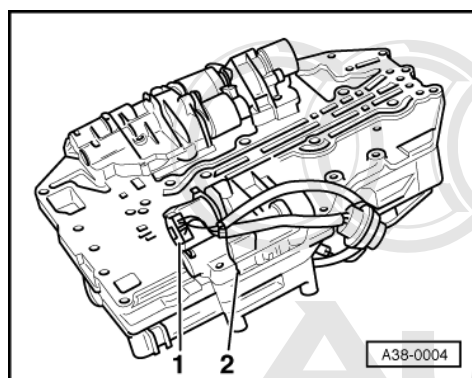
1.8 - Removing and installing solenoid valve -N91 (pressure regulator)

Note:

The pressure regulator -N91 can only be renewed together with the modulator housing.

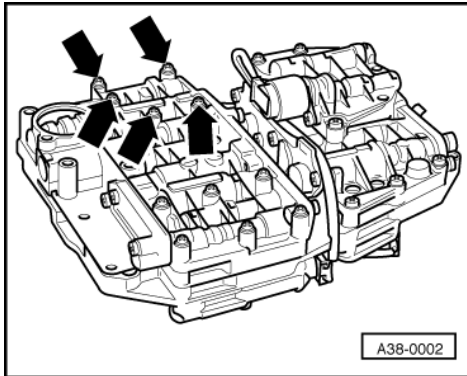
Removing

- Remove valve body => Page 68 .



- -> Unplug connector -1-.
- Release retaining clip -2-.

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- Unscrew bolts -arrows-.

Notes:

- ♦ Only slacken the securing bolts indicated in the illustration -arrows-.
- ♦ If other bolts are slackened, this can affect the functioning of the valve body.

Installing

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

- Install valve body => page 68 .
- Install ATF screen=>Page 67 .
- Install oil pan => Page 67 .
- Fill up with ATF => Page 50 .

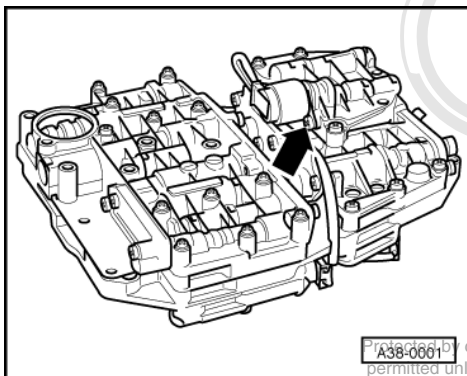
Tightening torque

Component	Nm
Modulator housing to valve body	5

1.9 - Removing and installing solenoid valve -N92

Removing

- Remove ATF screen => Page 67 .
- Unplug connector at solenoid valve.



- -> Unbolt retainer -arrow-.

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Installing

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

- Install ATF screen=>Page 67 .
- Install oil pan => Page 67 .
- Fill up with ATF => Page 50 .

Tightening torque

Component	Nm
Retainer for solenoid valve	5



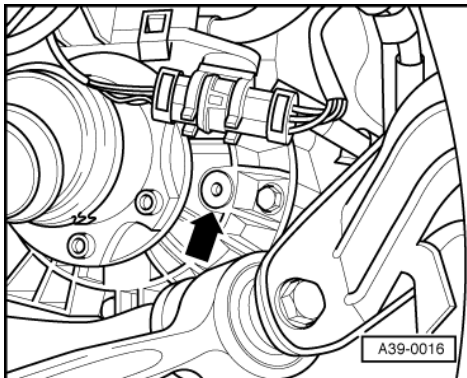
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39 - Final drive, Differential rear

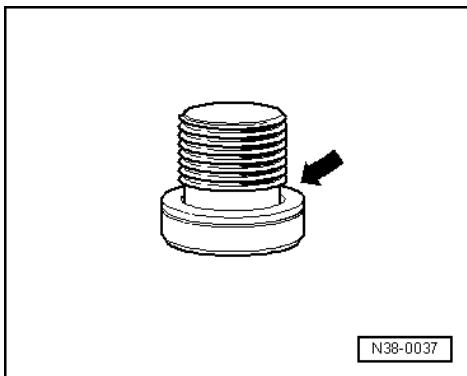
1 - Gear oil in front final drive

1.1 - Gear oil in front final drive

1.2 - Checking oil level in front final drive



- -> Unscrew oil filler plug -arrow-.
- Specification: oil level should be up to bottom edge of hole.
- Top up oil as necessary.
- Specification => Page 3



- -> Always renew seal -arrow- for filler plug.

Note:

- Screw in oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	45

1.3 - Changing gear oil in front final drive or filling after repairs

- Place drip tray underneath.



- Remove oil drain plug at bottom of differential cover and drain oil.
- Always renew seal for oil drain plug.
- Screw in oil drain plug.
- Remove oil filler plug -arrow 1-.
- Fill slowly with gear oil.
 - Specification: oil level should be up to bottom edge of hole
 - Specification => page 4
- Always renew seal for oil filler plug.
- Insert oil filler plug.

Tightening torques

Component	Nm
Oil drain plug	45
Oil filler plug	45

2 - Servicing front final drive

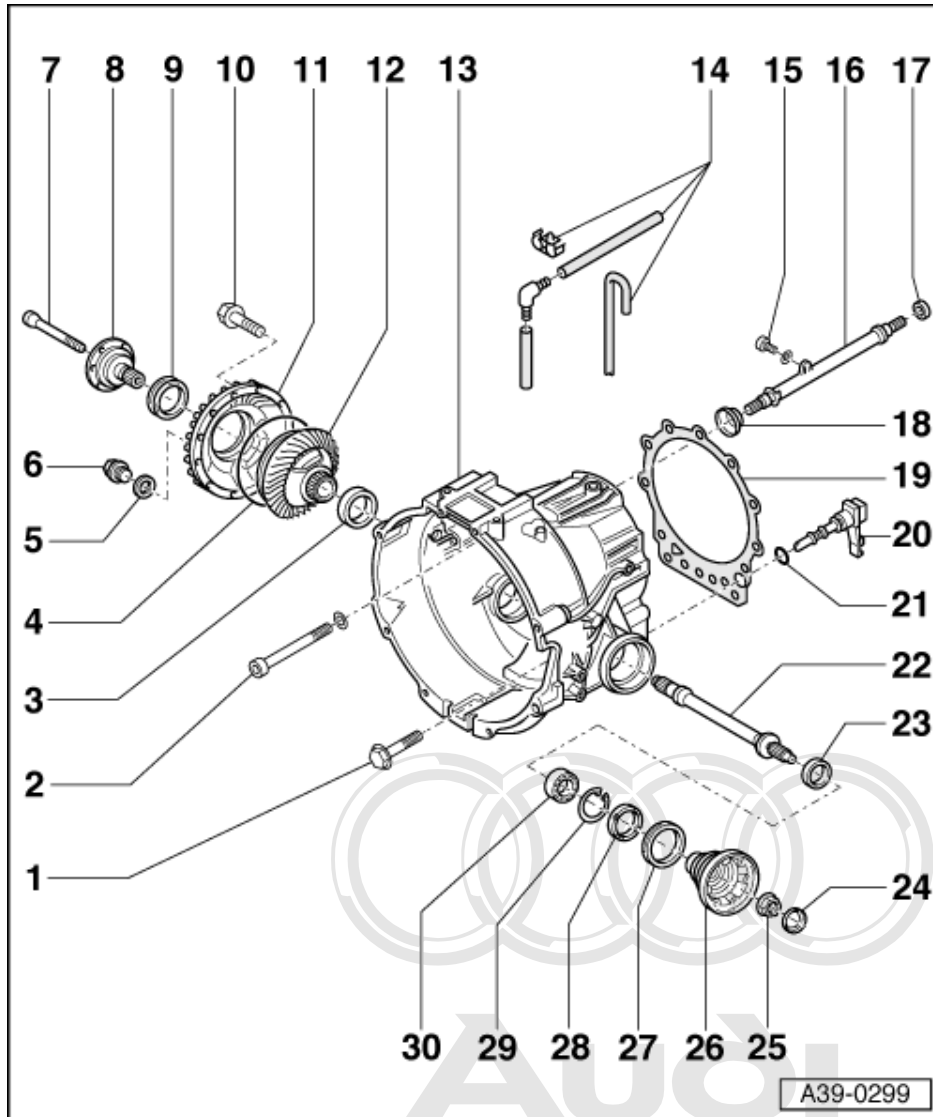
2.1 - Servicing front final drive

Notes:

- ♦ Observe the rules for cleanliness when working on the automatic gearbox => page 53 .
- ♦ General repair instructions => Page 5 .
- ♦ Lubricate O-rings and oil seals with a small amount of ATF. Other lubricants or grease will cause malfunctions in the hydraulic gearbox actuators.
- ♦ If required, use only Vaseline to stick components in place when assembling. Other types of grease will cause malfunctions in the hydraulic gearbox actuators.
- ♦ Do not interchange shims or the inner or outer races of bearings of the same size.



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1 Hexagon bolt - 46 Nm

- ♦ Loosen inaccessible bolts using Hazet tool 3432 (or other suitable commercial tool)

2 Torx socket head bolt - 46 Nm

3 Oil seal

- ♦ Between final drive and torque converter bellhousing
- ♦ Renewing => Page 91

4 O-ring

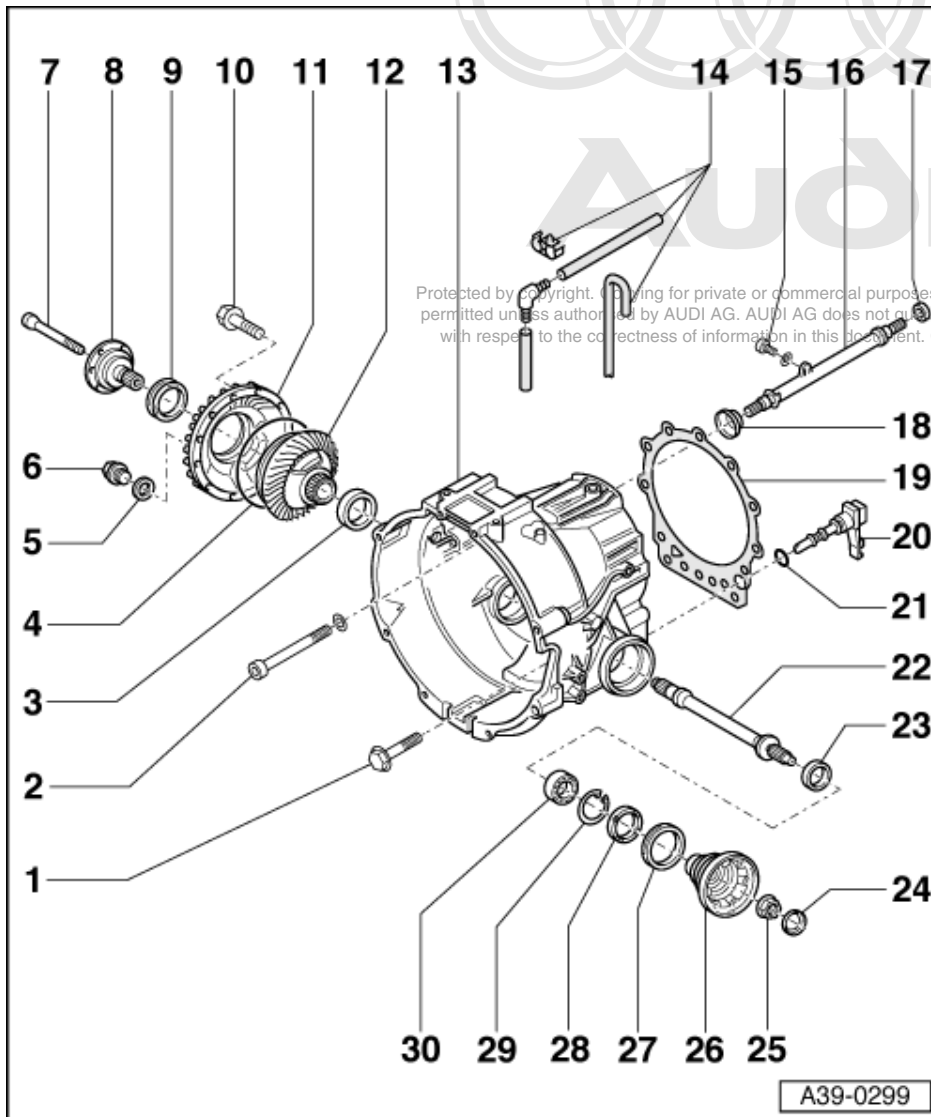
- ♦ Renew

5 Sealing ring

- ♦ Renew

6 Screw plug, 45 Nm

- ♦ Plug combined with O-ring: must be renewed if O-ring is damaged



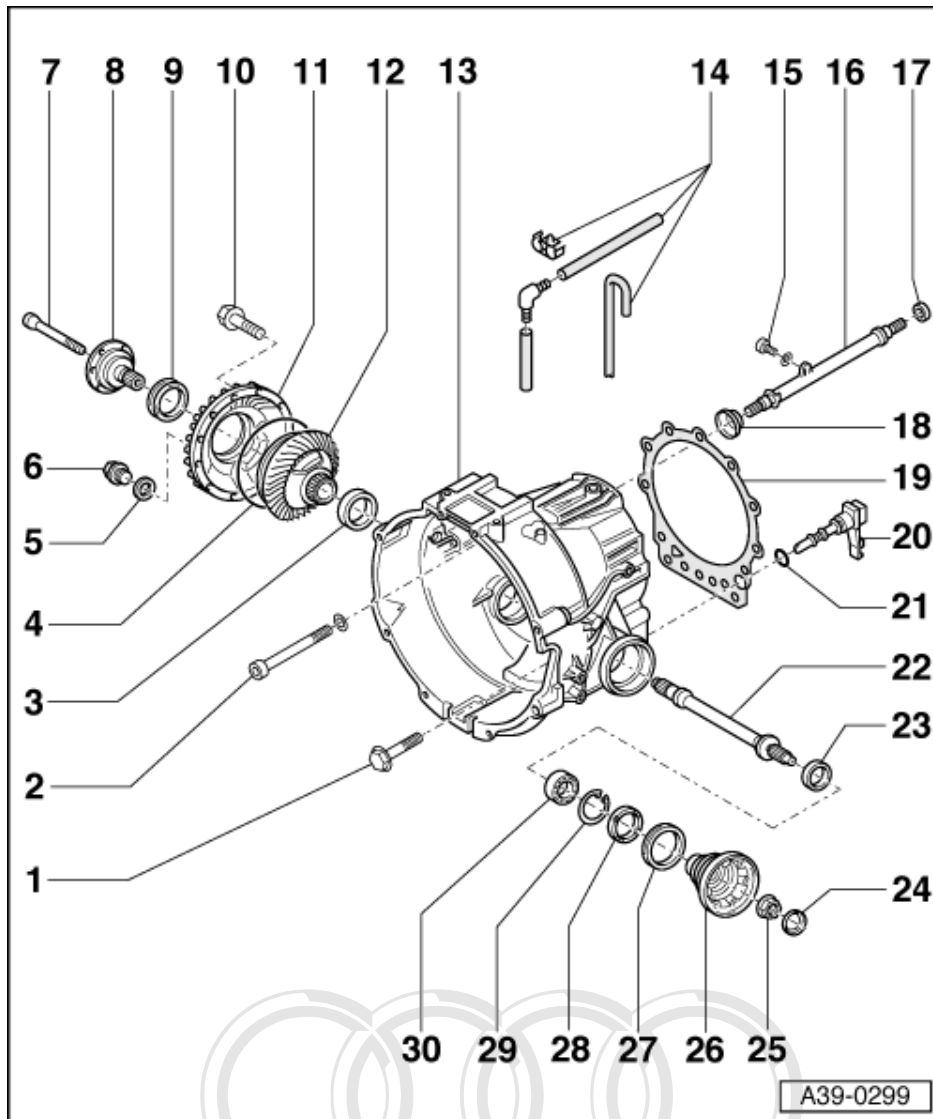
7 Hexagon socket head bolt
- 23 Nm

8 Right-hand flange shaft
♦ Removing and installing
=>Page 84

9 Oil seal
♦ Renewing => page 84

10 Hexagon bolt - 25 Nm
♦ Tighten bolts in several stages and in diagonal sequence

11 Differential cover
♦ When removing, ensure that taper roller bearing outer race and shim behind bearing race do not drop out
♦ The shim has a measured thickness, and must not be exchanged with a shim of different thickness



12 Differential

13 Torque converter bellhousing

- ◆ Ensure that taper roller bearing outer race for differential and shim behind bearing race do not drop out
- ◆ The shim has a measured thickness, and must not be exchanged with a shim of different thickness

14 Breatherpipe

- ◆ Installation position=>Fig. 1

15 Torx socket head bolt,

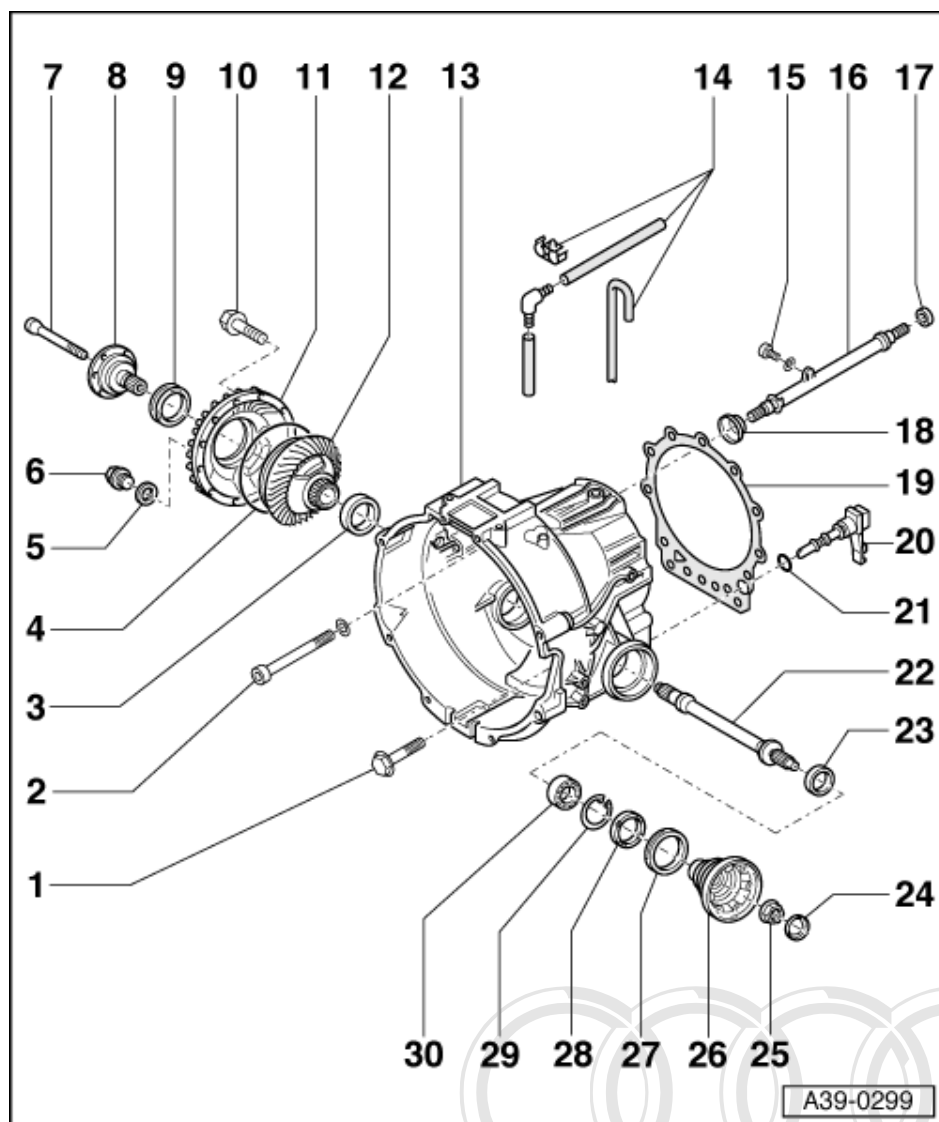
- 8 Nm

16 Intermediate shaft

- ◆ With protective tube

17 Oil seal

- ◆ Renewing=>Page 86



18 Oil seal

- ◆ Renewing=>Page 86

19 Gasket

- ◆ Renew

20 Speedometer sender -G22

- ◆ Removing and installing
=> Page 95

21 O-ring

- ◆ Renew

22 Transverse shaft

- ◆ Removing and installing
=>Page 82

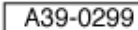
23 Oil seal

- ◆ Renew

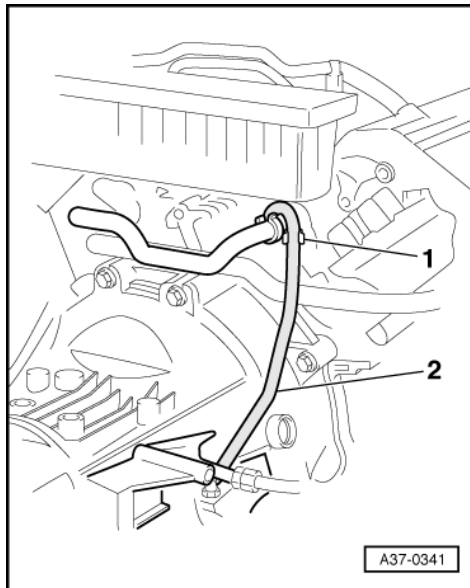
24 Locking plate

- ◆ For -Item 25 -
- ◆ Renew=>Page 84

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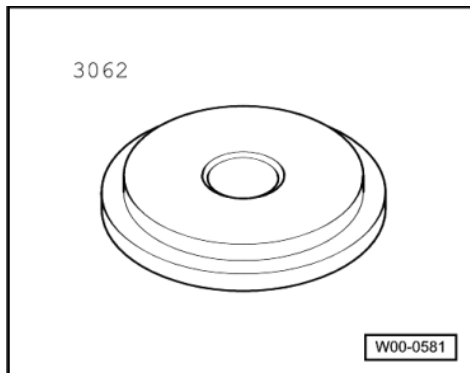
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-> Fig.1 Installation position of breather pipe

- Secure breather hose -2- for differential to engine with retaining clip -1-.

2.2 - Renewing left-hand flange shaft oil seal



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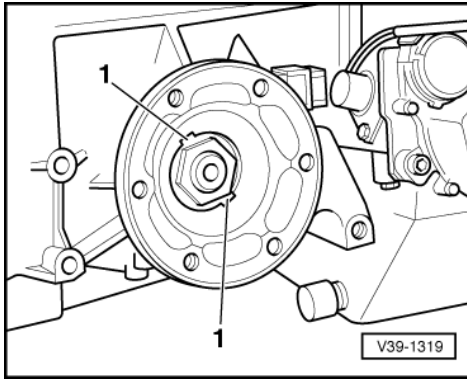
Special tools and workshop equipment required

- ♦ Thrust pad 3062
- ♦ Drip tray

Removing

- Gearbox installed
- Unbolt left drive shaft from flange shaft.

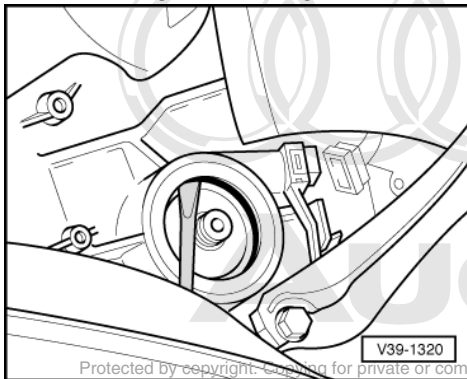
=> Running gear, Front and four-wheel drive; Repair group 40; Removing and installing drive shaft Removing and installing drive shaft



- Move drive shaft clear to the front and tie up.
- ➔ Bend open locking plate -1- of collared nut with a screwdriver.
- Unscrew nut on flange shaft. To do this, screw 2 bolts into flange shaft and brace with a suitable lever.
- Place container under the gearbox.
- Release flange shaft with 2 levers and pull out flange shaft by hand together with drive wheel for speedometer sender -G22.

Note:

Do not damage collar on gearbox housing when levering out flange shaft.



- ➔ Lever out oil seal for flange shaft with a screwdriver.

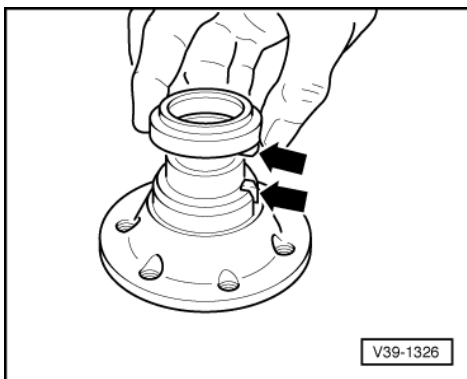
Note:

Do not damage seating surfaces for oil seal.

Installing

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

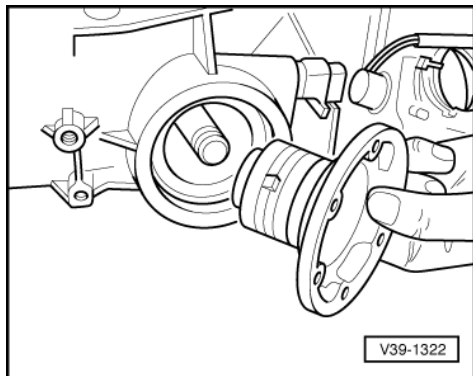
- Check seating surfaces for oil seal in gearbox housing for damage and rework if necessary.
- Drive oil seal in up to stop with thrust pad 3062.
 - The open side of the oil seal faces the gearbox.
 - The oil seal must be inserted at the same depth in the housing all round.
- Apply multi-purpose grease to inner face of magnetic ring and fit onto flange shaft.



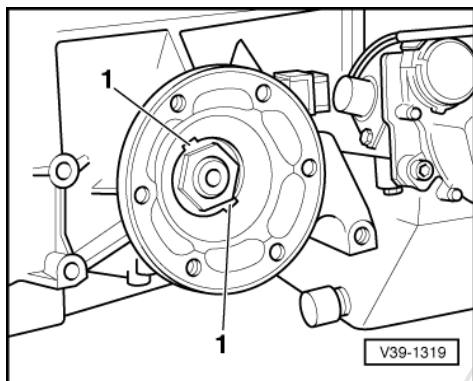


Note:

-> The lugs of the drive wheel must engage in the cut-outs of the flange shaft -arrows-.



- -> Insert flange shaft with drive wheel for speedometer sender.



- -> Secure flange shaft with collared nut and lock with new locking plate -1-.

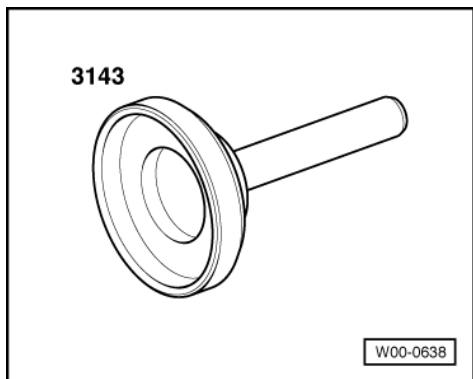
Tightening torques

Component		Nm
Left flange shaft to gearbox	M20	100
Drive shaft to flange shaft	M10	77

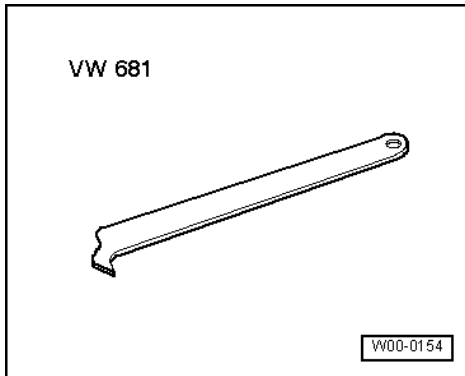
2.3 - Renewing right-hand flange shaft oil seal

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Special tools and workshop equipment required



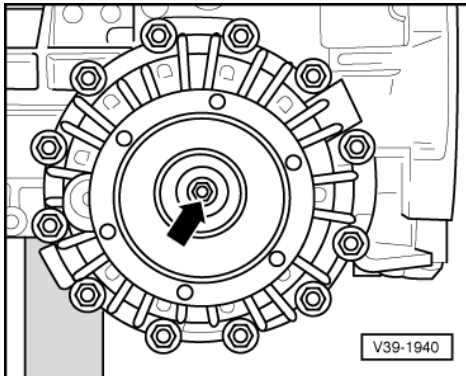
- ♦ Drift sleeve 3143



- ♦ Extractor lever VW 681
- ♦ Drip tray

Removing

- Gearbox installed

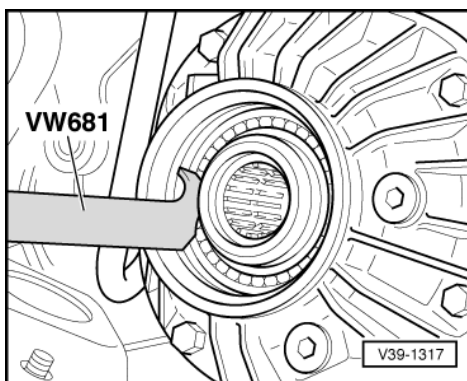


- Unbolt right-hand drive shaft from flange shaft

=> Running gear, Front and four-wheel drive; Repair group 40; Removing and installing drive shaft Removing and installing drive shaft

- Move drive shaft clear to the side.
- -> Remove centre bolt -arrow- for right flange shaft by screwing two bolts into flange shaft and bracing with a suitable lever.
- Place container under the gearbox.
- Pull out right flange shaft (release with 2 levers if necessary).

Note:



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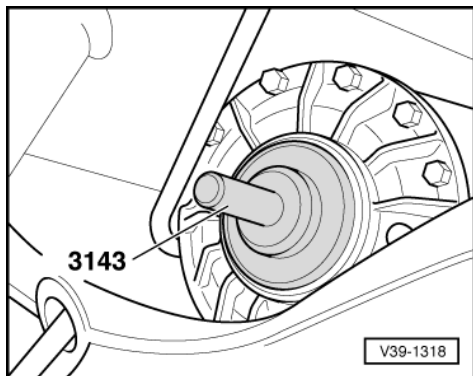


Do not damage collar on gearbox housing when levering out flange shaft.

- -> Pull out flange shaft oil seal with extractor lever VW 681.

Installing

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



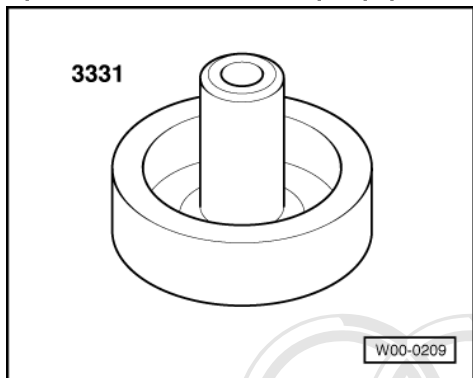
- -> Using drift sleeve 3143, drive in oil seal for right flange shaft onto stop.
- Fill front final drive of automatic gearbox with gear oil and check oil level => page 75 .

Tightening torques

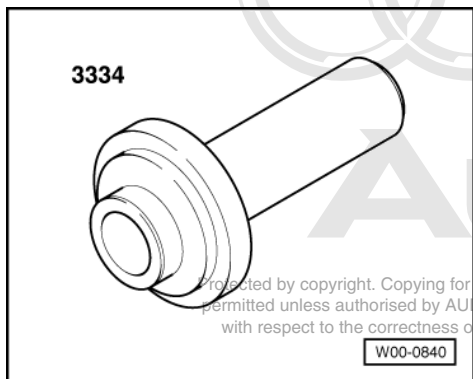
Component		Nm
Right flange shaft to gearbox	M8	25
Drive shaft to flange shaft	M10	77

2.4 - Removing front and rear oil seals for intermediate shaft

Special tools and workshop equipment required



- ♦ Thrust piece 3331

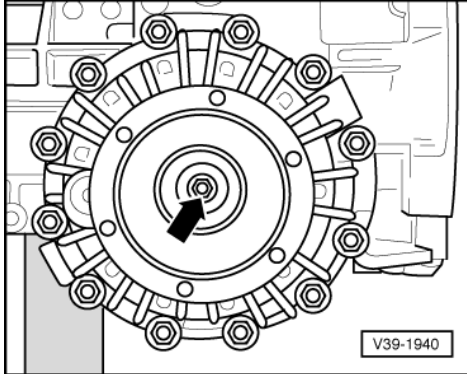


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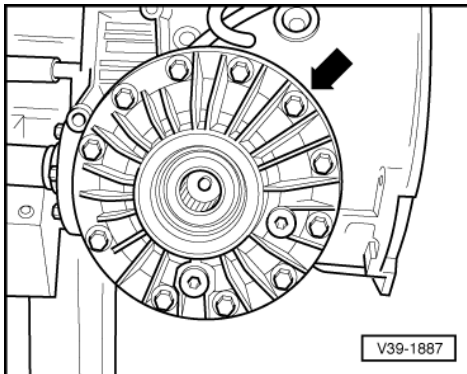
- ♦ Thrust piece 3334

Removing

- Gearbox removed
- Remove torque converter.



- Secure gearbox to repair stand
=>Page 45 .
- Drain ATF=>Page 50 .
- Drain gear oil in front final drive => page 75 .
- -> Remove centre bolt -arrow- for right flange shaft by screwing two bolts into flange shaft and bracing with a suitable lever.
- Pull out right flange shaft.



- -> Loosen securing bolts -arrow- for differential cover using diagonal sequence and remove bolts.
- Remove differential cover.

Note:

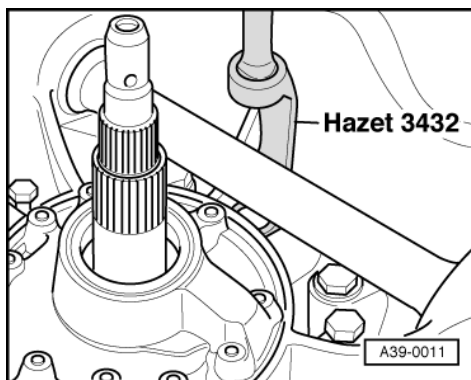
When removing differential cover, secure differential to prevent it from falling out.

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- Take out differential with inner races for taper roller bearings. Leave the outer races in place.

Notes:

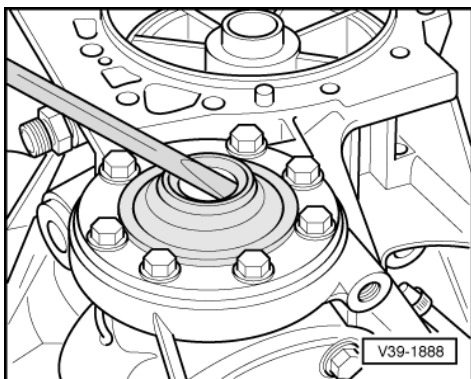
- ♦ When removing, ensure that taper roller bearing outer race and shim behind bearing race do not drop out.
- ♦ The shim has a measured thickness, and must not be exchanged with a shim of different thickness.
- Remove torque converter oil seal=>Page 8 .
- Bring gearbox into a vertical position with torque converter bellhousing facing up.
- Unscrew bolts for torque converter bellhousing.



Note:

-> Loosen inaccessible bolts using Hazet tool 3432 (or other suitable commercial tool).

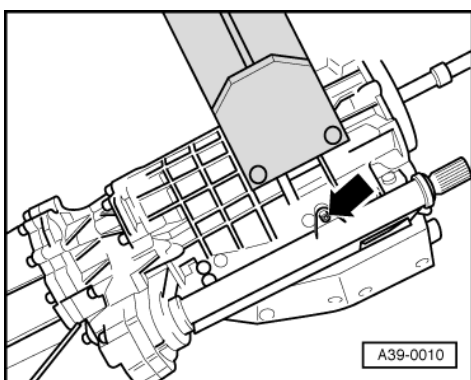
- Lever off torque converter bellhousing over input shaft and put down on a clean surface.



- -> Lever out oil seal for final drive with a screwdriver.

Note:

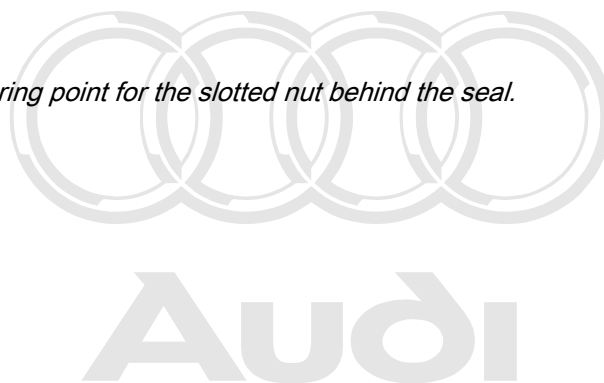
Take care not to damage the peened securing point for the slotted nut behind the seal.



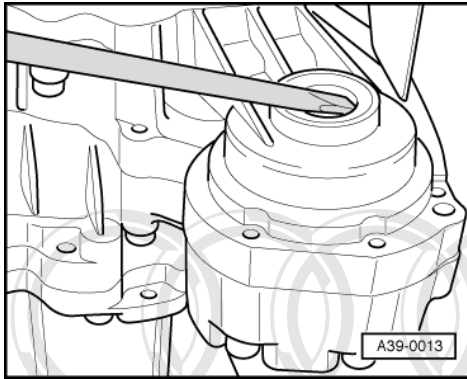
- -> Unbolt protective tube -arrow-.
- Push out intermediate shaft.

Note:

If there is visible scoring on the intermediate shaft, renew the intermediate shaft together with oil seals.



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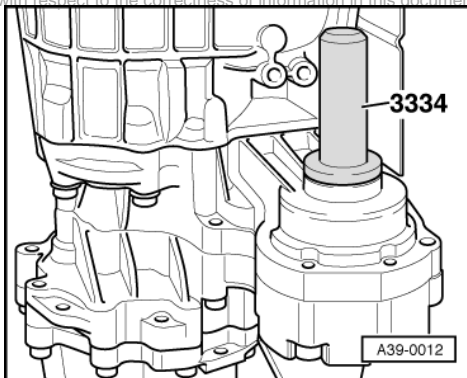
- -> Lever out oil seal for transfer gearing with a screwdriver.

Note:

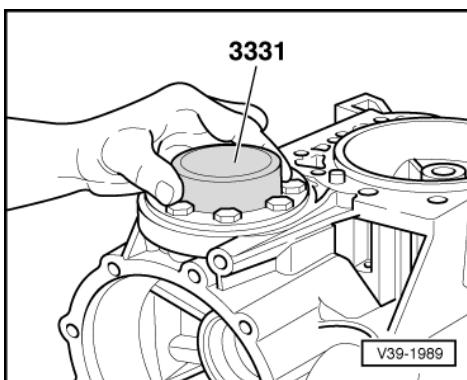
Do not damage seating surfaces for oil seal.

Installing

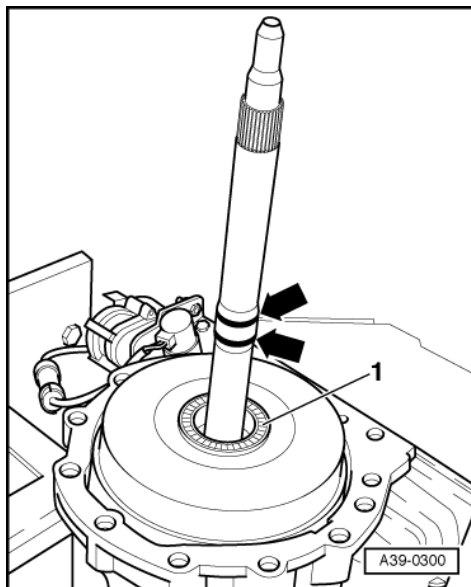
Installation is carried out in the reverse order, when doing this note the following:
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- -> Drive in oil seal onto stop with thrust piece 3334.



- -> Drive in oil seal onto stop with thrust piece 3331.
- Renew gasket for torque converter bellhousing.



- -> Renew square-section rings on input shaft (apply Vaseline when fitting).

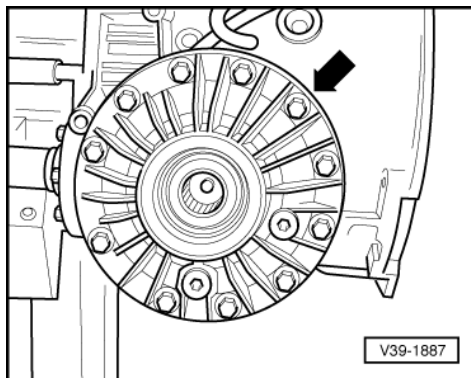
Note:

Use only Vaseline; other types of grease will cause malfunctions in the hydraulic gearbox actuators.

- Stick shim for axial bearing -1- on stator shaft (on inside of torque converter bellhousing) with Vaseline.
- Fit axial bearing -1- in flared washer.
 - Position of washer: flared side towards axial bearing.
- Guide torque converter bellhousing over input shaft (keep housing straight - 2nd mechanic required).

If the torque converter bellhousing is not kept straight when installing, this will shear off the square-section rings. If this happens, the gearbox will still transmit power in selector lever position "N".

- If necessary, turn the drive pinion shaft slightly in both directions until the torque converter bellhousing is fully seated.
- Insert differential into gearbox housing.



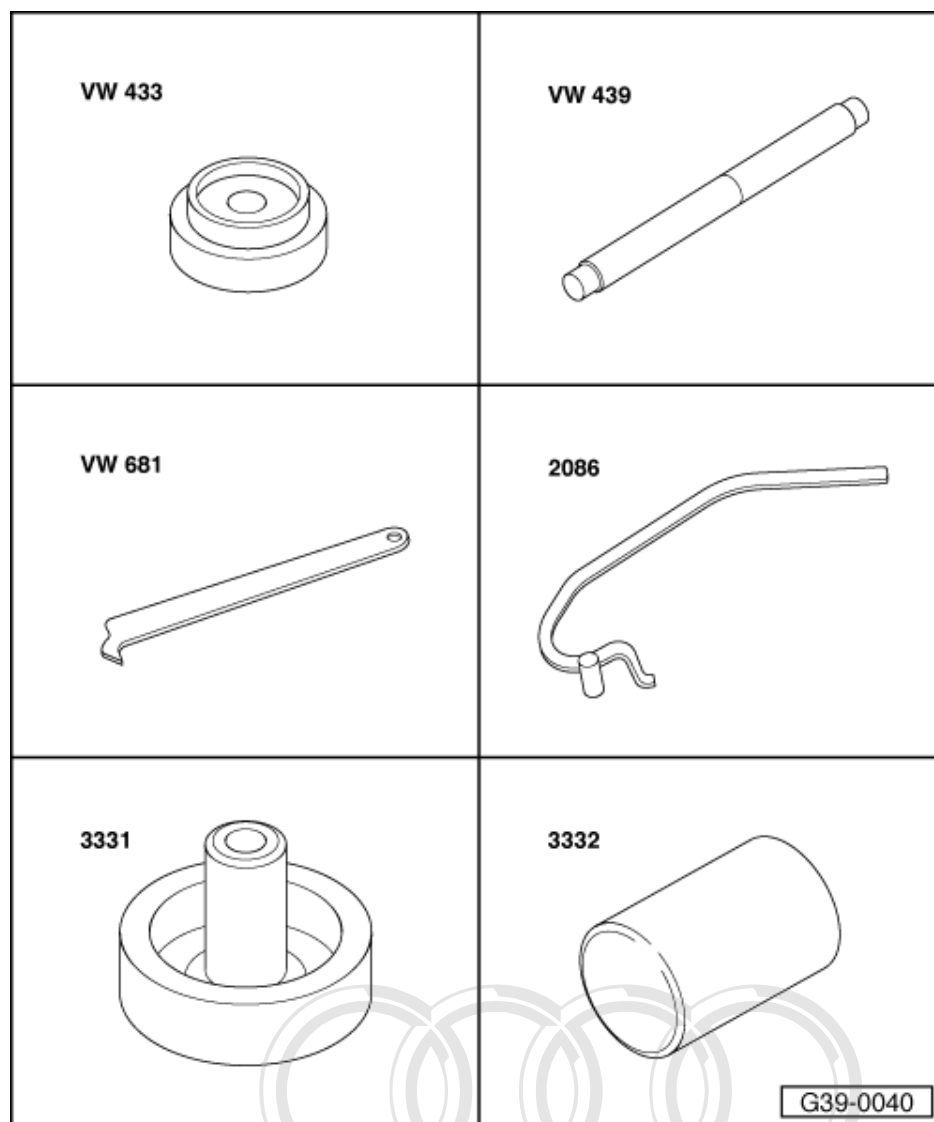
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- -> Install differential cover with new O-ring and tighten securing bolts -arrow- in diagonal sequence.
- Install torque converter oil seal
=>Page 9 .
- Install right-hand flange shaft with oil seal
=>Page 86 .
- Fill up with ATF => Page 50 .
- Fill front final drive of automatic gearbox with gear oil and check oil level => Page 75 .

Tightening torque

Component	Nm
Protective tube to gearbox housing	8
Torque converter bellhousing to gearbox housing	45
Differential cover to gearbox housing M8	25

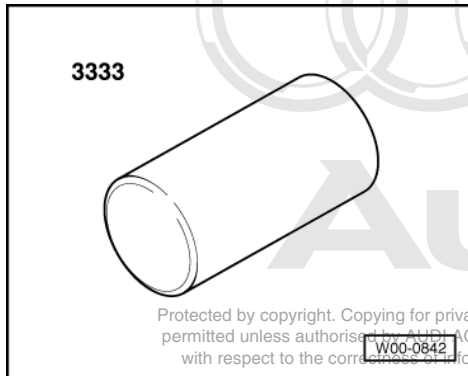
2.5 - Renewing oil seals for torque converter bellhousing



Special tools and workshop equipment required

- ◆ Press tool VW 433
- ◆ Guide pin VW 439
- ◆ Oil seal extractor lever VW 681
- ◆ Extractor hook 2086
- ◆ Thrust piece 3331
- ◆ Thrust piece 3332

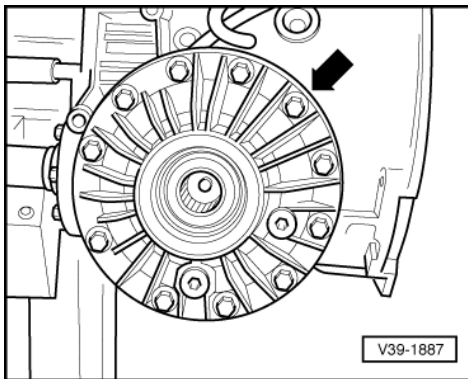
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- ♦ Thrust piece 3333

Removing

- Gearbox removed
- Remove torque converter
- Secure gearbox to repair stand
=>Page 45
- Drain ATF=>Page 50 .
- Drain gear oil in front final drive => Page 75 .



- Remove left-hand flange shaft with oil seal
=>Page 82 .
- -> Loosen securing bolts -arrow- for differential cover using diagonal sequence and remove bolts.
- Remove differential cover.

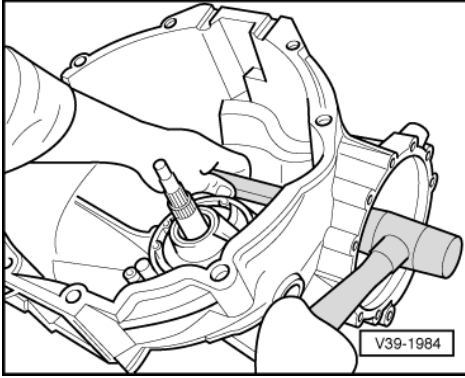
Note:

When removing differential cover, secure differential to prevent it from falling out.

- Take out differential with inner races for taper roller bearings. Leave the outer races in place.

Notes:

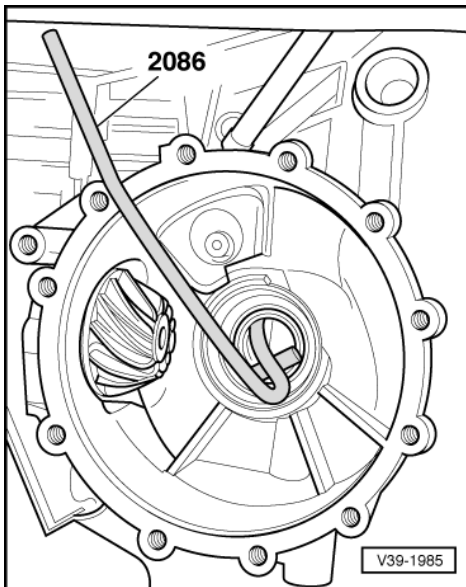
- ♦ When removing, ensure that taper roller bearing outer race and shim behind bearing race do not drop out.
- ♦ The shim has a measured thickness, and must not be exchanged with a shim of different thickness.
- Remove right-hand flange shaft with oil seal
=>Page 84 .
- Remove circlip -Item 81 for transverse shaft bearing.



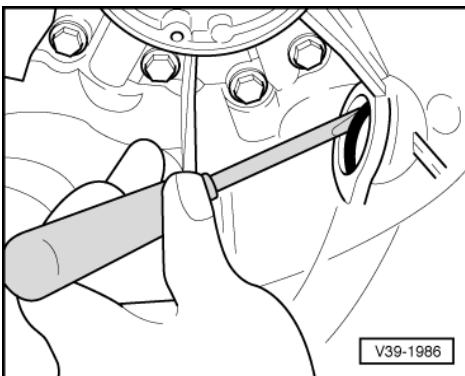
- -> Drive out transverse shaft bearing with light hammer blows on the transverse shaft using a plastic hammer.

Note:

Prevent transverse shaft from dropping out when removing transverse shaft bearing.



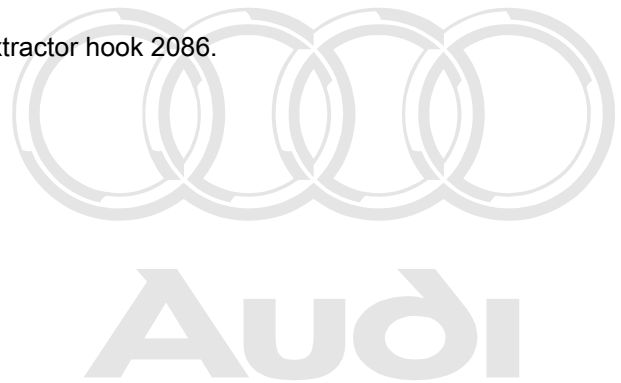
- -> Pull out left oil seal for transverse shaft using extractor hook 2086.



- -> Carefully lever out left oil seal for transverse shaft with a screwdriver.

Note:

Do not damage seating surfaces for oil seal.

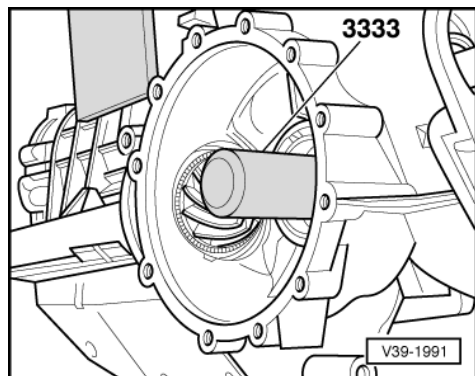


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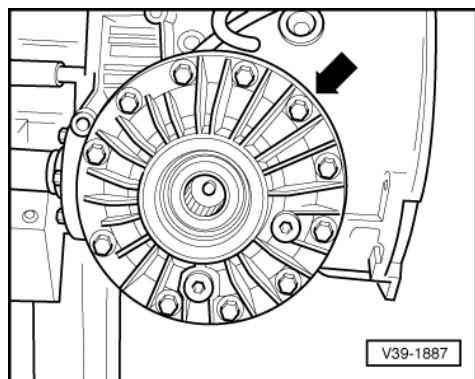
Installing

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

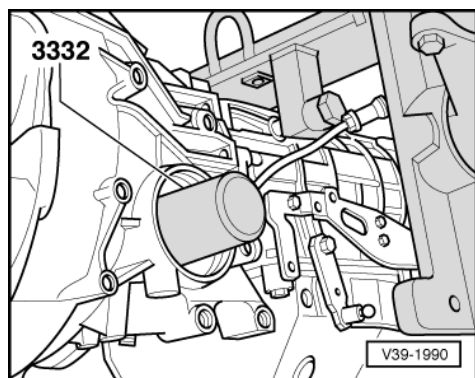


- -> Drive in right oil seal for transverse shaft onto stop using thrust piece 3333.

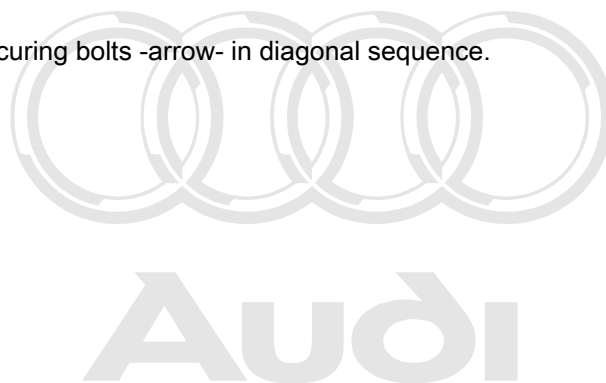
- Insert differential into gearbox housing.



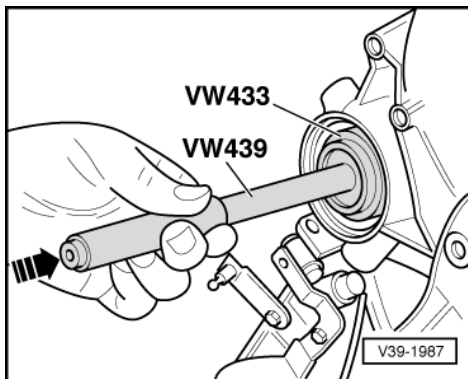
- -> Install differential cover with new O-ring and tighten securing bolts -arrow- in diagonal sequence.



- -> Drive left oil seal for transverse shaft onto stop using thrust piece 3332.



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- -> Carefully slide in transverse shaft.
- Drive in transverse shaft bearing onto stop using press tool VW 433 and guide pin VW 439.
- Install circlip.
- Pack transverse shaft bearing with 25 g of grease G 000 100.
- Install left-hand flange shaft with oil seal
=>Page 83 .
- Install right-hand flange shaft with oil seal
=>Page 86 .
- Fill up with ATF => Page 50 .

Tightening torque

Component		Nm
Differential cover to gearbox housing	M8	25

3 - Removing and installing speedometer sender -G22 and drive wheel for speedometer sender

3.1 - Removing and installing speedometer sender -G22 and drive wheel for speedometer sender

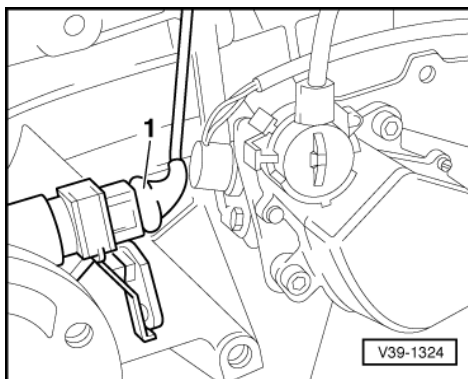
- Gearbox installed

Removing and installing speedometer sender -G22

Note:

Fitting location => Item 80 .

Removing



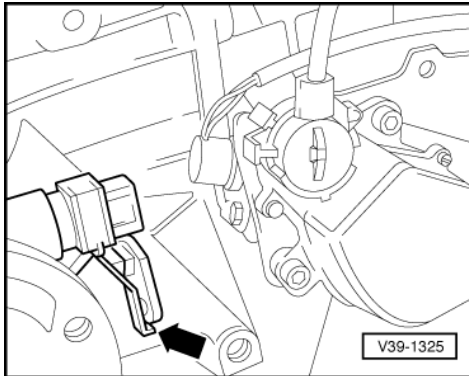
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- -> Unplug connector -1- from speedometer sender -G22.

Note:

Illustration shows gearbox without left gearbox support.



- -> Press retainer -arrow- on sender towards the front, turn retainer and pull out sender.

Installing

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

- Renew O-ring on sender.
- Apply a small quantity of multi-purpose grease and install sender.

Removing and installing drive wheel for speedometer sender -G22

Note:

Fitting location => Item 81.

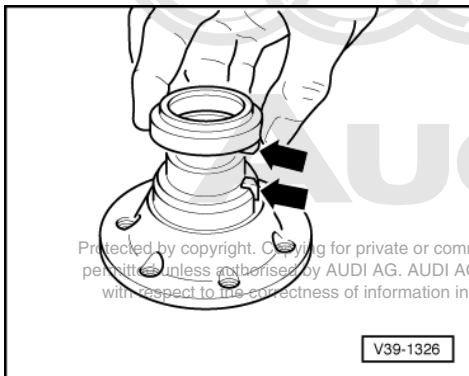
Removing

- Remove left flange shaft=>Page 82.
- Pull drive wheel off flange shaft.

Installing

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

- Apply multi-purpose grease to inner face of magnetic ring and fit onto flange shaft.



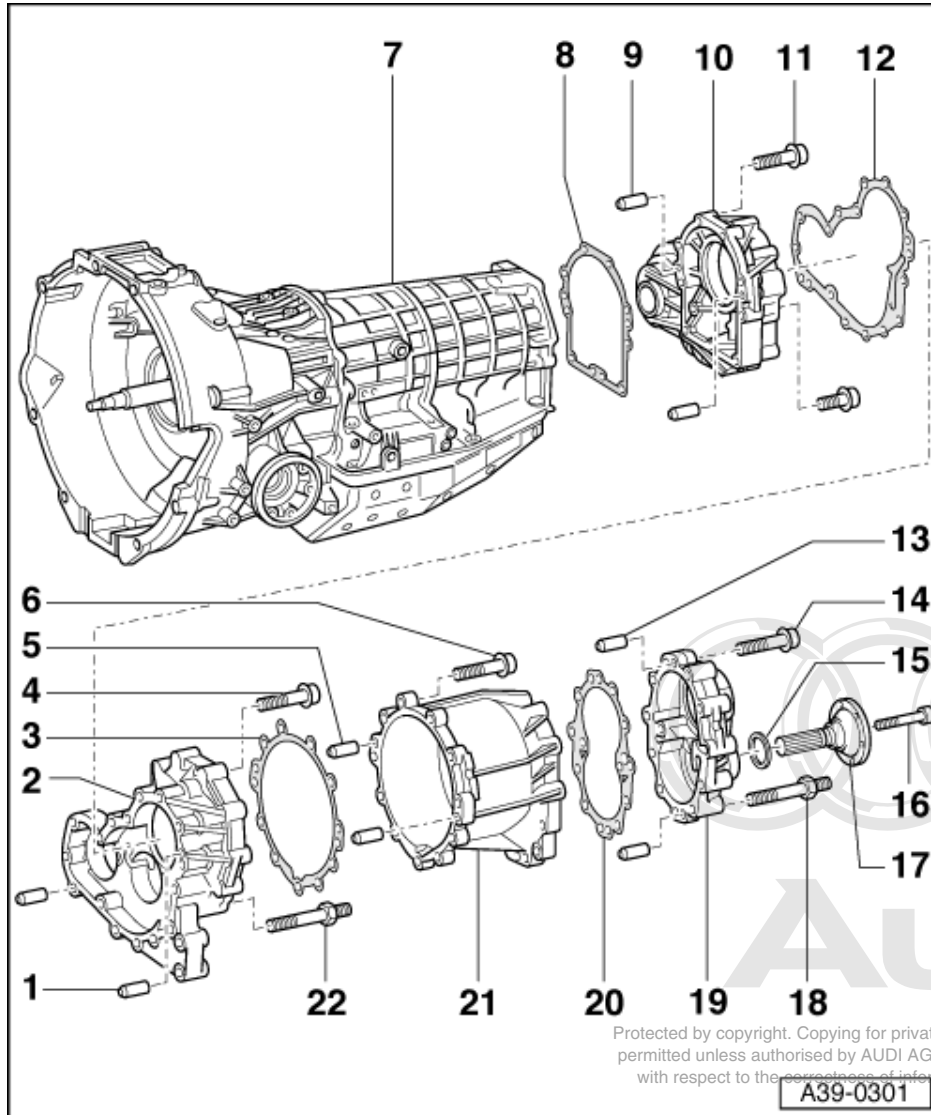
Note:

-> The lugs of the drive wheel must engage in the cut-outs of the flange shaft -arrows-.

- Install left flange shaft=>Page 83 .

4 - Servicing transfer gearing

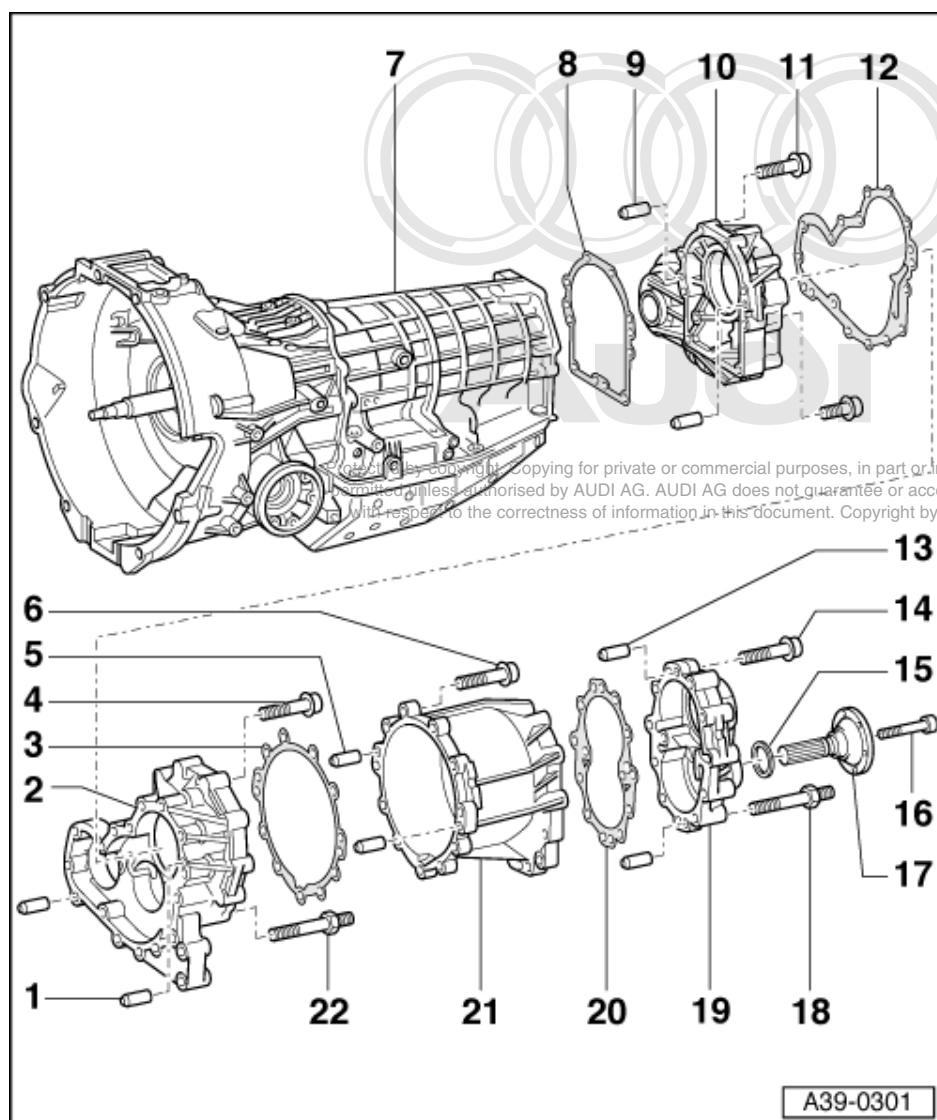
4.1 - Servicing transfer gearing



- 1 Dowel sleeve
- 2 Rear intermediate housing
- 3 Gasket
 - ♦ Renew
- 4 Bolt - 23 Nm
 - ♦ Tighten in several stages and in diagonal sequence
- 5 Dowel sleeve
- 6 Bolt - 23 Nm



- ♦ Tighten in several stages and in diagonal sequence



7 Gearbox housing

8 Gasket

- ♦ Renewing => Page 100

9 Dowel sleeve

10 Front intermediate housing

11 Bolt - 23 Nm

- ♦ Tighten in several stages and in diagonal sequence

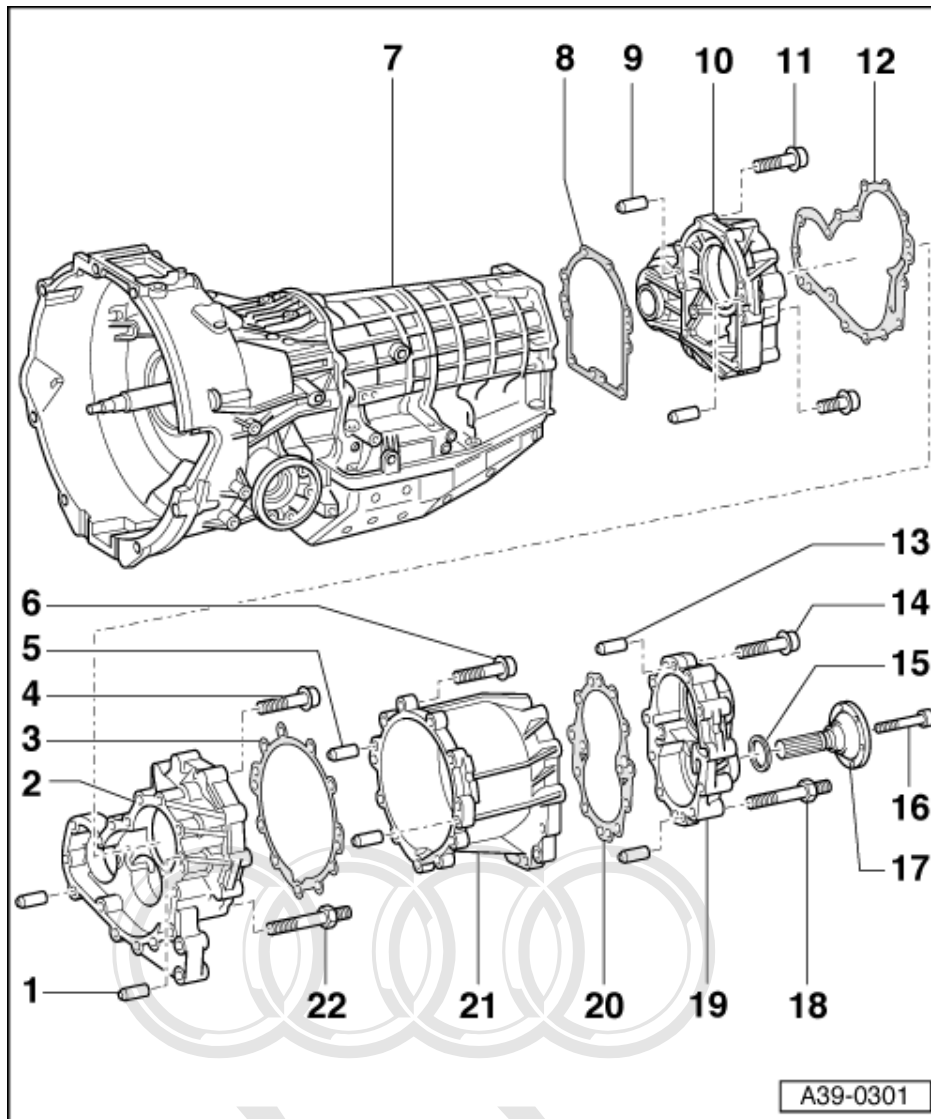
12 Gasket

- ♦ Renew

13 Dowel sleeve

14 Bolt - 23 Nm

- ♦ Tighten in several stages and in diagonal sequence



15 Oil seal

- ♦ Renewing => Page 106

**16 Hexagon socket head bolt,
- 23 Nm**

17 Output flange

18 Stud - 23 Nm

19 Cover for transfer gear housing

20 Gasket

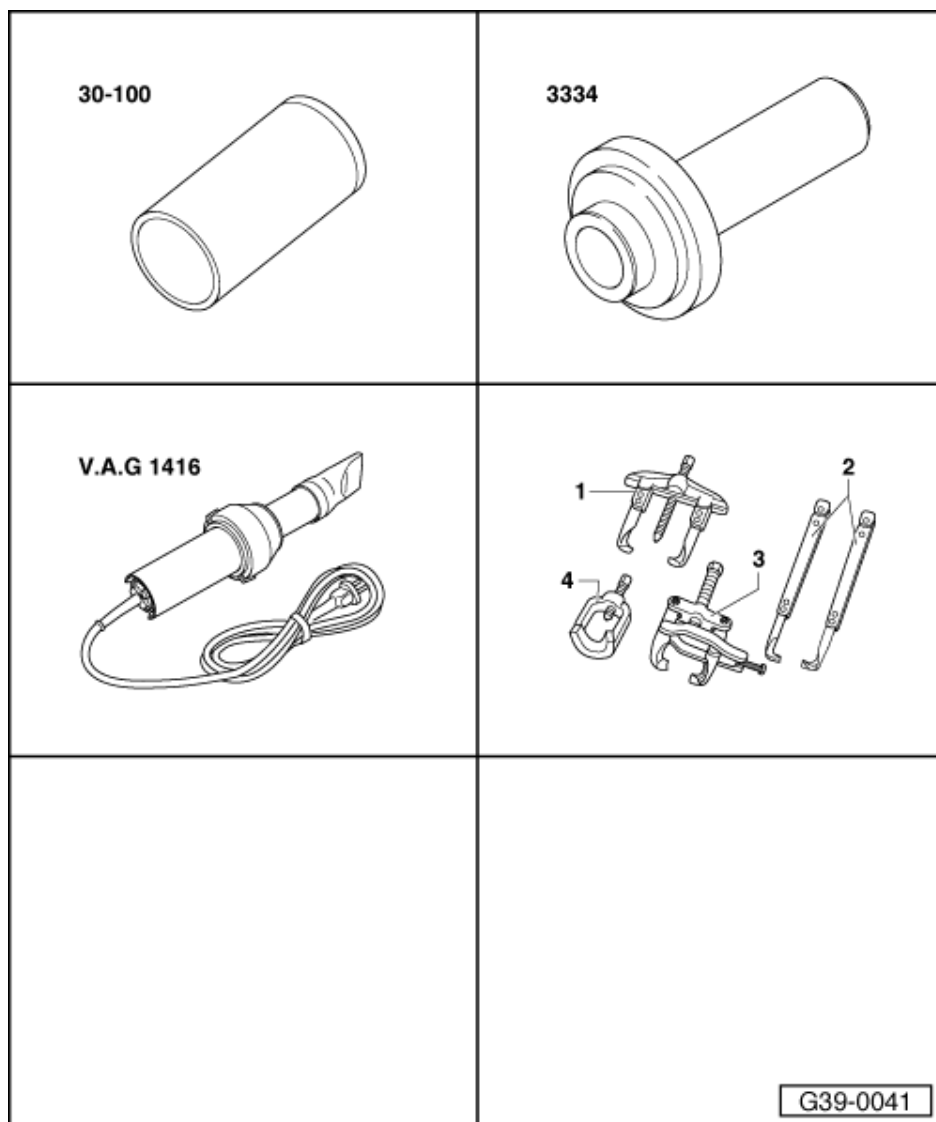
- ♦ Renew

21 Transfer gear housing

22 Stud - 23 Nm



4.2 - Renewing gasket between front intermediate housing and gearbox housing



Special tools and workshop equipment required

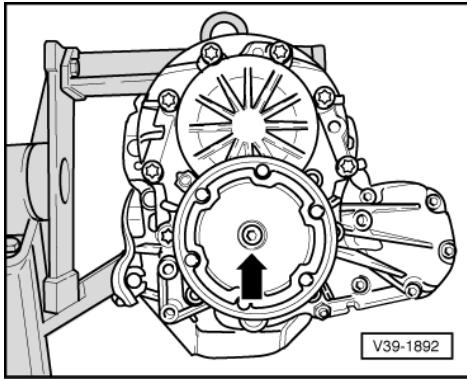
- ♦ Drift sleeve 30-100
- ♦ Thrust piece 3334
- ♦ Hot air blower V.A.G 1416
- ♦ 1 - Puller Kukko 20-10
- ♦ 2 - Arms for puller Kukko 1-250

Removing

- Gearbox removed
- Remove torque converter.



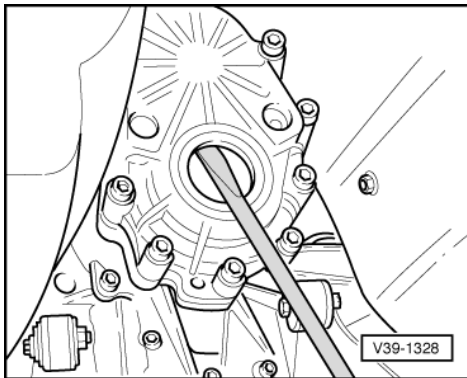
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- Secure gearbox to repair stand
=>Page 45
- Drain ATF=>Page 50 .
- -> Unscrew bolt securing drive flange -arrow- (screw 2 bolts into flange and brace with a suitable lever).
- Pull out drive flange (if necessary, release with 2 levers).

Note:

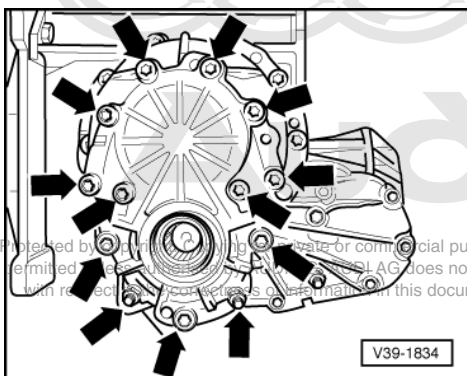
Do not damage collar on gearbox housing when levering off drive flange.



- -> Lever out oil seal for propshaft drive flange with a screwdriver.

Notes:

- ◆ Do not damage seating surfaces for oil seal.
- ◆ Illustration shows gearbox in vehicle.



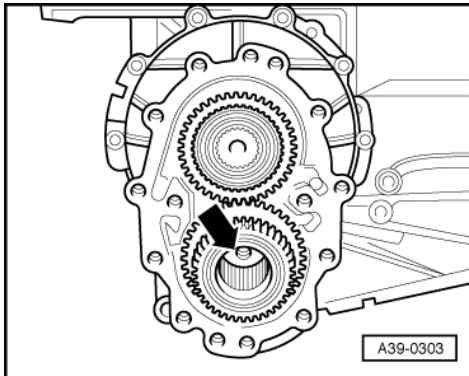
- -> Loosen securing bolts -arrows- on cover for transfer gear housing in diagonal sequence and remove bolts.
- Remove housing cover.

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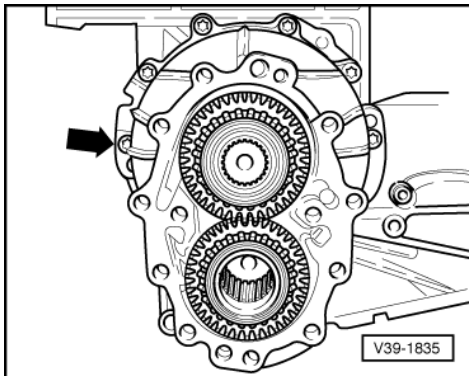


Note:

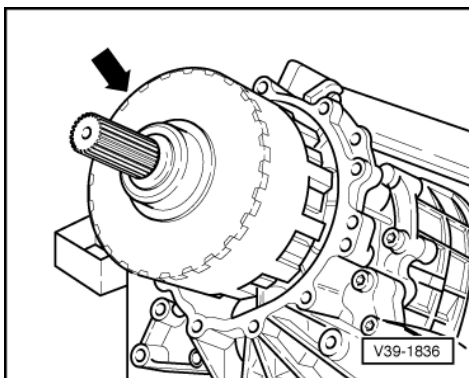
When removing housing cover, prevent spur gears from dropping out.



- -> Take out spur gears. When doing this, watch position of tensioning nut -arrow-.
- Put down spur gears in bearing shells in housing cover.

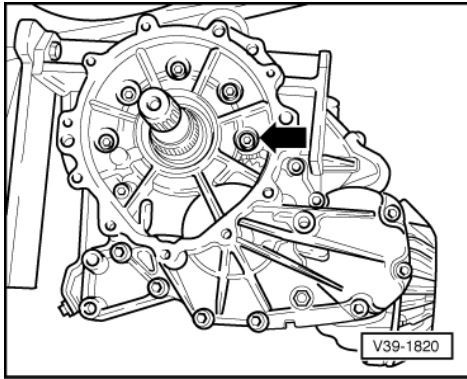


- -> Loosen securing bolts -arrow- for transfer gear housing in diagonal sequence and remove.
- Pull transfer gear housing off gearbox.

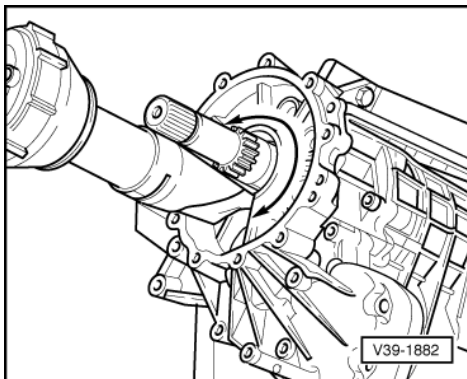


- -> Pull centre differential -arrow- off output shaft towards the rear.

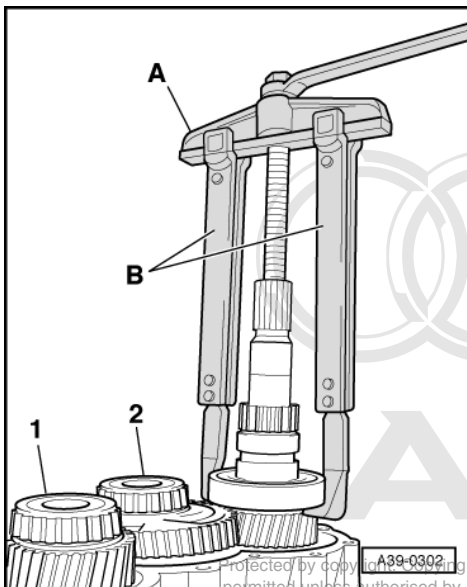
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- -> Loosen securing bolts -arrow- for rear intermediate housing in diagonal sequence and remove bolts.



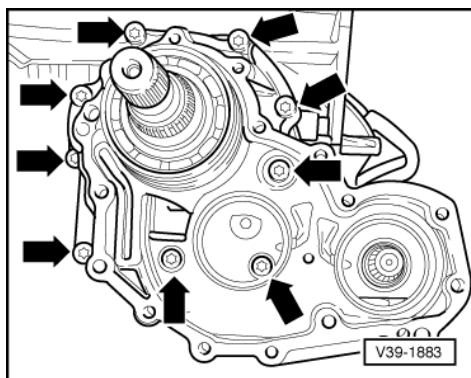
- -> Apply heat to rear intermediate housing -arrows- using hot air blower V.A.G 1416.
- Remove housing.



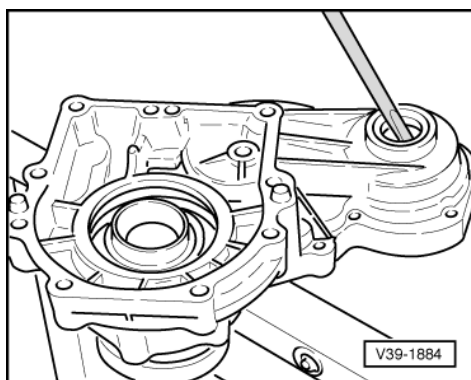
- Mark drive pinion -1- and intermediate pinion -2-, to ensure they are installed later in the correct positions and facing the right way.
- -> Lift output shaft bearing approx. 10 mm.

A - Puller, e.g. Kukko 20-10
B - Arms for puller, e.g. Kukko 1-250

- Take out drive pinion and intermediate pinion.



- -> Loosen securing bolts -arrows- for front intermediate housing in diagonal sequence and remove bolts.
- Pull front intermediate housing off gearbox.
- Put down front intermediate housing on a clean surface.



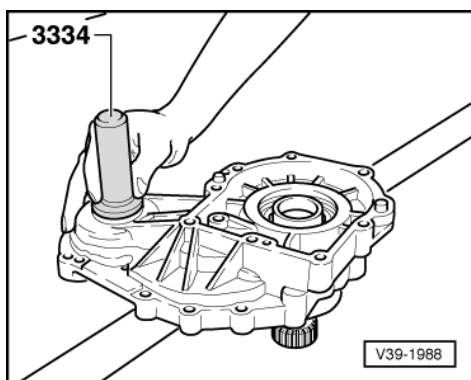
- -> Lever out oil seal for transfer gearing with a screwdriver.

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Note:

If there is visible scoring on the intermediate shaft, renew intermediate shaft together with oil seals=>Page 86.

Installing

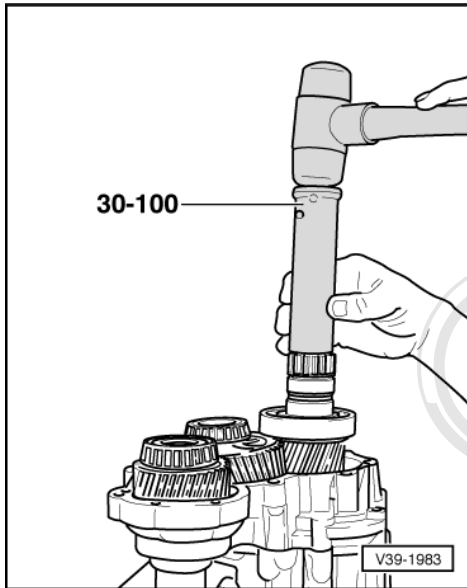


Installation is carried out in the reverse order, when doing this note the following:

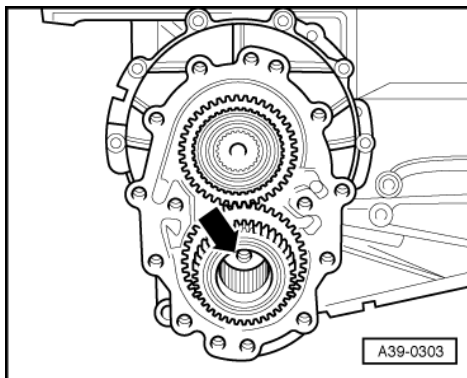
Note:

Replace gaskets and seals.

- Drive oil seal in onto to stop using thrust piece 3334.



- Install drive pinion and intermediate pinion according to markings made earlier.
- -> Drive on output shaft bearing over output shaft.
- Apply heat to rear intermediate housing using hot air blower V A G 1416 and install housing.
- Install centre differential.
- Install bolts for transfer gear housing and tighten in diagonal sequence to specified torque in several stages.



- -> Stick tensioning nut for flange shaft -arrow- to front side of spur gear 2.

Note:

Only use Vaseline. Other types of grease will impair the function of the hydraulic gearbox actuators.

- Install spur gears 1 and 2.
- Install bolts securing cover for transfer gear housing and tighten in diagonal sequence to specified torque in several stages.
- Install oil seal for propshaft drive flange and install drive flange=>Page 107 .
- Fill up with ATF => Page 50 .

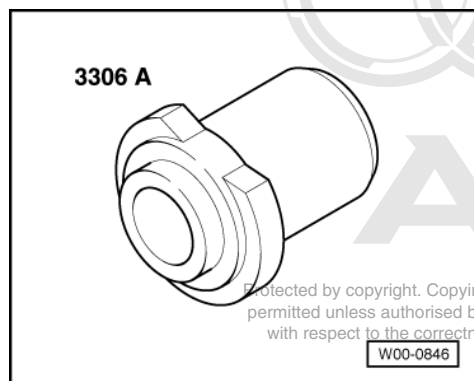
Tightening torques

Component	Nm
Front intermediate housing to gearbox housing	23
Rear intermediate housing to front intermediate housing	23



Component	Nm
Transfer gear housing to rear intermediate housing	23
Cover for transfer gear housing to transfer gear housing	23
Hexagon socket head bolt for rear flange shaft	23

4.3 - Renewing oil seal on drive flange for propshaft

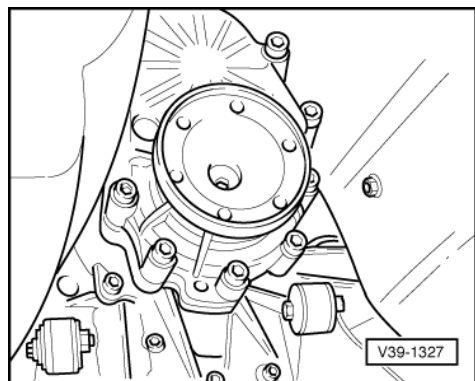


Special tools and workshop equipment required

- ♦ Thrust piece 3306 A
- ♦ Drip tray

Removing

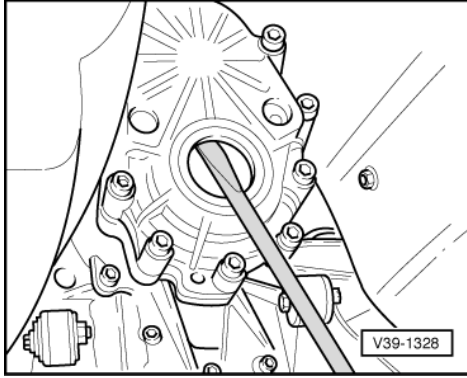
- Gearbox installed
- Mark position of propshaft at rear flange shaft before removing.
- Remove propshaft => Page 111 .



- -> Unscrew bolt securing drive flange (use pin to prevent drive flange from turning).
- Place container under the gearbox.
- Pull out drive flange (if necessary, release drive flange with two levers).

Note:

Do not damage collar on gearbox housing when levering off drive flange.



- -> Lever out oil seal for propshaft drive flange with a screwdriver.

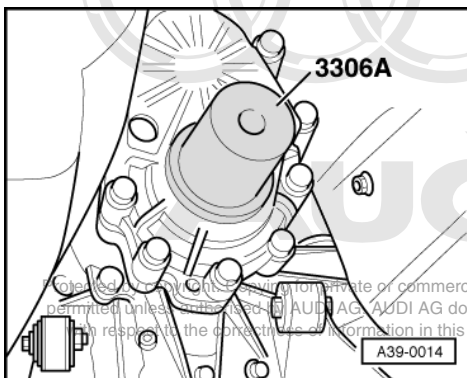
Note:

Do not damage seating surfaces for oil seal.

Installing

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

- Clean oil seal seat in gearbox housing.
- Lubricate the outer circumference and the sealing lips of the oil seal with ATF.
 - Installation position: open side of oil seal towards gearbox



- -> Drive in oil seal onto stop with thrust piece 3306 A.
- Secure drive flange with hexagon socket head bolt.
- Install propshaft => Page 114 .

Tightening torque

Component	Nm
Hexagon socket head bolt for rear flange shaft	23

5 - Servicing propshaft

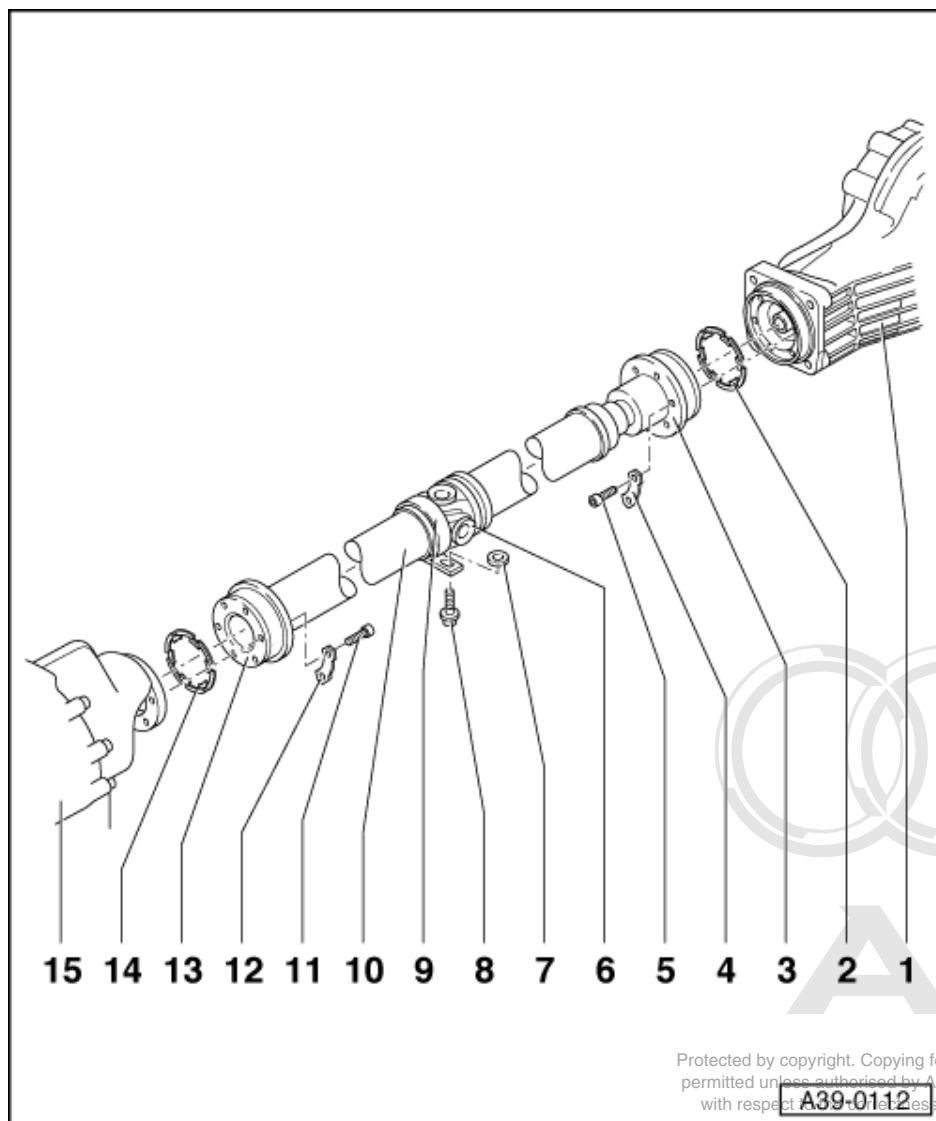
5.1 - Servicing propshaft

Notes:

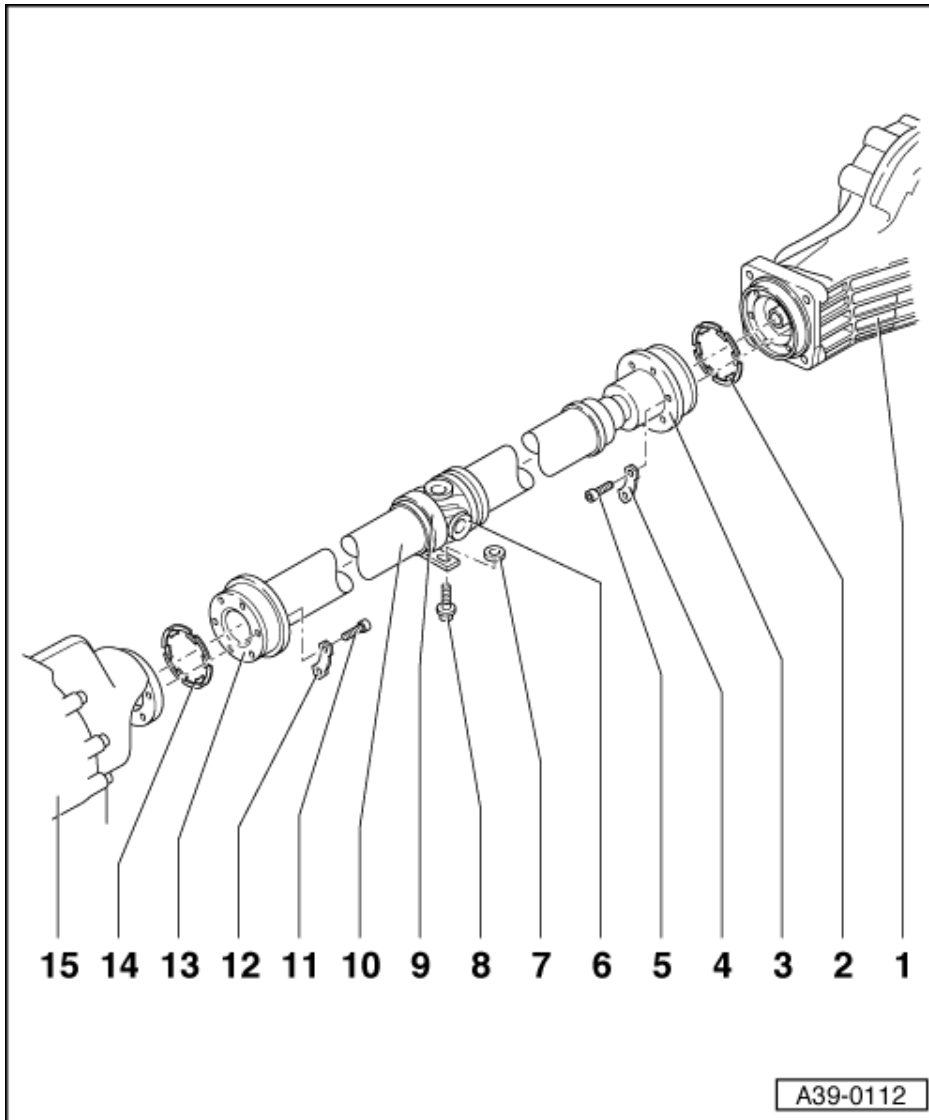
- ◆ Observe General instructions =>Page 5 .
- ◆ Do not bend the propshaft more than 25 ° at the central joint, otherwise the universal joint will be damaged.
- ◆ Only store and transport propshaft extended.
- ◆ No repair work can be carried out on the propshaft with the exception of removing, installing and adjusting.



- ♦ If the propshaft is only detached at the gearbox or from rear final drive then the propshaft is to be tied-up or supported at the constant velocity joint.
- ♦ Before removing, mark the position of the joint in relation to the flange. Reinstall in the same position otherwise this can cause excessive imbalance, resulting in bearing damage and rumbling noises.
- ♦ If complaints are received (noises, vibrations), it is essential to check whether correct adjustment of the propshaft rectifies the fault before replacing the propshaft.
- ♦ After removing the propshaft from the rear final drive, the additional balance disc (thick washer) that may be located between the lock plate and the bolt head should not be reinstalled.



- 1 Rear final drive**
- 2 Gasket**
 - ♦ Renew
 - ♦ Pull off backing foil, and stick self-adhesive side of gasket to flange shaft. Make sure that the adhesive surface is free of grease.
- 3 Constant velocity joint**
 - ♦ Maximum permissible angle of deflection 8°
- 4 Lock plate**
- 5 Hexagon socket head bolt, 55Nm**
 - ♦ Self-locking
 - ♦ Renew
 - ♦ Always clean threaded holes for bolts in flange shafts (e.g. with a thread tap)



6 Universal joint

- ♦ Maximum permissible angle of deflection 25°

7 Shims

- ♦ Determining thickness
=> Page 116

8 Hexagon bolt - 23 Nm

9 Propshaft centre mounting

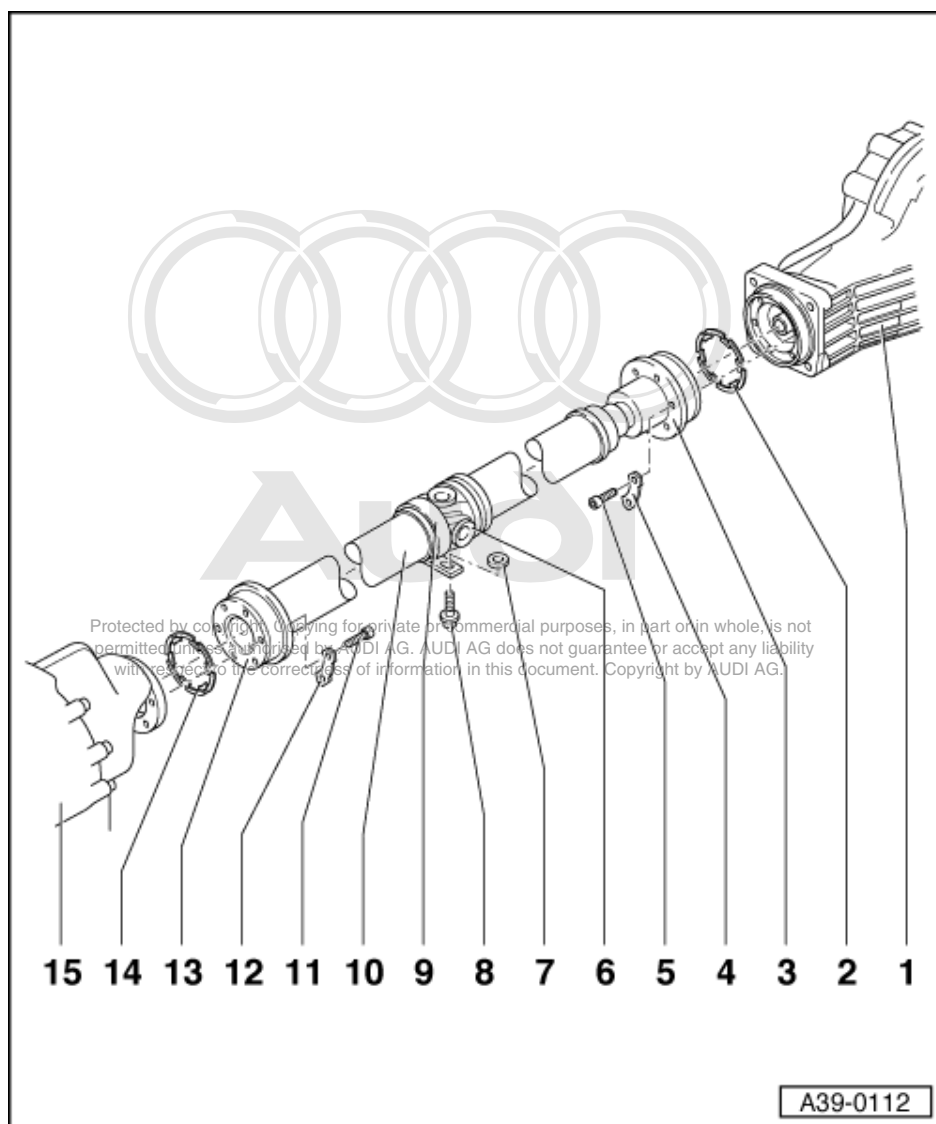
10 Propshaft

- ♦ Adjusting => Page 114

11 Hexagon socket head bolt - 55Nm

- ♦ Self-locking
- ♦ Renew
- ♦ Always clean threaded holes for bolts in flange shafts (e.g. with a thread tap)

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12 Lock plate

13 Constant velocity joint

- ♦ Maximum permissible angle of deflection 8°

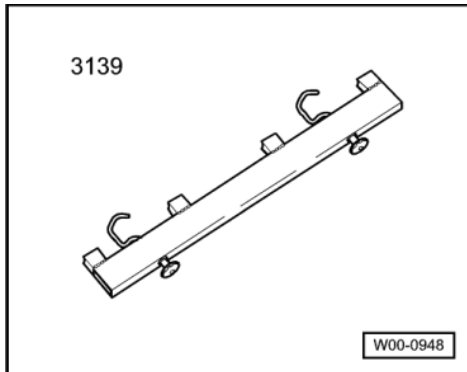
14 Gasket

- ♦ Renew
- ♦ Pull off backing foil, and stick self-adhesive side of gasket to flange shaft. Make sure that the adhesive surface is free of grease.

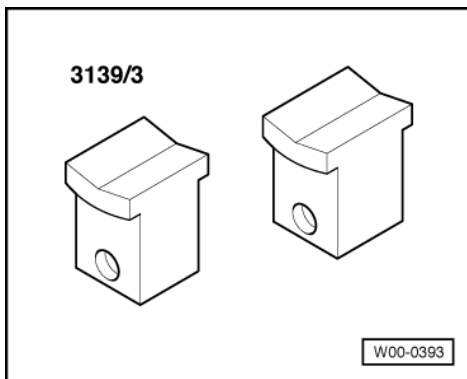
15 Gearbox

5.2 - Removing and installing propshaft

Special tools and workshop equipment required



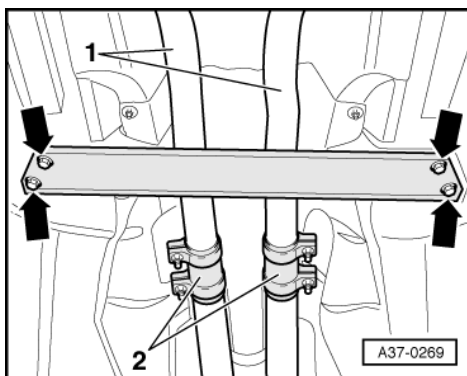
- ♦ Assembly appliance 3139



- ♦ Spacers 3139/3

Caution
Contact corrosion. Notes => Page 4 .

- Observe notes => Page 107 .



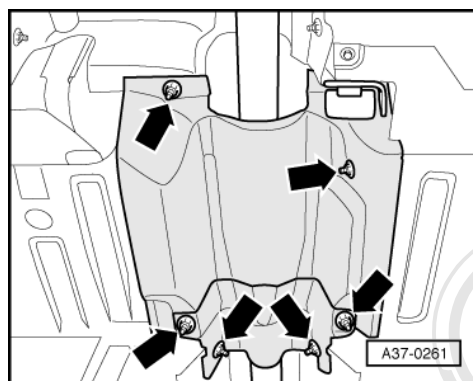
Removing

- -> If fitted, remove cross member below exhaust system -arrows-
- Loosen clamps -2-.

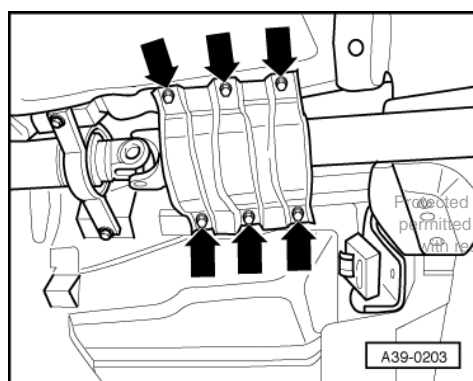
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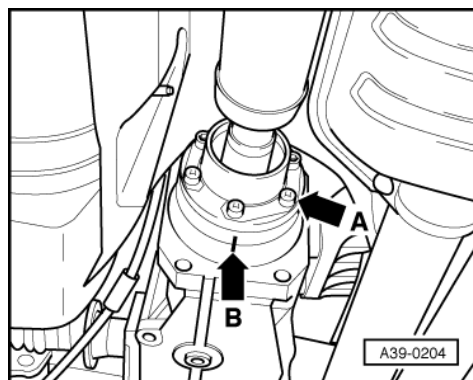
- Disengage rear section of exhaust system -1- and remove.



- -> Remove heat shields above propshaft -arrows-.



- -> Remove tunnel support -arrows-.

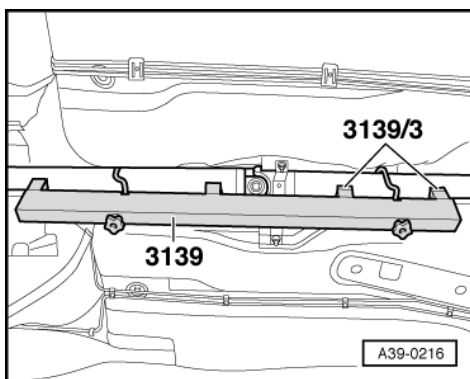


- -> Check whether there is a factory marking (paint) on the propshaft and the drive flange on the rear final drive. If not, mark position of propshaft flange in relation to rear final drive with paint -arrow B-.

Note:

Only mark if the same propshaft is to be reinstalled.

- Loosen securing bolts -arrow A- of both propshaft flanges slightly.
- Loosen securing bolts of centre propshaft mounting slightly.



- -> Attach assembly appliance 3139 with spacers 3139/3, and tighten the plastic nuts.

Note:

Never fit assembly appliance onto balance plates.

- Remove securing bolts on gearbox and rear final drive flanges.
- Slide propshaft together towards rear final drive. The constant velocity joints move along their axes.
- Detach centre propshaft mounting.
- Guide out propshaft with assembly appliance past gearbox flange.

Note:

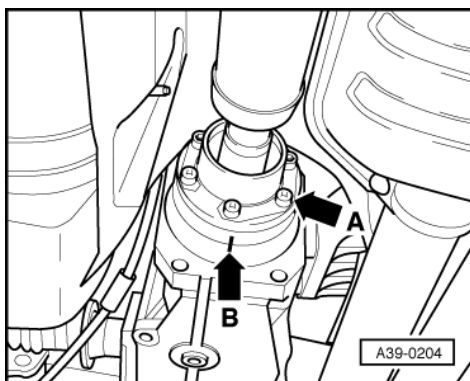
Only transport and store propshaft when extended.

Installing

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

Notes:

- ◆ It is essential that the locking fluid remaining in the threads in the flange shafts on the gearbox and rear final drive is cleaned out after removing the propshaft. Otherwise there is a danger that the new bolts will seize when they are screwed in and then shear if they have to be removed later.
- ◆ The threaded holes can be cleaned with a thread tap.
- ◆ Renew the gaskets on the flange shafts (remove backing foil and stick gaskets onto flange shaft; make sure that the surfaces are free of grease).



- ◆ -> To prevent imbalance, the flanges on the propshaft and on the rear final drive must be installed so that the factory markings (or the markings made on removal) are in alignment -arrow B-.
- ◆ If a new propshaft is being installed and the factory marking on the rear final drive flange is no longer visible, the radial run-out at the flange for the propshaft must be measured => Page 131, and the coloured marking on the propshaft must be aligned with the marking on the flange.
- ◆ After removing the propshaft from the rear final drive, the additional balance disc (thick washer) that may be located between the lock plate and the bolt head must not be reinstalled.



- ♦ Renew propshaft bolts (self-locking).
- Adjust propshaft after installing => Page **114** .
- Align exhaust system free of stress

=> 8-cylinder engine, Mechanics; Repair Group 26; Aligning exhaust system free of stress Aligning exhaust system free of stress

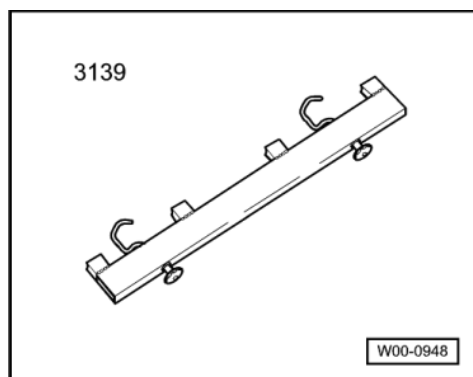
Tightening torques

Component	Nm
Propshaft to gearbox (output flange)	55
Propshaft to final drive (input flange)	55
Propshaft centre mounting to body	23
Heat shield for propshaft to gearbox	23
Cross member to body	25
Tunnel support to body	25

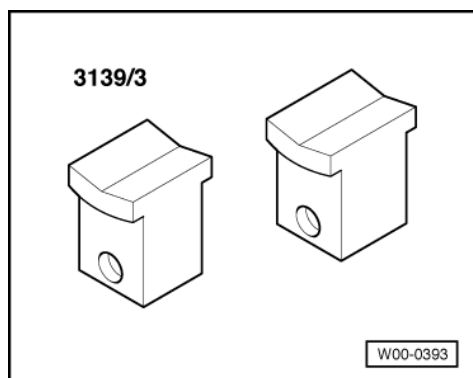
5.3 - Adjusting propshaft

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Special tools and workshop equipment required



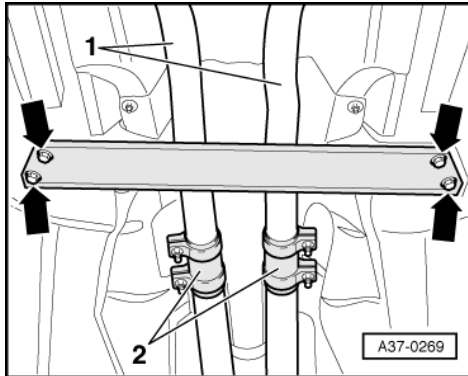
- ♦ Assembly appliance 3139



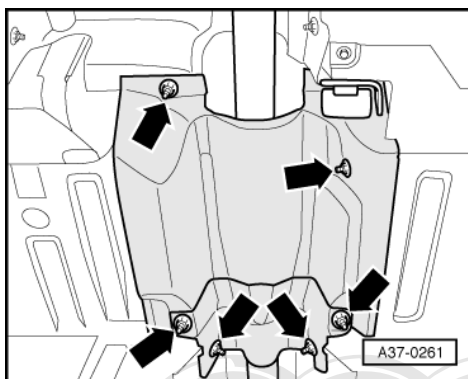
- ♦ Spacers 3139/3

Caution
Contact corrosion. Notes => Page 4 .

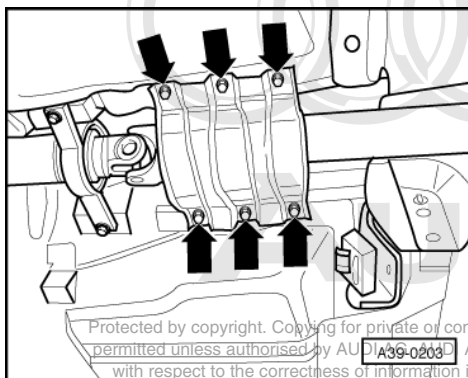
- Observe notes => Page 107 .



- -> If fitted, remove cross member below exhaust system -arrows-.
- Loosen clamps -2-.
- Disengage rear section of exhaust system -1- and remove.

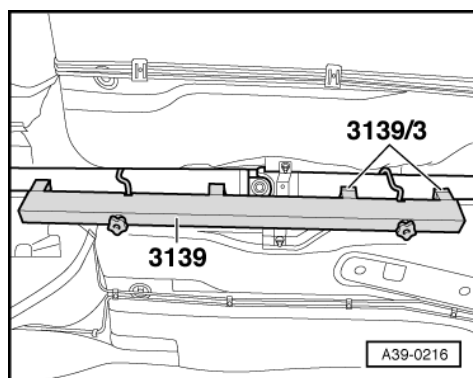


- -> Remove heat shields above propshaft -arrows-.



- -> Remove tunnel support -arrows-.

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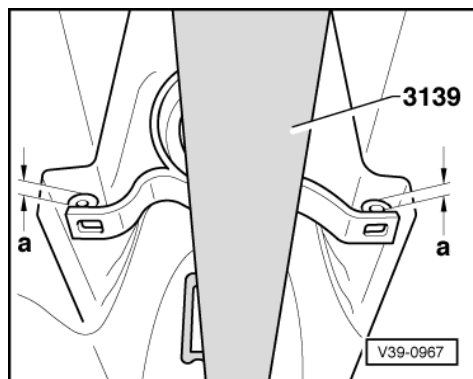


- -> Attach assembly appliance 3139 with spacers 3139/3, and tighten the plastic nuts.

Note:

Never fit assembly appliance onto balance plates.

- Loosen bolts securing centre propshaft mounting to body.
- Remove securing bolts and shims from centre mounting.



- -> Align centre propshaft mounting so that distance -a- is the same on both sides.
- Measure distance -a- on both sides.
- Determine shim(s) from table. Part numbers

=> Parts catalogue

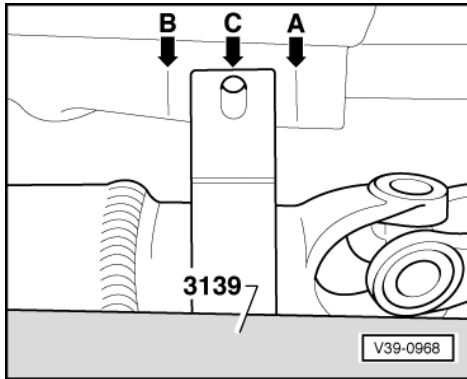
The following shims are available:

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

- Install the correct shims on both sides.

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Aligning propshaft longitudinally



- -> Using assembly appliance, push propshaft towards the rear as far as it will go.
- Mark position of centre mounting on body -arrow A-.
- Using assembly appliance, push propshaft towards the front as far as it will go.
- Mark position of centre mounting on body -arrow B-.
- Align propshaft -arrow C-.
- The centre mounting must be positioned centrally between the markings -A- and -B-.
- Install securing bolts of propshaft centre mounting and previously determined shims and tighten.
- Remove assembly appliance.
- Install tunnel support.
- Install heat shield above propshaft.
- Align exhaust system free of stress

=> 8-cylinder engine, Mechanics; Repair Group 26; Aligning exhaust system free of stress Aligning exhaust system free of stress

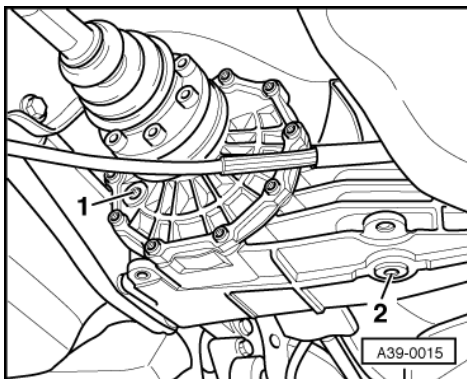
Tightening torques

Component	Nm
Propshaft centre mounting to body	23
Cross member to body	25
Tunnel support to body	25

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6 - Checking oil level in rear final drive

6.1 - Checking oil level in rear final drive



- -> Remove oil filler plug -1- to check final drive oil level.
- Specification: oil level up to lower edge of filler hole
- Top-up gear oil if necessary. Specification => Page 4 .



- Fit oil filler plug.

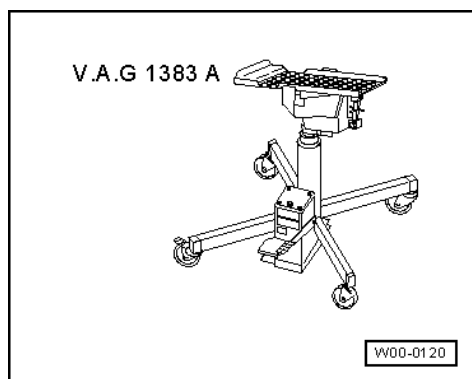
Tightening torque

Component	Nm
Oil filler plug	35

7 - Removing and installing rear final drive

7.1 - Removing and installing rear final drive

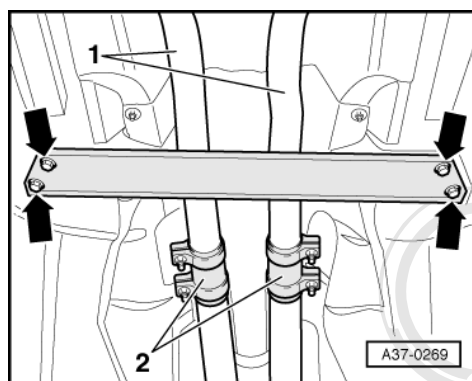
Special tools and workshop equipment required



- ♦ Engine/gearbox jack V.A.G 1383 A

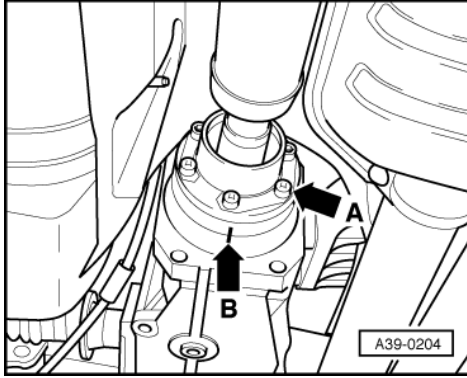
Caution
Contact corrosion. Notes => Page 4 .

Removing

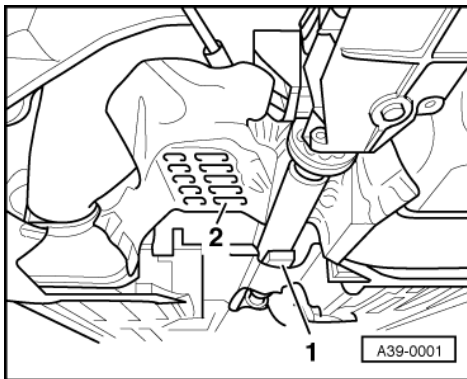


- -> If fitted, remove cross member below exhaust system -arrows-.
- Loosen clamps -2-.
- Disengage rear section of exhaust system -1- and remove.

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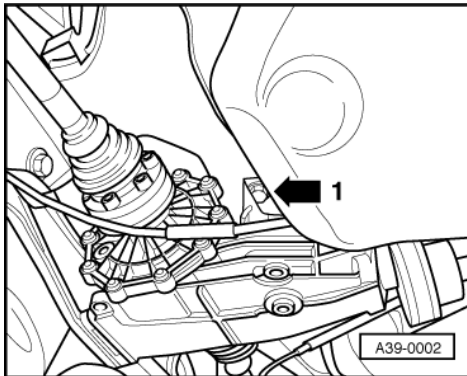


- -> Check whether there is a factory marking (paint) on the propshaft and the drive flange on the rear final drive. If not, mark position of propshaft flange in relation to rear final drive with paint -arrow B-.
- Loosen securing bolts -arrow A- of propshaft to rear final drive.

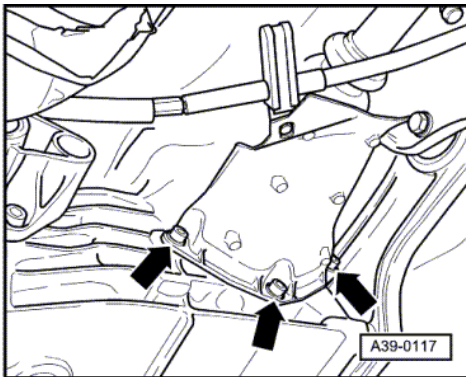


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- -> Support propshaft using a wooden wedge -1-, press upwards against heat shield.
- Remove heat shield -2-.
- Remove securing bolts of propshaft to rear final drive.

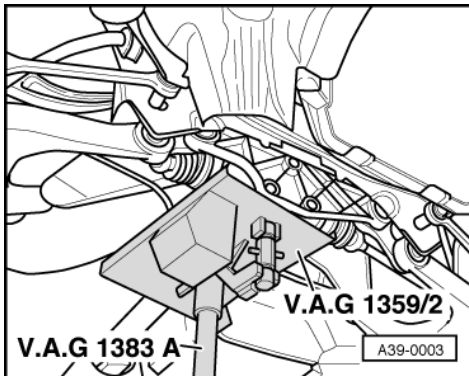


- -> If fitted, detach retainer for handbrake cable -arrow 1-.

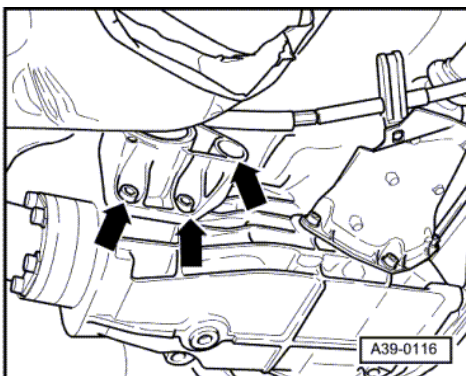


- -> Remove heat shield for left drive shaft -arrows-.
- Unbolt left and right-hand drive shafts and tie-up.

=> Running Gear, Front and 4WD; Repair group 42; Removing and installing drive shaft Removing and installing drive shaft



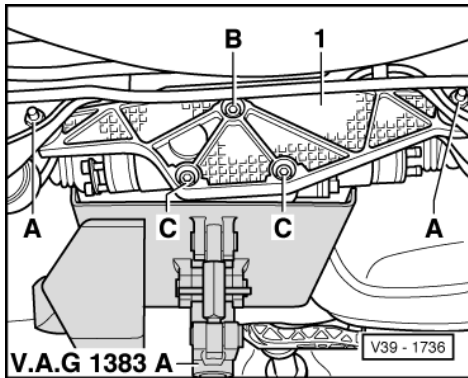
- -> Support final drive with gearbox jack V.A.G 1383 A and universal support V.A.G 1359/2.
- Secure final drive with a strap.



- -> Remove securing bolts -arrows- of left final drive support.

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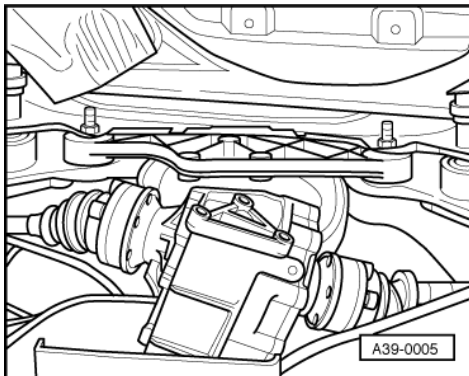




- -> Unscrew securing bolts -B- and -C- of rear cross member on rear final drive.

Note:

The cross member -1- need not be removed.



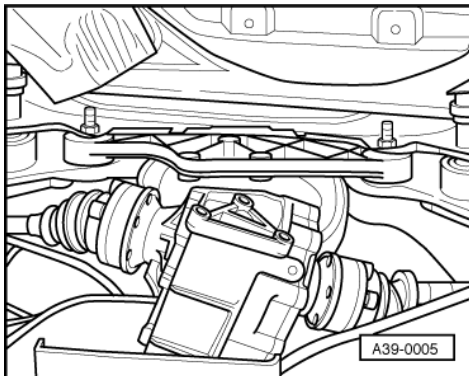
- -> Lower final drive slowly.

Installing

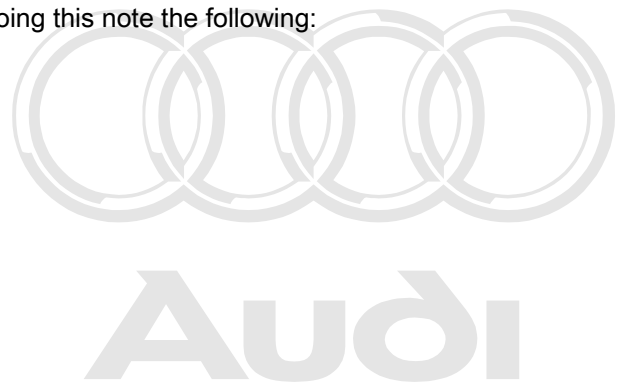
Installation is carried out in the reverse order, when doing this note the following:

Note:

Always renew self-locking nuts.



- -> Raise final drive with gearbox jack until both drive shafts can be connected.
- Lightly tighten securing bolts for drive shafts.
- Lift final drive and bolt to cross member and final drive support.
- Bolt on propshaft => Page **113**.

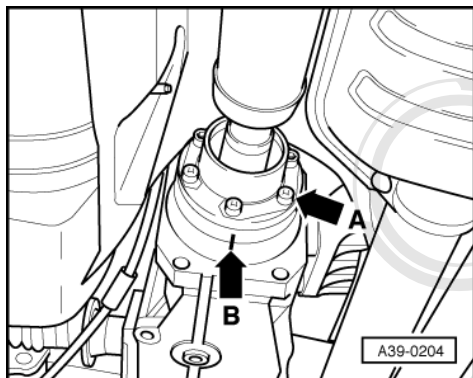


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Notes:

- ♦ After removing the propshaft, it is important to clean out the locking fluid remaining in the threads of the flange shaft on the rear final drive. If this is neglected, the new bolts can seize and then shear off later if they have to be removed.
- ♦ The threaded holes can be cleaned with a thread tap.
- ♦ Renew the gasket on the flange shaft (remove backing foil and stick gasket onto flange shaft). Surface must be free of grease.



- ♦ -> To prevent imbalance, the flanges on the propshaft and on the rear final drive must be installed so that the factory markings (or the markings made on removal) are in alignment -arrow B-.
 - ♦ After removing the propshaft from the rear final drive, the additional balance disc (thick washer) that may be located between the lock plate and the bolt head must not be reinstalled.
 - ♦ Renew propshaft bolts (self-locking).
- Check gear oil in rear final drive => Page 117 .
- Align exhaust system free of stress

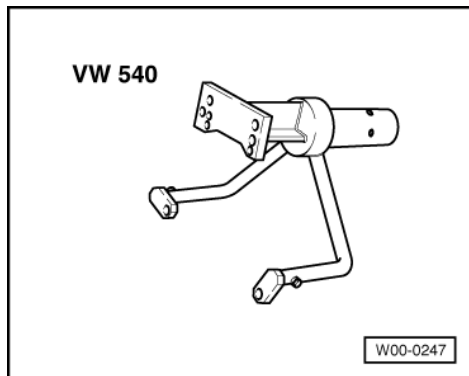
=> 8-cylinder engine, Mechanics; Repair Group 26; Aligning exhaust system free of stress Aligning exhaust system free of stress

Tightening torques

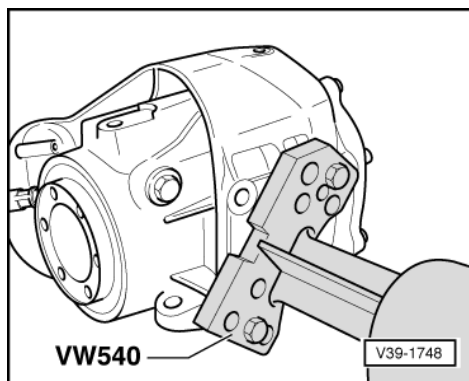
Component	Nm
Final drive support (front) to final drive	40
Rear cross member to final drive	55
Drive shaft to final drive	M8 40
	M10 77
Propshaft to final drive	55
Cross member to body	25
Heat shield for drive shaft (left)	25
Retainer for handbrake cable	25

7.2 - Securing rear final drive to repair stand

Special tools and workshop equipment required



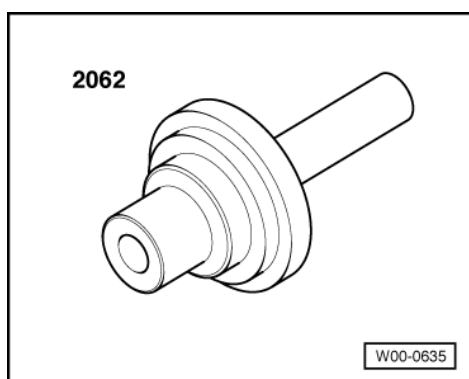
- ♦ Engine/gearbox support VW 540



- -> Secure complete rear final drive to repair stand using engine and gearbox support VW 540.

8 - Renewing flange shaft oil seals

8.1 - Renewing flange shaft oil seals



Special tools and workshop equipment required

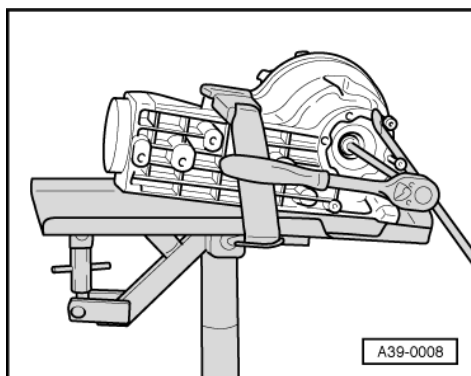
- ♦ Mandrel 2062
- ♦ Drip tray

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- Rear final drive removed

Note:



The procedure is identical for left and right-hand seals.

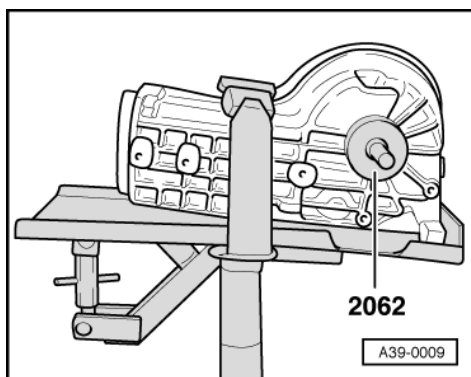
Removing

- -> Remove flange shaft. To loosen the securing bolt, screw two bolts into the flange shaft and counter-hold with a lever.
- Place drip tray under final drive.
- Pull out flange shaft using the bolts already screwed in.
- Lever out flange shaft oil seal using a suitable lever.
- Clean seat for oil seal.

Installing

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

- Moisten outer circumference of seal with gear oil.
- Fill space between sealing lip and dust lip with multi-purpose grease.



- -> Install oil seal onto stop with drift 2062, do not cant seal when doing this.
- Drive in flange shaft and tighten.
- Install rear final drive => Page 121 .
- Top-up gear oil in rear final drive and check oil level => Page 117 .

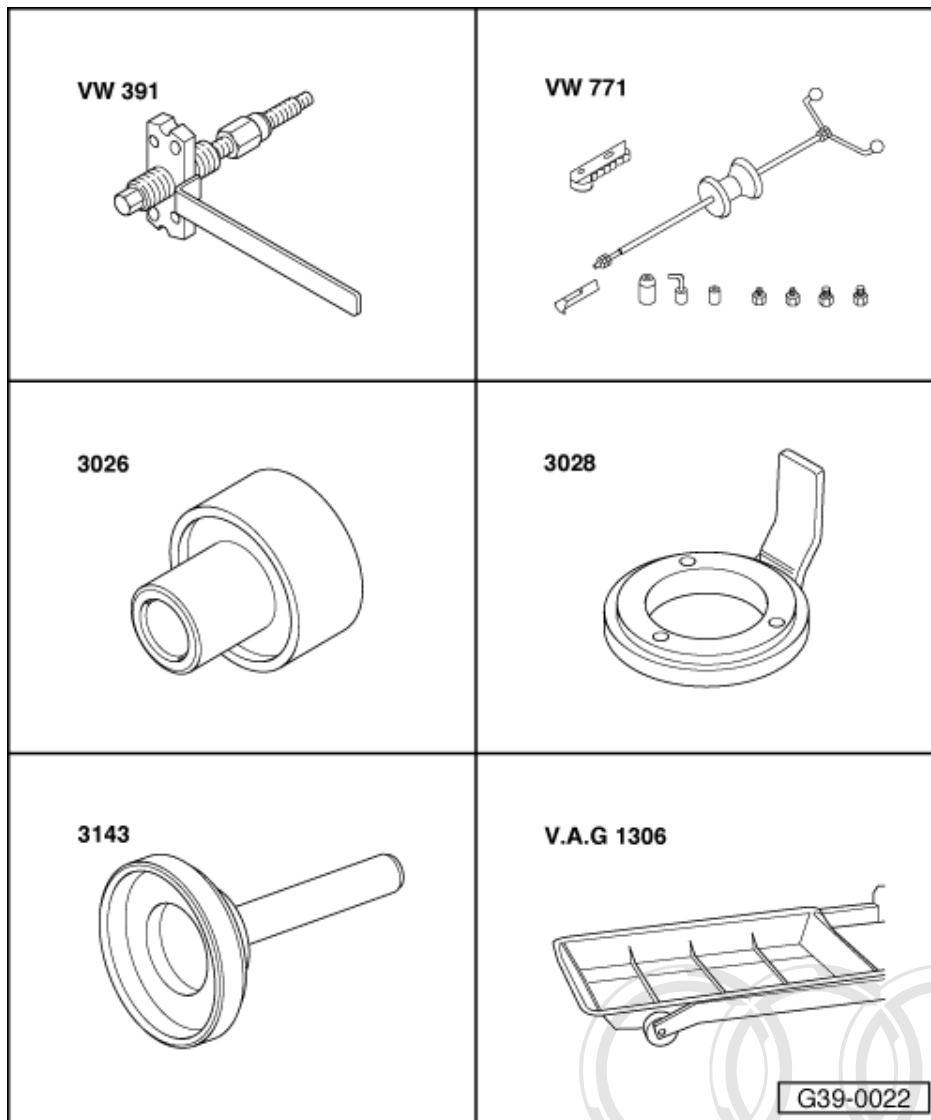
Tightening torque

Component	Nm
Flange shaft to final drive	25

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9 - Renewing oil seal for propshaftdrive flange

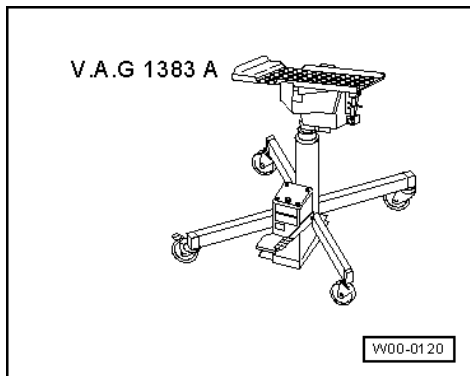
9.1 - Renewing oil seal for propshaftdrive flange



Special tools and workshop equipment required

- ◆ Special tool VW 391
- ◆ Multi-purpose tool VW 771
- ◆ Special tool 3026
- ◆ Special tool 3028
- ◆ Special tool 3143
- ◆ V.A.G 1306

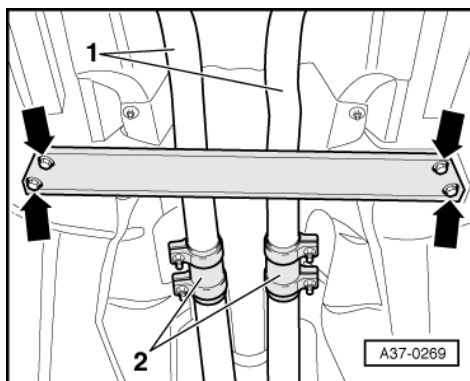
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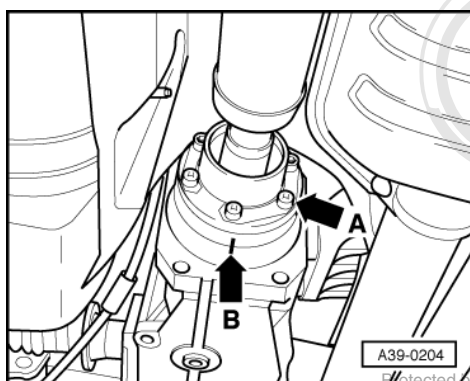
- ♦ Engine/gearbox jack V.A.G 1383 A
- ♦ Depth gauge
- ♦ Locking fluid D 000 600

Note:

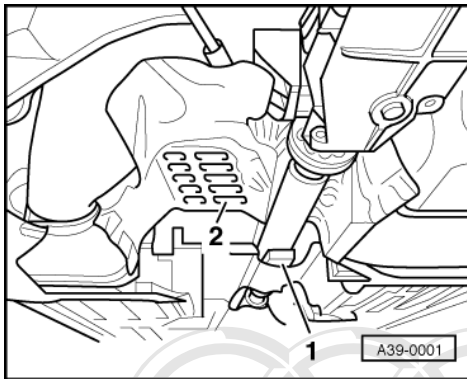
The seal can be replaced with the rear final drive remaining installed. But the final drive must be lowered.

**Removing**

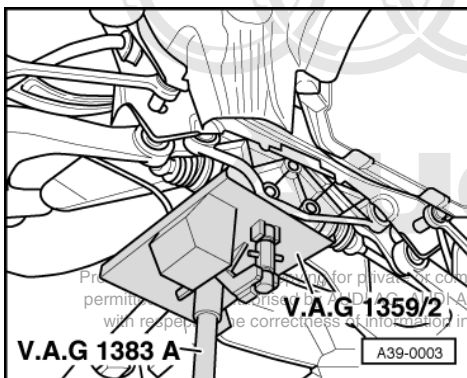
- -> If fitted, remove cross member below exhaust system -arrows-.
- Loosen clamps -2-.
- Disengage rear section of exhaust system -1- and remove.
- Place drip tray V.A.G 1306 underneath and drain oil.



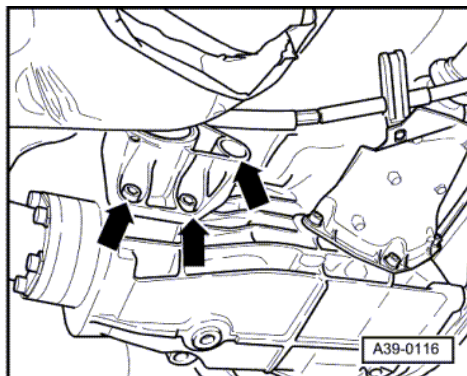
- -> Check whether there is a factory marking (paint) on the propshaft and the drive flange on the rear final drive. If not, mark position of propshaft flange in relation to rear final drive with paint -arrow B-.
- Loosen securing bolts -arrow A- of propshaft to rear final drive.



- -> Support propshaft using a wooden wedge -1-, press upwards against heat shield -2-.
- Remove securing bolts of propshaft to rear final drive.



- -> Support final drive with gearbox jack V.A.G 1383 A and universal support V.A.G 1359/2.

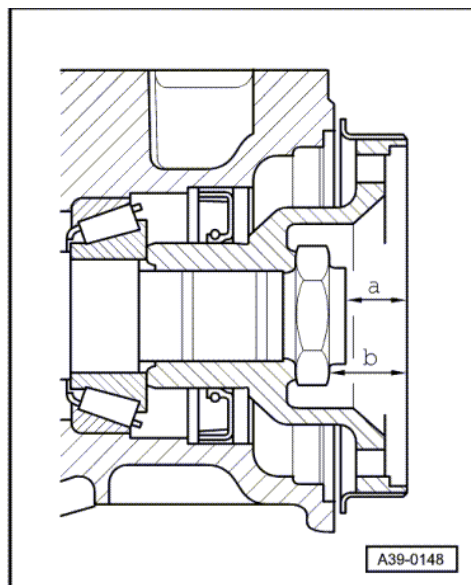


- -> Remove securing bolts -arrows- of left final drive support.

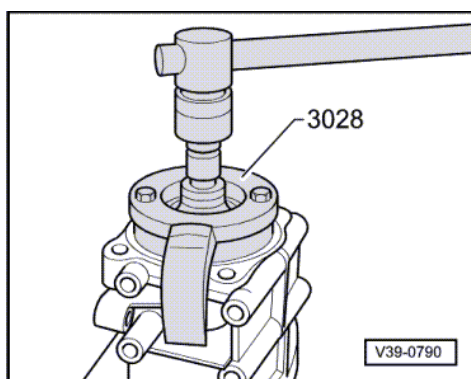
Note:

The rear final drive/cross member securing bolts are not loosened.

- To ease removing and installing, lower rear final drive slightly at front.



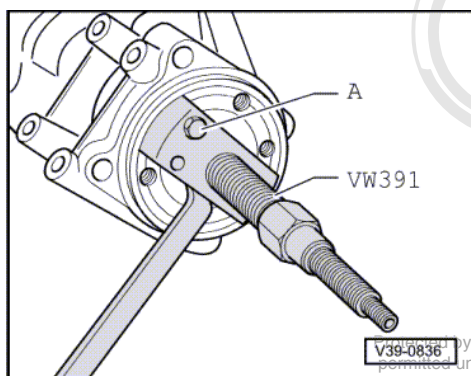
- Mark position of drive pinion retaining nut with paint.
- -> To check when assembling, measure the following with a depth gauge.
 - Dimension a = distance: flange/drive pinion
 - Dimension b = distance: flange/drive pinion nut



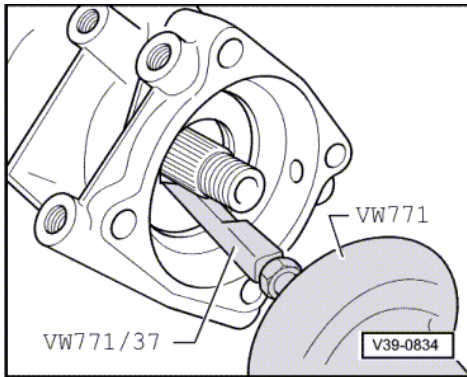
Note:

Illustrations show the final drive removed for the following work sequence.

- -> Fit counter-hold tool 3028 and remove drive pinion nut.



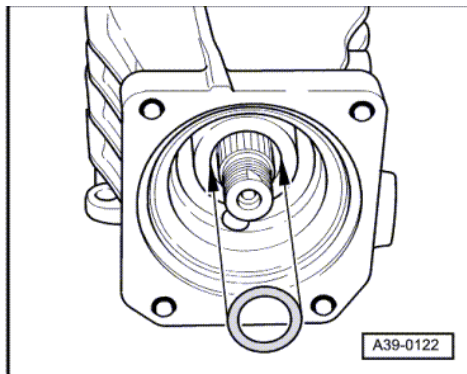
- -> Pull off flange with removal tool VW 391.
- Screw two M8 x 30 hexagon bolts -A- into flange.



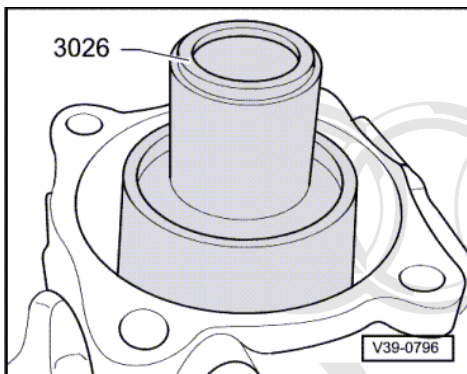
- -> Pull out seal.

Installing

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

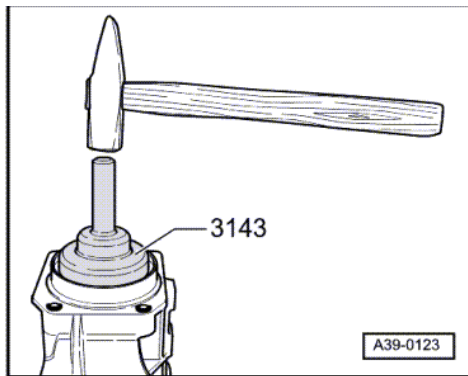


- -> Renew O-ring between drive pinion bearing and flange.
- Lightly oil O-ring before installing.



- Moisten outer circumference of seal with gear oil.
- Fill space between sealing and dust lips with multipurpose grease.
- -> Drive in seal for propshaft flange onto stop with drift 3026.

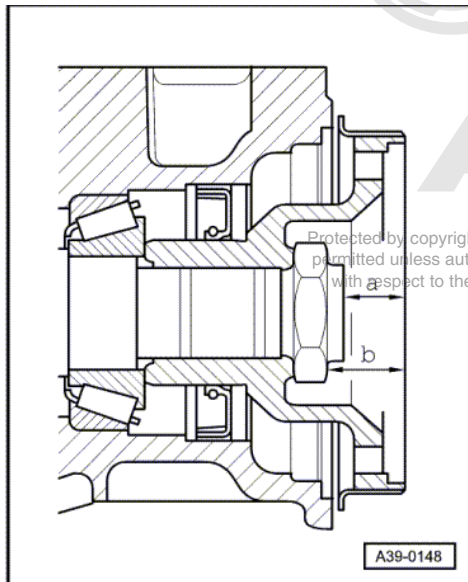
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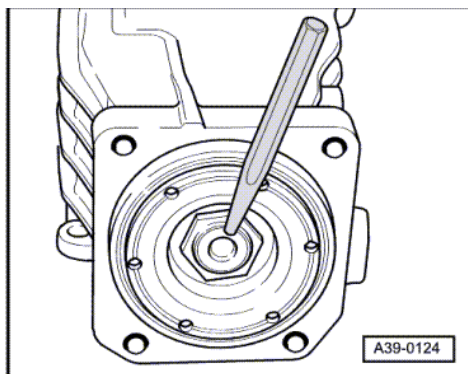
- -> Drive propshaft flange onto drive pinion until retaining nut can be fitted.
- Clean drive pinion nut and threads on drive pinion of oil and grease residues. Thinly coat threads with locking fluid D 000 600.

Note:

Use the originally fitted hexagon nut to secure the flange on the drive pinion, otherwise it will not be possible to reproduce the original installation position.



- Tighten drive pinion nut exactly onto previously marked position.
- -> To ensure that the assembly is correct, perform check measurement of dimensions -a- and -b-.
- Maximum permissible deviation from original measurements: ± 0.5 mm



- -> Peen drive pinion nut with a punch.
- Bolt final drive to final drive support.

- Renew gasket on propshaft flange and tighten propshaft securely.

Notes:

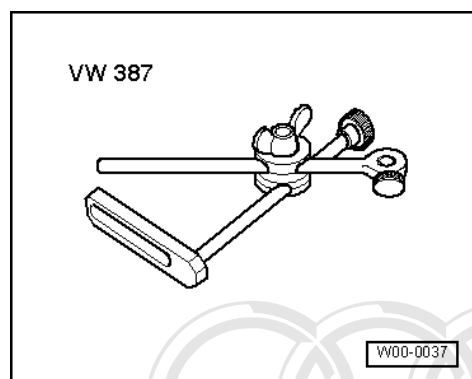
- ♦ After detaching the propshaft, it is important to clean out the locking fluid remaining in the threads of the flange shaft on the rear final drive. If this is neglected, the new bolts can seize when they are screwed in and shear off later if they have to be removed.
- ♦ The threaded holes can be cleaned with a thread tap.
- ♦ After removing the propshaft from the rear final drive, the additional balance disc (thick washer) that may be located between the lock plate and the bolt head must not be reinstalled.
- ♦ Renew propshaft bolts (self-locking).
- If there is a factory marking on the propshaft, measure the radial run-out at the propshaft flange=>Page **131** and align the paint marking on the propshaft with the new marking on the flange.
- If there was no factory marking (paint) on the propshaft and the position of the propshaft in relation to the propshaft flange was therefore marked on removal, reinstall the propshaft in the same position => from Page **113**.
- Top-up gear oil in rear final drive and check oil level => Page **117**.
- Align exhaust system free of stress

=> 8-cylinder engine, Mechanics; Repair Group 26; Aligning exhaust system free of stress Aligning exhaust system free of stress

Tightening torques

Component	Nm
Final drive support (front) to final drive	40
Propshaft to final drive	55
Cross member to body	25

9.2 - Measuring radial run-out at propshaft flange and marking



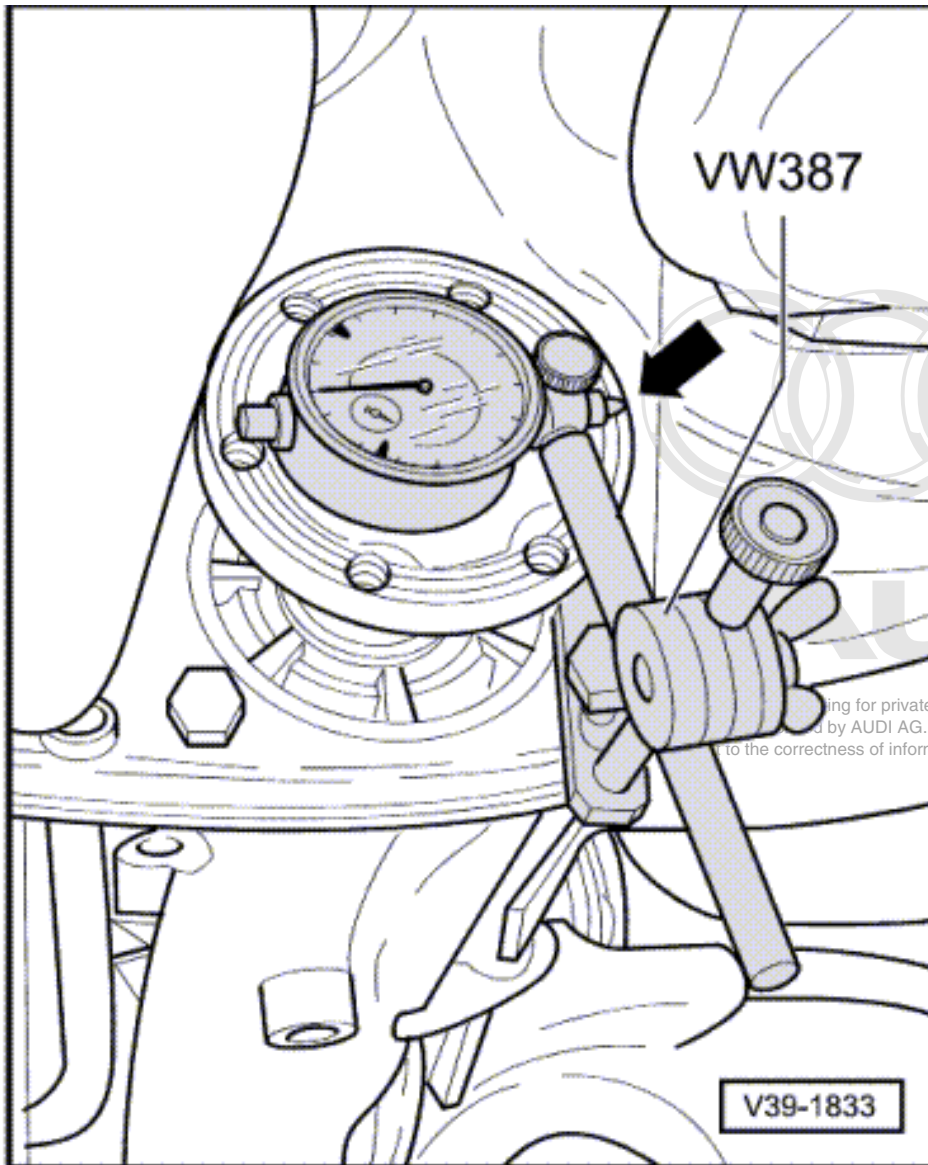
Special tools and workshop equipment required

- ♦ Universal dial gauge bracket VW 387
- ♦ Dial gauge

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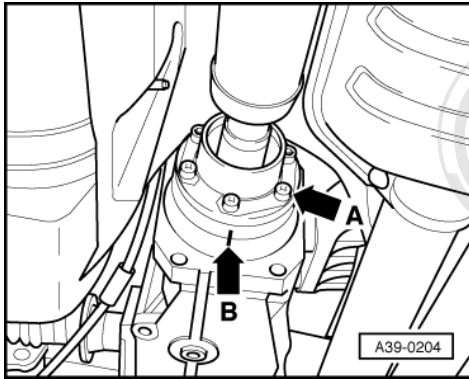


Work sequence



Notes:

- ♦ The radial run-out must always be measured when drive pinion or propshaft flange are removed.
- ♦ The radial run-out can be measured when rear final drive is installed but the propshaft must be disconnected at rear final drive. Observe notes =>Page 107 .
- -> Secure universal dial gauge retainer VW 387 with dial gauge to cross member/final drive bolted joint.
- Position dial gauge on ground circumference -arrow- in propshaft flange and set to "0" with a preload of 1 mm.
- Turn differential via both rear wheels (left and right flange shaft) at same time in one direction until the propshaft flange has turned once completely.
- Mark the position of greatest radial run-out on flange exterior (equates to greatest distance from rotational axis).
- Remove old marks on propshaft flange.

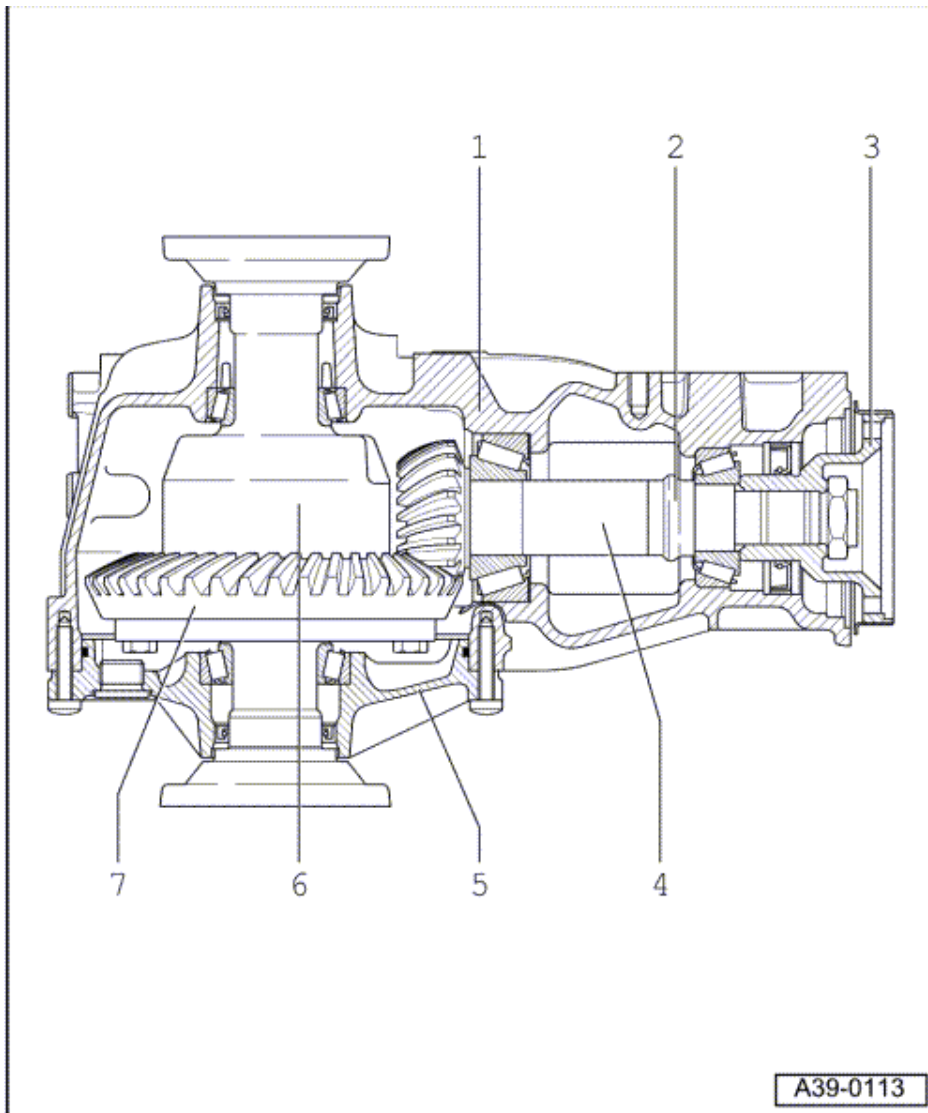


- -> When installing the propshaft, the marking on the propshaft flange must be aligned with the marking on the rear final drive -arrow -B-.

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10 - Dismantling and assembling rear final drive

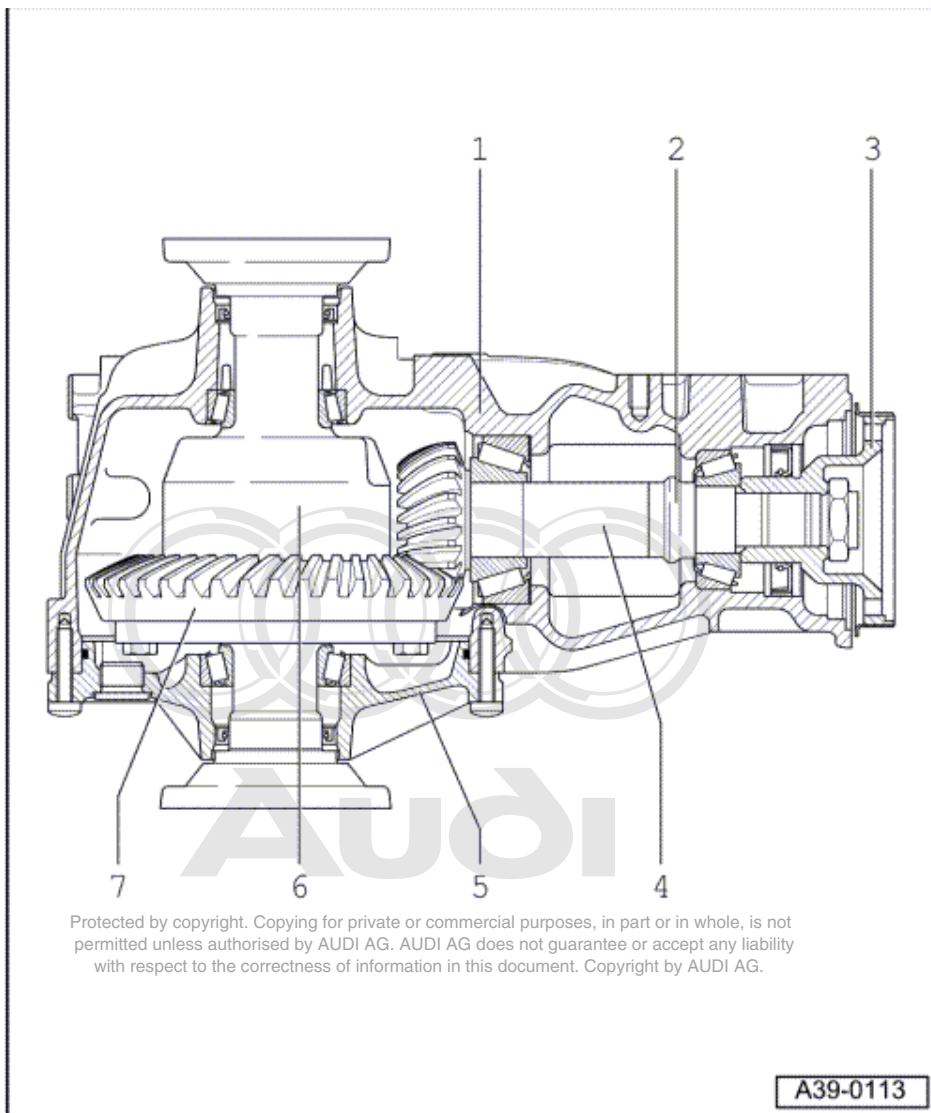
10.1 - Dismantling and assembling rear final drive





10.2 - Overview

- 1 Final drive housing
- 2 Spacer sleeve
 - ♦ Renew
- 3 Flange for propshaft
 - ♦ Removing and installing
 - => Page 154
- 4 Drive pinion
 - ♦ Is mated with crown wheel, always renew together as a set
 - ♦ Removing and installing
 - => Page 154

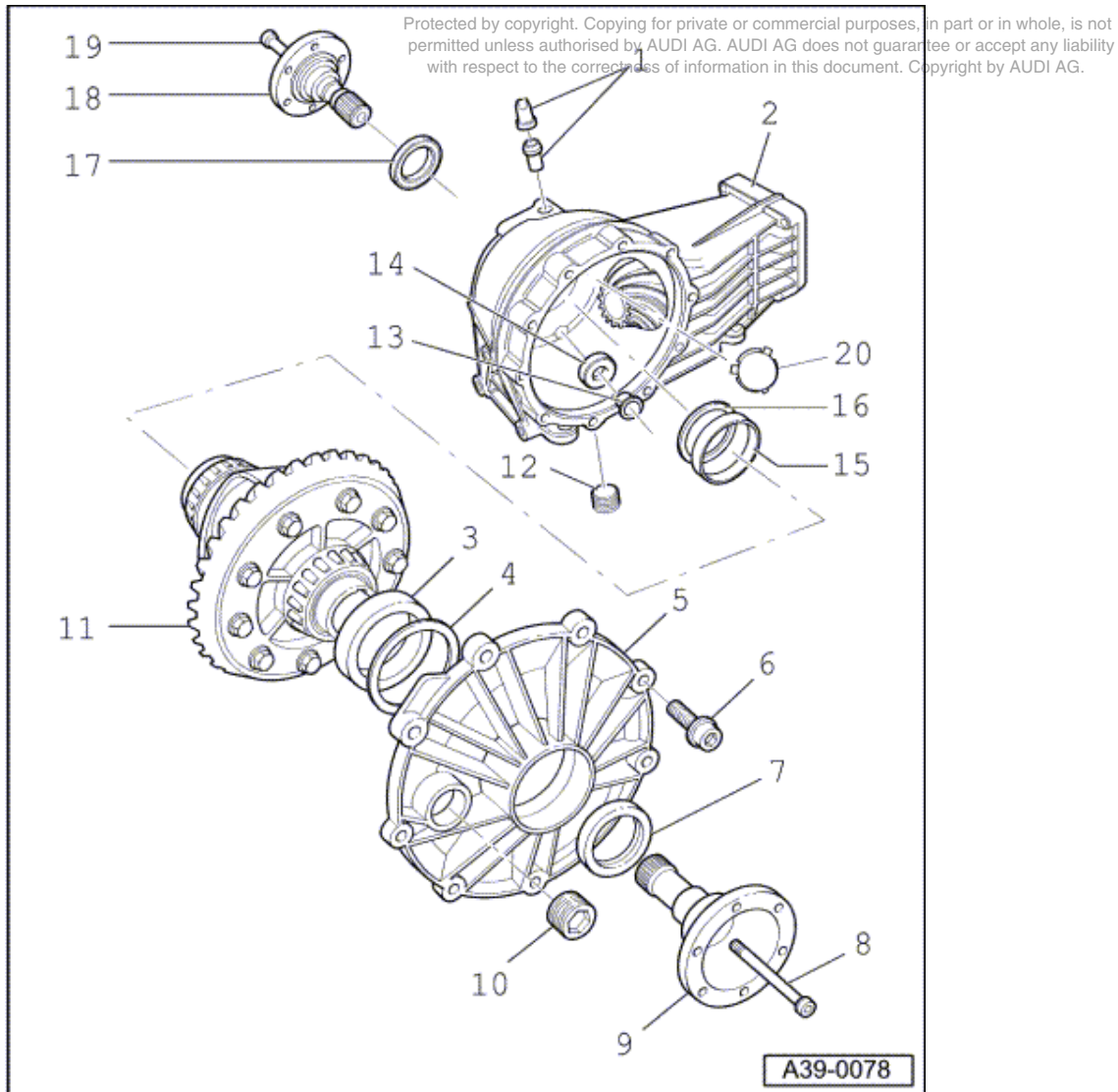


- 5 Cover for final drive
- 6 Differential
 - ♦ Must be removed before dismantling drive pinion
 - ♦ Removing and installing
 - =>Page 135
 - ♦ Dismantling and assembling
 - => Page 141
- 7 Crown wheel

- ♦ Is mated to drive pinion(gear set)
- ♦ Removing and installing
=> Page 141

11 - Removing and installing differential

11.1 - Removing and installing differential



Notes:

- ♦ General repair instructions =>Page 5 .
- ♦ Securing final drive to repair stand => Page 39-76.
- ♦ Adjustments are required when replacing components marked 1)
=> Adjustment overview Page 169 .

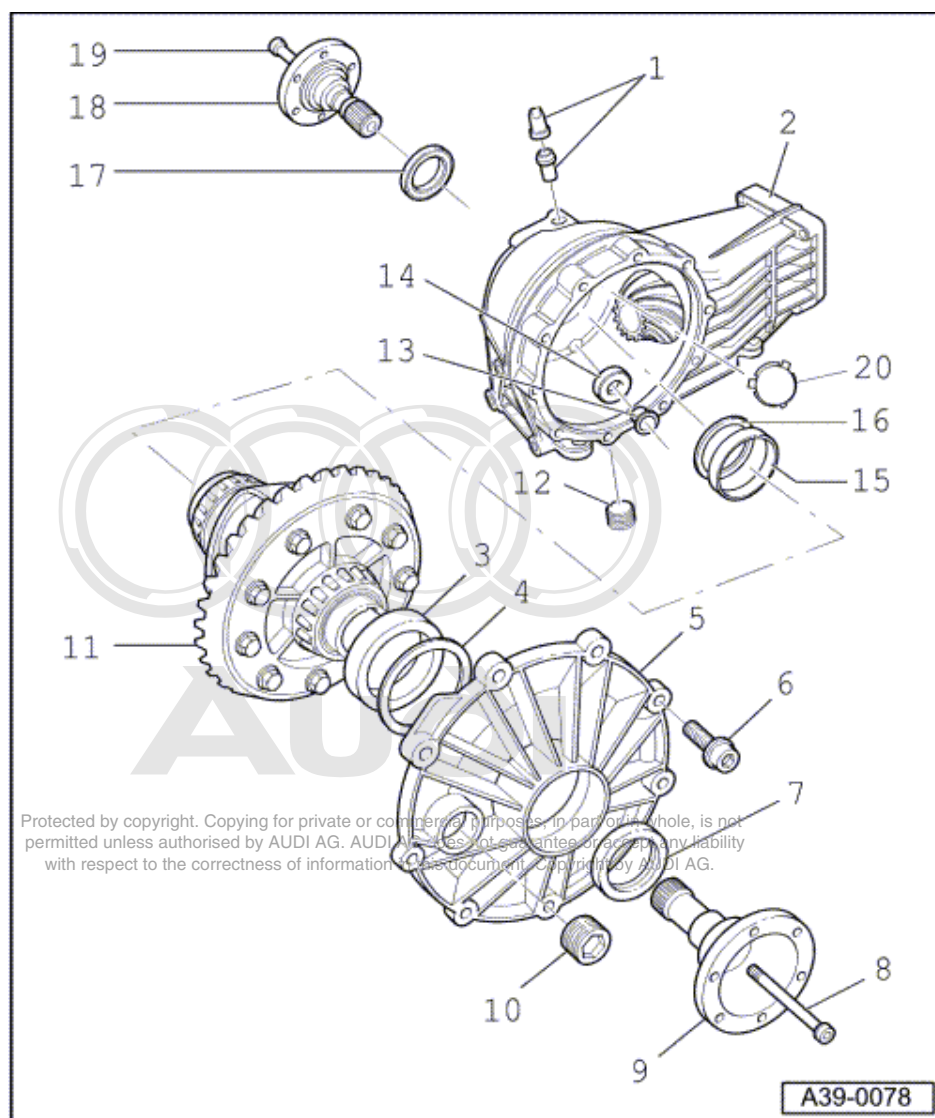
1 Breather sleeve

- ♦ With rubber valve
- ♦ Installation position
=> Fig. 139

2 Final drive housing 1)

- ♦ With drive pinion
- ♦ Removing and installing drive pinion

=> Page 154



3 Outer race for large taper roller bearing 1)

- ◆ Driving out
=> Fig. 150
- ◆ Driving in
=> Fig. 151

4 Shim "S1"

- ◆ Note thickness
- ◆ Adjustment overview
=> Page 169

5 Cover for final drive 1)

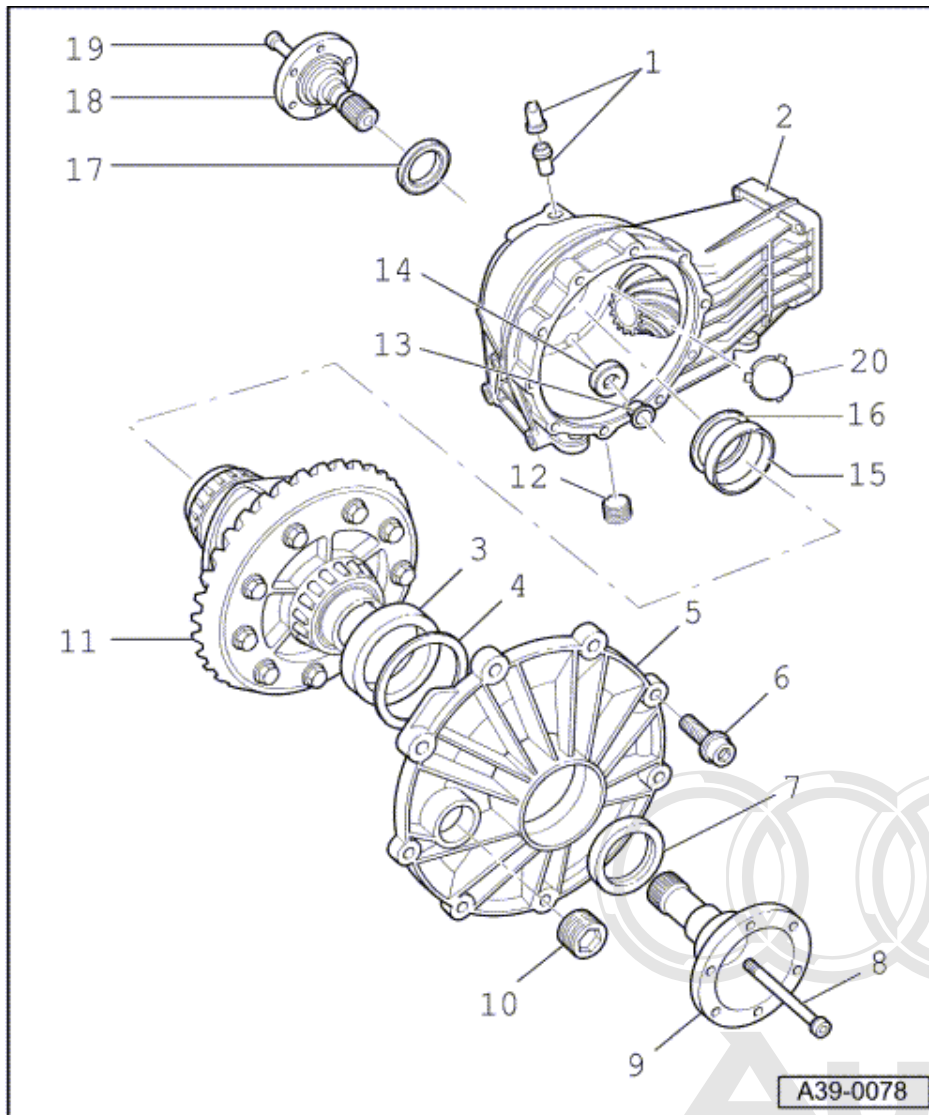
- ◆ With seal
- ◆ Renew O-ring
- ◆ Lubricate O-ring with oil when installing

6 Torx bolt - 25 Nm

7 Oil seal, right

- ◆ Renewing => Page 123

8 Hexagon socket head bolt,
25 Nm



9 Flange shaft, right

- ♦ Removing and installing
=>Fig. 139

10 Oil filler plug - 35 Nm

11 Differential with crown wheel 1)

- ♦ Dismantling and assembling
=> Page 141

12 Oil drain plug - 35 Nm

13 Bush

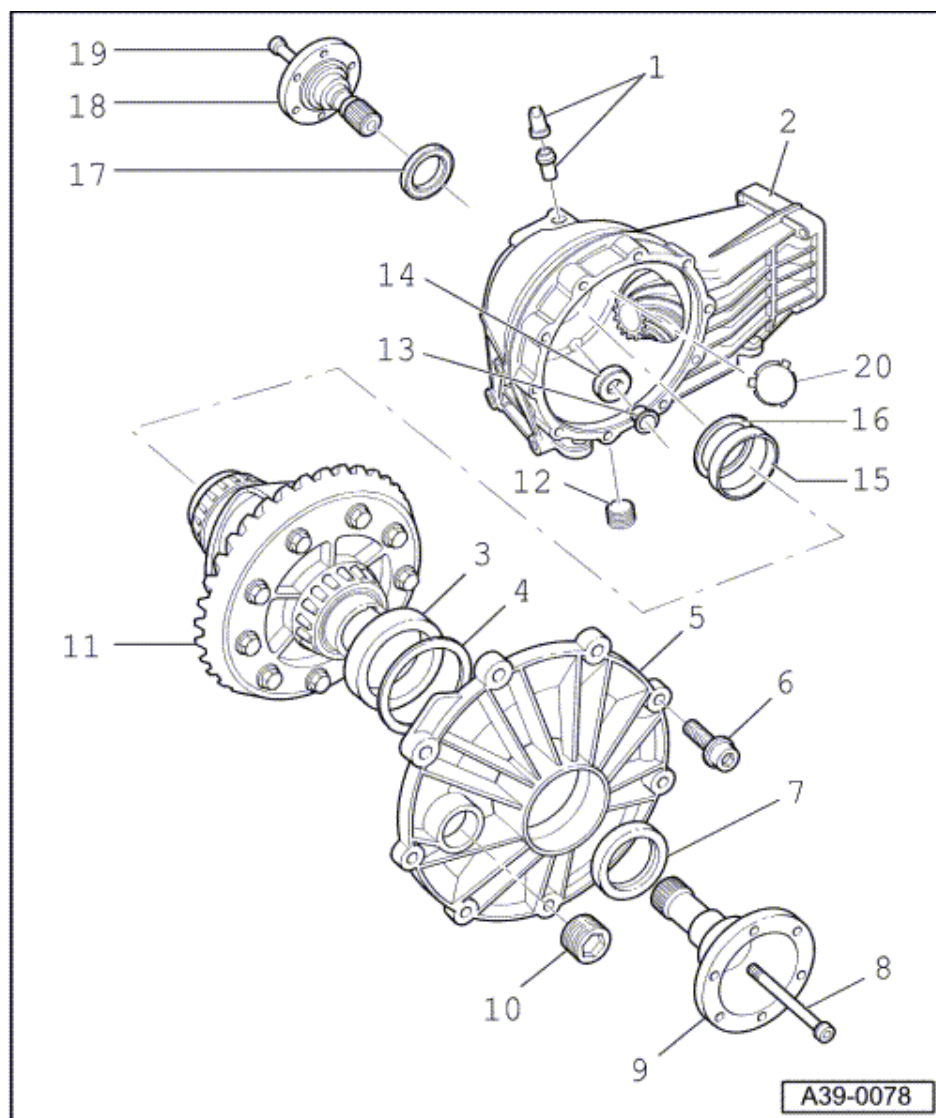
- ♦ Holds magnet in position
- ♦ Knock-in onto stop

14 Magnet

15 Outer race for small taper roller bearing 1)

- ♦ Removing and installing
=> Page 141

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16 Shim "S2"

- ◆ Note thickness
- ◆ Adjustment overview
=> Page **169**

17 Oil seal, left

- ◆ Renewing => Page **123**

18 Flange shaft, left

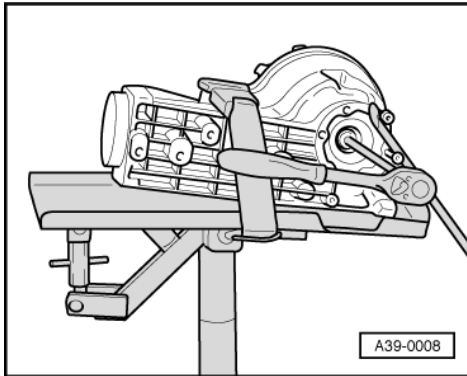
- ◆ Removing and installing
=>Fig. **139**

**19 Hexagon socket head bolt,
25 Nm**

20 Cover

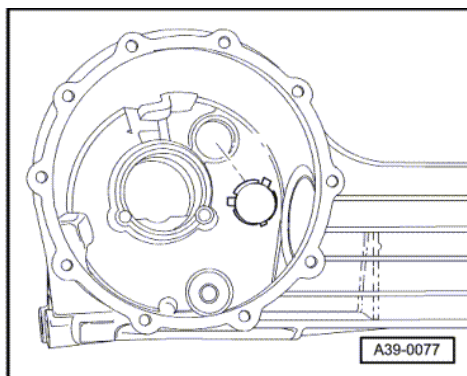
- ◆ Installing => Fig. **139**

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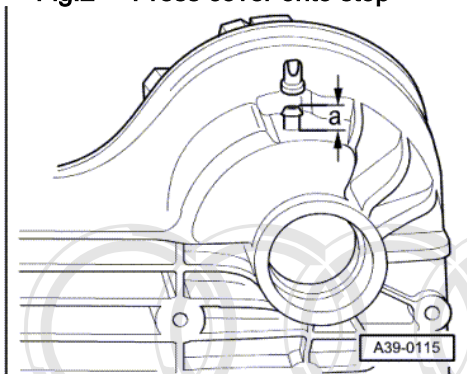


-> Fig.1 Removing and installing flange shaft

- To loosen the securing bolt, screw two bolts into the flange shaft and counter-hold with a lever.
- Pull out flange shaft using the bolts already screwed in.



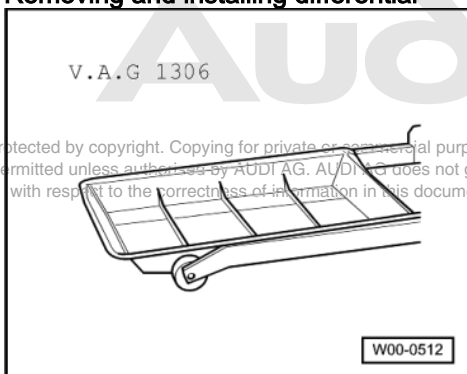
-> Fig.2 Press cover onto stop



-> Fig.3 Position of breather sleeve

The breather sleeve should project 13 mm (distance "a") out of the housing after pressing in. The slot in the rubber valve should be in line with the direction of travel.

Removing and installing differential



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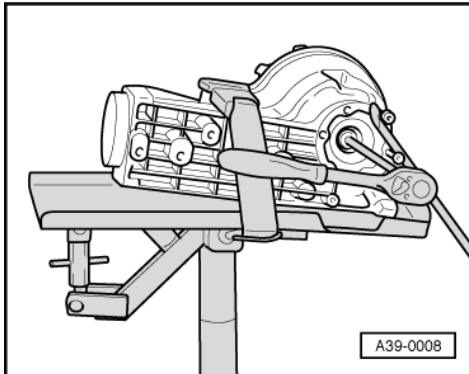
- Rear final drive removed

Special tools and workshop equipment required

- ♦ Drip tray V.A.G 1306

Removing

- Secure complete rear final drive on repair stand =>Page 123 .
- Place drip tray V.A.G 1306 underneath and drain oil.



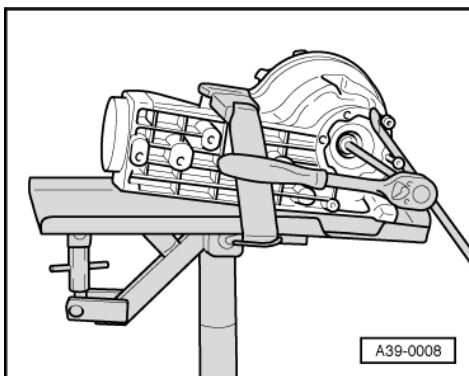
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- -> Remove left and right-hand flange shafts.
- To loosen the securing bolt, screw two bolts into the flange shaft and counter-hold with a lever.
- Mark flange shafts (for left and right sides).
- Pull out flange shaft using the bolts already screwed in.
- Unscrew securing bolts from cover for final drive.
- Take cover for final drive off axle housing and remove differential.

Installing

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

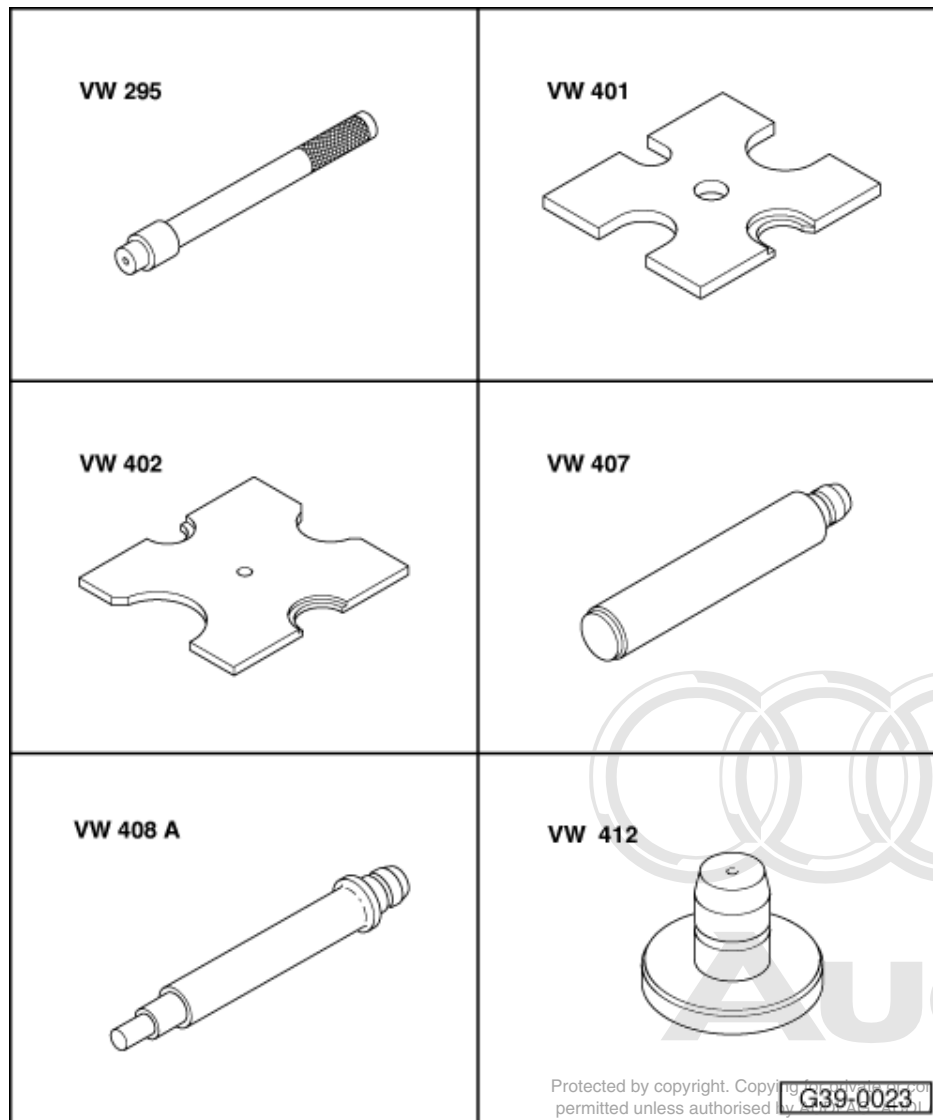
- Insert differential.
- Renew O-ring for cover for final drive and oil when installing.
- Fit cover for final drive on final drive housing and tighten in diagonal sequence to 25 Nm.
- Renew flange shaft oil seals
=>Page 123 .
- Pack space between sealing lip and dust lip with multipurpose grease.



- -> Install flange shafts and tighten.
- Top-up gear oil in rear final drive and check oil level => Page 117 .

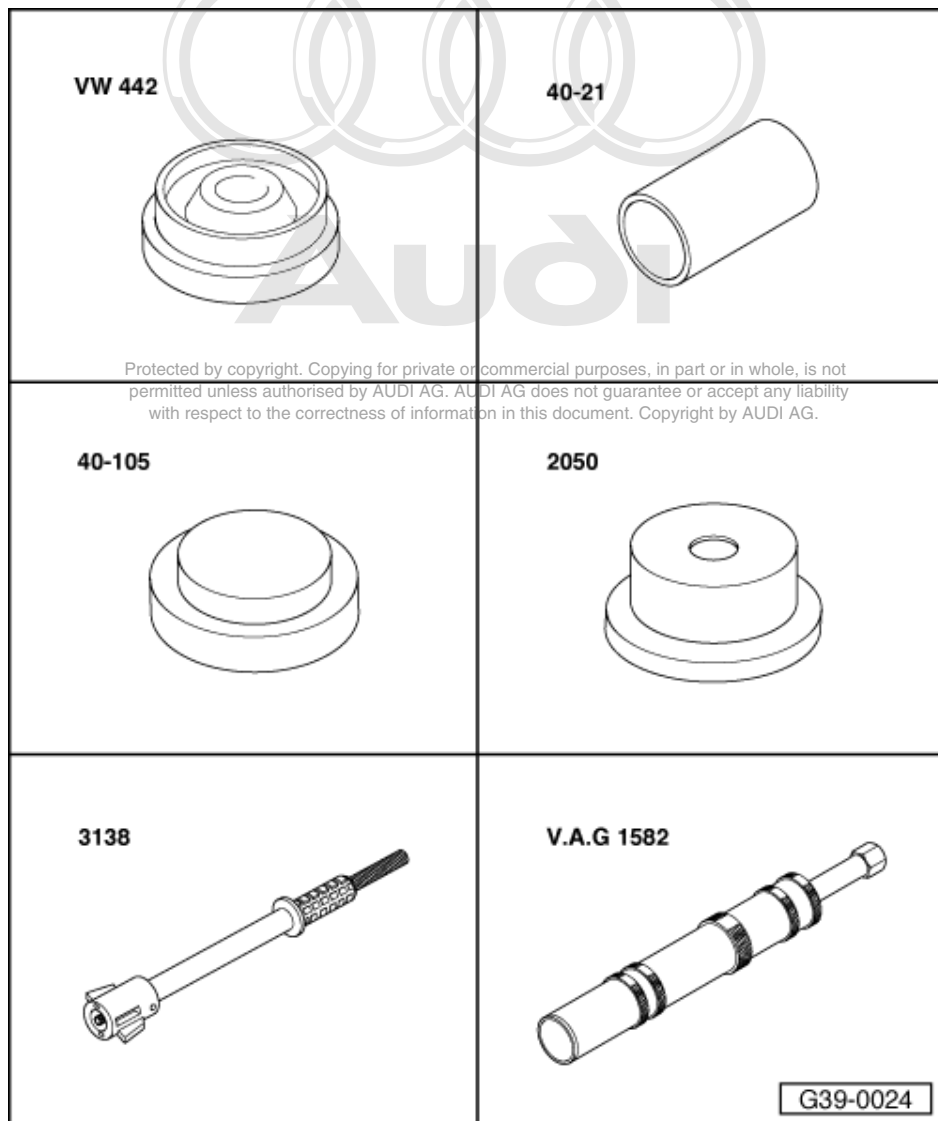
12 - Dismantling and assembling differential

12.1 - Dismantling and assembling differential

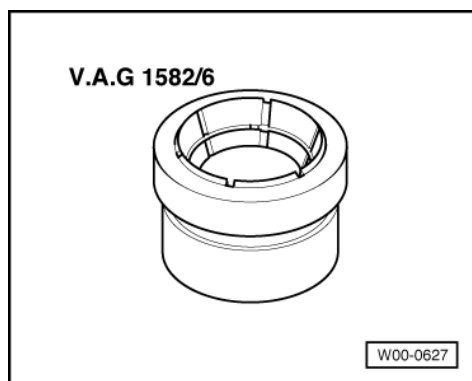


Special tools and workshop equipment required

- ◆ Special tool VW 295
- ◆ Special tool VW 401
- ◆ Special tool VW 402
- ◆ Special tool VW 407
- ◆ Special tool VW 408 A
- ◆ Special tool VW 412



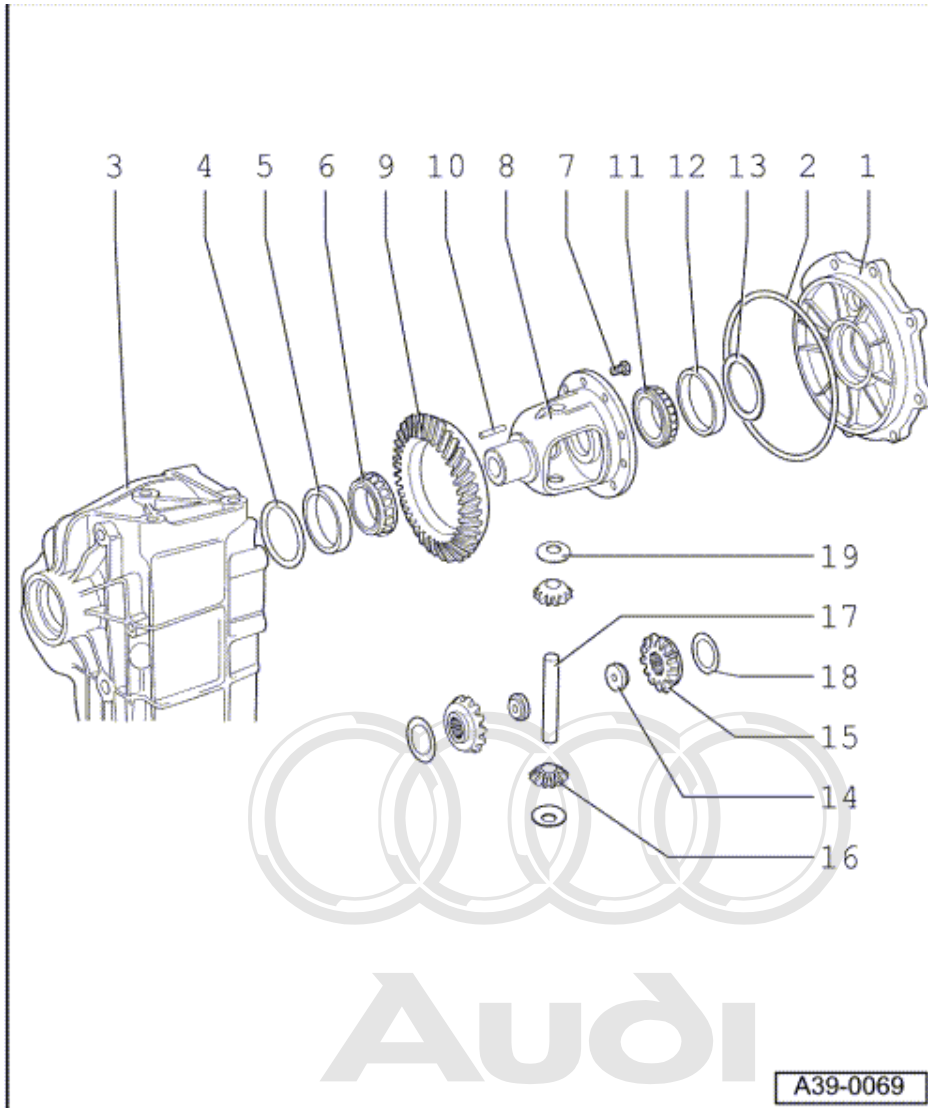
- ♦ Special tool VW 442
- ♦ Special tool 40-21
- ♦ Special tool 40-105
- ♦ Special tool 2050
- ♦ Special tool 3138
- ♦ V.A.G 1582



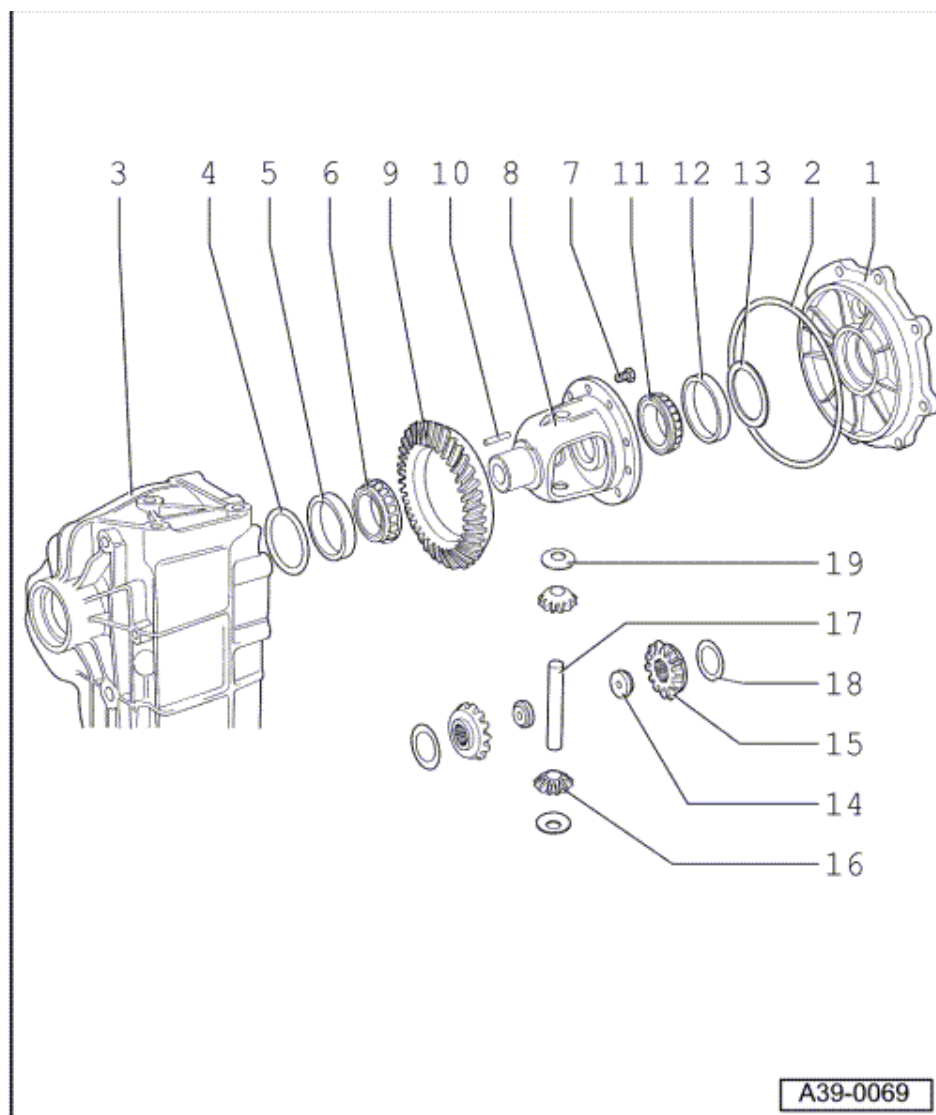
- ♦ V.A.G 1582/6
- ♦ Two-arm puller Kukko 44/2

Notes:

- ◆ Repair instructions =>Page 5 .
- ◆ Replace both taper roller bearings of differential together. Use same make if possible.
- ◆ Adjustments are required when replacing components marked 1)
=>Adjustment overview Page 169 .



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- 1 Cover for final drive 1)**
 - 2 O-ring**
 - ◆ Renew
 - ◆ Lubricate with oil before installing
 - 3 Final drive housing 1)**
 - 4 Shim "S2"**
 - ◆ Note thickness
 - ◆ Adjustment overview
=> Page 169
 - 5 Outer race for small taper roller bearing 1)**
 - ◆ Knocking out => Fig. 148
 - ◆ Pressing in => Fig. 148



6 Inner race for small taper roller bearing 1)

- ♦ Pulling out
=> Fig. 148
- ♦ Pressing in
=> Fig. 149

7 Bolt - 60 Nm + turn 45°further

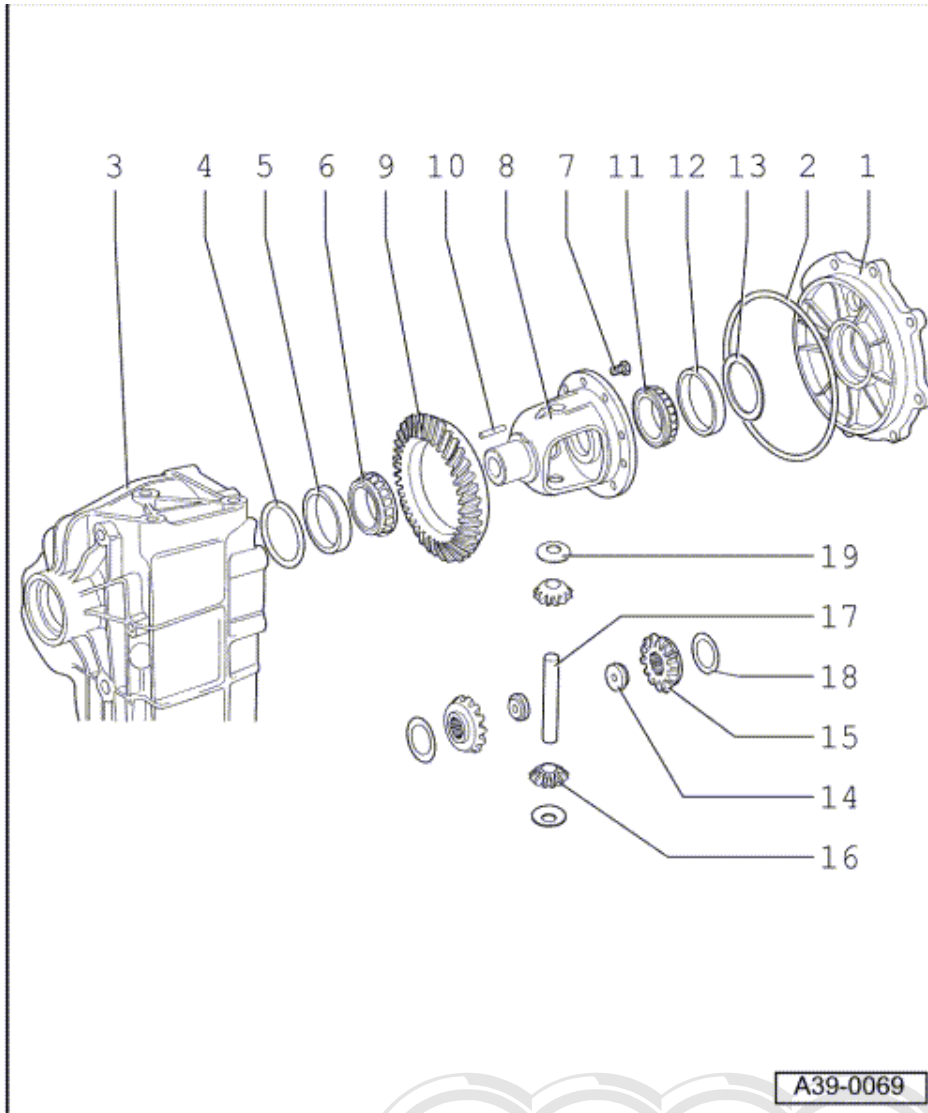
- ♦ Renew
- ♦ Allocation

=> Parts catalogue

- ♦ Lightly tighten bolts then tighten diagonally to correct torque

8 Differential housing 1)

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9 Crown wheel 1)

- ◆ Paired with drive pinion (final drive set)
- ◆ Select correct version according to code letters

=> Parts catalogue

- ◆ Drive off differential housing with a punch
=> Fig. 151
- ◆ Installing on differential housing
=> Fig. 151

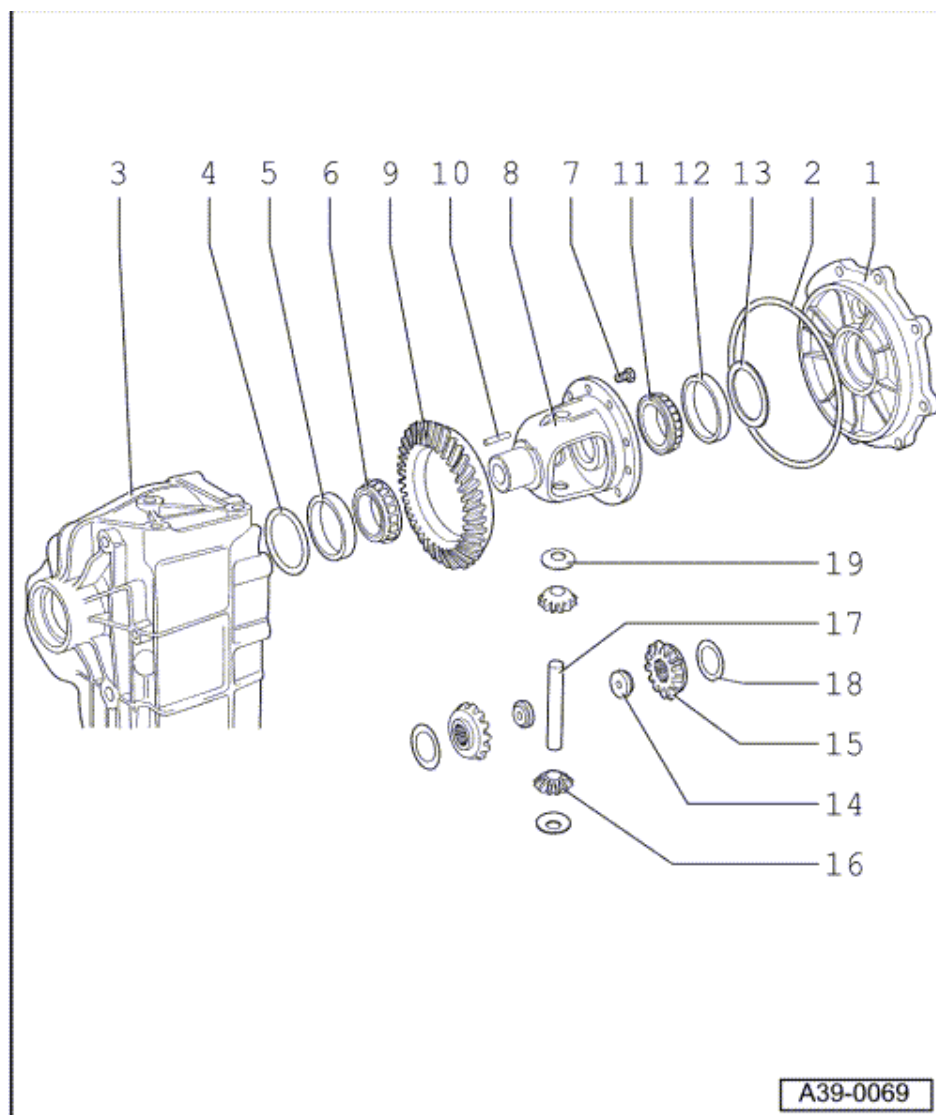
10 Spring pin

- ◆ For securing planet pinion axis shaft
- ◆ Drive in flush

11 Inner race for large taper roller bearing 1)

- ◆ Pulling off
=> Fig. 149
- ◆ Pressing on
=> Fig. 150

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12 Outer race for large taper roller bearing 1)

- ♦ Driving out
=> Fig. 150
- ♦ Pressing in
=> Fig. 151

13 Shim "S1"

- ♦ Note thickness
- ♦ Adjustment overview
=> Page 169

14 Threaded piece

15 Sun wheel

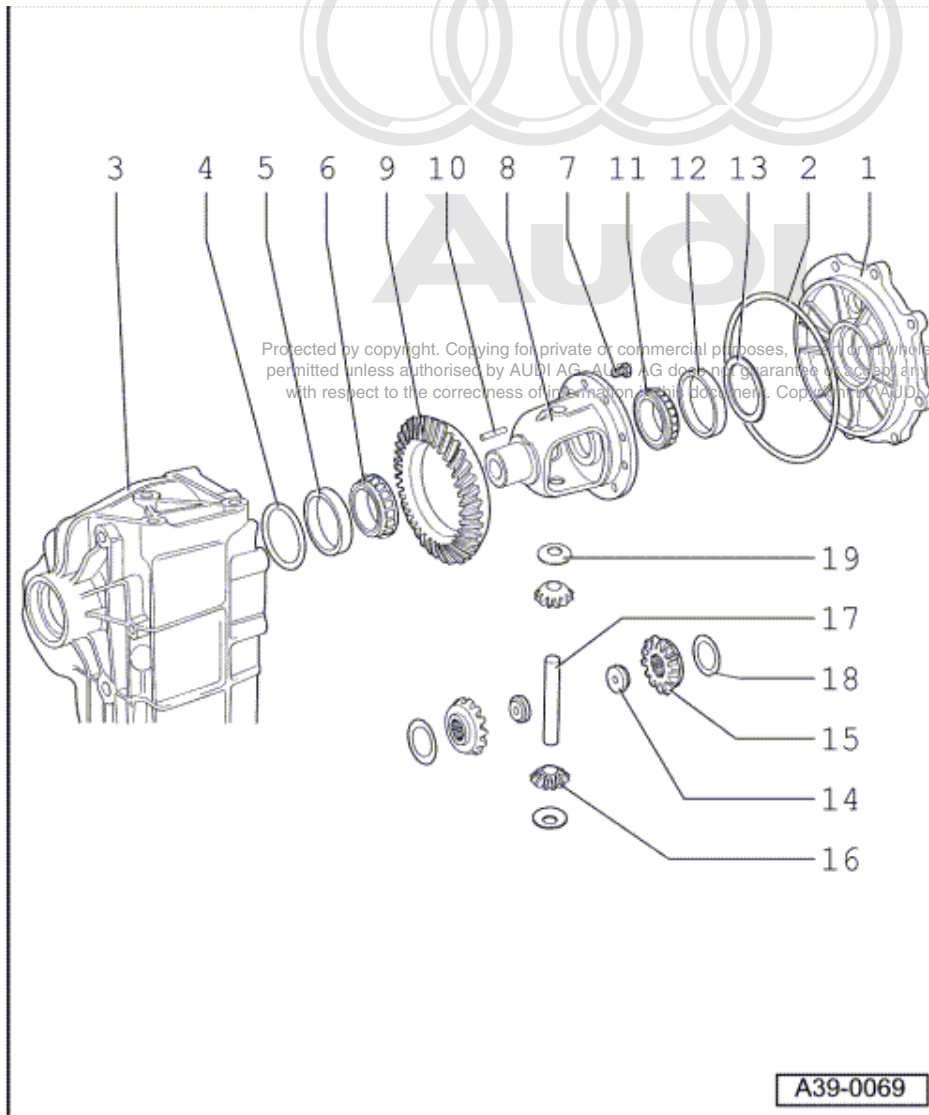
- ♦ Installing
=> Fig. 152
- ♦ Adjusting
=> Fig. 152

16 Planet pinion

- ♦ Installing
=> Fig. 152



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17 Planet pinion axis shaft

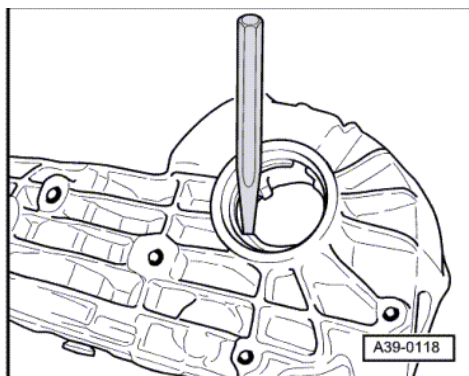
- ◆ Knock out with drift
- ◆ Drive in carefully so that the thrust washers are not damaged
- ◆ Secure with spring pin -item **10** -

18 Shim

- ◆ Re-determining thickness
=> Fig. **152**

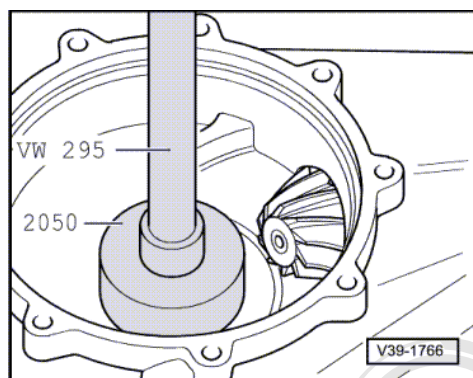
19 Thrust washer

- ◆ Check for cracks.

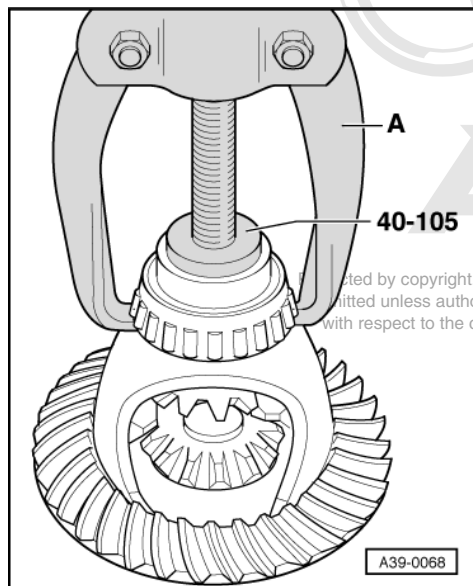


-> Fig.1 Knocking outer race of small taper roller bearing out of housing

- After removing check shims for damage.

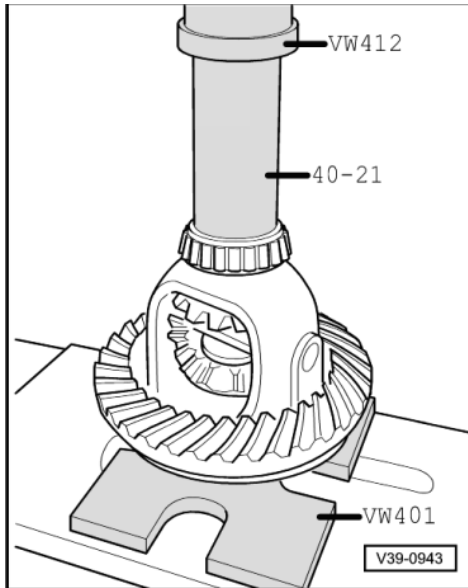


-> Fig.2 Pressing outer race of small taper roller bearing into housing (press against stop)



-> Fig.3 Pulling off inner race for small taper roller bearing

A - Two arm puller, e.g. Kukko 44/2

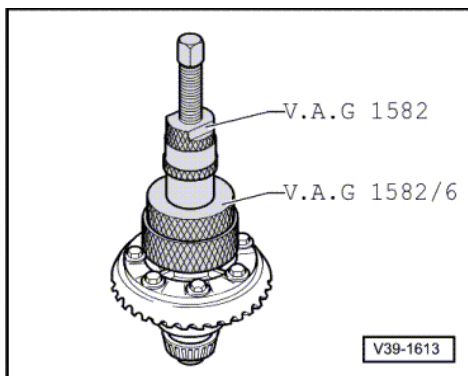


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-> Fig.4 Pressing on inner race for small taper roller bearing

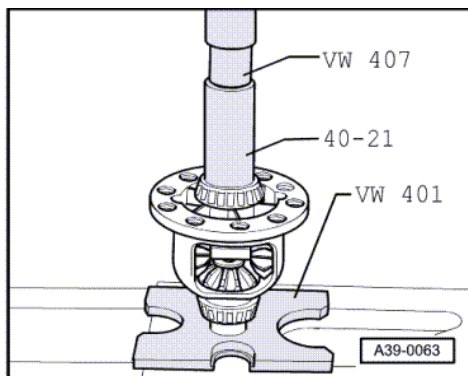
Caution
Wear protective gloves.

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



-> Fig.5 Pulling off inner race for large taper roller bearing

- Before fitting the extractor position press piece 40-105 on differential housing.

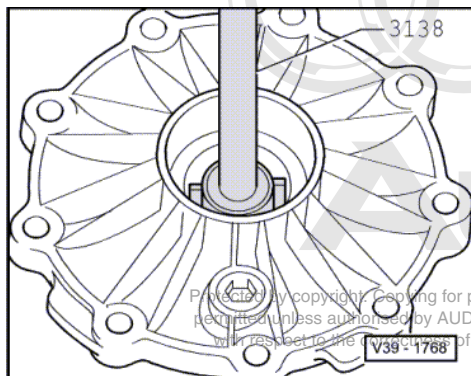




-> Fig.6 Pressing on inner race for large taper roller bearing

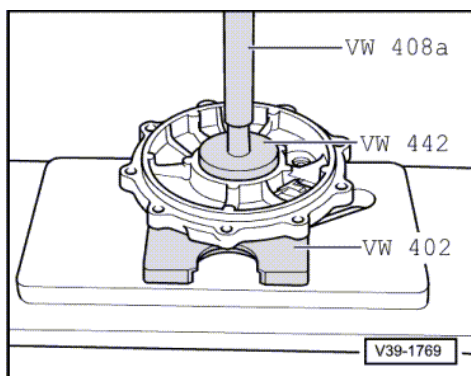
Caution
Wear protective gloves.

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

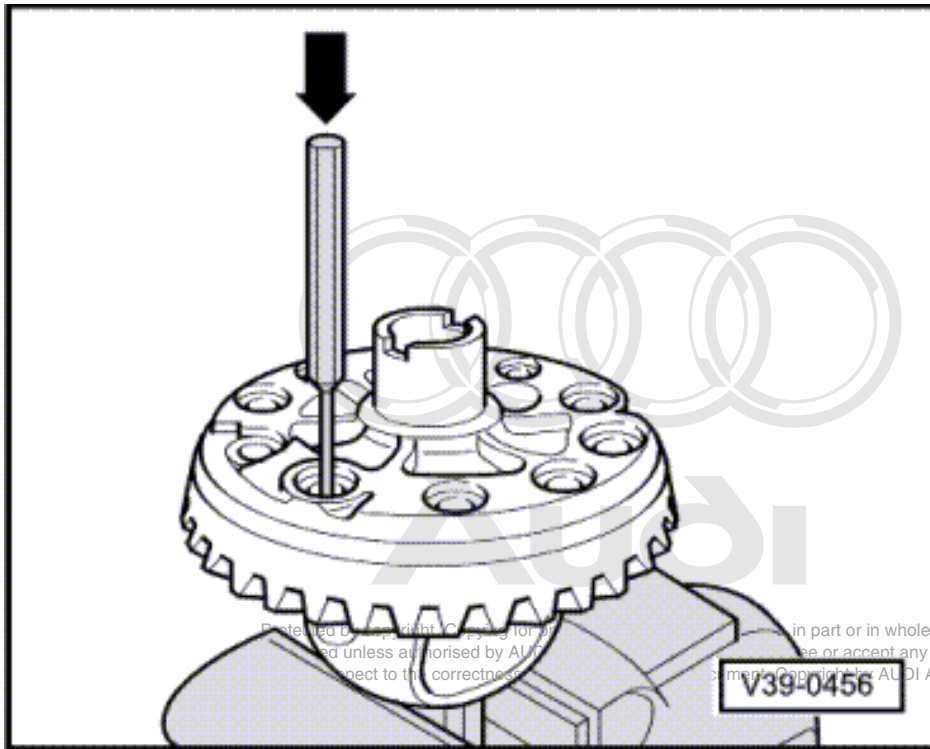


-> Fig.7 Driving outer race for large taper roller bearing out of cover

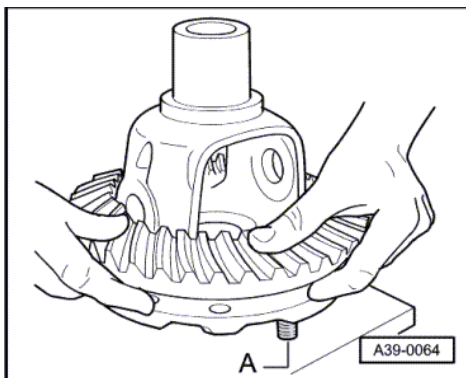
- After removing check shims for damage.



-> Fig.8 Pressing outer race for large taper roller bearing into cover



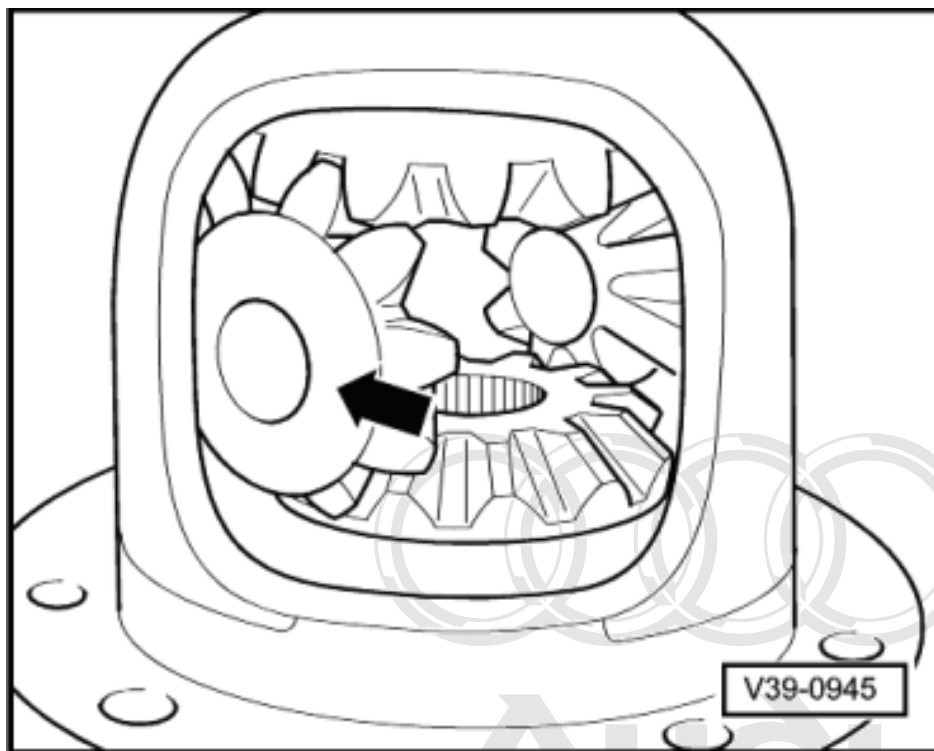
-> Fig.9 Driving crown wheel off housing



-> Fig.10 Installing crown wheel

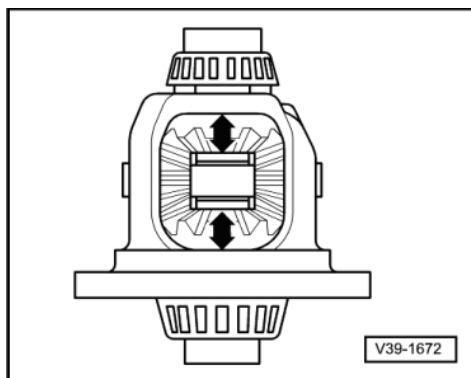
Caution
Wear protective gloves.

- Use 2 centring pins -A- (local manufacture) as a guide.
- Heat crown wheel to approx. 100 °C and install.



-> Fig.11 Installing sun wheels and planet pinions

- If the sun wheels have been renewed, measure and select new shims => Fig. 12.
- Insert sun wheels with the measured shims.
- Install planet pinions spaced 180° apart, and rotate into position -arrow-.
- Fit and align thrust washers.
- Insert threaded pieces.
- Drive planet pinion shaft into final position and secure.



-> Fig.12 Adjusting differential bevel gears

- Insert sun wheels with thinnest shims (0.5 mm).
- Insert planet pinions with thrust washers spaced 180° apart.

Note:

Do not now interchange bevel gears and thrust washers.

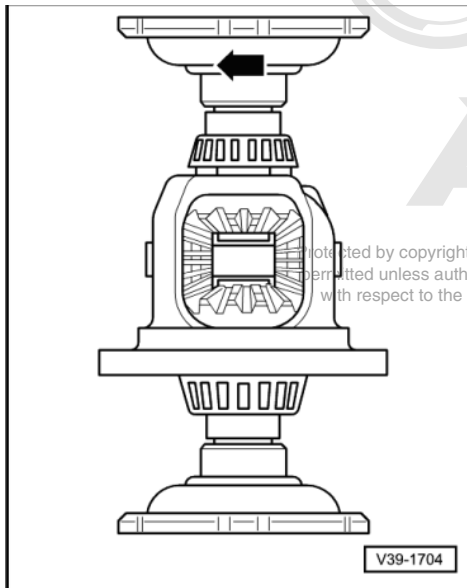
- Drive in planet pinion axis shaft.
- Press planet pinions outwards.
- Press sun wheels in direction indicated (arrows), and check the amount of play.
- Determine the thickest shims for the sun wheels (on each side) which can still just be inserted.

- The shims should be the same thickness for both sides
- Identify shims according to the table.
Part numbers.

=> Parts catalogue

The following shims are available:

Shim thickness (mm)		
0.50	0.70	0.90
0.60	0.80	1.00



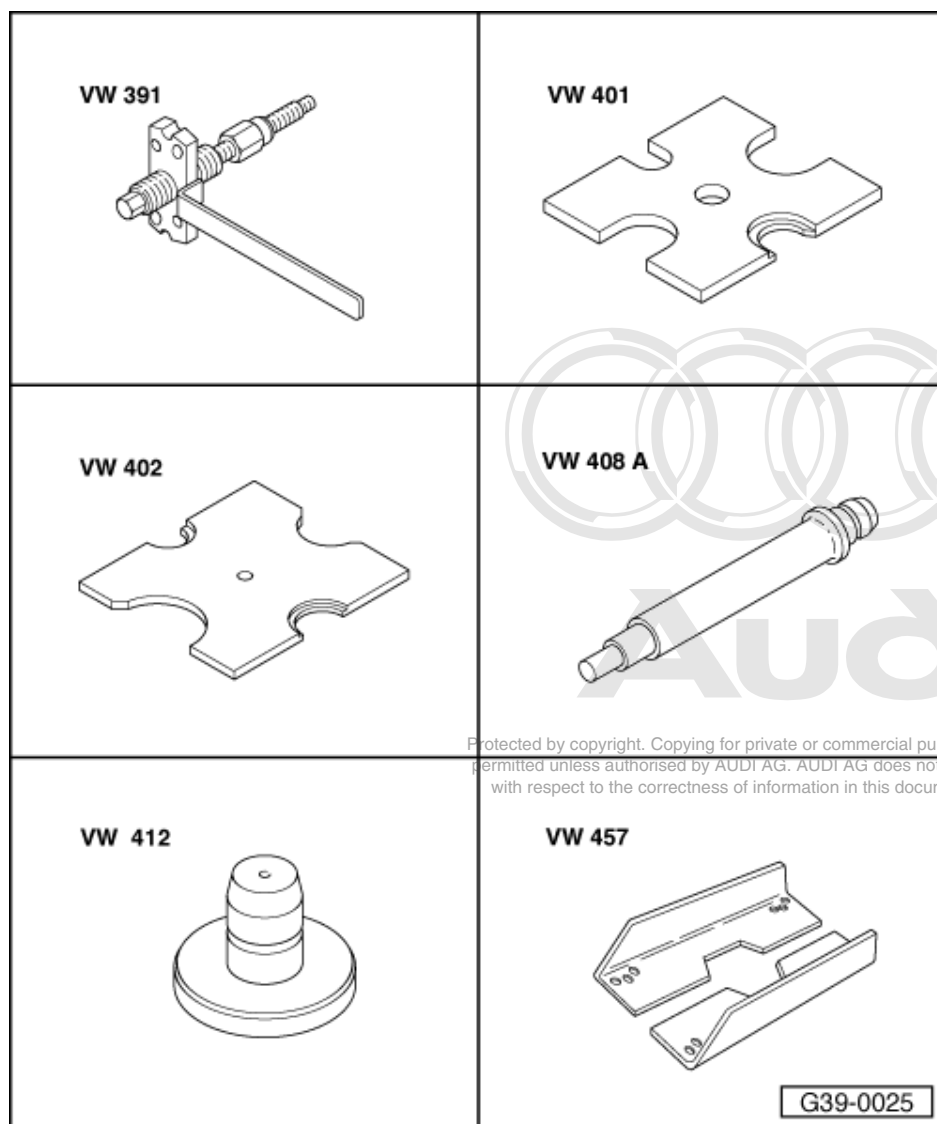
Note:

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



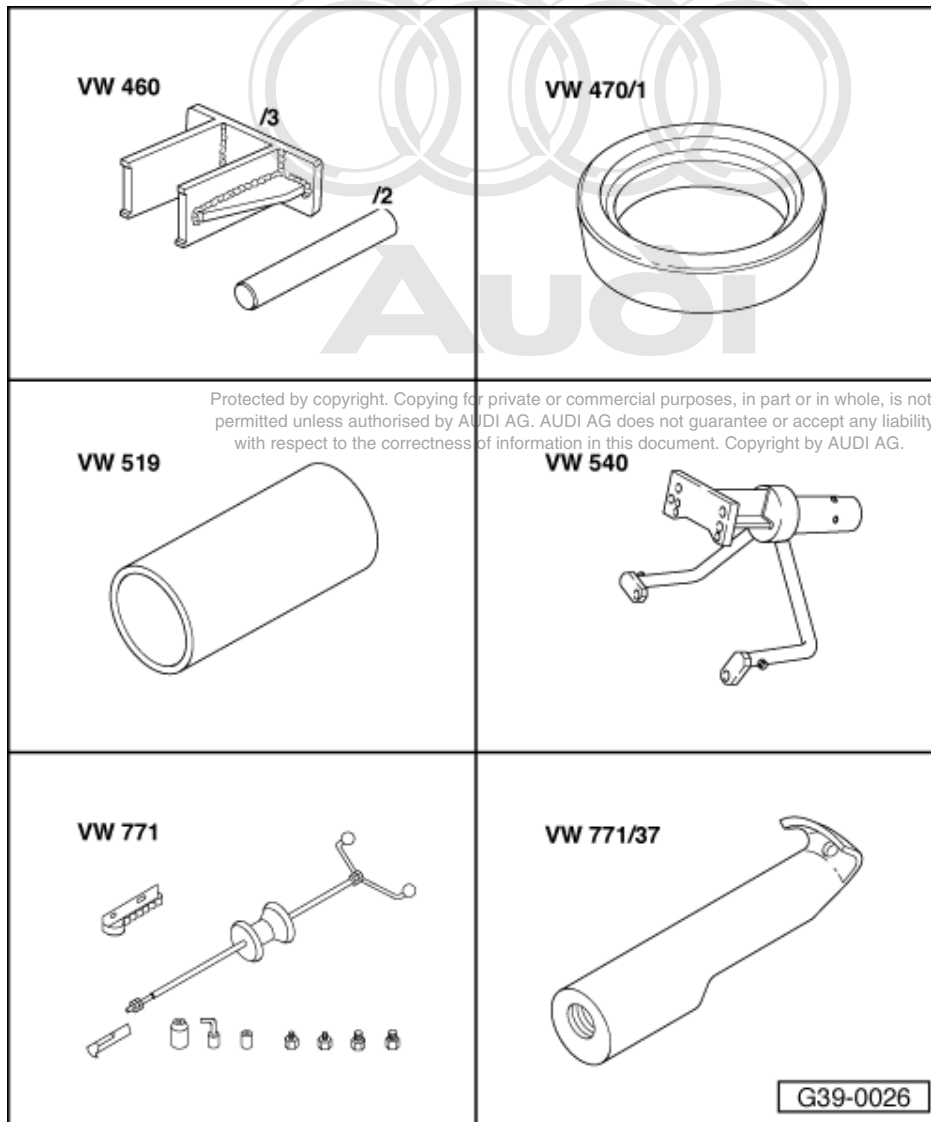
13 - Removing, installing, dismantling and assembling drive pinion

13.1 - Removing, installing, dismantling and assembling drive pinion

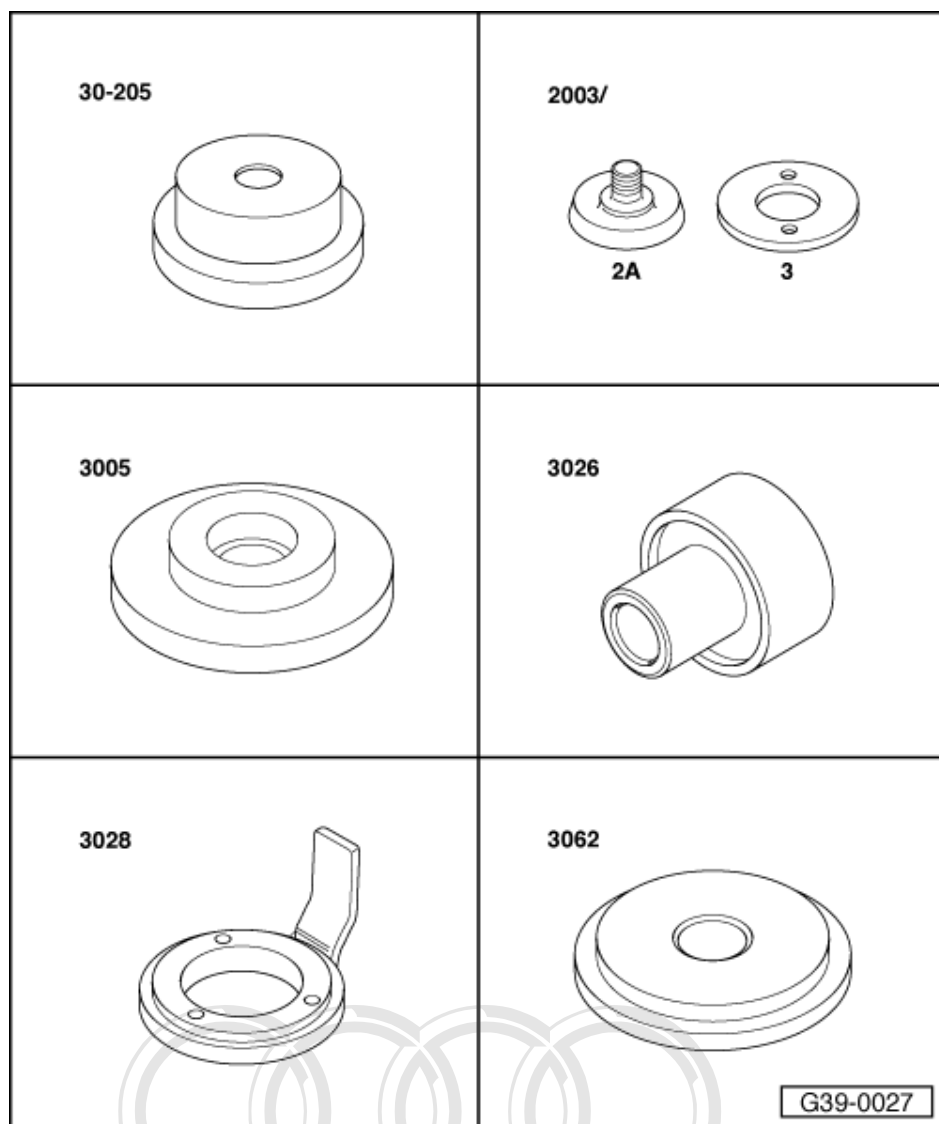


Special tools and workshop equipment required

- ♦ Special tool VW 391
- ♦ Special tool VW 401
- ♦ Special tool VW 402
- ♦ Special tool VW 408 A
- ♦ Special tool VW 412
- ♦ Special tool VW 457

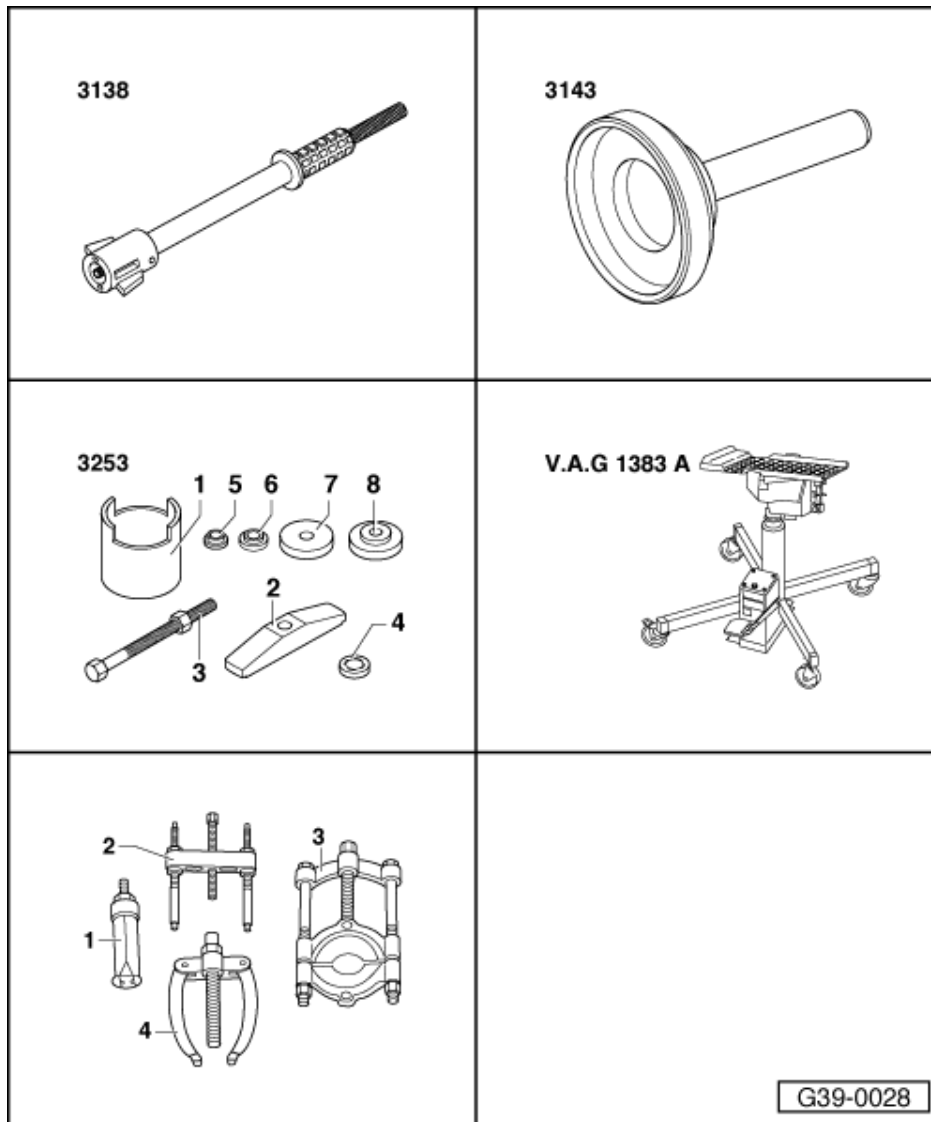


- ◆ Special tool VW 460/2
- ◆ Special tool VW 470/1
- ◆ Special tool VW 519
- ◆ Special tool VW 540
- ◆ Special tool VW 771
- ◆ Special tool VW 771/37



- ◆ Special tool 30-205
- ◆ Special tool 2003/3
- ◆ Special tool 3005
- ◆ Special tool 3026
- ◆ Special tool 3028
- ◆ Special tool 3062

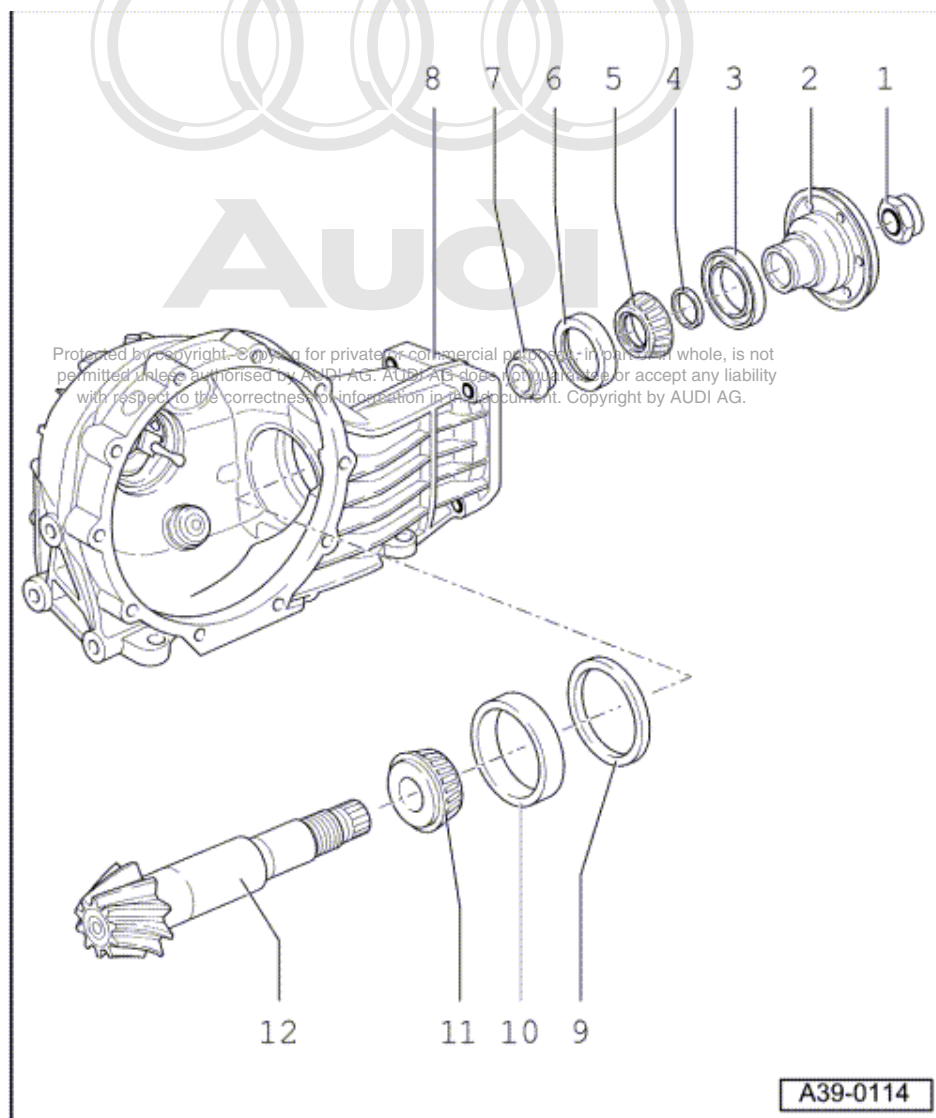
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- ◆ Special tool 3138
- ◆ Special tool 3143
- ◆ Special tool 3253 with 3253/3 and 3253/4
- ◆ V.A.G 1383 A
- ◆ Kukko 17/2
- ◆ Kukko 21/7
- ◆ Kukko 22/2
- ◆ Torque gauge 0 ... 600 Ncm
- ◆ Long socket (36 mm A/F)

Notes:

- ◆ Repair instructions => Page **5**.
- ◆ Secure final drive on repair stand => Page 39-76.
- ◆ Replace both taper roller bearings together. Use same make if possible.
- ◆ Do not additionally oil new taper roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.
- ◆ Removing differential => Page **135**.
- ◆ Adjustments are required when replacing components marked 1)
=>Adjustment overview Page **169**.



1 Nut

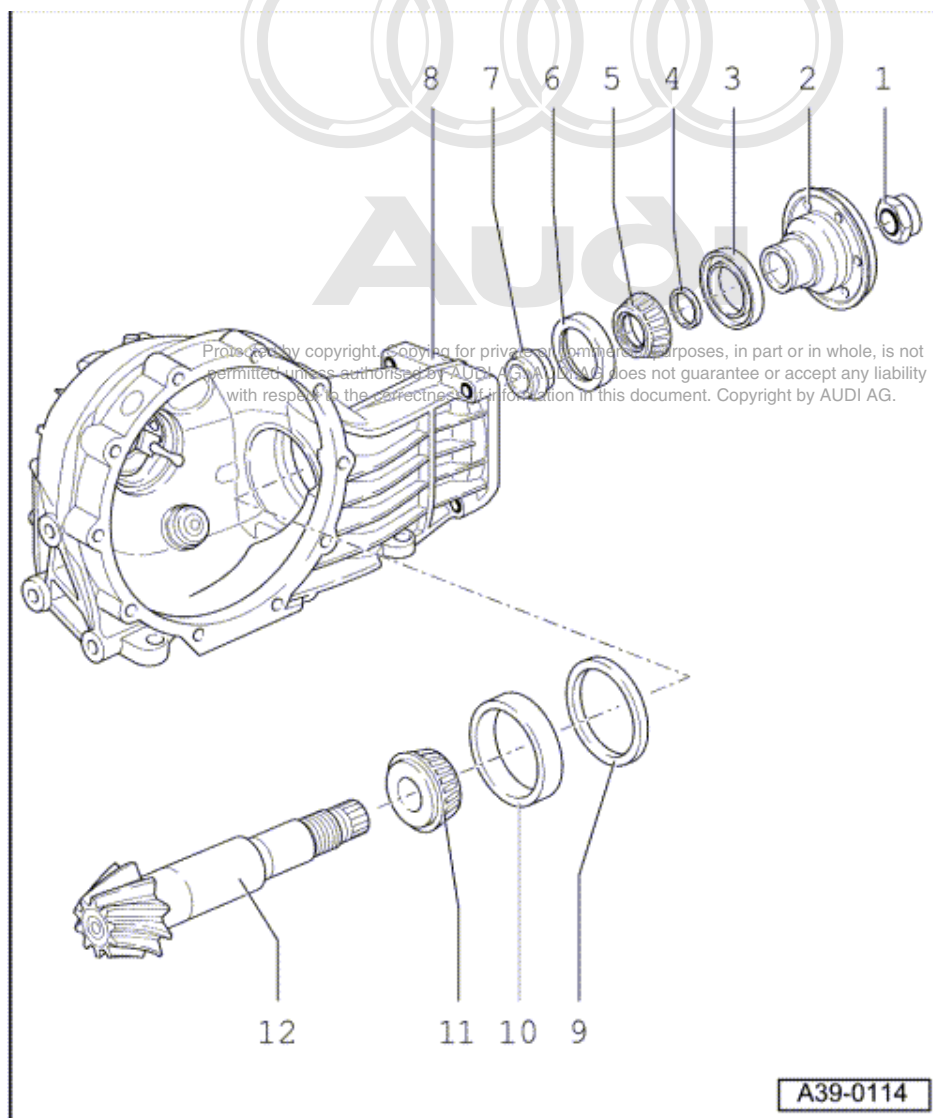
- ◆ Removing
=> Fig. 161
- ◆ Installing
=> Fig. 165
- ◆ Measuring friction torque
=> Fig. 166
- ◆ Securing
=> Fig. 166

2 Flange for propshaft

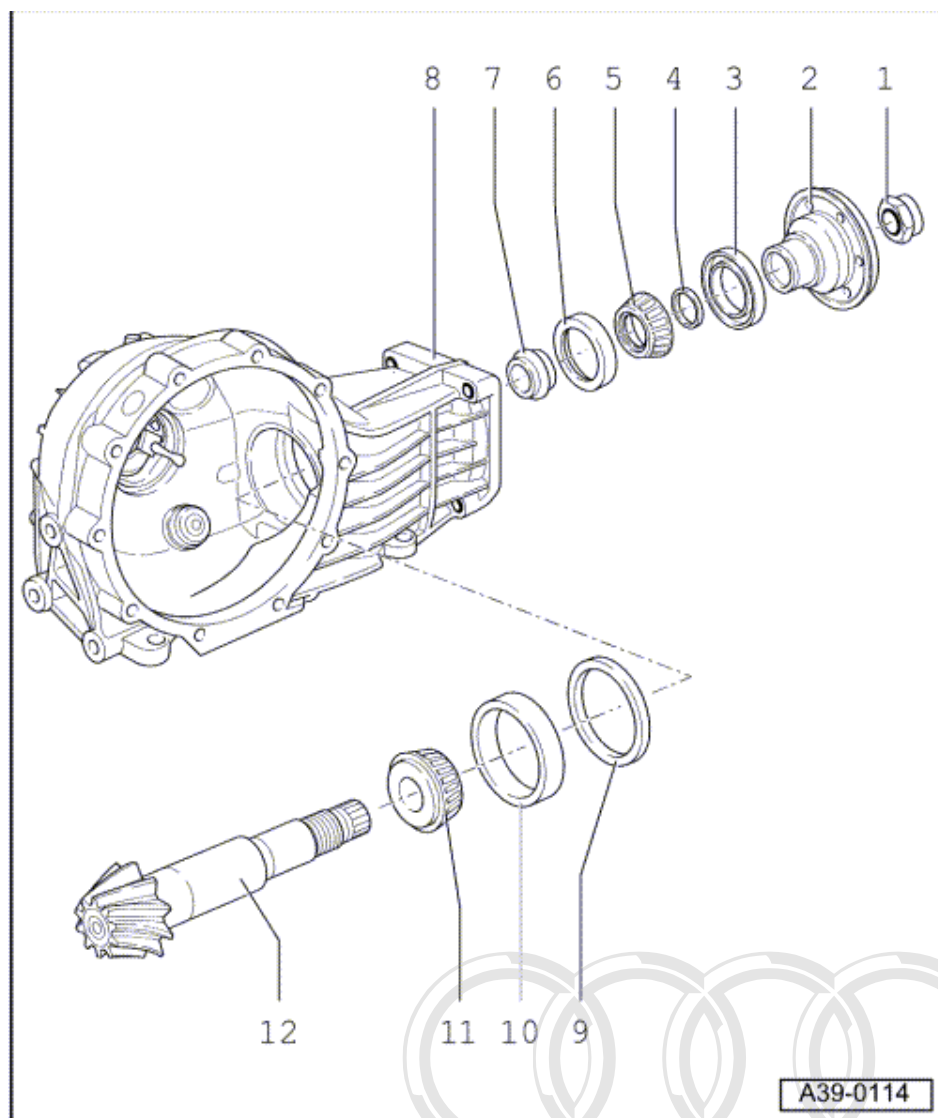
- ◆ Removing
=> Fig. 161
- ◆ Installing
=> Fig. 165

3 Oil seal

- ◆ Removing
=> Fig., Page 162
- ◆ Driving in
=> Fig. 165



- 4 O-ring
 - ♦ Renew
 - ♦ Lubricate with gear oil when installing => Fig. 164
- 5 Inner race for small taper roller bearing 1)
 - ♦ Pressing out drive pinion
=> Fig. 162
 - ♦ Pressing on
=> Fig. 164
- 6 Outer race for small taper roller bearing 1)
 - ♦ Pulling out
=> Fig. 162
 - ♦ Pressing in
=> Fig. 164
- 7 Spacer sleeve 1)
 - ♦ Renew



8 Final drive housing 1)

9 Shim "S3"

- ♦ Note thickness
- ♦ Adjustment overview
=> Page 169

10 Outer race for large taper roller bearing 1)

- ♦ Driving out
=> Fig. 162
- ♦ Pulling in
=> Fig. 163

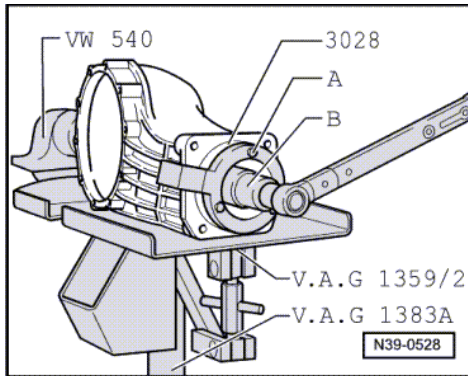
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11 Inner race for large taper roller bearing 1)

- ♦ Pulling off
=> Fig. 163
- ♦ Pressing on
=> Fig. 163

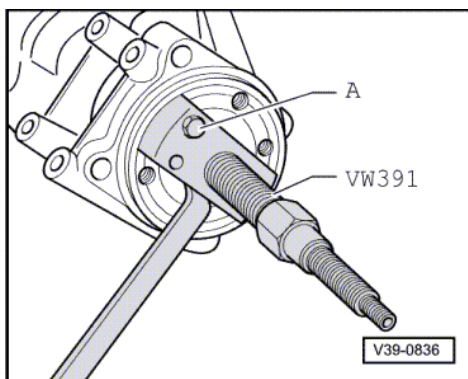
12 Drive pinion 1)

- ♦ Is mated with crown wheel, always renew together as a set



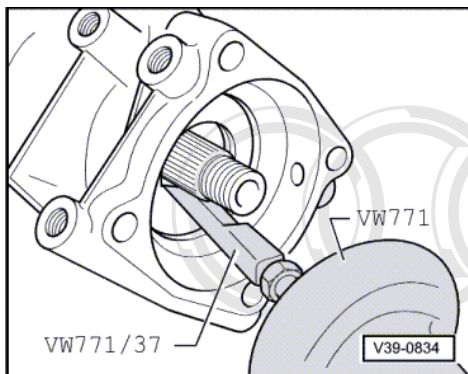
-> Fig.1 Removing nut for drive pinion

- Screw in two M8 x 30 hexagon bolts -A-.
- B - Socket attachment (long) 36 mm A/F
- The final drive must be supported when loosening the nut (e.g. using universal support V.A.G 1359/2 in combination with gearbox jack V.A.G 1383 A).



-> Fig.2 Pulling flange for propshaft off drive pinion

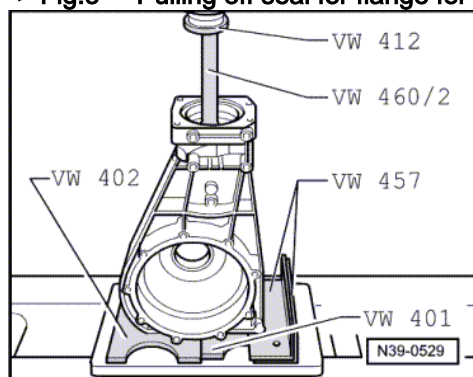
- Screw two M8 x 30 hexagon bolts -A- into the flange.



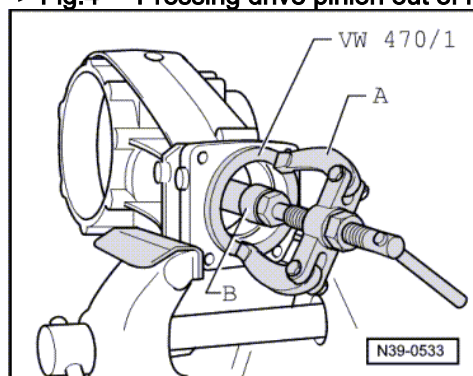
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-> Fig.3 Pulling off seal for flange for propshaft

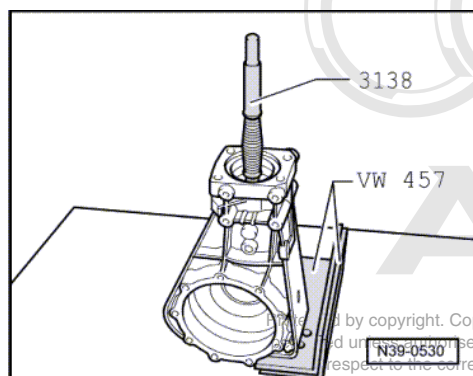


-> Fig.4 Pressing drive pinion out of inner race for small taper roller bearing



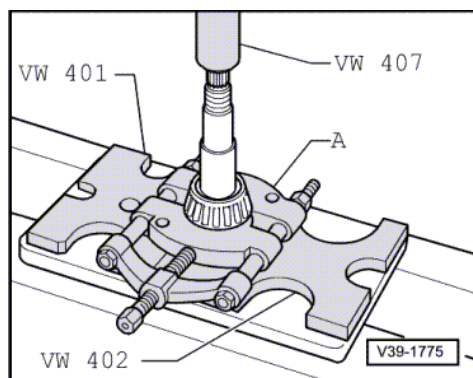
-> Fig.5 Pulling out outer race for small taper roller bearing

- A - Counter support e.g. Kukko 22/2
- B - Internal puller 46 ... 58 mm, e.g. Kukko 21/7



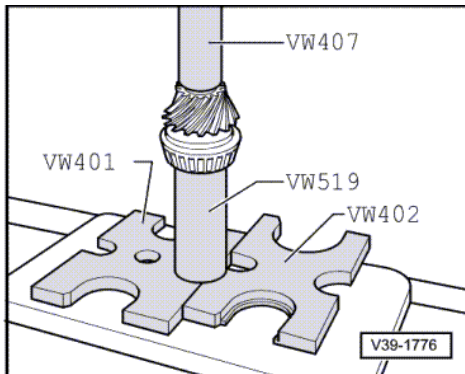
-> Fig.6 Driving out outer race for large taper roller bearing

- After removing check shims for damage.



-> Fig.7 Pressing inner race for large taper roller bearing off drive pinion

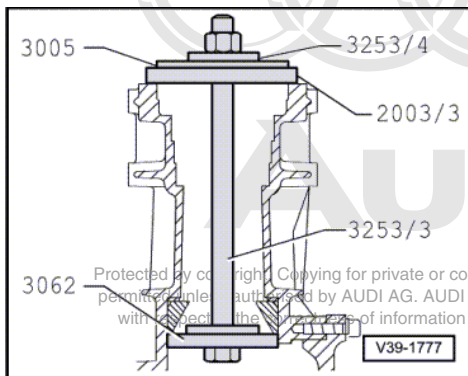
A - Separating device 22 ... 115 mm, e.g. Kukko 17/2



-> Fig.8 Pressing inner race for large taper roller bearing onto drive pinion

Caution
Wear protective gloves.

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

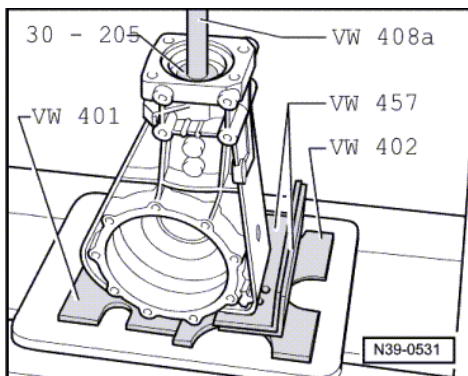


-> Fig.9 Pulling in outer race for large taper roller bearing

- Insert predetermined shim "S3" for drive pinion => Page 173 .

Note:

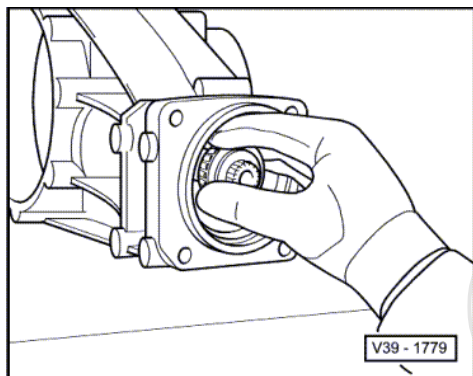
Inscription "Oben" faces the nut of the puller with thrust washer 3253/4.





-> Fig.10 Pressing in outer race for small taper roller bearing

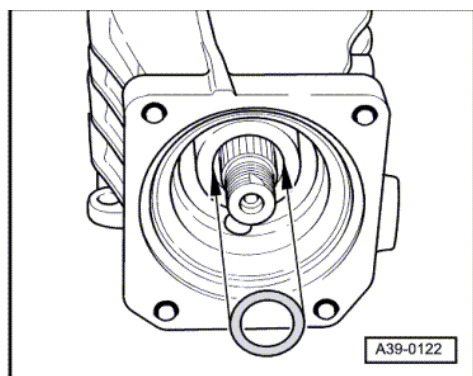
- Lubricate outer race with oil and fit using press tool VW 408 A and thrust plate 30-205.



-> Fig.11 Pressing on small taper roller bearing inner race

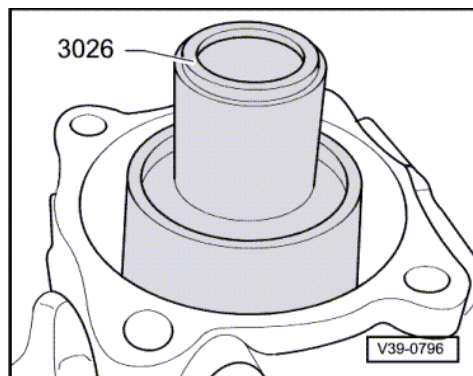
Caution
Wear protective gloves.

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- Insert drive pinion with new **spacer sleeve**.
 - Heat inner race for small taper roller bearing to approx. 100 °C and fit onto drive pinion.
 - Press up drive pinion and insert bearing with thrust plate 40-21 onto stop.



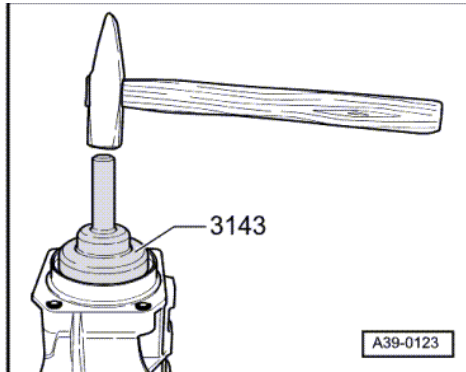
-> Fig.12 Installing O-ring

- Lightly oil O-ring before installing.



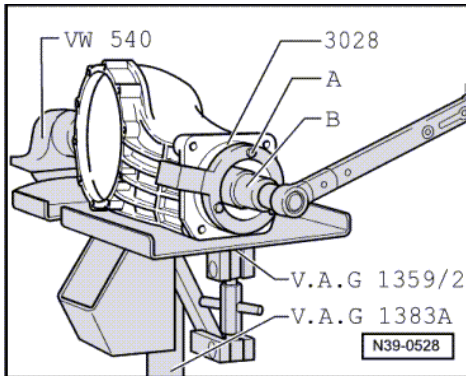
-> **Fig.13 Driving in seal for flange for propshaft**

- Moisten outer circumference of seal with gear oil.
- Fill space between sealing lip and dust lip with multipurpose grease.
- Drive in oil seal for propshaft flange onto stop with drift 3026.



-> **Fig.14 Installing flange**

- Knock flange for propshaft onto drive pinion until the nut can be fitted.

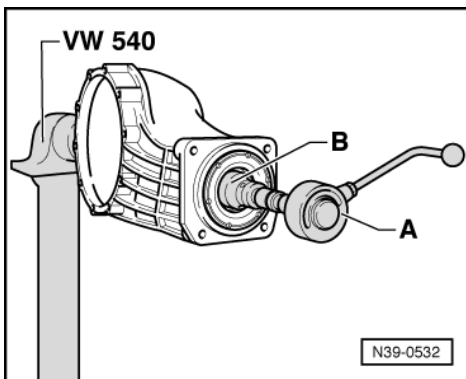


-> **Fig.15 Tightening nut for drive pinion and measuring friction torque**

- Screw in two M8 x 30 hexagon bolts -A-.
- B - Socket attachment (long) 36 mm A/F
- The final drive must be supported when tightening the nut (e.g. using universal support V.A.G 1359/2 together with gearbox jack V.A.G 1383 A).

Note:

Increase tightening torque slowly and check friction torque at regular intervals, if the specified friction torque is exceeded, the spacer sleeve must be renewed and the adjustment repeated. A spacer sleeve which has been compressed too much cannot be reused.





-> Fig.16 Measuring friction torque

- A - Torque gauge, commercially available, 0 ... 600 Ncm
- B - Socket attachment, 36 mm A/F

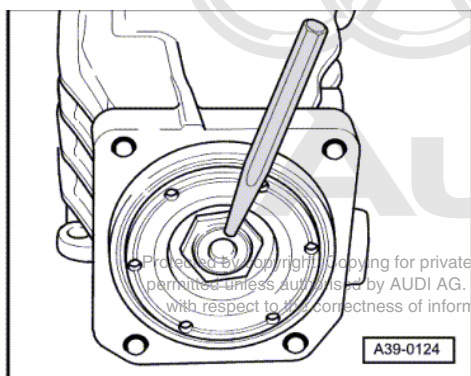
Note:

Use 3/4 " / 1/2 " adapter if necessary.

- The following friction torques should be set:

New bearings	Used bearings ¹⁾
200 ... 250 Ncm	30 ... 60 Ncm

- 1) run at least 50 km (30 miles)



-> Fig.17 Securing drive pinion nut

- Peen drive pinion nut with a punch.
- Then measure radial run-out on flange for propshaft and mark => Page 131 .

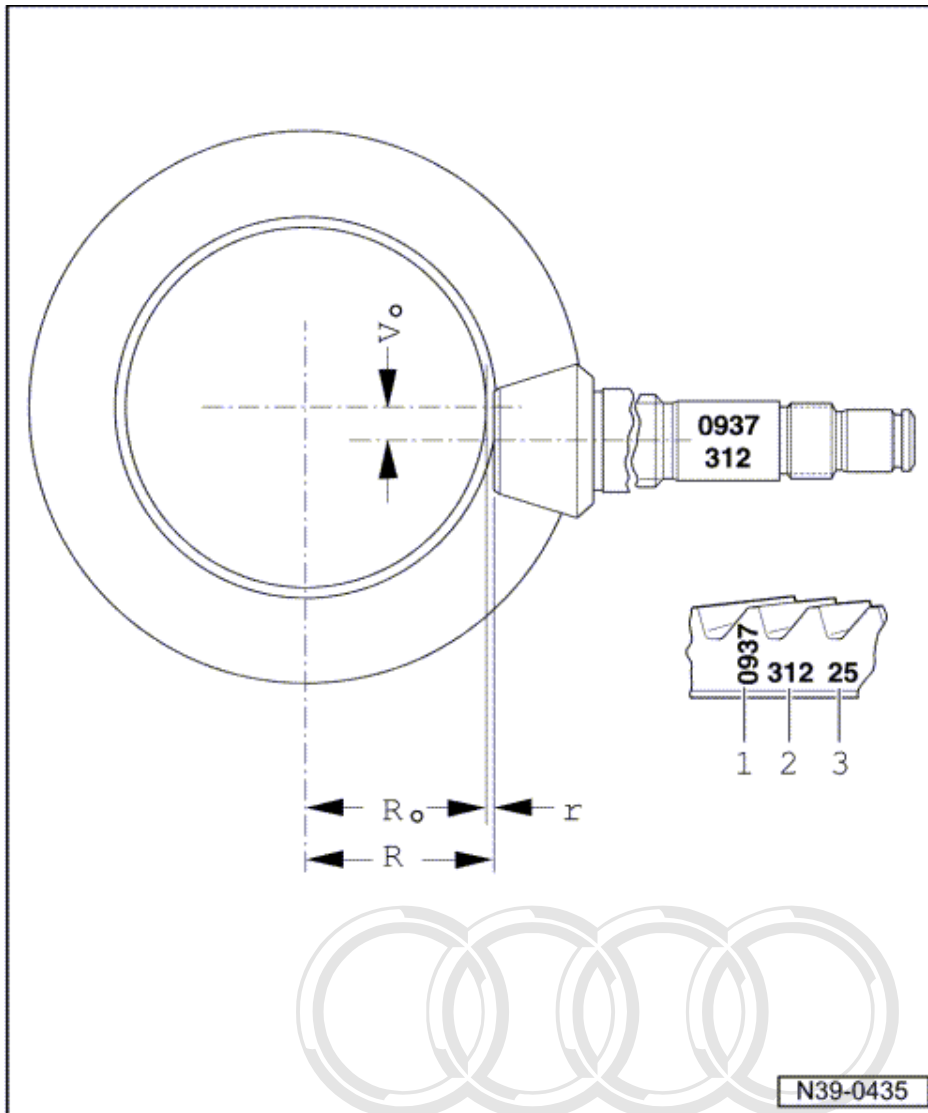
14 - Adjusting drive pinion and crown wheel

14.1 - Adjusting drive pinion and crown wheel

General notes:

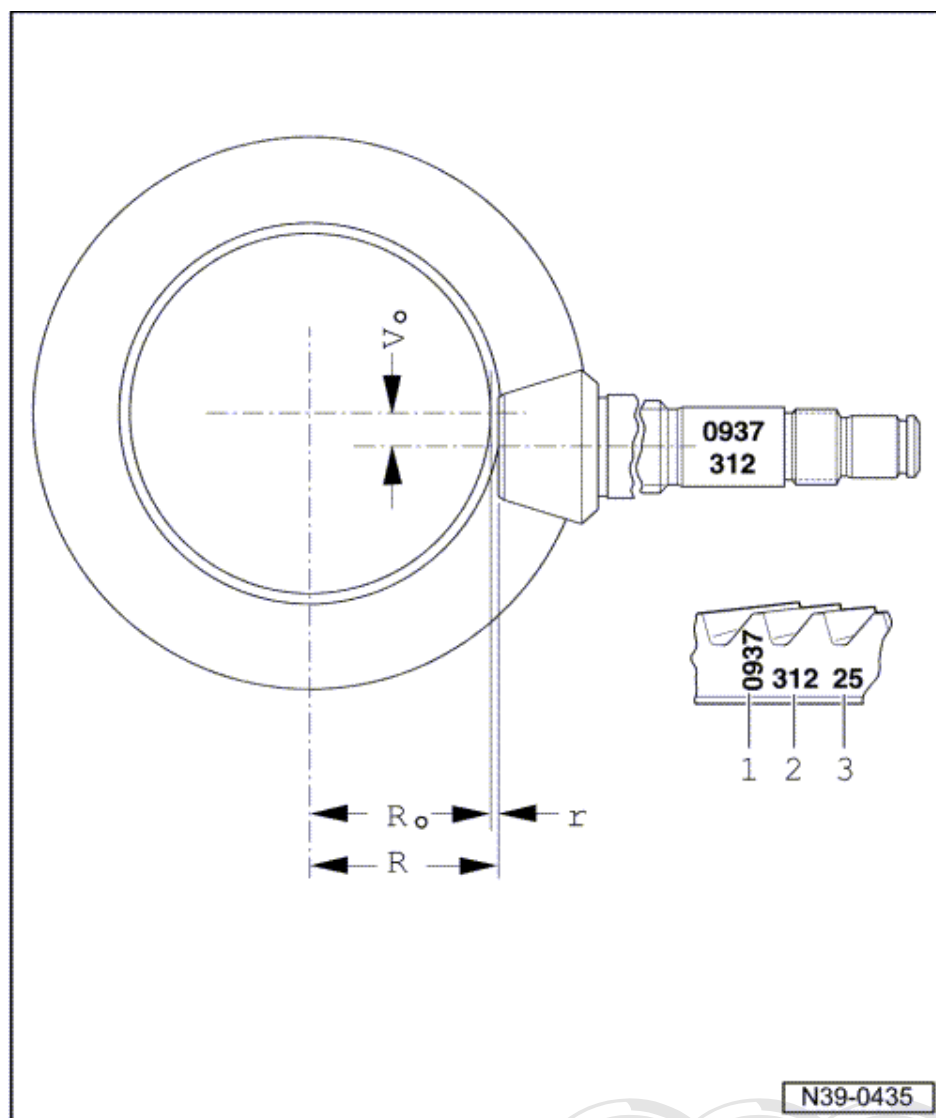
- ♦ Careful adjustment of the drive pinion and crown wheel is important for the service life and smooth running of the final drive. For this reason, the drive pinion and crown wheel are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions of rotation. The position of quietest running is found by moving the drive pinion in an axial direction and at the same time lifting the crown wheel out of the zero-play mesh position by the amount necessary to maintain the backlash within the specified tolerance.
- ♦ The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.
- ♦ The deviation (tolerance) "r", which is related to the master gauge "Ro", is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the crown wheel. The final drive set (drive pinion and crown wheel) may only be replaced together as a matched pair.
- ♦ Observe the general repair instructions for taper roller bearings and shims.
- ♦ Maximum care and cleanliness are essential for achieving good results when performing repairs and taking measurements.

14.2 - Adjusting and marking of gear sets



- 1 Identification "0937" signifies Oerlikon gear set with a ratio of 37:9.
- 2 Gear set pairing number (312).
- 3 Deviation (tolerance) "r" is based on the test machine master gauge used in the production. The deviation "r" is always given in 1/100 mm. Example: "25" signifies $r = 0.25 \text{ mm}$

Ro - Length of master gauge used for test machine "Ro".
Ro - Crown wheel = 57.50 mm



R - Actual distance between centre axis of crown wheel and face of drive pinion at point with quietest running for this gear set.
 $R = R_0 + r$

Vo - Hypoid offset

14.3 - Recommended sequence for readjusting final drive set

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

- 1.) Determine total shim thickness "Stotal" for "S1" + "S2" for the specified preload for taper roller bearings for differential.
- 2.) Determine total shim thickness "S3" to reproduce the installation position for the drive pinion determined on the test machine in production.
- 3.) Distribute total shim thickness "Stotal" for "S1" + "S2" so that the specified backlash exists between crown wheel and drive pinion.

Note:

Overview of components and shims =>Page 170 .

14.4 - Adjustment overview

Note:

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

Part renewed: ▼	to be adjusted:		
	Crown wheel "S1"+"S2" 1) => Page 179	Drive pinion "S3" 1) via deviation "r" => Page 173	Check backlash => Page 182
Final drive housing	X	X	X
Differential housing	X		X
Taper roller bearing for drive pinion		X	X
Taper roller bearing for differential	X		X
Final drive set 2)	X	X	X
Cover for final drive	X		X

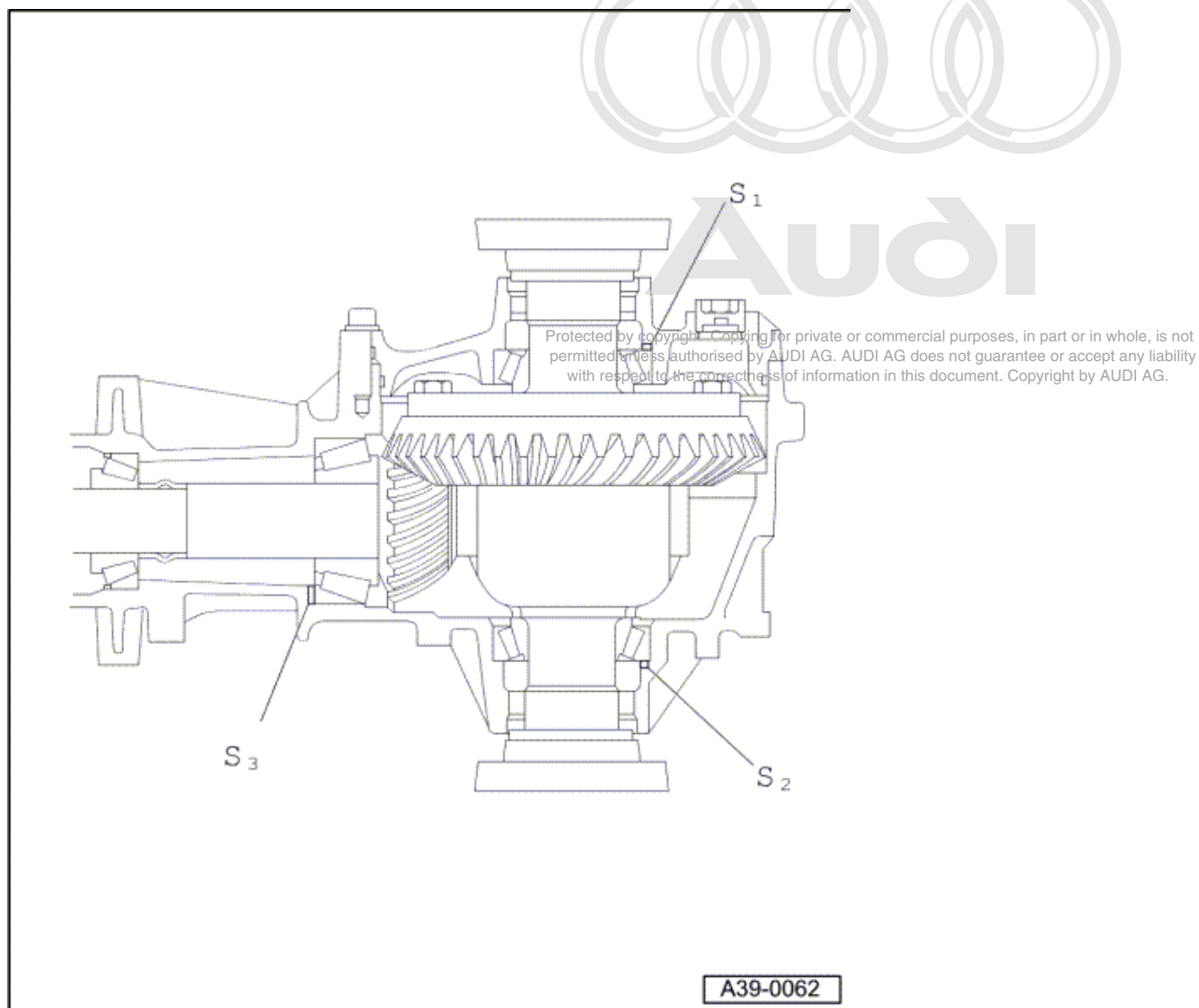
- 1) Shims; installation position => Page 170 .
- 2) Drive pinion and crown wheel; only renew together.



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14.5 - Position of shims

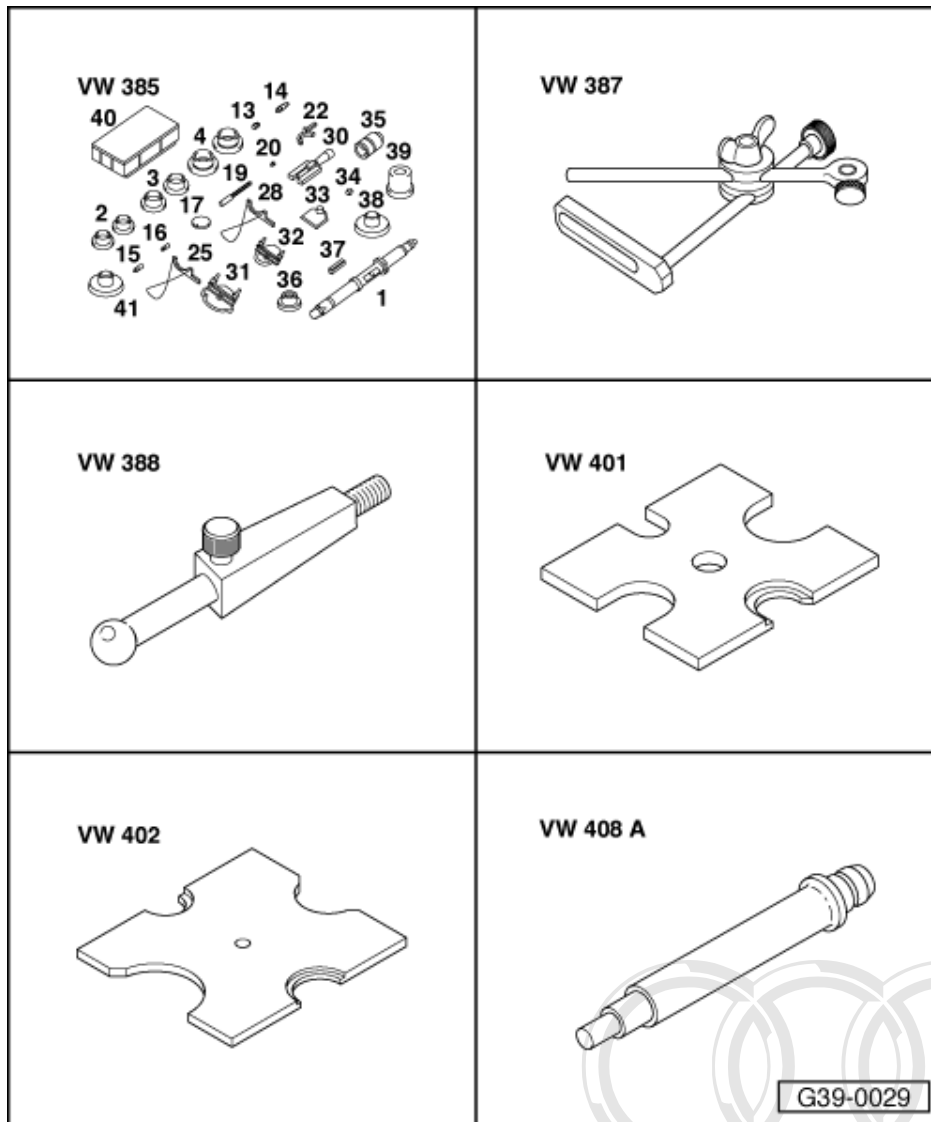


Note:

Adjustment overview when renewing individual components of final drive

=>Page **169**.

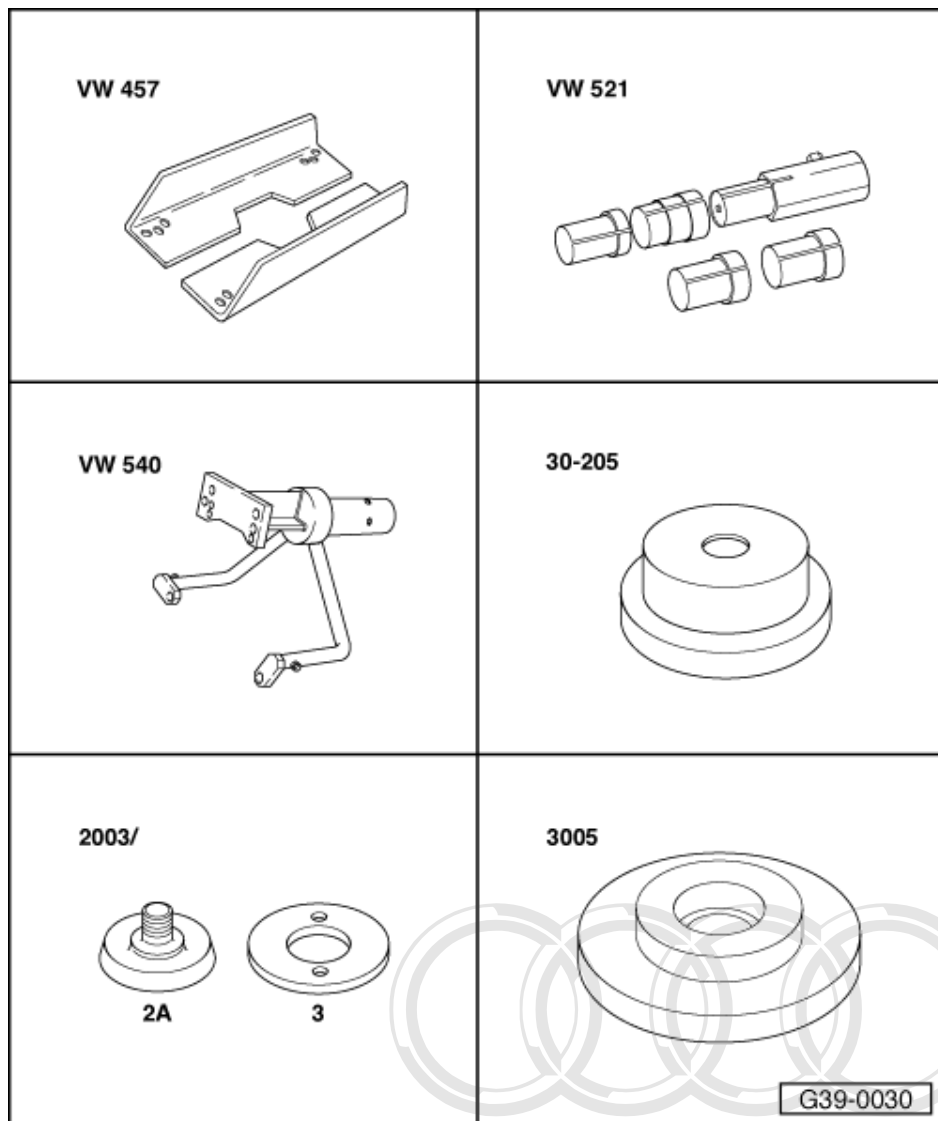
- S1 - Adjustment shim for crown wheel in cover for final drive**
- S2 - Adjustment shim for crown wheel in final drive housing**
- S3 - Adjustment shim for drive pinion in final drive housing**



Special tools and workshop equipment required

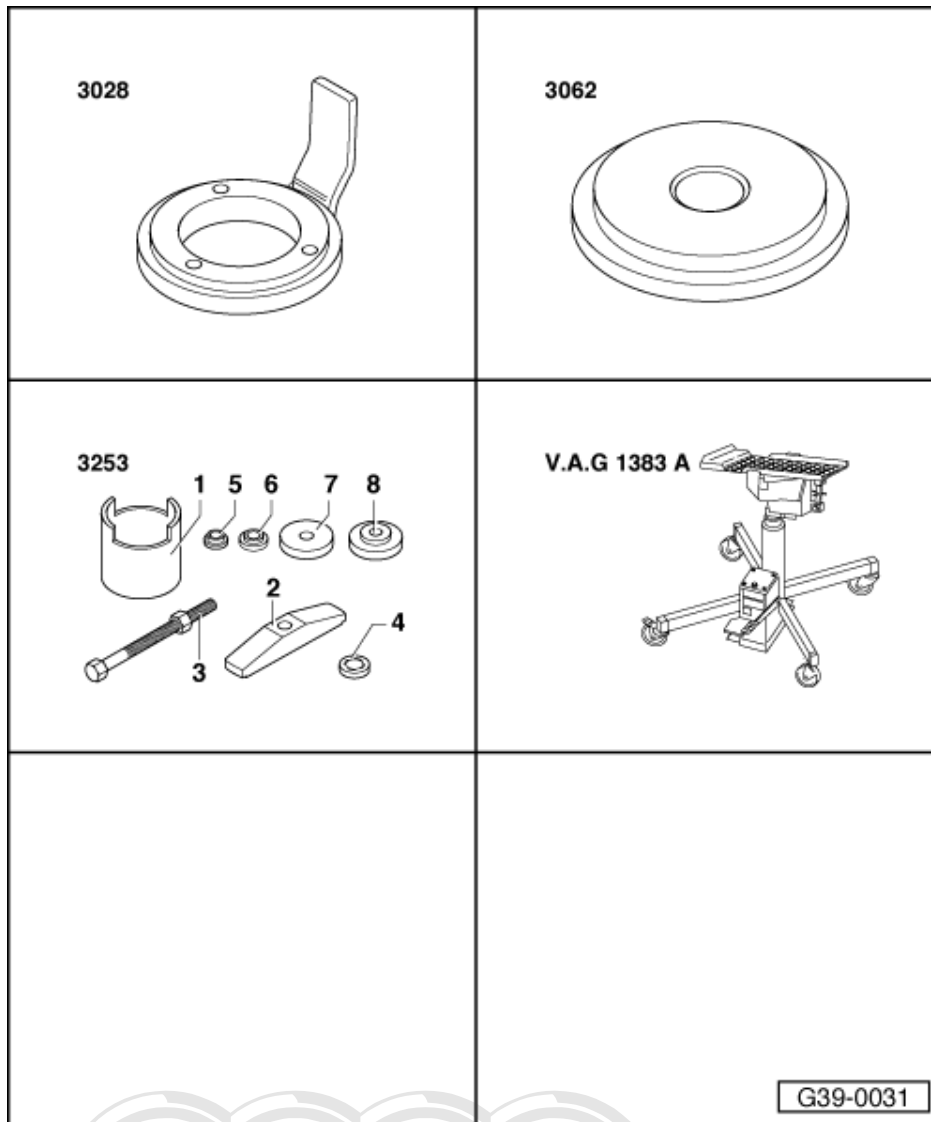
- ◆ Special tool VW 385
- ◆ Special tool VW 387
- ◆ Special tool VW 388
- ◆ Special tool VW 401
- ◆ Special tool VW 402
- ◆ Special tool VW 408 A

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- ◆ Special tool VW 457
- ◆ Special tool VW 521/4 and 521/8
- ◆ Special tool VW 540
- ◆ Special tool VW 30-205
- ◆ Special tool VW 2003/3
- ◆ Special tool VW 3005

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- ◆ Special tool 3028
- ◆ Special tool 3062
- ◆ Special tool 3253 with 3253/3 and 3253/4
- ◆ V.A.G 1383 A
- ◆ Dial gauge extension 30 mm
- ◆ Dial gauge
- ◆ Torque gauge 0 ... 600 Ncm

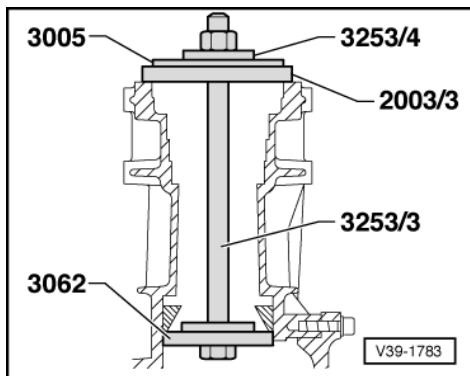
14.6 - Adjusting drive pinion

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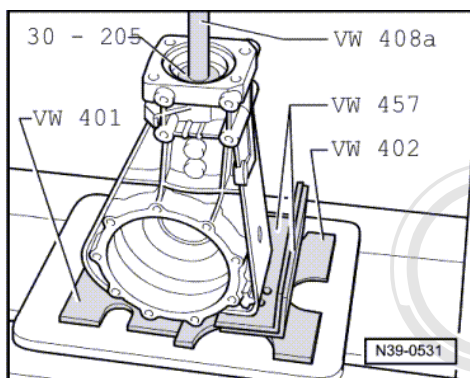
- ◆ Before adjusting drive pinion, adjust crown wheel (determine total shim thickness "Stotal" for shims "S1" + "S2") => Page **179**.
- ◆ The drive pinion only has to be readjusted if the final drive set (crown wheel and drive pinion), the taper roller bearings for the drive pinion or the final drive housing are renewed. Adjustment overview => Page **169**.
- ◆ Do not additionally oil new taper roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.

**Determine thickness of shim "S3"**

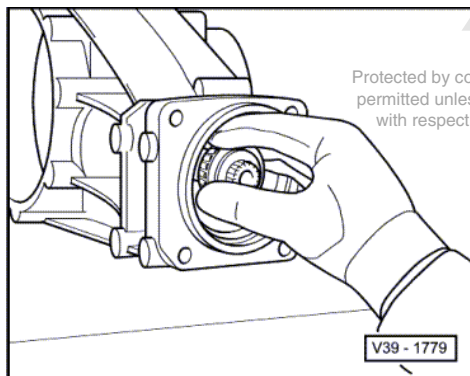
(Setting preload of taper roller bearing for drive pinion)



- Mount final drive on repair stand =>Page 123 .
- -> Pull outer race of large taper roller bearing into housing (without shim).

Note:*Inscription "Oben" with thrust washer 3253/4 faces the nut of the puller.*

- -> Pull outer race for small taper roller bearing into housing.
- Lubricate outer race with oil and fit using press tool VW 408 A and thrust plate 30-205.



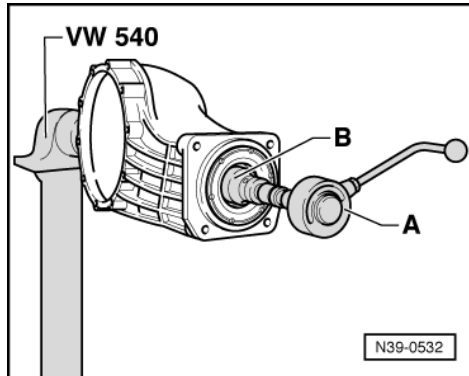
- -> Insert drive pinion without spacer sleeve.

Caution
Wear protective gloves.

- Heat inner race for taper roller bearing to approx. 100 °C and fit onto drive pinion.

Notes:

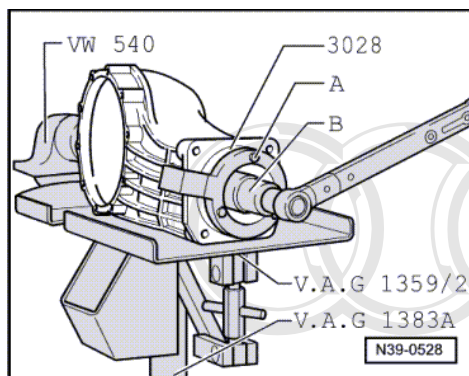
- ◆ Do not additionally oil new taper roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.
- ◆ Only install spacer sleeve for final friction torque measurement (after determining shim "S3").



- A - -> Torque gauge, commercially available, 0 ... 600 Ncm
B - Socket attachment, 36 mm A/F

Note:

Use adapter (3/4 " to 1/2 ") if necessary.



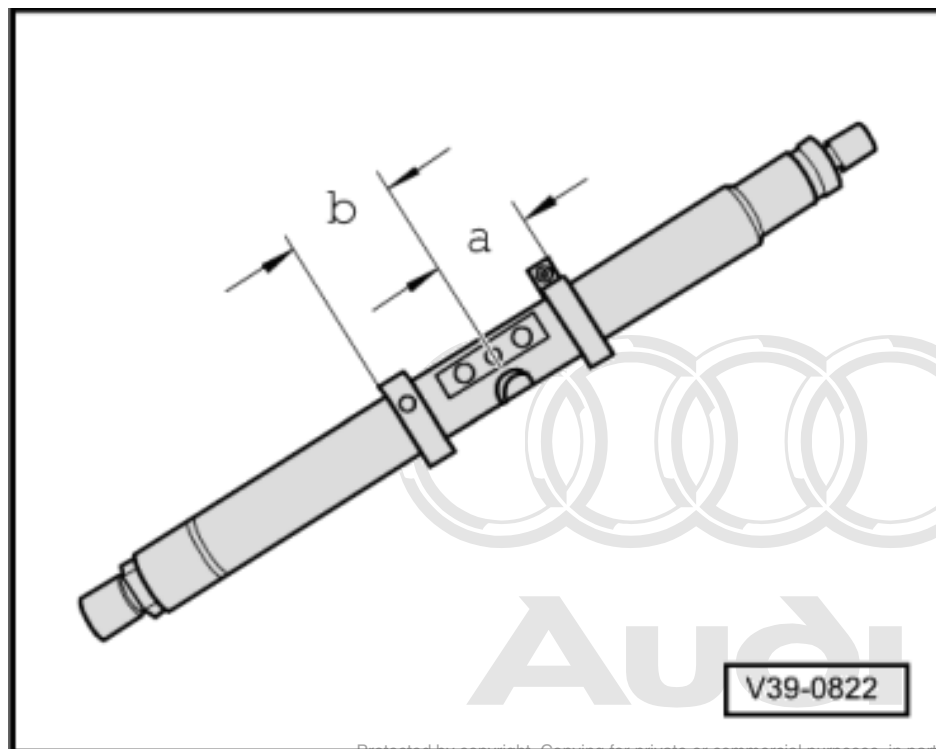
- Attach retainer 3028 with two M8 x 30 hexagon bolts -A-.
- B - Socket attachment (long) 36 mm A/F
- -> Tighten drive pinion nut until the following friction torque is obtained.

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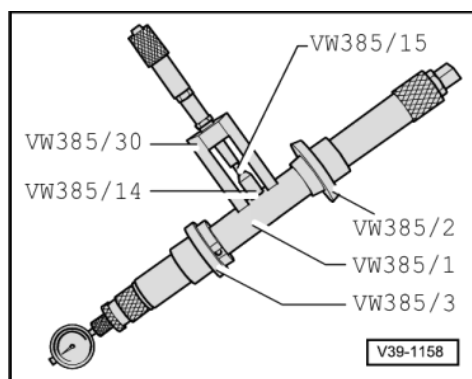
New bearings	Used bearings ¹⁾
200 ... 250 Ncm	30 ... 60 Ncm

1) run at least 50 km (30 miles)

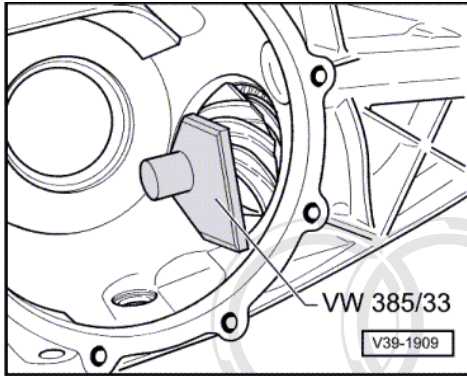
- The final drive must be supported when tightening the nut (e.g. using universal support V.A.G 1359/2 together with gearbox jack V.A.G 1383 A).



- -> Set adjustment ring of universal mandrel VW 385/1.
- Distance a = 60 mm
- Set sliding adjustment ring.
- Dimension b = 55 mm



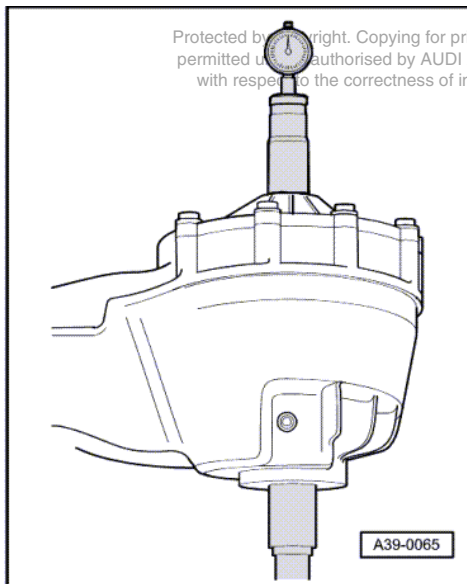
- -> Assemble universal mandrel as illustrated:
- Dial gauge extension VW 385/15 = 9 mm long
- Set universal master gauge VW 385/30.
- Ro = 57.50 mm
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.



Note:

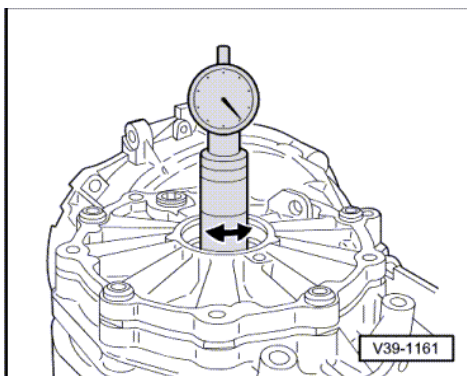
Before performing following measurements turn drive pinion at least five turns in both directions, so that the taper roller bearings settle. Otherwise a false reading will be obtained.

- -> Place end measuring plate VW 385/33 onto drive pinion head.



- -> Remove master gauge and insert measuring mandrel in the housing.
- The centring disc 385/3 faces towards cover for final drive
- Fit cover for final drive and tighten 4 bolts.
- Using the adjustable ring, move 2nd centring disc out as far as possible so that the mandrel can still just be turned by hand.

Determining measurement "e"





- -> Turn mandrel until the dial gauge point touches the end measuring plate on drive pinion head, then measure maximum deflection (return point). The measured value is dimension "e" (in red scale).
- Measurement in following example: "e" = 1.60 mm

Note:

Dimension "e" is required to determine thickness of shim "S3".

- After removing universal mandrel, check once again whether the dial gauge reads "0" with 2 mm preload when master gauge VW 385/30 is in place - otherwise repeat the measurement.

Determining shim thickness "S3"**Formula:**

$$\text{"S3"} = \text{"e"} - \text{"r"}$$

e = Measured value

r = Deviation (tolerance): marked on crown wheel in 1/100 mm

Example:

Determined value "e"	1.60 mm
- Deviation "r"	0.42 mm
= Thickness of shim "S3"	1.18 mm

- Determine shim(s) as accurately as possible from table. Part numbers

=> Parts catalogue

The following shims are available for "S3"

Shim thickness (mm) 1)		
0.95	1.20	1.45
1.00	1.25	1.50
1.05	1.30	1.55
1.10	1.35	
1.15	1.40	

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

- Remove universal mandrel.
- Remove drive pinion and outer race of large taper roller bearing and install together with measured shims "S3" and spacer sleeve => from Page 161.
- Install inner race of small taper roller bearing and tighten nut for drive pinion until specified friction torque is obtained => Fig. 165.

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Notes:

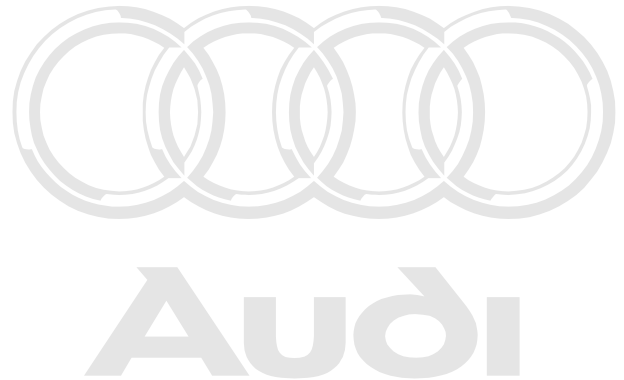
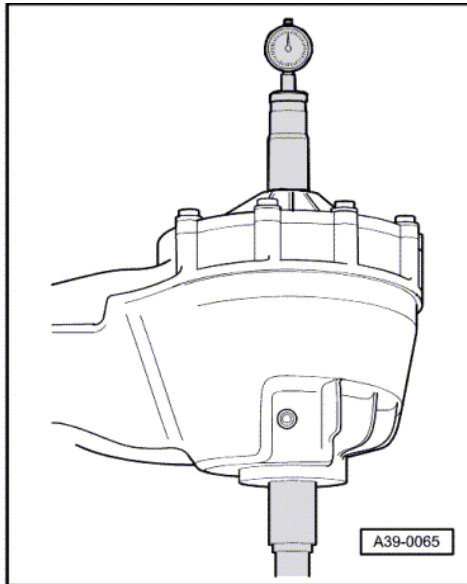
- ♦ Do not additionally oil new taper roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.
- ♦ Increase tightening torque slowly and check friction torque at regular intervals, if the specified friction torque is exceeded, the spacer sleeve must be renewed and the adjustment repeated. A spacer sleeve which has been compressed too much cannot be reused.
- Set to following friction torques:

New bearings	Used bearings1)
200 ... 250 Ncm	30 ... 60 Ncm

- 1) run at least 50 km (30 miles)

Performing check measurement

Checking dimension "r"



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- Turn drive pinion at least 5 turns in both directions.
- ➔ Insert universal mandrel and perform check measurement.
 - If the shims have been correctly selected, the dial gauge should now show the value of "r" as marked on the crown wheel, reading anti-clockwise in the red scale, within a tolerance of ± 0.04 mm.
- Peen drive pinion nut with a punch.

Note:

Measure and mark radial run-out at propshaft flange =>Page **131** .

14.7 - Adjusting crown wheel

(Adjusting differential)

Repairs after which the crown wheel has to be adjusted
=>Adjustment overview Page **169** .

Notes:

- ◆ Differential tapered roller bearings are low friction bearings. Therefore the friction torque only has a limited use as a check. Correct adjustment is only possible by determining the total shim thickness "Stotal".
- ◆ Do not additionally oil new taper roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.

Determining total shim thickness "Stotal" for shims "S1" + "S2"

(Setting preload of taper roller bearing for differential)

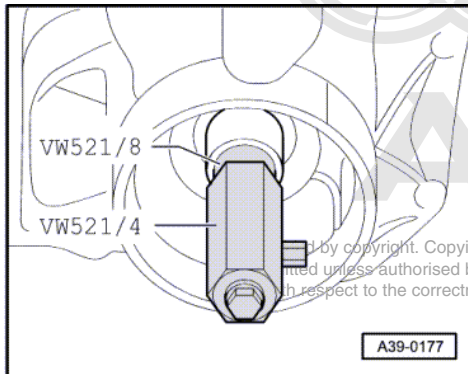
- Drive pinion removed or crown wheel dismantled from differential housing
- Pull out flange shaft oil seal with lever.
- Remove differential taper roller bearing outer races and take out shims => Page **141** .
- Press outer race of left-hand taper roller bearing for differential (housing side) with shim "S2" into housing =>Page **141** . To perform the measurement use a shim "S2*" with a thickness of 1.00 mm (one 0.80 mm shim and one 0.20 mm shim).



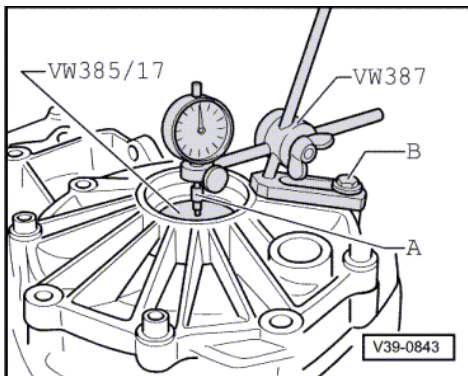
Note:

For measurement purposes a shim "S2" of 1.0 mm is initially inserted which will be designated "S2*" in the following. After determining the backlash "S2*" will be replaced by the correct "S2".

- Knock in outer race of right-hand taper roller bearing for differential (final drive cover side) without shims:
=>Page 141 (install as far as the stop).
- Insert differential into housing. The crown wheel is positioned on the right side (cover side).



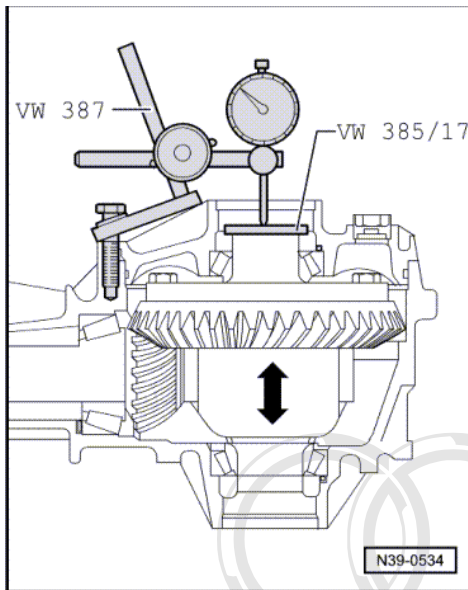
- Fit cover and tighten bolts to 25 Nm.
- -> Install special tools VW 521/4 and 521/8 onto housing side in differential housing.
- Turn cover side of differential housing upwards.



- Turn differential 5 turns in both directions to settle the taper roller bearing.
- Place measuring plate VW 385/17 onto differential.
- -> Fit measuring tools.

- A - Dial gauge extension approx. 30 mm long
- B - Hexagon bolt M8 x 45

- Place dial gauge extension on the centre of the measuring plate VW 385/17.



- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.
- ➔ Lift differential without turning; read off play on dial gauge and note.
 - Measurement in following example: 0.50 mm

Note:

If the measurement has to be repeated, the differential must again be turned 5 turns in each direction to settle the taper roller bearing.

Formula:

"Stotal" = "S2*" + measurement + bearing preload

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Example:

Inserted shim(s) "S2**"	1.00 mm
+ Measured value	0.50 mm
+ Bearing preload (constant)	0.30 mm
= Total shim thickness "Stotal" for shims "S1" + "S2"	1.80 mm

Determining thickness of shim "S1"**

Notes:

- ♦ The preliminary adjustment shim "S1**" will be replaced with the final shim "S1" after determining the backlash.
- ♦ The total shim thickness "Stotal" remains unchanged.

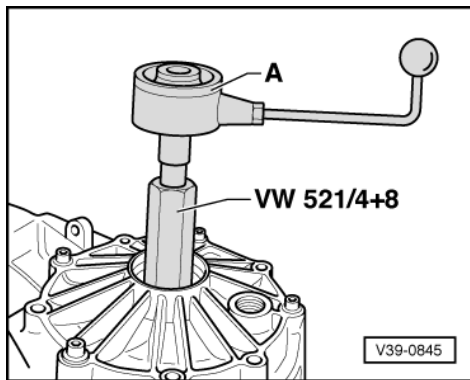
Formula:

"S1*" = "Stotal" - "S2"**

Example:

Total shim thickness "Stotal" for shims "S1" + "S2"	1.80 mm
- Inserted shim(s) "S2**"	1.00 mm
= Thickness of shim "S1**"	0.80 mm

- Determine shim(s) from table => Page 184 .

**Measuring friction torque (check)**

- Drive pinion removed
- Differential fitted with shims "S1*" and "S2*"
- -> Fit torque gauge 0 ... 600 Ncm -A- onto differential.
- Read off friction torque.

Friction torque specifications:

New bearings	Used bearings 1)
150 ... 300 Ncm	30 ... 60 Ncm

- 1) run at least 50 km (30 miles)

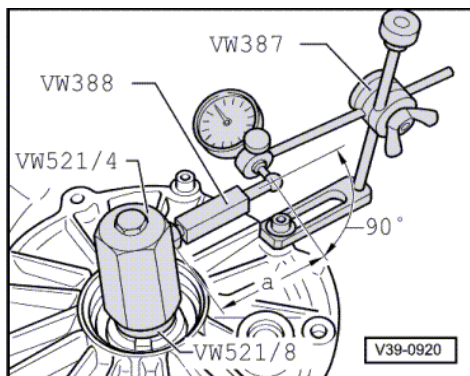
Notes:

- ♦ Differential tapered roller bearings are low friction bearings. Therefore the friction torque only has a limited use as a check. Correct adjustment is only possible by determining the total shim thickness "Stotal".
- ♦ Do not additionally oil new taper roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.
- ♦ If the final drive set (drive pinion and crown wheel) is being re-adjusted, the adjustment of the drive pinion should be performed now, and the adjustment checked =>Page 173.

Adjusting backlash

(Positioning crown wheel in final drive housing)

- Drive pinion with shim "S3" installed
- Differential with shims "S1*" + "S2*" installed
- Insert differential in final drive housing, install cover and tighten all bolts to 25 Nm.



- Turn differential 5 turns in both directions to settle the taper roller bearings.
- -> Assemble measuring equipment.
- Use dial gauge extension VW 382/10 (6 mm flat).

- Set measuring lever VW 388 to dimension "a" = 60 mm.
- Determine play between the teeth flanks as follows:
 - Turn crown wheel until it makes contact with a tooth flank (end of backlash travel).
 - Set dial gauge to "0" with 1 mm preload.
- Turn crown wheel back until lying against an opposite tooth flank (backlash).
- Read off backlash and note value.
- Turn crown wheel through 90° and repeat measurements a further 3 times.

Note:

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

Determining average backlash

Example:	
1st measurement	0.28 mm
+ 2nd measurement	0.30 mm
+ 3rd measurement	0.30 mm
+ 4th measurement	0.28 mm
= Sum of measured values	1.16 mm

- Result: The average backlash is $1.16 / 4 = 0.29$ mm

Determining thickness of shim "S2"

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

Example:	
Inserted shim "S2*"	1.00 mm
- Average backlash	0.29 mm
+ Lift (constant)	0.15 mm
= Thickness of shim "S2"	0.86 mm

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- Determine shim(s) as accurately as possible from table. **Part numbers**

=> Parts catalogue

The following shims are available for "S2"

Shim thickness (mm) 1)		
0.15	0.50	1.50
0.20	0.80	
0.25	1.00	

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

Determining thickness of shim "S1"

Formula:	
"S1"	= "Stotal" - "S2"

Example:	
Total shim thickness "Stotal" for "S1" + "S2"	1.80 mm
- Thickness of shim "S2"	0.86 mm



= Thickness of shim "S1"	0.94 mm
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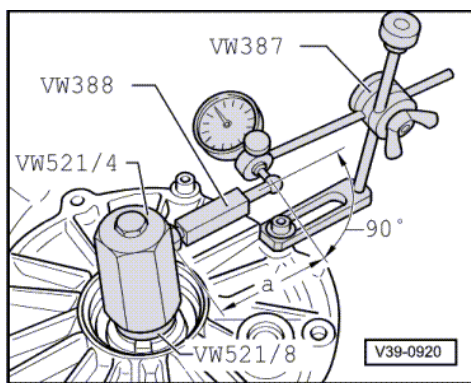
- Determine shim(s) as accurately as possible from table. Part numbers

=> Parts catalogue

The following shims are available for "S1"

Shim thickness (mm) 1)		
0.15	0.50	0.90
0.20	0.60	1.00
0.30	0.70	1.20
0.40	0.80	

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



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-> Performing check measurement

- Drive pinion with shim "S3" installed
- Differential with shims "S1" + "S2" installed
- Turn differential 5 turns in both directions so that the taper roller bearings settle.
- Measure backlash four times on circumference.
 - Specifications: 0.12 ... 0.22 mm

Notes:

- ♦ If the backlash lies outside the tolerances, the adjustments must be repeated, but the total shim thickness "Stotal" must remain unchanged.
- ♦ The individual measurements must not differ by more than 0.06 mm from each other.