

Audi A8 1994 ➤

Automatic gearbox 01F Four-wheel drive	
Gearbox ID	CMN

Edition 09.1998

List of Workshop Manual Repair GroupsList of Workshop Manual
Repair GroupsList of Workshop Manual Repair Groups

Audi A8 1994 ➤

Automatic gearbox 01F 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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Contents

00 - Technical data	1
1 Identification of gearbox	1
1.1 Identification of gearbox	1
2 Code letters, assembly allocation, ratios and equipment	2
2.1 Code letters, assembly allocation, ratios and equipment	2
3 Identification of rear final drive	2
3.1 Identification of rear final drive	2
4 Code letters, assembly allocation and ratios	3
4.1 Code letters, assembly allocation and ratios	3
5 Capacities	3
5.1 Capacities	3
6 Repair instructions	5
6.1 Repair instructions	5
6.2 Contact corrosion	5
6.3 General repair instructions	5
32 - Torque converter	7
1 Torque converter	7
1.1 Torque converter	7
1.2 Identification of torque converter	7
1.3 Checking torque converter	8
1.4 Draining torque converter	8
1.5 Renewing oil seal for torque converter	9
1.6 Installing torque converter	10
37 - Controls, Housing	12
1 Servicing shift mechanism	12
1.1 Servicing shift mechanism	12
1.2 Checking ignition key removal lock	12
1.3 Checking shift mechanism	12
1.4 Dismantling and assembling shift mechanism	13
1.5 Removing and installing selector lever cable	22
1.6 Checking and adjusting selector lever cable	24
1.7 Removing and installing locking cable	25
2 Checking gearbox	30
2.1 Checking gearbox	30
3 Removing and installing gearbox	31
3.1 Removing and installing gearbox	31
3.2 Transporting the automatic gearbox	45
3.3 Securing gearbox to repair stand	46
3.4 Removing and installing left gearbox support	47
4 Checking ATF level; changing ATF	48
4.1 Checking ATF level; changing ATF	48
4.2 Checking ATF level	48
4.3 Changing ATF or filling up after repairs	51
5 Gearbox with shift elements	53
5.1 Gearbox with shift elements	53
5.2 Gearbox schematic diagram	53
5.3 Position of shift elements	55
6 Dismantling and assembling gearbox	56
6.1 Dismantling and assembling gearbox	56
6.2 Rules for cleanliness when working on automatic gearbox	56



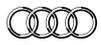
6.3	Removing and installing ATF pipes	57
6.4	Cleaning ATF pipes and ATF cooler	59
6.5	Removing and installing multi-function switch -F125	60
6.6	Adjusting multi-function switch -F125	60
38	- Gears, Hydraulic controls	64
1	Removing and installing oil pan, ATF screen and valve body	64
1.1	Removing and installing oil pan, ATF screen and valve body	64
1.2	Removing and installing oil pan	64
1.3	Removing and installing ATF screen	65
1.4	Removing and installing valve body	66
1.5	Removing and installing wiring harness in gearbox	68
1.6	Renewing internal oil pipe	69
2	Removing and installing ATF pump	71
2.1	Removing and installing ATF pump	71
39	- Final drive, Differential rear	87
1	Removing and installing speedometer sender -G22 and drive wheel for speedometer sender	87
1.1	Removing and installing speedometer sender -G22 and drive wheel for speedometer sender	87
2	Gear oil in front final drive	88
2.1	Gear oil in front final drive	88
2.2	Checking oil level in front final drive	88
2.3	Changing gear oil in front final drive or filling after repairs	89
3	Servicing front final drive	89
3.1	Servicing front final drive	89
3.2	Renewing oil seals for flange shafts.	97
3.3	Renewing oil seal for right flange shaft	99
3.4	Renewing oil seal(right) for input shaft	101
3.5	Renewing oil seal(left) for input shaft and oil seal for left flange shaft	104
3.6	Removing and installing intermediate sleeve for drive pinion shaft.	109
4	Servicing intermediate drive for front final drive	113
4.1	Servicing intermediate drive for front final drive	113
4.2	Removing and installing front intermediate drive with transfer gearing	121
4.3	Dismantling front intermediate drive	130
4.4	Renewing ATF breather	133
4.5	Renewing oil seals in front intermediate drive	134
5	Gear oil in transfer gearbox	136
5.1	Gear oil in transfer gearbox	136
5.2	Checking oil level in transfer gearbox	136
5.3	Changing gear oil in transfer gearbox(or filling up after repairing)	137
6	Servicing transfer gearbox and rear intermediate drive	138
6.1	Servicing transfer gearbox and rear intermediate drive	138
6.2	Removing and installing vibration damper on transfer gearbox	145
6.3	Renewing oil seal for rear flange shaft	146
6.4	Sealing cover plate of transfer gearbox	148
6.5	Removing and installing transfer gearbox	149
6.6	Renewing oil seals in transfer gearbox	153
6.7	Renewing gasket for housing end cover for rear intermediate drive	155
6.8	Dismantling rear intermediate drive	157
6.9	Checking axial clearance of Torsen differential and adjusting	158
7	Servicing propshaft	163
7.1	Servicing propshaft	163
7.2	Removing and installing propshaft	167
7.3	Adjusting propshaft	171

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8	Checking oil level in rear final drive	174
8.1	Checking oil level in rear final drive	174
9	Removing and installing rear final drive	174
9.1	Removing and installing rear final drive	174
9.2	Securing rear final drive to repair stand	179
10	Renewing flange shaft oil seals	179
10.1	Renewing flange shaft oil seals	179
11	Renewing oil seal for propshaft drive flange	181
11.1	Renewing oil seal for propshaft drive flange	181
11.2	Measuring radial run-out at propshaft flange and marking	187
12	Dismantling and assembling rear final drive	189
12.1	Dismantling and assembling rear final drive	189
12.2	Overview	190
13	Removing and installing differential	191
13.1	Removing and installing differential	191
14	Dismantling and assembling differential	197
14.1	Dismantling and assembling differential	197
15	Removing, installing, dismantling and assembling drive pinion	210
15.1	Removing, installing, dismantling and assembling drive pinion	210
16	Adjusting drive pinion and crown wheel	222
16.1	Adjusting drive pinion and crown wheel	222
16.2	Adjusting final drive gear set; identification markings	223
16.3	Recommended sequence for readjusting final drive set	224
16.4	Adjustment overview	225
16.5	Position of shims	226
16.6	Adjusting drive pinion	229
16.7	Adjusting crown wheel	235

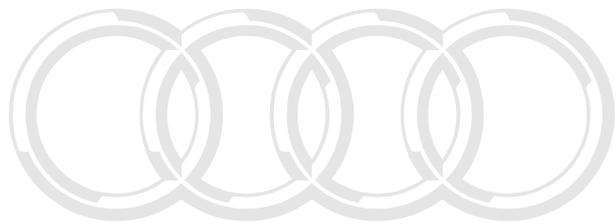


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Audi A8 1994 >

Audi Automatic gearbox 01F Four-wheel drive - Edition 09.1998



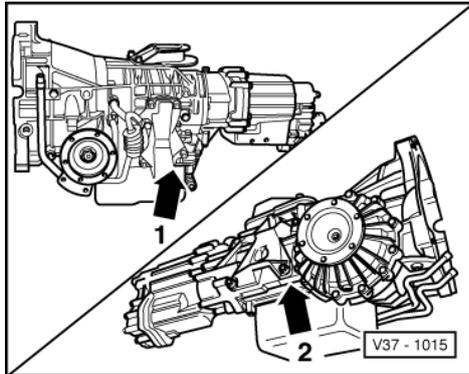
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00 - Technical data

1 - Identification of gearbox

1.1 - Identification of gearbox



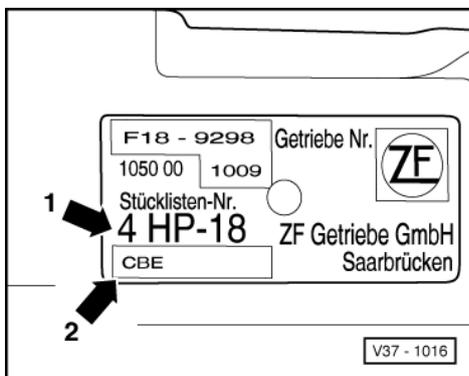
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The 4-speed automatic gearbox 01F (four-wheel drive) is installed in combination with the 6-cylinder engine in the Audi A8 1994 ▶. Allocation =>Technical data, Page 2 .

Location on gearbox

-> The code letters of the automatic gearbox 01F 4WD are given on the data plate below the left gearbox support -arrow 1- and below the right gearbox support -arrow 2-.



-> Code letters -arrow 2- and designation of automatic gearbox 01F 4WD -arrow 1-.

Note:

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



2 - Code letters, assembly allocation, ratios and equipment

2.1 - Code letters, assembly allocation, ratios and equipment

Automatic gearbox, four wheel drive

Automatic gearbox		01F
Gearbox	Code letters	CMN
	Manufactured from to	05.94 03.96
Torque converter	Code	F11
Ratios	1st gear	2.580
	2nd gear	1.407
	3rd gear	1.000
	4th gear	0.742
	Reverse gear	2.882
Allocation	Model	Audi A8 1994 ▶
	Engine	2.8 ltr. - 128 kW

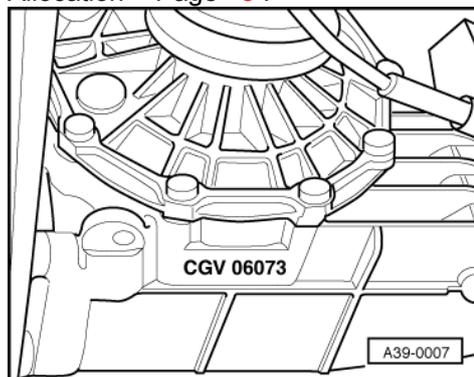
Automatic gearbox		01F
Gearbox	Code letters	CMN
Intermediate drive for front final drive	No. of teeth	Input gear 27
		Intermediate gear 33
		Output gear 36
		Ratio 1.333
Intermediate drive for rear final drive	No. of teeth	Input gear 37
		Output gear 39
		Ratio 1.054
Front final drive	No. of teeth	Drive pinion 12
		Crown wheel 39
		Ratio 3.250
Drive shaft flange dia.		130 mm
Rear final drive allocation	Code letters	CGV

3 - Identification of rear final drive

3.1 - Identification of rear final drive

Final drive 01R is allocated to automatic gearbox 01F 4WD.

Allocation=>Page 3.



-> Code 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 given on the vehicle data stickers.

4 - Code letters, assembly allocation and ratios

4.1 - Code letters, assembly allocation and ratios

Rear final drive

Rear final drive		01R
Final drive	Code letters	CGV
	Manufactured from to	11.93 -
Ratios	Final drive	Z2 : Z1 = i 37 : 9 = 4.111
Drive shaft flange dia.		108 mm
Allocation	Model	Audi A8 1994 >
	Engine	2.8 ltr. - 128 kW
Allocation to automatic gearbox 01F 4WD		Code letters CMN

5 - Capacities

5.1 - Capacities

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Planetary gearbox

Capacities	Planetary gearbox	Automatic gearbox
Initial filling	7.0 ltr.	01F 4WD
Change	approx. 2.7 ltr. 1)	
Lubricant	VW ATF G 052 162 ..	

1) Change intervals.

=> Maintenance Manual, Description of work; Automatic gearbox; Changing ATF

VW ATF G 052 162 .. is transparent and 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



Notes:

- ◆ For vehicles from 07.95 > only VW ATF with Part No. G 052 162 .. (colour: transparent/yellow) may be used.
- ◆ For vehicles > 06.95 remaining stock of ATF Dexron may be used up. Thereafter also use ATF with Part No. G 052 162 .. (colour: transparent/yellow).
- ◆ It is not permitted to use additives.

Checking or changing ATF=>Page **48** .

Front final drive

Capacities	Front final drive	Automatic gearbox
Initial filling	approx. 0.7 ltr.	01F 4WD
Change	Filled for life No change	
Lubricant	Gear oil SAE 75 W 90 G 052 145 (synthetic oil)	

Gear oil SAE 75 W 90 G 052 145 .. (synthetic oil) is available as a replacement part.

- ◆ 0.5 ltr. - Part No. G 052 145 A1
- ◆ 1.0 ltr. - Part No. G 052 145 A2

Checking oil level in front final drive=>Page **88** .

Transfer gearbox

Capacities	Transfer gearing	Automatic gearbox
Initial filling	1.02 ltr.	01F 4WD
Change	Filled for life No change	
Lubricant	Gear oil SAE 75 W 90 G 052 145 (synthetic oil)	

Gear oil SAE 75 W 90 G 052 145 .. (synthetic oil) is obtainable as a replacement part:

- ◆ 0.5 ltr. - Part No. G 052 145 A1
- ◆ 1.0 ltr. - Part No. G 052 145 A2

Checking oil level in transfer gearbox=>Page **136** .

Rear final drive

Capacities	Rear final drive	Rear axle
Initial filling	1.5 ltr.	01R
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 **174** .

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.

Gearbox

- ◆ Do not run the engine or tow the vehicle if the oil sump is removed or if the ATF has been drained from the gearbox.
- ◆ When exchanging the automatic gearbox, check the following fluid levels and top-up if necessary: ATF in planetary gearbox (=> Page 3).
- ◆ When exchanging the rear final drive, check the oil level in the rear final drive and top-up if necessary (=> Page 3).
- ◆ 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 dimension 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.
- ◆ Observe rules for cleanliness when working on automatic gearbox => Page 56.

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.
- ◆ When installing oil seals, lightly coat outer edge and sealing lips with vaseline.
- ◆ Coat O-rings with vaseline before installing; this prevents the rings from being crushed when inserting.
- ◆ Only use vaseline in small quantities. Other types of grease can cause malfunctions in the hydraulic actuators in the gearbox.
- ◆ The open side of the oil seals faces toward the side with fluid filling.
- ◆ After installing, check fluid levels in all affected areas and top-up if necessary: ATF in planetary gearbox (=> Page 3).

Locking elements

- ◆ Do not over-stretch circlips; renew if necessary.
- ◆ Circlips must be properly seated in the base of the groove.

Nuts, bolts

- ◆ Slacken the bolts in reverse 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.
- ◆ Renew self-locking 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.
- ◆ The tightening torques stated apply to non-oiled nuts and bolts.

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.
- ◆ 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.

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- ◆ 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.

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 01F and 01K self-diagnosis; Repair Group 01; Performing self-diagnosis Performing self-diagnosis

32 - Torque converter

1 - Torque converter

1.1 - Torque converter

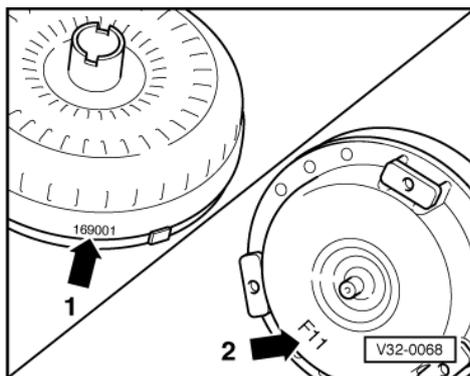
Warning!
Before installing gearbox, check torque converter installation dimensions =>Page 10 .

Notes:

- ◆ Observe rules for cleanliness when working on automatic gearbox => Page 56 .
- ◆ General repair instructions => Page 5 .
- ◆ Coat oil seals thinly with Vaseline. Other lubricants will cause malfunctions in the hydraulic actuators in the gearbox.

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1.2 - Identification of torque converter

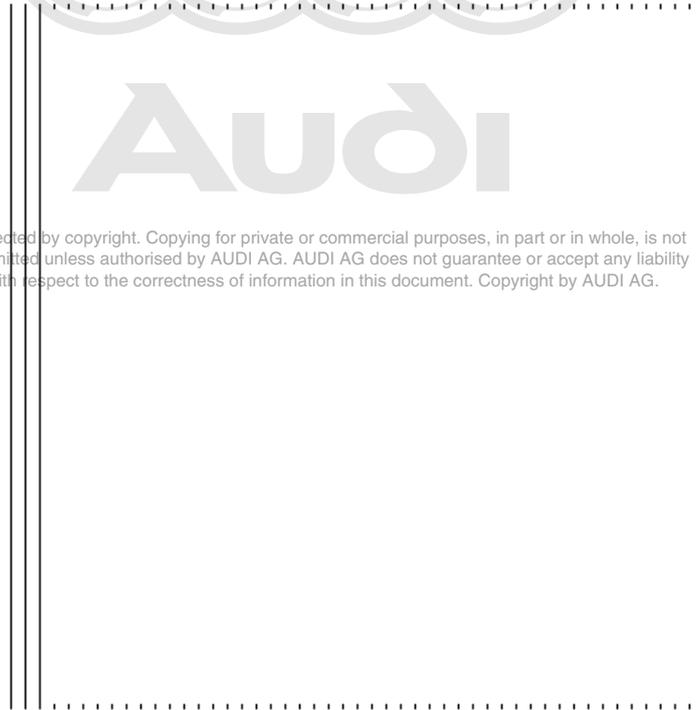


-> There are different torque converters. The identification is provided on the circumference -arrow 1- and on the side of the torque converter facing the engine -arrow 2-.

Torque converter / Gearbox allocation=>from Page 2 .



1.3 - Checking torque converter

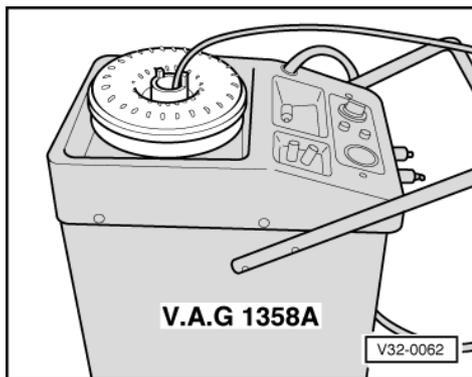


- -> Check the hub of the torque converter for signs of wear -arrow-.

Note:

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

1.4 - Draining torque converter

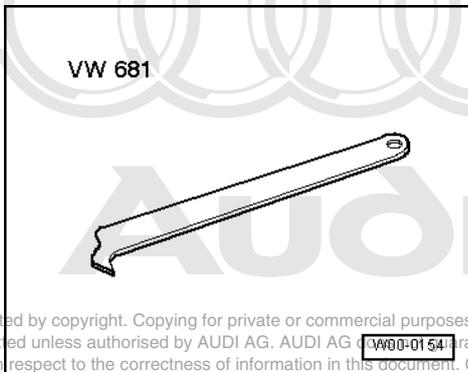


If there is dirt in the ATF resulting from internal wear, or if the gearbox is being overhauled, the torque converter must be drained.

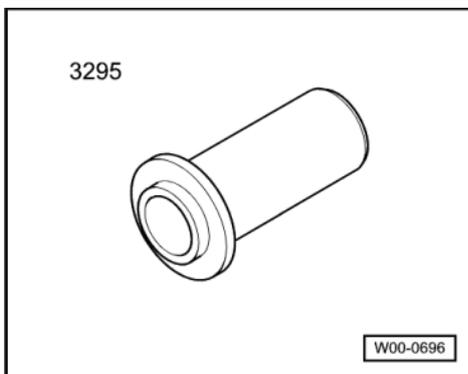
- -> Extract ATF from torque converter with oil extractor V.A.G 1358 A and probe V.A.G 1358 A/1.

1.5 - Renewing oil seal for torque converter

Special tools and workshop equipment required



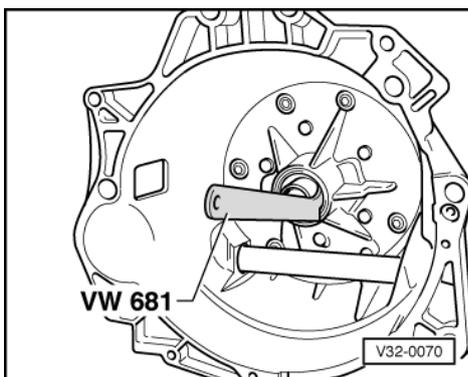
- ◆ Extractor lever VW 681



- ◆ Thrust piece 3295

Work sequence

- Remove gearbox => Page 31 .
- Remove torque converter.



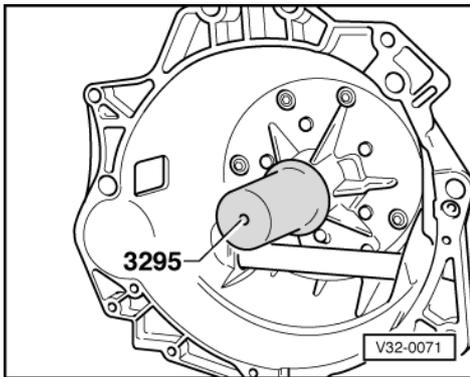
- Mount gearbox on assembly stand => Page 46 or place on a flat surface.
- -> Remove torque converter oil seal with oil seal extractor lever VW 681.

Notes:

- ◆ The open side of the oil seal faces towards the gearbox.



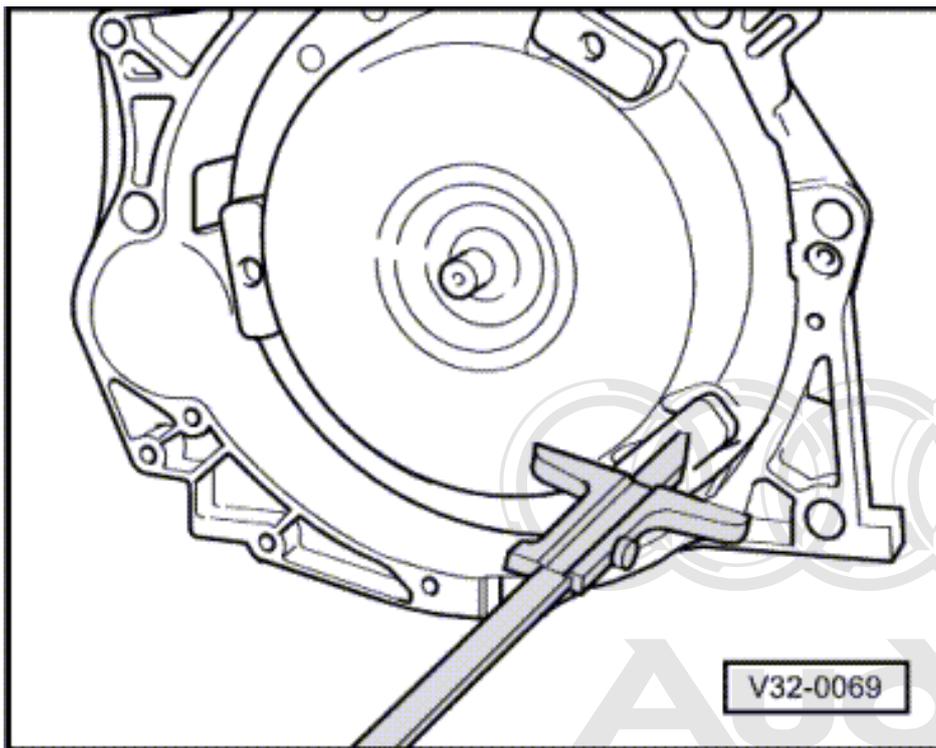
- ◆ Before installing, thinly coat outer circumference and oil seal sealing lip with Vaseline.



- -> Drive in torque converter oil seal with thrust piece 3295 until thrust piece reaches stop.

1.6 - Installing torque converter

- 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

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-> When the torque converter is correctly inserted, the distance between the surface of the securing eyes and the surface of the torque converter bell housing is at least 19 mm.

If the torque converter is not inserted correctly, this distance is approximately 14 mm and the freewheel support is not fully seated.

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 must be possible to move ignition key to removal position without "sticking".
- Pull out ignition key.
- It must 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. Solenoid for selector lever lock blocks selector lever.

- Brake pedal depressed:

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Solenoid for selector lever lock releases selector lever. It is possible to shift into a driving gear. 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. Solenoid for selector lever lock blocks selector lever.

- Brake pedal depressed:

Solenoid for selector lever lock releases selector lever. It is possible to shift into a driving gear.

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 5 km/h (almost stopped) and shifting into selector lever position "N", solenoid for selector lever lock must not engage until after approx. 1 sec. Selector lever cannot be shifted out of "N" position until brake pedal is depressed.

1.4 - Dismantling and assembling shift mechanism

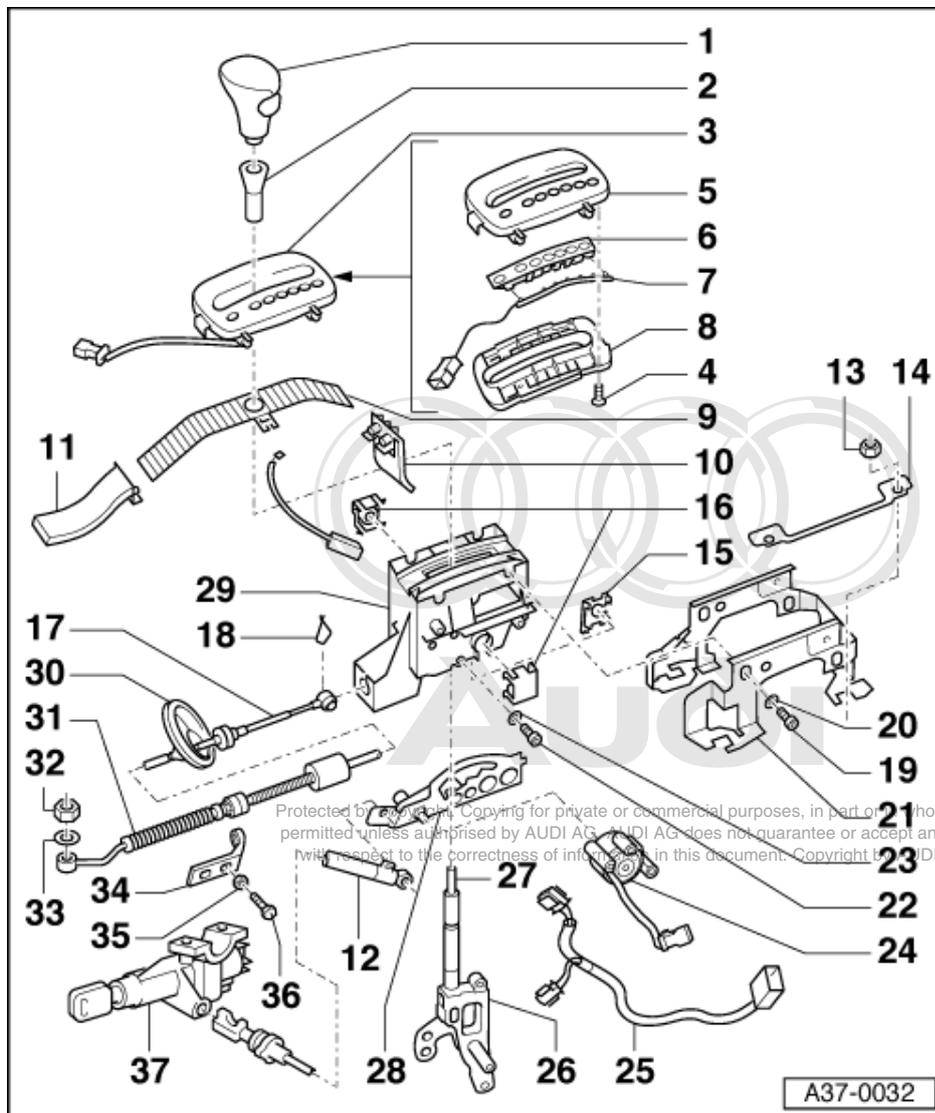
Warning

- ◆ Contact corrosion => Page 5 .
- ◆ Move selector lever into position

- ◆ The entire selector mechanism is removed upwards.

Note:

Lubricate bearings and moving surfaces with poly-carbamide grease, Part No. G 052 142 A2.



1 Selector lever handle

- ◆ To remove, press down shaft section for selector lever -Item 2 -, 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



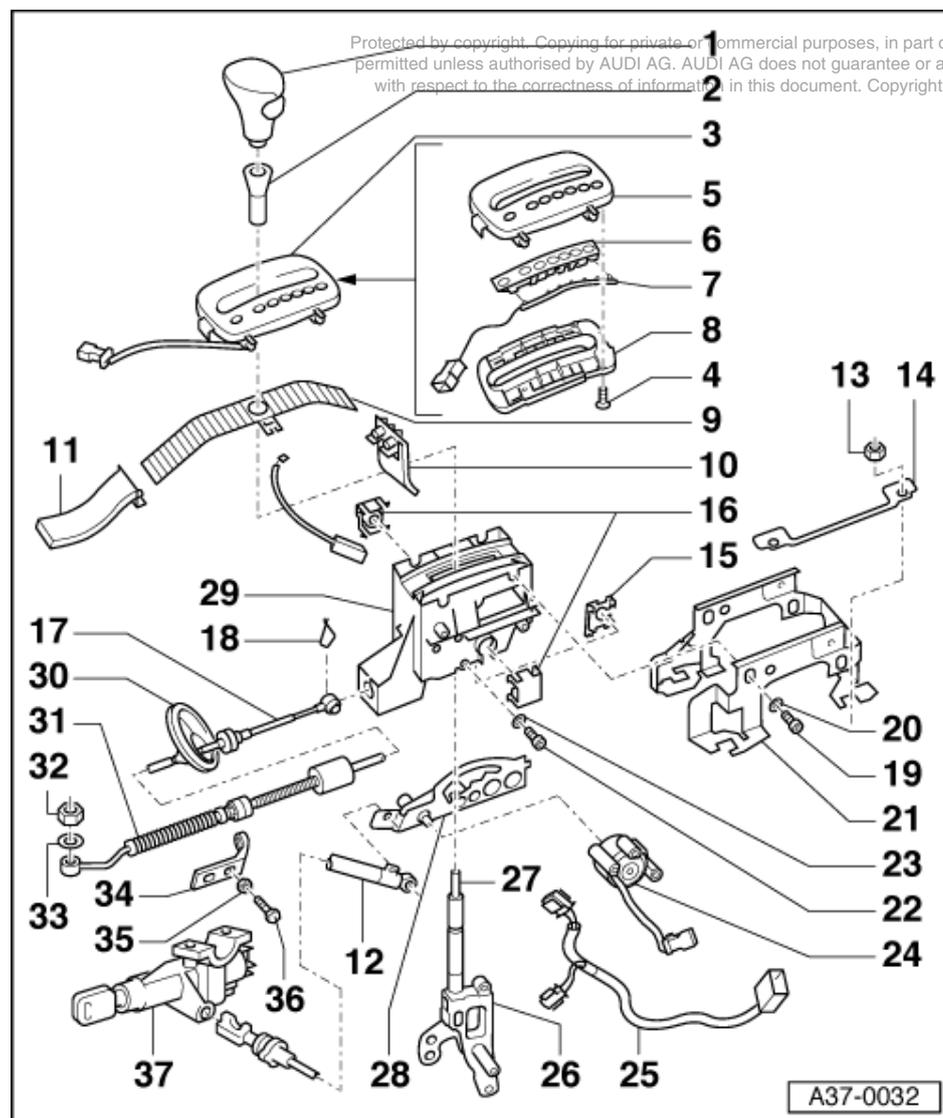
2 Shaft section for selector lever

- ◆ Check that seal on shaft section is properly seated and not damaged

3 Cover assembly

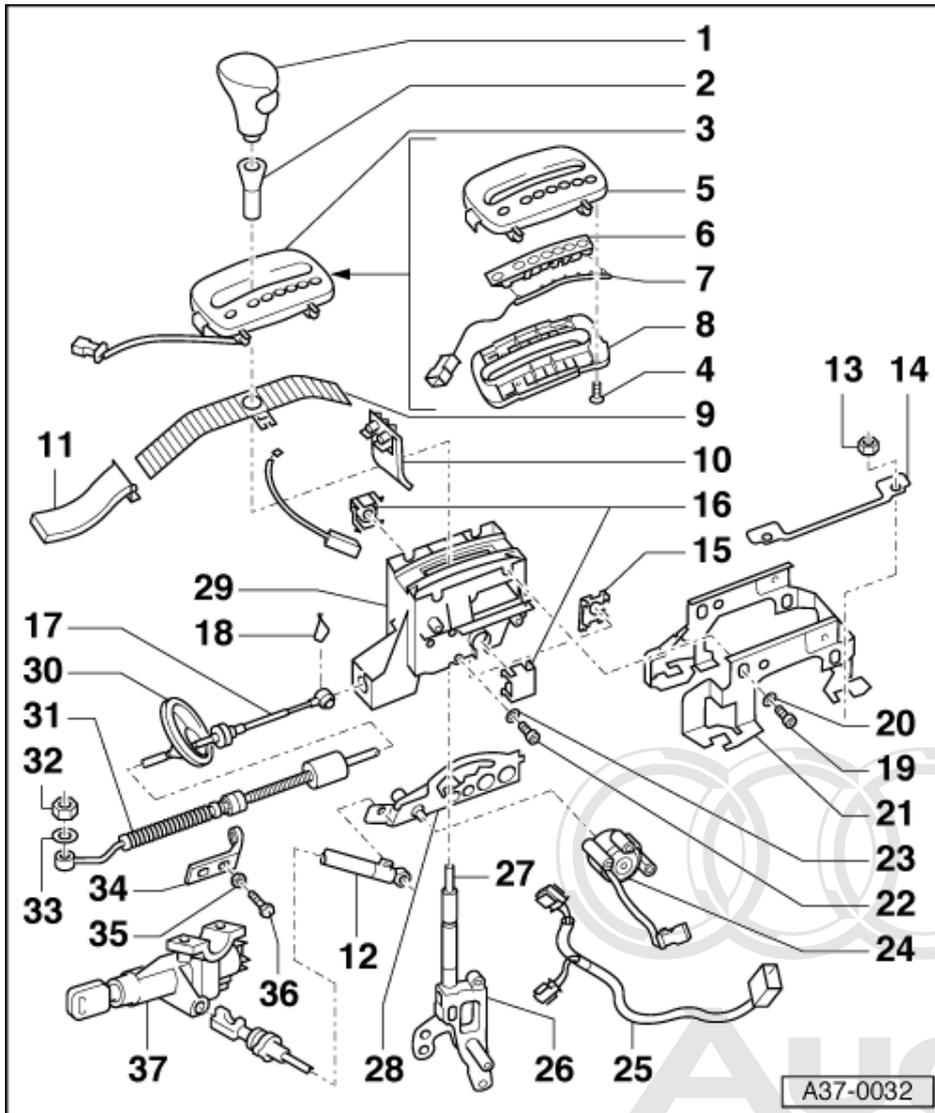
- ◆ Removing and installing:

=> General body repairs, Interior; Repair group 68; Trays, compartments and trim; Removing and installing ashtray, storage compartment, gear-shift trim and centre console trim. Trays, compartments and trim Removing and installing ashtray, storage compartment, gear-shift trim and centre console trim.



- 4 Bolt
 - ◆ Install with locking fluid D 000 600 A2
- 5 Cover
- 6 Light strip
 - ◆ With diodes for illumination.
- 7 Wiring harness
 - ◆ Take out of the cover -Item 5 - together with light strip -Item 6 -
- 8 Trim
- 9 Masking panel
- 10 Rear guide

- ◆ To remove, release from selector housing -Item 29 -.



11 Front guide

12 Locking cable

- ◆ For ignition key removal lock
- ◆ Must not be kinked
- ◆ Removing and installing =>Page 25
- ◆ Adjusting => Page 29

13 Bolt - 9 Nm

14 Packing plate

- ◆ Qty. 2 (left and right)

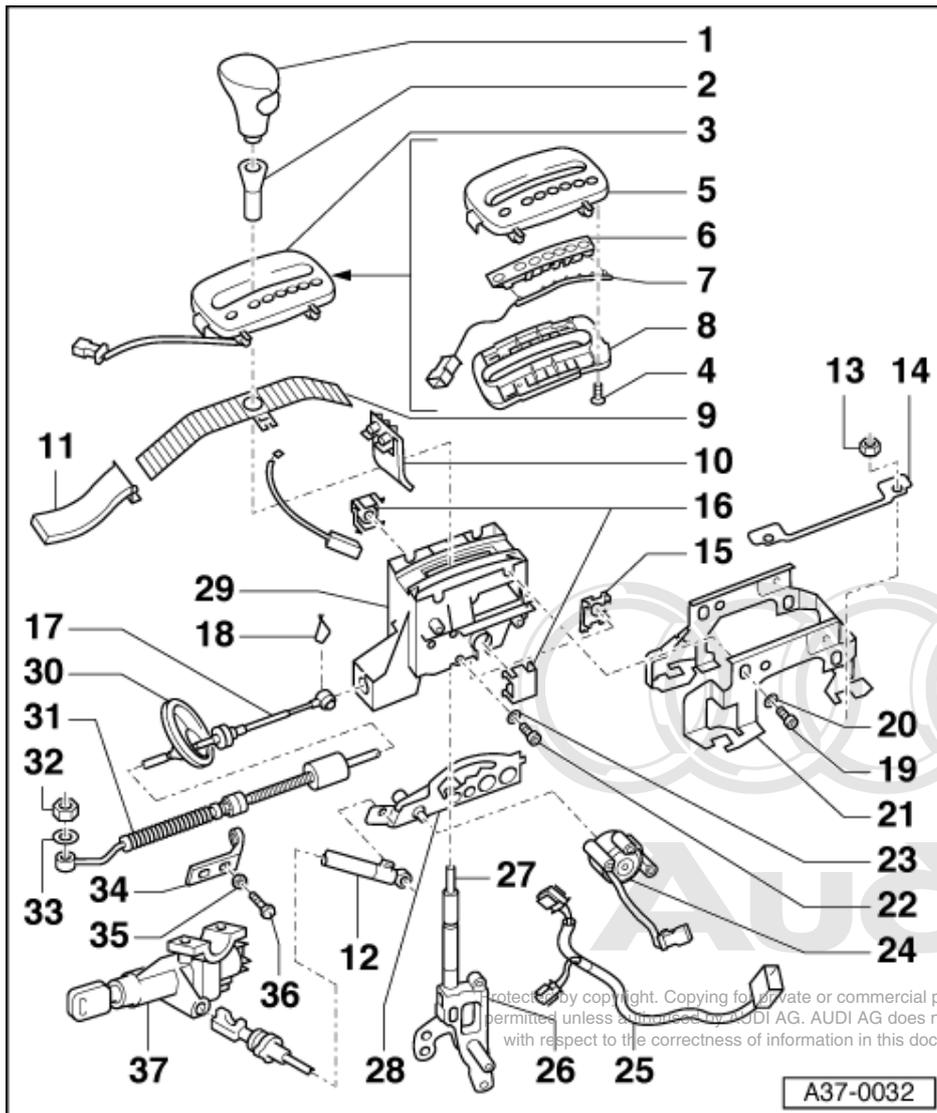
15 Retaining clip

- ◆ To remove, release from selector housing -Item 29 -.

16 Securing clip

- ◆ To remove, release from selector housing -item 29 -.
- ◆ Grease bearings on selector lever.

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17 Selector lever cable

- ◆ With guide and bush
- ◆ Removing and installing
=>Page 22

18 Retaining clip

19 Washer

20 Hexagon socket head bolt

- 9Nm

21 Retainer

- ◆ For selector housing -Item 29 -
- ◆ Do not lay any wiring between retainer and vehicle body.

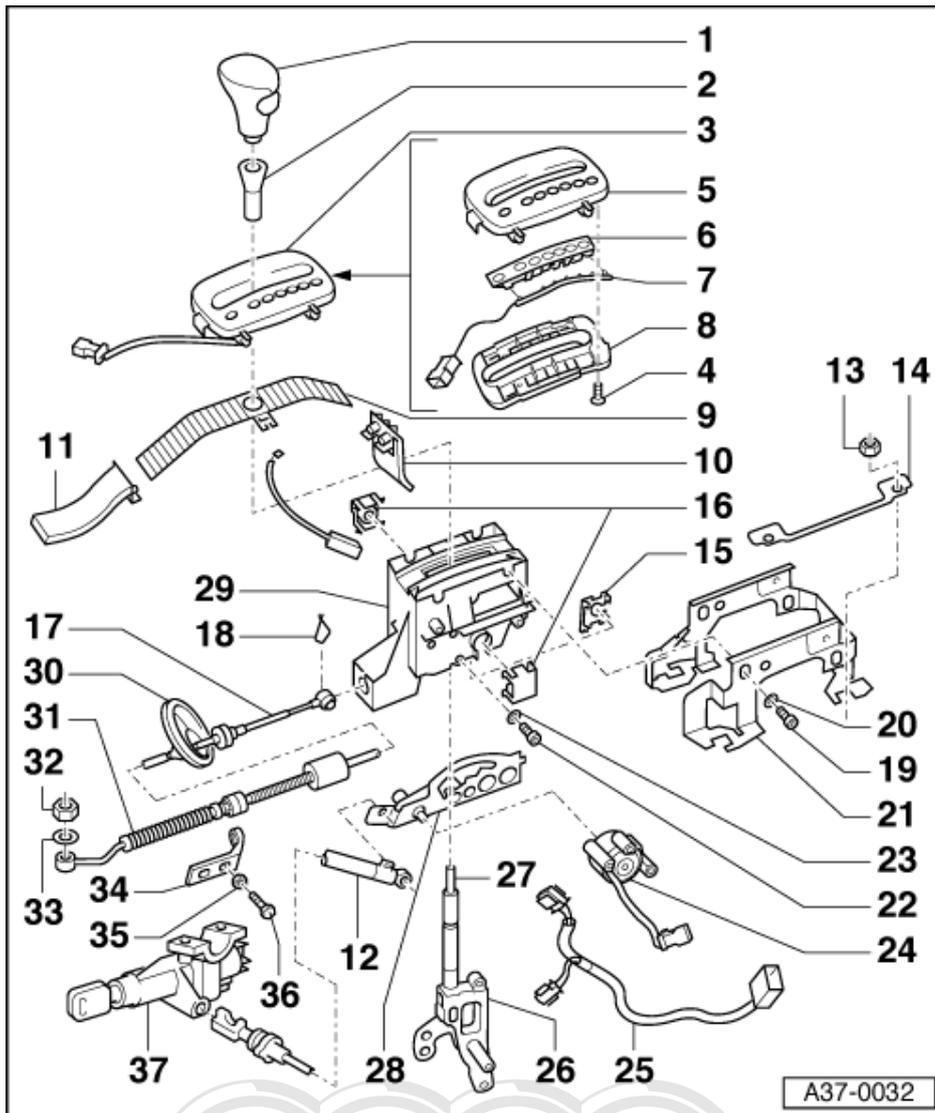
22 Washer

23 Hexagon socket head bolt

- 9 Nm

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A37-0032



25 Wiring harness

- ◆ Laying and securing wiring harness; connector positions =>Fig. 21

26 Selector lever

- ◆ To remove, keep pull rod -Item 27 - under tension.
- ◆ Grease gear locking roller, guide for pull rod and locking pin

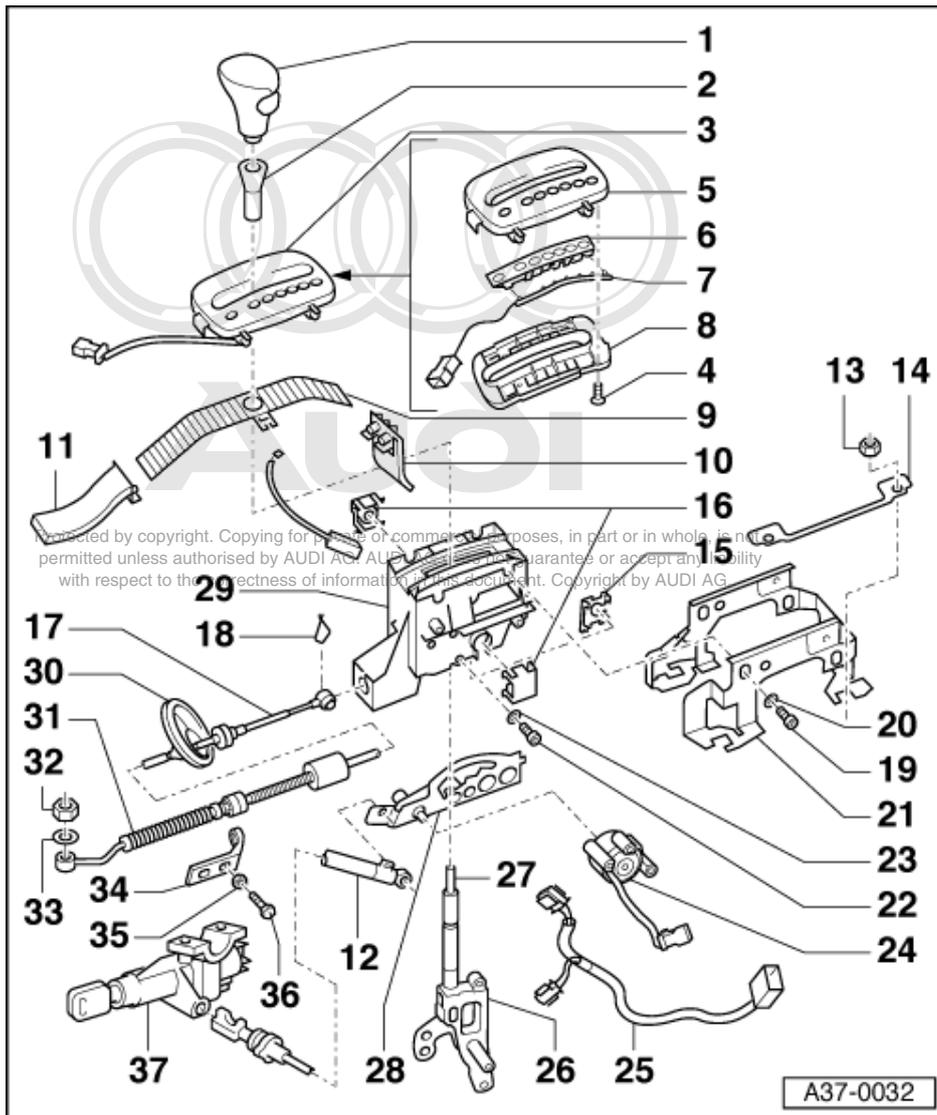
27 Pull rod

- ◆ To remove, knock out locking sleeve and locking pin

28 Gear locking mechanism with locking plate.

- ◆ Grease area to be lubricated on locking plate and gear locking mechanism for locking pin

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32 Securing nut - 5.6 Nm

33 Washer

34 Support bracket

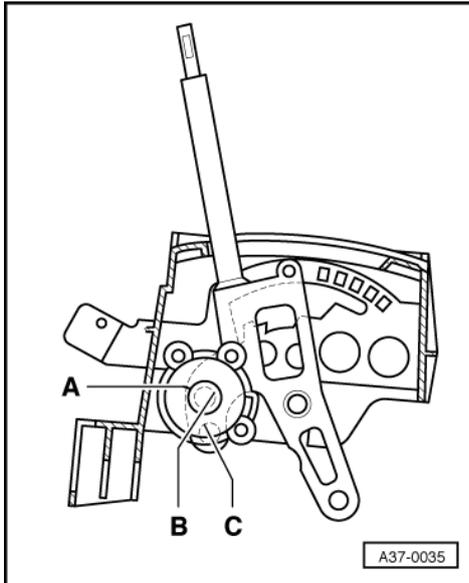
- ◆ For selector lever cable
- ◆ On gearbox
- ◆ Version for gearbox 01K pictured.

35 Washer

36 Bolt - 23 Nm

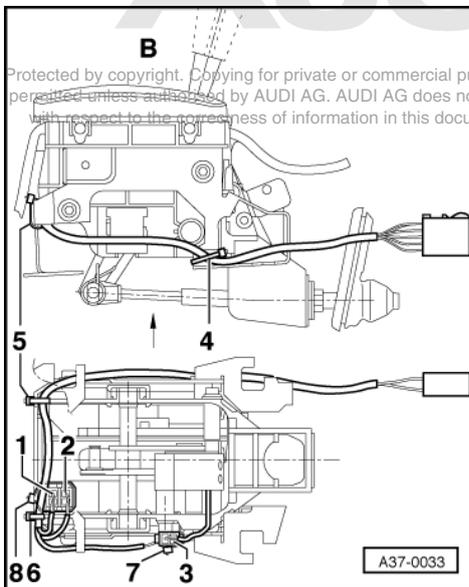
37 Ignition/starter switch

- ◆ With ignition key removal lock



-> Fig.1 Adjusting selector lever lock solenoid -N110.

- Bolts on selector lever lock solenoid -N110 (3 left, 1 right) loosened.
- Shift selector lever into position "P" as shown.
- Position selector lever lock solenoid such that locking pin -A- is exactly aligned with hole -B- in selector lever.
 - Check through hole in selector housing (shift gate)
 - It should be possible to press locking pin into selector lever hole with finger.
- Tighten bolts on selector lever lock solenoid to 9 Nm.
- Shift selector lever into position "N" and test to see if locking pin -A- is aligned with hole -C-. Adjust if necessary.



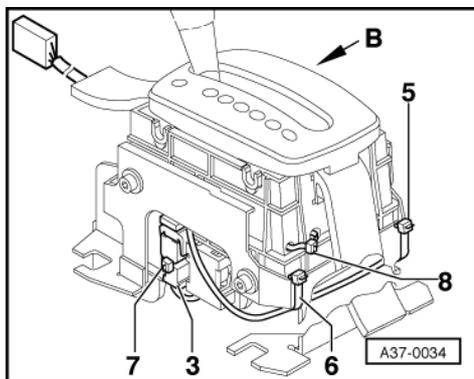
-> Fig.2 Laying and securing wiring harness; connector positions

- 1 - Brown connector for background illumination.
- 2 - Yellow connector for gear indicator
- 3 - Black connector for selector lever lock solenoid -N110
- Secure electrical wiring on selector housing with cable ties at positions -4, 5, 6, 7 and 8-.



Note:

Do not route any wiring between body and selector housing.

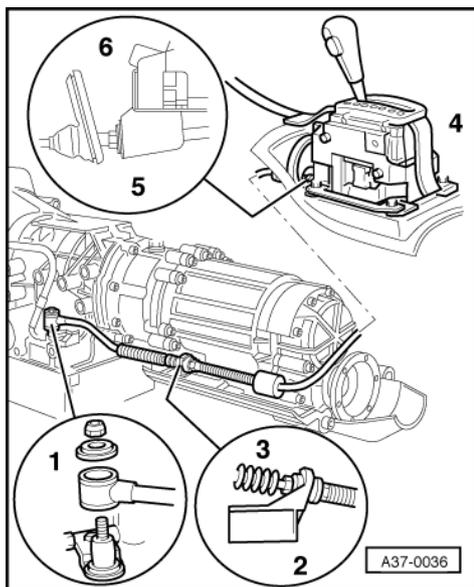


1.5 - Removing and installing selector lever cable

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Removing

- Unbolt heat shield for selector lever cable on gearbox.



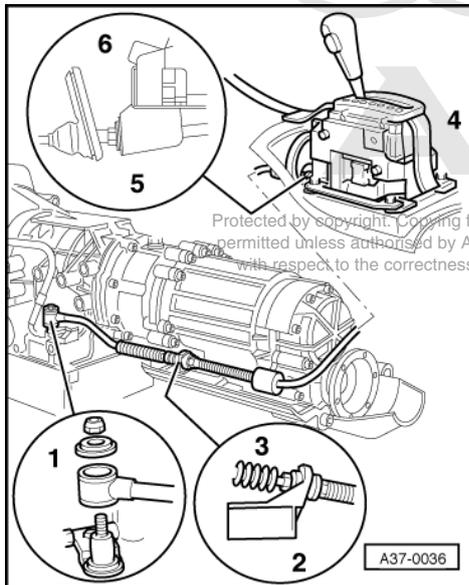
- -> Unscrew nut, remove washer and carefully pull selector lever cable -arrow 1- upwards off selector shaft lever.
- Unscrew bolts -arrow 2- on support bracket and detach support bracket from selector lever cable -arrow 3-.
- Remove centre console.

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

- Unclip front guide for masking panel.
- Unscrew four bolts -arrow 4-, remove packing plates and detach grommet -arrow 6-.
- Carefully remove selector mechanism with cable from vehicle.

Note:

A second person is required to perform removal and installation.



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- -> Detach selector lever cable from selector housing -arrow 5-.
- Unfasten retainer clips for selector lever cable on selector lever and detach selector lever cable.

Installing

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

- Check that grommet -arrow 6- is fitted correctly.
- Check and adjust selector lever cable =>Page 24 .

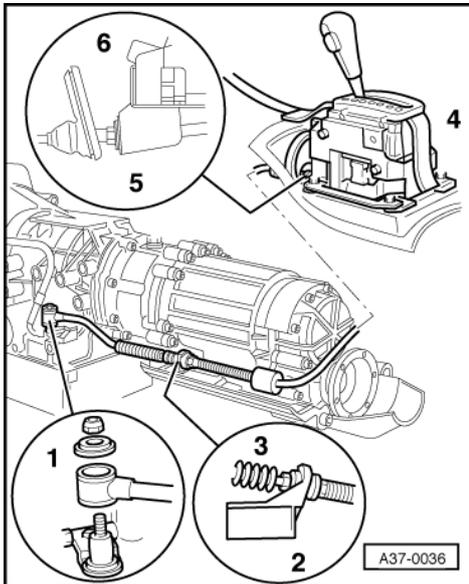
Tightening torques

Component	Nm
Support bracket for selector lever cable to gearbox	23
Selector lever cable to selector shaft lever	5.6
Selector lever cable to support bracket	12
Selector housing to vehicle body	9
Heat shield to gearbox	23



1.6 - Checking and adjusting selector lever cable

Checking

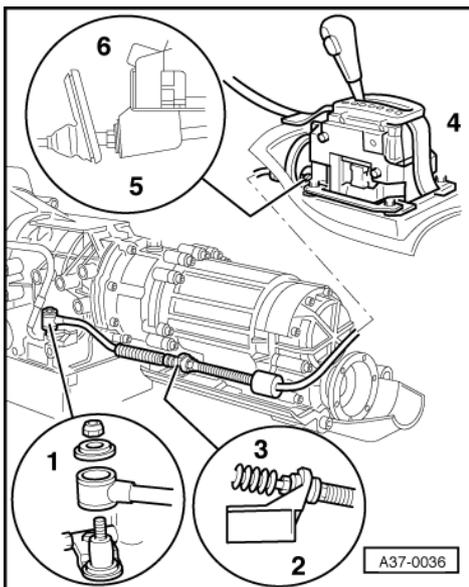


- Shift selector lever into position "P".
- -> Unscrew nut, remove washer and carefully pull off selector lever cable -arrow 1- upwards.
- Shift selector lever from "P" to "1".
 - The shift mechanism and selector lever cable should move smoothly and easily; if necessary, replace selector lever cable or service shift mechanism.
- Shift selector lever into position "P".
 - It should now be possible to press selector lever cable onto selector shaft lever; adjust selector lever cable if necessary.

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Adjusting

- Unbolt heat shield for selector lever cable on gearbox.
- Move selector lever and selector shaft lever into position "P" (parking lock should engage).



- -> Slightly slacken bolts -arrows 2- at support bracket.
- Ensure that selector lever cable is free of tension; adjust if necessary.
- Tighten support bracket bolts to 23 Nm.

- Checking selector mechanism => Page 12 .

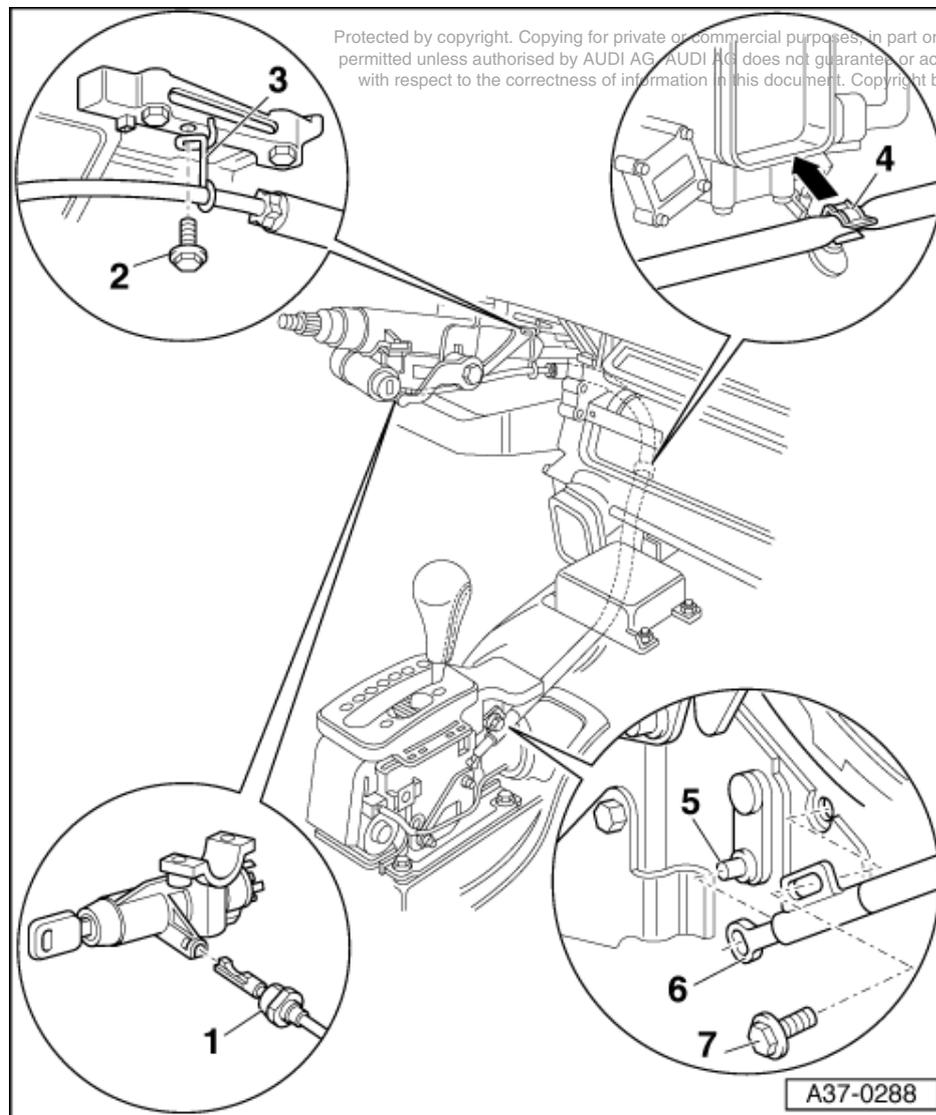
Note:

If gear display -G96 in dash panel insert does not correspond to selector lever position, repeat adjustment or adjust multi-function switch F125=>Page 60 .

Tightening torques

Component	Nm
Support bracket for selector lever cable to gearbox	23
Selector lever cable to selector shaft lever	5.6
Heat shield to gearbox	23

1.7 - Removing and installing locking cable



Removing

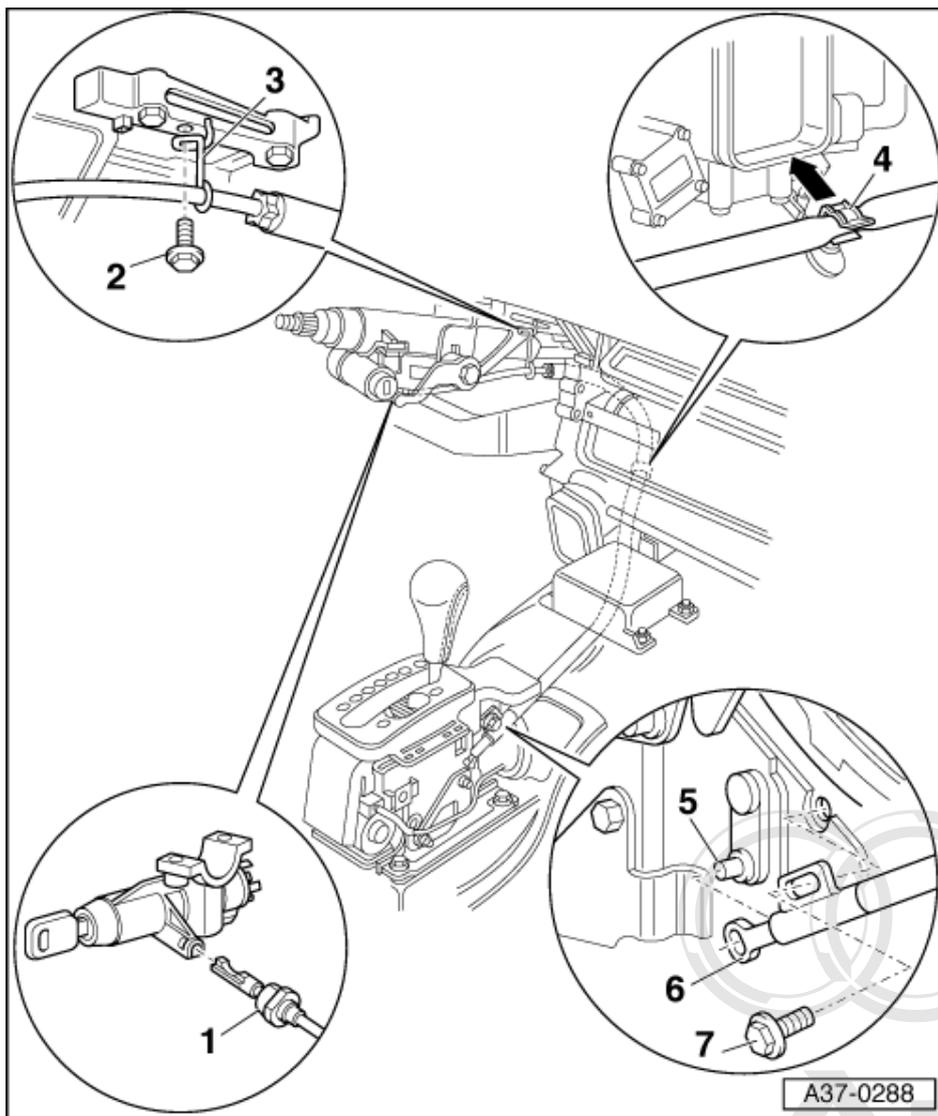


Note:

Do not kink locking cable.

- Shift selector lever to position "2".
- 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



- Remove centre console:

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

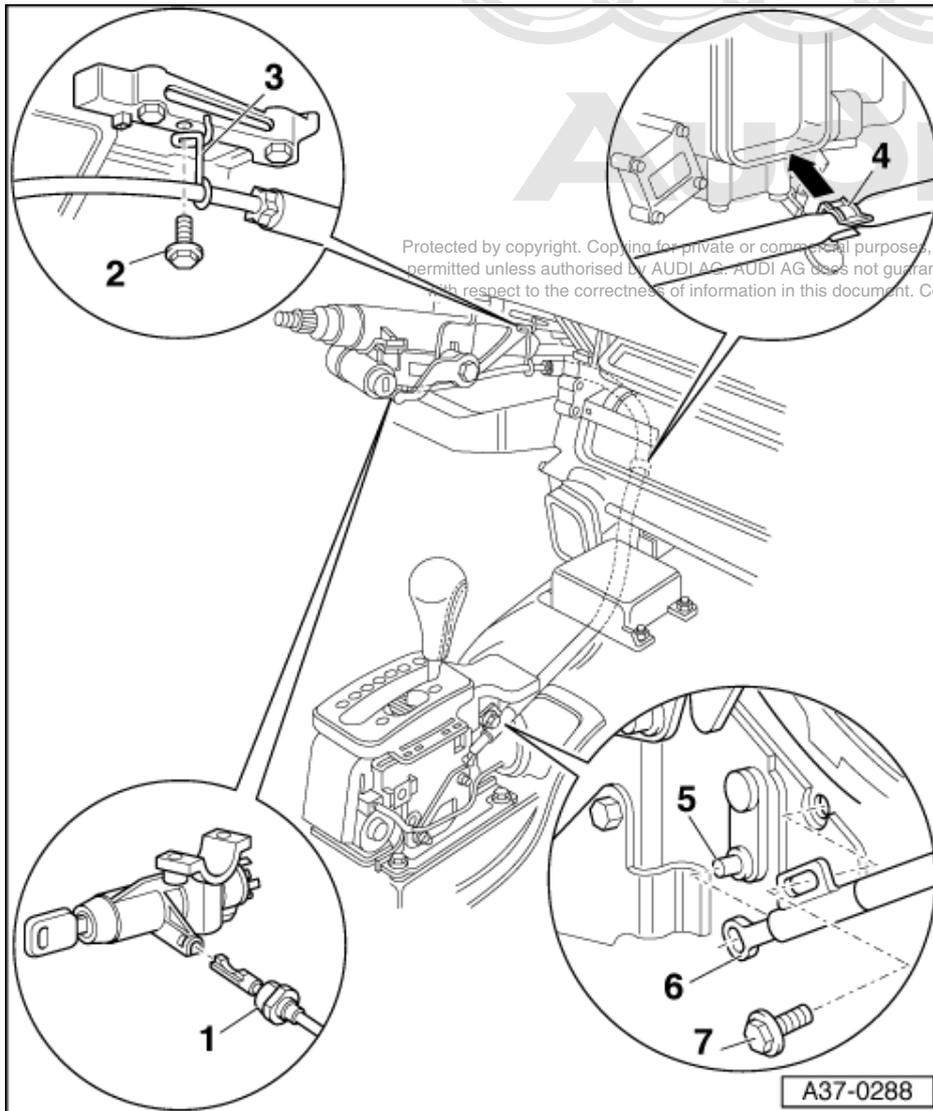
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- Remove steering column switch:

=> Electrical system; Repair group 94; Servicing steering column switch; Removing and installing steering column switch Servicing steering column switch Removing and installing steering column switch

- Turn ignition key to "ignition on" position.
- Shift selector lever to position "P".
- Lift locking clip on locking device -1- and pull locking cable out from ignition/starter switch.

- Unbolt locking cable support bracket at shift mechanism and disengage locking cable eye.

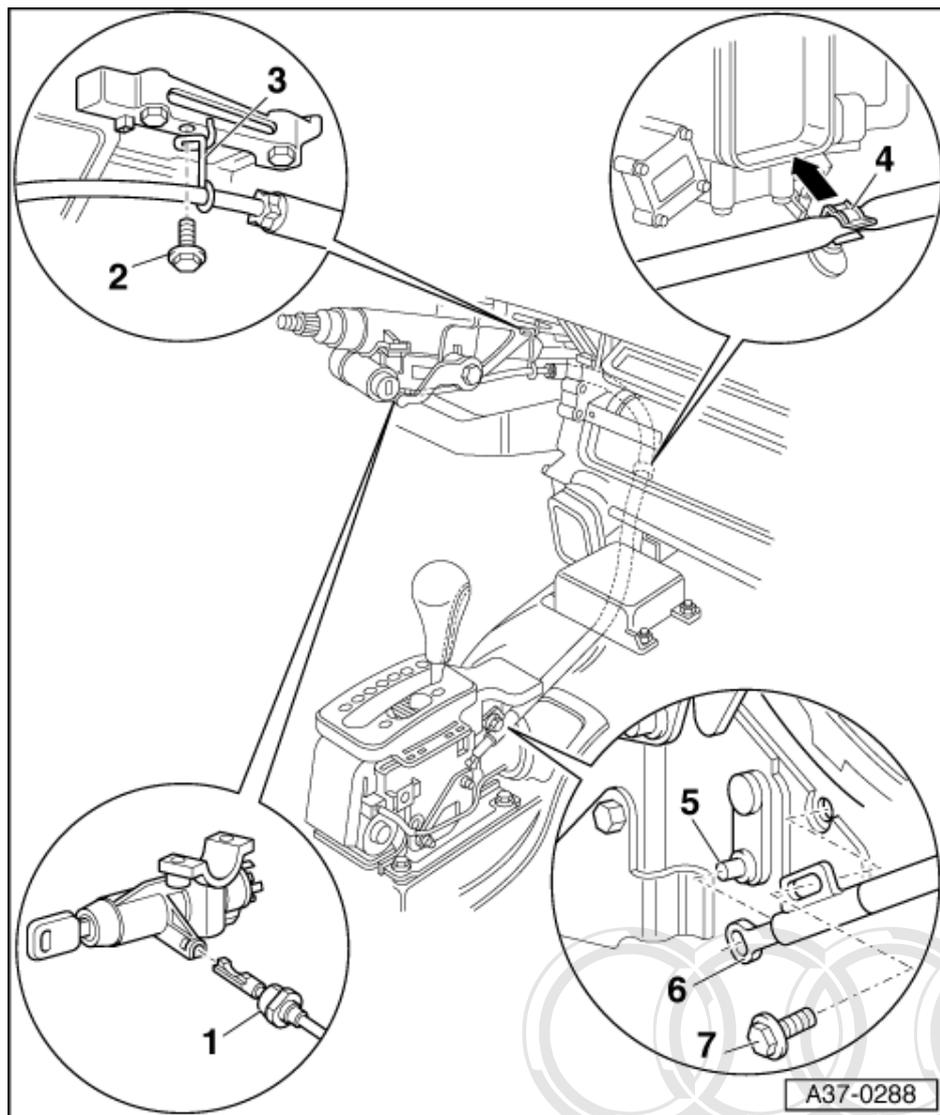


- Slacken bolt -2- at steering column and remove locking cable together with wire retainer -3-.
- Release locking cable from retaining clip -4- and take out.
- Unbolt airbag control unit.

=> General body repairs, Interior; Repair group 69; Servicing airbag; Removing and installing airbag control unit -J234 Servicing airbag Removing and installing airbag control unit -J234

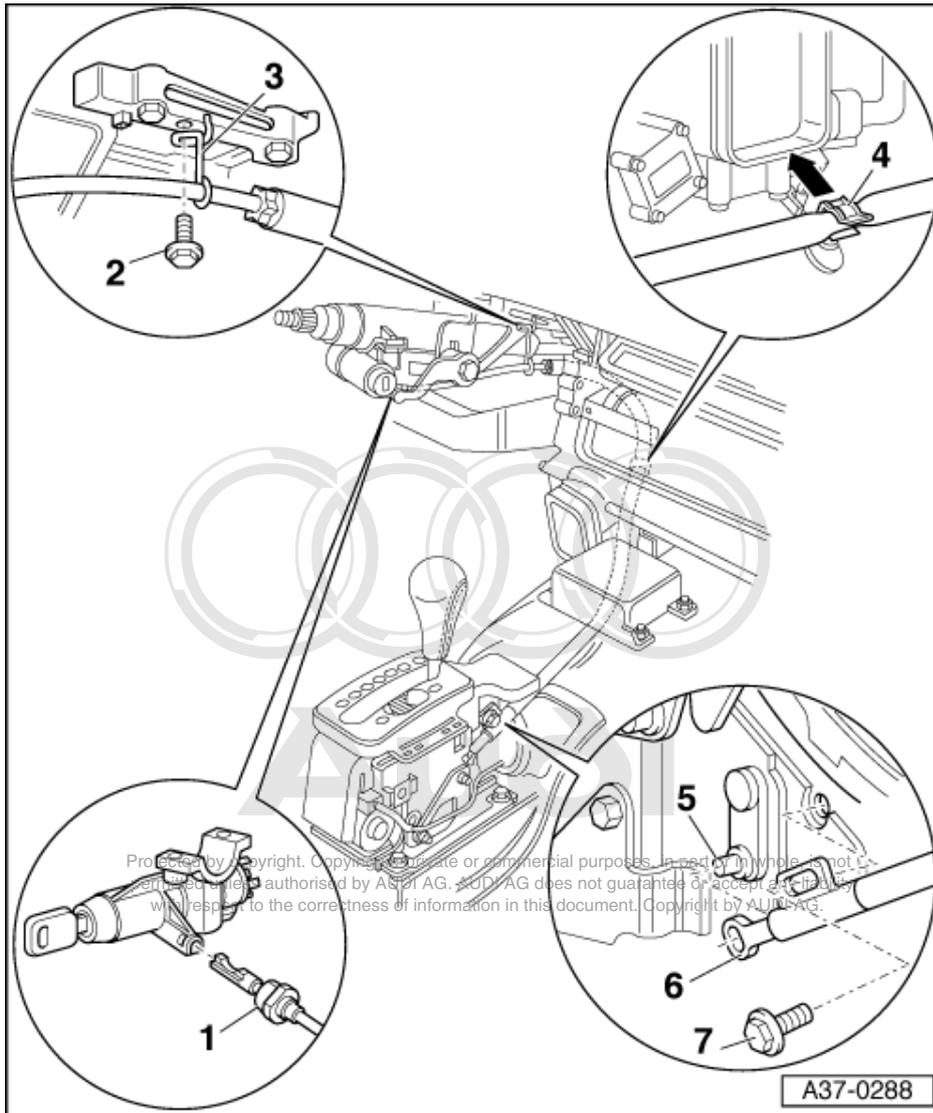
Installing

- 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.



- 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 -6- onto pin -5-.
- Loosely tighten bolt -7- for locking cable support bracket at shift mechanism.
- Adjust locking cable => Page 29 .

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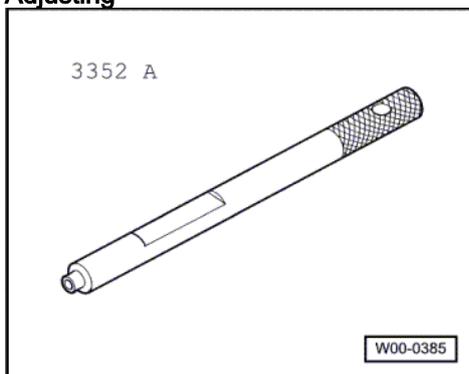
Continue installing in the reverse order, noting the following points:

- 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

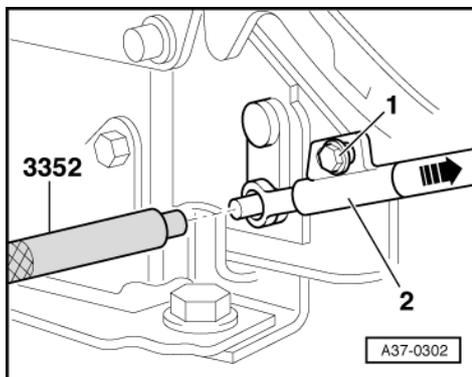




Special tools and workshop equipment required

- ◆ Adjustment gauge for locking cable 3352 A

Work sequence



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- -> Slacken bolt -1-.
- It should be possible to move support bracket -2- for locking cable by hand.
- Insert setting bar 3352 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 the setting bar.
- Always test the ignition key removal lock after adjusting locking cable => Page 12 .

2 - Checking gearbox

2.1 - Checking gearbox

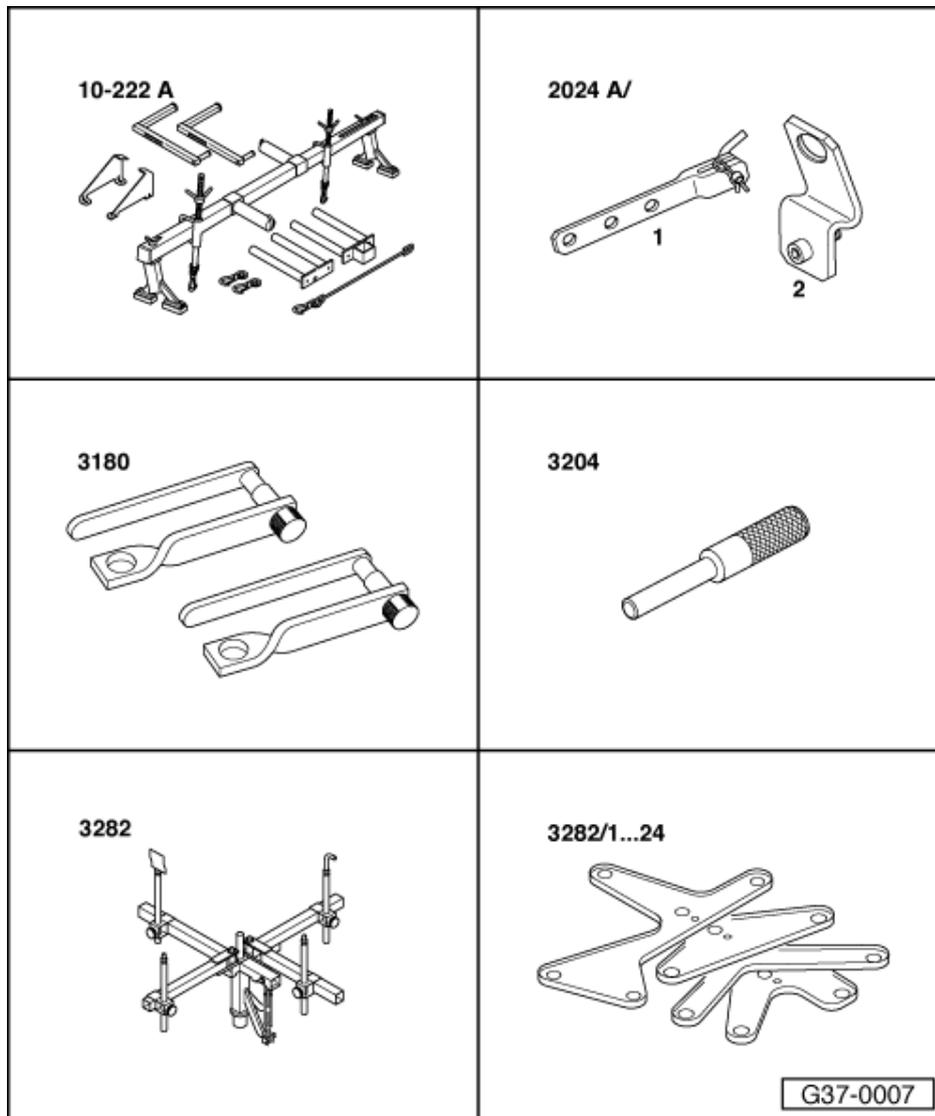
When tracing the cause of faults, always perform self-diagnosis as a first step.

=> Automatic Gearbox 01F and 01K 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.

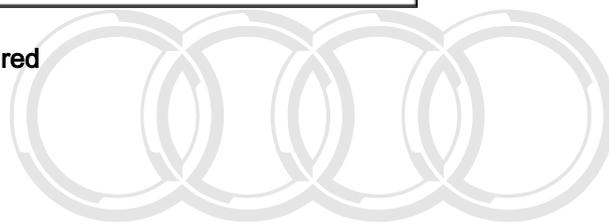
3 - Removing and installing gearbox

3.1 - Removing and installing gearbox



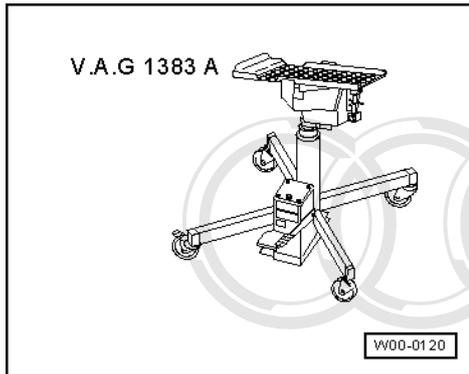
Special tools and workshop equipment required

- ◆ Support bar 10-222 A with 10-222 A/4
- ◆ Bar 2024 A/2
- ◆ Retainer 3180
- ◆ Special tool 3204
- ◆ Gearbox support 3282
- ◆ Adjustment plate 3282/13



Audi

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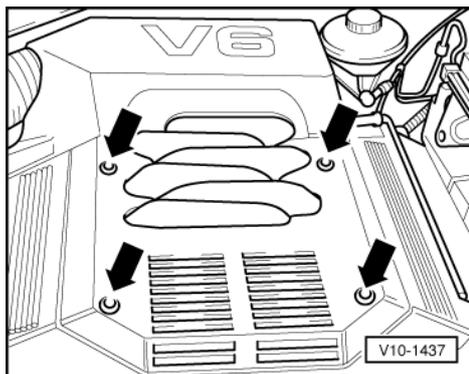
- ◆ Engine/gearbox jack V.A.G 1383 A



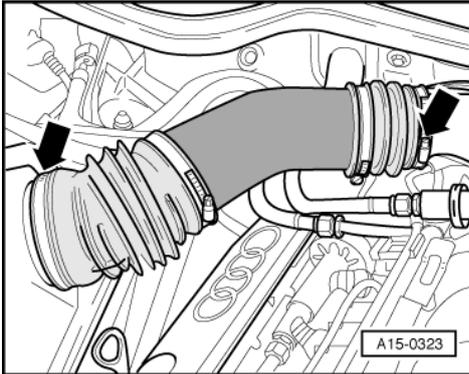
- ◆ Matra V/175 15 mm A/F socket attachment

Removing

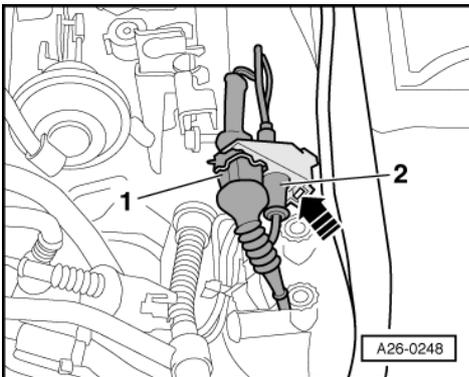
Caution
Contact corrosion. Notes => Page 5 .



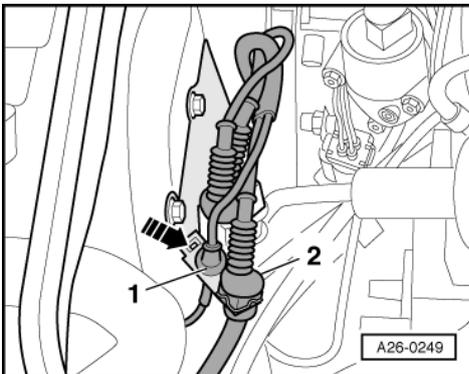
- Obtain radio code on vehicles with coded radio.
- Switch off ignition and disconnect battery earth strap (in luggage compartment).
- -> Remove engine cover panel -arrows-.



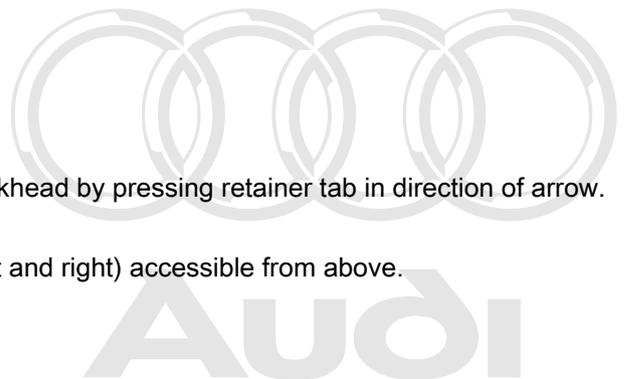
- -> Remove air hose between air mass meter and intake manifold -arrows-.



- -> Unclip mounting (on left) for connectors on bulkhead by pressing retainer tab in direction of arrow.
- Unplug connectors -1- and -2- to the lambda probe.
- Push lambda probe wiring downwards.



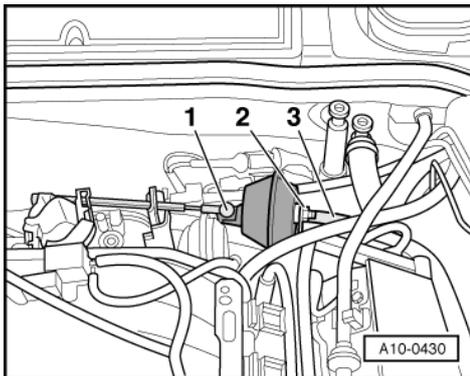
- -> Unclip mounting (on right) for connectors on bulkhead by pressing retainer tab in direction of arrow.
- Unplug connectors -1- and -2- to lambda probe.
- Push lambda probe wiring downwards.
- Unscrew securing nuts on front exhaust pipes (left and right) accessible from above.



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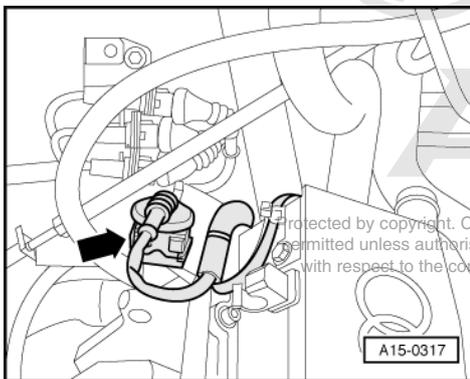


Vehicles with cruise control system:

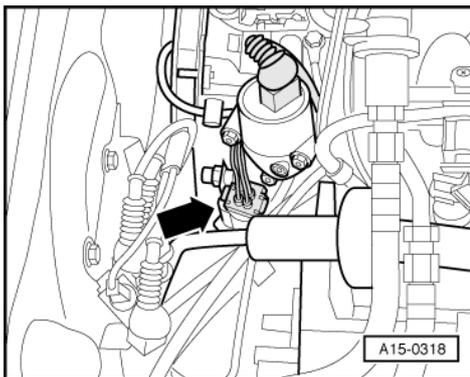


- -> Disengage actuator rod -1- at vacuum unit.
- Pull vacuum hose -3- off vacuum unit.
- Unscrew nut -2- and remove vacuum unit.

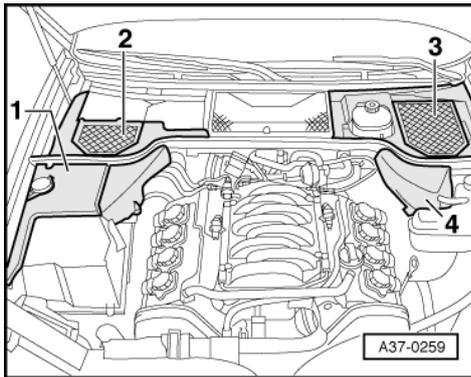
All models:



- -> Pull off connector -arrow- and disengage lower part of connector from mounting.
- Pull spark plug connector off cylinder 5.



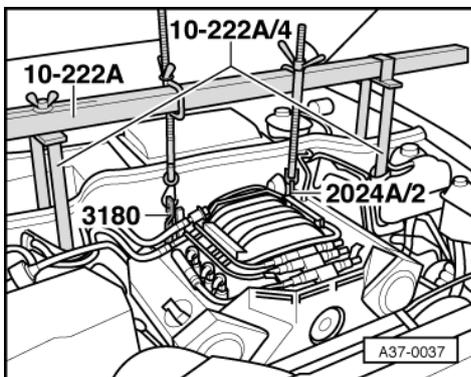
- -> Unplug connector at coolant temperature sender -G2 -arrow-.



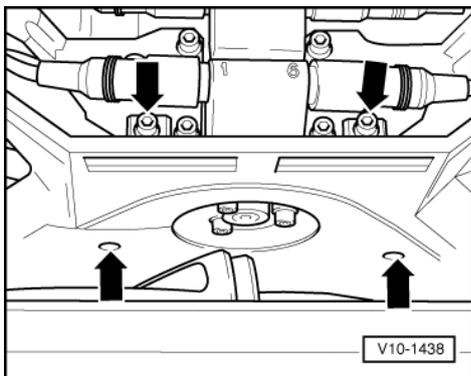
- -> Remove covers 1 - 4.

Note:

Shown in illustration on 8-cylinder engine.



- -> Assemble engine support bracket 10-222 A with adapters 10-222 A/4 and spindles.
- Left spindle in front of support bracket, right spindle behind.
- Position engine support bracket 10-222 A onto bolts for suspension strut mountings and check stability.
- Fit retainer 3180.
 - Fit pin into eye from rear and secure.
- Fit retainer 2024/A2.
 - Fit bolt into eye from rear and secure.
- Tighten spindle slightly, but do not take up weight of engine.



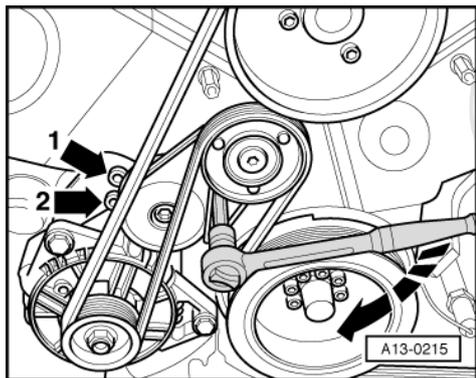
- -> Remove ribbed belt cover -arrows-.

Note:

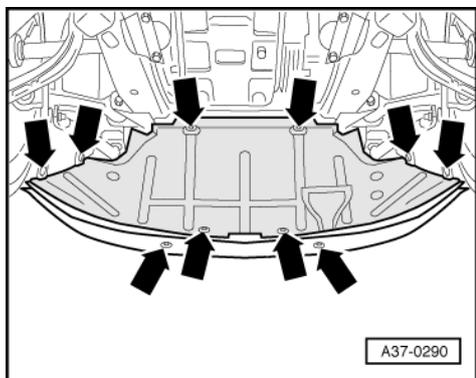
Mark the direction of rotation with chalk or felt pen before removing the ribbed belt. If the belt rotates in the wrong direction when it is refitted, it may break.



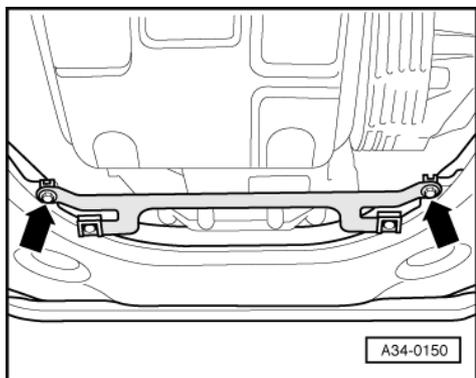
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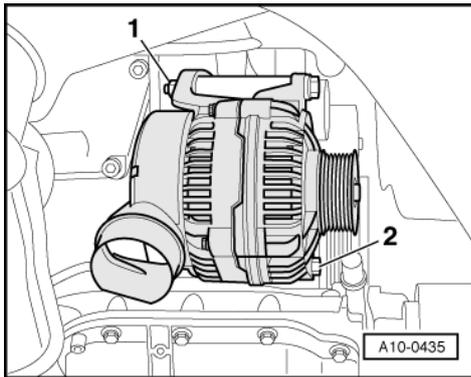
- -> To slacken ribbed belt, turn tensioning element in direction of arrow with Allen key (10 mm).
- Insert mandrel 3204 into holes -1- and -2- to stop tensioning element from turning.
- Remove ribbed belt.
- Remove front wheels.



- -> Remove noise insulation -arrows-.

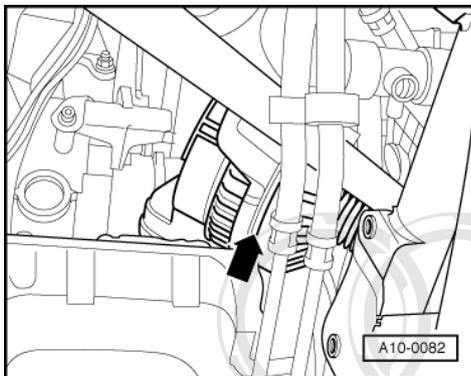


- -> Unbolt bracket for noise insulation -arrows-.
- Unclip air duct for alternator.

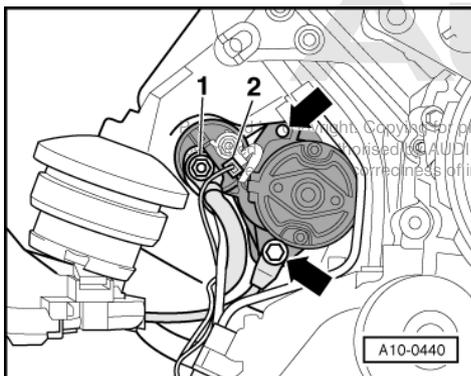


- -> Unscrew bolt -2-.
- Slacken nut -1-.
- Swing alternator over to the side and unscrew wiring.
- Remove alternator.

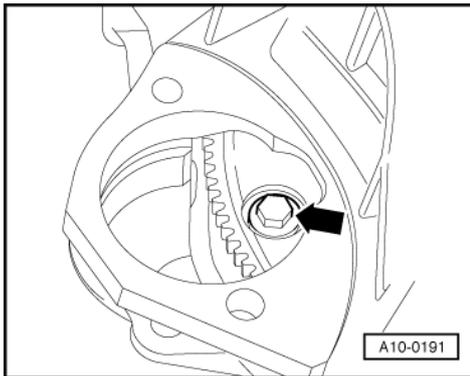
Note:



-> If a body strut impedes the removal of the alternator, set alternator on body strut.



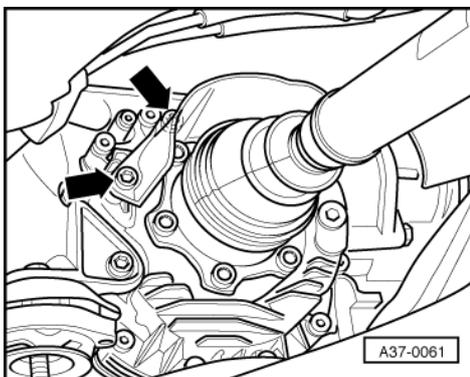
- -> Detach wires -1- and -2- from starter; remove insulator from positive connection on starter.
- Unscrew starter bolts -arrows- working from gearbox side, and remove starter.



- -> Unscrew 3 torque converter bolts through opening of removed starter using Matra V/175 15 mm A/F socket attachment (turn crankshaft 1/3 turn each time).

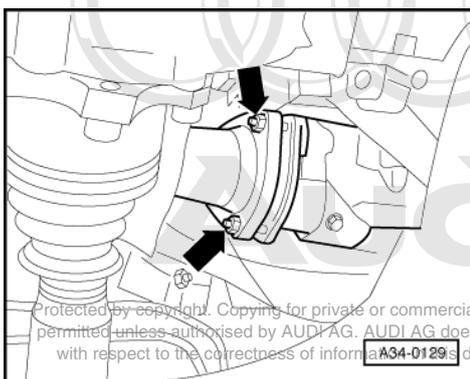
Note:

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



- -> 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.

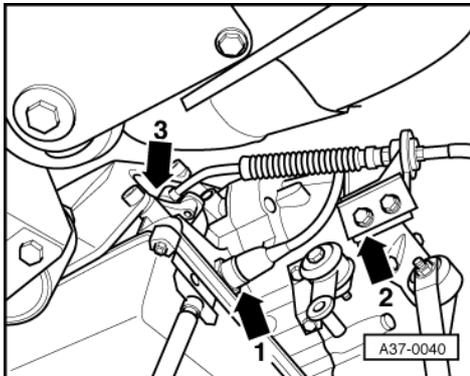
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Note:

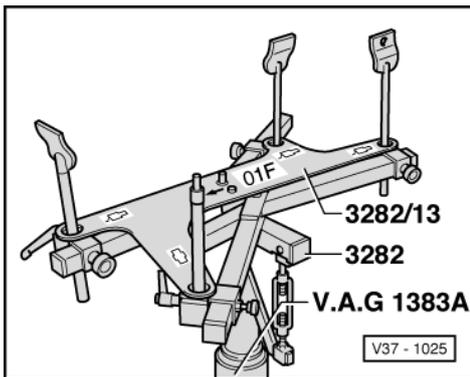
Observe rules for cleanliness when working on automatic gearbox => Page 56 .

- Release wiring guide -arrow 3- from multi-function switch by pressing spring catch on base of connector.



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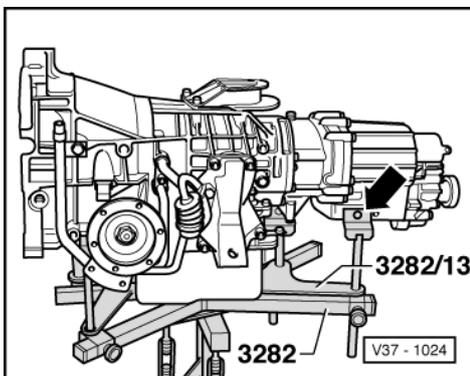
- -> Release bayonet fitting on 8-pin connector 1- by turning anti-clockwise. Detach connector from gearbox.
- Unscrew bolts -arrow 2- on support bracket and remove support bracket from gearbox.
- Unscrew nut -arrow 3-, remove washer and carefully lift selector lever cable -arrow 1- from selector shaft lever.
- Unclip all wiring from retainers on gearbox.



- -> Assemble gearbox support 3282 to remove automatic gearbox 01F with adjustment plate 3282/13 and place on support V.A.G 1383 A.

Note:

The symbols on the adjustment plate indicate the mounts required for the automatic gearbox 01F, and the arrow points in the direction of travel.

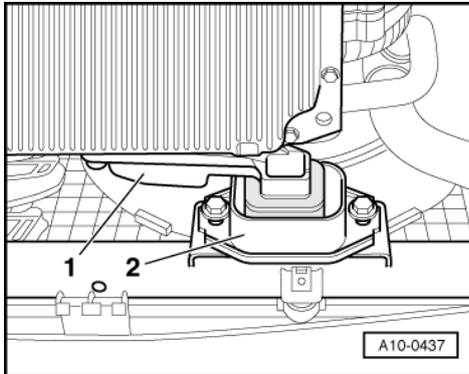


- -> Run gearbox jack V.A.G 1383 A with gearbox support 3282 under the gearbox, secure -arrow- and take up the weight of the gearbox.

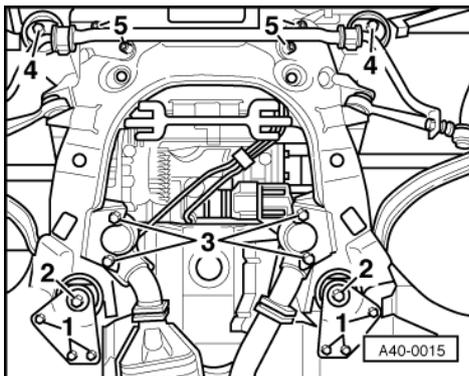
Note:

If gearbox support 3282 is not available, gearbox can be removed and installed using engine and gearbox jack V.A.G 1383 A and universal support V.A.G 1359/2.

- Support gearbox with gearbox jack V.A.G 1383 A.



- -> Unscrew torque reaction support -1- and torque reaction support stop -2-.
- Remove left gearbox support together with gearbox mounting.
- Remove right gearbox mounting.

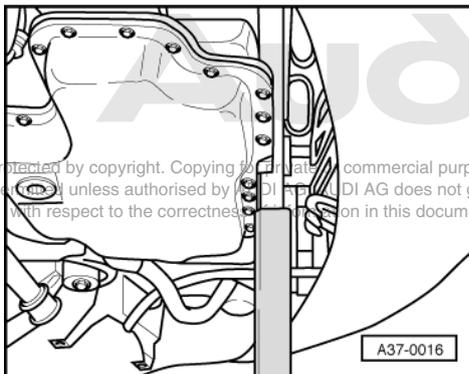


- -> Unscrew securing bolts -1- and -2- at rear of subframe.

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.

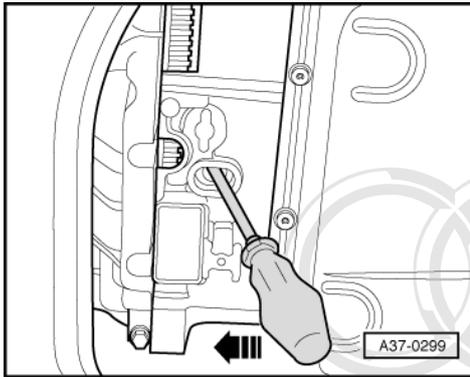
- Lower the gearbox slightly at the rear.
- Move the drive shafts clear to the front.



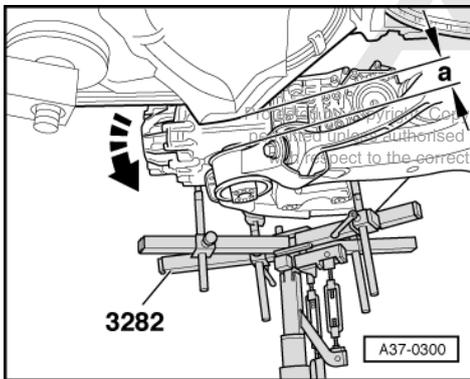
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- -> Support engine at front with commercially available support.
- Remove upper engine/gearbox connecting bolts.



- -> 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 -arrow-.
- Move the gearbox away down to the rear (subframe has been lowered by distance a = approx. 80 mm).

Notes:

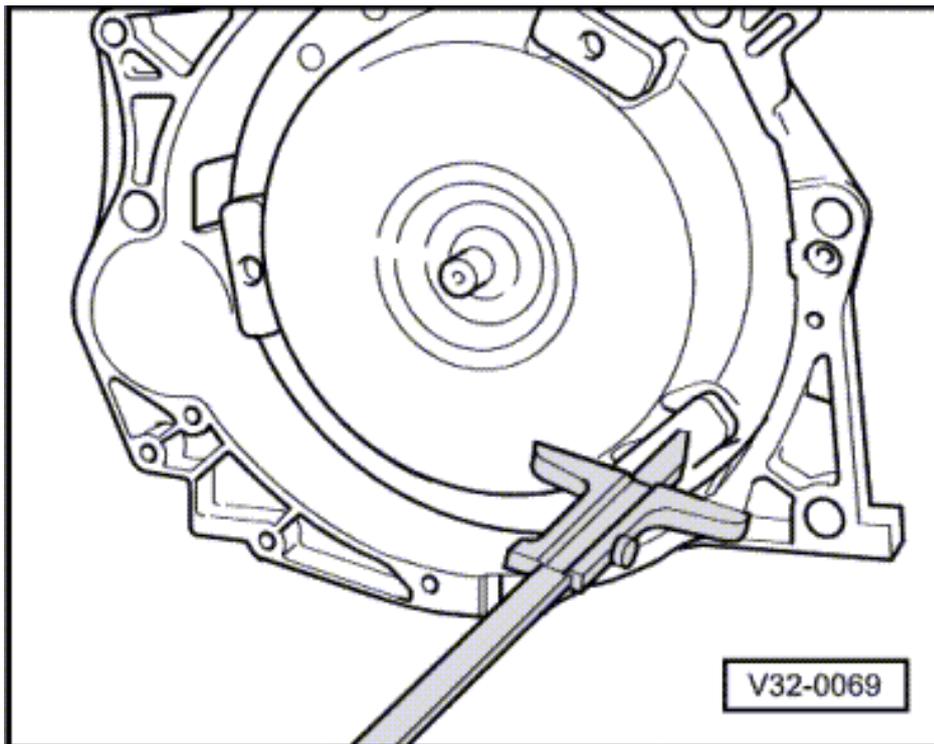
- ♦ If necessary, slacken spindle on support bracket 10-222 A.
- ♦ Ensure adequate clearance between bulkhead and engine.
- ♦ Secure the torque converter to prevent it from dropping out.

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 59 .
- Before installing gearbox, make sure that torque converter is inserted into gearbox properly
=>Page 10 .



-> When the torque converter is correctly inserted, the distance between the surface of the securing eyes and the surface of the torque converter bell housing is at least 19 mm.

- Before installing gearbox, make sure dowel sleeves are properly positioned on engine 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.

Note:

When installing ATF pipes, renew O-rings and coat new O-rings thinly with Vaseline.

- Renew M14 bolts on subframe and their lock washers.
- 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 171 .
- Align exhaust system free of stress

=> 6-Cylinder engine, Mechanics; Repair group 26; Removing and installing parts of exhaust system; Stress-free alignment of exhaust system
Removing and installing parts of exhaust system Stress-free alignment of exhaust system

- Checking oil level in final drive of automatic gearbox => Page 88 .
- Check ATF level => Page 48 .
- After connecting battery, enter anti-theft code for radio

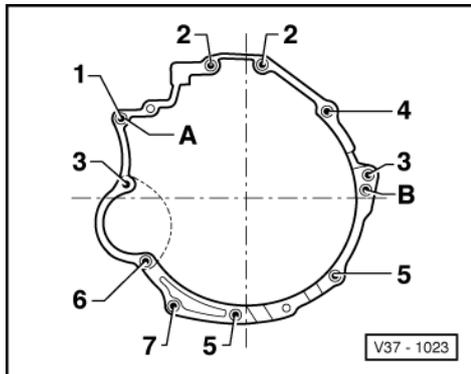
=> Radio operating instructions

- 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	Qty	Nm
1	M12 x 50	1	65
2	M12 x 67	2	65
3	M12 x 80	2	65
4	M12 x 100	1	65
5	M10 x 38	2	45
6	M10 x 80	1	45
7	M8 x 40	1	25

A, B: centring sleeves

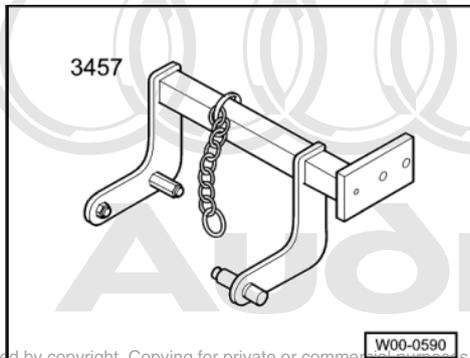
Component	Nm
Torque converter to drive plate	85
Subframe to body => Running gear, Front and four-wheel drive; Repair Group 40; Removing and installing subframe	
Torque reaction support to body	40
Torque reaction support to sump	42
Gearbox support to gearbox	42
Gearbox mountings to subframe	40
Gearbox mountings to gearbox support	42
ATF pipe to gearbox	20
Drive shaft to flange shaft	77
Heat shield for drive shaft to gearbox	23
Support bracket for selector lever cable to gearbox	23
Selector lever cable to selector shaft lever	5.6

Component	Nm	
Heat shield for selector lever cable to gearbox	23	
Alternator to engine	M8	22
	M10	45
Wheel bolts to wheel hub	120	

Note:

Tightening torques for ATF pipe mountings=>from Page 57.

3.2 - Transporting the automatic gearbox

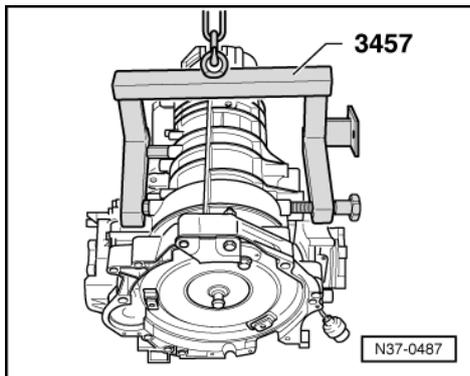


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Special tools and workshop equipment required

- ◆ Transportation appliance 3457

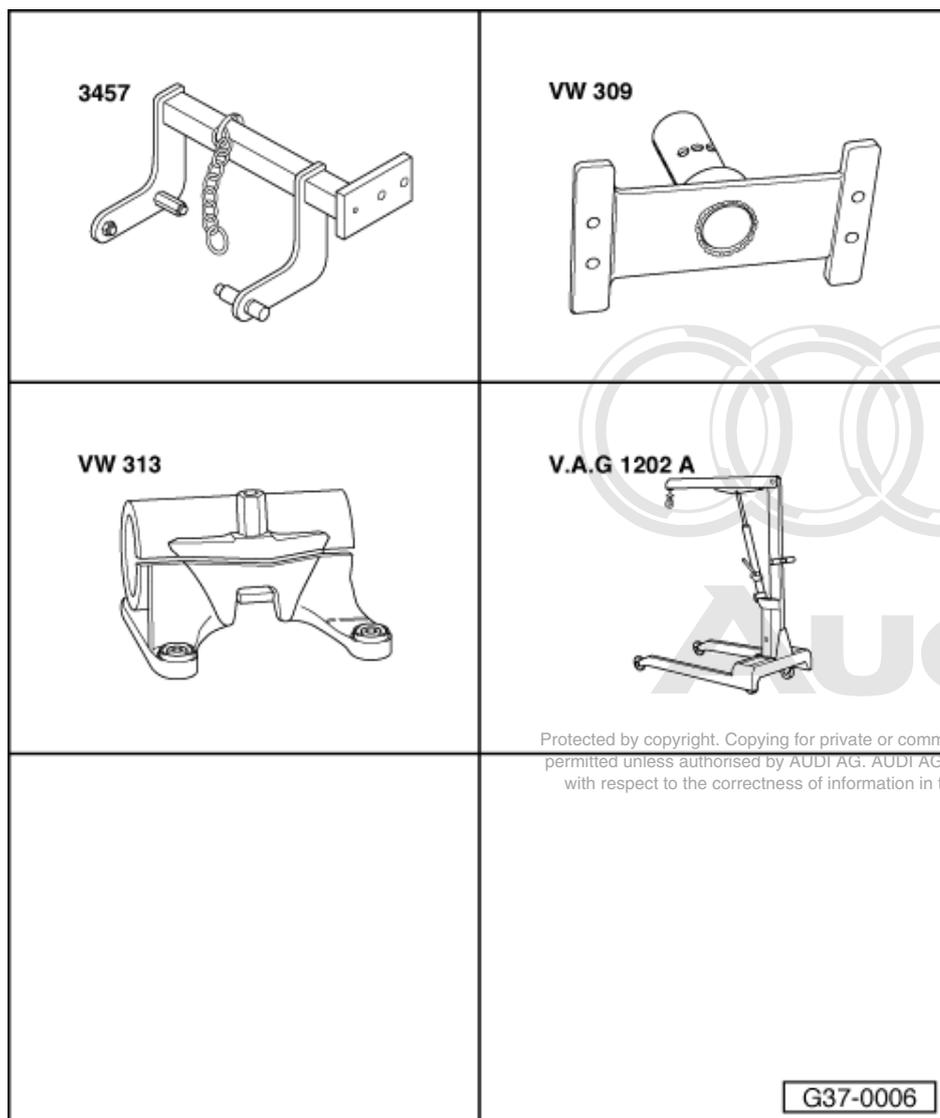
The automatic gearbox can be transported using transportation appliance 3457.



- -> Fit transportation appliance 3457 to attachment points on gearbox housing and secure in place.
- Secure torque converter in gearbox to prevent it falling out.

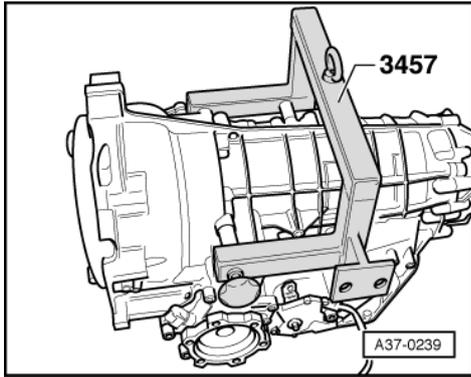


3.3 - Securing gearbox to repair stand



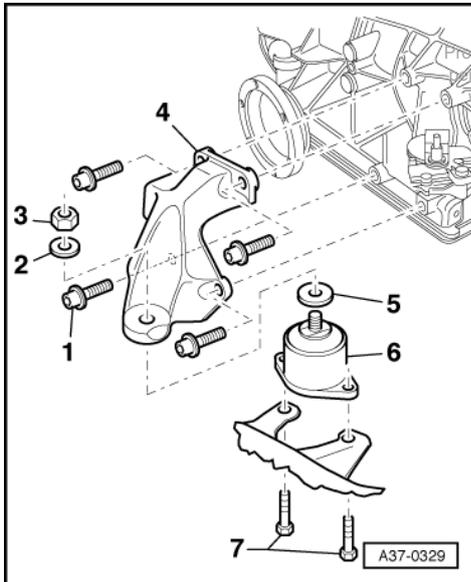
Special tools and workshop equipment required

- ◆ Transportation appliance 3457
 - ◆ Holding plate VW 309
 - ◆ Support clamp VW 313
 - ◆ Workshop crane V.A.G 1202 A
- Secure torque converter in gearbox to prevent it falling out.



- -> Bolt transportation appliance 3457 to gearbox.
- Attach holding plate VW 309 to support clamp VW 313.
- Lift gearbox using workshop crane V.A.G. 1202 A attached to transportation appliance 3457 and screw on holding plate VW 309.

3.4 - Removing and installing left gearbox support



- 1 - -> Bolt - 42 Nm
- 2 - Washer
- 3 - Nut - 42 Nm
- 4 - Left gearbox support
- 5 - Washer
- 6 - Gearbox mounting
- 7 - Bolt - 40 Nm

Note:

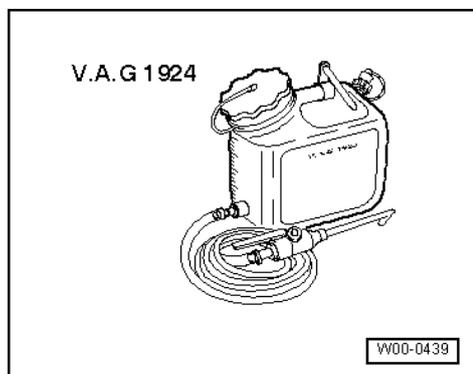
If necessary, lift gearbox slightly to facilitate bolting on gearbox support.



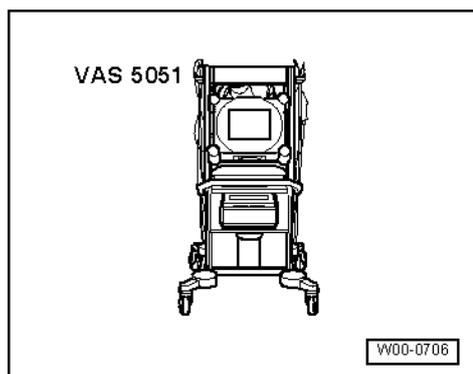
4 - Checking ATF level; changing ATF

4.1 - Checking ATF level; changing ATF

Special tools and workshop equipment required



- ♦ ATF filling system V.A.G 1924



- ♦ VAS 5051 and VAS 5051/1
- or
- ♦ V.A.G 1551 and V.A.G 1551/3 A

4.2 - Checking ATF level

Requirements for test:

- Gearbox not in emergency running mode.
- Vehicle in horizontal position.
- Selector lever at position "P", engine idling.
- Air conditioner and heating must be switched off.

Notes:

- ♦ For vehicles from 07.95 >only VW-ATF with Part No. G 052 162 .. (colour: transparent/yellow) may be used and it is not permitted to use additives.
- ♦ For vehicles >06.95, remaining stock of ATF Dexron may be used up. Thereafter also use ATF with Part No. G 052 162 .. (colour: transparent/yellow).



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Container sizes:

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

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.
- ◆ The ATF temperature can be checked using fault reader V.A.G 1551.

Checking ATF temperature

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Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select control unit for gearbox electronics by entering address word "02" and advance until display reads "Select function XX"

=> Automatic Gearbox 01F and 01K Self-Diagnosis; Repair Group 01; Performing self-diagnosis Performing self-diagnosis

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block	Q
Enter display group number	XXX

- Enter "004" to select Display group 004 and confirm entry with Q key.

-> Indicated on display:

Read measured value block	4		
1	2	3	4

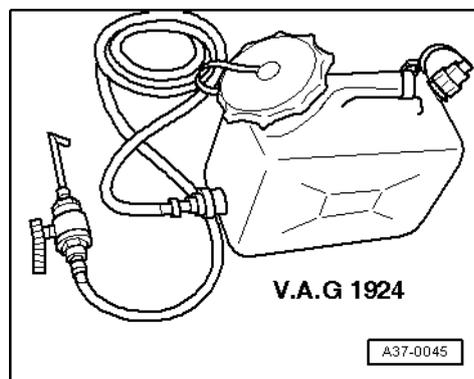
- Read off ATF temperature in display zone 4.

Check ATF level and top up as required.

Notes:

- ◆ The ATF level is checked at the ATF inspection plug.
- ◆ If the ATF level is correct, a small amount of fluid will come out at the ATF inspection plug when ATF temperature is between 35 ° and 45 °C 1) (the fluid level will rise slightly as the temperature increases).

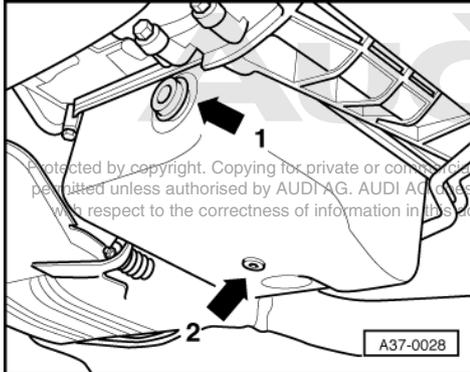
1)50°C for tropical countries





Warning!
Wear eye protection

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



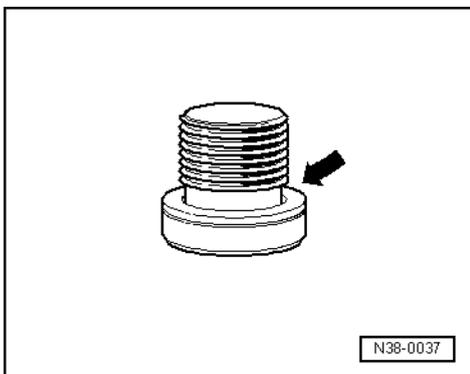
- -> When an ATF temperature of 35 °C is reached, open ATF inspection plug -arrow 1- and drain off excess ATF if necessary.
- If ATF comes out at the inspection plug before the ATF has reached a temperature of 40 °C, the ATF level is correct.

Note:

The ATF inspection plug must be screwed in again before the ATF reaches a temperature of 45 °C 1).

1)50°C for tropical countries

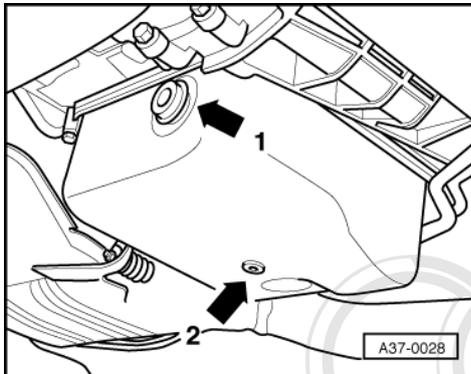
- If no ATF runs out at ATF inspection plug before ATF reaches 40 °C, top up ATF with filler hook from V.A.G 1924 until ATF comes out at the ATF inspection plug.



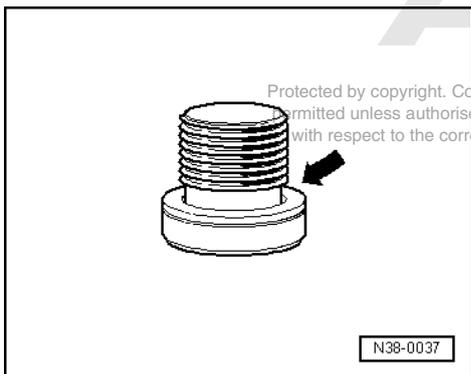
- -> Always renew seal -arrow- for ATF inspection plug.
- Screw in ATF inspection plug (60 Nm).
- Press =>key on V.A.G 1551.
- Enter "06" to select the function "End output" and confirm entry with Q key.

4.3 - Changing ATF or filling up after repairs

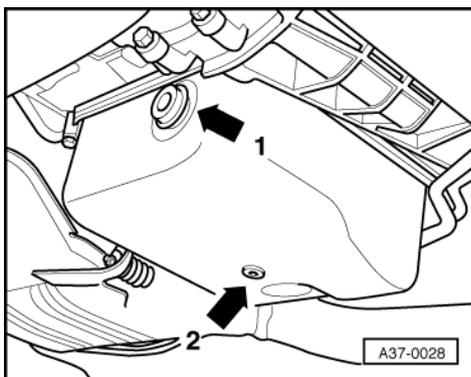
Notes:



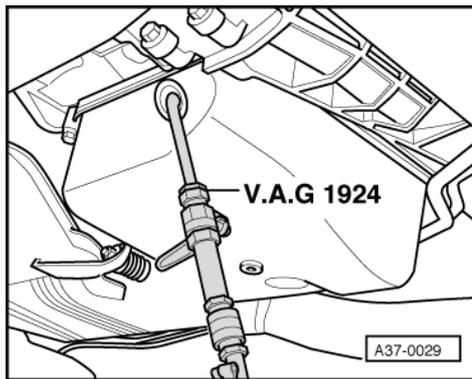
- ◆ Observe environmental requirements for disposal.
- ◆ The engine must not be started and the vehicle must not be towed if there is no ATF in the gearbox!
- Place container under the gearbox.
- -> Remove ATF drain plug -arrow 2- and drain ATF.



- -> Always renew seal -arrow- for ATF drain plug.
- Screw in ATF drain plug (35 Nm).



- -> Unscrew ATF inspection plug -arrow 1-.



- -> Top up ATF with filler hook from V.A.G 1924 until ATF comes out at ATF inspection plug.
- Shift selector lever to position "P", start engine and allow to run at idling speed.
- With engine running, top up ATF again until ATF comes out of ATF inspection plug.
- With brake pedal depressed, select all selector lever positions (P, R, N, D, 3, 2, 1) with engine running at idling speed, whereby each selector position must be retained for 2 - 3 seconds.
- Then check and top up ATF level =>from Page 48 .

Note:

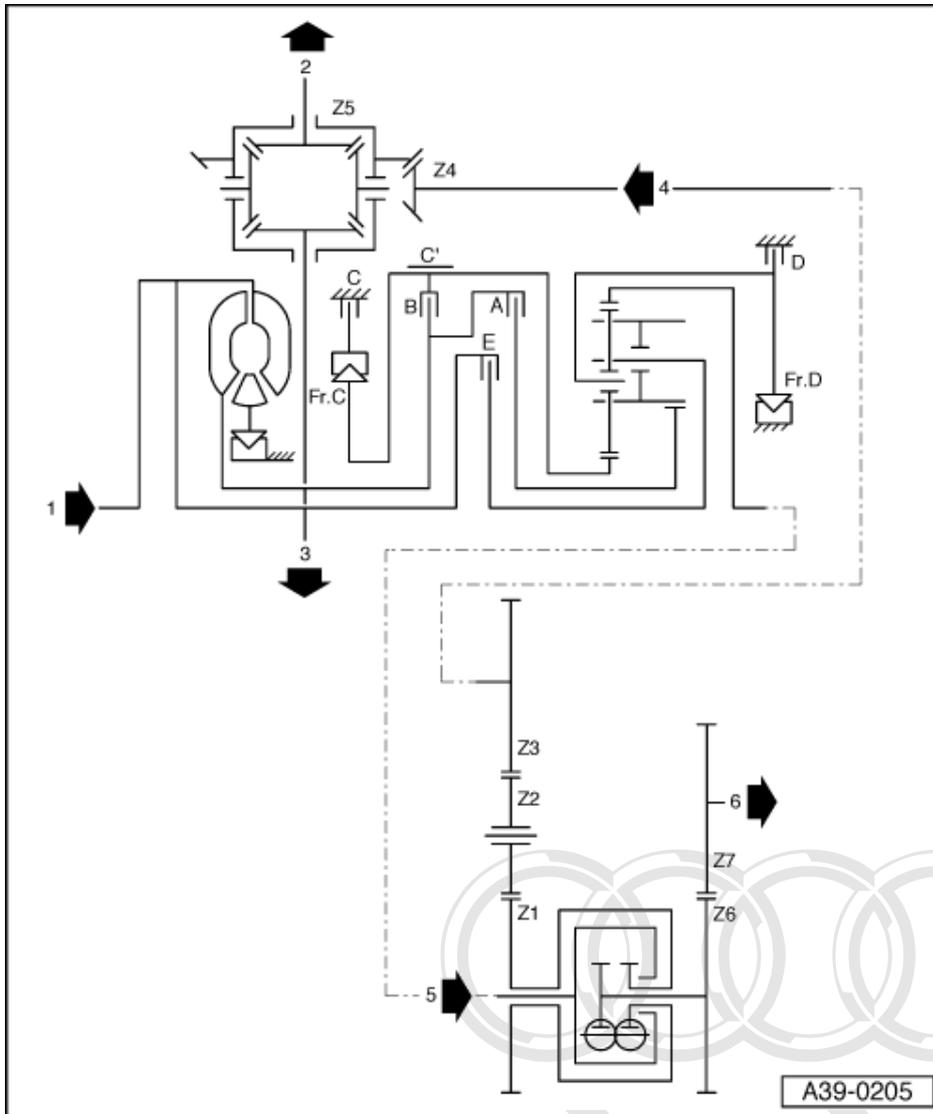
Observe all notes and test requirements as for "Checking ATF level".



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5 - Gearbox with shift elements

5.1 - Gearbox with shift elements



5.2 - Gearbox schematic diagram

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A = Clutch A

B = Clutch B

E = Clutch E

C = Brake C

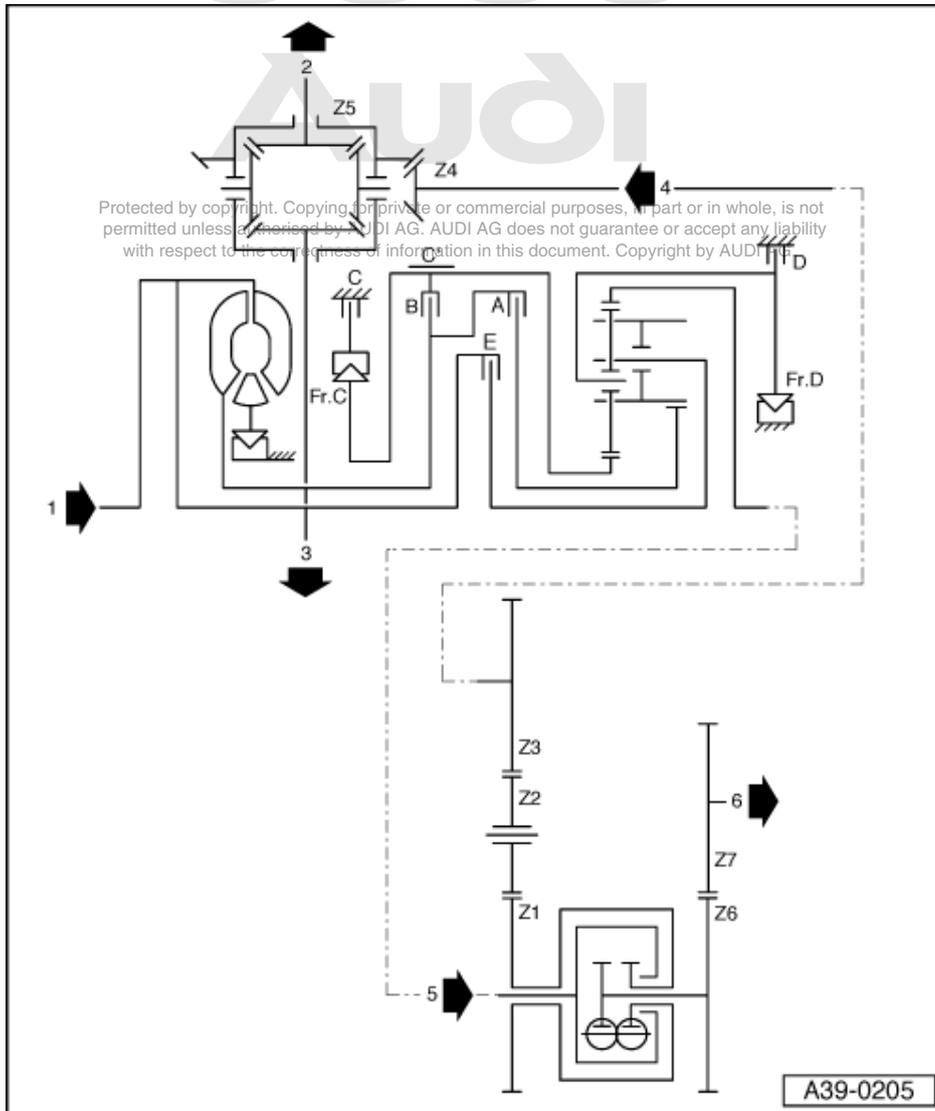
C' = Brake C'

D = Brake D



Fr.C = Freewheel C

Fr.D = Freewheel D



Z1 - Z3 = Front intermediate drive

Z4, Z5 = Front final drive

Z6, Z7 = Rear intermediate drive

Ratios => from page 2

Power flow:

- Arrow 1 - from engine
- Arrow 2 - to front right wheel
- Arrow 3 - to front left wheel
- Arrow 4 - from Torsen differential via intermediate drive for front final drive to front final drive
- Arrow 5 - to Torsen differential
- Arrow 6 - from Torsen differential via intermediate drive for rear final drive to rear final drive

5.3 - Position of shift elements

Notes:

- ◆ Always perform self-diagnosis first before performing gearbox repairs

=> Automatic Gearbox 01F and 01K Self-Diagnosis; Repair Group 01; Performing self-diagnosis Performing self-diagnosis

- ◆ To help deal with complaints regarding poor acceleration and performance or general malfunctions, the following tables show which shift elements are operated in the individual gears. This will give an indication of which shift elements are not working properly.

Solenoid valve logic						
Selector lever position	Gear	Solenoid valves				Main pressure regulator
		-N88	-N89	-N90	-N91	
P	-	-	x	x	-	x
R	Reverse gear	-	-	-	-	x
N	-	-	x	x	-	x
D	1st gear	-	x	-	-	x
D	2nd gear	x	x	-	-	x
D	3rd gear	x	-	-	-	x
D	4th gear	-	-	-	-	x
2	1st gear	-	x	-	x	x
1	1st gear	-	x	-	-	x
D	3rd - 4th gear overlap	(x)	-	-	-	x
D	4th - 3rd gear overlap	(x)	-	- x	-	x
-	Emergency running (backup) programme	-	-	-	-	-

x = Component active - = Component inactive (x) = Component active depending on driving state (overlap)

Clutch logic									
Selector lever position	Gear	Clutch			Brake			Freewheel	
		A	B	E	C	C'	D	Fr.C	Fr.D
P	-	-	-	-	-	-	-	-	-
R	Reverse gear	-	x	-	-	-	x	-	-
N	-	-	-	-	-	-	-	-	-
D	1st gear	x	-	-	-	-	-	-	x
D	2nd gear	x	-	-	x	x	-	x	-
D	3rd gear	x	-	x	x	-	-	-	-
D	4th gear	-	-	x	x	x	-	-	-
2	1st gear	x	-	-	-	-	x	-	x
1	1st gear	x	-	-	-	-	x	-	x
D	3rd - 4th gear overlap	(x)	-	x	x	(x)	-	-	-
D	4th - 3rd gear overlap	(x)	-	x	x	(x)	-	-	-



Clutch logic									
-	Emergency programme	x	-	-	x	x	-	-	-

<p>x = Component active - = Component inactive (x) = Component active depending on driving state (overlap)</p>
--

6 - Dismantling and assembling gearbox

6.1 - Dismantling and assembling gearbox

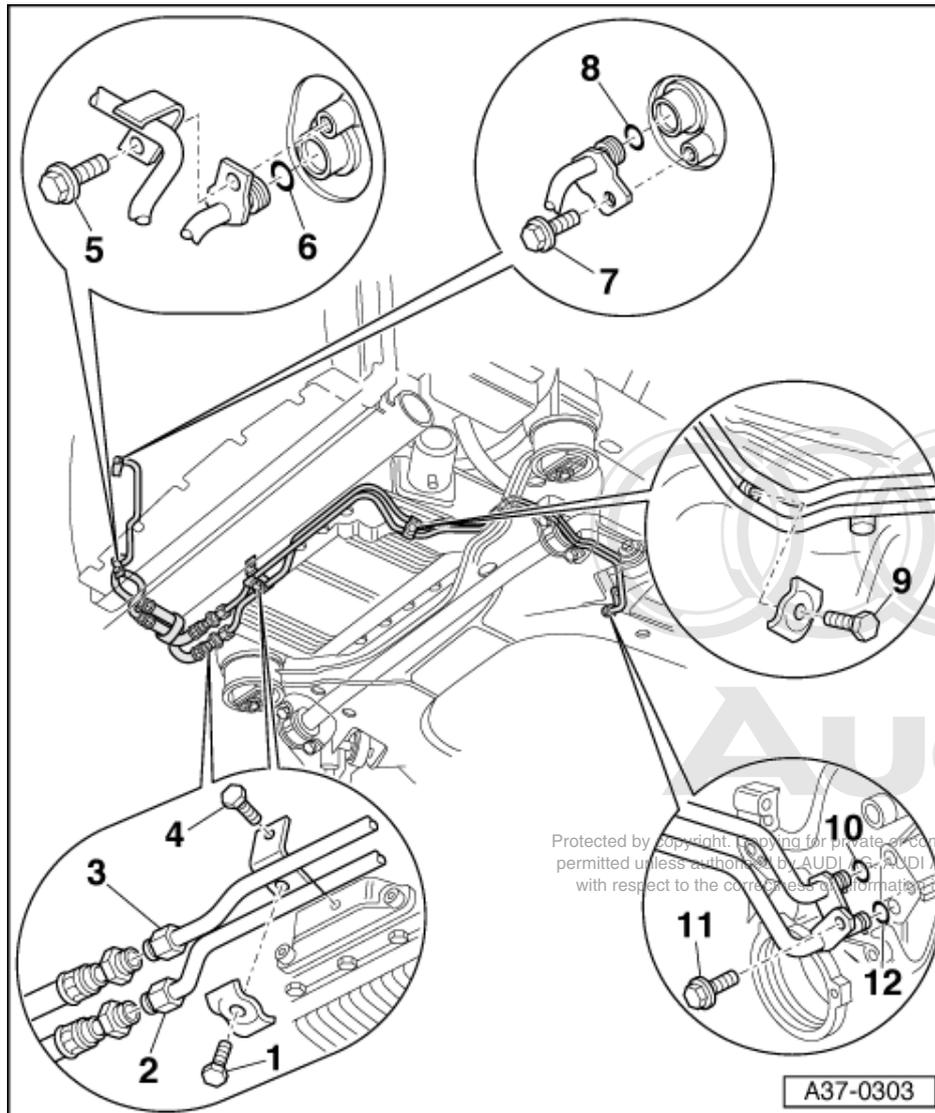
- Observe general repair instructions=> Page 5 .

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.
- ◆ Coat O-rings with Vaseline before installing to prevent the rings from being crushed when inserting.
- ◆ Always use Vaseline only in small amounts. Other greases will cause malfunctions in controls of hydraulic gearbox.
- ◆ After installing, check following fluid levels and top up if necessary: ATF in planetary gearbox (=> Page 3 .

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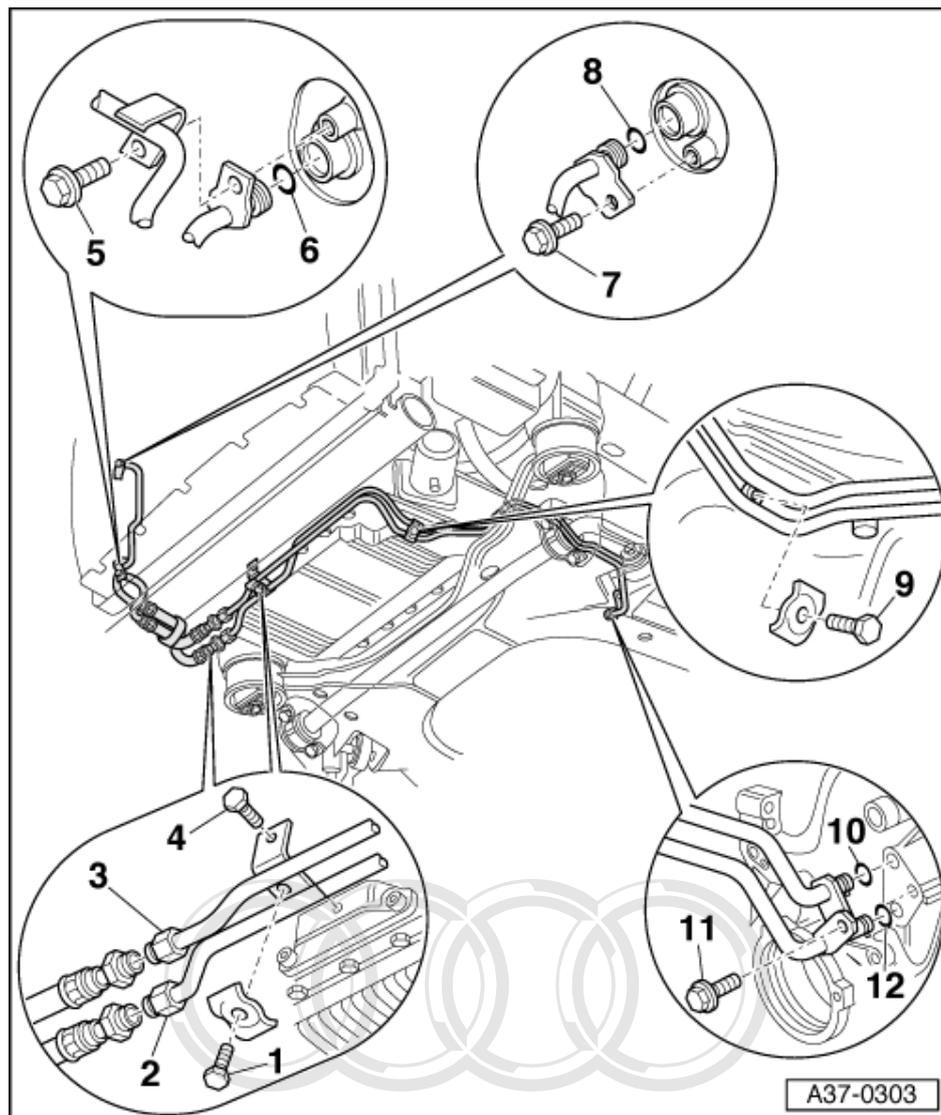
6.3 - Removing and installing ATF pipes



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 Bolt - 5 Nm
- 2 Bolt - 25 Nm
- 3 Union nut - 25 Nm
- 4 Union nut - 25 Nm
- 5 Bolt - 5 Nm



- 6 O-ring
 - ◆ Renew
 - ◆ Insert with ATF
- 7 Bolt - 5 Nm
- 8 O-ring
 - ◆ Renew
 - ◆ Insert with ATF
- 9 Bolt - 10 Nm
- 10 O-ring
 - ◆ Renew
 - ◆ Insert with ATF
- 11 Bolt - 20 Nm
- 12 O-ring
 - ◆ Renew
 - ◆ Insert with ATF

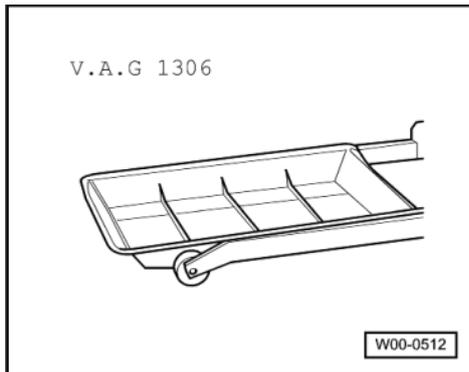
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6.4 - Cleaning ATF pipes and ATF cooler

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.

Special tools and workshop equipment required



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

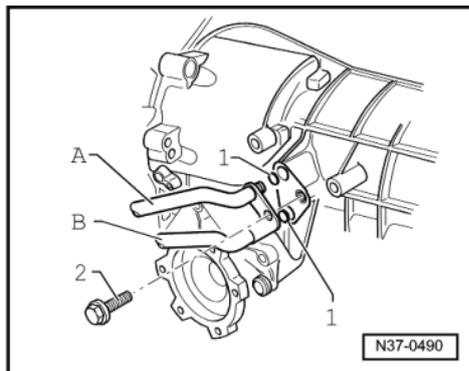


Work sequence

Warning!
Wear eye protection

- Place drip tray V.A.G 1306 underneath.

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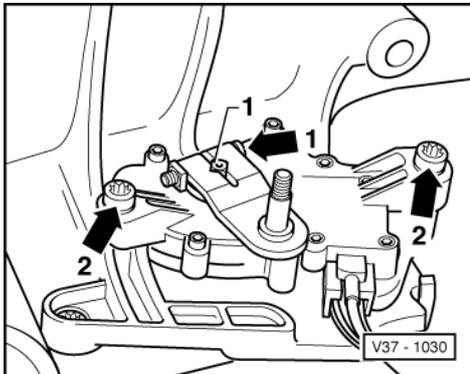
- -> Unscrew bolt -2-.
- Pull ATF pipes off gearbox.
- Place a hose with a diameter of about 18 mm onto ATF pipe -A- and secure with hose clamp. Place the other end of the hose in a suitable container.
- Blow through ATF pipe -B- with a compressed air gun.
- Change hose from ATF pipe -A- over to ATF pipe -B- and repeat sequence.
- Secure ATF pipes again.
- Then check and top up ATF level =>from Page 48 .



6.5 - Removing and installing multi-function switch -F125

Removing

- Remove left-hand gearbox support => page 47 .
- Disconnect selector lever cable from selector shaft lever.



- -> Completely remove clamping bolt -arrow 1- for lever and pull lever off selector shaft -1-.
- Remove securing bolts of multi-function switch -arrows 2- and pull multi-function switch off selector lever.

Installing

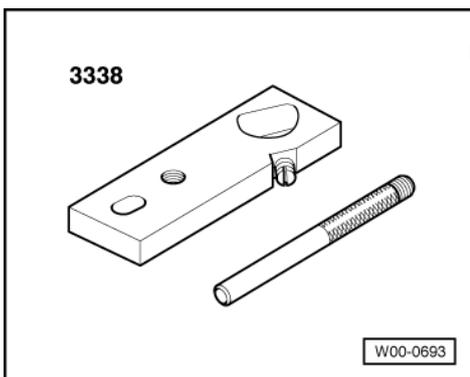
- Move selector shaft with an 8 mm AF open jaw spanner in opposite direction of travel into position "P" (up to stop).
- From this position move selector shaft back two detents into position "N".
- Fit multi-function switch on selector shaft.

Note:

The multi-function switch can only be fitted on the selector shaft in one position.

- Only screw in securing bolts so far that multi-function switch can still be moved within elongated holes.
- Adjusting multi-function switch =>page 60 .

6.6 - Adjusting multi-function switch -F125



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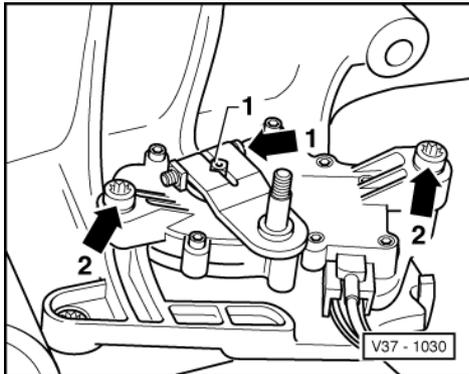
Special tools and workshop equipment required

- ♦ Adjustment appliance 3338

Work sequence

- Remove left-hand gearbox support
=> page 47 .

- Disconnect selector lever cable from selector lever shaft.

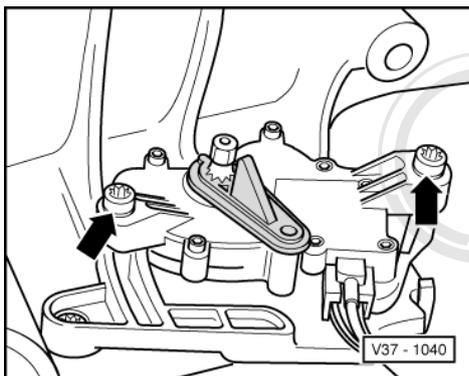


- -> Completely remove clamping bolt -arrow 1- for lever and pull lever off selector shaft.
- Move selector shaft -1- with an 8 mm AF open jaw spanner in opposite direction of travel into position "P" (up to stop).
- From this position move selector shaft back two detents into position "N".

Note:

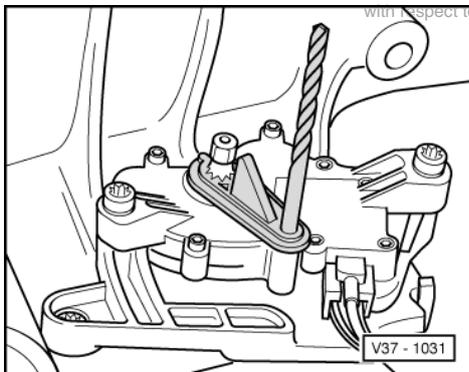
The multi-function switch can be adjusted with adjusting tool 0 501 311 626 (only supplied as a spare part with multi-function switch) or with assembly device 3338.

Adjusting with adjusting tool



- -> Fit adjusting tool on selector shaft.
- Loosen securing bolts for multi-function switch -arrows-.

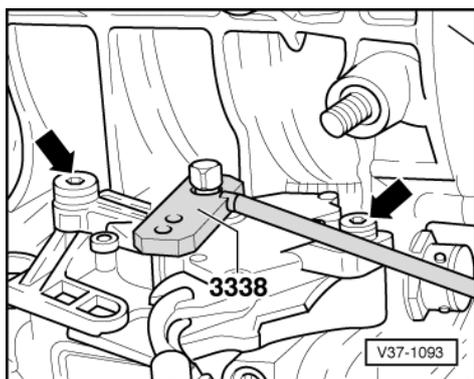
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- -> Turn multi-function switch until hole in adjusting tool aligns with adjustment on multi-function switch and can be fixed with a pin or 4 mm dia. drill.
- Tighten securing bolts for multi-function switch (8 Nm).
- Remove adjusting tool and pin or drill.



Adjusting with adjustment appliance 3338

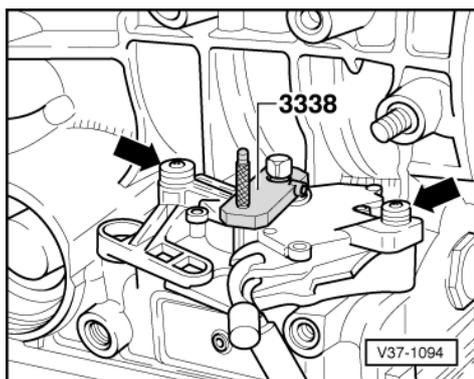


- -> Fit adjustment appliance 3338 on selector shaft and tighten its fixing screw with a small screwdriver.

Note:

Check before fixing that the adjustment appliance lies flat on the multi-function switch; unscrew the fixing screw slightly first if necessary.

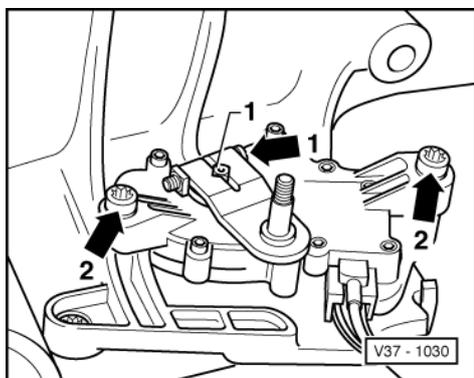
- Loosen securing bolts of multi-function switch -arrows-.



- -> Turn multi-function switch until hole in adjustment appliance 3338 aligns with adjuster on multi-function switch and can be fixed with pin of adjustment appliance 3338.
- Tighten securing bolts -arrows- of multi-function switch (8 Nm).
- Remove adjustment appliance.

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Installing



- -> Fit lever on selector shaft -1- and tighten clamping bolt -arrow 1- (8 Nm).
- Tighten selector level cable on selector shaft (9 Nm).
- Reconnect connector for multi-function switch.
- Relieve weight of engine at support bar.

- 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 60 .

- Take up weight of engine again at support bar.
- Install left gearbox support=>Page 47 .



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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

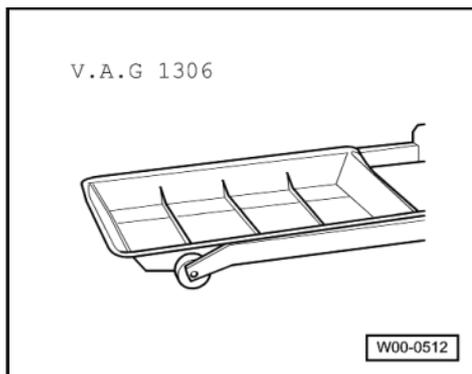
Do not run engine or tow vehicle with oil pan removed or when there is no ATF in the gearbox.

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 56 .
- ◆ General repair instructions => Page 5 .
- ◆ Coat O-rings and oil seals thinly with Vaseline. Other greases will cause malfunctions in controls of hydraulic gearbox.

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1.2 - Removing and installing oil pan

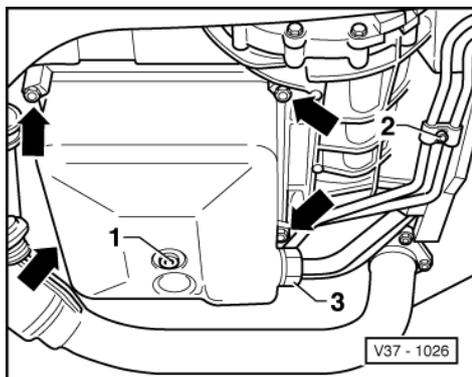


Special tools and workshop equipment required

- ◆ Drip tray V.A.G 1306

Removing

- Place drip tray V.A.G 1306 underneath.



- -> Unscrew ATF drain plug -1- and drain off ATF.
- Remove clamp -2- for ATF pipe.
- Loosen securing nuts -arrows- with spacers using diagonal sequence.

Installing

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

- If necessary, clean deposits off magnet in oil pan (used for catching metal particles).

Note:

Make sure magnet is positioned correctly within flared rim of oil pan, otherwise noises may result.

- Renew gasket for oil pan.
- Always renew seal for ATF drain plug.
- Fill with ATF and check ATF level => page 51 .

Tightening torques

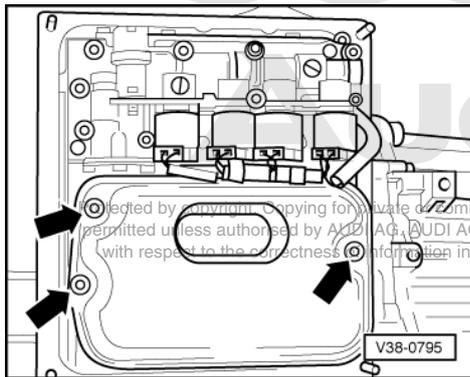
Component		Nm
Oil pan to gearbox	M6	6
ATF drain plug to oil pan	M14	35

Note:

Tightening torques for ATF pipe brackets

=>from Page 57

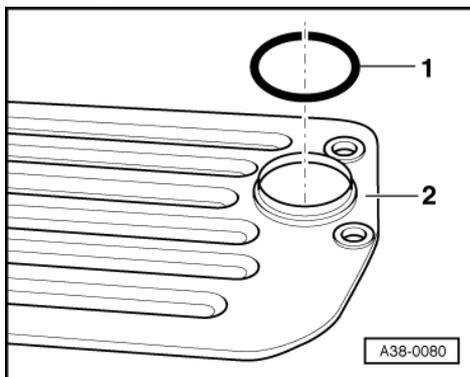
1.3 - Removing and installing ATF screen



Removing

- Remove oil pan => Page 64 .
- -> Unscrew bolts on ATF screen -arrows-.
- Pull ATF screen off valve body.

Installing





- -> Replace O-ring -1- on ATF screen.
- Thinly coat O-ring on rim of ATF screen intake hole -2- with Vaseline.
- Install ATF screen.
- Install oil pan => Page 64 .
- Fill with ATF and check ATF level => Page 51 .

Tightening torque

Component		Nm
ATF screen to valve body	M6	8

1.4 - Removing and installing valve body

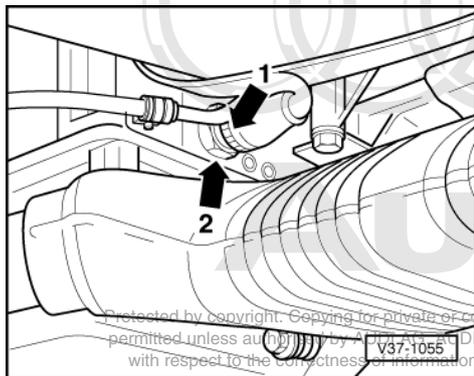
Notes:

- ◆ Always replace valve body if it has collected dirt or if it is defective.
- ◆ General repair instructions => Page 5 .
- ◆ Observe rules for cleanliness when working on automatic gearbox => Page 56 .

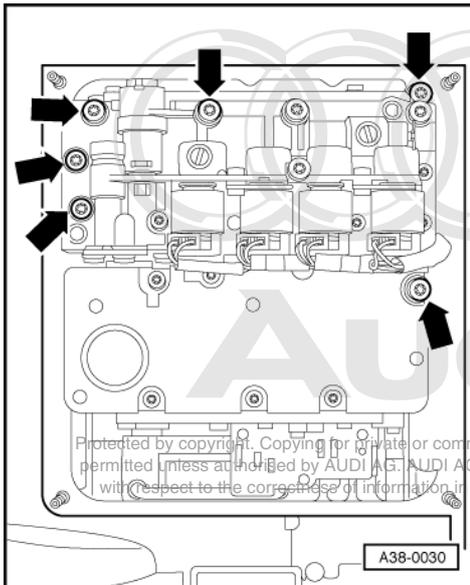
Removing

- If necessary, remove exhaust pipe with catalytic converter.

=> 6-Cylinder engine, Mechanics; Repair Group 26; Removing and installing parts of exhaust system; Removing and installing left front exhaust pipe with catalytic converter
 Removing and installing parts of exhaust system
 Removing and installing left front exhaust pipe with catalytic converter



- -> Release bayonet fitting on 8-pin connector-arrow 1- by turning anti-clockwise, and detach connector from gearbox.
- Slacken union nut -arrow 2-.
- Remove oil pan => Page 64 .
- Remove ATF screen => Page 65 .



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- -> First, tighten bolts securing valve body -arrows- hand-tight.
- Then tighten bolts for valve body to final tightening torque using diagonal sequence.
- Renew O-ring on oil strainer.
- Install ATF screen => Page 65 .
- Install oil pan => page 64 .

Tightening torques

Component	Nm
Union nut to wiring harness	20
Valve body to gearbox housing (diagonal sequence)	8
ATF screen to valve body	8

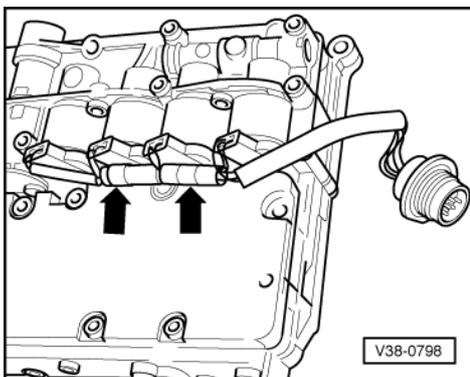
1.5 - Removing and installing wiring harness in gearbox

Note:

Observe rules for cleanliness when working on automatic gearbox => page 56 .

Removing

- Remove oil pan => Page 64 .
- Remove ATF screen => Page 65 .
- Remove valve body => Page 66 .



- -> Take wiring harness out of retainer -arrows-.
- Lever out retaining lugs of connector on solenoid valves with a small screwdriver and pull connector off.

Installing

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

- Connect connector of new wiring harness to relevant solenoid valves.

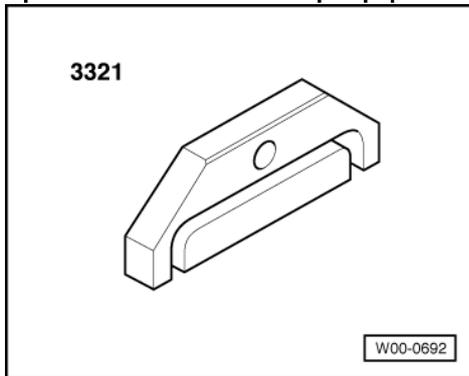
Note:

The retaining lugs must engage.

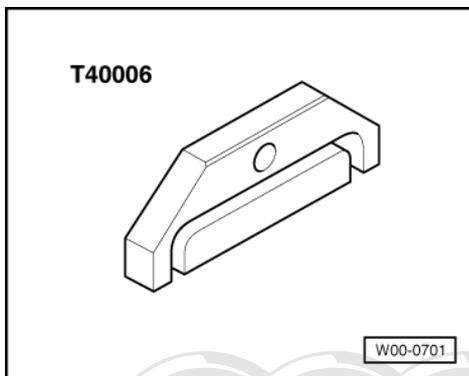
- Hook wiring harness into retainer.
- Install valve body => page 66 .

1.6 - Renewing internal oil pipe

Special tools and workshop equipment required

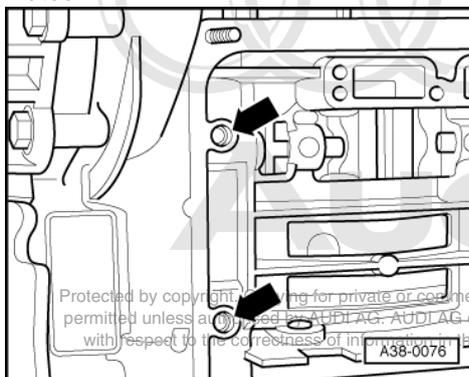


- ◆ Installing tool 3321



- ◆ Installing tool T40006

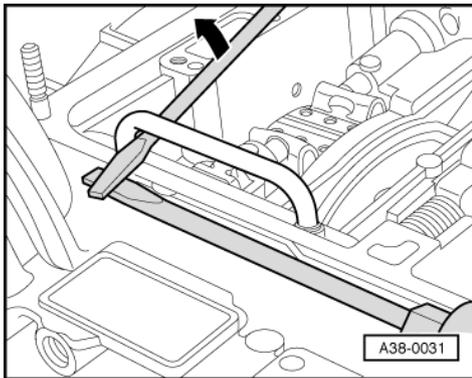
Notes:



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- ◆ Always fit new oil pipe after removing.
- ◆ -> As of gearbox No. 13 665, the gearbox housing has a notch -arrows- in each hole for the oil pipe. When a new oil pipe is installed, this gearbox is always fitted with O-rings, without regard to which type of oil pipe was fitted previously.
- ◆ The oil pipe may only be installed using installing tool 3321(for oil pipe without O-ring) or installation tool T40006(for oil pipe with O-ring).
- ◆ If the oil pipe is installed without using the relevant special tool, the result may be leaks caused by bending the oil pipe.
- ◆ A bad fit or defective O-rings on the internal oil pipe will allow ATF to leak into differential, which will overflow and cause oil to drip out of differential breather.



Removing

- Remove valve body => Page 66 .
- -> Lever internal oil pipe off gearbox housing using a screwdriver (apply pressure evenly).

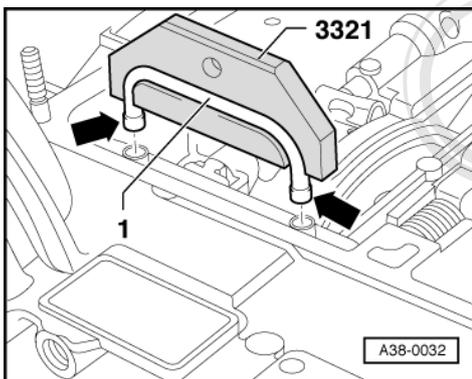
Note:

Do not damage the sealing surface of the oil pan when pressing the oil pipe off. Use a second screwdriver as a support base as necessary.

Installing oil pipe on gearboxes before No. 13 664

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

- Allow oil to drain completely out of hole for oil pipe.
- Degrease hole for oil pipe with quick-acting cleaning solution(e.g. Z 371 405 TE).



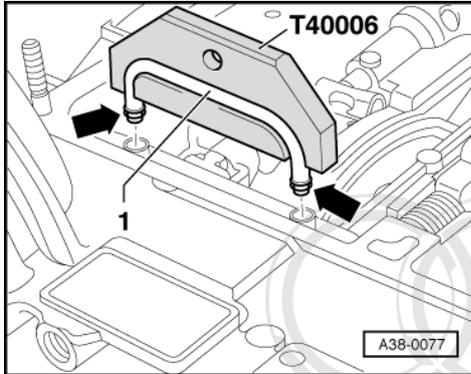
- -> Place new oil pipe -1- in installing tool 3321.
- Coat ends of oil pipe -arrows- with locking fluid AMV 185 101 A1.
- Drive oil pipe into gearbox housing with light blows of a plastic hammer on installing tool 3321.

Notes:

- ◆ Open side of installing tool 3321 faces towards outer wall of gearbox.

- ◆ Ensure that oil pipe is kept straight; knock both ends in evenly.
- Install valve body => page 66 .
- Fill with ATF and check ATF level => page 51 .
- Check oil level in front final drive => page 88 .

Installing oil pipe on gearboxes after No. 13 665



- -> Fit new O-rings -arrows- on new internal oil pipe.
- Apply a thin coating of Vaseline to O-rings. Do not use locking fluid.
- Place oil pipe -1- in installing tool T40006.
- Using a plastic hammer, gently tap installing tool T40006 to knock oil pipe into gearbox housing until the tool makes contact.

Notes:

- ◆ The open side of installing tool T 40006 should be facing outer wall of gearbox.
- ◆ Ensure that oil pipe is kept straight; knock both ends in evenly.
- Install valve body => page 66 .
- Fill with ATF and check ATF level => page 51 .
- Check oil level in front final drive => page 88 .

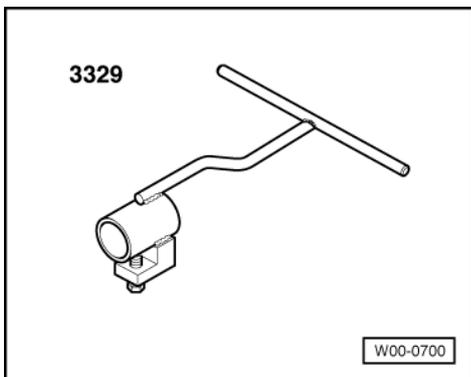
2 - Removing and installing ATF pump

2.1 - Removing and installing ATF pump

Notes:

- ◆ If the pump elements of the ATF pump are defective, it only makes sense to renew the ATF pump if the clutches are not damaged. Always check for clutch wear before repairing the ATF pump.
- ◆ General repair instructions => Page 5 .
- ◆ Rules for cleanliness before working on automatic gearbox => Page 56 .

Special tools and workshop equipment required





- ◆ Assembly tool 3329

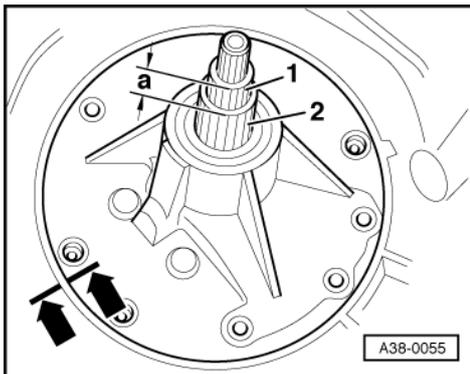
Removing ATF pump

- Remove gearbox => Page 31 .
- Secure gearbox to repair stand => Page 46 .
- Drain ATF (=> Page 51) and check ATF for clutch lining particles when doing so.
- Pull off torque converter.
- Remove valve body => Page 66 .
- Remove input shaft from front final drive =>Page 104 .



Audi

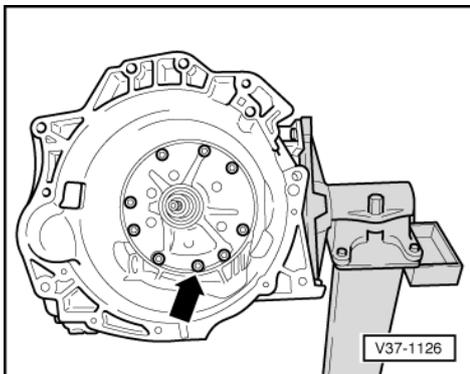
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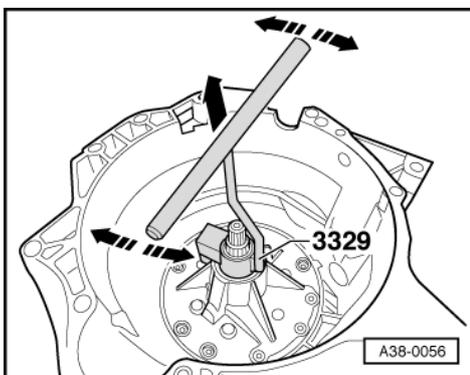
- -> Measure dimension -a- between turbine shaft -1- and stator shaft -2- as shown in illustration and note (approx. 18 mm).

Note:

For ease of installation, mark fitting location of ATF pump in case the same pump is to be re-installed -arrows-.

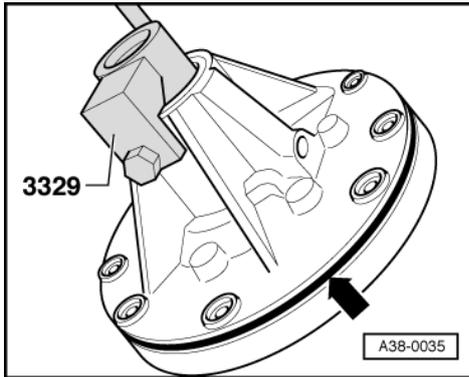


- -> Loosen all securing bolts -arrow- of ATF pump using diagonal sequence and remove.



- -> To remove ATF pump, fit assembly tool 3329 and secure with clamping bolt.

- Loosen ATF pump and pull out -arrows-.



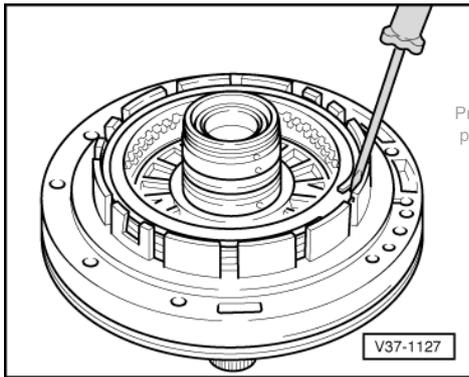
- -> Always renew O-ring -arrow-.

Notes:

- ◆ If only the O-ring on the outer circumference of the ATF pump is to be renewed, the ATF pump may be re-installed=>Page 78 .
- ◆ When renewing ATF pump, follow procedure described, starting from Page 73 .

Renewing ATF pump

Note:



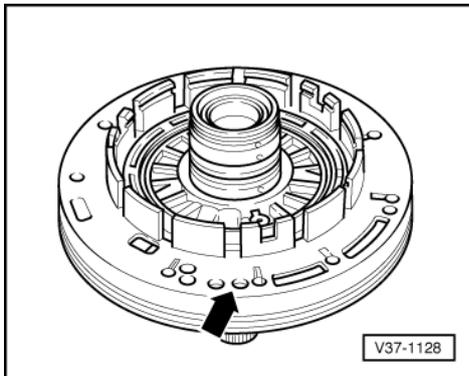
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-> If the ATF pump is to be renewed, then the parts of brake "C" from the old pump need to be installed in the new pump.

- Pry circlip for plates of brake "C" out of slot in intermediate plate.
- Take out end plate, lined plates, outer plates and dished spring. When doing this, note the sequence.

Note:

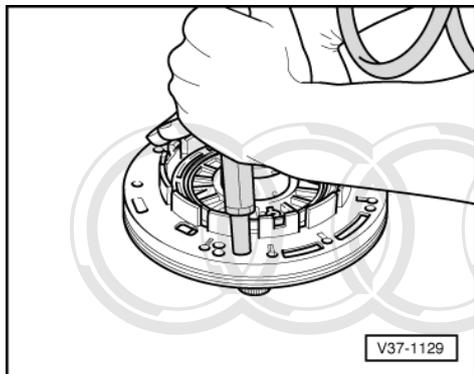
Check plates for wear and damage caused by heat.



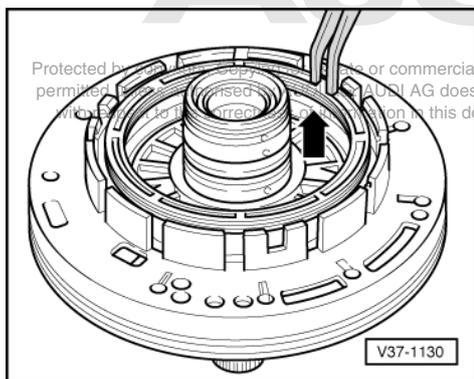


- -> Place compressed air gun over hole -arrow- in intermediate plate.

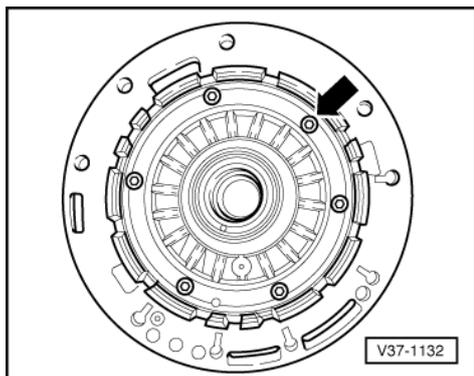
Warning!
Wear eye protection



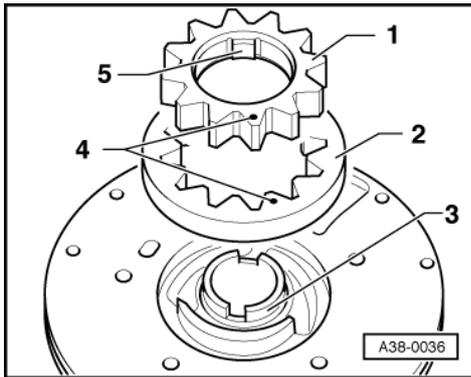
- -> Lift piston with compressed air.



- -> Take out piston.

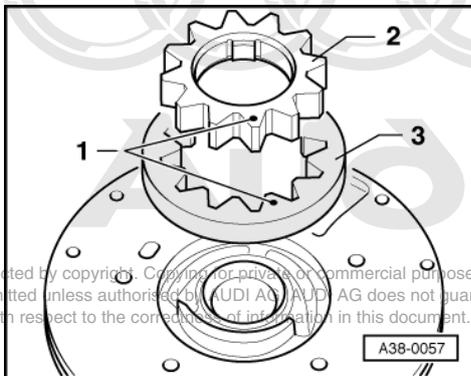


- -> Remove securing bolts -arrow-, separate intermediate plate from ATF pump.



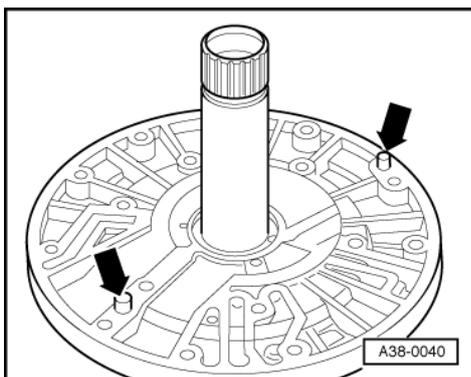
- -> Take out pump gear -1- and internal gear -2-.
- Check pump gear and internal gear for signs of scoring and damage caused by heat and renew entire ATF pump if necessary.
- Take off spacer -3-.

Assembly is carried out in the reverse order. When doing this, note the following:

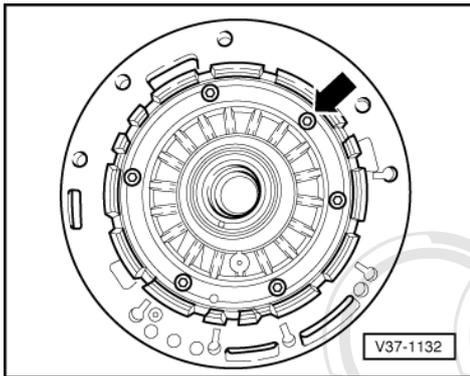


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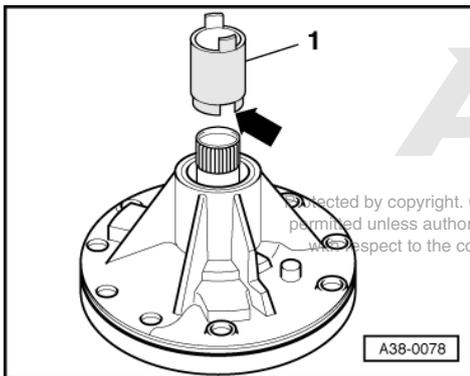
- Fit pump gear -2- and internal gear -3- with marking -1- facing upwards.



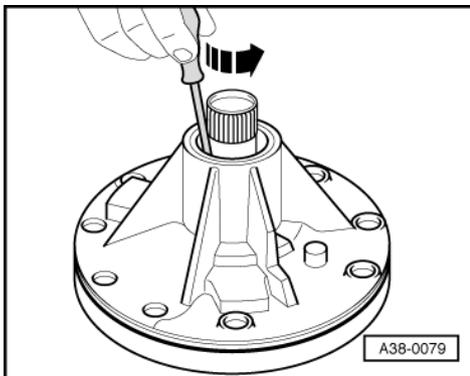
- -> Check that both dowel pins -arrows- in the intermediate plate are seated correctly.



- -> Tighten intermediate plate to ATF pump using diagonal sequence (10 Nm).



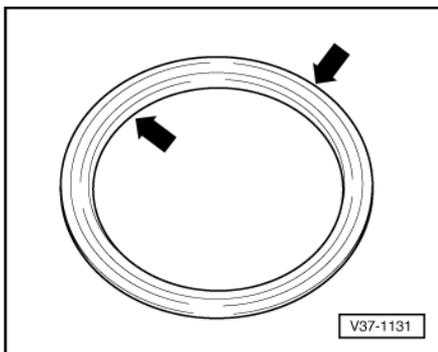
- Turn pump over.
- -> Fit spacer tube -1- from front. Make sure drive lugs on pump gear engage in slots -arrow-.



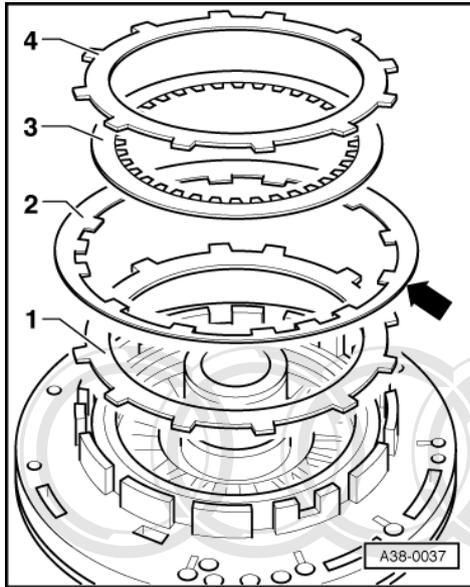
- -> Test to see if pump wheel and internal gear are turning freely by rotating spacer tube -arrow-.

Note:

Use a small screwdriver to avoid damaging sealing ring.

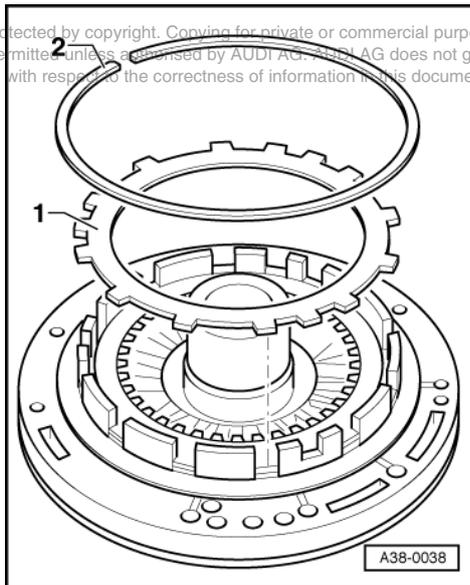


- -> Inspect O-rings -arrows- of piston "C" and renew if necessary.
- Coat O-rings of piston "C" thinly with Vaseline and press piston into intermediate plate.



- -> Insert first outer plate -1- (of steel) into intermediate plate.
- Insert dished spring -2- so that outer edge -arrow- is raised off intermediate plate.
- Insert lined plate -3-.
- Then insert alternately all remaining outer plates -4- and lined plates.

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- -> End plate -1- (thicker outer plate with more retaining lugs) is inserted last.
- Insert circlip -2-.

Note:

Do not replace circlip with a circlip of another thickness.

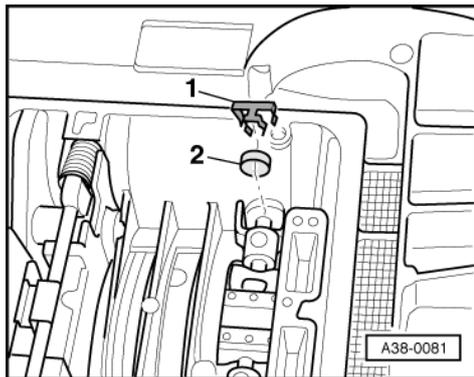


Installing ATF pump

Note:

It may have been necessary to pull parts of planetary gearbox and clutches apart to remove ATF pump. For this reason the gearbox must be dismantled up as far as the planetary gear set. These parts must then be put together individually.

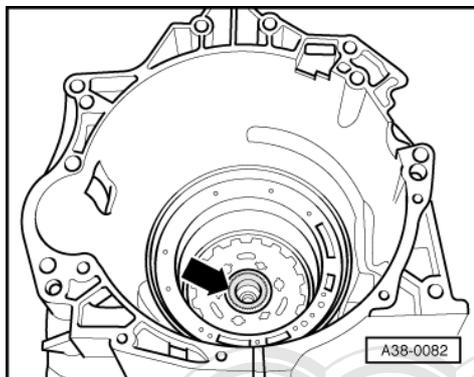
- Take all individual components of automatic gearbox up to planetary gear set out of gearbox housing. Pay attention to the washers/plates and axial needle bearings in between.



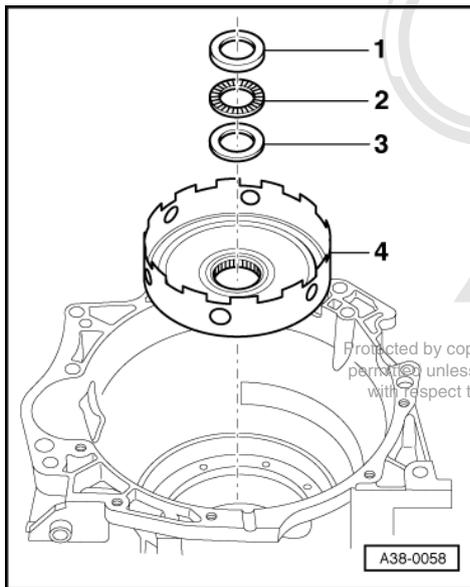
- -> Pull off retainer clip -1- and shim -2-.

Notes:

- ◆ The brake band of brake "C" opens a little further when the shim is pulled out (for ease of assembly).
- ◆ Older gearboxes have a differently shaped retainer clip (fitted in gearbox housing) for holding the shim.

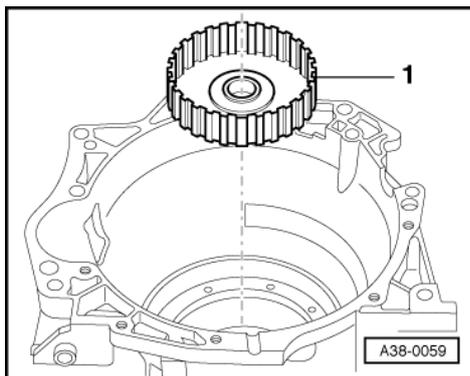


- -> Check to see if sun gear is installed in planetary gearbox -arrow-.

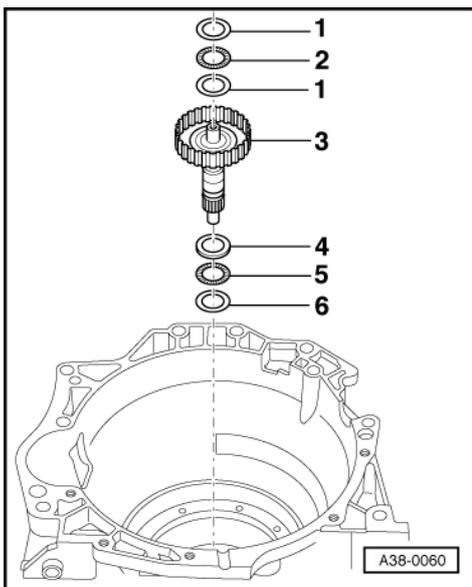


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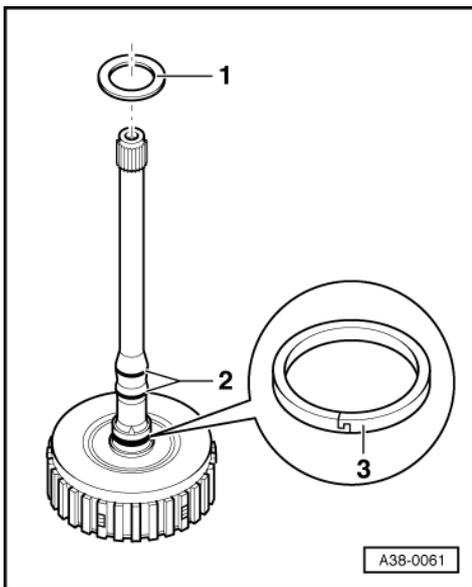
- -> Place sun gear cup -4- on teeth of sun gear.
- Fit flat washer -3-.
- Place axial needle bearing -2- on washer.
- Fit flared washer -1- on axial needle bearing.
 - Fitting position of washer: flared side faces axial needle bearing.



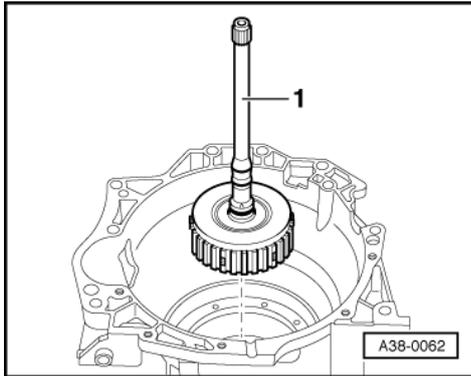
- -> Fit sun gear shaft -1-. Make sure teeth engage by rotating sun gear shaft back and forth.



- -> Fit flat washer -6- onto sun gear shaft.
- Fit axial needle bearing -5- on washer.
- Fit flared washer -4- onto axial needle bearing.
- Fitting position of washer: flared side facing axial needle bearing.
- Fit intermediate shaft -3-. Make sure the teeth are engaged.
- Fit both washers -1- with axial needle bearing -2-.



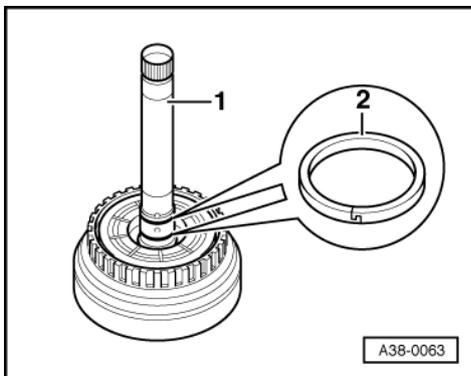
- -> Fit axial needle bearing -1- on engine shaft with clutch "E."
- Fitting position of axial needle bearing: roller bearings facing clutch shell.
- Check to see if both plastic rings -2- are flush.
- Check position of piston ring -3-.
- Ends of piston ring should be hooked together at joint.



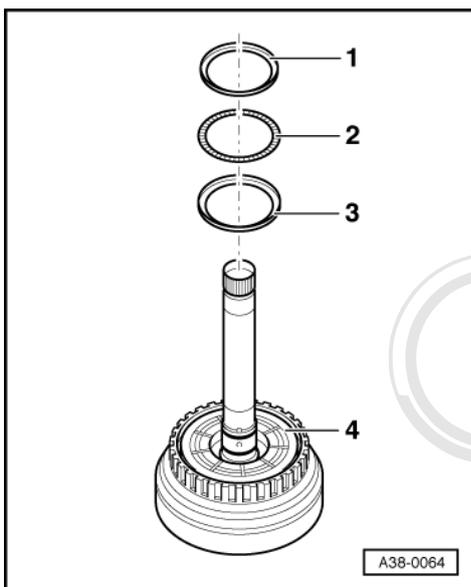
- -> Install engine shaft with clutch "E" -1- ingearbox.

Note:

When installing, rotate engine shaft with clutch "E" until all the plates have meshed. To test: lift engine shaft a few millimetres and let fall on bearing. This should produce a slight sound.



- -> Check positioning of piston rings -2- on turbine shaft with clutch "A" -1-.
- Ends of piston rings must be hooked together at joint.



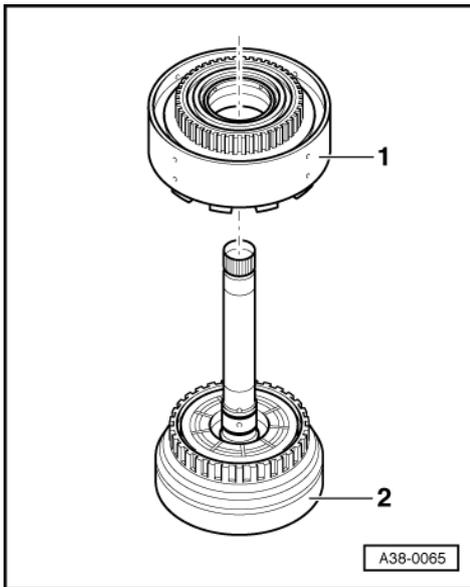
- -> Fit flared washer -3- (with large diameter) onto turbine shaft with clutch "A" -4-.
- Fitting position of washer: flared side facing up.

- Fit axial needle bearing -2-
- Fit flared washer -1- (with small diameter) onto axial needle bearing.

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- Fitting position of washer: flared side facing up.

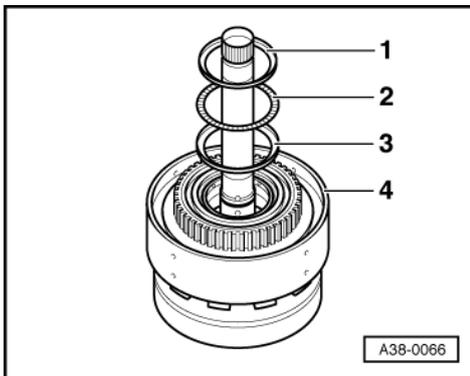


- -> Fit 2nd gear freewheel with clutch "B" -1- onto turbine shaft with clutch "A" -2-.

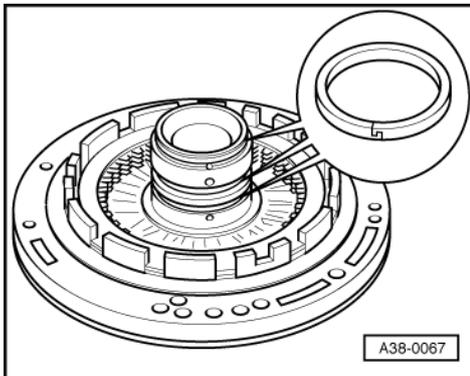
Notes:

- ♦ The 2nd gear freewheel with clutch "B" and the turbine shaft with clutch "A" are paired before installation in gearbox housing.
- ♦ When installing, rotate the 2nd gear freewheel with clutch "B" until all plates mesh.

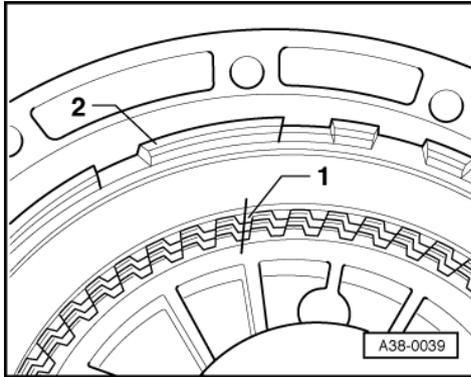
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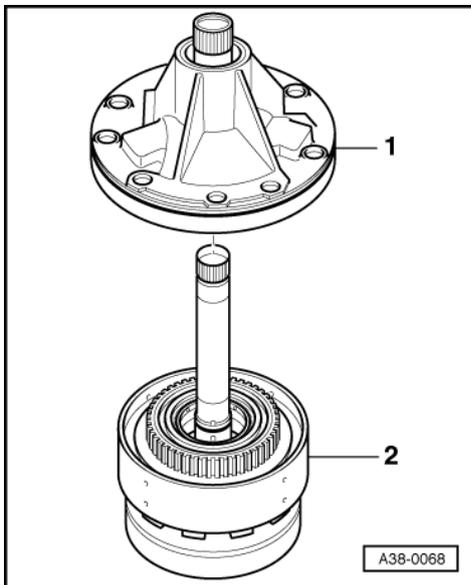
- -> Fit flat washer -3- onto 2nd gear freewheel with clutch "B" -4-.
- Fit axial needle bearing -2- onto washer.
- Fit flared washer -1- onto axial needle bearing.
- Fitting position of washer: flared side facing down.



- -> Check position of piston rings on ATF pump with clutch "C".
- Ends of piston rings should be hooked together at joint.



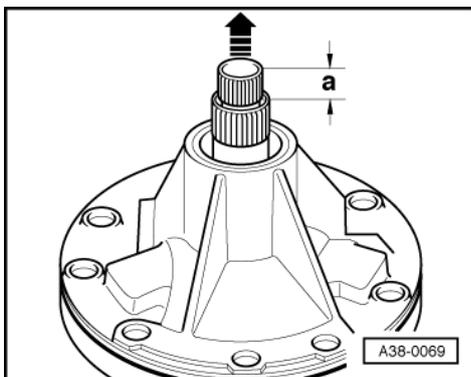
- -> For ease of assembly, position lined plates centrally in relation to intermediate plate -2-. Also align retainer pins -1- of lined plates one over the other.



- -> Fit ATF pump -1- onto assembled parts -2- (turbine shaft with clutch "A" / 2nd gear freewheel with clutch "B").

Notes:

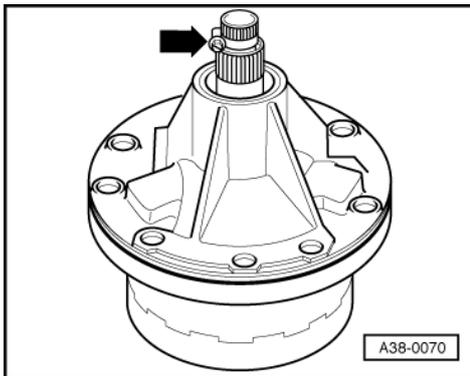
- ◆ Fit ATF pump onto assembled parts before installation in gearbox housing.
- ◆ When fitting, rotate ATF pump until all plates mesh. If necessary, lift ATF pump slightly, turn and fit anew.



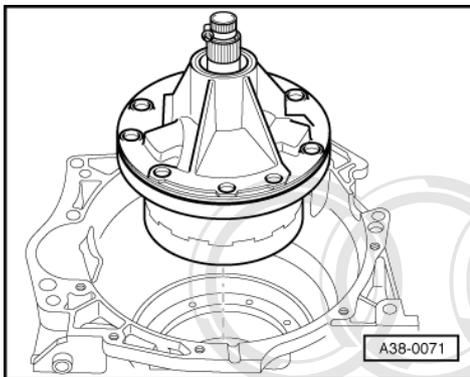
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- -> Pull turbine shaft firmly upwards -arrow-.
- If properly installed, dimension -a- should now be the same as originally noted (approx. 18 mm).



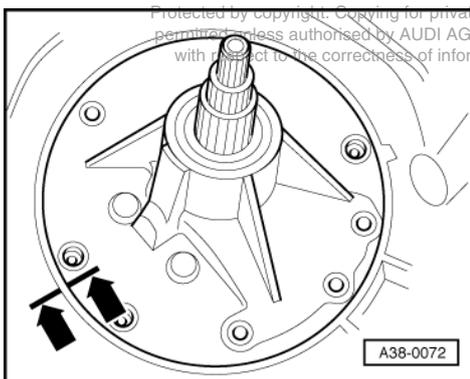
- -> Secure turbine shaft with hose clamp -arrow- so that shaft cannot slide down. Securely tighten hose clamp.



- -> Insert entire group of parts (ATF pump / turbine shaft with clutch "A" / 2nd gear freewheel with clutch "B") into gearbox housing.

Note:

Use assembly tool 3329.



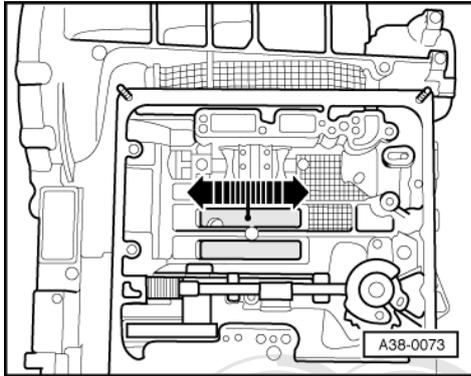
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- -> When re-installing an old ATF pump, observe markings for correct fitting position -arrows-.
- When installing a new ATF pump, make sure all corresponding bolt holes of ATF pump and gearbox housing are aligned.

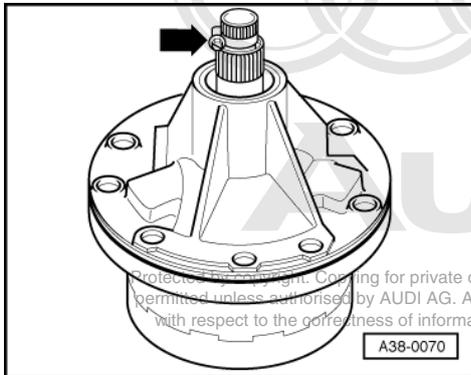
Notes:

- ♦ If necessary, before fitting ATF pump screw an M8 stud into one of the holes on gearbox housing to facilitate alignment.

- ◆ Do not rotate ATF pump after installing in gearbox housing, otherwise sealing ring will be damaged.

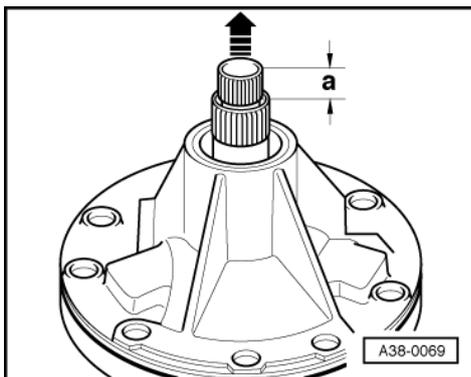


- -> Move cup for sun gear back and forth in direction of arrows until all plates of clutch "C" mesh and the ATF pump settles back onto flange in gearbox housing.
- Bolt on ATF pump with new sealing washers.

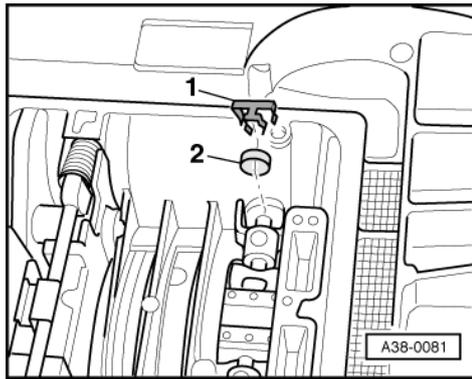


- -> Remove hose clamp -arrow- from turbine shaft.

- Check installation:
 - The cup for sun gear should move freely
=>Fig. A38-0073, Page 85



- -> Dimension -a- should be the same as originally noted (approx. 18 mm). Check to see if spacer for torque converter is still engaged.



- -> Fit shim -2- with retainer clip -1-.
- Install valve body => Page 66 .
- Check torque converter oil seal and renew if necessary => Page 9 .
- Install input shaft=>Page 106 .
- Install torque converter=>Page 10 .
- Install gearbox=>Page 42 .
- Fill with ATF and check ATF level => Page 51 .

Tightening torques

Component		Nm
ATF pump to gearbox	M6	10
Intermediate plate to pump	M6	10



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39 - Final drive, Differential rear

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

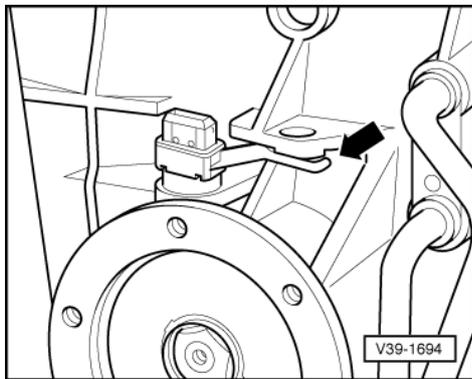
1.1 - Removing and installing speedometer sender -G22 and drive wheel for speedometer sender

- Gearbox installed

Removing and installing speedometer sender -G22

Note:

Fitting location => Item 94 .



Removing

- Pull connector off speedometer sender -G22.
- -> Press sender retainer -arrow- down, turn sideways and pull sender out upwards.

Installing

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

- Renew 2 O-rings for sender.
- Fit sender with multi-purpose grease.

Removing and installing drive wheel for speedometer sender -G22

Note:

Fitting location => Item 96 .

Removing

- Remove left flange shaft and oil seal=>Page 104
- Pull drive wheel off flange shaft.

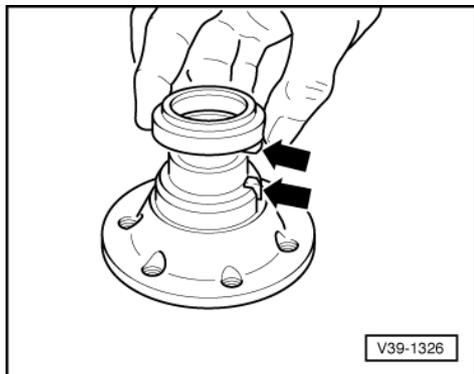
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Installing

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

- Apply multi-purpose grease to face of new 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-.

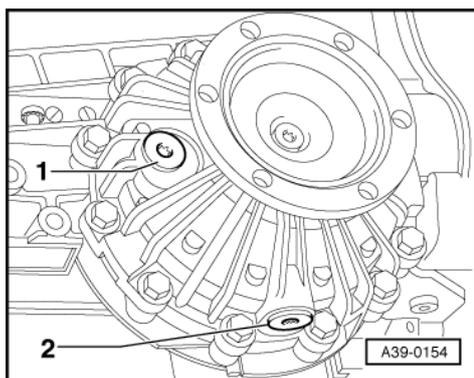
- Secure flange shaft with collar nut and lock with new locking plate

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2 - Gear oil in front final drive

2.1 - Gear oil in front final drive

2.2 - Checking oil level in front final drive

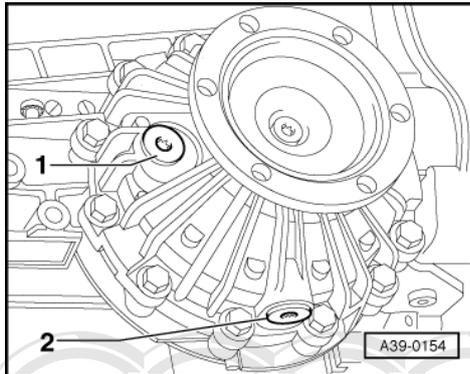


- -> Remove oil filler plug -arrow 1-.
 - Specification: oil level should be up to the bottom of the hole.
- Top up oil as necessary.
 - Specification => Page 4
- Always fit a new seal on oil filler plug.
- Screw in oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	50

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



- Place drip tray underneath.
- -> Remove oil drain plug -arrow 2- and drain gear 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 the bottom of the hole
 - Specification => Page 4
- Always renew seal for oil filler plug.
- Insert oil filler plug.

Tightening torques

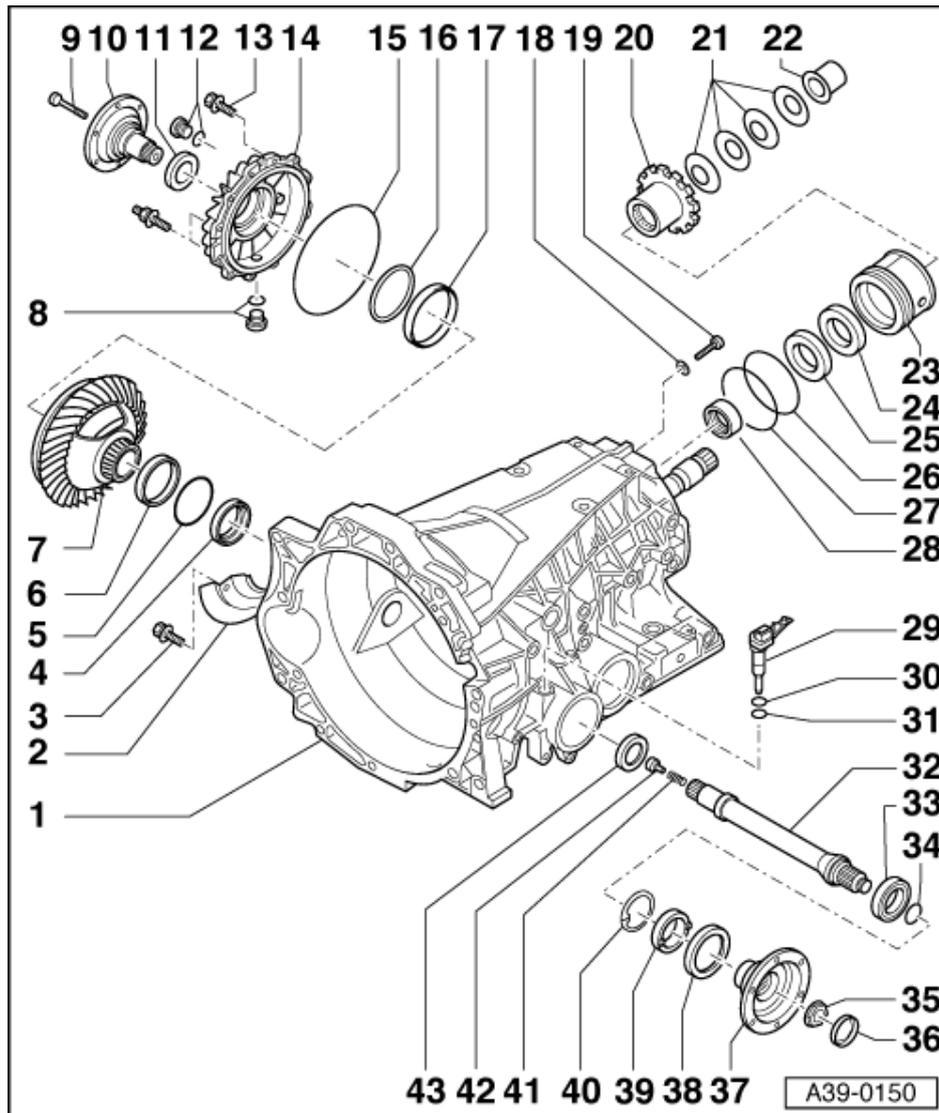
Component	Nm
Oil drain plug	50
Oil filler plug	50

3 - Servicing front final drive

3.1 - Servicing front final drive

Notes:

- ◆ The components shown in the following illustrations can be removed with the gearbox installed.
- ◆ Observe the rules for cleanliness when working on the automatic gearbox => Page 56 .
- ◆ General repair instructions => Page 5 .
- ◆ Coat O-rings and oil seals thinly with Vaseline. Other greases will cause malfunctions in the controls of the hydraulic gearbox.
- ◆ Do not interchange inner or outer races of bearings of the same size.

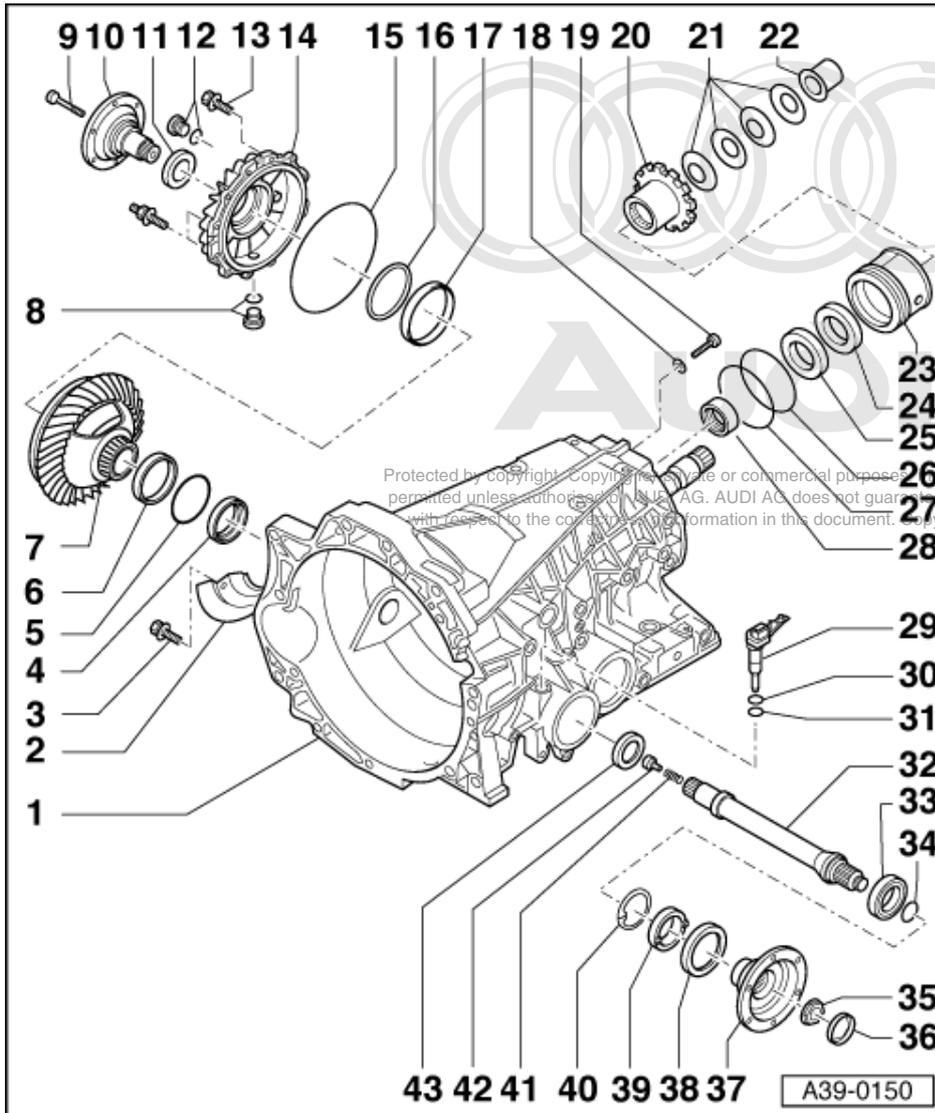


- 1 Gearbox housing
- 2 Baffle plate
- 3 Bolt - 8 Nm
 - ◆ Qty. 2
- 4 Sealing ring
 - ◆ Renewing => Page 101
- 5 Shim
 - ◆ Behind bearing race
 - ◆ Is determined by measurement and cannot be exchanged for another shim at will
- 6 Bearing outer race
 - ◆ Remove and install by hand
- 7 Differential
 - ◆ With taper roller bearing

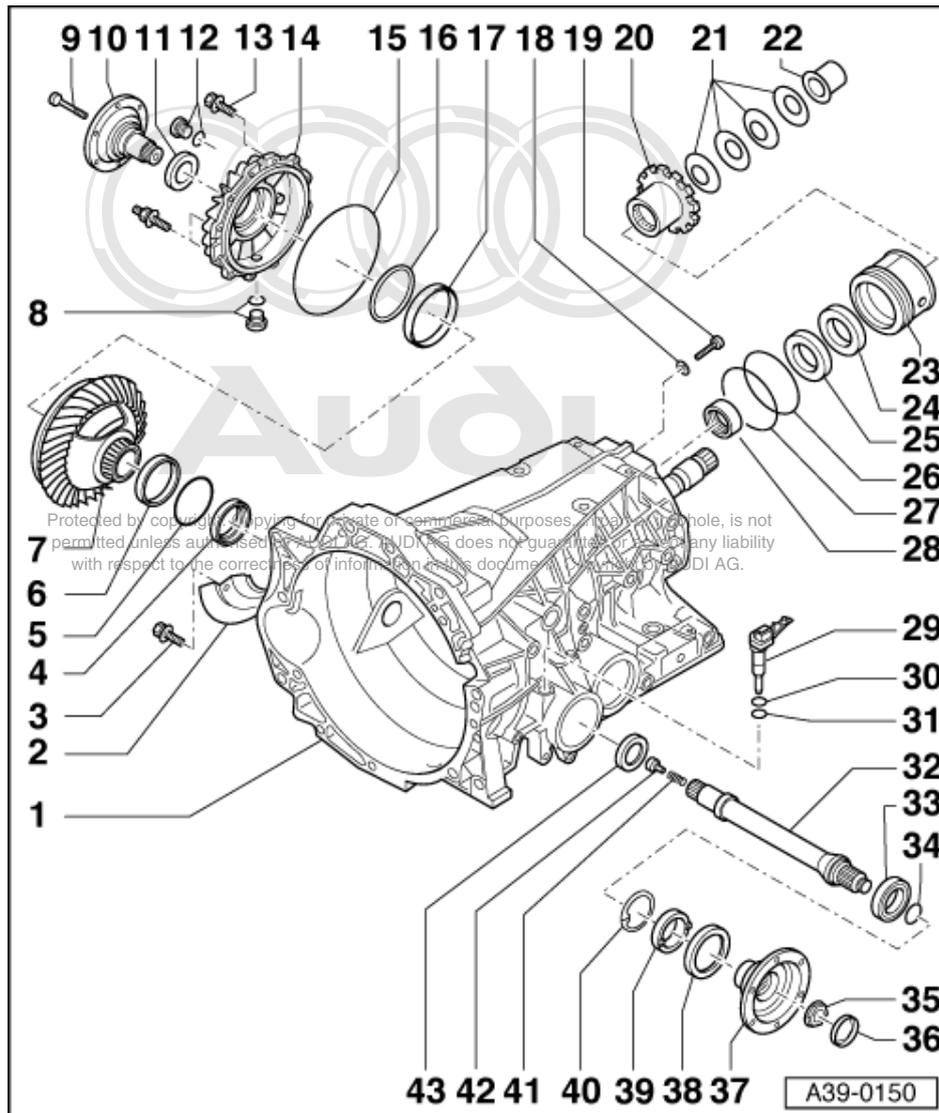


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- 8 Oil drain plug - 50 Nm**
 - ◆ With seal
- 9 Bolt - 25 Nm**
- 10 Right-hand flange shaft**
 - ◆ Renewing =>Page 99
- 11 Seal**
 - ◆ Renewing => Page 99
- 12 Oil filler plug - 50 Nm**
 - ◆ For checking oil level
 - ◆ With seal
- 13 Bolt - 23 Nm**
 - ◆ Qty. 12
 - ◆ For securing -Item 14 -
- 14 Differential cover**



15 O-ring

- ◆ Renewing => page 101
- ◆ Fit with Vaseline

16 Shim

- ◆ Behind bearing race
- ◆ Is determined by measurement and cannot be exchanged for another shim at will

17 Bearing outer race

18 Washer

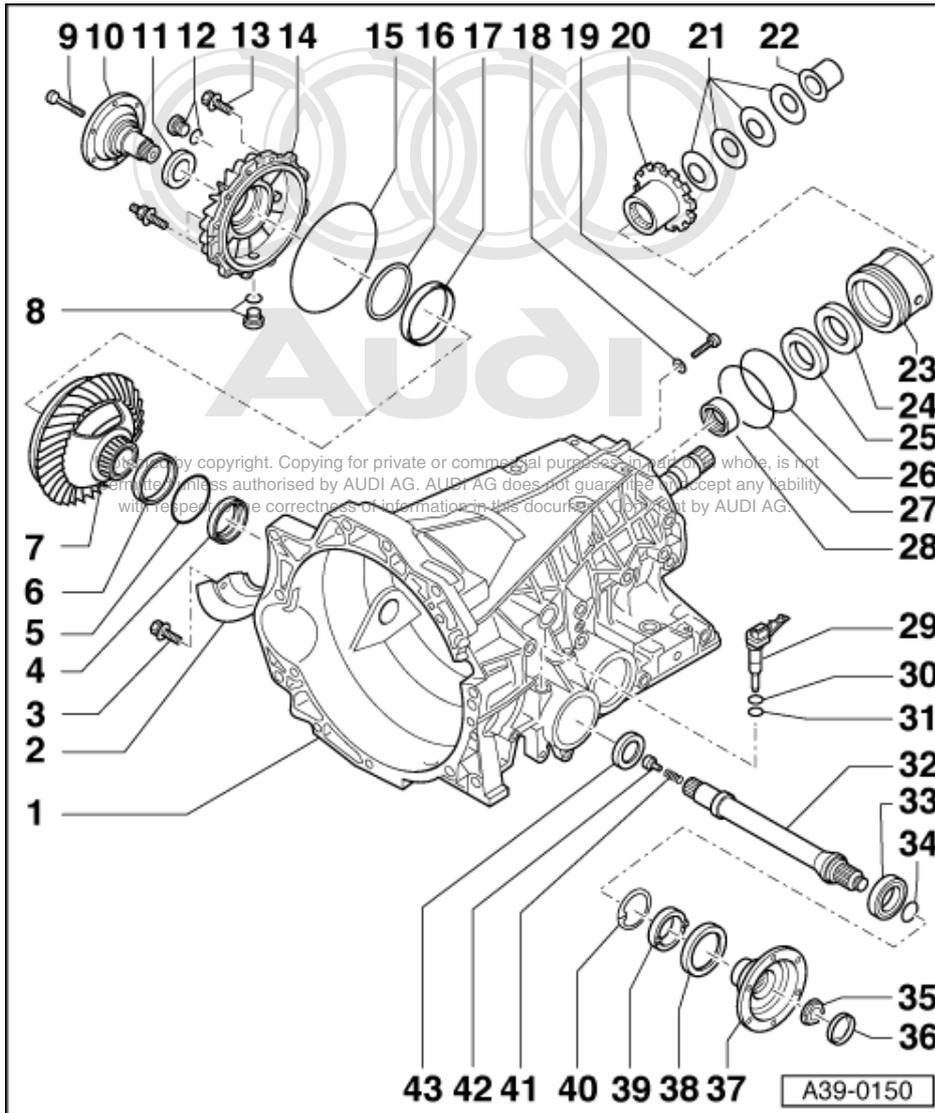
19 Bolt - 23 Nm

- ◆ For locking element for -Item 23 -

20 Parking lock gear

21 Dished spring

- ◆ Qty. 4
- ◆ Always insert 2 springs facing against one another



22 Bush

23 Intermediate sleeve

- ◆ Renewing => Page 109

24 Oil seal

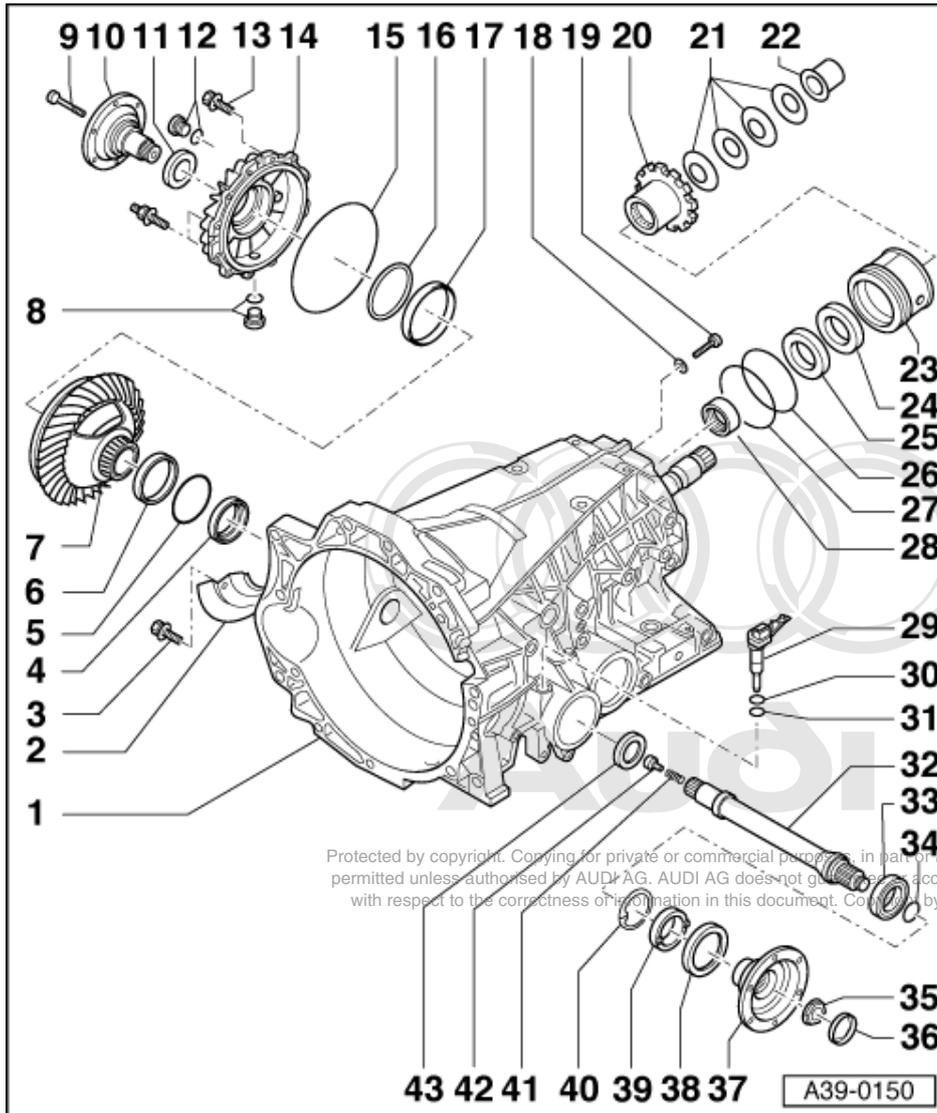
- ◆ For ATF side
- ◆ Pressed into intermediate sleeve -Item 23-.
- ◆ Only renew together with -Item 109

25 Oil seal

- ◆ For gear oil side
- ◆ Pressed into intermediate sleeve -Item 23-.
- ◆ Only renew together with -Item 109

26 O-ring

- ◆ Black
- ◆ Only renew together with -Item 109
- ◆ Fit with Vaseline



27 O-ring

- ◆ Green
- ◆ Only renew together with -Item **109**
- ◆ Fit with Vaseline

28 Nut (special) - 120 Nm

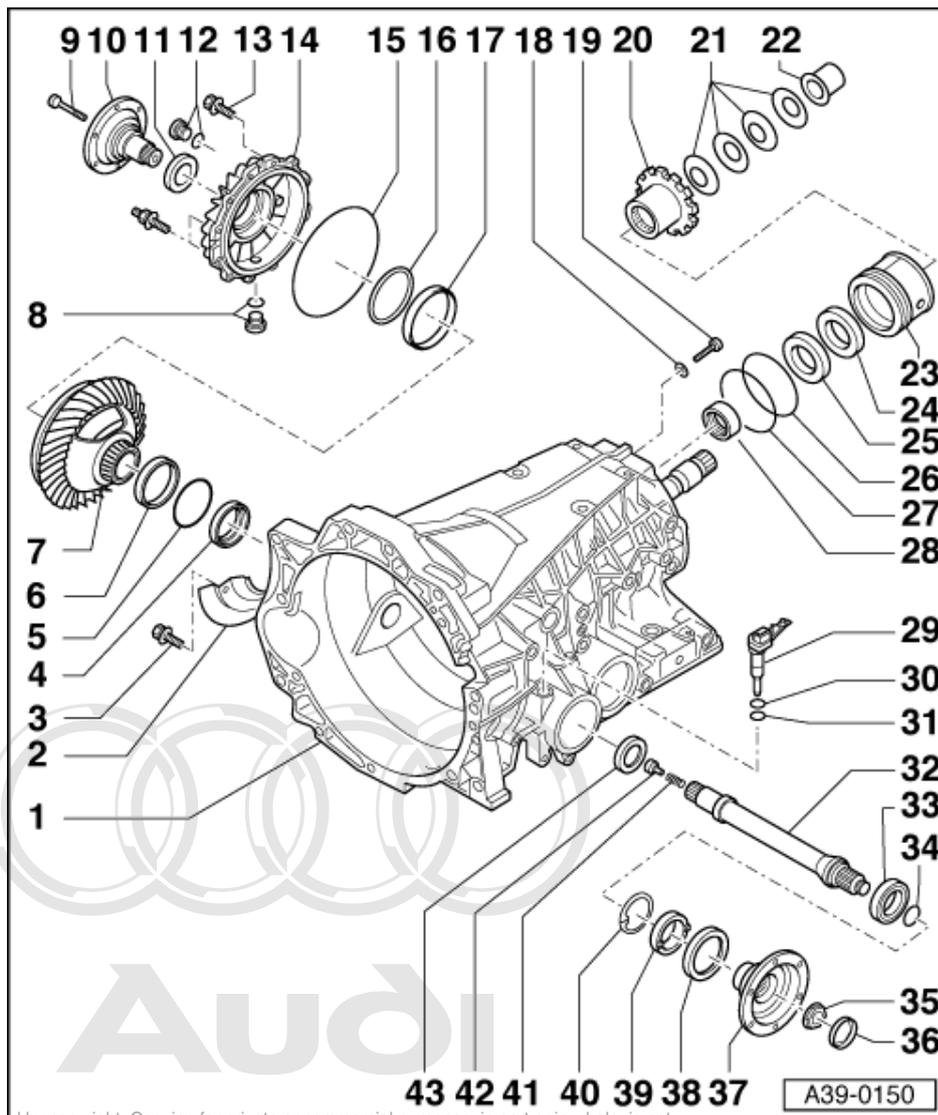
- ◆ For drive pinion shaft.
- ◆ Renewing => Page **109**
- ◆ Check for scoring on oil seals (Items - **24** - and - **25** -).
- ◆ Peen at 2 positions after installing.

29 Speedometer sender -G22

- ◆ Removing and installing=>Page **87**

30 O-ring

- ◆ Fit with Vaseline



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31 O-ring

- ◆ Fit with Vaseline

32 Input shaft

- ◆ Removing and installing
=>Page 104

33 Bearing

- ◆ Fit filled with multi-purpose grease

34 O-ring

35 Collared nut - 100 Nm

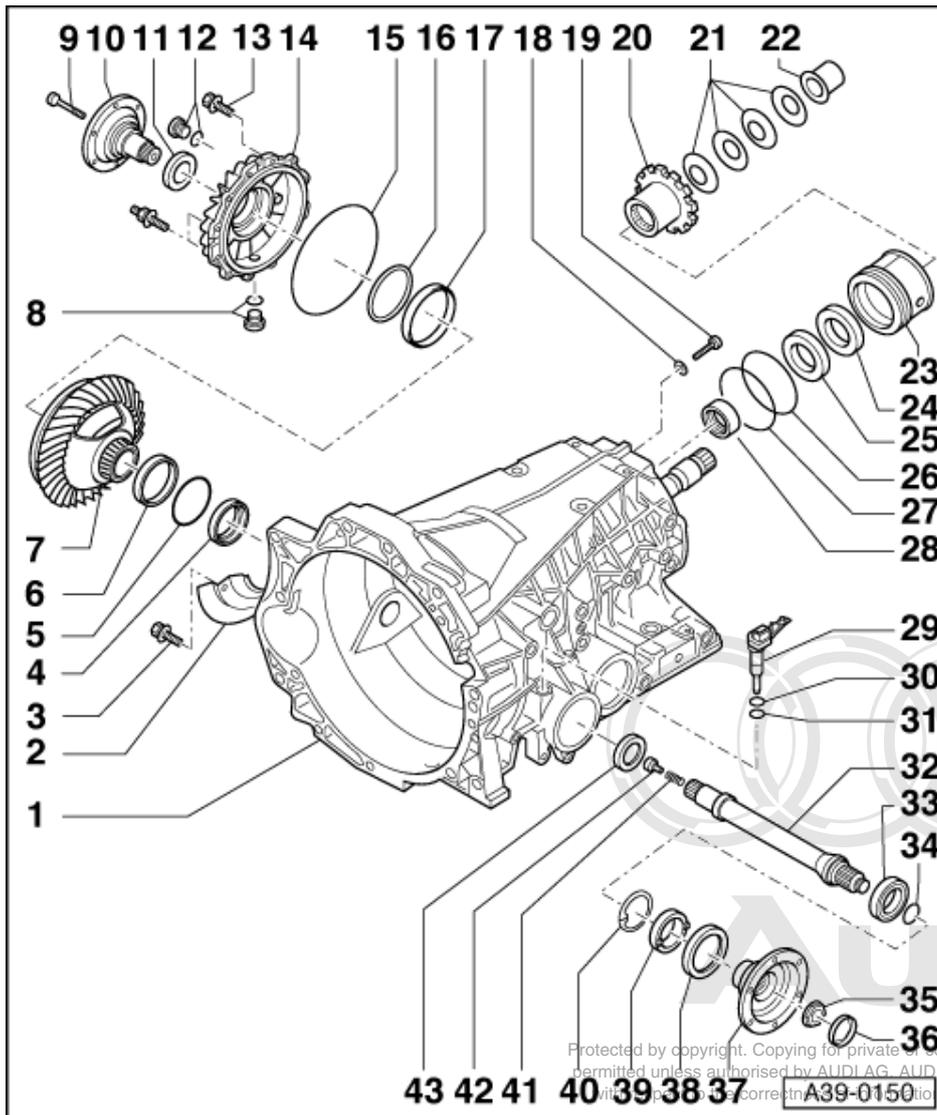
- ◆ Securing=>Fig. 97

36 Locking plate

- ◆ For -Item 35 -
- ◆ Renewing=>Page 104

37 Left-hand flange shaft

- ◆ Removing and installing
=>Page 104



38 Oil seal

- ◆ Renewing => Page 104

39 Drive gear

- ◆ For speedometer sender -G22
- ◆ Removing and installing=>Page 87

40 Circlip

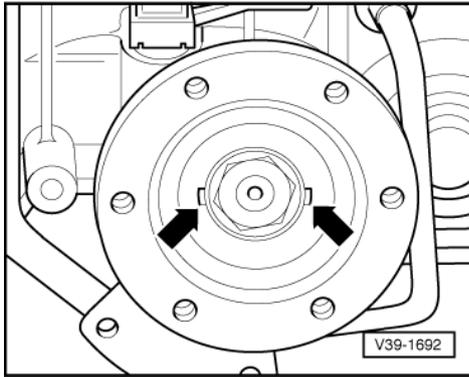
- ◆ For -Item 33 - in gearbox housing

41 Not installed

42 Not installed

43 Seal

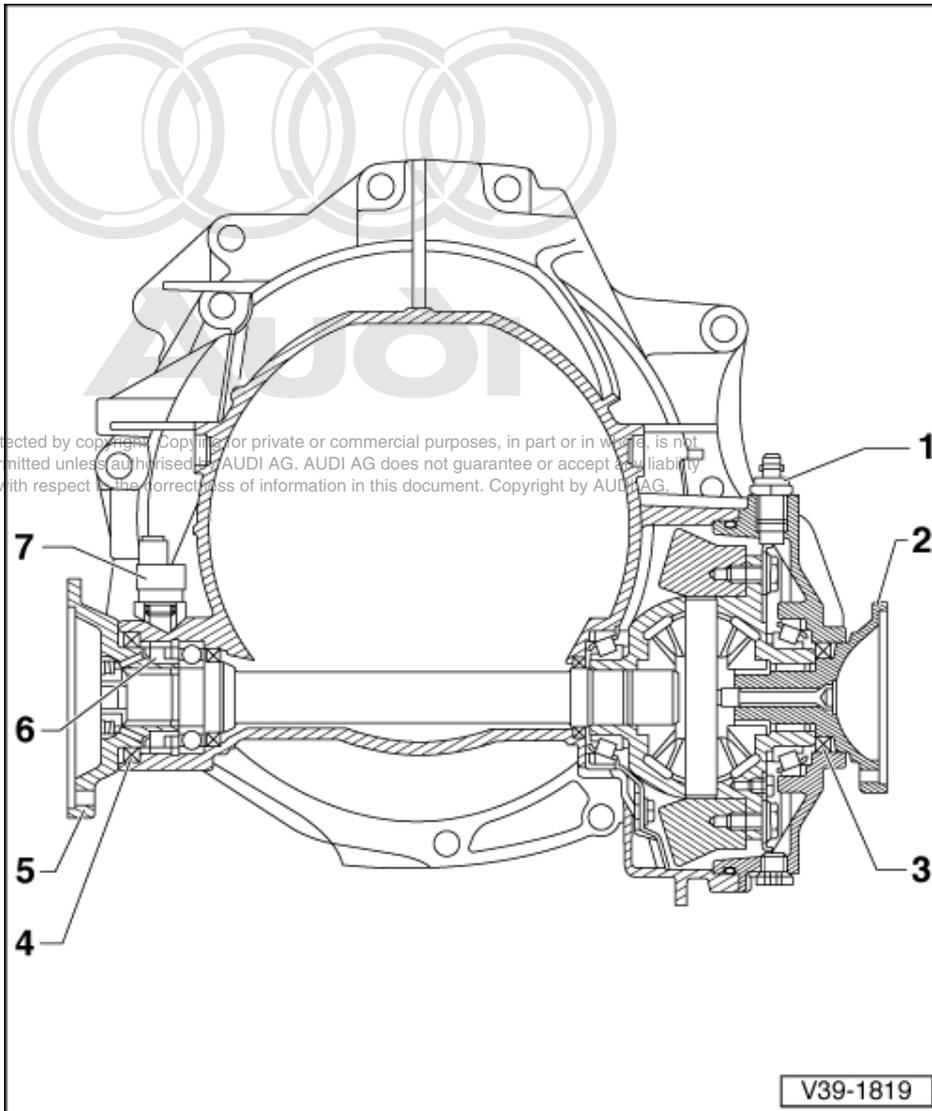
- ◆ Renewing => Page 104



-> Fig.1 Securing collared nut on flange shaft.

- Tighten collared nut on flange shaft and secure with a new locking plate -arrows-.

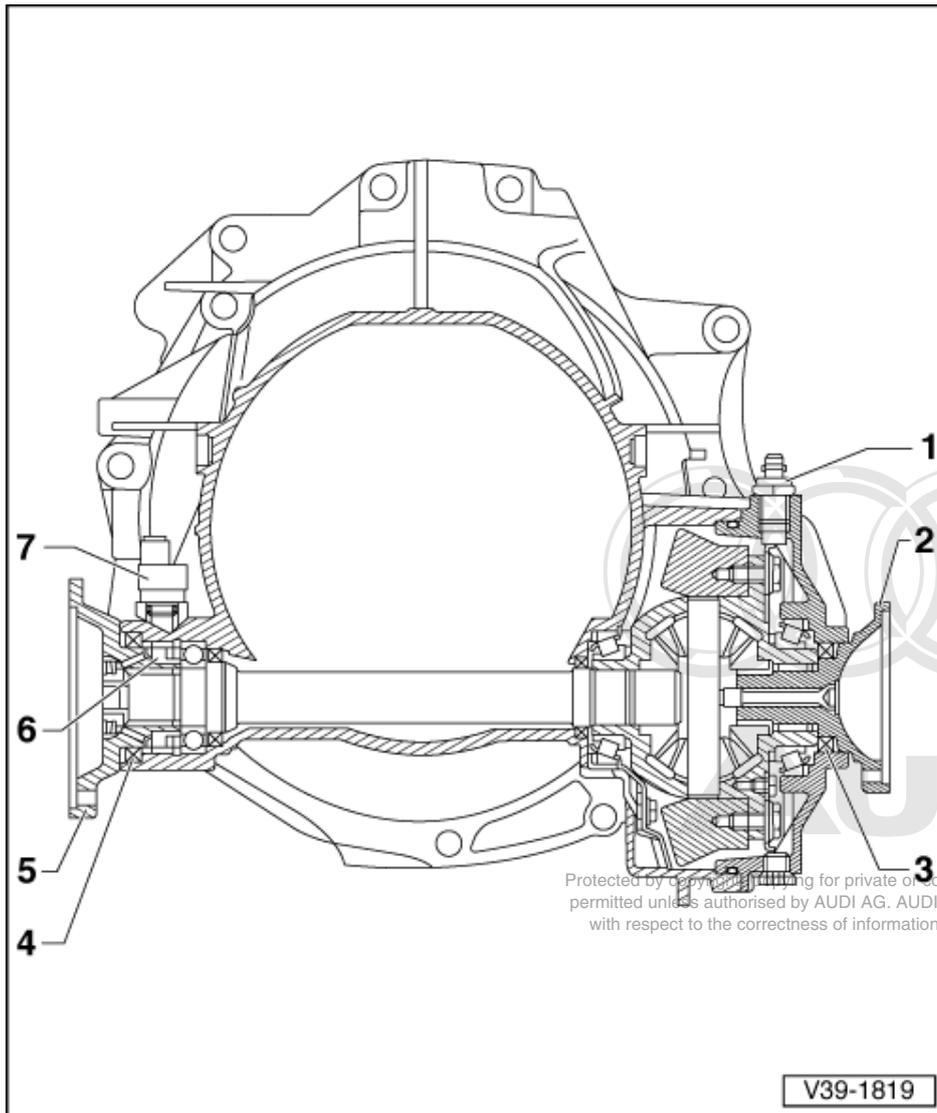
3.2 - Renewing oil seals for flange shafts.



- Gearbox installed



- 1 Not installed
- 2 Right-hand flange shaft
 - ◆ Removing and installing
=>Page 99
- 3 Oil seal
 - ◆ Renewing => Page 99
- 4 Oil seal
 - ◆ Renewing=>Page 104
- 5 Left-hand flange shaft
 - ◆ Removing and installing
=>Page 104

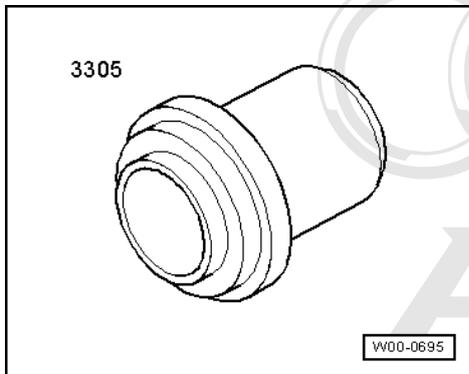


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- 6 Drive gear
 - ◆ For speedometer sender -G22
 - ◆ Removing and installing
=>Page 87
- 7 Speedometer sender -G22
 - ◆ Removing and installing
=>Page 87

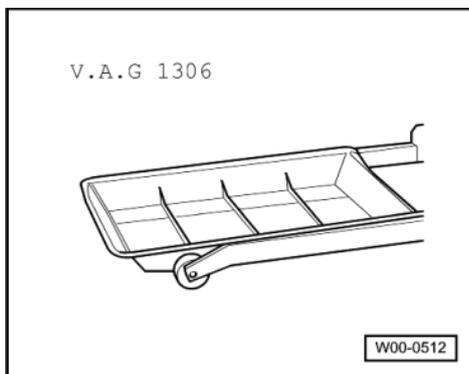
3.3 - Renewing oil seal for right flange shaft

Special tools and workshop equipment required



- ◆ Thrust piece 3305

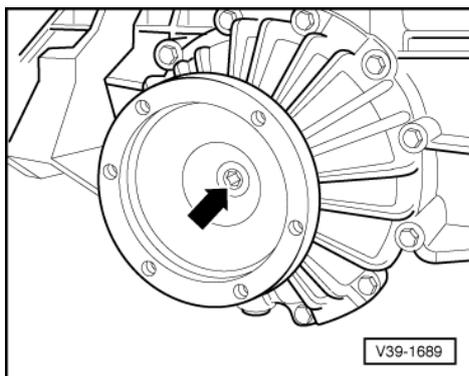
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- ◆ Drip tray V.A.G 1306

Removing

- Remove right front wheel.



- Remove right front exhaust pipe with catalytic converter.

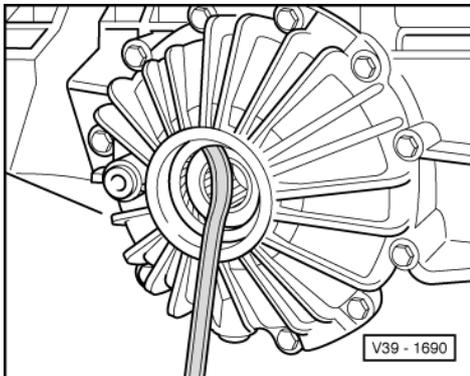
=> 6-Cylinder engine, Mechanics; Repair group 26; Removing and installing parts of exhaust system; Removing and installing right front exhaust pipe with catalytic converter
 Removing and installing parts of exhaust system
 Removing and installing right front exhaust pipe with catalytic converter

- 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

- -> Remove centre bolt -arrow- for right flange shaft by screwing two bolts into flange shaft and bracing with a suitable lever.
- Place drip tray V.A.G 1306 underneath.
- Pull out right flange shaft.



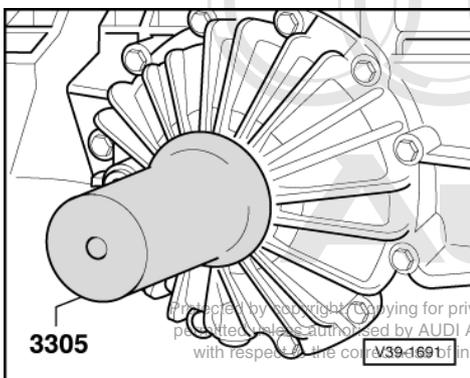
- -> Lever out oil seal of right flange shaft with a suitable lever.

Installing

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

Notes:

- ◆ The open side of the oil seal faces toward the gearbox.
- ◆ Moisten outer circumference and sealing lip of oil seal with gear oil or coat thinly with Vaseline.

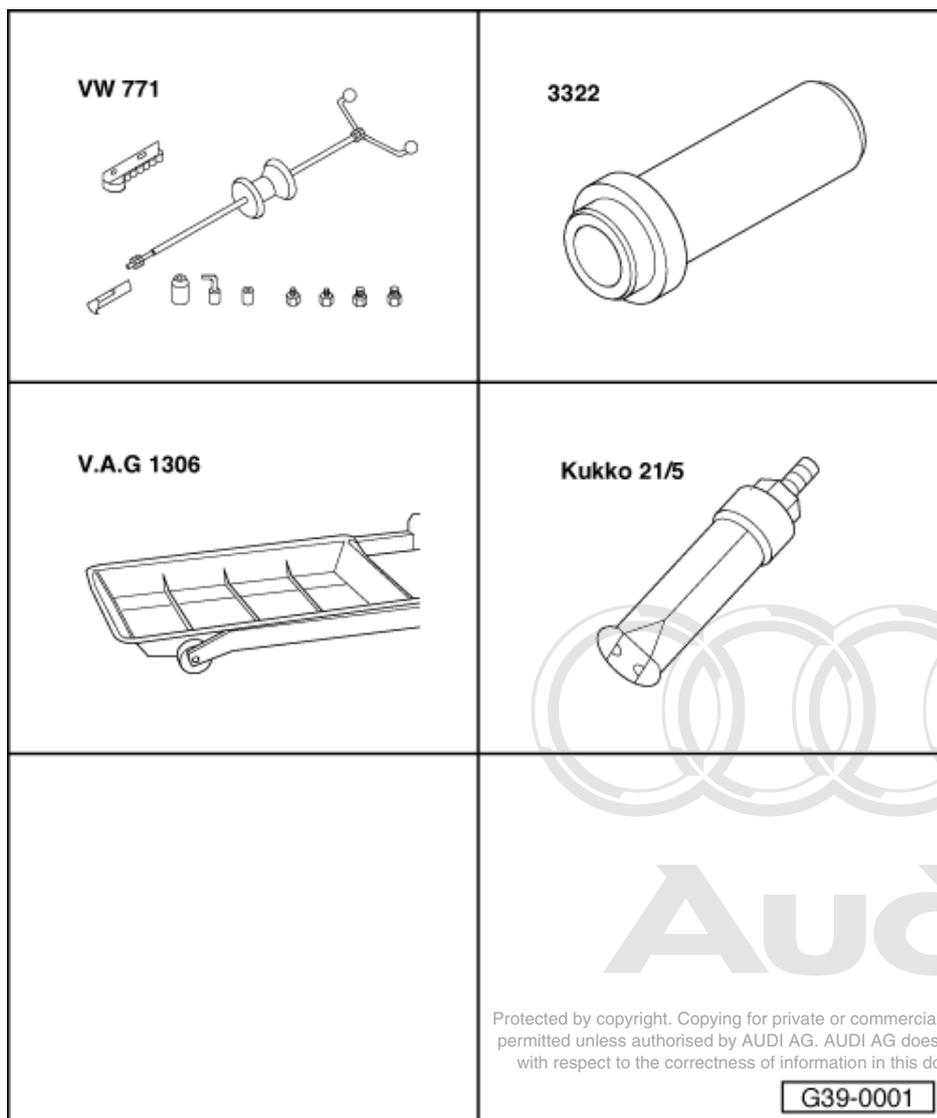


- -> Using thrust piece 3305, drive in oil seal for right flange shaft until thrust piece contacts stop.
- The oil seal must be inserted at the same depth in the housing all round.
- Check oil level in front final drive of automatic gearbox => page 88 .

Tightening torques

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

3.4 - Renewing oil seal(right) for input shaft



Special tools and workshop equipment required

- ◆ Multi-purpose tool VW 771
- ◆ Thrust piece 3322
- ◆ Drip tray V.A.G 1306
- ◆ Kukko 21/5

Removing

- Remove front right wheel.
- Remove right front exhaust pipe with catalytic converter.

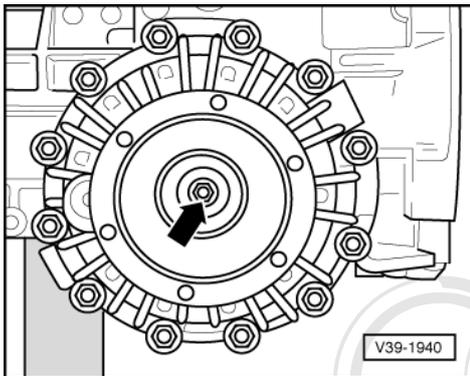
=> 6-Cylinder engine, Mechanics; Repair group 26; Removing and installing parts of exhaust system; Removing and installing right front exhaust pipe with catalytic converter. Removing and installing parts of exhaust system Removing and installing right front exhaust pipe with catalytic converter.

- Remove right drive shaft.

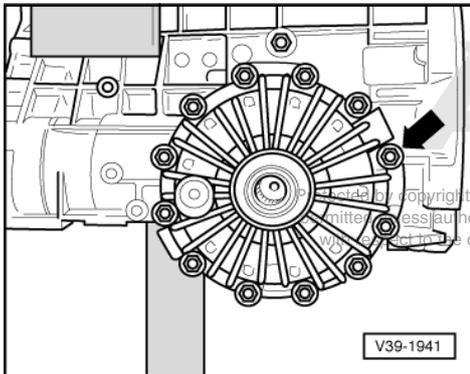
=> Running gear, Front and four-wheel drive; Repair group 40; Removing and installing drive shaft Removing and installing drive shaft



- Place drip tray V.A.G 1306 underneath.
- Drain gear oil in front final drive => page 89 .



- -> 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.

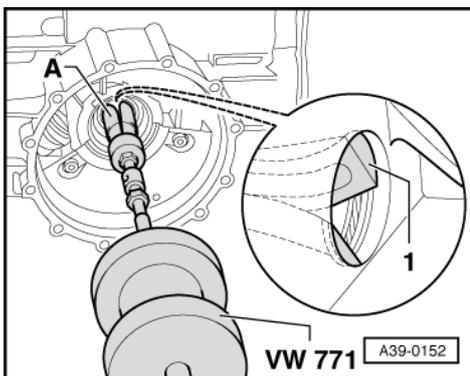


- -> Loosen securing bolts -arrow- for differential cover using diagonal sequence and remove bolts.
- Remove differential cover.

Note:

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

- Take out differential with inner races for taper roller bearings. Leave the outer races in place.
- Remove input shaft => Page 104 .



- -> Assemble Kukko 21/5 -A- and multi-purpose tool VW 771 as shown in illustration and pull out oil seal.

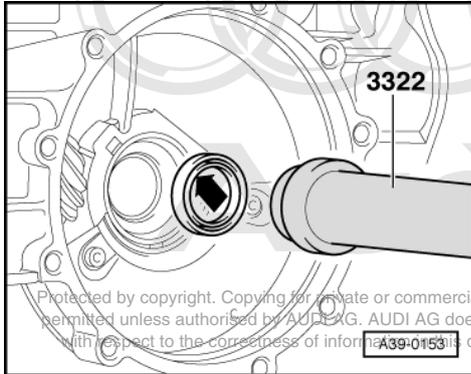
Notes:

- ♦ When inserting the tool, make sure the extractor hooks -1- of Kukko 21/5 only make contact with the oil seal and not with the gearbox housing.
- ♦ As the Kukko 21/15 is applied, allow the hooks to spread out gradually until the relevant diameter is reached.

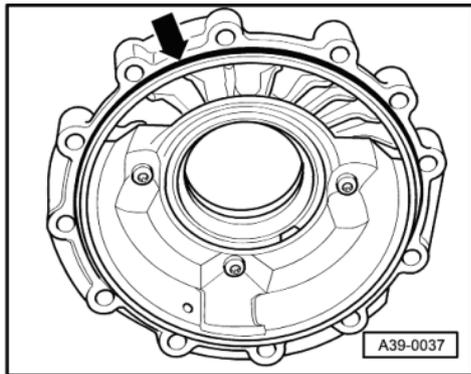
- ◆ If necessary, use a screwdriver to stretch out oil seal carefully and pull out with a pair of pliers.

Installing

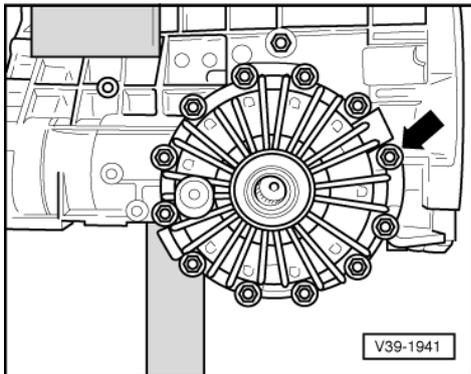
Installation is carried out in the reverse order. When doing this, note the following:



- Check oil seal seat in gearbox housing for damage and rework if necessary.
- Moisten outer circumference and sealing lips of oil seal with gear oil or coat thinly with Vaseline.
- -> Slide on new oil seal with sealing lip -arrow- facing thrust piece 3322.
- Drive on oil seal up to stop.



- -> Renew O-ring -arrow- and coat with Vaseline.
- Insert shim and bearing outer race into differential cover if they have fallen out.
- Insert differential into gearbox housing.



- -> Fit differential cover and tighten securing bolts -arrow- using diagonal sequence.
- Fill front final drive of automatic gearbox with gear oil and check oil level => Page 89 .

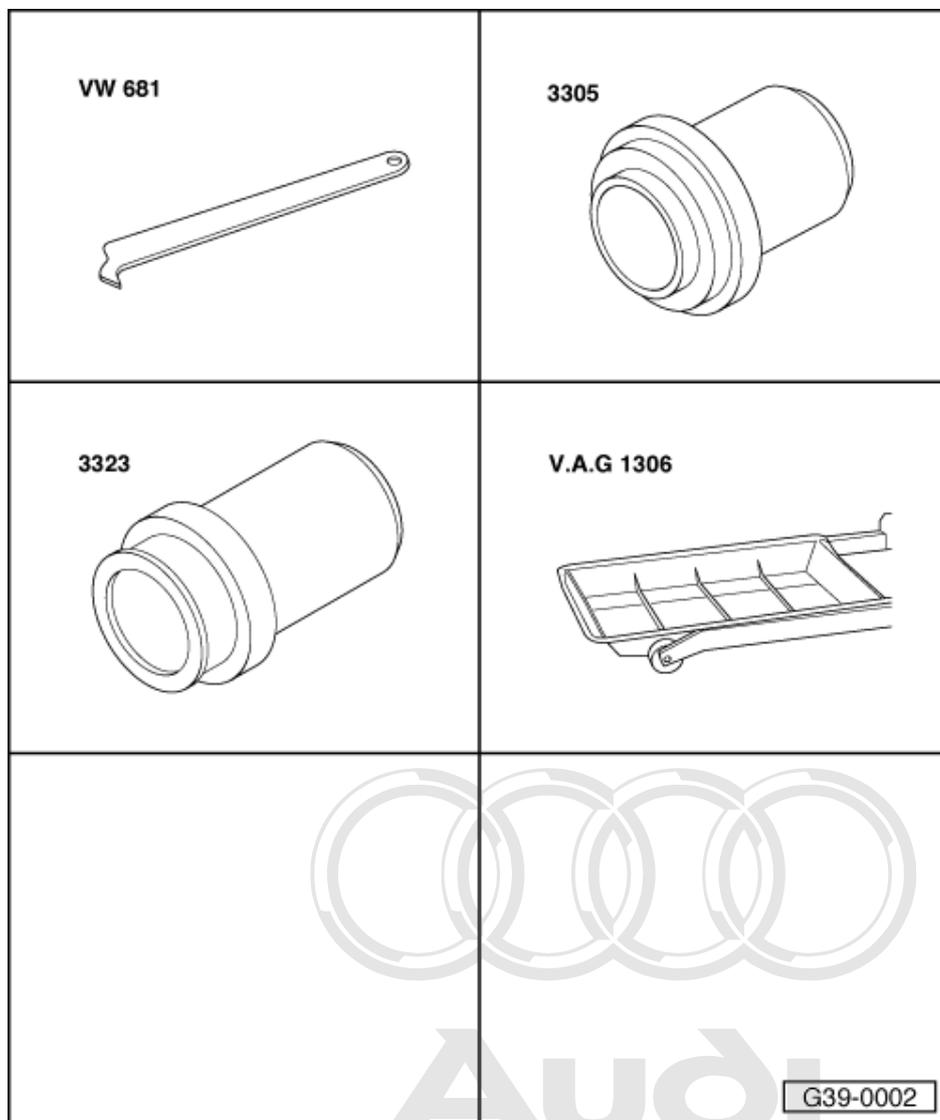
Tightening torques

Component		Nm
Differential cover to gearbox housing	M8	23



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

3.5 - Renewing oil seal(left) for input shaft and oil seal for left flange shaft

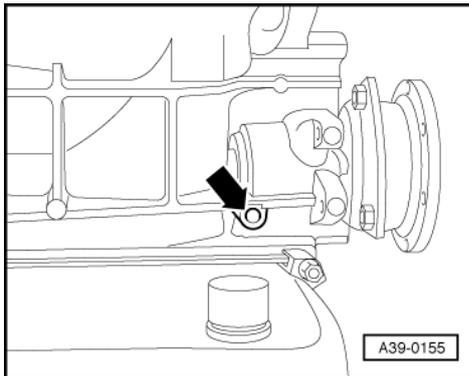


Special tools and workshop equipment required

- ◆ Oil seal extractor lever VW 681
- ◆ Thrust piece 3305
- ◆ Thrust piece 3323
- ◆ Drip tray V.A.G 1306

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Note:



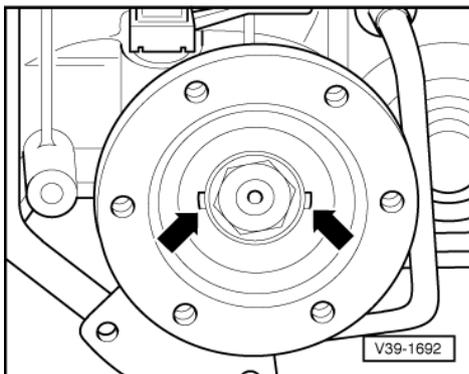
-> Under the left flange shaft on the gearbox housing there is an oil-leak inspection hole -arrow- for the left oil seal of the input shaft. If the left oil seal is defective, there is a possibility that grease will leak out. If ATF or gear oil leaks out, check the ATF pump, the torque converter or the right oil seal of the input shaft for leaks.

Removing

- Remove front left wheel.
- Remove left front exhaust pipe with catalytic converter.

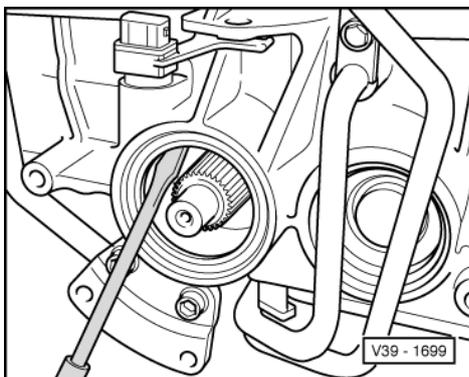
=> 6-Cylinder engine, Mechanics; Repair group 26; Removing and installing parts of exhaust system; Removing and installing left front exhaust pipe with catalytic converter. Removing and installing parts of exhaust system Removing and installing left front exhaust pipe with catalytic converter.

- 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

- -> Bend up locking plate -arrows- of collar nut with a screwdriver and take off.
- Unscrew collar nut for flange shaft. To loosen the collar nut, screw two bolts into flange shaft and brace with a suitable lever.
- Pull out flange shaft.



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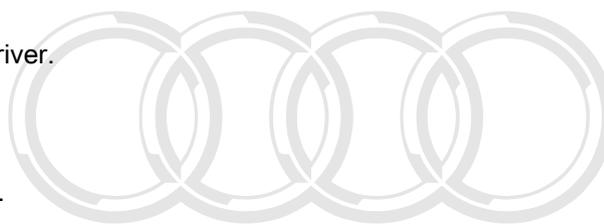


- -> Lever out oil seal for flange shaft with a screwdriver.

Note:

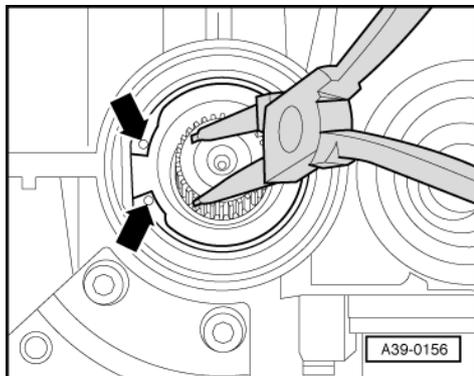
Support screwdriver only on input shaft.

- Remove speedometer sender -G22 => Page 87 .
- Pull out drive wheel for speedometer sender -G22.

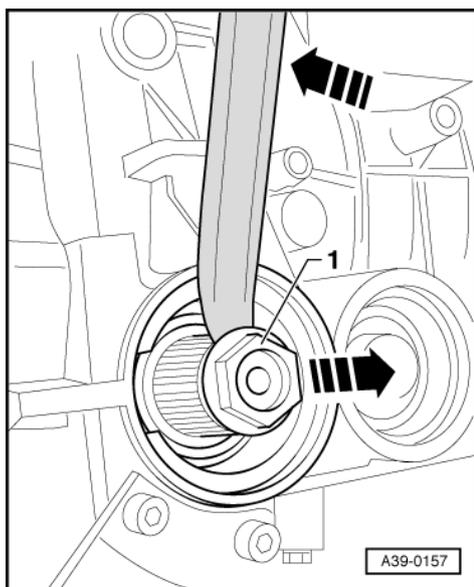


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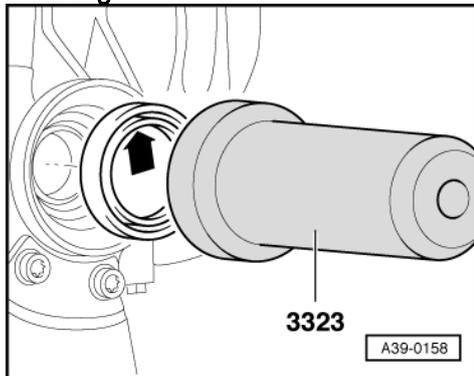


- -> Remove circlip for bearing -arrows-.
- Place drip tray V.A.G 1306 underneath.



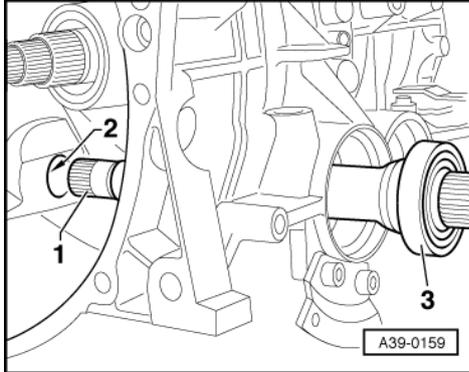
- -> Screw collar nut -1- onto input shaft and lever input shaft out with a suitable lever.
- Pull out left oil seal with lever VW 681.

Installing



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

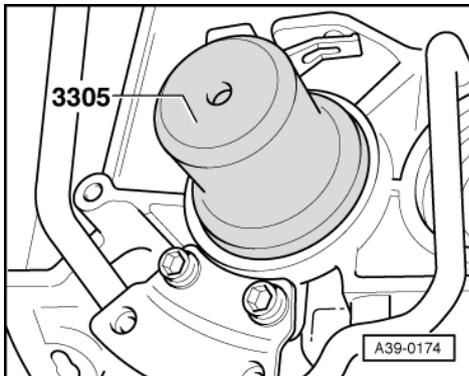
- Check oil seal seat in gearbox housing for damage and rework if necessary.
- Moisten outer circumference and sealing lips of oil seal with gear oil or thinly coat with Vaseline.
- -> Slide on new oil seal with sealing lip -arrow- facing thrust piece 3323.
- Drive oil seal in up to stop with thrust piece 3323.



- -> Check right-hand end -1- of input shaft for burrs and rework if necessary.
- Fill bearing -3- with 30 g of multi-purpose grease.
- Carefully guide input shaft into hole -2- in gearbox housing.

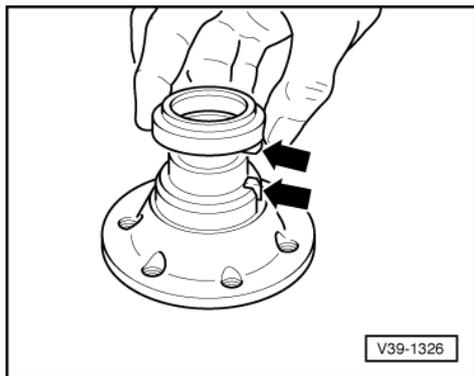
Notes:

- ◆ Shown in illustration with gearbox removed and without torque converter.
- ◆ The oil seal near hole -2- can be damaged if the input shaft is guided in carelessly=> from Page 89 .
- Moisten outer circumference and sealing lip of oil seal for left flange shaft with gear oil or apply a thin coat of Vaseline.



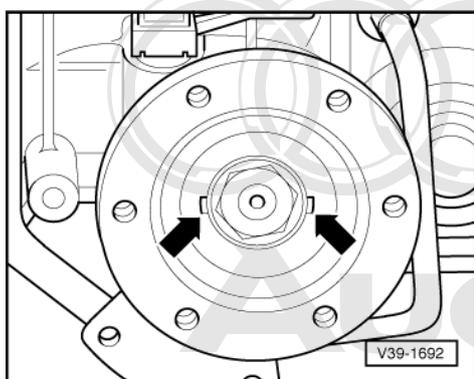
- -> Check oil seal seat in gearbox housing for damage and rework if necessary.
- The open side of the oil seal faces the gearbox.
- Drive oil seal for left flange shaft in up to stop of special tool using thrust piece 3305 or 3171.
- The oil seal must be inserted at the same depth in the housing all round.
- Apply multi-purpose grease to inner face of magnetic ring and fit onto flange shaft.

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Note:

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

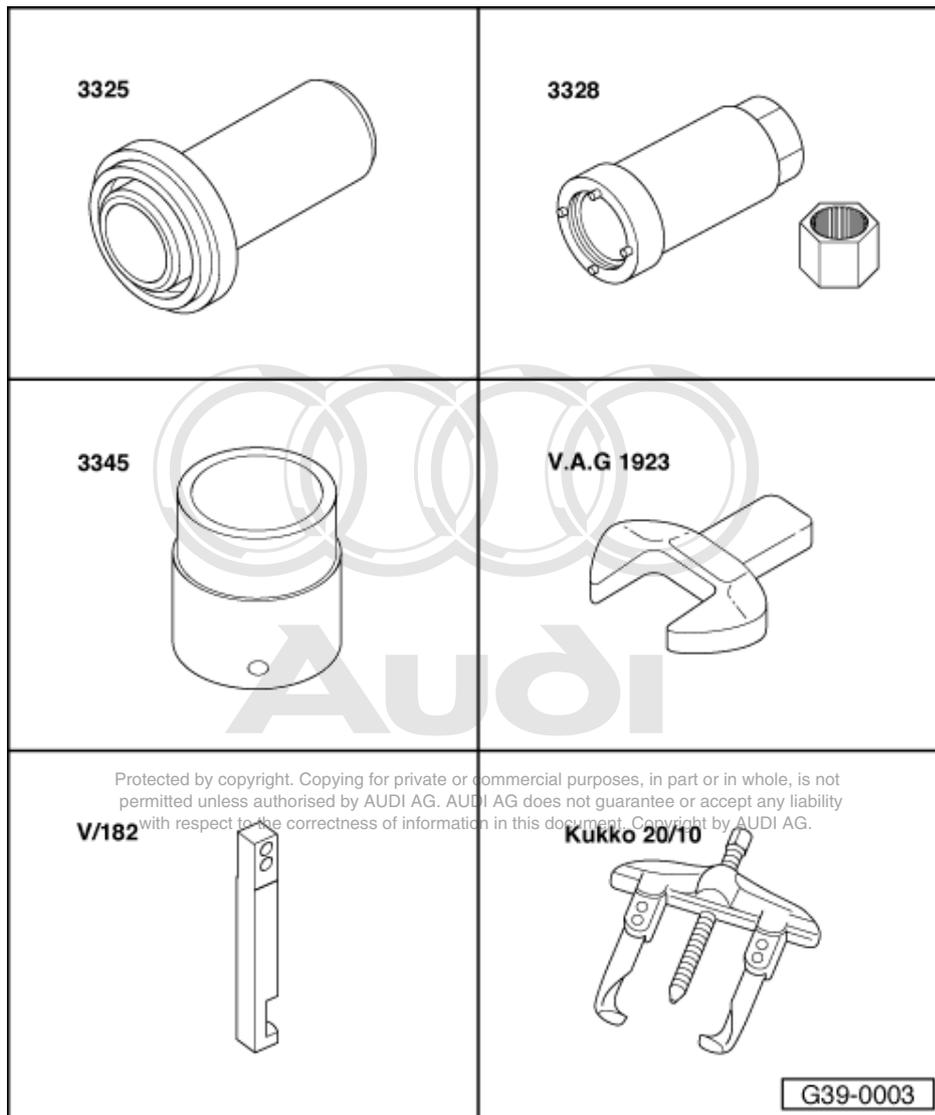


- Tighten collared nut on flange shaft and secure with new locking plate -arrows-.
- Check oil level in front final drive of automatic gearbox => Page 88 .

Tightening torques

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

3.6 - Removing and installing intermediate sleeve for drive pinion shaft.

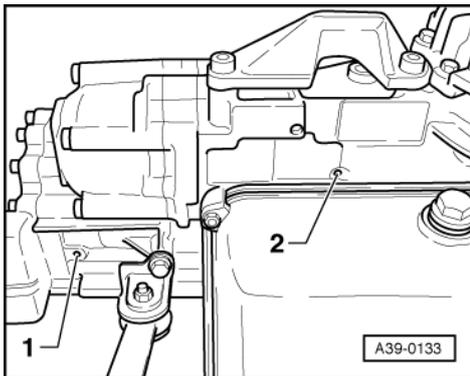


Special tools and workshop equipment required

- ◆ Thrust piece 3325
- ◆ Wrench with retainer 3328
- ◆ Tube for wheel bearing 3345
- ◆ Open-end spanner insert V.A.G 1923
- ◆ Special tool V/182
- ◆ Kukko 20/10

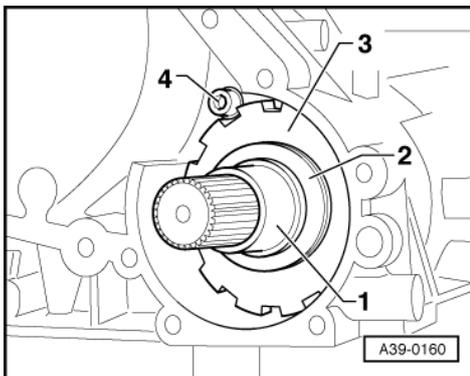


Notes:

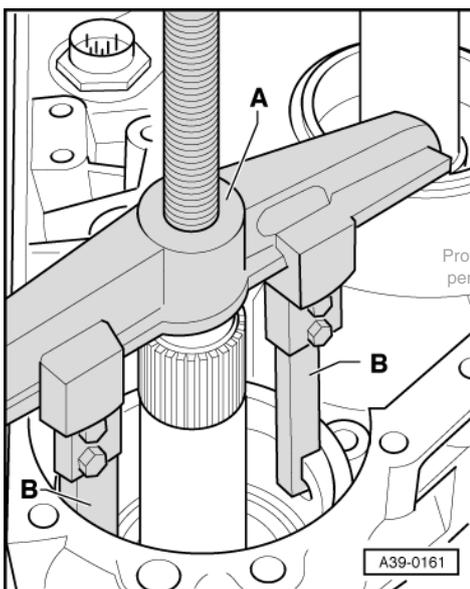


- ♦ -> On the lower right of the housing there is an oil leak inspection hole -2- for the seals (two oil seals and two O-rings) of the intermediate sleeve that separates the gear oil side from the ATF side.
- ♦ If leaks occur, renew the entire intermediate sleeve with seals, check nut (on which the oil seals run) for scoring and renew if necessary.

Removing



- Remove front intermediate drive => Page 121 .
- -> Remove sleeve -1-, dished springs -2- and parking lock wheel -3-.
- Remove bolt -4- with washer.



- -> Pull out intermediate sleeve.

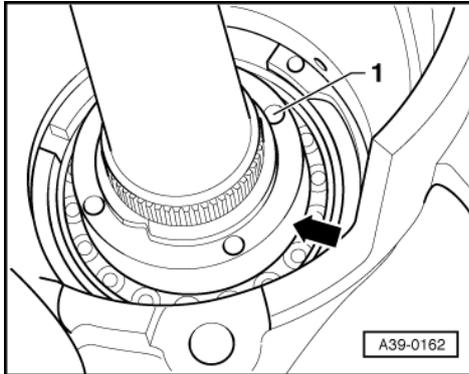


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- A - Kukko 20/10
- B - Special tool V/182

Installing

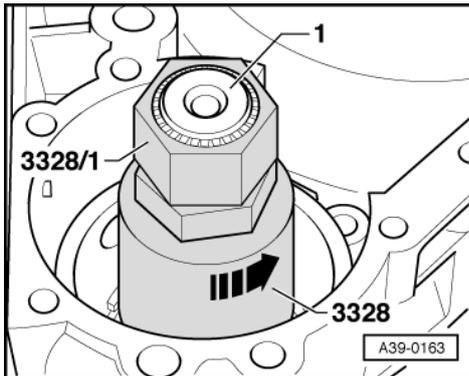


Installation is carried out in the reverse order, when doing this note the following:

- -> Check outer circumference of nut -arrow- for scoring. If scoring is evident, renew as follows:

Removing nut:

- Insert pins of wrench 3328 into holes -1- of nut.

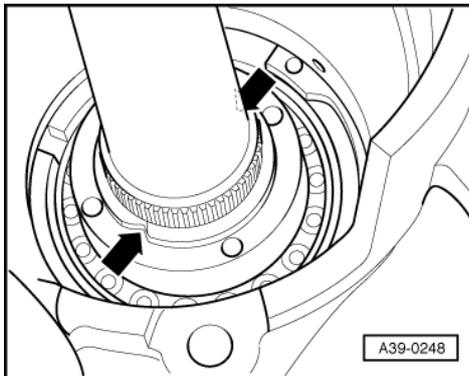


- -> Fit retainer 3328/1 onto splines of drive pinion shaft -1-.
- Loosen nut by turning wrench 3328 anti-clockwise and bracing with retainer 3328/1.

Note:

To turn wrench 3328, use the 38 mm open-end spanner insert V.A.G 1923.

Fitting nut:

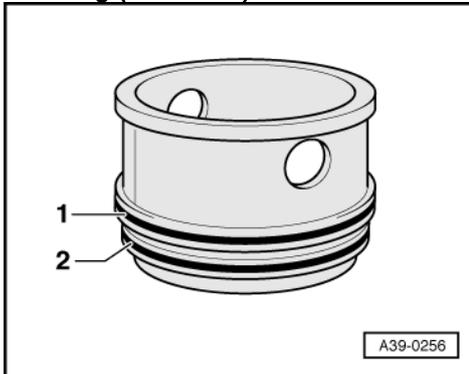


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- Insert pins of wrench 3328 into holes of nut.
- Fit retainer 3328/1 onto splines of drive pinion shaft.
- Tighten nut to 120 Nm. To do this, turn wrench 3328 clockwise and brace with retainer 3328/1.
- -> Peen nut on both sides -arrows-.

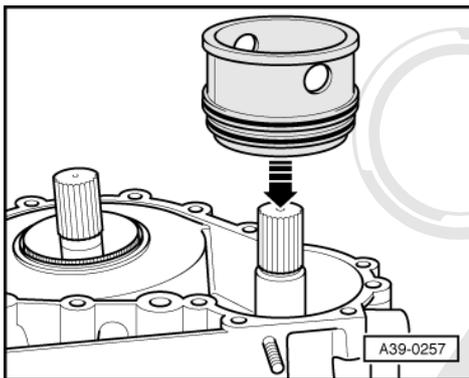
Installing (continued):



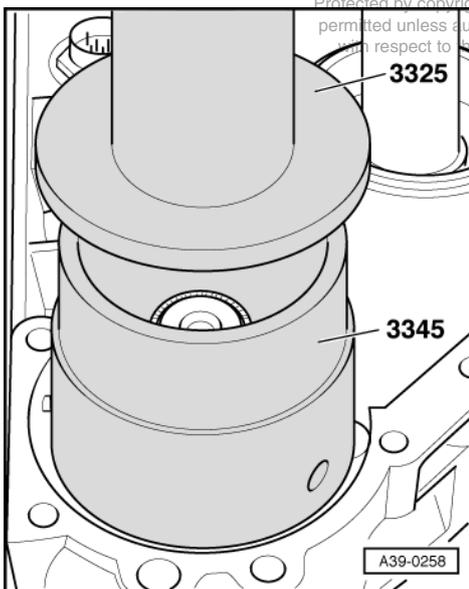
- Fit intermediate sleeve with both O-rings.

- 1 - -> Black O-ring
- 2 - Green O-ring

- Thinly coat O-rings and sealing lips of intermediate sleeve with Vaseline.

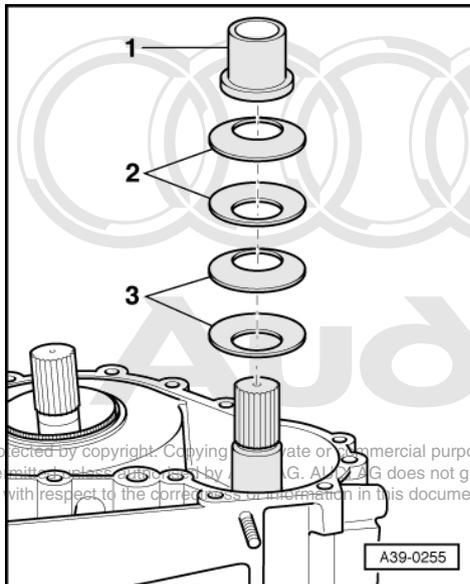


- -> Insert intermediate sleeve as far in as possible by hand -arrow-.



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- -> Fit larger outer diameter of tube for wheel bearing 3345 centrally on intermediate sleeve.
- Fit thrust piece 3325 centrally onto tube for wheel bearing 3345 and use a rubber hammer to gently knock intermediate sleeve in as far as it will go.



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- -> Fit parking lock wheel with shoulder facing drive pinion.
- Fit each pair of dished springs (-2- and -3-) with concave sides facing together.
- Fit sleeve -1- with collar facing drive pinion.
- Check oil level in front final drive of automatic gearbox => Page 88 .

Tightening torques

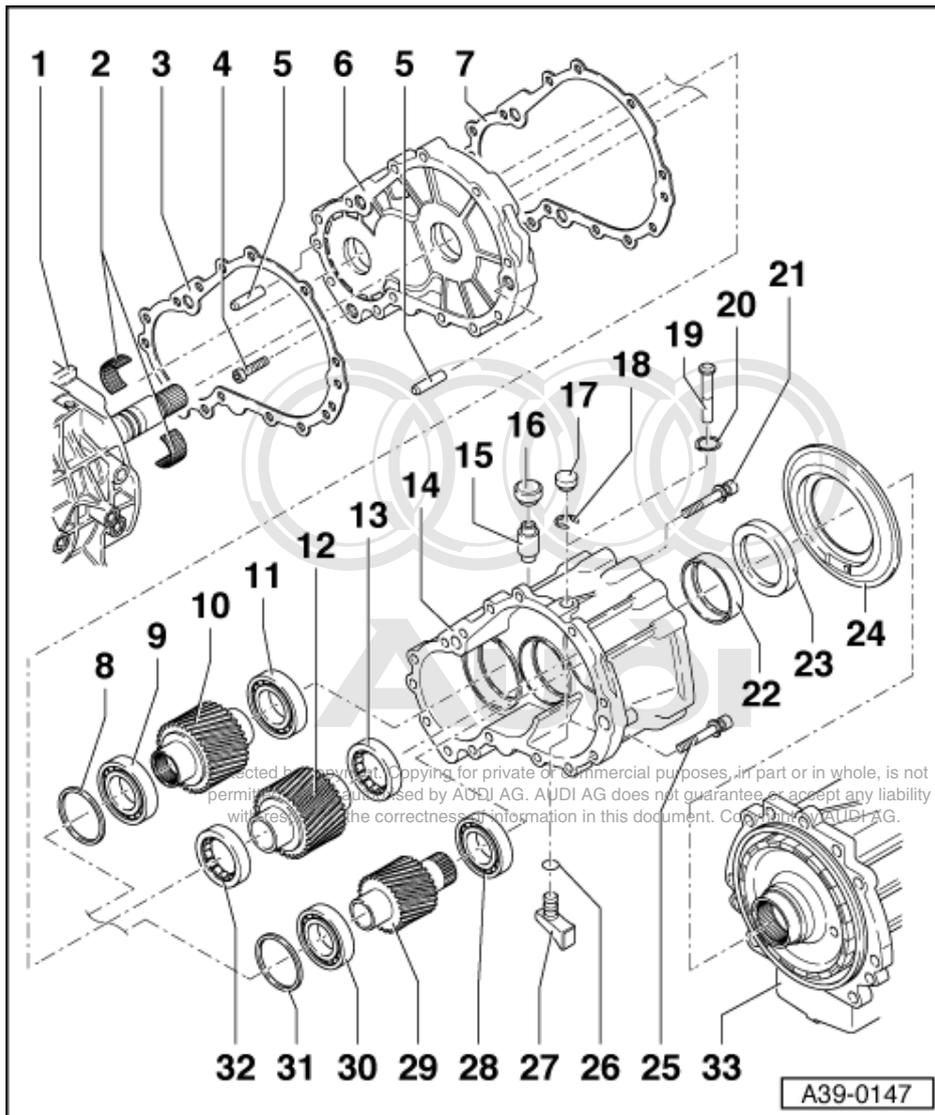
Component		Nm
Nut for drive pinion shaft	M40	120
Bolt for securing intermediate sleeve	M8	23

4 - Servicing intermediate drive for front final drive

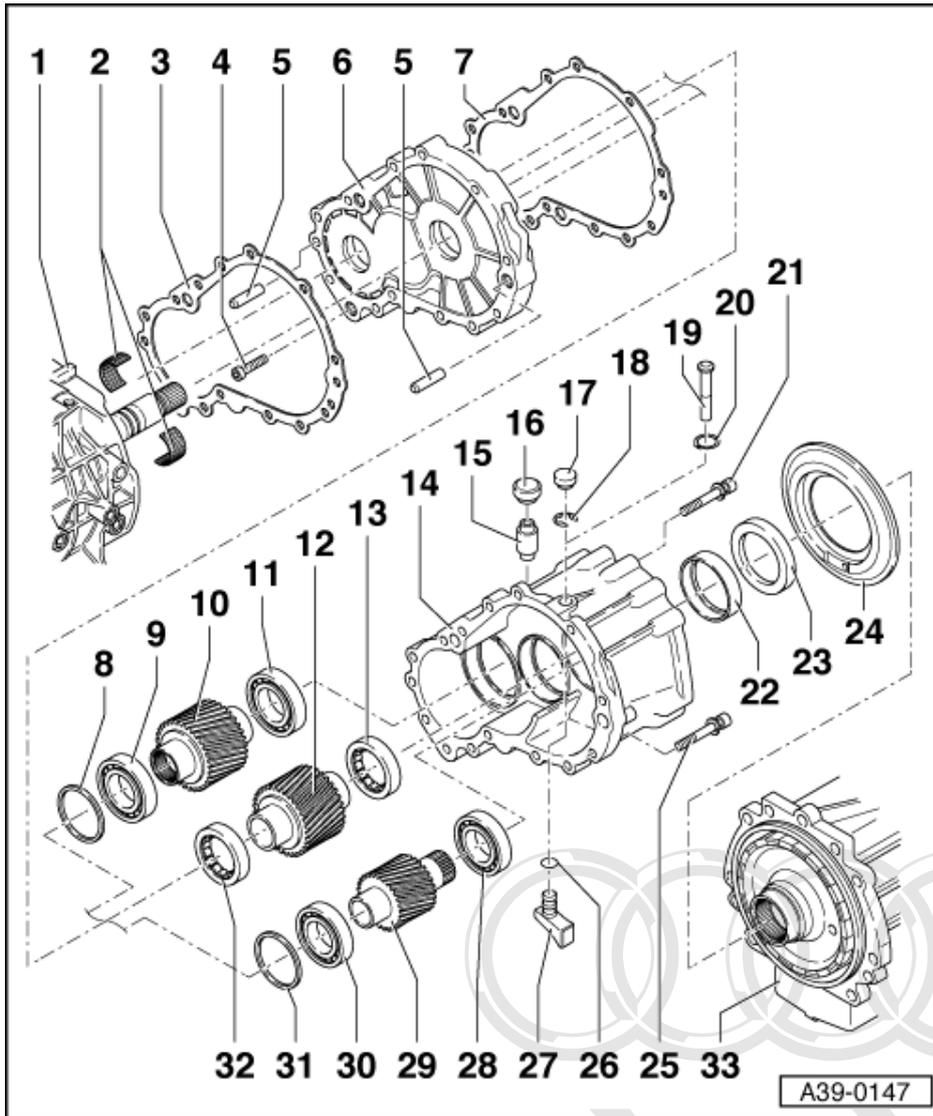
4.1 - Servicing intermediate drive for front final drive

Notes:

- ◆ General repair instructions => Page 5 .
- ◆ Ratios => from Page 2 .
- ◆ Do not pull off bearing inner races and bearing cages that have been pressed onto the spur gears. Do not pull out bearing outer races that have been pressed into the housing.
- ◆ Do not interchange the position of spur gears, their bearings and shims, as the bearings and shims are set to one another and are run in.
- ◆ The spur gears, bearings, intermediate flange or housing of the front intermediate drive cannot be renewed individually, as this changes the bearing preload of the spur gears. If one of these components is damaged, the entire front intermediate drive must be renewed.
- ◆ If the front intermediate drive is renewed, the axial clearance for the Torsen differential must be checked and if necessary adjusted
=> Page 158 .



- 1 Automatic gearbox
- 2 Needle roller bearing
 - ◆ Split
- 3 Gasket
 - ◆ Renewing => from Page 121
- 4 Bolt - 10 Nm
 - ◆ Qty. 3
 - ◆ For securing intermediate flange -Item 6 - to housing for intermediate drive -Item 14 -
- 5 Fitted pin
 - ◆ Qty. 2
 - ◆ For locating -Item 1 -, -Item 14 - and -Item 6 - together
- 6 Intermediate flange
 - ◆ Do not renew individually
 - ◆ Removing and installing
=>Page 130



7 Gasket

- ◆ Renewing => Page 130

8 Shim

- ◆ Rear bearing race for bearing preload
- ◆ Is determined by measurement and cannot be exchanged for another shim at will

9 Taper roller bearing

- ◆ Do not change allocation

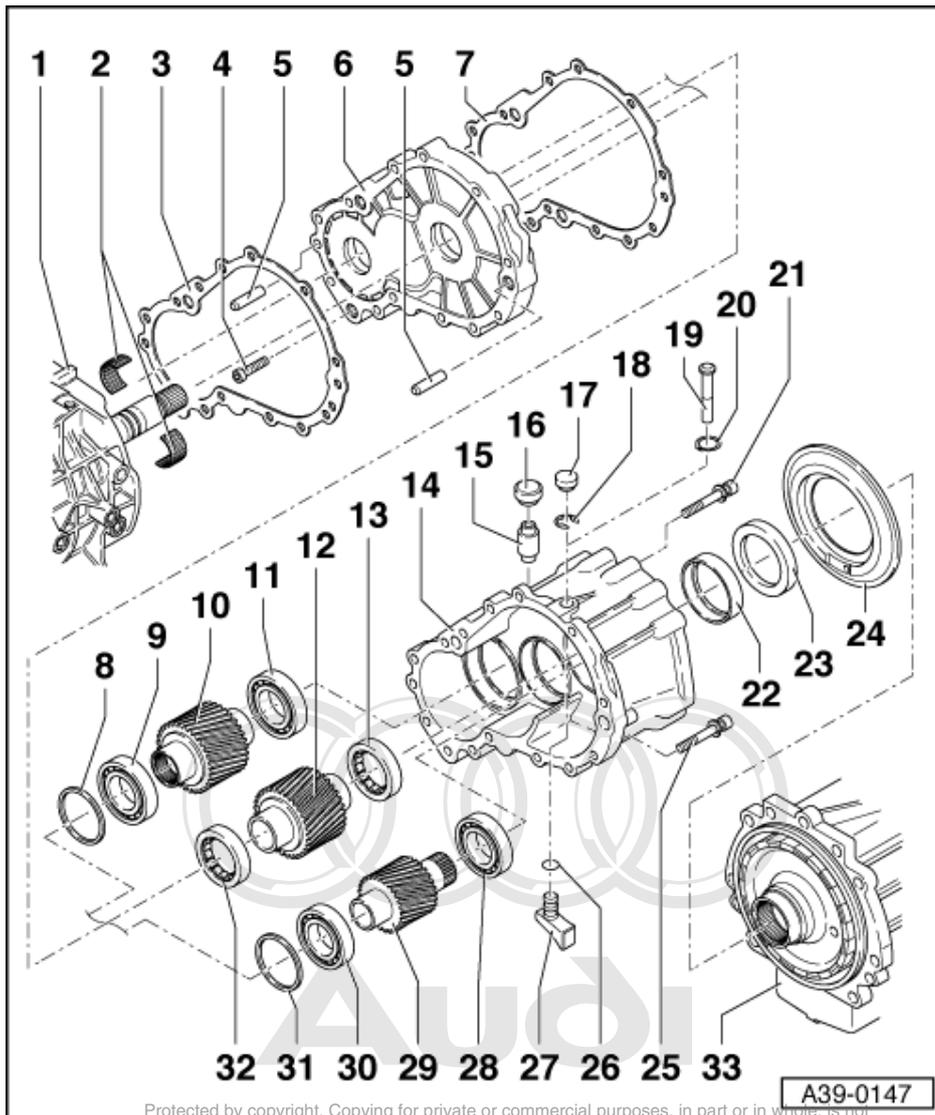
10 Output gear

- ◆ For front intermediate drive
- ◆ Do not renew individually
- ◆ Removing and installing
=>Page 130

11 Taper roller bearing

- ◆ Do not change allocation

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12 Intermediate gear

- ◆ For front intermediate drive
- ◆ Do not renew individually
- ◆ Removing and installing
=>Page 130

13 Cylinder roller bearing

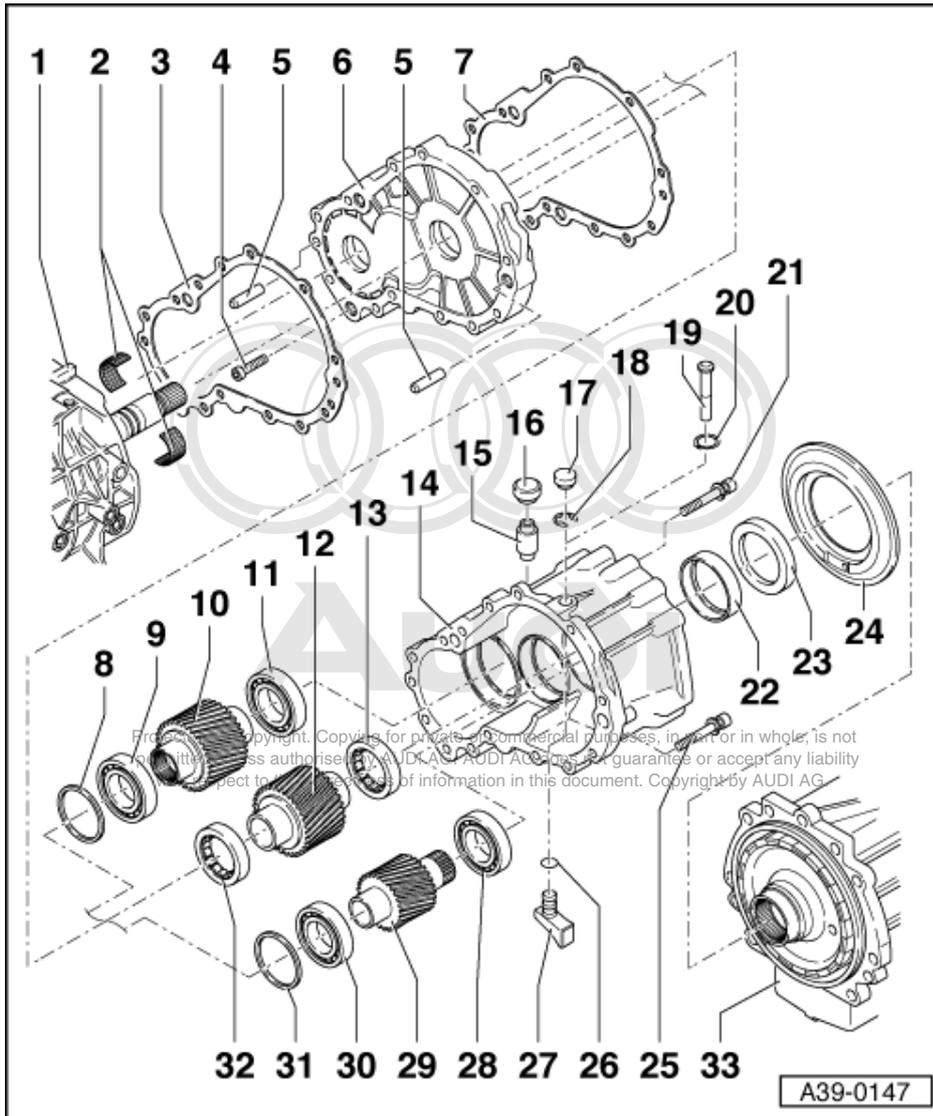
- ◆ Do not change allocation

14 Housing for intermediate drive

- ◆ Do not renew individually
- ◆ Removing and installing
=>Page 130

15 Breather

- ◆ For transfer gearbox (gear oil side)
- ◆ To renew, pull off upwards and heat gearbox housing quickly with hot air blower if necessary



16 Cap

- ◆ For breather -Item **15** -

17 Cap

- ◆ For breather -Item **27** -

18 Circlip

- ◆ For breather -Item **27** -

19 Breather

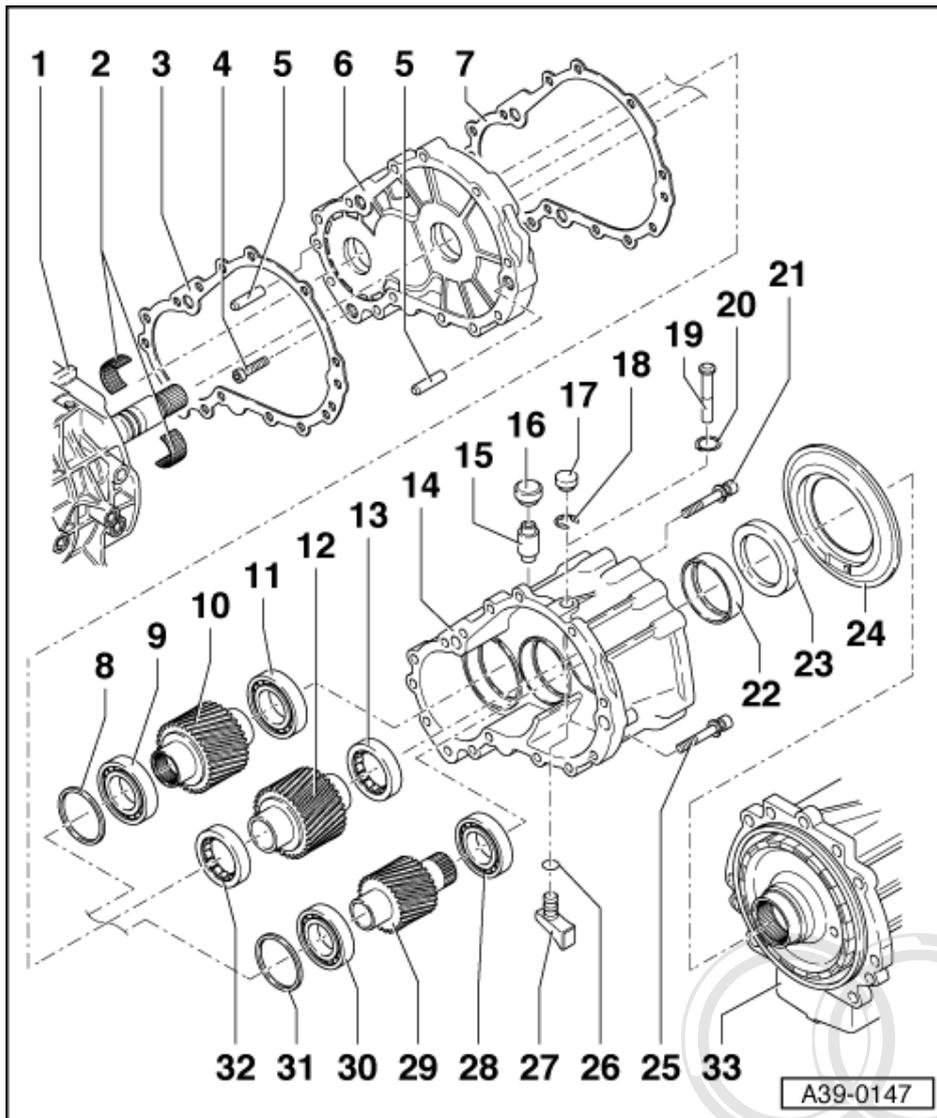
- ◆ For ATF side
- ◆ New steel version with cap
- ◆ Renewing => Page **133**

20 Circlip

- ◆ For breather -Item **19** -

21 Bolt - 23 Nm

- ◆ Qty. 6
- ◆ For securing transfer gearbox to intermediate drive



22 Seal

- ◆ For ATF side
- ◆ Renewing => Page 134

23 Seal

- ◆ For gear oil side
- ◆ Renewing => Page 134

24 Baffle plate

- ◆ Only remove for cleaning, pull out evenly at circumference

25 Bolt - 23 Nm

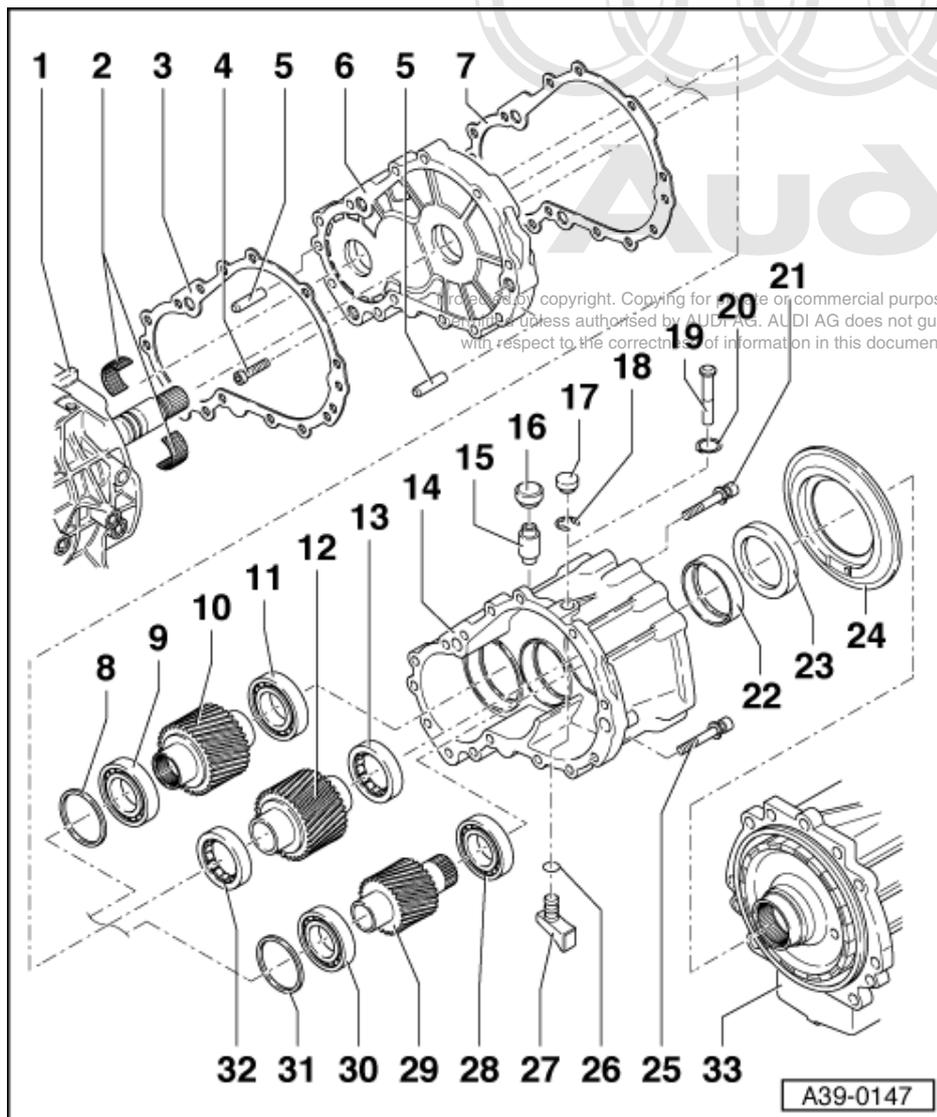
- ◆ Qty. 7
- ◆ For securing transfer gearbox to front of gearbox housing

26 O-ring

- ◆ Renew

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27 Breather

- ◆ For ATF side
- ◆ Older version with plastic cap
- ◆ Renewing => Page 133

28 Taper roller bearing

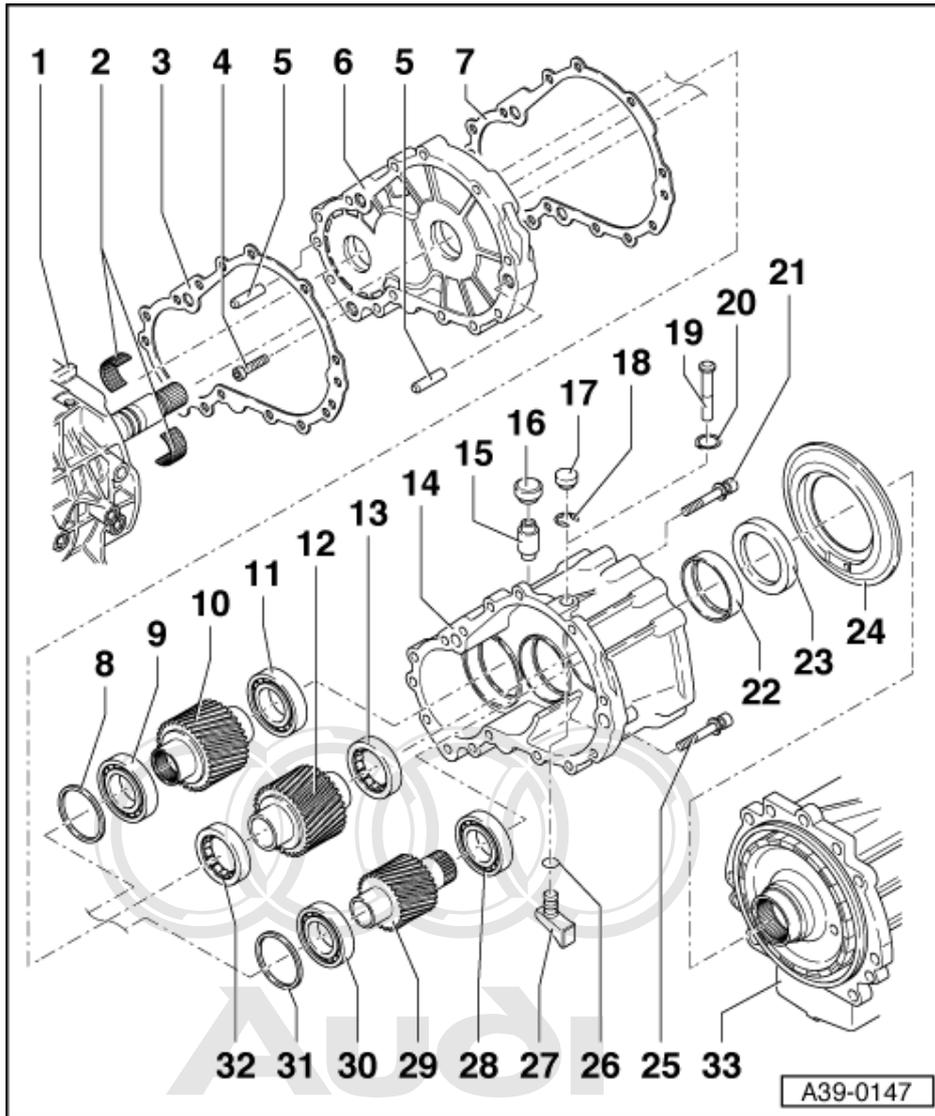
- ◆ Do not change allocation

29 Drive gear

- ◆ For front intermediate drive
- ◆ Do not renew individually
- ◆ Removing and installing
=>Page 121

30 Taper roller bearing

- ◆ Do not change allocation



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- ◆ Behind bearing race
- ◆ For bearing preload
- ◆ Is determined by measurement and cannot be exchanged for another shim at will

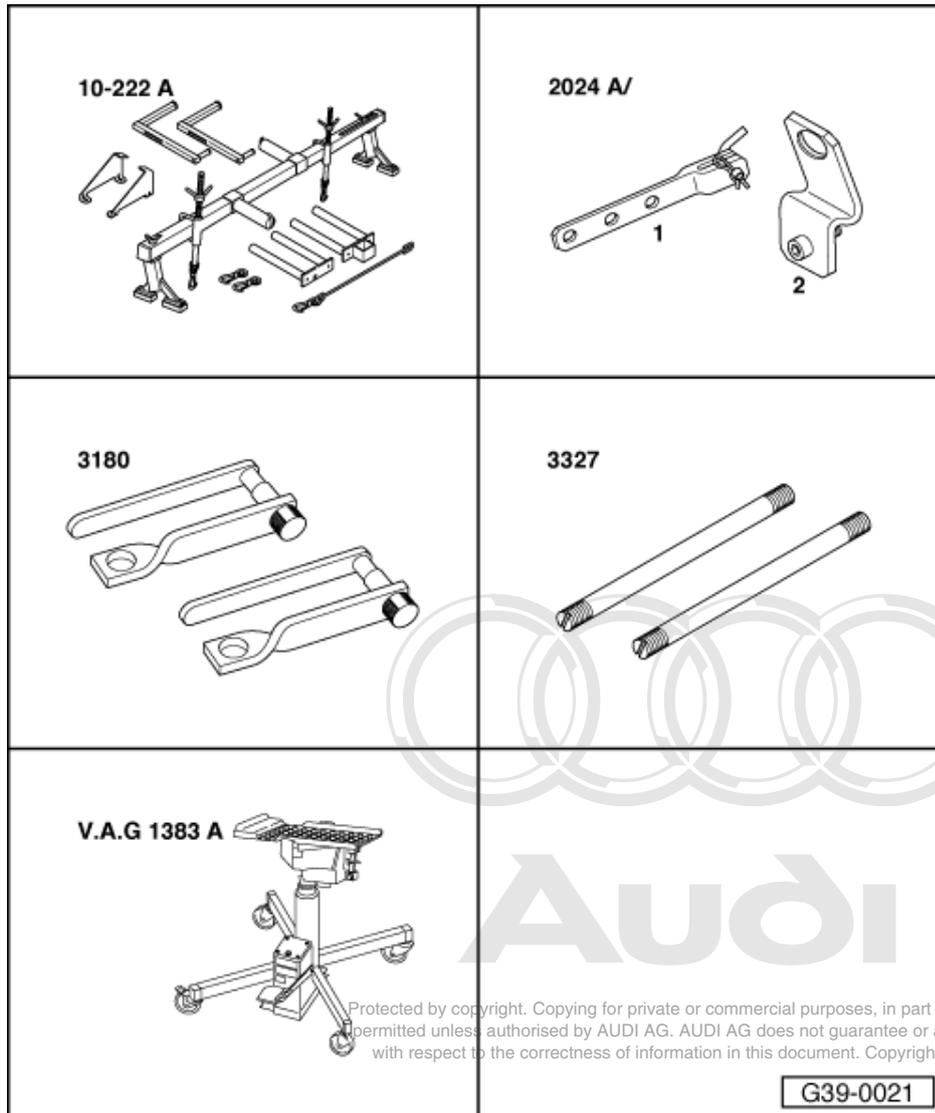
32 Cylinder roller bearing

- ◆ Do not change allocation

33 Transfer gearbox

- ◆ Removing and installing =>Page 149
- ◆ Servicing =>Page 138

4.2 - Removing and installing front intermediate drive with transfer gearing



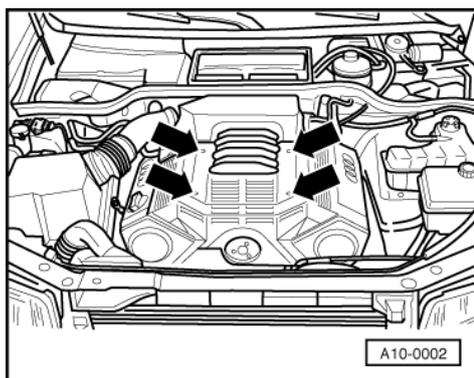
Special tools and workshop equipment required

- ◆ Engine support bracket 10-222 A with adapter 10-222 A/4
- ◆ Bar 2024 A/2
- ◆ Retainer 3180
- ◆ Guide pins 3327
- ◆ V.A.G 1383 A

Caution
 Contact corrosion. Notes => Page 5 .



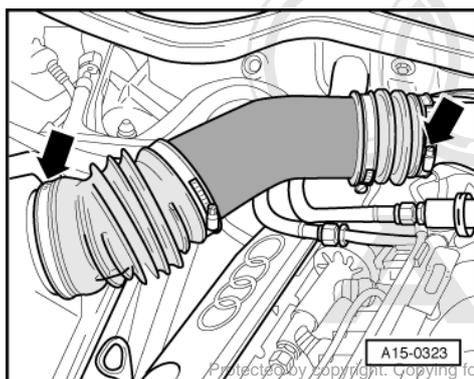
Note:



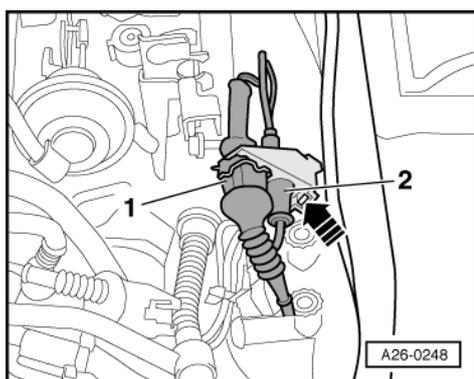
The front intermediate drive can only be removed and installed together with the transfer gearbox.

Removing

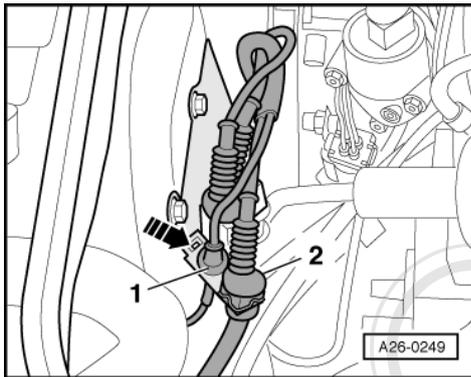
- Obtain radio code on vehicles with coded radio.
- With ignition switched off disconnect battery earth strap.
- -> Remove engine cover -arrows-.



- -> Remove air intake hose between air mass meter and intake manifold -arrows-

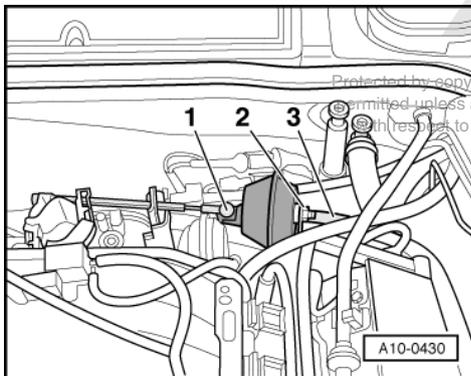


- -> Unclip connector bracket(left) on bulkhead by pressing retainer tab in direction of arrow.
- Unplug connectors -1- and -2- for lambda probe.
- Guide lambda probe wiring downwards.



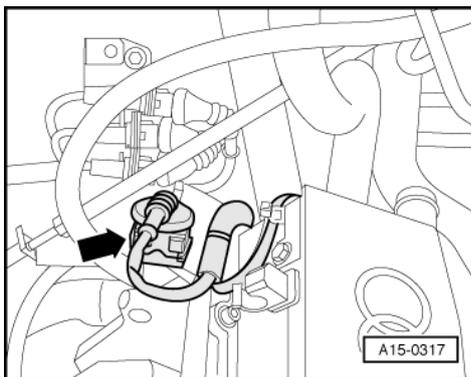
- -> Unclip connector bracket(right) on bulkhead by pressing retainer tab in direction of arrow.
- Unplug connectors -1- and -2- for lambda probe.
- Guide lambda probe wiring downwards.
- Unscrew securing nuts on front exhaust pipes (left and right) accessible from above.

Vehicles with cruise control system

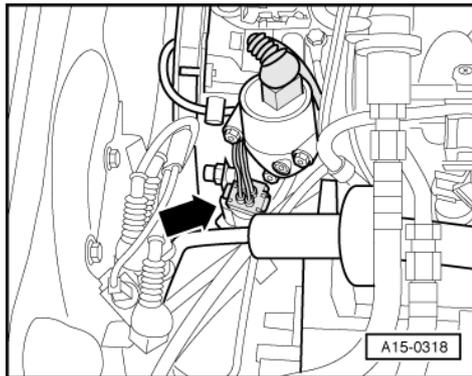


- -> Disengage actuating rod -1- from vacuum unit.
- Pull vacuum hose -3-off vacuum unit.
- Unscrew nut -2- and take out vacuum unit.

All models



- -> Unplug connector -arrow- and disengage lower section of connector from bracket.
- Pull spark plug connector off cylinder 5.

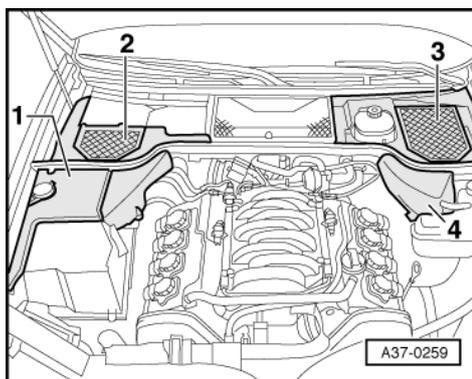


- -> Pull connector off coolant temperature sender -G2 -arrow-



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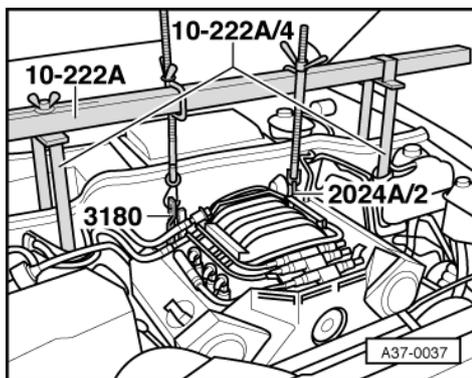
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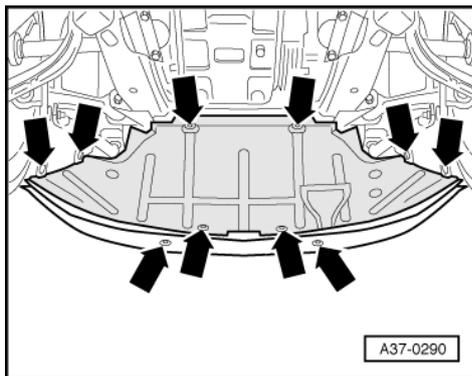
- -> Remove covers 1 - 4.

Note:

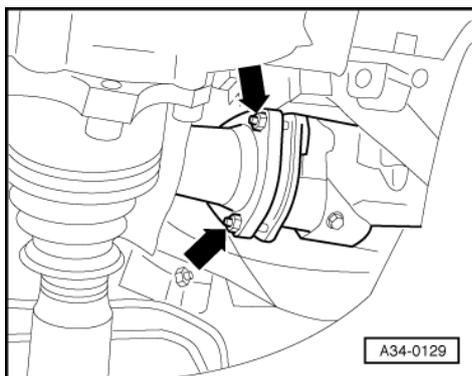
In illustration: covers on 8-cylinder engine.



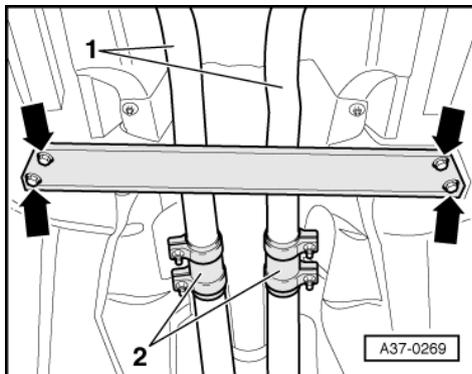
- -> Assemble engine support bracket 10-222 A with adapters 10-222 A/4 and spindles.
- Left spindle in front of support bracket, right spindle behind.
- Position engine support bracket 10-222 A onto bolts for suspension strut mountings and check stability.
- Fit retainer 3180.
 - Fit pin(rear) into eye and secure.
- Fit bar 2024/A2.
 - Fit bolt into eye from rear and secure.
- Take up weight of engine via spindles.



- -> Remove noise insulation -arrows-.



- -> 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:

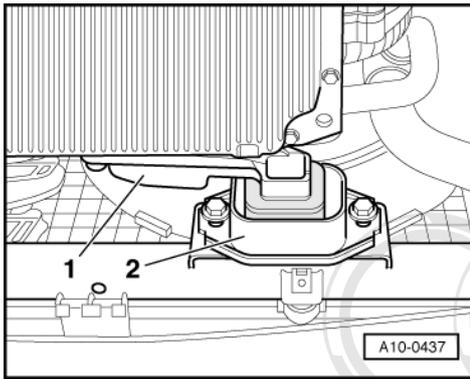
Ensure that connectors for lambda probes are clear.

- Remove heat shield for propshaft from housing end cover => Page 168 .
 - Unbolt propshaft from gearbox flange and tie up on constant velocity joint => from Page 163 .

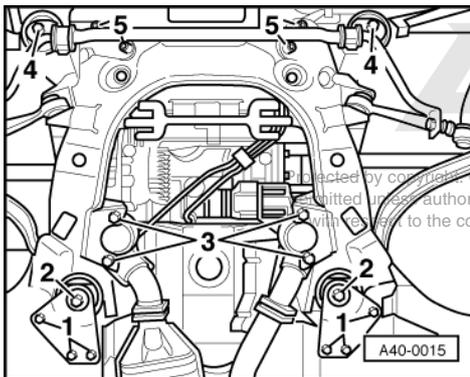
Note:

Do not bend propshaft more than 25°, otherwise the universal joint could be damaged.

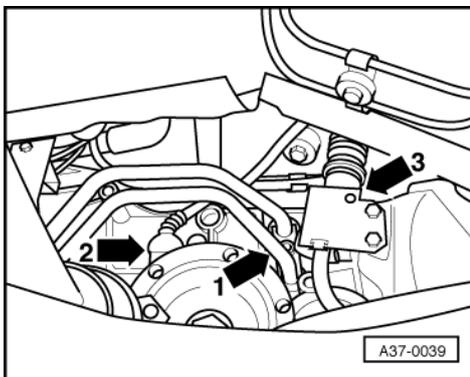
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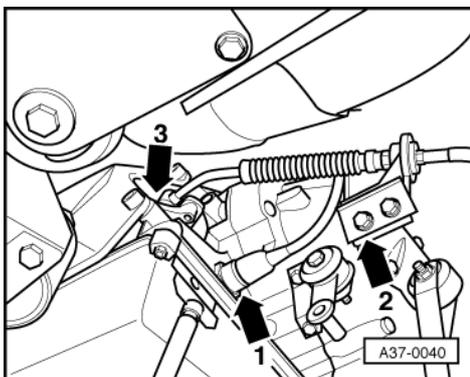
- -> Unscrew stop for torque reaction support -2-.



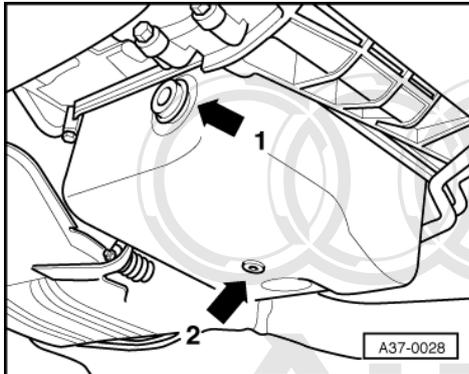
- -> Unscrew lower securing bolts -5- at engine mountings approx. 3 turns.
- Unbolt heat shield for selector lever cable on gearbox.



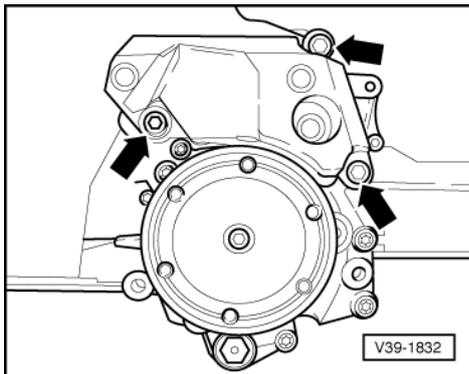
- -> Detach wiring -arrow 3- of multi-function switch, when doing so compress spring catch on base of connector.



- -> Release bayonet fitting of 8-pin connector by turning anti-clockwise -arrow 1-. Unplug connector from gearbox.
- Unscrew bolts -arrow 2- on support bracket and take support bracket off gearbox.
- Unscrew nut -arrow 3-, remove washer and carefully pull selector lever cable -arrow 1- off selector shaft lever upwards.
- Place container under the gearbox.



- -> Unscrew ATF drain plug -arrow 2- and drain ATF.
- Support gearbox at rear with gearbox jack V.A.G 1383 A and universal support V.A.G 1359/2.
- Remove gearbox support(left) togetherwith gearbox mounting
=>Page 47
- Remove right gearbox mounting.
- Lower gearbox with engine / gearbox jack approx 50 mm.

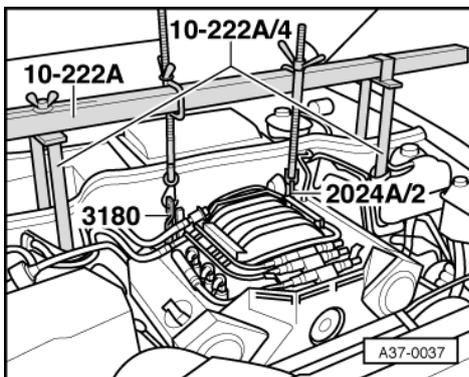


- -> Unbolt vibration damper -arrows- and pull off towards rear.

Note:

The vibration damper is also located with a dowel pin.

- Check that all wiring from gearbox to vehicle has been detached. Unplug or unclip wiring connections if necessary.

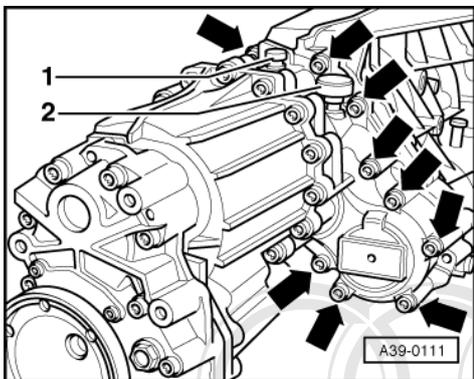




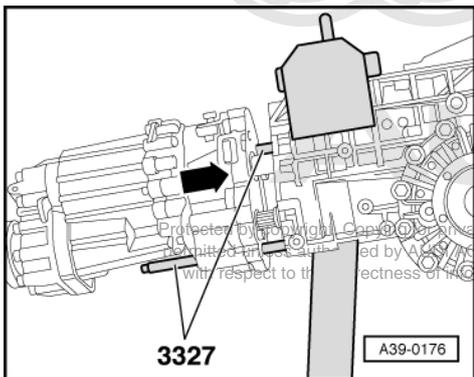
- -> Slacken spindles of engine support bracket 10-222 A until rear of gearbox is lowered approx. 150 mm.

Note:

Make sure that the throttle valve unit, wiring and hose connections are not damaged. Remove the wiring and hoses if necessary.



- -> To secure the front intermediate drive, loosen two bolts 5 turns only. Completely unscrew all remaining bolts.



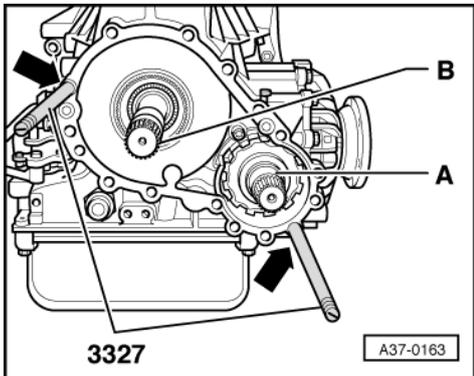
- -> Screw guide pins 3327 through bolt holes of automatic gearbox housing.
- Remove remaining bolts.

Note:

The guide pins 3327 are necessary to prevent damage to oil seals when removing and installing.

- Carefully pull off intermediate drive with transfer gearbox towards rear (opposite direction of arrow).

Notes:



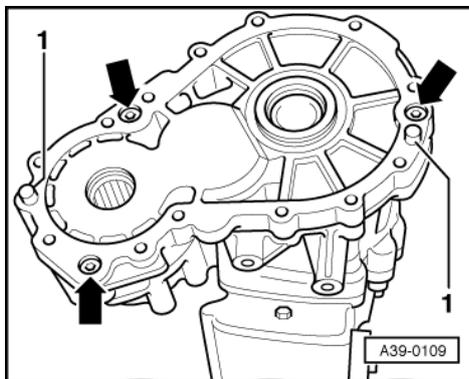
- ◆ -> On the output shaft -B- there are two needle bearing halves that fall out when pulling off the transfer gearbox.
 - ◆ Always hold down the rear end of the transfer gearbox, as otherwise gear oil will run out.
 - ◆ The gear oil in the transfer gearbox has additives mixed in at the factory which are not available for after-sales service.
- Secure sleeve, dished springs and parking lock wheel (pushed onto drive pinion shaft -A-) against falling out.

Installing:

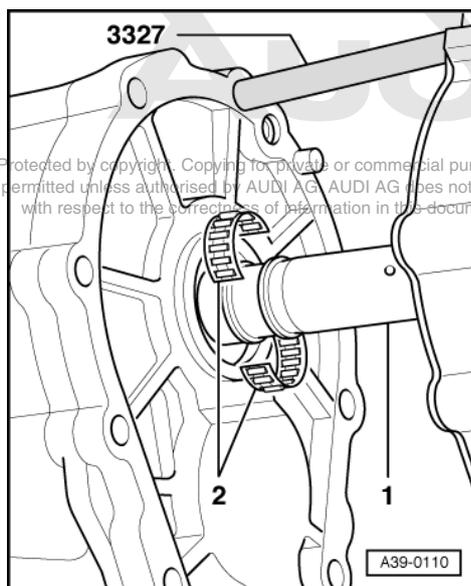
Installation is carried out in the reverse order. When doing this, note the following:

Notes:

- ◆ The vibration damper must lie flush on the contact surface.
 - ◆ Always renew self-locking bolts.
 - ◆ Tighten the securing bolts of the vibration damper evenly.
 - ◆ If the front intermediate drive or its components are renewed, the axial clearance for the Torsen differential must be checked and adjusted if necessary => Page 158 .
- Check sealing surfaces of housing for damage.



- Coat new gaskets thinly with Vaseline, place on sealing surface of housing and secure.
- -> Before assembling the intermediate drive, ensure dowel pins -1- in intermediate flange are seated correctly. Dowel pins locate intermediate flange to housing of automatic gearbox and intermediate drive.
- If sleeve, dished springs and parking lock wheel have inadvertently been pulled off drive pinion shaft:
 - Insert parking lock wheel with step toward drive pinion.
 - Insert two dished springs in each case so that their outer circumferences touch each other.
 - Insert sleeve with shoulder towards drive pinion.



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- -> Carefully slide transfer gearbox (assembled complete with intermediate drive) with guide pins onto output shaft -1- and fix both needle bearing halves -2- on output shaft with Vaseline.

Notes:

- ◆ When fitting assembled intermediate drive, do not damage splines of input shaft, drive pinion shaft and Torsen differential; if necessary, rotate shafts carefully.
- ◆ By hand it is only possible to fit transfer gearbox to within approx. 3 mm from automatic gearbox housing. The dished springs on the drive pinion shaft will be compressed as the transfer gearbox is installed further. Use the bolts to lessen the gap between the housings uniformly and tighten to torque using diagonal sequence.
- Check selector lever cable setting => Page 24 .
- Check oil level in transfer gearbox => Page 136 .
- Bolt on propshaft => Page 169 .
- Renew gasket between propshaft and gearbox flange. To do this, pull off protective foil and stick gasket onto gearbox flange. Replenish grease for constant velocity joint if necessary.
- Fill with ATF and check ATF level => Page 51 .

Tightening torques

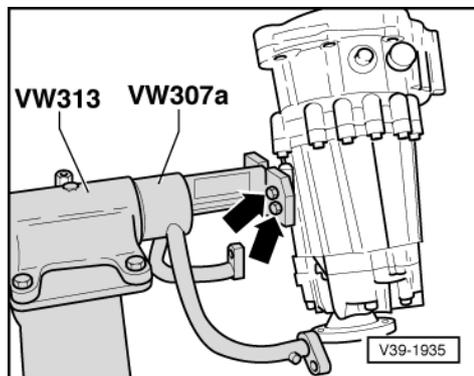
Component		Nm
Front intermediate drive to automatic M8 gearbox housing		25
Vibration damper to gearbox	M8	15 + 90°1)
Propshaft to gearbox	M8	55
Heat shield for propshaft to gearbox	M8	23
Support bracket for selector lever cable to gearbox	M8	23
Selector lever cable to lever for selector shaft		5.6
Cross member to body		25
Gearbox mountings to subframe		40
Gearbox mountings to gearbox support		42
Engine support to engine mounting	M10	45

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1) 90° is the same as a quarter turn

4.3 - Dismantling front intermediate drive

Removing

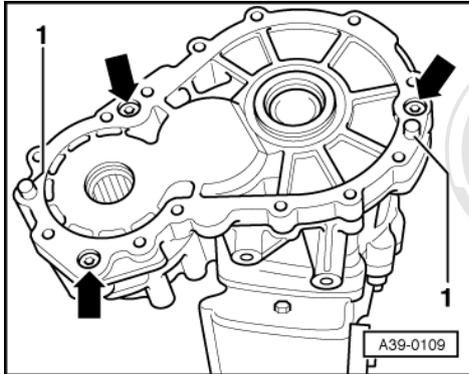


- Remove front intermediate drive => Page 121 .
- -> Bolt transfer gearbox to bracket VW 307a with two M8 bolts -arrows-.

Note:

Always hold down rear end of transfer gearbox, as otherwise gear oil leaks out.

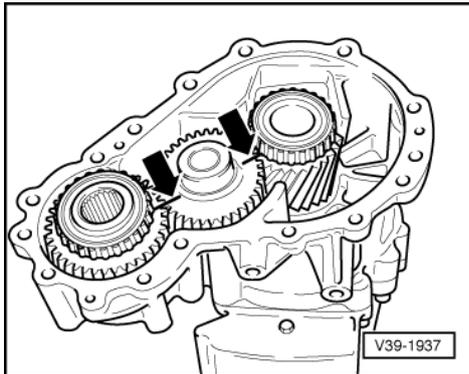
- Pull gasket off flange surface.



- -> Remove 3 Torx bolts -arrows-.
- Lever intermediate flange evenly off housing of intermediate drive upwards using a suitable lever on webs cast onto side, and place on a clean work bench.

Note:

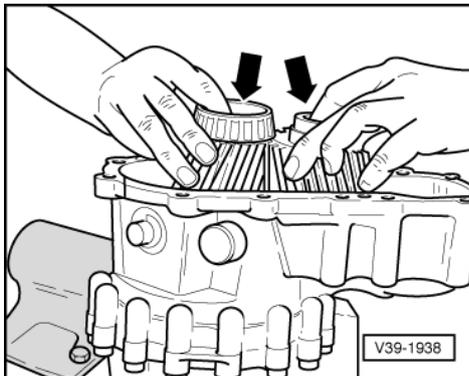
Do not damage housing sealing surfaces.



- -> Mark the relative positions of all spur gears -arrows-.

Notes:

- ◆ The position of the spur gears, their bearings and shims must not be interchanged.
- ◆ Damaged spur gears must not be reinstalled. In this case renew the entire intermediate drive.





- -> First remove the lower spur gear and then both upper spur gears together -arrows-.
- Pull gasket off gearbox flange.

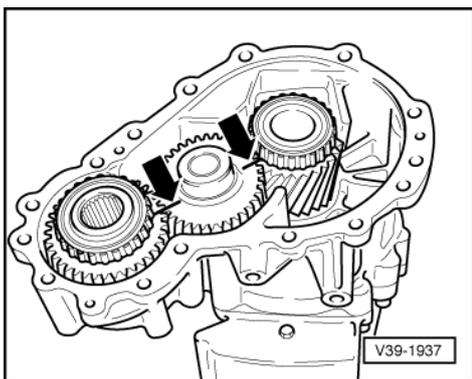
Installing

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

Note:

If the front intermediate drive or any of its components have been renewed, the axial clearance for the Torsen differential must be checked and adjusted if necessary => page 158.

- Check sealing surfaces of housing for damage.



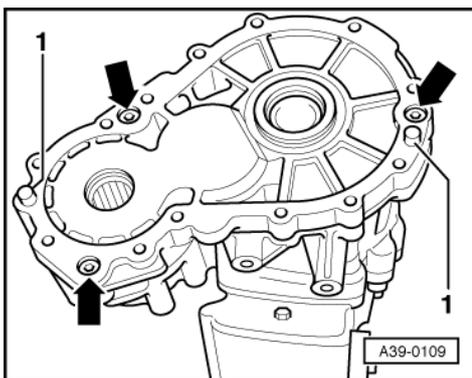
- -> Insert spur gears with markings -arrows- facing upwards.

Notes:

- ◆ The position of the spur gears, their bearings and shims must not be interchanged.
- ◆ Damaged spur gears must not be reinstalled. In this case renew the entire intermediate drive.

- Coat new gaskets thinly with Vaseline, place on sealing surfaces of housing and secure.

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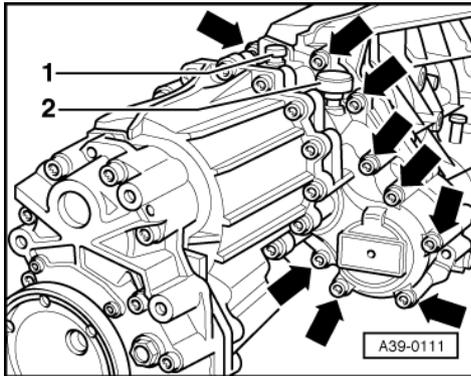


- -> Before assembling intermediate drive, ensure dowel pins -1- in intermediate flange are seated properly. Dowel pins locate intermediate flange to housing of automatic gearbox and intermediate drive.
- Tighten bolts -arrows- alternately and in gradual steps.

Tightening torque

Component	Nm
Intermediate flange to housing of intermediate M6 drive (Torx)	8

4.4 - Renewing ATF breather



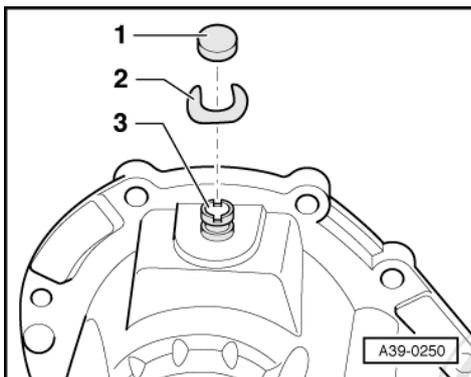
-> ATF breather -1- sits on top of intermediate drive housing.

Note:

If ATF leaks from the breather in the intermediate drive housing despite proper ATF level, replace the factory-installed plastic breather with the new steel version=>Page 64 .

Removing

- Remove front intermediate drive => Page 121 .
- Dismantle front intermediate drive => Page 130 .

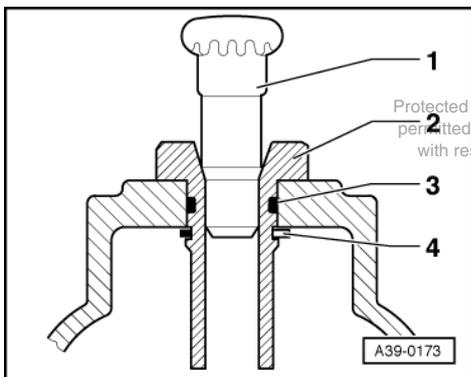


- -> Pull cap -1- off ATF breather and press off securing washer -2- with a screwdriver.
- Drive out breather -3- inwards together with plastic cover.

Installing

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

- Check breather seating hole in gearbox end cover for damage.



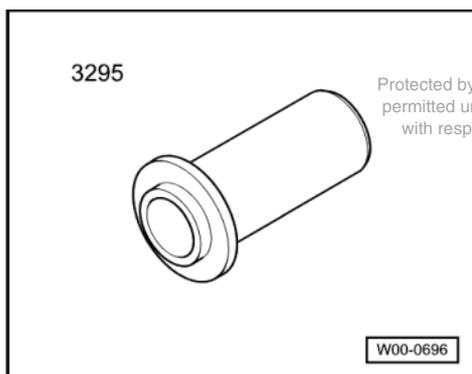
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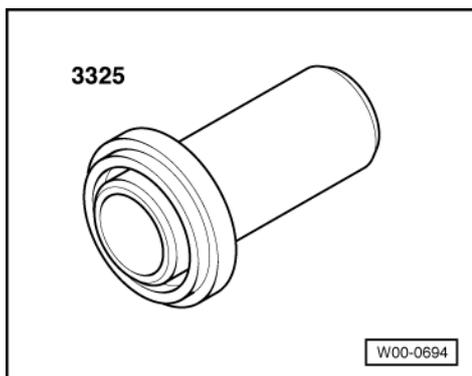
- -> Coat O-ring -3- on adapter thinly with Vaseline to prevent damage when installing.
- Insert new aluminium adapter -2- from outside.
- Lock aluminium adapter with circlip -4-.
- Drive in new breather -1- up to stop with light blows of a plastic head hammer.

4.5 - Renewing oil seals in front intermediate drive

Special tools and workshop equipment required

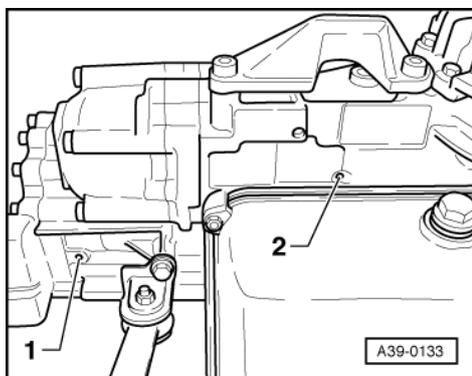


- ◆ Special tool 3295



- ◆ Special tool 3325

Notes:



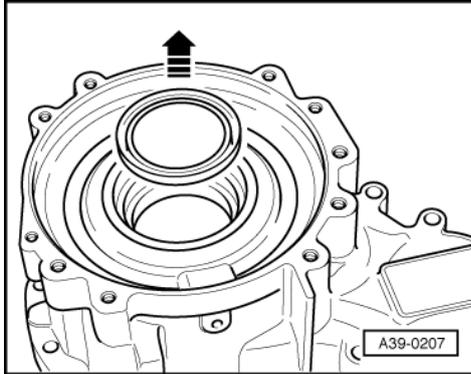
- ◆ -> On the lower housing of the intermediate drive there is an oil leak inspection hole -1- for the four oil seals that separate the gear oil side from the ATF side.

- ◆ If oil leaks out of the oil-leak inspection hole, renew both oil seals in the front intermediate drive as well as both oil seals in the transfer gearbox => Page **153** .

Removing

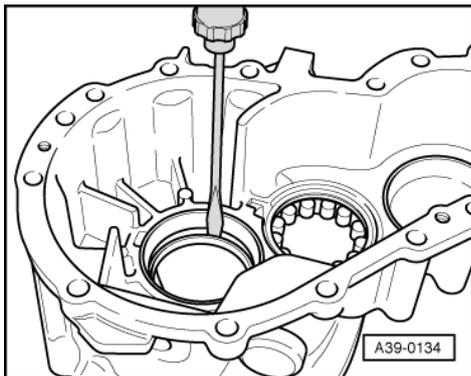
- Remove transfer gearbox => Page **149** .

Oil seal for gear oil side:



- -> Pull out oil seal -arrow- towards transfer gearbox using a suitable hook.

Oil seal for ATF side:



Note:

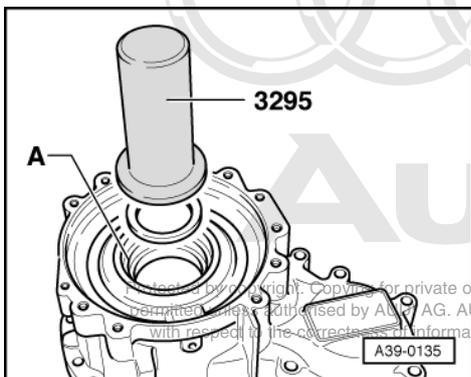
The oil seal for the gear oil side must be removed to renew the oil seal for the ATF side.

- -> Drive oil seal out towards transfer gearbox with a large screwdriver.

Installing

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

Oil seal for ATF side:

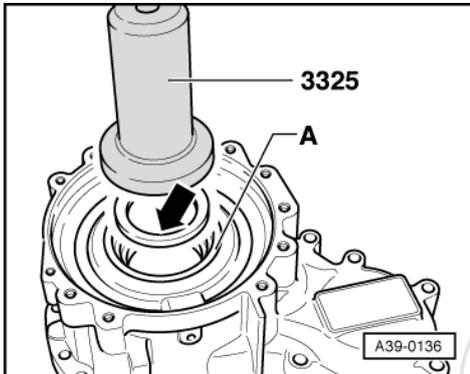


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- -> Check oil seal seat and contact surface -A- for thrust piece in housing for damage and rework if necessary.
- Coat outer circumference and sealing lip of oil seal thinly with Vaseline.
- Fit oil seal on thrust piece 3295 so that sealing lip faces towards housing.
- Drive in oil seal up to stop of thrust piece using thrust piece 3295.

Oil seal for gear oil side:



- -> Check oil seal seat and contact surfaces -A- for thrust piece in housing for damage and rework if necessary.
- Coat outer circumference and sealing lip of oil seal thinly with Vaseline.
- Fit oil seal on thrust piece 3325 so that sealing lip -arrow- faces towards thrust piece.
- Drive in oil seal up to stop of press piece using thrust piece 3325.

5 - Gear oil in transfer gearbox

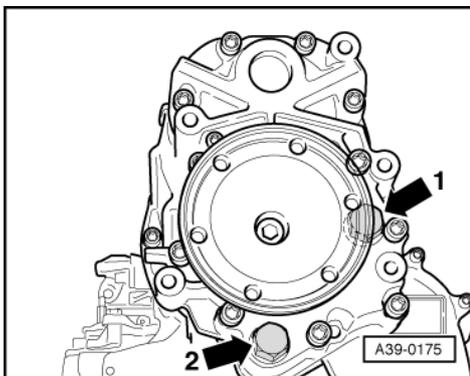
5.1 - Gear oil in transfer gearbox

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Notes:

- ◆ The gear oil in the transfer gearbox has additives mixed in at the factory which are not available for after-sales service. The gear oil should therefore only be drained if it is absolutely necessary for repairs.
- ◆ The service life of the transfer gearbox is not affected if filled with regular gear oil available for after-sales service.

5.2 - Checking oil level in transfer gearbox



- -> Remove oil filler plug -arrow 1-.
- Specification: oil level up to lower edge of oil filler hole.
- Top up gear oil if necessary.
Specification => Page 4 .
- Always renew seal for oil filler plug.

- Insert oil filler plug.

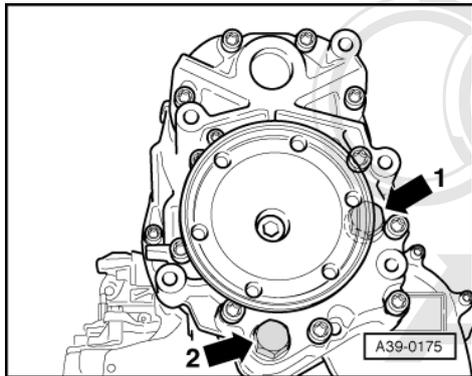
Tightening torque

Component		Nm
Oil filler plug	M16	30

5.3 - Changing gear oil in transfer gearbox(or filling up after repairing)

Draining gear oil

- Place drip tray underneath.



- -> Remove oil drain plug, arrow 2, and drain gear oil.
- Always renew seal for oil drain plug.
- Install oil drain plug.

Tightening torque

Component		Nm
Oil drain plug	M18	40

Filling with gear oil

A - Transfer gearbox was not removed (e.g. after removing and installing flange shaft)

- Remove oil filler plug.
- Fill with gear oil up to lower edge of oil filler hole. Specification and quantity => Page 4 .
- Always fit a new seal on oil filler plug.
- Screw in oil filler plug.
- Depending on engine version, cross member below exhaust system and front exhaust pipe must be installed for test drive, removed again for subsequent check of oil level and then reinstalled afterwards.
- Carry out road test (vehicle should be driven for 15 minutes).

Note:

During the road test oil flows into the output cup and the Torsen differential, causing the oil level in the transfer gear housing to drop.

- Check oil level in transfer gearbox => Page 136 .

B - Transfer gearbox was removed and dismantled

- Fill 200 ml gear oil into output cup.
- Assemble transfer gearbox and install => Page 151 .
- Unscrew oil filler plug.
- Fill transfer gearbox with 820 ml of gear oil.



- Always fit a new seal on oil filler plug.
- Screw in oil filler plug.

Note:

It is not necessary to check the oil level at this stage.

Tightening torque

Component		Nm
Oil filler plug	M16	30

6 - Servicing transfer gearbox and rear intermediate drive

6.1 - Servicing transfer gearbox and rear intermediate drive

Warning!

Do not run engine when transfer gearbox has been taken off or when there is not gear oil in transfer gearbox, and do not tow vehicle.

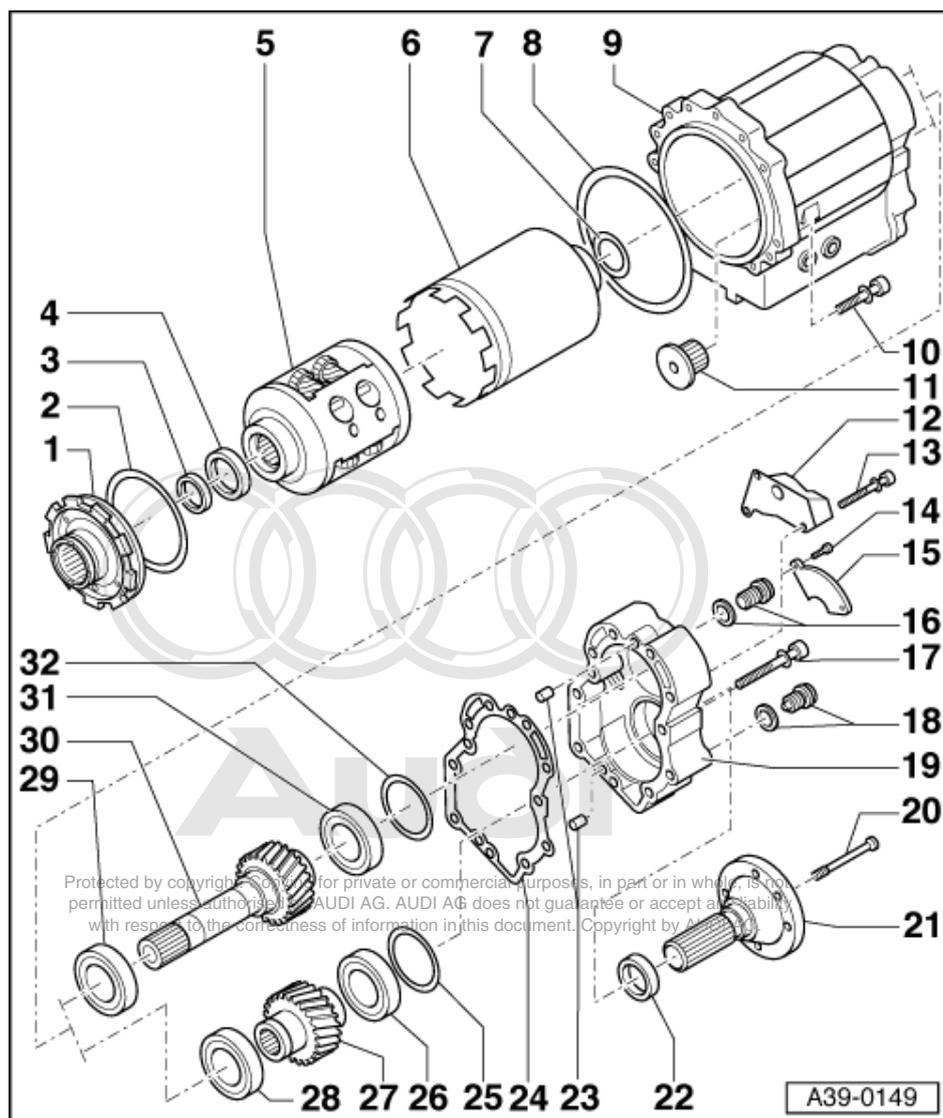
Notes:

- ◆ General repair instructions => Page 5 .
- ◆ Ratios => from Page 2 .
- ◆ The gear oil in the transfer gearbox has additives mixed in at the factory which are not available for normal after-sales service. The gear oil should therefore only be drained if it is absolutely necessary for repairs. If it is required to fill or top up the transfer gearbox => capacities, Page 4 .
- ◆ Do not pull off bearing inner races and bearing cages that have been pressed onto the spur gears. Do not pull out bearing outer races that have been pressed into the housing.
- ◆ Do not interchange the position of the spur gears or their bearings and shims, as the bearings and shims are set to each other and are run-in.

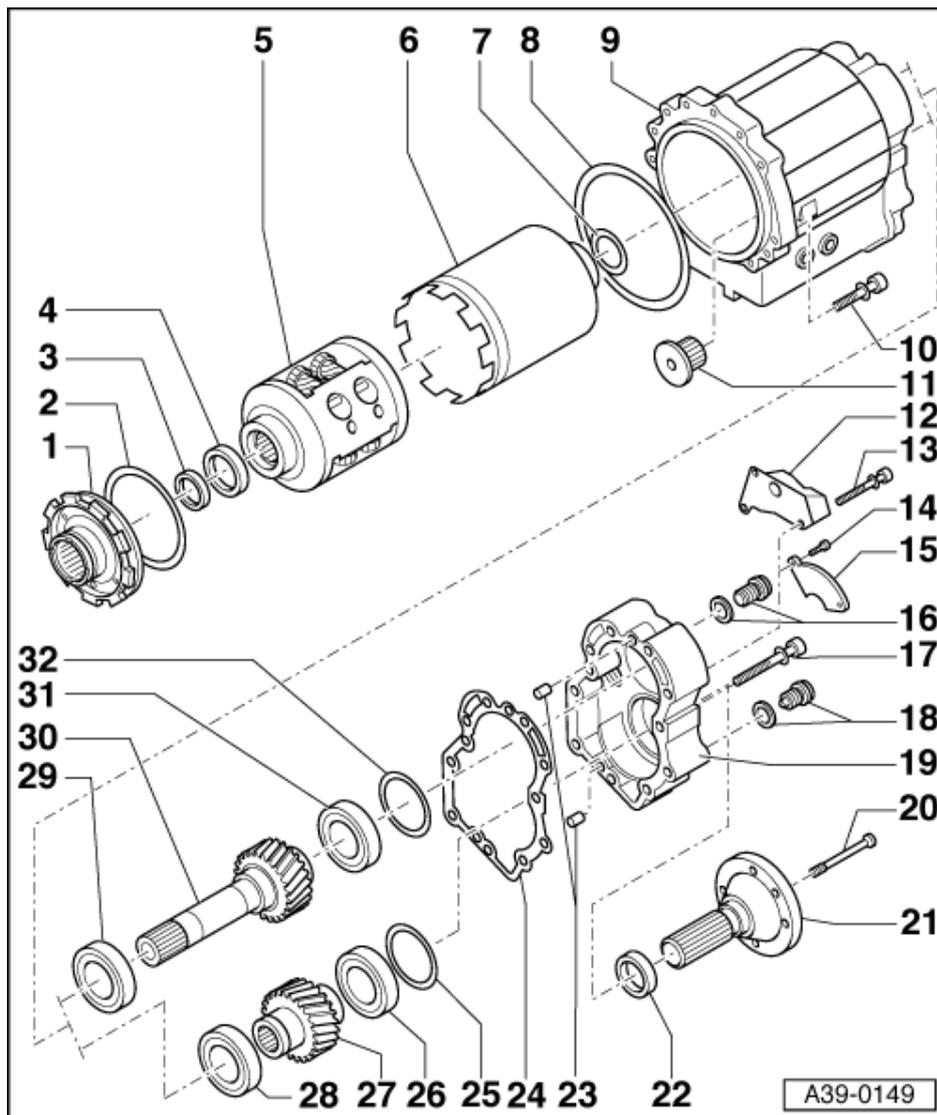


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- 2 O-ring**
 - ◆ Always renew => Page 149
- 3 Seal**
 - ◆ For ATF side
 - ◆ Renewing => Page 153
- 4 Seal**
 - ◆ Renewing => Page 153
- 5 Torsen differential**
 - ◆ Removing and installing
=>Page 149
- 6 Output cup**
 - ◆ Removing and installing
=>Page 149
- 7 Thrust washer**
 - ◆ Adjusting => Page 158



8 O-ring

- ◆ Always renew => Page 149

9 Housing for transfer gearbox

- ◆ Do not renew individually
- ◆ Removing and installing =>Page 149

10 Bolt - 23 Nm

- ◆ Qty. 13
- ◆ For securing -Item 9 - to front intermediate drive

11 Clamping nut

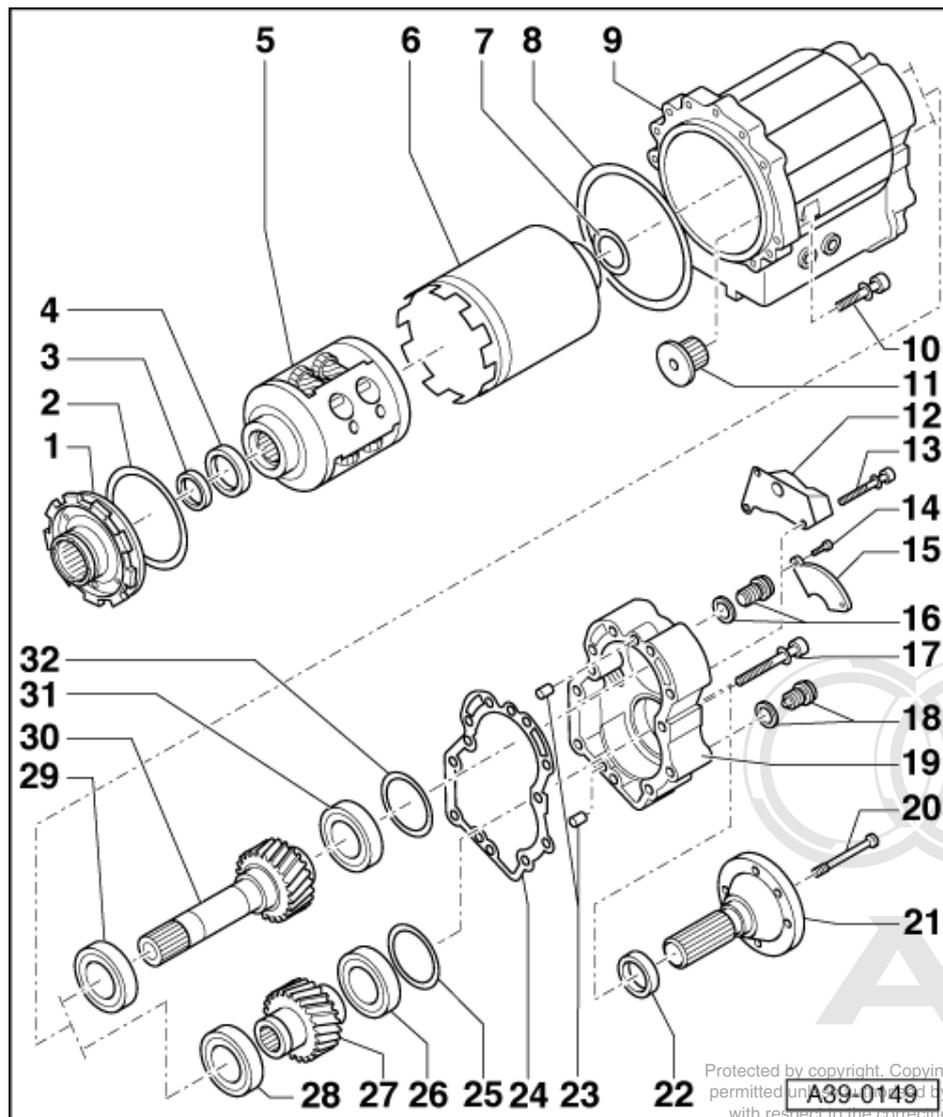
- ◆ For securing flange shaft -Item 21 -

12 Vibration damper

- ◆ Removing and installing =>Page 145



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13 15 Nm + 1/4 turn (90 °) further

- ◆ Qty. 3
- ◆ For securing -Item 12- to -Item 19 -

14 Bolt - 5 Nm

- ◆ Qty. 2
- ◆ For securing -Item 15 - to -Item 19 -

15 Cover plate

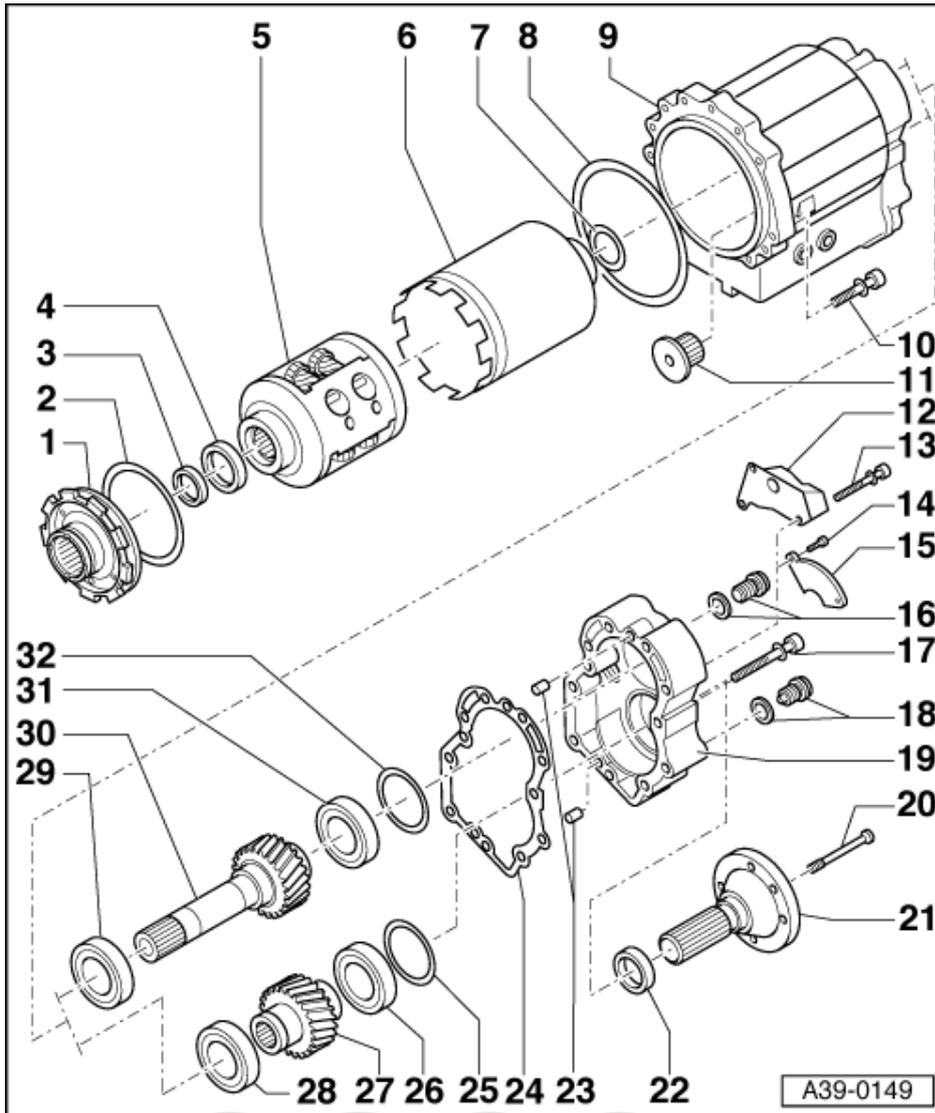
- ◆ Sealing => Page 148

16 Oil filler plug - 30 Nm

- ◆ With seal

17 Bolt - 25 Nm

- ◆ Qty. 12
- ◆ For securing -Item 19 - to -Item 9 -



18 Oil drain plug - 40 Nm

- ◆ With seal

19 Housing end cover

- ◆ Do not renew individually
- ◆ Removing and installing
=>Page 155

20 Bolt - 25 Nm

- ◆ For securing -Item 21 - to
-Item 11 -

21 Flange shaft

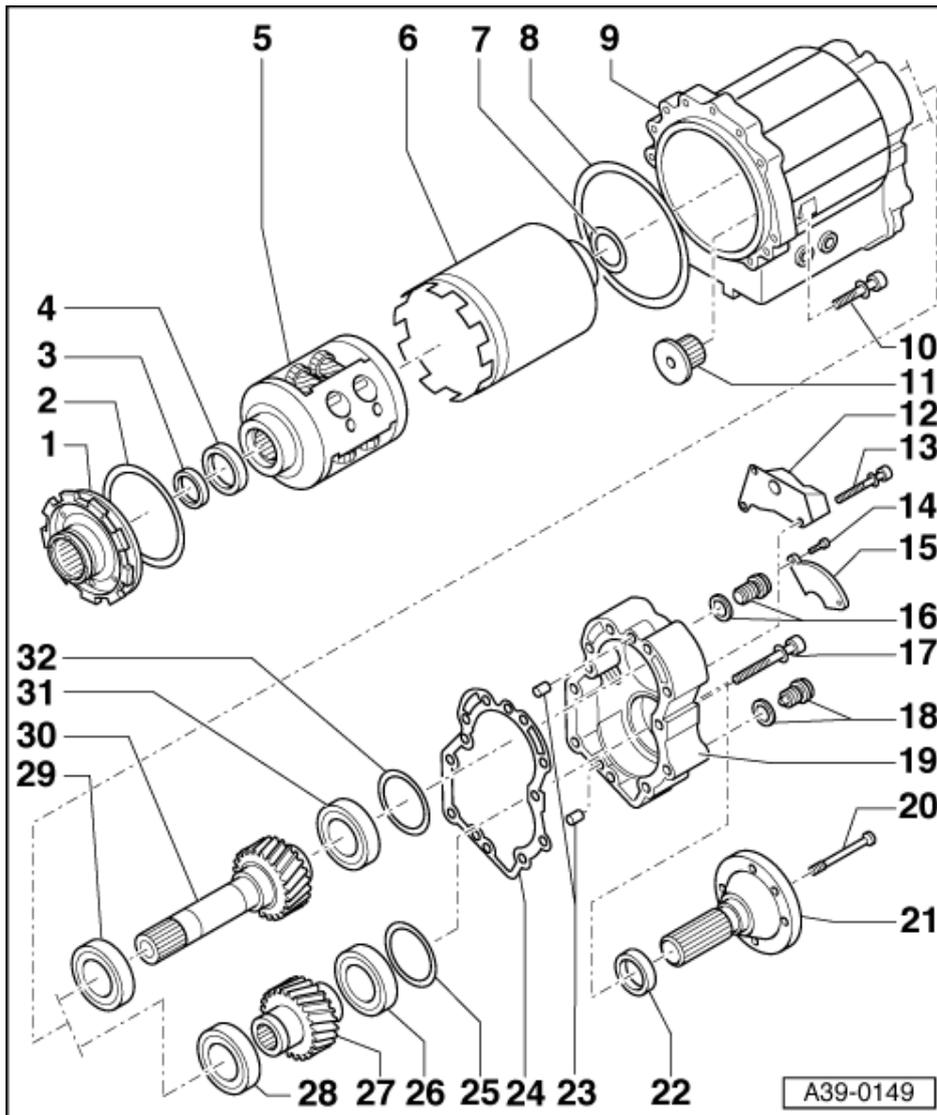
- ◆ Removing and installing
=>Page 146

22 Seal

- ◆ Renewing => Page 146
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23 Dowel pin

- ◆ Qty. 2
- ◆ For locating -Item 19 -



24 Gasket

- ◆ Renewing =>Page 155

25 Shim

- ◆ Behind bearing race
- ◆ Bearing preload
- ◆ Is determined by measurement and cannot be exchanged for another shim at will

26 Taper roller bearing

- ◆ Do not change allocation

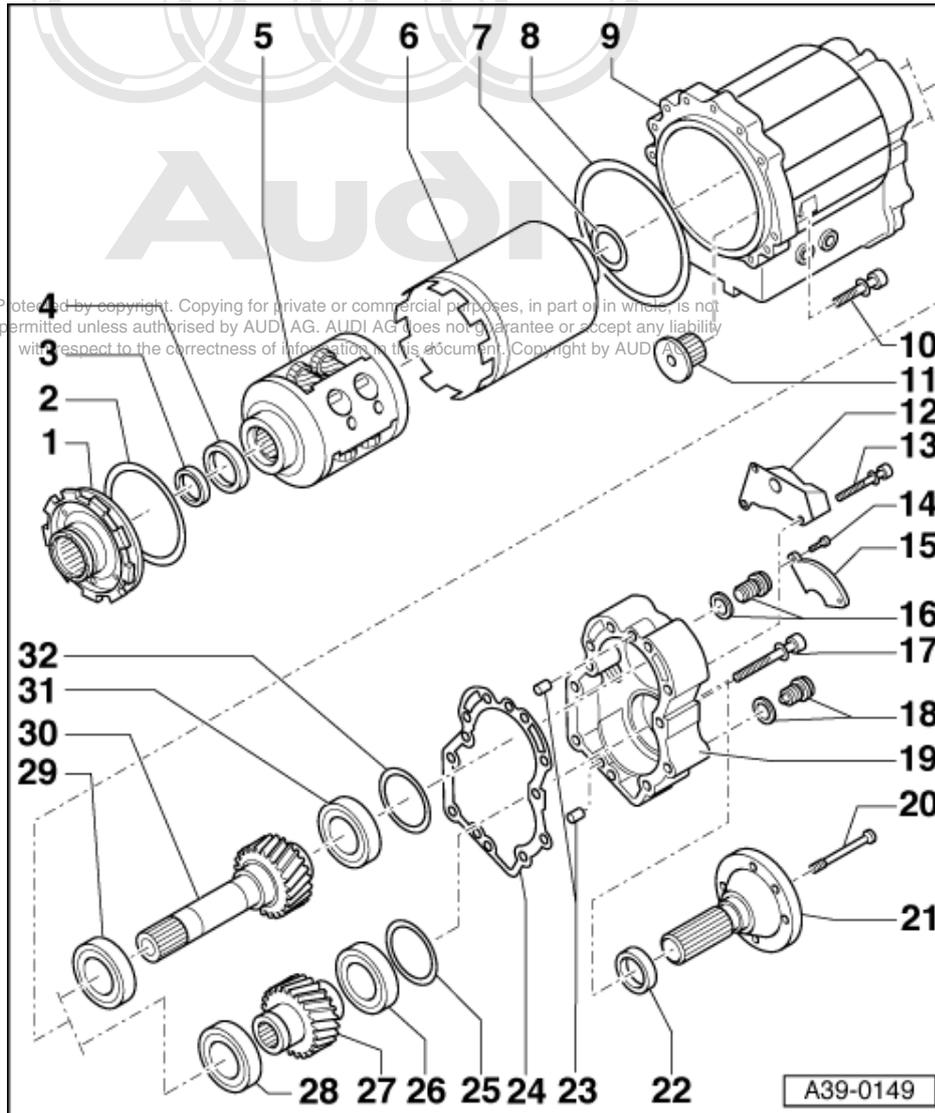
27 Output gear

- ◆ Do not renew individually
- ◆ Removing and installing
=>Page 157

28 Taper roller bearing

- ◆ Do not change allocation

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29 Taper roller bearing

- ◆ Do not change allocation

30 Drive gear with rear axle shaft

- ◆ Do not renew individually
- ◆ Removing and installing =>Page 157

31 Taper roller bearing

- ◆ Do not change allocation

32 Shim

- ◆ Behind bearing race
- ◆ Bearing preload
- ◆ Is determined by measurement and cannot be exchanged for another shim at will

6.2 - Removing and installing vibration damper on transfer gearbox

Removing

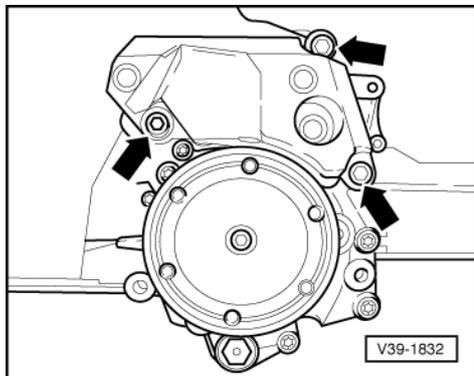
- Remove front exhaust pipes (left and right) with catalytic converter



=> 6-Cylinder engine, Mechanics; Repair group 26; Removing and installing parts of exhaust system Removing and installing parts of exhaust system

- Remove propshaft heat shield from housing end cover
=> Page 168 .
- Unbolt propshaft from gearbox flange and tie up on constant velocity joint => from Page 163 .

Note:



Do not bend propshaft more than 25°, otherwise the universal joint could be damaged.

- -> Unbolt securing bolts of vibration damper -arrows- and pull vibration damper off to rear.

Note:

Vibration damper is additionally located by a dowel pin.

Installing

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

Notes:

- ♦ The vibration damper must lie flush on contact surface.
- ♦ Always renew self-locking bolts.
- ♦ Tighten the securing bolts of the vibration damper evenly.

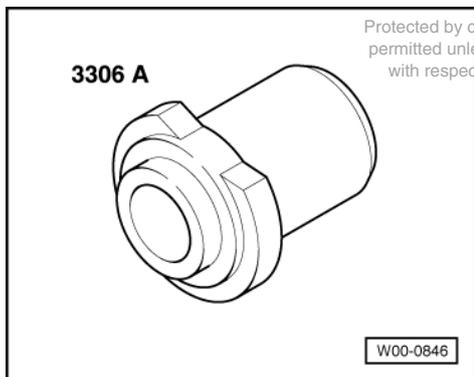
- Bolt on propshaft => Page 169 .

Tightening torques

Component		Nm
Vibration damper to gearbox	M8	15 + 90° 1)
Propshaft to gearbox	M8	55
Heat shield for propshaft to gearbox	M8	23

1) 90° is the same as a quarter turn

6.3 - Renewing oil seal for rear flange shaft



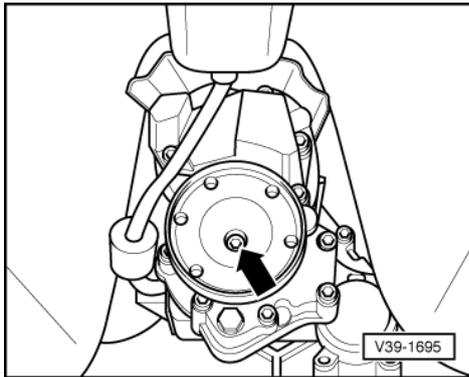
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Special tools and workshop equipment required

- ◆ Special tool 3306 A

Removing

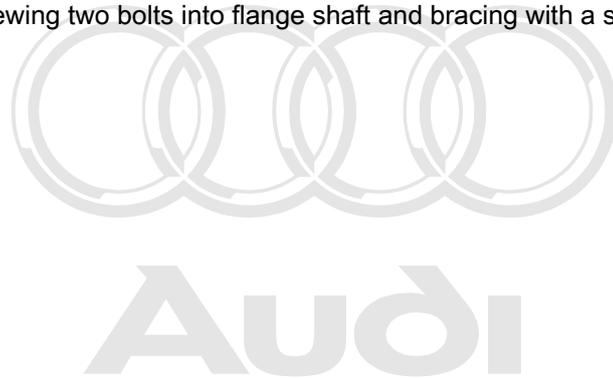
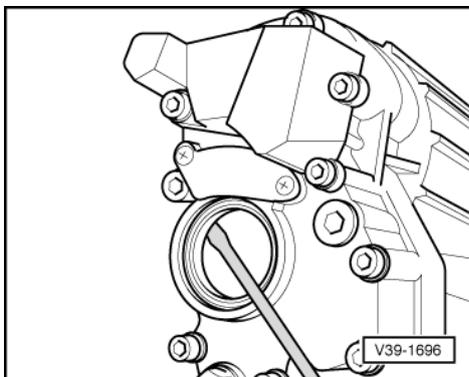
- Remove left and right exhaust pipes with catalytic converter and intermediate pipe.
- Remove propshaft heat shield from housing end cover
=> Page 168 .
- Unbolt bolts securing propshaft to flange shaft of rear final drive, and tie up propshaft.



Note:

Do not bend propshaft more than 25°, otherwise the universal joint could be damaged.

- -> Remove securing bolt -arrow- by screwing two bolts into flange shaft and bracing with a suitable lever.
- Pull flange shaft off to rear.



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- -> Lever oil seal out with a suitable screwdriver.

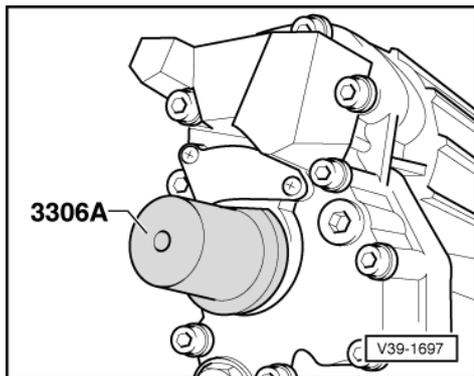
Installing

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

- Check oil seal seat and housing surface in area of oil seal seat for damage and rework if necessary.
- Coat outer circumference and sealing lip of oil seal thinly with Vaseline.
- Slide oil seal onto thrust piece 3306 A so that sealing lip faces towards gearbox.

Note:

Make sure oil seal is fitted evenly and straight.



- -> Drive in oil seal up to stop of thrust piece using thrust piece 3306 A.
- Bolt on propshaft => Page 169 .



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Tightening torques

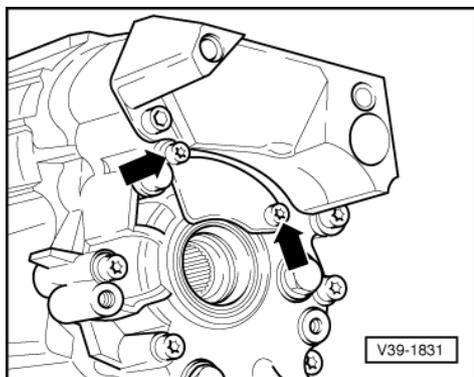
Component		Nm
Rear flange shaft to gearbox		25
Propshaft to gearbox	M8	55
Heat shield for propshaft to gearbox	M8	23

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6.4 - Sealing cover plate of transfer gearbox

Removing

- Remove rear flange shaft => Page 146 .
- Check rear flange shaft and oil seal for damage and renew if necessary => Page 146 .



- -> Remove both bolts -arrows- and take off cover plate.

Installing

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

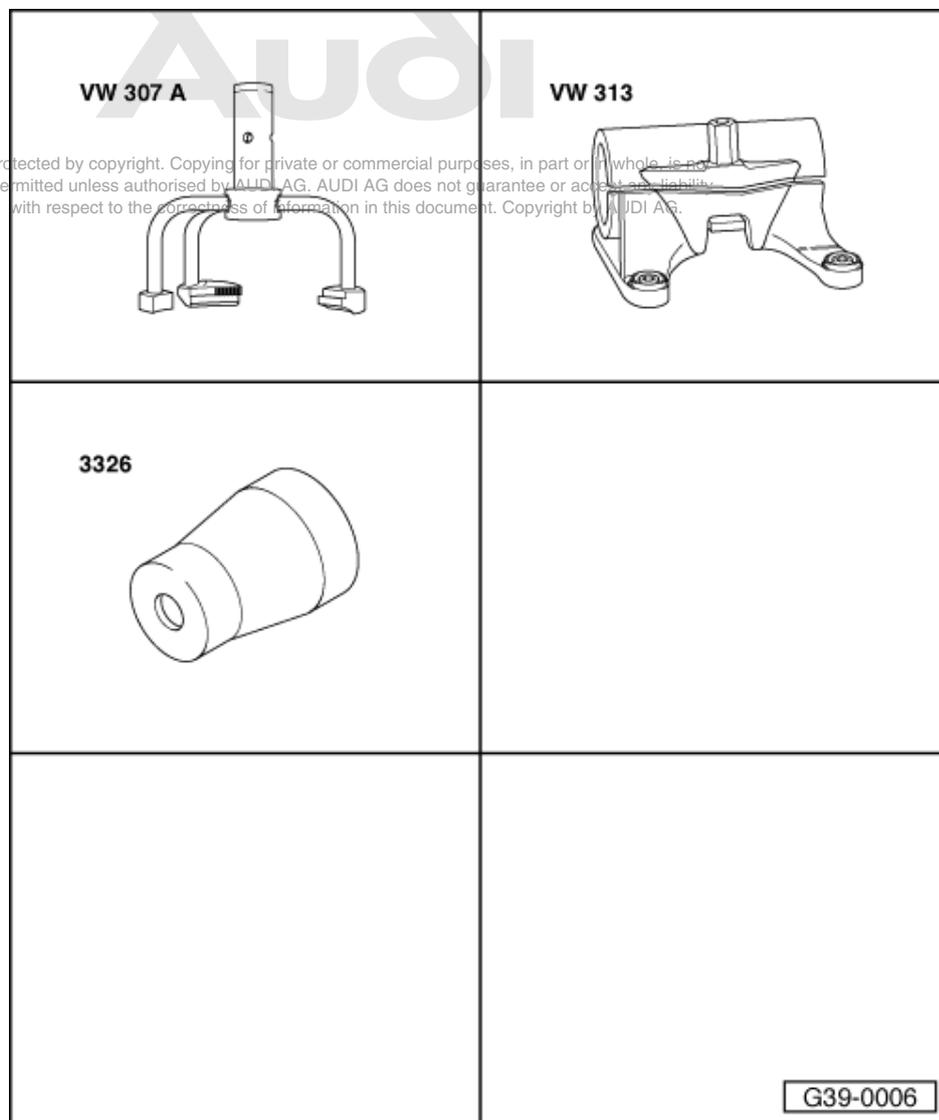
- Clean sealing surfaces and coat on one side with sealing compound D 454 300 A2.
- Fit bolts with locking compound D 185 400 A2.

Tightening torques

Component		Nm
Rear flange shaft to gearbox		25

Component	Nm
Cover plate to gearbox end cover	5

6.5 - Removing and installing transfer gearbox

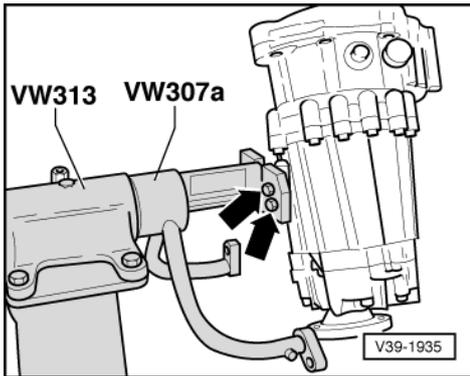


Special tools and workshop equipment required

- ◆ Special tool VW 307 A
- ◆ Support clamp VW 313
- ◆ Special tool 3326

Removing

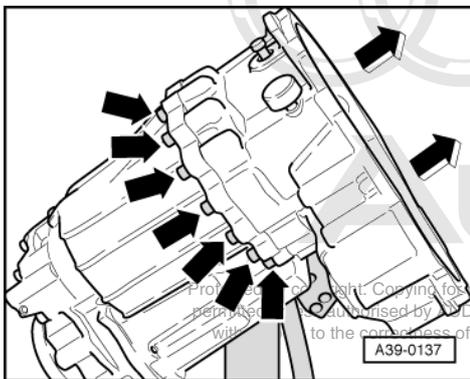
- Remove front intermediate drive => Page 121 .
- Dismantle front intermediate drive => Page 130 .



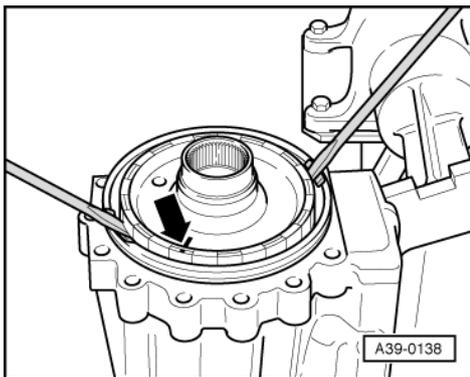
- -> Bolt transfer gearbox to bracket VW 307a using two M8 bolts -arrows-.

Notes:

- ♦ Always hold down the rear end of the transfer gearbox, as otherwise gear oil will run out.
- ♦ The gear oil in the transfer gearbox has additives mixed in at the factory which are not available for normal after-sales service.



- -> Remove securing bolts -left-hand arrows- of housing for front intermediate drive/transfer gearbox.
 - Pull off housing for front intermediate drive evenly -right-hand arrows-.

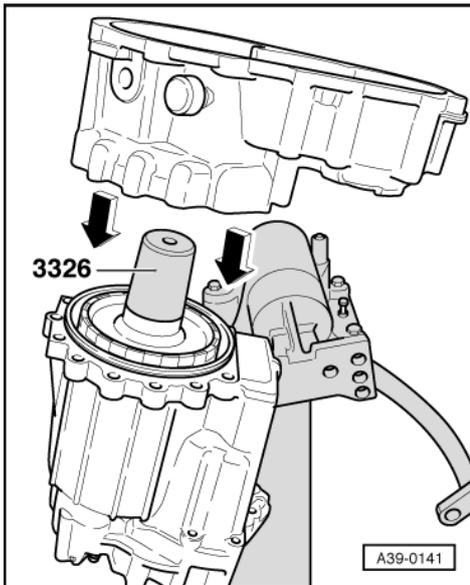


- -> Mark position of hub relative to output cup -arrow-.

Note:

The position of the hub to the output cup must not be changed, as both have run in with each other.

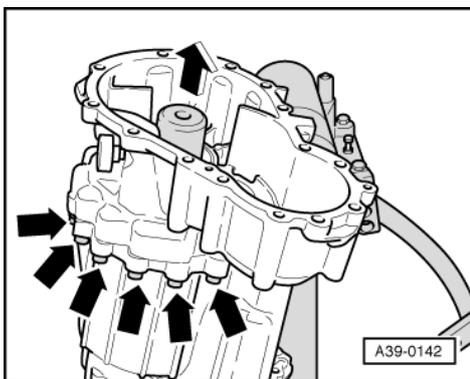
- Lift hub upwards using two large screwdrivers, protecting housing sealing surface against damage when doing so.



- Insert O-ring (=> -Item 141) into groove on flange of transfer gearbox with Vaseline.
- -> Fit guide sleeve 3326 onto hub.
- Fit housing for intermediate drive onto transfer gearbox.

Note:

The guide sleeve 3326 is required to protect the two oil seals in the housing for the intermediate drive from being damaged.



- -> Screw securing bolts -lower arrows- for housing for intermediate drive into transfer gearbox by hand and tighten to final torque using diagonal sequence.
- Pull guide sleeve 3326 off upwards.

Tightening torque

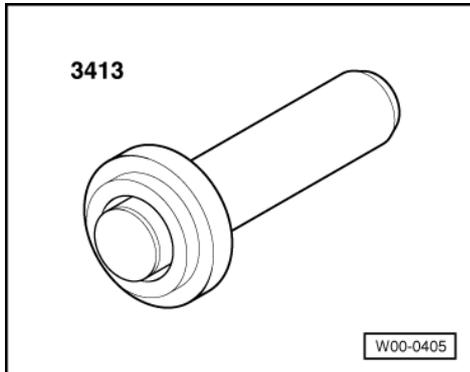
Component		Nm
Intermediate drive to transfer gearbox	M8	23



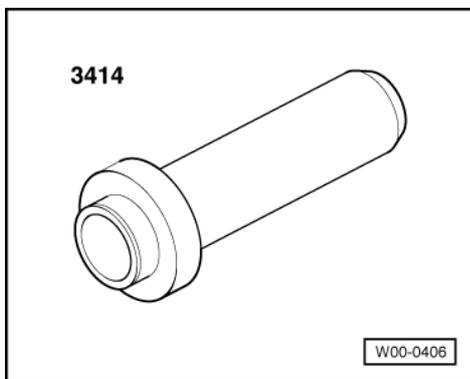
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6.6 - Renewing oil seals in transfer gearbox

Special tools and workshop equipment required

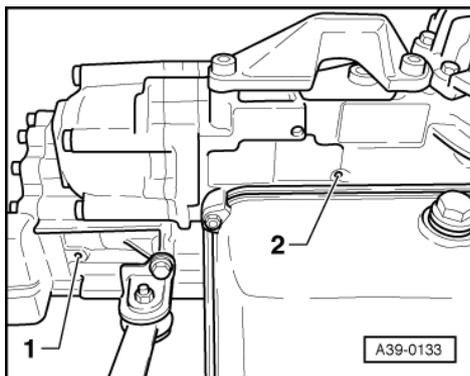


- ◆ Special tool 3413



- ◆ Special tool 3414

Note:



- ◆ -> At the bottom on the housing of the intermediate drive there is an oil-leak inspection hole -1- for the four oil seals that separate the gear oil side from the ATF side.
- ◆ If oil leaks out of the oil-leak inspection hole, both oil seals in the front intermediate drive and both oil seals in the transfer gearbox must be renewed =>Page 134 .

Removing

- Remove front intermediate drive => Page 121 .

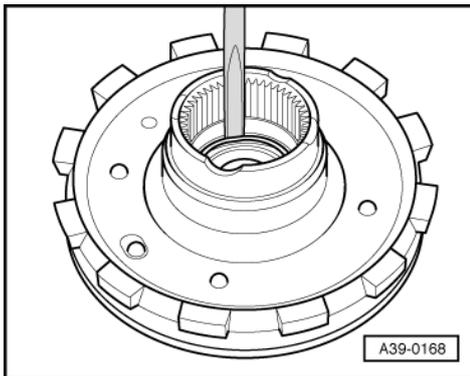


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- Dismantle front intermediate drive => Page 130 .



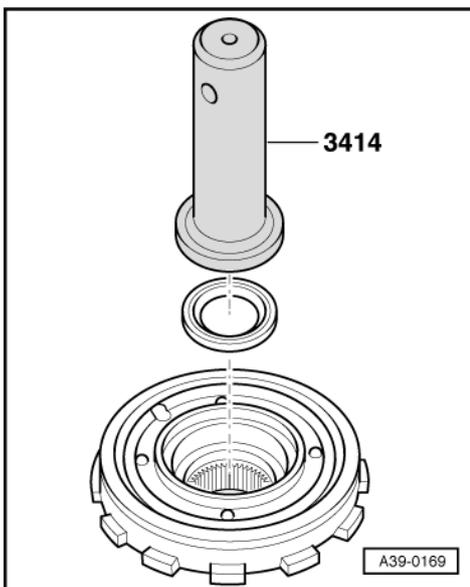
- Remove hub
=> Removing transfer gearbox, Page 149 .
- -> Place screwdriver behind sealing lip and drive out both oil seals uniformly towards the bottom.

Installing

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

Installing oil seal for ATF side:

- Check oil seal seat and contact surfaces of thrust piece for damage and rework if necessary.
- Coat outer circumference and sealing lip of oil seal thinly with Vaseline.



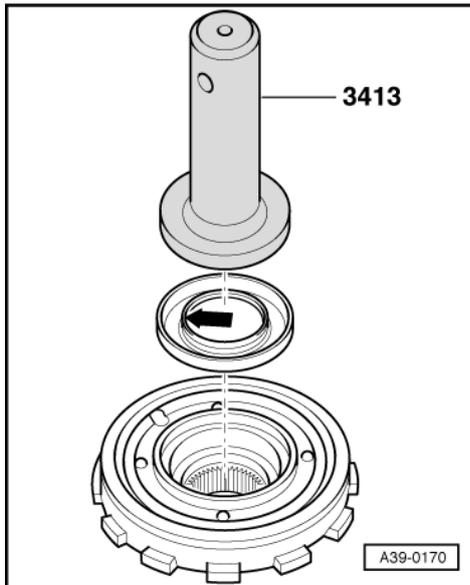
- -> Fit oil seal on thrust piece 3414 so that sealing lip faces towards hub.
- Drive in oil seal up to stop of thrust piece using thrust piece 3414.

Installing oil seal for gear oil side:

- Check oil seal seat and contact surfaces of thrust piece for damage and rework if necessary.
- Coat outer circumference and sealing lip of oil seal thinly with Vaseline.



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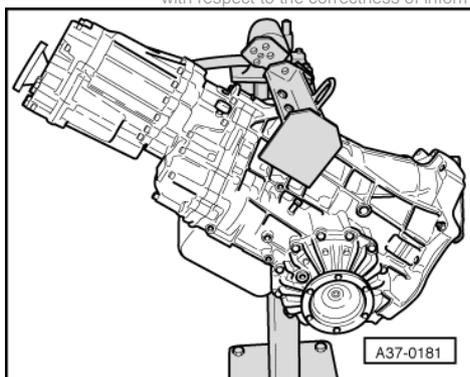


- -> Fit oil seal on thrust piece 3413 so that sealing lip -arrow- faces towards thrust piece.
- Drive in oil seal up to stop of thrust piece using thrust piece 3413.

6.7 - Renewing gasket for housing end cover for rear intermediate drive

Notes:

- ◆ This work can be performed with the gearbox installed by detaching the propshaft from the gearbox and draining the gear oil from the transfer gearbox.
 - ◆ This work can also be performed with the transfer gearbox removed (complete with front intermediate drive and rear intermediate drive). Bolt the transfer gearbox to bracket VW 307 A with two M8 bolts => Page 131 and drain gear oil.
 - ◆ For clarity the following work sequence illustrations show a complete gearbox that has been removed. The gear oil need not be drained to do this.
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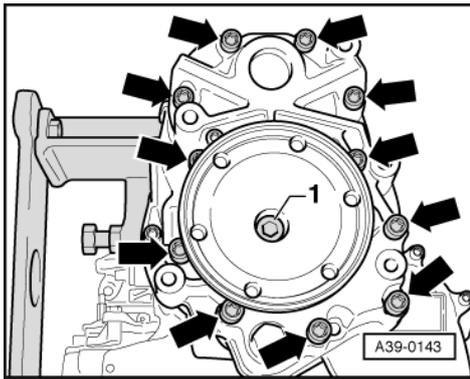


Removing

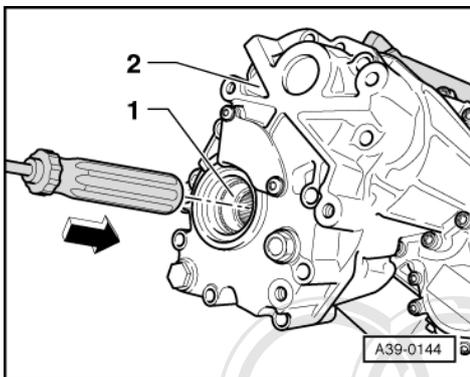
- Secure gearbox to repair stand => Page 46 .
- -> Turn rear of gearbox approx. 45° upwards.

Note:

Always hold the rear of the transfer gearbox up, as otherwise oil will run out.



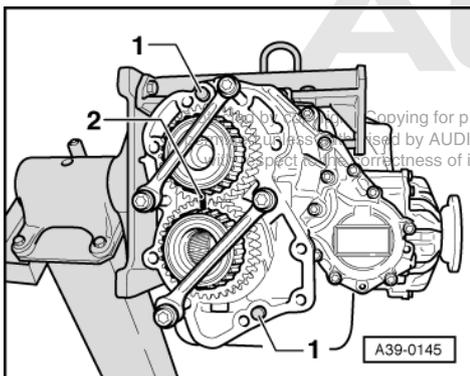
- -> Remove securing bolt -1- by screwing two bolts into flange shaft and bracing with a suitable lever.
- Pull flange shaft off to rear.
- Remove securing bolts -arrows- of housing end cover.



- -> Press lower spur gear -1- with blunt end of wooden or plastic rod (e.g. screwdriver handle) in direction of arrow towards transfer gearbox and pull off housing end cover -2- evenly towards rear.

Note:

The spur gears must be held continuously in their bearing seats (towards the transfer gearbox). Otherwise the clamping nut (=> -Item 149) to enable the clamping nut to be reinserted in the lower spur gear.



- -> Secure both spur gears against falling out. The illustration shows one of the possibilities for securing the spur gears.

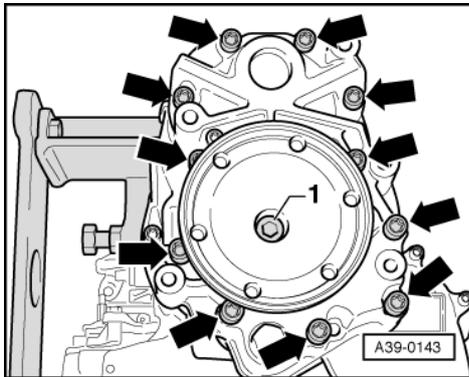
Installing

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

Notes:

- ◆ The position of the spur gears, their bearings and shims must not be interchanged.

- ◆ Damaged spur gears may not be reinstalled. In this case, renew the entire intermediate drive.
- Coat new gaskets thinly with Vaseline, place on sealing seat surface of housing and secure.
- Before assembling intermediate drive, ensure dowel pins -1- are seated properly.



- -> Pull housings together evenly with securing bolts -arrows- and tighten bolts to final tightening torque using diagonal sequence.
- Check oil seal for rear flange shaft and renew if necessary => Page 146 .
- Check oil level in transfer gearbox => Page 136 .
- Renew gasket between propshaft and gearbox flange by pulling off protective foil and sticking onto gearbox flange. Replenish grease for constant velocity joint if necessary.

Tightening torques

Component		Nm
Rear flange shaft to gearbox		25
Housing end cover to housing for transfer gearbox	M8	25
Propshaft to gearbox	M8	55
Heat shield for propshaft to gearbox	M8	23

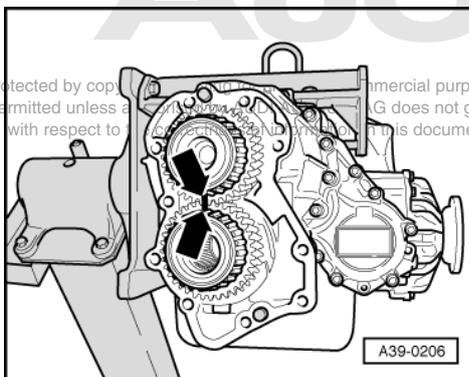
6.8 - Dismantling rear intermediate drive

Notes:

- ◆ The position of the spur gears, their bearings and shims must not be interchanged.
- ◆ Do not take the bearing outer races and shims out of the housing.
- ◆ Do not pull the bearing inner races off the spur gears.

Removing

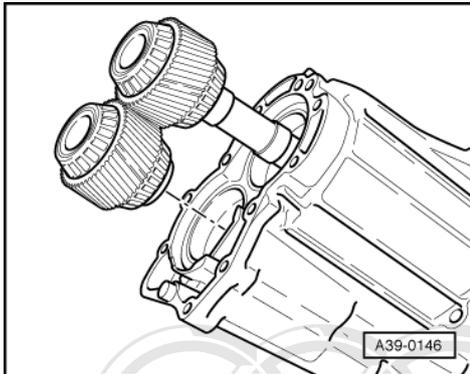
- Remove front intermediate drive => Page 121 .
- Dismantle front intermediate drive => Page 130 .
- Remove transfer gearbox => Page 149 .



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- Remove housing end cover for rear intermediate drive
=> Page 155 .
- -> Mark both spur gears of the rear intermediate drive -arrows-.



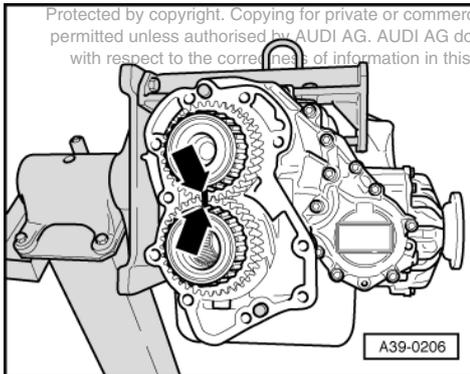
- -> Take out both spur gears (with thrust washer for output cup if necessary).

Note:

The thrust washer for the output cup must not be exchanged for another, as its thickness will influence the axial clearance of the Torsen differential =>Checking axial clearance of Torsen differential and adjusting, Page 158 .

Installing

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



- Check sealing surfaces of the housing for damage.
- -> Insert spur gears so that marking -arrows- is visible.

Note:

Damaged spur gears may not be reinstalled. In this case, renew the entire intermediate drive.

6.9 - Checking axial clearance of Torsen differential and adjusting

Note:

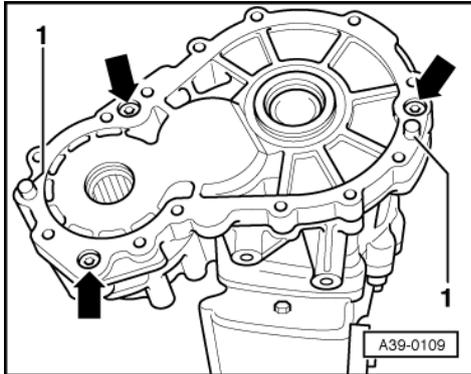
The Torsen differential axial clearance must be checked and readjusted if necessary when the front intermediate drive, the Torsen differential, the rear intermediate drive or parts of these assemblies (e.g. housing, bearings, gears, shims) are renewed.

Special tools and workshop equipment required

- ◆ Depth gauge (with digital display and at least a 220 mm wide contact surface if possible).

- ◆ Micrometer (measuring range: 0 - 25 mm)

Checking axial clearance of Torsen differential

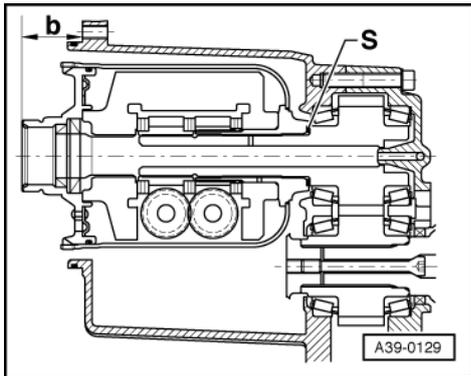


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- Remove front intermediate drive => Page 121 .
- Dismantle front intermediate drive => Page 130 .
- Unbolt transfer gearbox from front intermediate drive => Page 149 .
- Insert input gear (=> -Item 119) with bearing into housing of front intermediate drive.
- -> Fit intermediate flange (=> -Item 114) with prescribed tightening torque to housing of front intermediate drive.

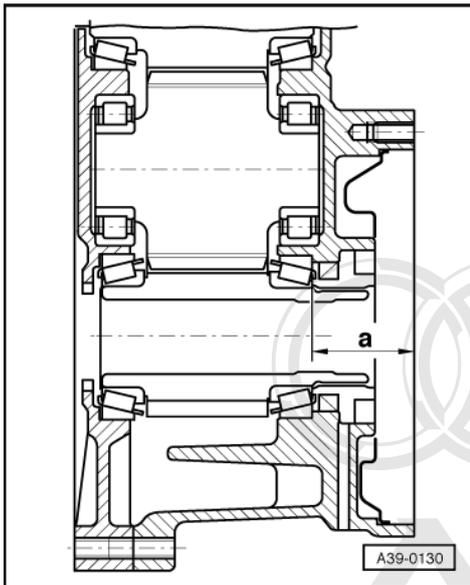
Note:

The transfer gearbox must be separated from the front intermediate drive.



-> The axial clearance "c" of the Torsen differential is checked with the thrust washer "S" of the output cup installed.

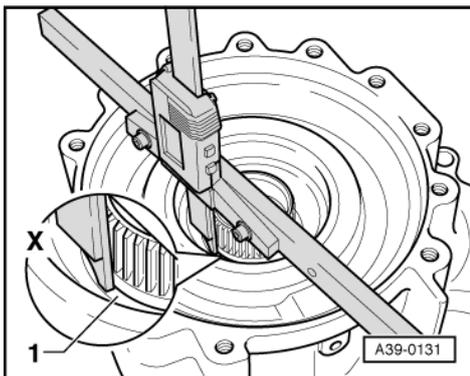
Formula:
 "c" = "a" - "b"
 a = measured value => Page 160
 b = measured value => Page 161



-> Determining dimension "a"

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- Check flange joint of intermediate drive to transfer gearbox for damage to provide a smooth contact surface for depth gauge.



- -> Place tip of depth gauge onto bearing inner race -1- of input gear.
- Measure at 4 different points on the bearing race and note measured values.

Note:

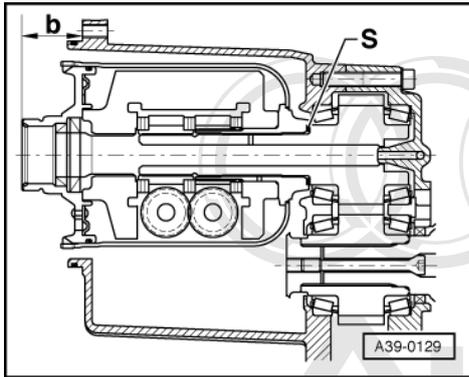
If the difference between the 4 measured values is more than 0.10 mm, the installation of the input pinion or the contact surface for the depth gauge on the housing is not in order. Rectify problem and repeat measurements.

- Add the four measured values together and divide by four.

Example:	
1st measured value	41.35 mm
+ 2nd measured value	41.32 mm
+ 3rd measured value	41.39 mm
+ 4th measured value	41.33 mm
= Sum of measured values	165.39 mm

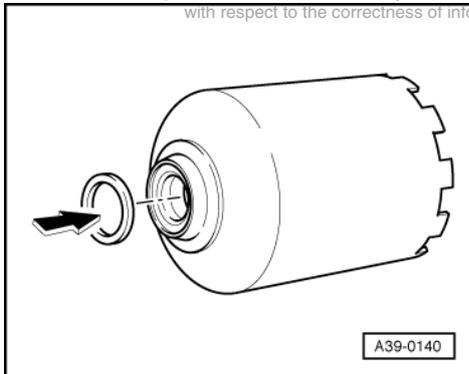
- Result: the average dimension "a" is

165.39 mm / 4 = 41.35 mm



-> Determining dimension "b"

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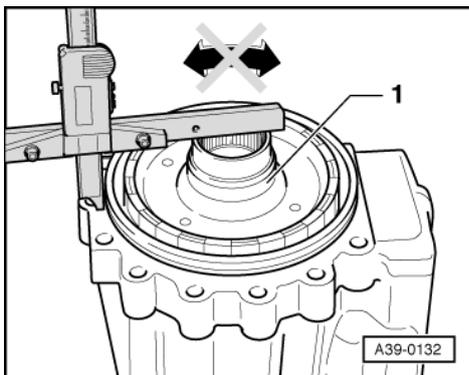


- -> Check seat of thrust washer "S" for output cup.
- Secure thrust washer on output cup with Vaseline and insert together up to stop on rear axle shaft.

Note:

The thrust washer can slip out of the cut-out in the output cup if not inserted carefully. This will alter the axial clearance of the Torsen differential.

- Place transfer gearbox on workbench so that hub is pointing exactly upwards.



- -> Check flange and hub -1- for damage to ensure a smooth contact surface for depth gauge.

Notes:

- ◆ Do not load the hub in the direction of the arrows when measuring, as otherwise the measurement will be falsified.
- ◆ Do not place the contact surface of the depth gauge in the recesses on the hub.



- Measure at 4 different points and note measured values.
- Add the four measured values together and divide by four.

Example:	
1st measured value	40.70 mm
+ 2nd measured value	40.80 mm
+ 3rd measured value	40.75 mm
+ 4th measured value	40.78 mm
= Sum of measured values	163.03 mm

- Result: the average dimension "b" is $163.03 \text{ mm} / 4 = 40.76 \text{ mm}$

Determining axial play "c" of Torsen differential

Formula:
"c" = average dimension "a" - average dimension "b"

Example:	
average dimension "a"	41.35 mm
- average dimension "b"	40.76 mm
= Value "c"	0.59 mm

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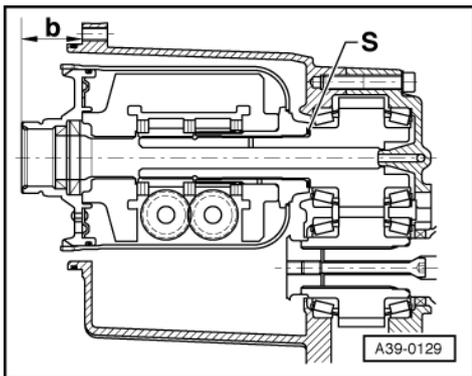
Axial clearance specification: 0.2 - 0.7 mm

- Result: in the example shown, the determined axial clearance for the Torsen differential (value "c") is, with thrust washer "S" installed, within the permissible tolerances.

If the determined axial clearance is outside the permissible tolerances, the axial clearance must be adjusted => page 162 .

If the determined axial clearance is within the permissible tolerances, install Torsen differential => page 163 .

Adjusting axial clearance for Torsen differential



-> The axial clearance for the Torsen differential is set with different thicknesses of thrust washer "S" of the output cup.

- Determine axial clearance "c" for Torsen differential => page 158 .
- Remove thrust washer "S".
- Measure thickness of previously removed thrust washer "S" using a micrometer and note thickness.

Note:

When readjusting the axial clearance "c", aim for a specification of 0.5 mm.

Determining thickness of new thrust washer "S"

Formula:	
Determined axial clearance "c" of Torsen differential	
- Specification for axial clearance "c"	
+ Thickness of previous thrust washer "S"	
= Thickness of new thrust washer "S"	

Example:	
Determined axial clearance "c" of Torsen differential	0.95 mm
- Specification for axial clearance "c"	0.50 mm
+ Thickness of previous thrust washer "S"	2.00 mm
= Thickness of new thrust washer "S"	2.45 mm

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- Determine thrust washer(s) from table. Part numbers

=> Parts catalogue

Note:

Select the relevant thrust washer that is closest to the thickness of the new thrust washer. Example: if 2.45 mm is determined, use a thrust washer with a thickness of 2.50 mm.

- Measure new thrust washer at several points on circumference with a micrometer.
- Install new thrust washer and check axial clearance of Torsen differential => Page 158 .

Installing

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

- Assemble front intermediate drive => Page 132 .
- Install transfer gearbox =>Page 151 .
- Install front intermediate drive => Page 129 .

7 - Servicing propshaft

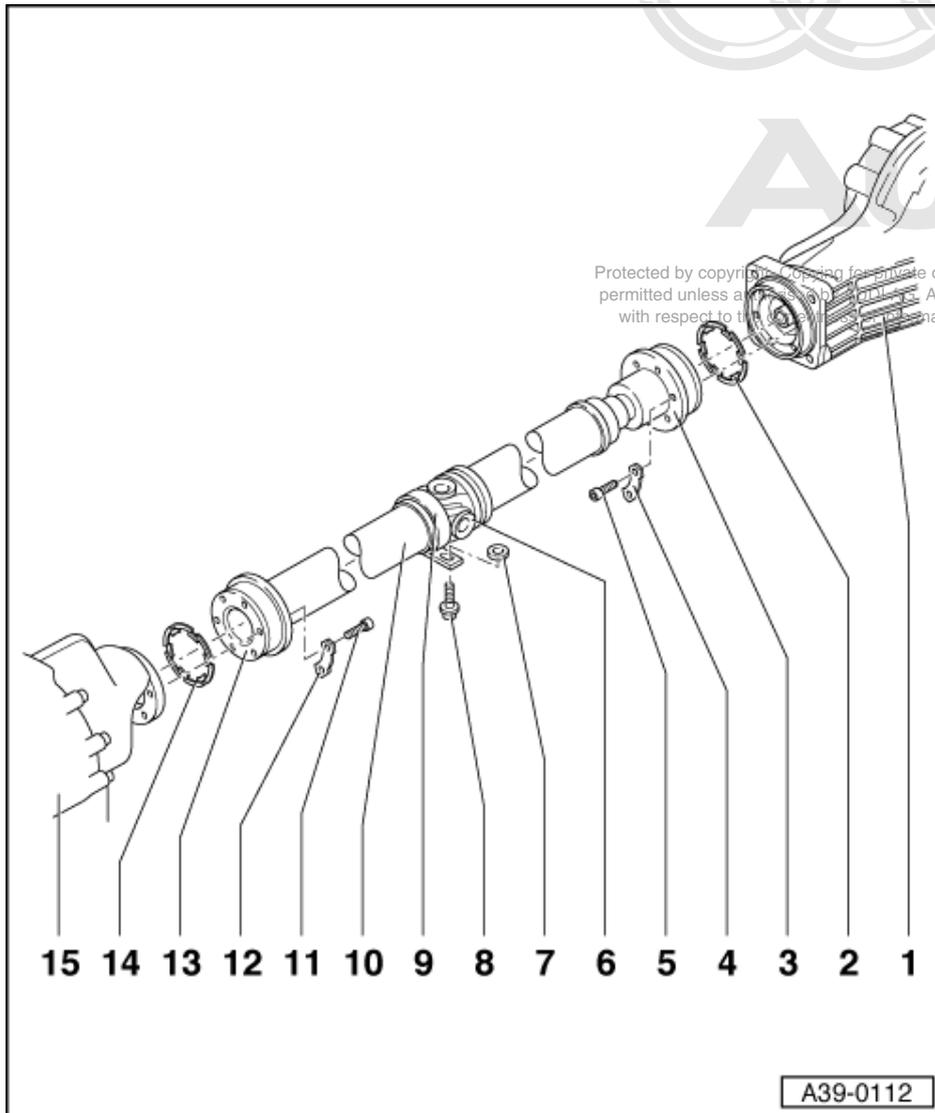
7.1 - Servicing propshaft

Notes:

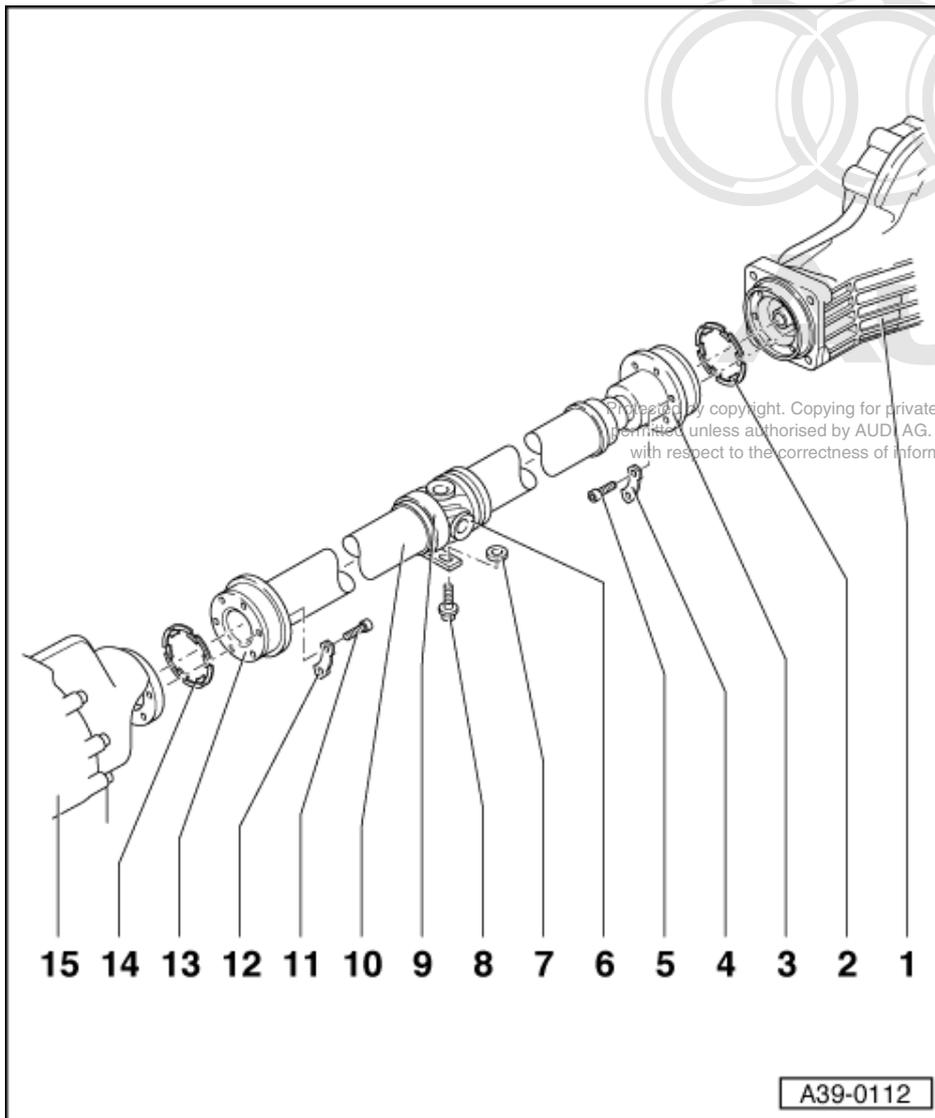
- ◆ Observe General instructions =>Page 5 .
- ◆ Do not bend the propshaft more than 25 ° at the central joint, otherwise the universal joint will be damaged.
- ◆ Only store and transport propshaft extended.
- ◆ No repair work can be carried out on the propshaft with the exception of removing, installing 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 173

8 Hexagon bolt - 23 Nm

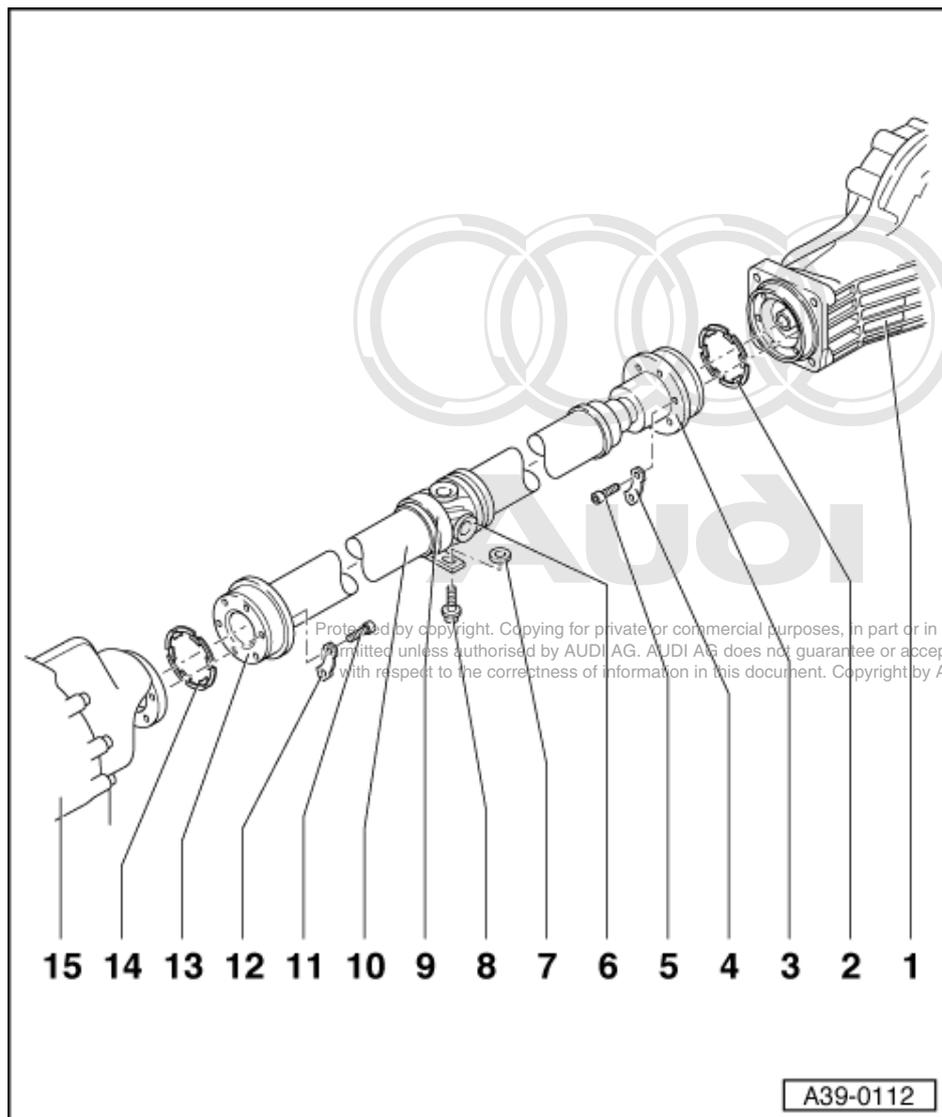
9 Propshaft centre mounting

10 Propshaft

- ◆ Adjusting => Page 171

11 Hexagon socket head bolt - 55Nm

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



12 Lock plate

13 Constant velocity joint

- ◆ Maximum permissible angle of deflection 8°

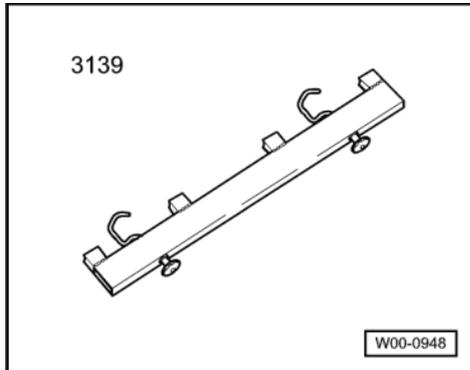
14 Gasket

- ◆ 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.

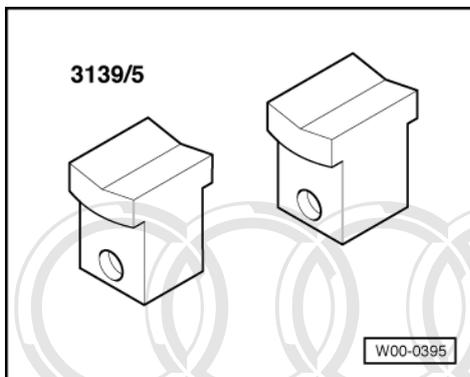
15 Gearbox

7.2 - Removing and installing propshaft

Special tools and workshop equipment required



- ◆ Assembly device 3139 with spacers 3139/3

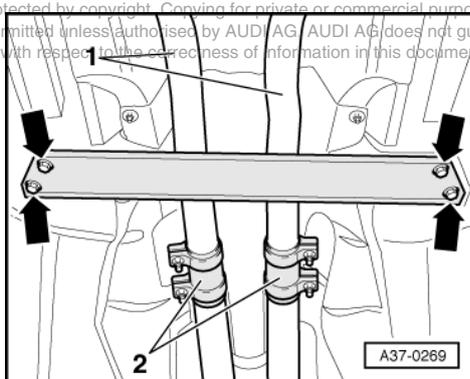


- ◆ Spacers 3139/5

Caution
Contact corrosion. Notes => Page 5 .

- Observe notes => Page 163 .

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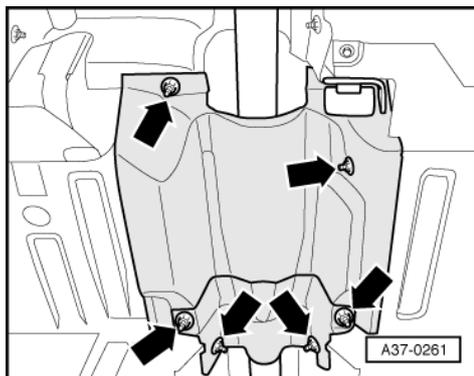


Removing

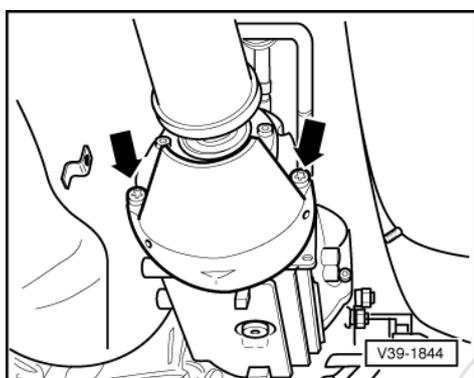
- -> If fitted, remove cross member below exhaust system -arrows-.
- Loosen clamps -2-.



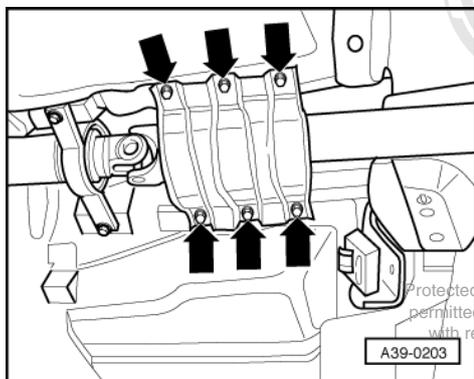
- Disengage rear section of exhaust system -1- and remove.



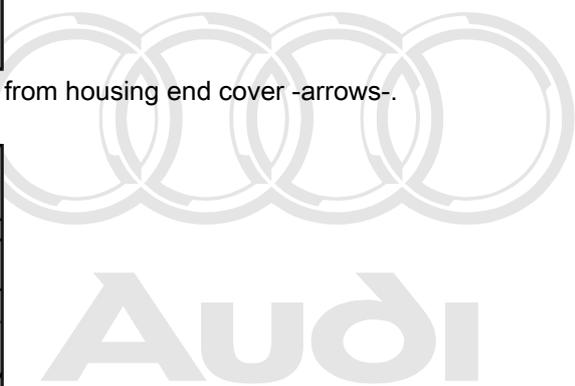
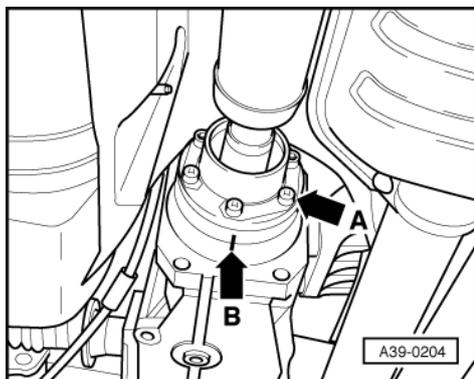
- -> Remove heat shields above propshaft -arrows-.



- -> Remove heat shield for propshaft from housing end cover -arrows-.



- -> Remove tunnel support -arrows-.



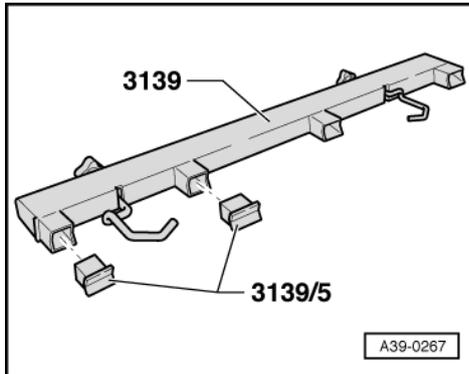
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- -> Check whether there is a factory marking (paint) on the propshaft and the drive flange on the rear final drive. If not, mark position of propshaft flange in relation to rear final drive with paint -arrow B-.

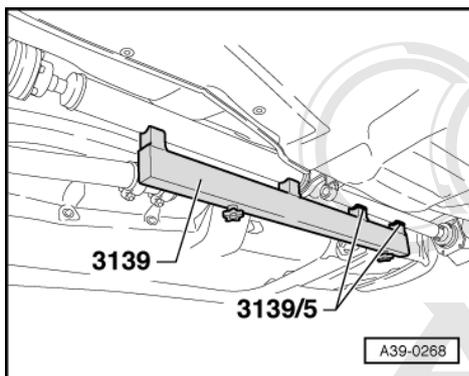
Note:

Only mark if the same propshaft is to be reinstalled.

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



- -> Set up the assembly device 3139 with the spacers 3139/5, as shown in the illustration.
- Loosen securing bolts of centre propshaft mounting slightly.



- -> Attach assembly device 3139 with spacers 3139/5, and tighten the plastic nuts.

Note:

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Never fit assembly device 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 device past gearbox flange.

Note:

Only transport and store propshaft when extended.

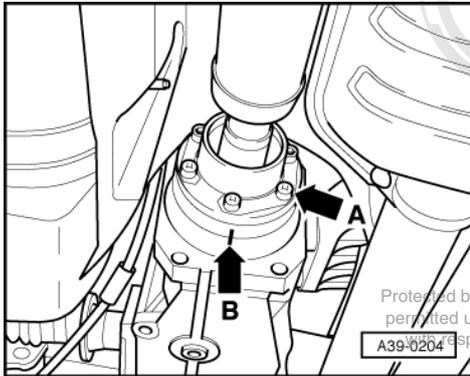
Installing

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 187), 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 base plate and the bolt head must not be reinstalled.
 - ◆ Renew propshaft bolts (self-locking).
- Adjust propshaft after installing => Page 171 .
- Align exhaust system free of stress

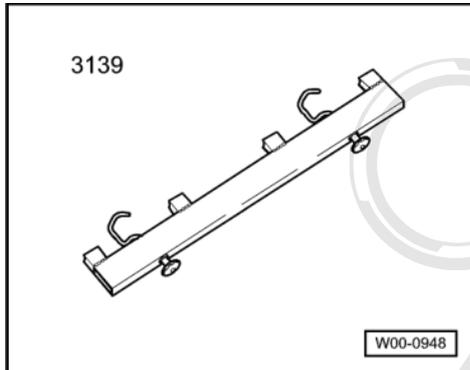
=> 6-Cylinder engine, Mechanics; Repair group 26; Removing and installing parts of exhaust system; Aligning exhaust system free of stress

Tightening torques

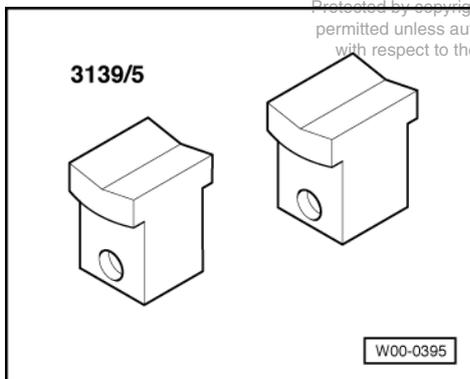
Component	Nm
Propshaft to gearbox (output flange)	55
Propshaft to final drive (input flange)	55
Propshaft centre mounting to body	23
Heat shield for propshaft to gearbox	23
Cross member to body	25
Tunnel support to body	25

7.3 - Adjusting propshaft

Special tools and workshop equipment required



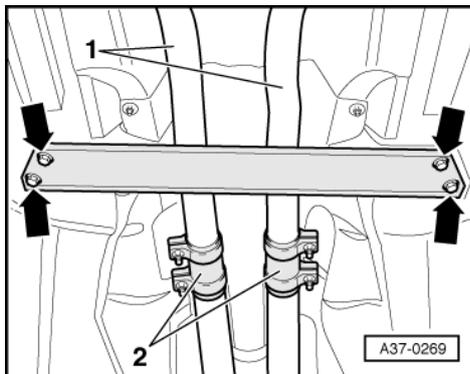
- ◆ Assembly device 3139



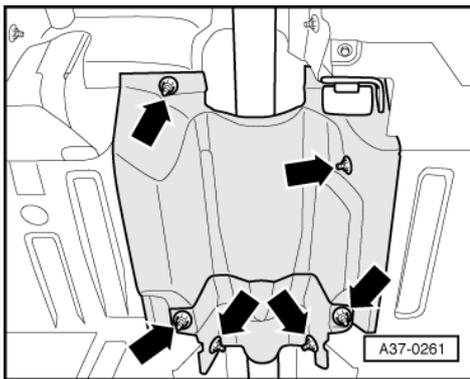
- ◆ Spacers 3139/5

Caution
 Contact corrosion. Notes => Page 5 .

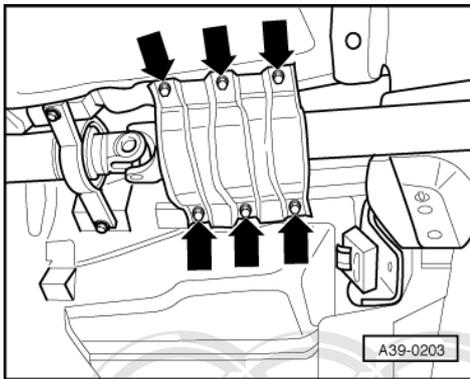
- Observe notes => Page 163 .



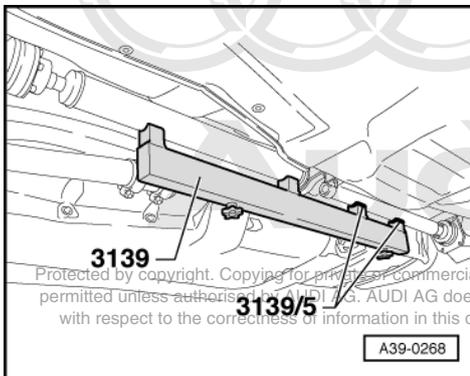
- -> If fitted, remove cross member below exhaust system -arrows-.
- Loosen clamps -2-.
- Disengage rear section of exhaust system -1- and remove.



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



- -> Remove tunnel support -arrows-.

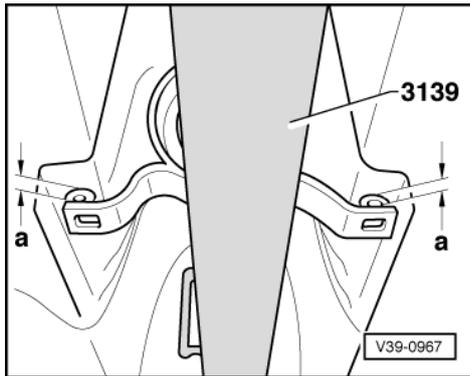


- -> Engage assembly device 3139 with spacers 3139/5, and tighten the plastic nuts.

Note:

Never fit assembly device 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

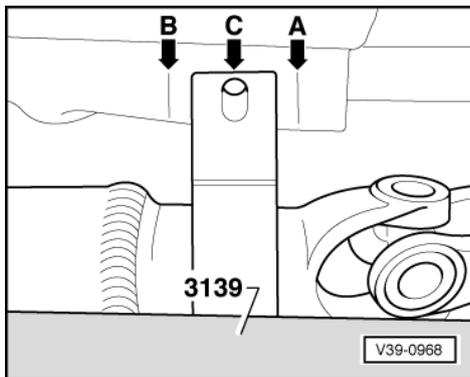
The following shims are available:

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

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- Install the correct shims on both sides.

Aligning propshaft longitudinally



- -> Using assembly device, push propshaft towards the rear as far as it will go.
 - Mark position of centre bearing on body -arrow A-.
 - Using assembly device, 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 device.
 - Install tunnel support.
 - Install heat shield above propshaft.
- Align exhaust system free of stress



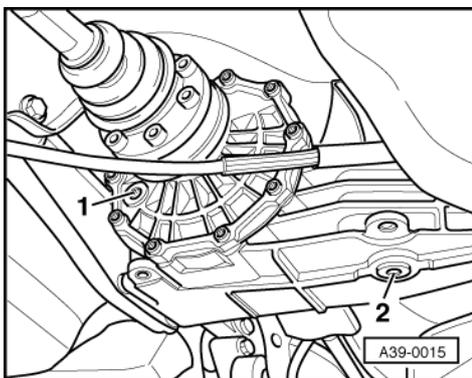
=> 6-Cylinder engine, Mechanics; Repair group 26; Removing and installing parts of exhaust system; Align exhaust system free of stress Removing and installing parts of exhaust system Align exhaust system free of stress

Tightening torques

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

8 - Checking oil level in rear final drive

8.1 - 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 3 .
- Fit oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	35

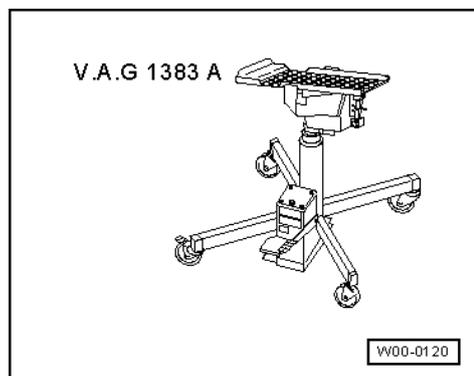


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9 - Removing and installing rear final drive

9.1 - Removing and installing rear final drive

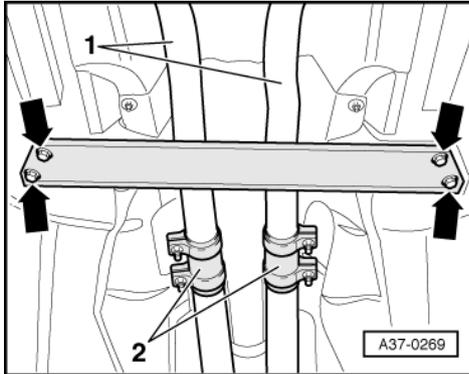
Special tools and workshop equipment required



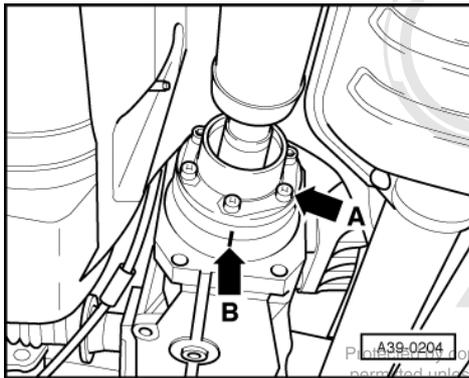
- ◆ Engine/gearbox jack V.A.G 1383 A

Caution
 Contact corrosion. Notes => Page 5 .

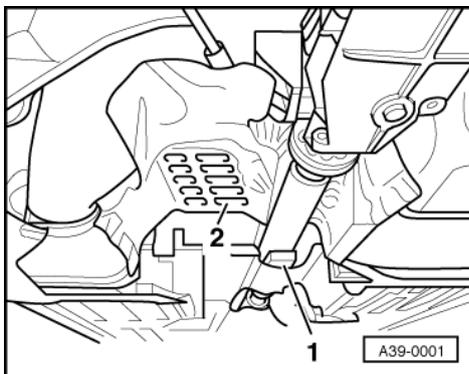
Removing



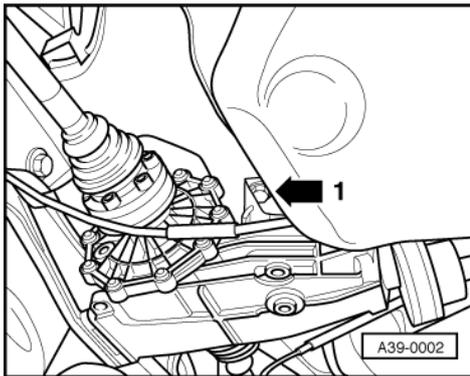
- -> If fitted, remove cross member below exhaust system -arrows-.
- Loosen clamps -2-.
- Disengage rear section of exhaust system -1- and remove.



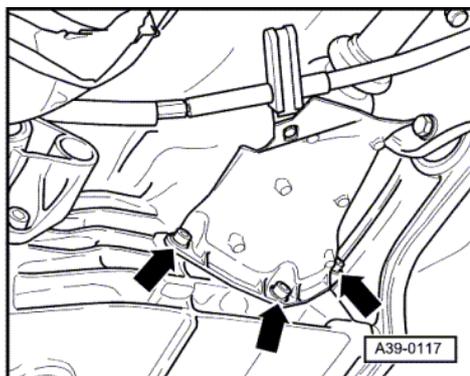
- -> Check whether there is a factory marking (paint) on the propshaft and the drive flange on the rear final drive. If not, mark position of propshaft flange in relation to rear final drive with paint -arrow B-.
- Loosen securing bolts -arrow A- of propshaft to rear final drive.



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

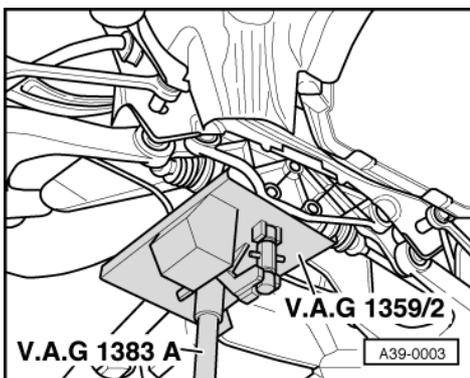


- -> If fitted, detach retainer for handbrake cable -arrow 1-.

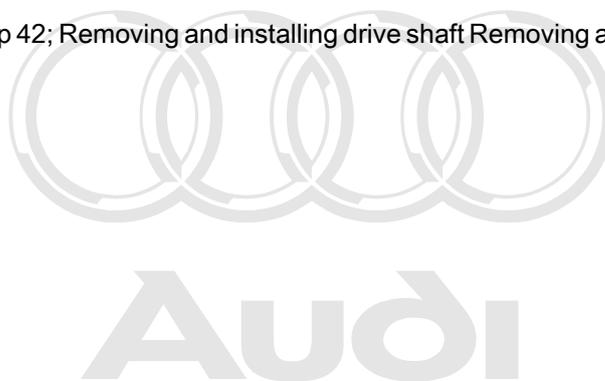


- -> Remove heat shield for left drive shaft -arrows-.
- Unbolt left and right-hand drive shafts and tie-up.

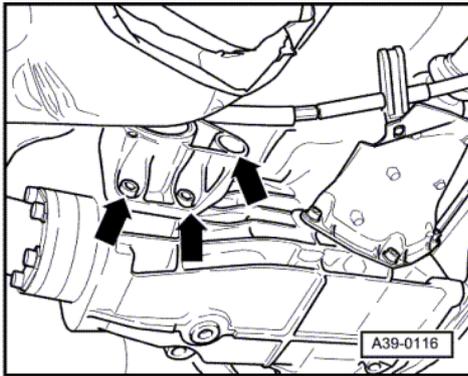
=> Running Gear, Front and 4WD; Repair group 42; Removing and installing drive shaft Removing and installing drive shaft



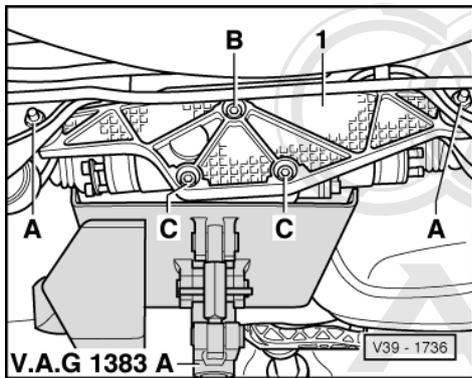
- -> Support final drive with gearbox jack V.A.G 1383 A and universal support V.A.G 1359/2.
- Secure final drive with a strap.



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

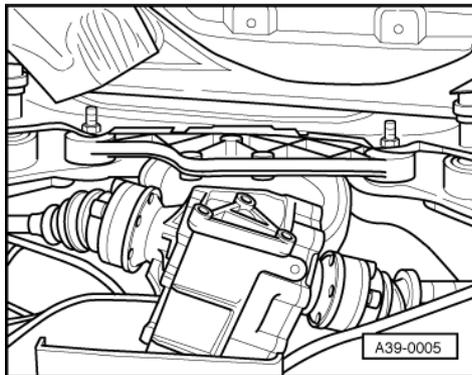


- -> Unscrew securing bolts -B- and -C- of rear cross member on rear final drive.

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Note:

The cross member -1- need not be removed.



- -> Lower final drive slowly.

Installing

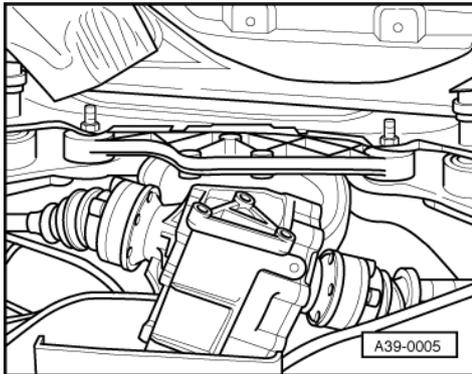
Installation is carried out in the reverse order. When doing this, note the following:

Notes:

- ◆ Always renew self-locking nuts.
- ◆ 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.

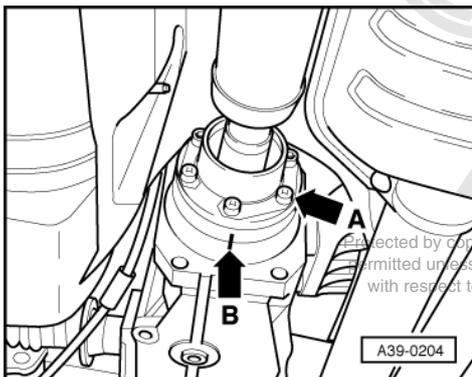


- ◆ Renew the gasket on the flange shaft (remove backing foil and stick gasket onto flange shaft). Surface must be free of grease.
- ◆ Renew propshaft bolts (self-locking).



- -> 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 169 .

Notes:



- ◆ -> 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 base plate and the bolt head must not be reinstalled.
- ◆ Renew propshaft bolts (self-locking).

- Check gear oil in rear final drive => Page 174 .
- Align exhaust system free of stress

=> 6-Cylinder engine, Mechanics; Repair group 26: Removing and installing parts of exhaust system; Align exhaust system free of stress Removing and installing parts of exhaust system Align exhaust system free of stress

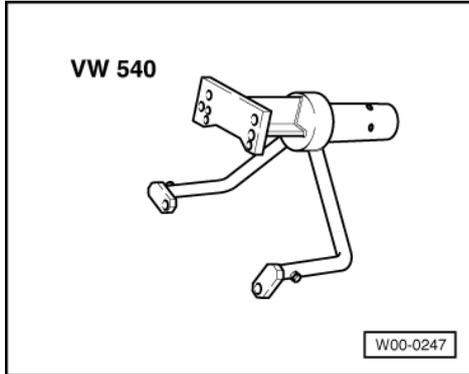
Tightening torques

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

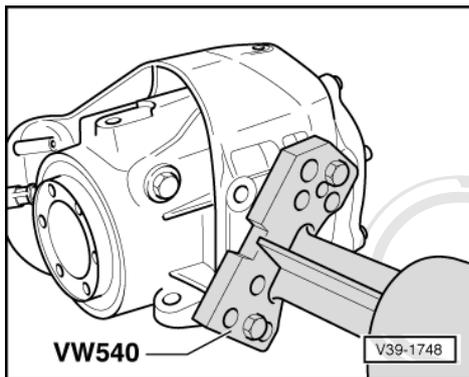
Component	Nm
Retainer for handbrake cable	25

9.2 - Securing rear final drive to repair stand

Special tools and workshop equipment required



- ◆ Engine/gearbox support VW 540



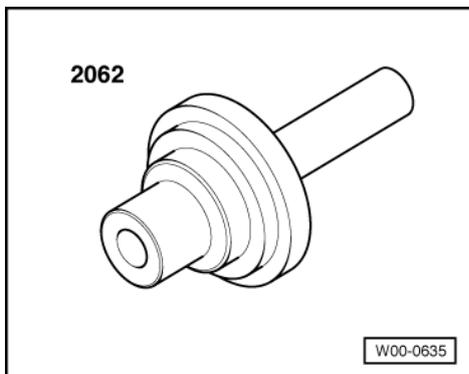
- -> Secure complete rear final drive to repair stand using engine and gearbox support VW 540.

10 - Renewing flange shaft oil seals

10.1 - Renewing flange shaft oil seals

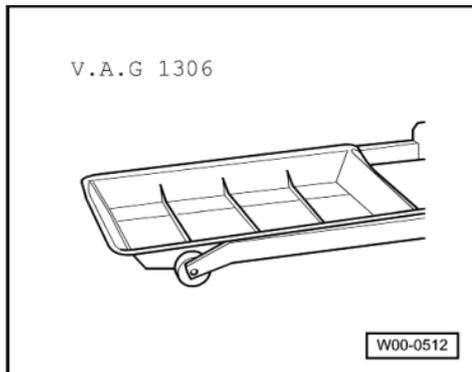
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Special tools and workshop equipment required





- ◆ Mandrel 2062



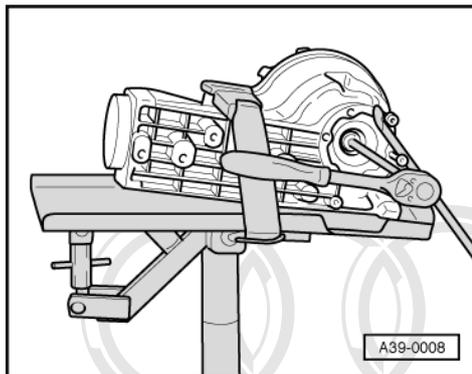
- ◆ Drip tray V.A.G 1306

- Rear final drive removed

Note:

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

Removing

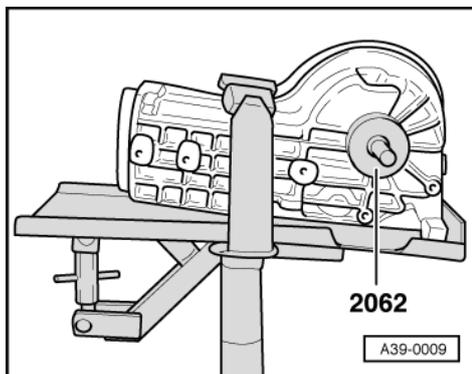


- -> Remove flange shaft. To loosen the securing bolt, screw two bolts into the flange shaft and counter-hold with a lever.
- Place drip tray V.A.G 1306 underneath.
- Pull out flange shaft using the bolts already screwed in.
- Lever out seals for flange shaft using a suitable lever.
- Clean seat for 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.

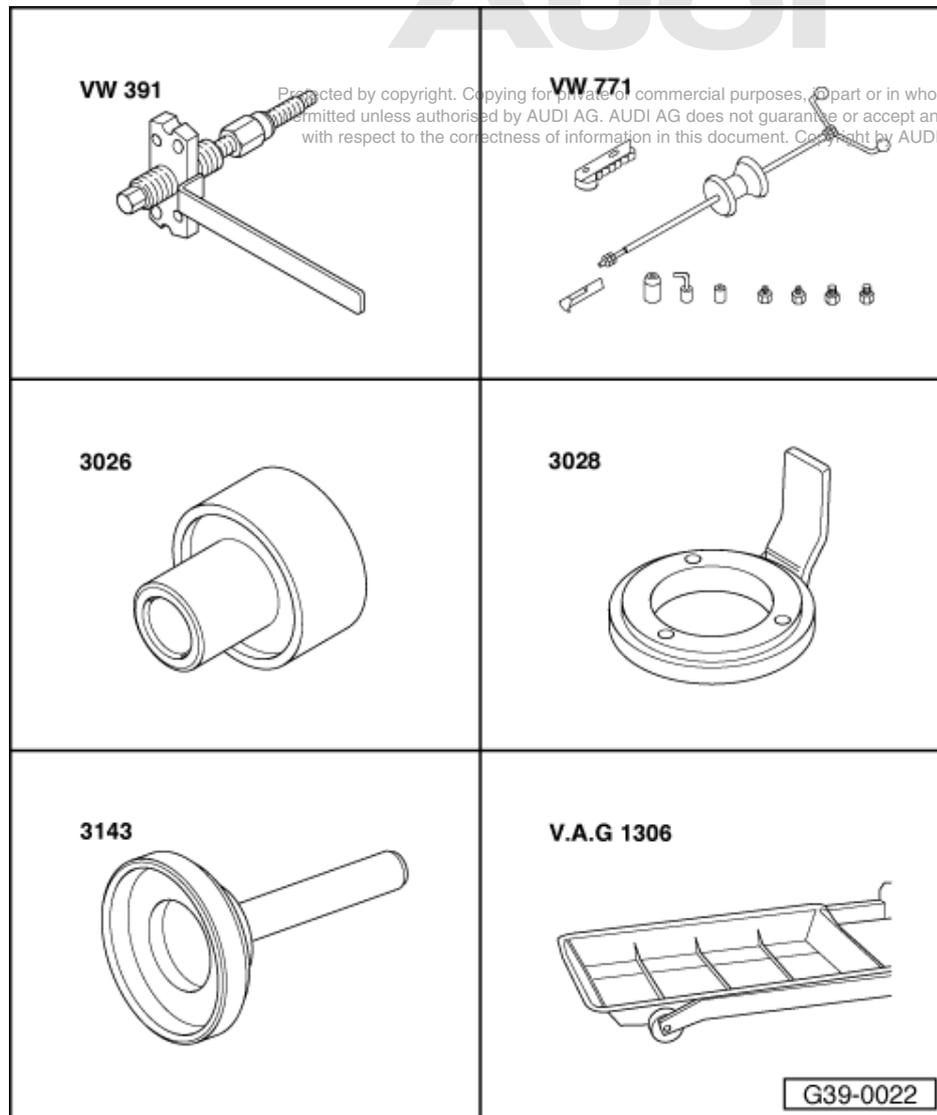
Tightening torque

Component	Nm
Flange shaft to final drive	25

- Install rear final drive => Page 177 .
- Top-up gear oil in rear final drive and check oil level => Page 174 .

11 - Renewing oil seal for propshaft drive flange

11.1 - Renewing oil seal for propshaft drive flange

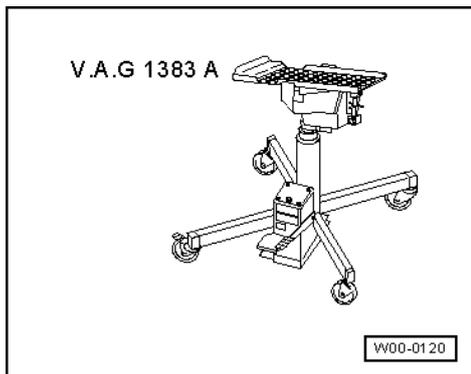


Special tools and workshop equipment required

- ◆ Special tool VW 391
- ◆ Multi-purpose tool VW 771
- ◆ Special tool 3026
- ◆ Special tool 3028
- ◆ Special tool 3143



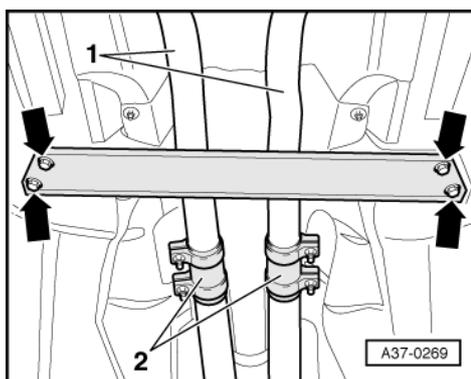
- ◆ V.A.G 1306



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

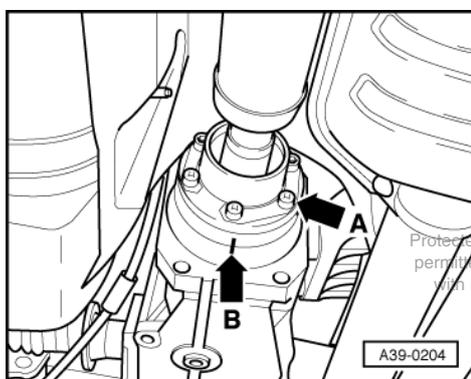
Note:

The seal can be replaced with the rear final drive still installed, but the final drive must be lowered.

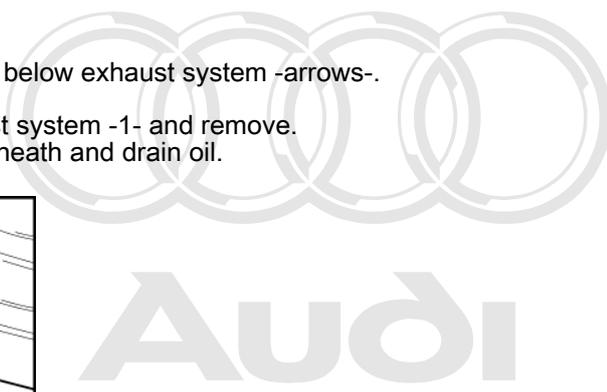


Removing

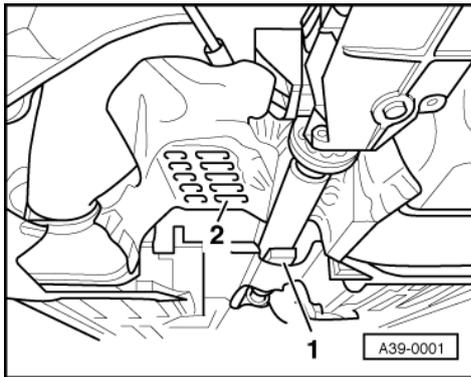
- -> If fitted, remove cross member below exhaust system -arrows-.
- Loosen clamps -2-.
- Disengage rear section of exhaust system -1- and remove.
- Place drip tray V.A.G 1306 underneath and drain oil.



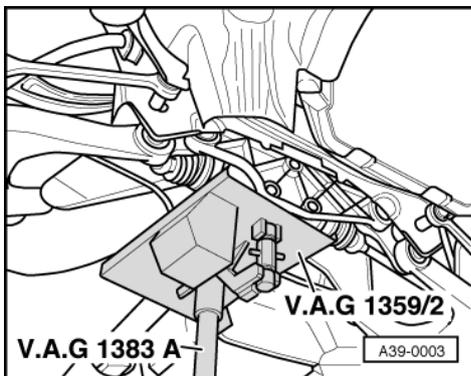
- -> Check whether there is a factory marking (paint) on the propshaft and the drive flange on the rear final drive. If not, mark position of propshaft flange in relation to rear final drive with paint -arrow B-.
- Loosen securing bolts -arrow A- of propshaft to rear final drive.



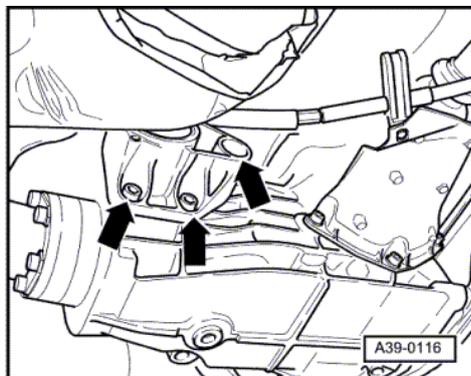
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- -> Support propshaft using a wooden wedge -1-, press upwards against heat shield -2-.
- Remove securing bolts of propshaft to rear final drive.



- -> 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.

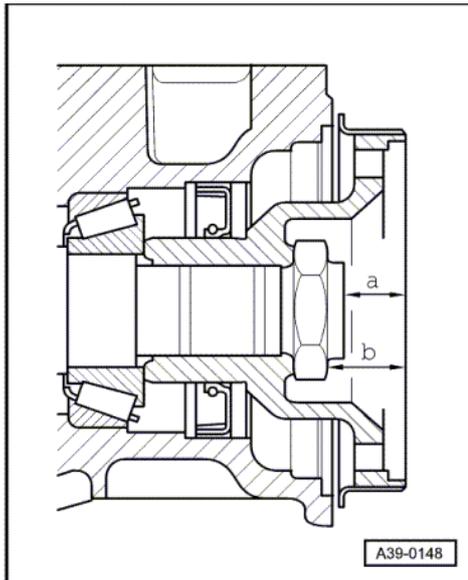
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Note:

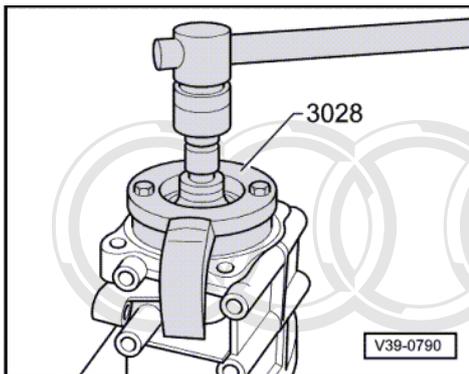
The rear final drive/cross member securing bolts are not loosened.

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





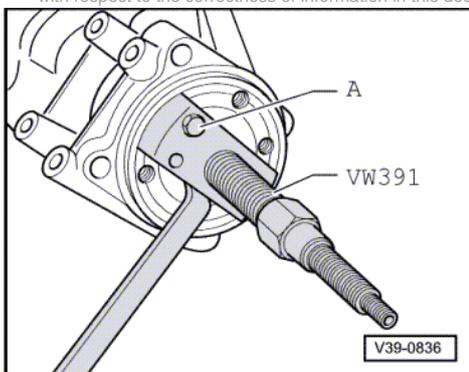
- Mark position of drive pinion retaining nut with paint.
- -> To check when assembling, measure the following with a depth gauge.
 - Dimension a = distance: flange/drive pinion
 - Dimension b = distance: flange/drive pinion nut



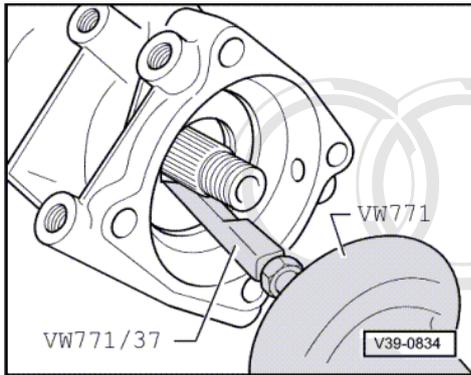
Note:

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

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



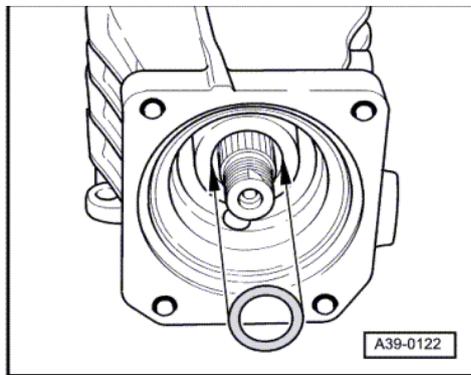
- -> Pull off flange with removal tool VW 391.
- Screw two M8 x 30 hexagon bolts -A- into flange.



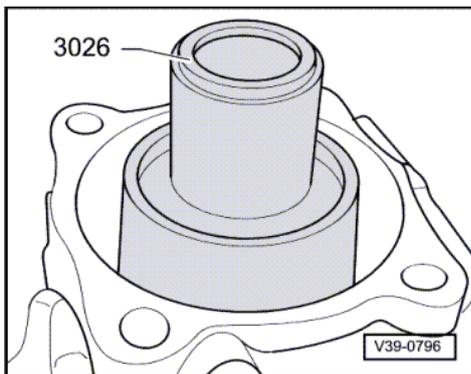
- -> Pull out seal.

Installing

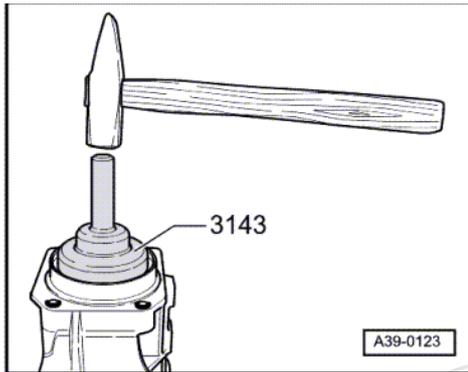
Installation is carried out in the reverse order. When doing this, note the following:
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- -> Renew O-ring between drive pinion bearing and flange.
- Lightly oil O-ring before installing.



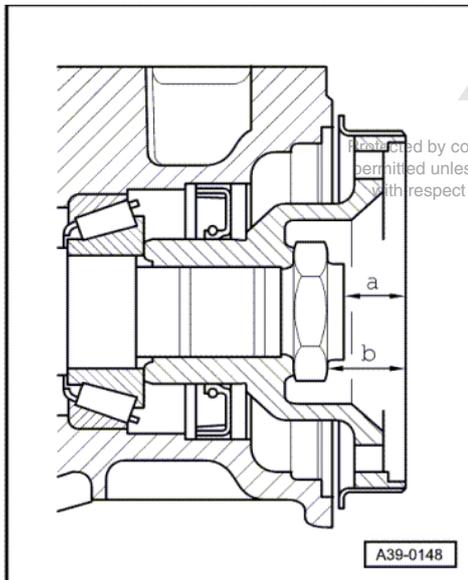
- Moisten outer circumference of seal with gear oil.
- Fill space between sealing and dust lips with multipurpose grease.
- -> Drive in seal for propshaft flange onto stop with drift 3026.



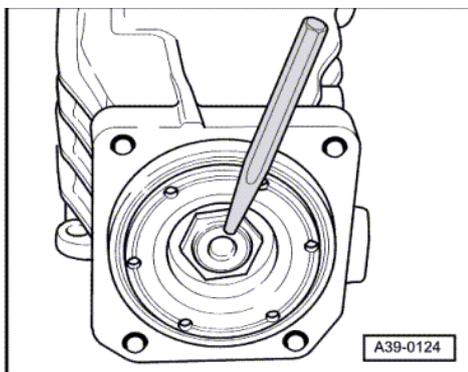
- -> Drive propshaft flange onto drive pinion until retaining nut can be fitted.
- Clean drive pinion nut and threads on drive pinion of oil and grease residues. Thinly coat threads with locking fluid D 000 600.

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 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:

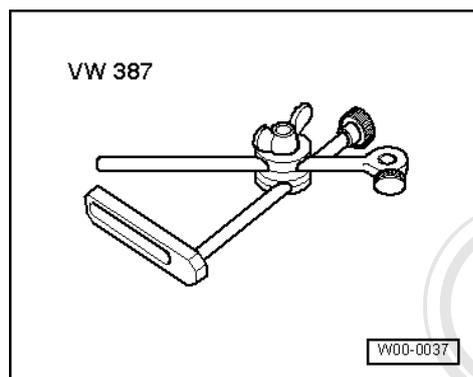
- ◆ After detaching the propshaft, it is important to clean out the locking fluid remaining in the threads of the flange shaft on the rear final drive. If this is neglected, the new bolts can seize when they are screwed in and shear off later if they have to be removed.
 - ◆ The threaded holes can be 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 base 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 187 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 169 .
 - Top-up gear oil in rear final drive and check oil level => Page 174 .
 - Align exhaust system free of stress

=> 6-Cylinder engine, Mechanics; Repair group 26; Removing and installing parts of exhaust system; Aligning exhaust system free of stress Removing and installing parts of exhaust system Aligning exhaust system free of stress

Tightening torques

Component	Nm
Oil drain/filler plug	35
Final drive support (front) to final drive	40
Propshaft to final drive	55
Cross member to body	25

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



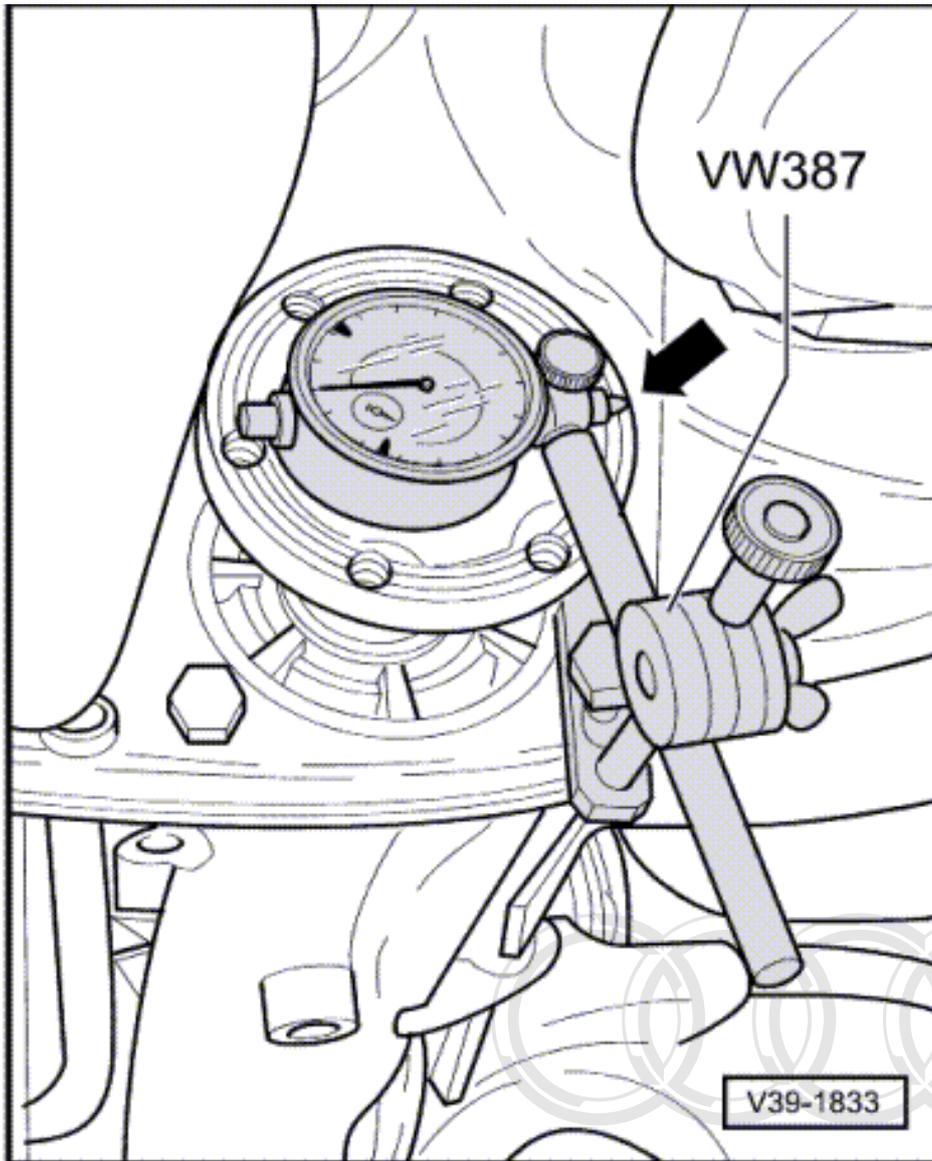
Special tools and workshop equipment required

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

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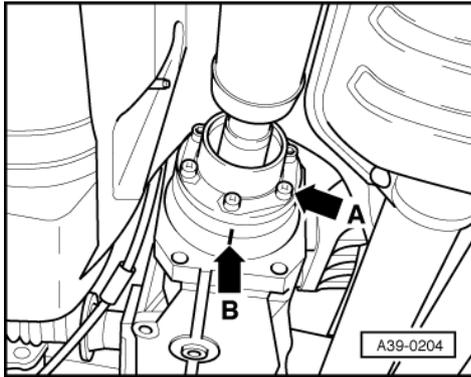


Work sequence



Notes:

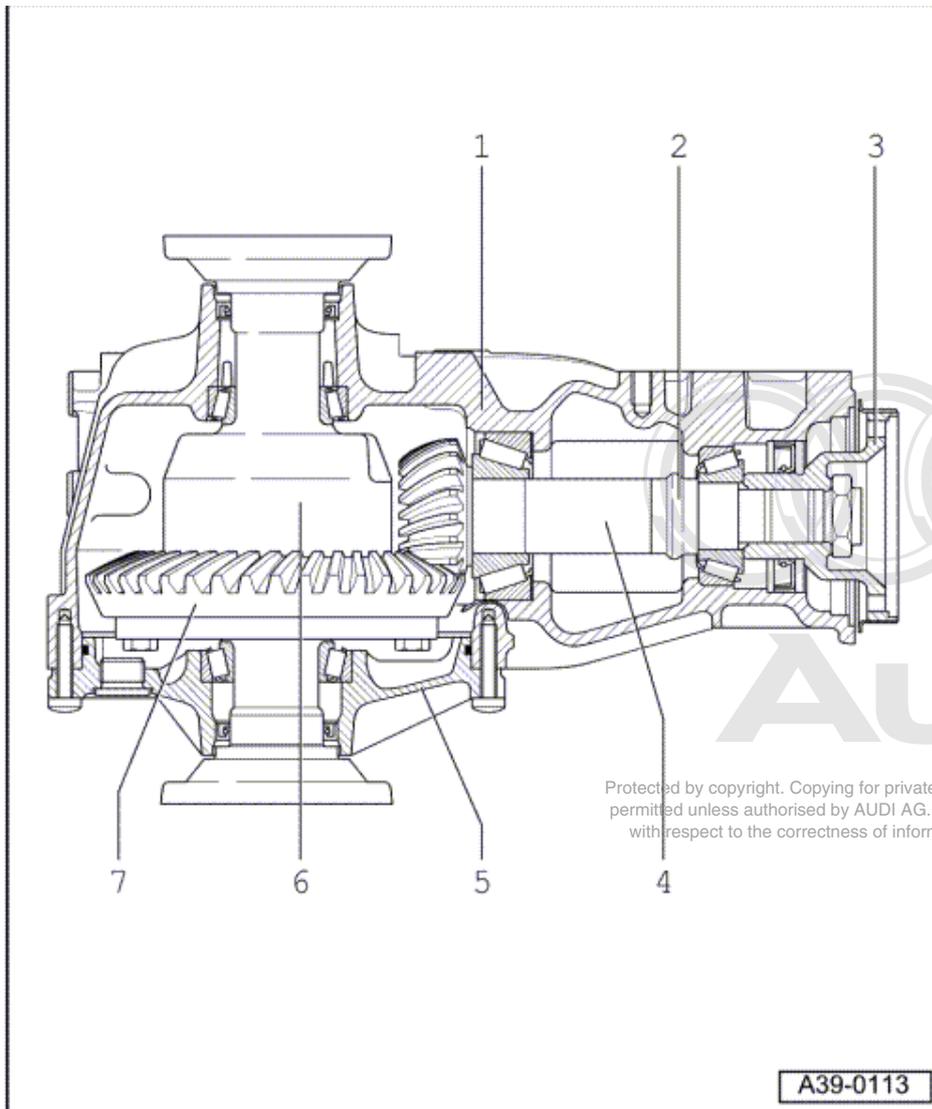
- ◆ The radial run-out must always be measured when drive pinion or propshaft flange are removed.
- ◆ The radial run-out can be measured when rear final drive is installed but the propshaft must be disconnected at rear final drive. Observe notes => [Page 163](#)
- -> Secure universal dial gauge retainer 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-.

12 - Dismantling and assembling rear final drive

12.1 - Dismantling and assembling rear final drive

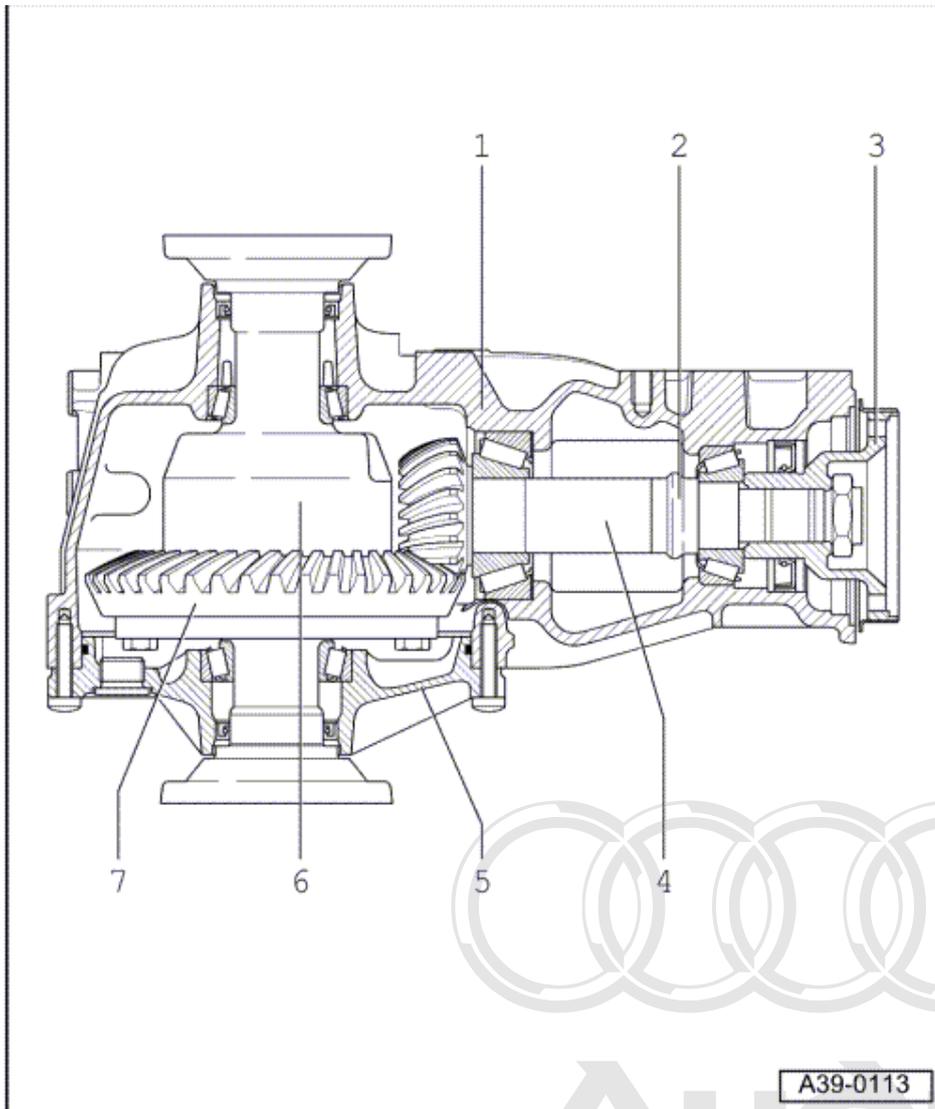


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12.2 - Overview

- 1 Final drive housing
- 2 Spacer sleeve
 - ◆ Renew
- 3 Flange for propshaft
 - ◆ Removing and installing
=>Page 210
- 4 Drive pinion
 - ◆ Is mated with crown wheel, always renew together as a set
 - ◆ Removing and installing
=>Page 210



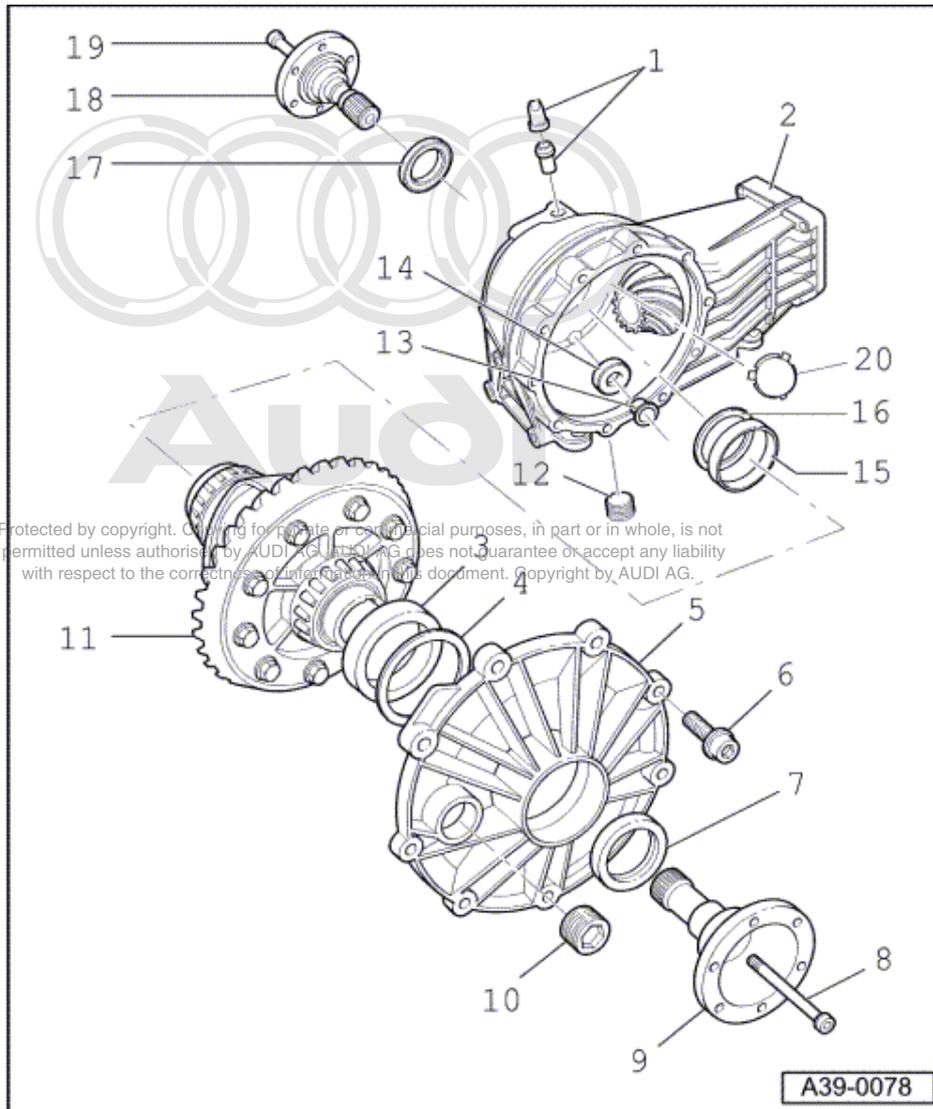
- 5 Cover for final drive
- 6 Differential
 - ◆ Must be removed before dismantling drive pinion
 - ◆ Removing and installing
=> Page 191
 - ◆ Dismantling and assembling
=> Page 197
- 7 Crown wheel

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- ◆ Is mated to drive pinion (pinion set)
- ◆ Removing and installing
=>Page **197**

13 - Removing and installing differential

13.1 - Removing and installing differential



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Notes:

- ◆ General repair instructions=>Page **5** .
- ◆ Securing final drive to repair stand => Page 39-142.
- ◆ Adjustments are required when replacing components marked 1)
=> Adjustment overview Page **225** .

1 Breather sleeve

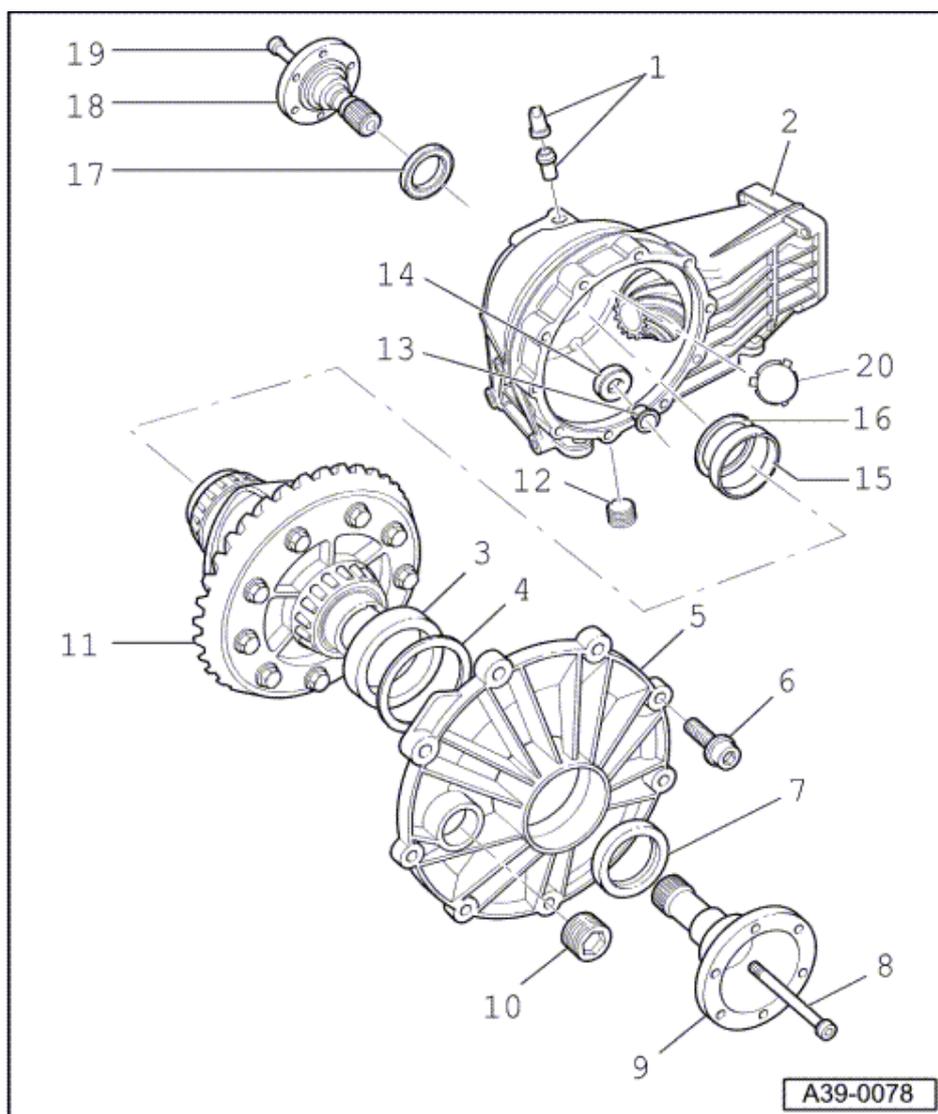
- ◆ With rubber valve
- ◆ Installation position
=> Fig. **195**

2 Final drive housing 1)

- ◆ With drive pinion
- ◆ Removing and installing drive pinion



=>Page 210



3) Outer race for large taper roller bearing 1)

- ◆ Driving out => Fig. 206
- ◆ Driving in => Fig. 207

4) Shim "S1"

- ◆ Note thickness
- ◆ Adjustment overview =>Page 225

5) Cover for final drive 1)

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

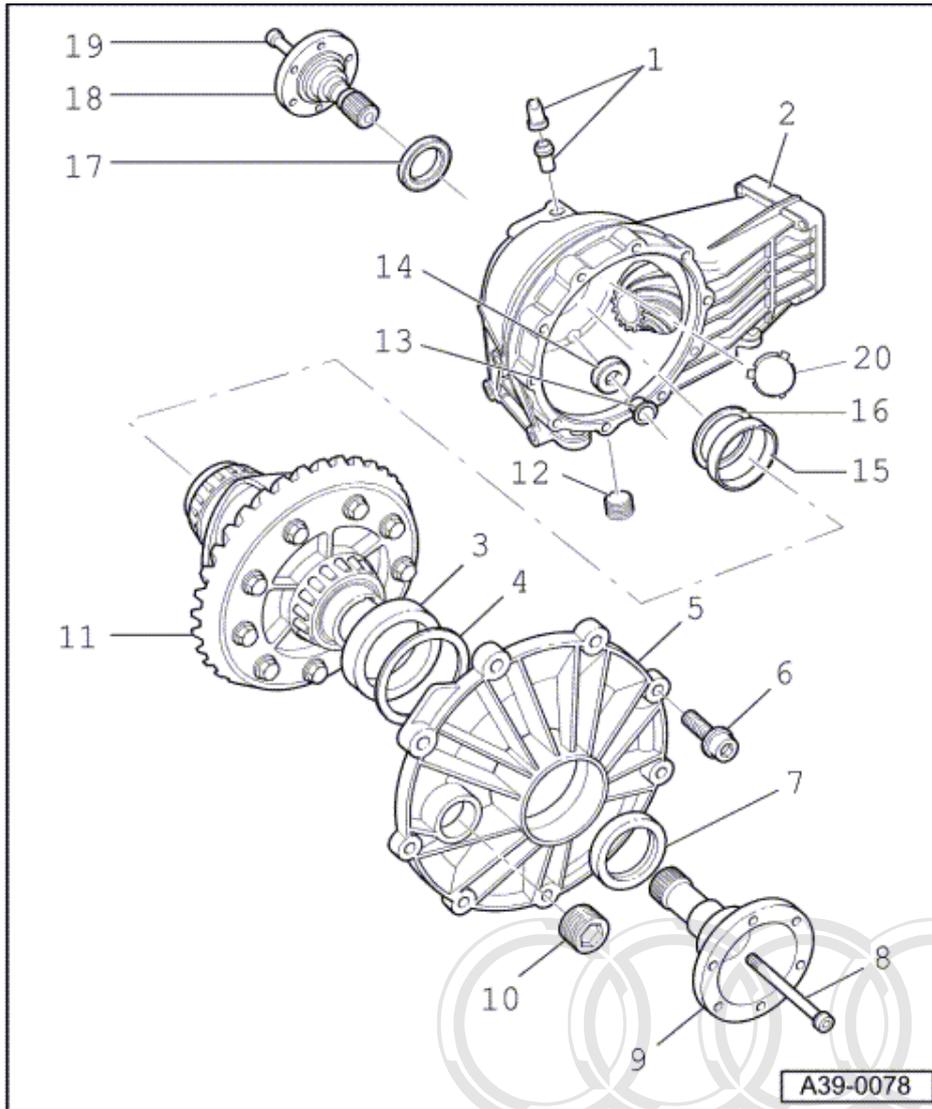
6) Torx bolt - 25 Nm

7) Oil seal, right

- ◆ Renewing => Page 179

8) Hexagon socket head bolt, 25 Nm

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9 Flange shaft, right

- ◆ Removing and installing
 =>Fig. 195

10 Oil filler plug - 35 Nm

11 Differential with crown wheel 1)

- ◆ Dismantling and assembling
 => Page 197

12 Oil drain plug - 35 Nm

13 Bush

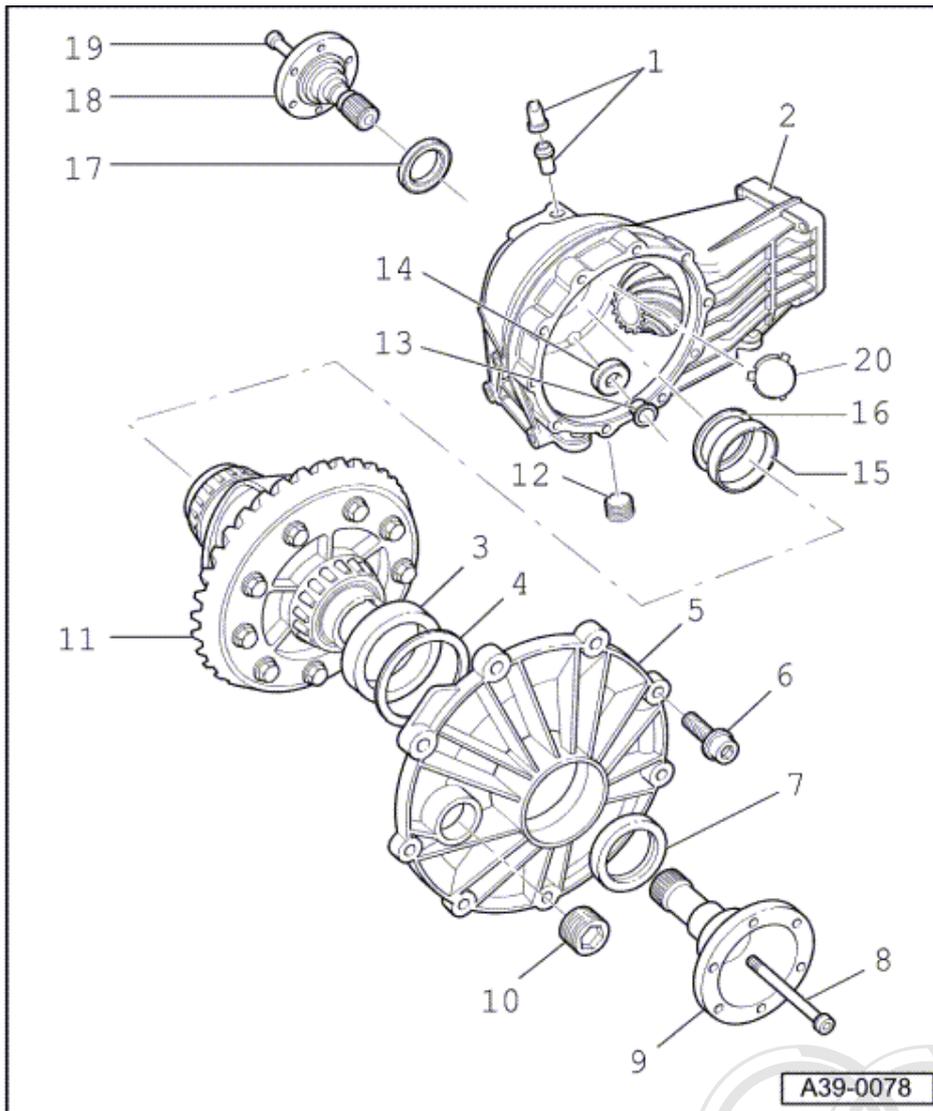
- ◆ Holds magnet in position
- ◆ Knock-in onto stop

14 Magnet

15 Outer race for small taper roller bearing 1)

- ◆ Removing and installing
 =>Page 197

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16 Shim "S2"

- ◆ Note thickness
- ◆ Adjustment overview
=>Page **225**

17 Oil seal, left

- ◆ Renewing => Page **179**

18 Flange shaft, left

- ◆ Removing and installing
=>Fig. **195**

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

20 Cover

- ◆ Installing => Fig. **195**

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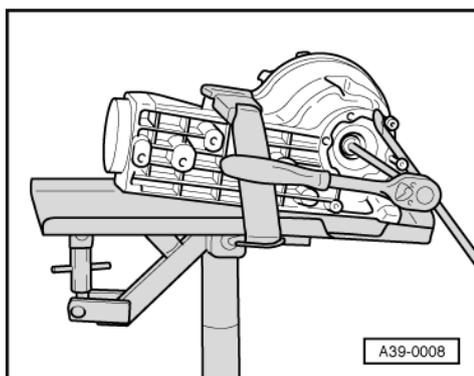
- Rear final drive removed

Special tools and workshop equipment required

- ◆ Drip tray V.A.G 1306

Removing

- Secure complete rear final drive on repair stand =>Page 179 .
- Place drip tray V.A.G 1306 underneath and drain oil.

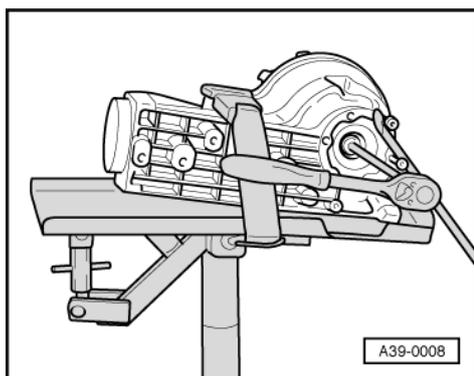


- -> Remove left and right-hand flange shafts.
- To loosen the securing bolt, screw two bolts into the flange shaft and counter-hold with a lever.
- Mark flange shafts (for left and right sides).
- Pull out flange shaft using the bolts already screwed in.
- Unscrew securing bolts from cover for final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

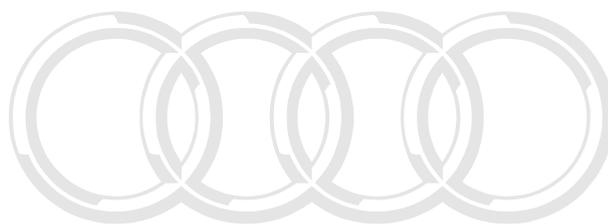
Installing

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.
- Replace flange shaft oil seals => Page 179 .
- Fill space between sealing and dust lips with multipurpose grease.



- -> Install flange shafts and tighten.
- Top-up gear oil in rear final drive and check oil level => Page 174 .

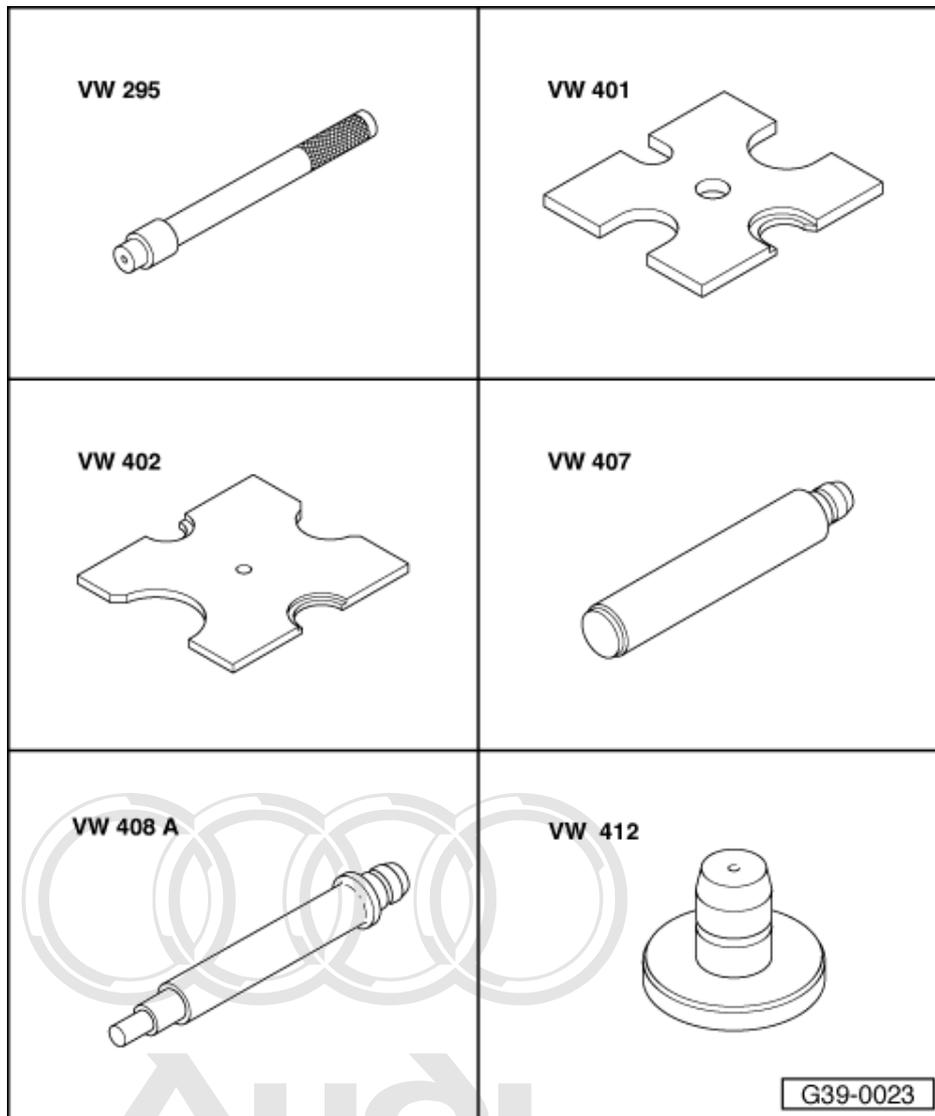


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14 - Dismantling and assembling differential

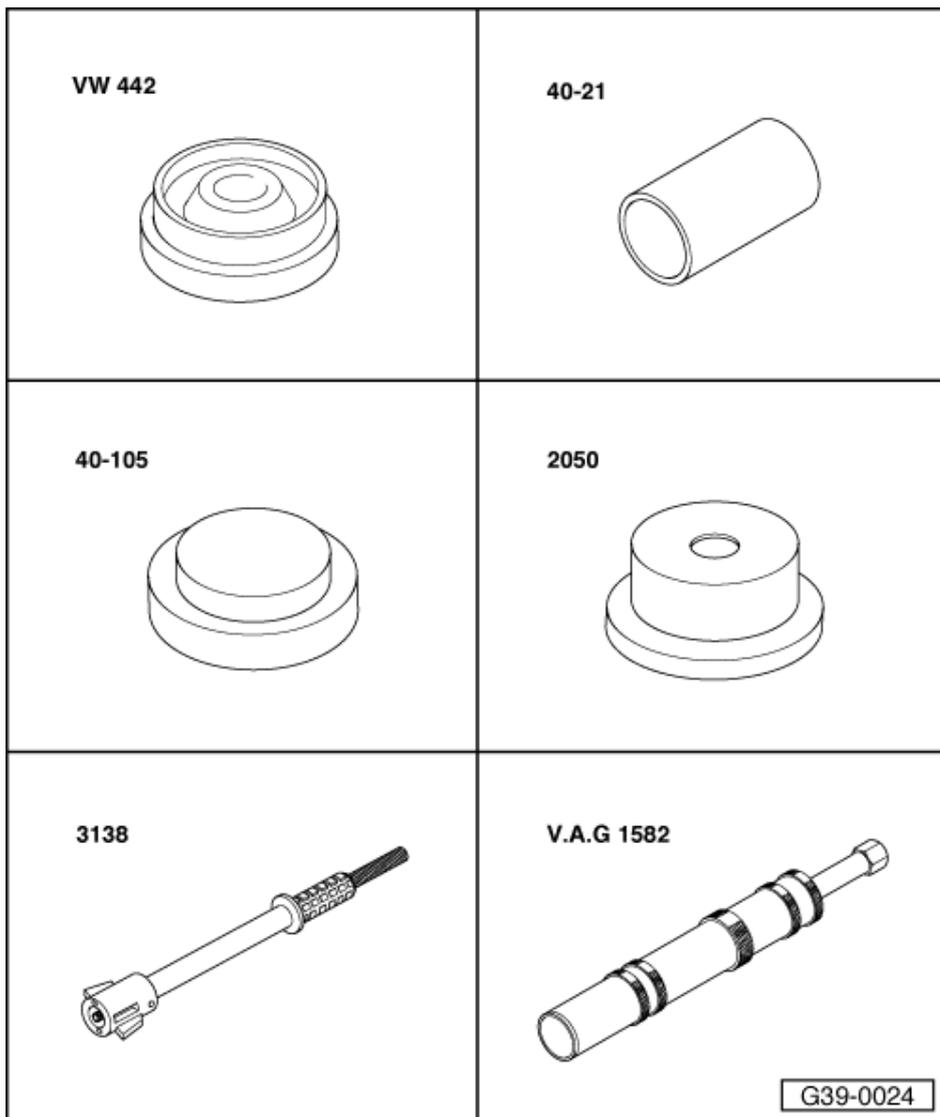
14.1 - Dismantling and assembling differential



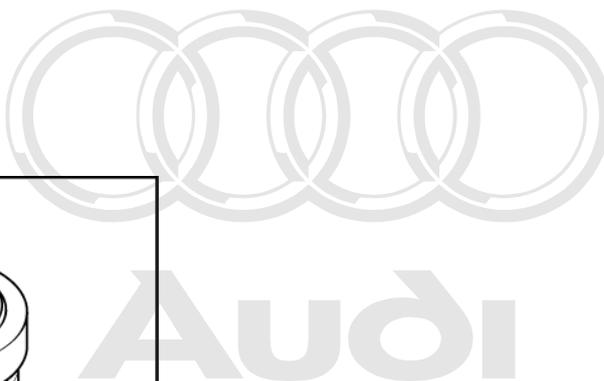
Special tools and workshop equipment required

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- ◆ 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

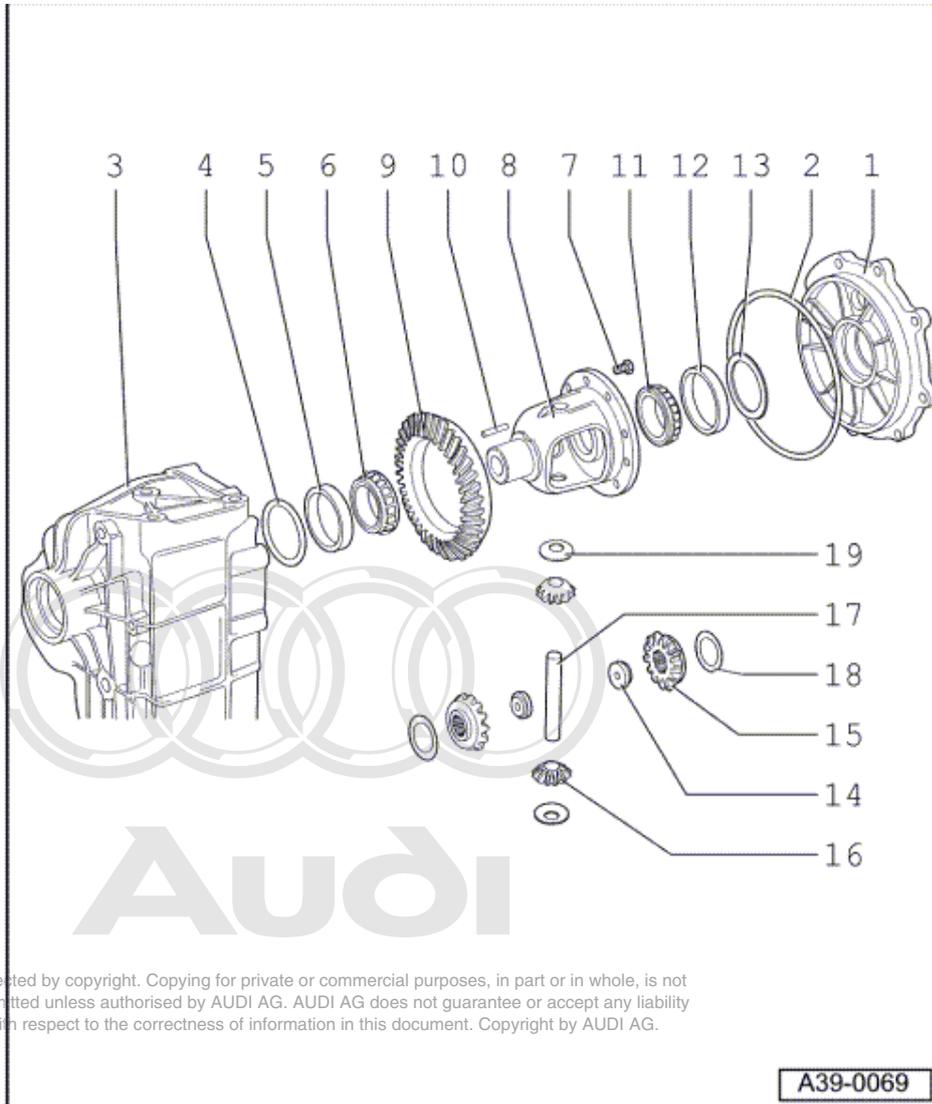


- ◆ V.A.G 1582/6
- ◆ Two-arm puller Kukko 44/2

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Notes:

- ◆ General 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 225 .



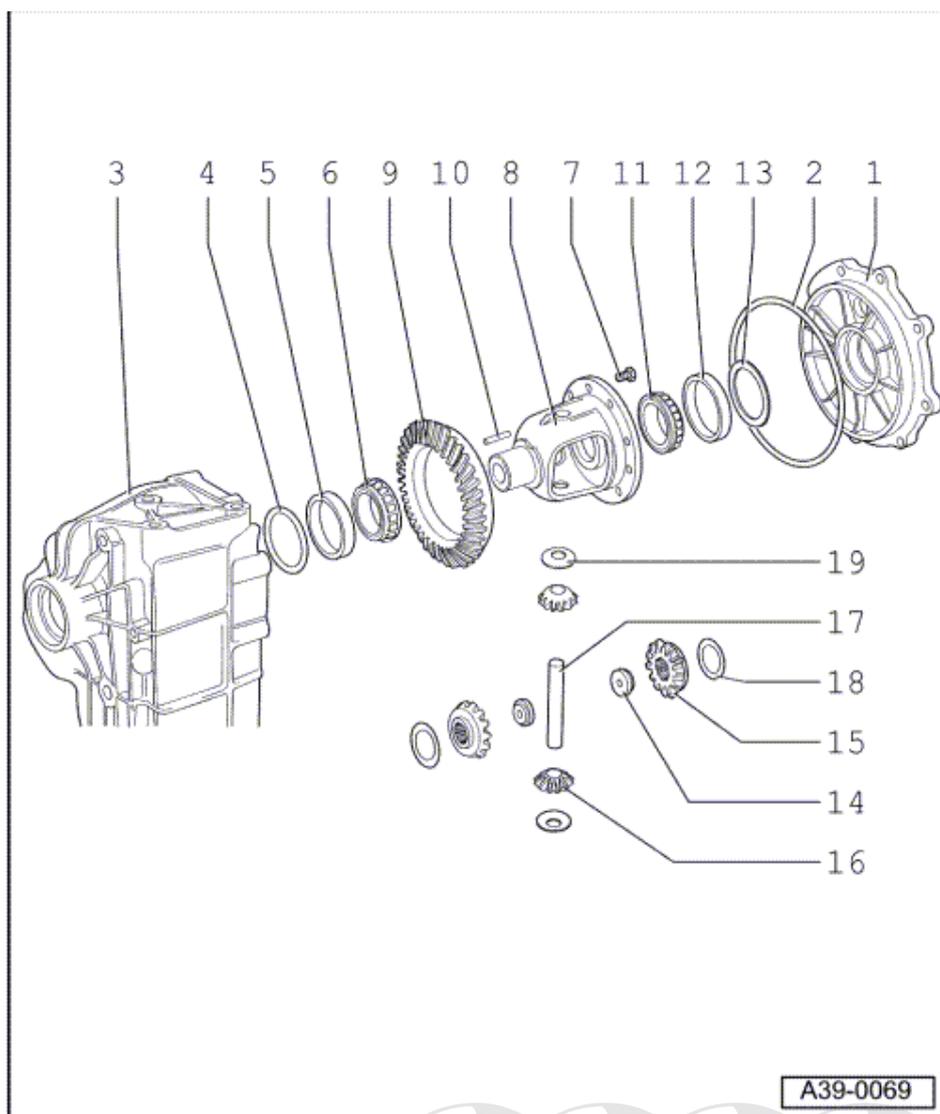
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- 1 Cover for final drive 1)**
- 2 O-ring**
 - ◆ Renew
 - ◆ Insert with oil
- 3 Final drive housing 1)**
- 4 Shim "S2"**
 - ◆ Note thickness
 - ◆ Adjustment overview
=>Page 225
- 5 Outer race for small taper roller bearing 1)**
 - ◆ Knocking out
=> Fig. 204
 - ◆ Pressing in

A39-0069



=> Fig. 204



6 Inner race for small taper roller bearing 1)

- ◆ Pulling out => Fig. 204
- ◆ Pressing in => Fig. 205

7 Bolt - 60 Nm + turn 45°further

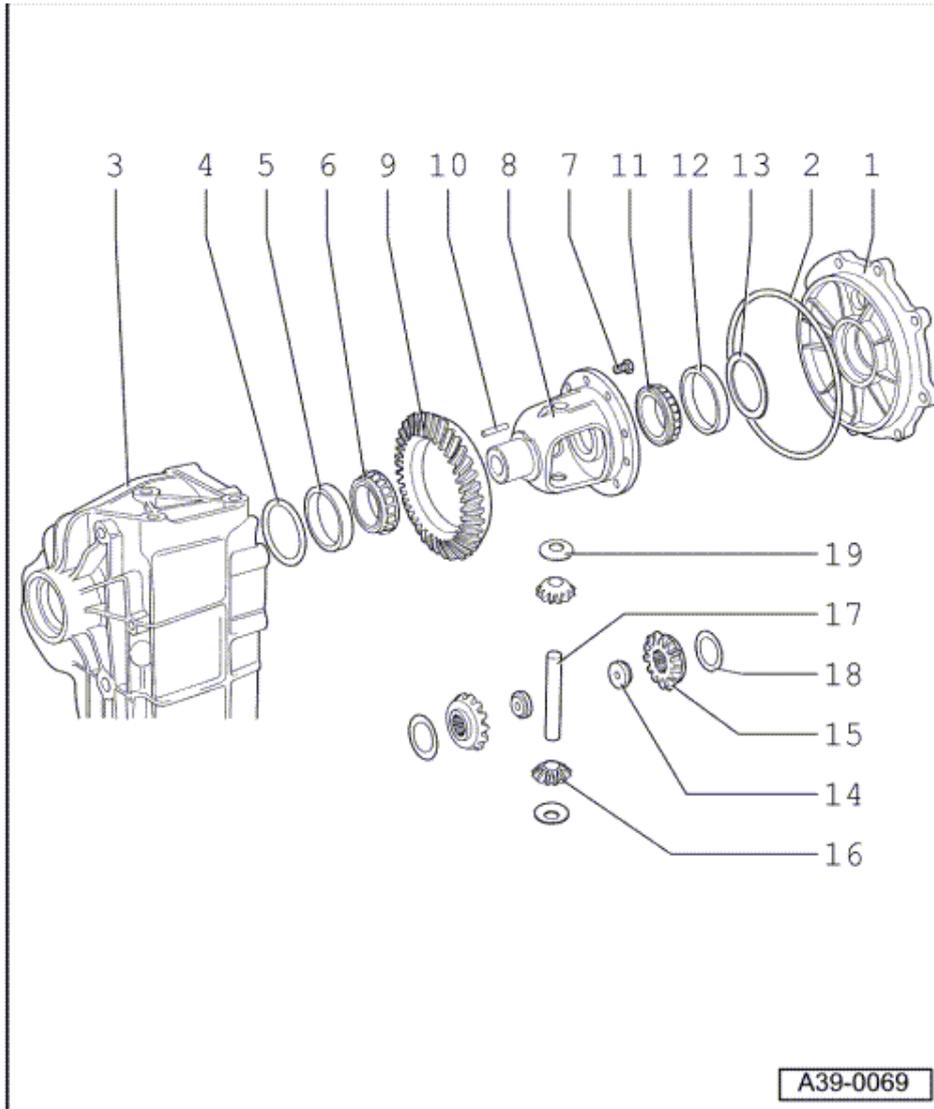
- ◆ Renew
- ◆ Allocation

=> 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. 207
- ◆ Installing on differential housing
=> Fig. 207

10 Spring pin

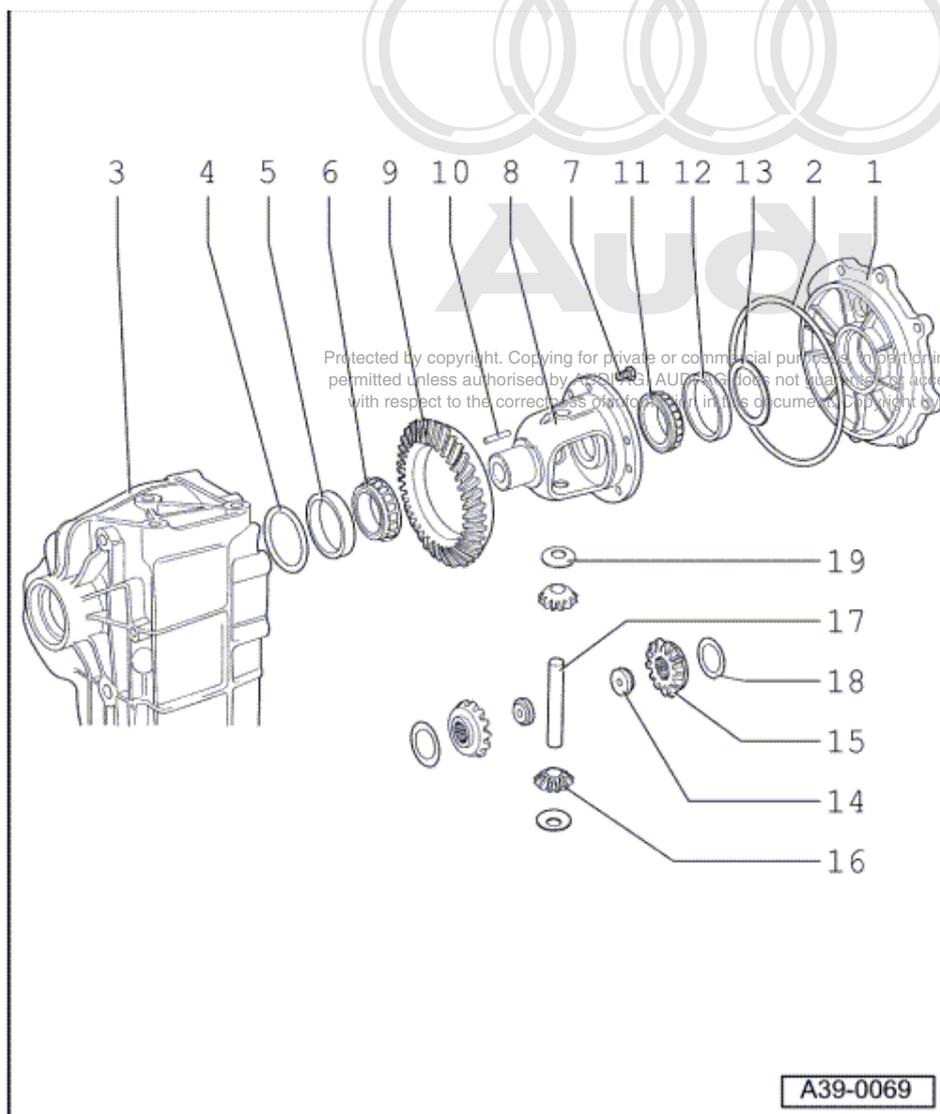
- ◆ For securing planet pinion axis shaft
- ◆ Drive in flush

11 Inner race for large taper roller bearing 1)

- ◆ Pulling off
=> Fig. 205
- ◆ Pressing on
=> Fig. 206



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12 Outer race for large taper roller bearing 1)

- ◆ Driving out
=> Fig. 206
- ◆ Pressing in
=> Fig. 207

13 Shim "S1"

- ◆ Note thickness
- ◆ Adjustment overview
=>Page 225

14 Threaded piece

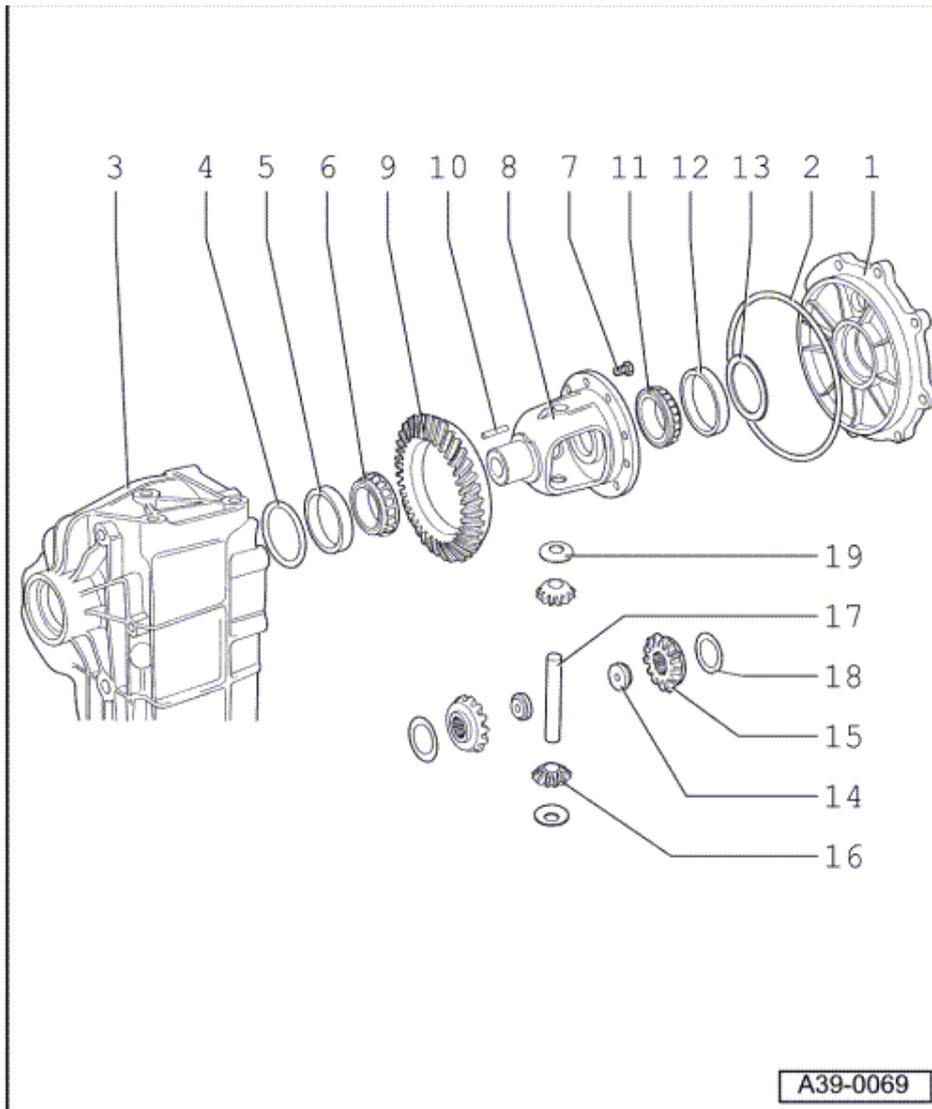
15 Sun wheel

- ◆ Installing
=> Fig. 208
- ◆ Adjusting
=> Fig. 208

16 Planet pinion

- ◆ Installing
=> Fig. 208

A39-0069



17 Planet pinion axis shaft

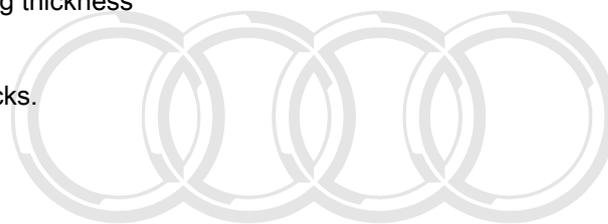
- ◆ Knock out with drift
- ◆ Drive in carefully so that the thrust washers are not damaged
- ◆ Secure with spring pin -Item 10 -

18 Shim

- ◆ Re-determining thickness
=> Fig. 208

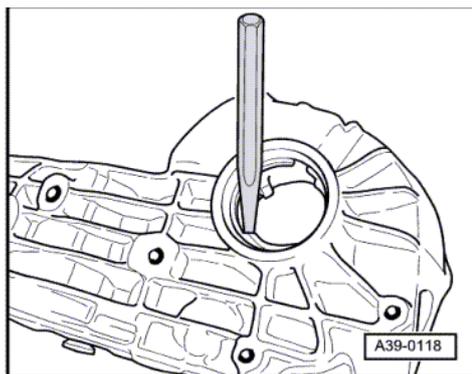
19 Thrust washer

- ◆ Check for cracks.



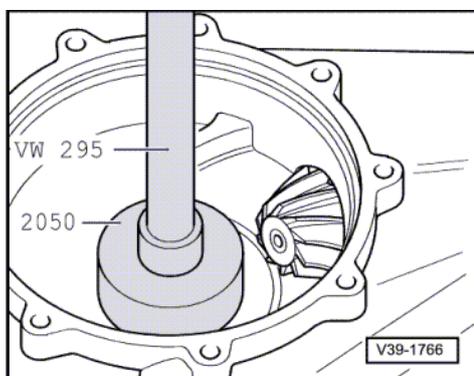
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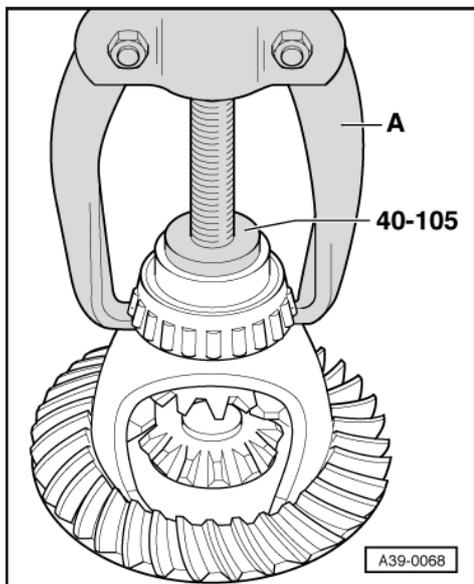


-> Fig.1 Knocking outer race of small taper roller bearing out of housing

- After removing, check shims for damage.



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

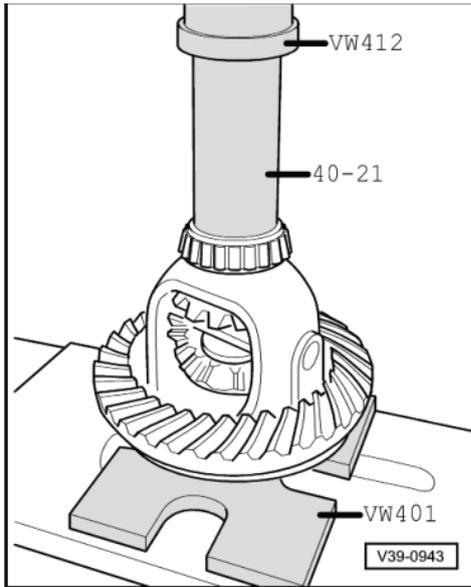


-> Fig.3 Pulling off inner race for small taper roller bearing

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



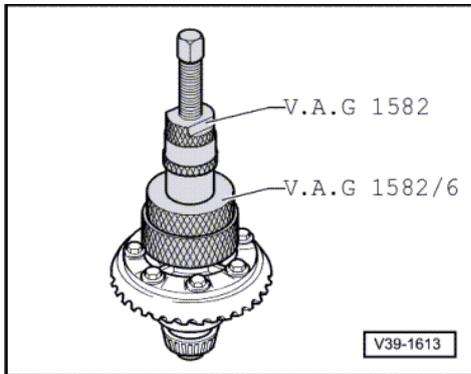
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-> Fig.4 Pressing on inner race for small taper roller bearing

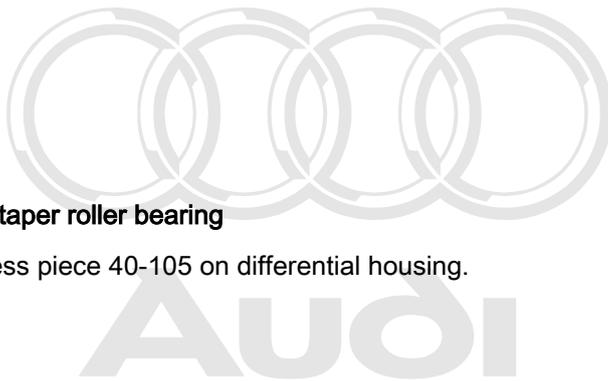
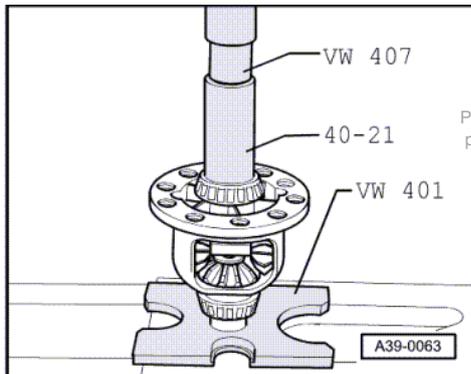
Caution
 Wear protective gloves.

- 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.



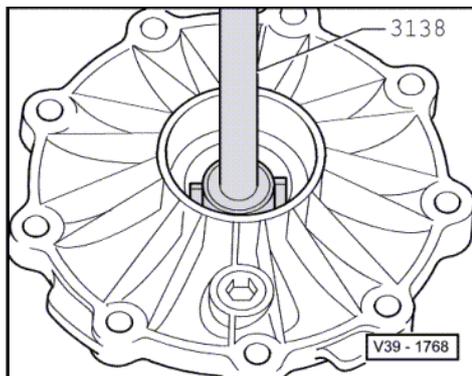
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-> Fig.6 Pressing on inner race for large taper roller bearing

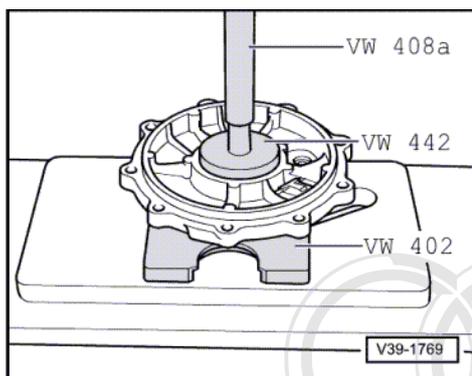
Caution
Wear protective gloves.

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



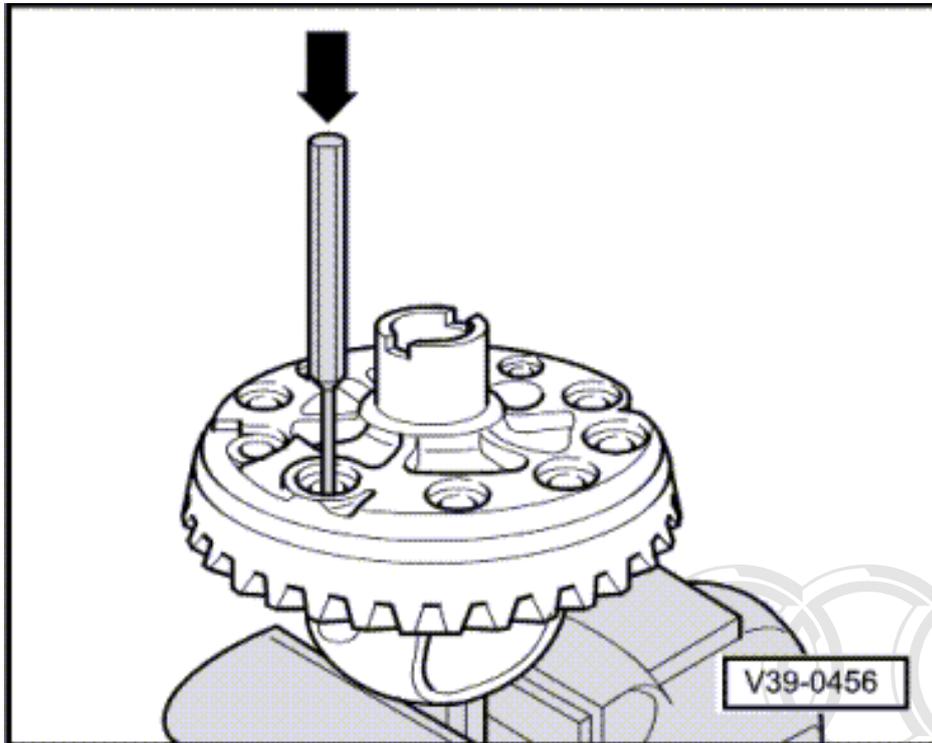
-> Fig.7 Driving outer race for large taper roller bearing out of cover

- After removing check shims for damage.

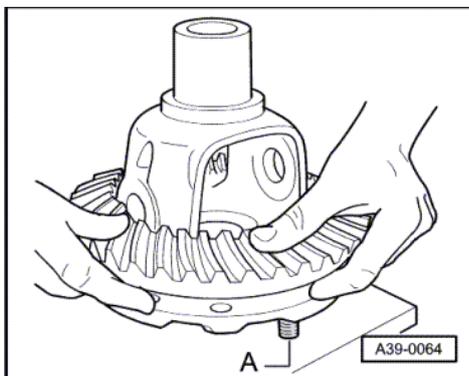


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-> Fig.8 Pressing outer race for large taper roller bearing into cover



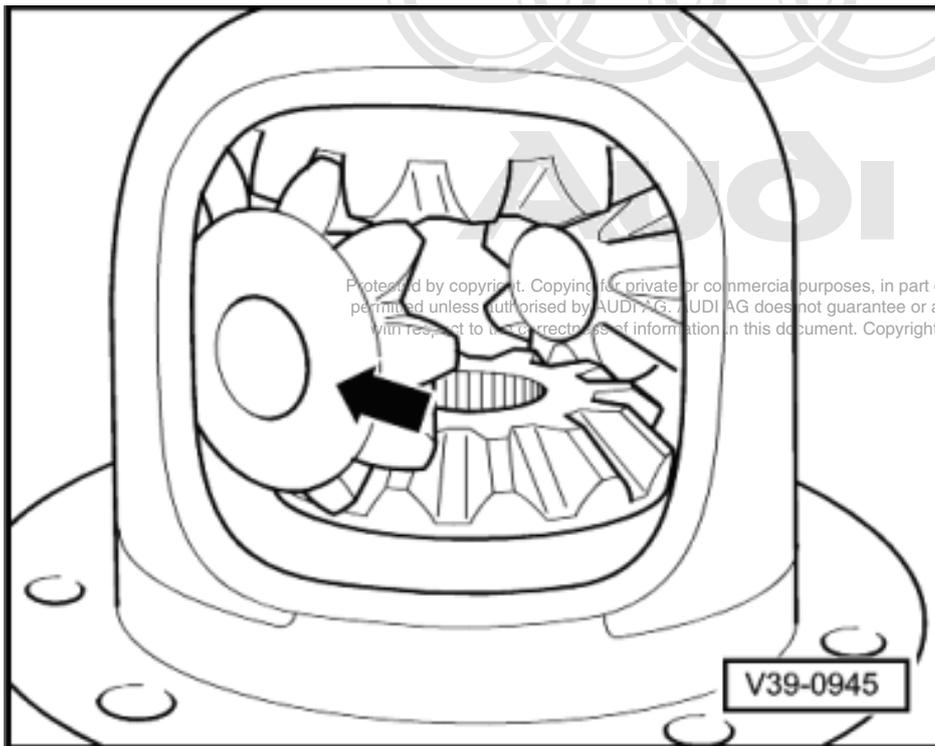
-> Fig.9 Driving crown wheel off housing



-> Fig.10 Installing crown wheel

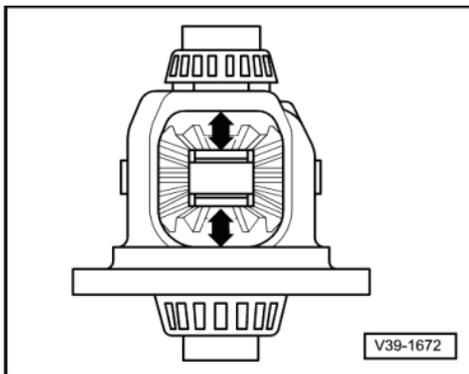
Caution
Wear protective gloves.

- 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.

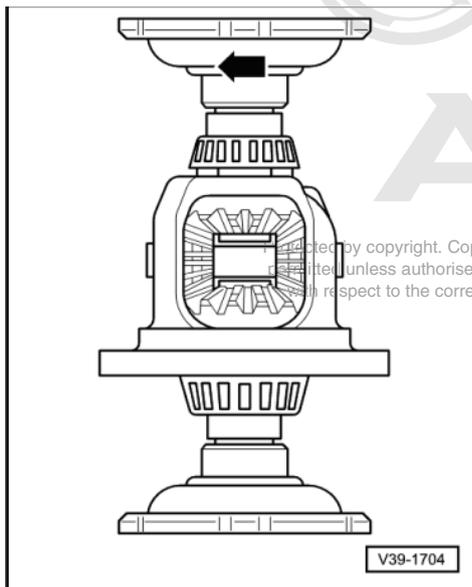
- Drive in planet pinion axis shaft.
- Press planet pinions outwards.
- Press sun wheels in direction indicated (arrows), and check the amount of play.
- Determine the thickest shims for the sun wheels (on each side) which can still just be inserted.

- 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



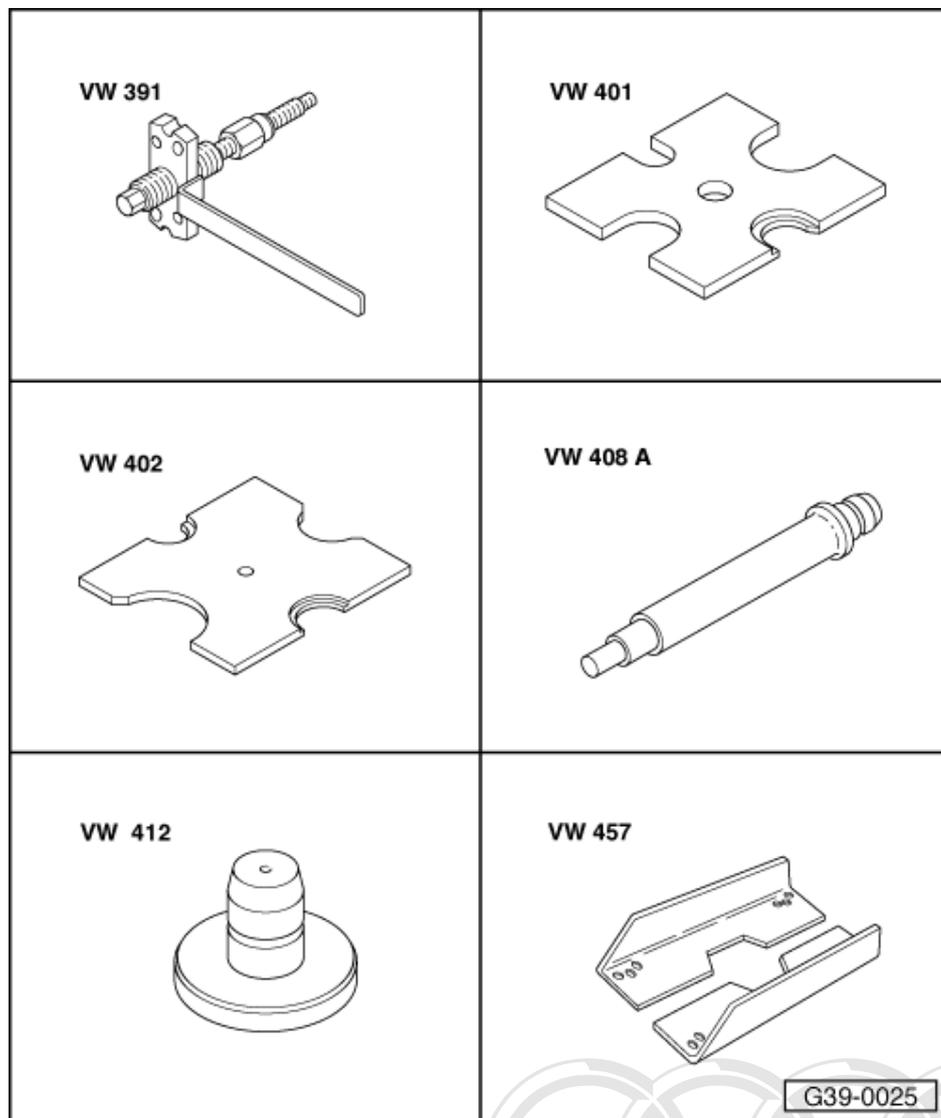
Note:

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



15 - Removing, installing, dismantling and assembling drive pinion

15.1 - Removing, installing, dismantling and assembling drive pinion

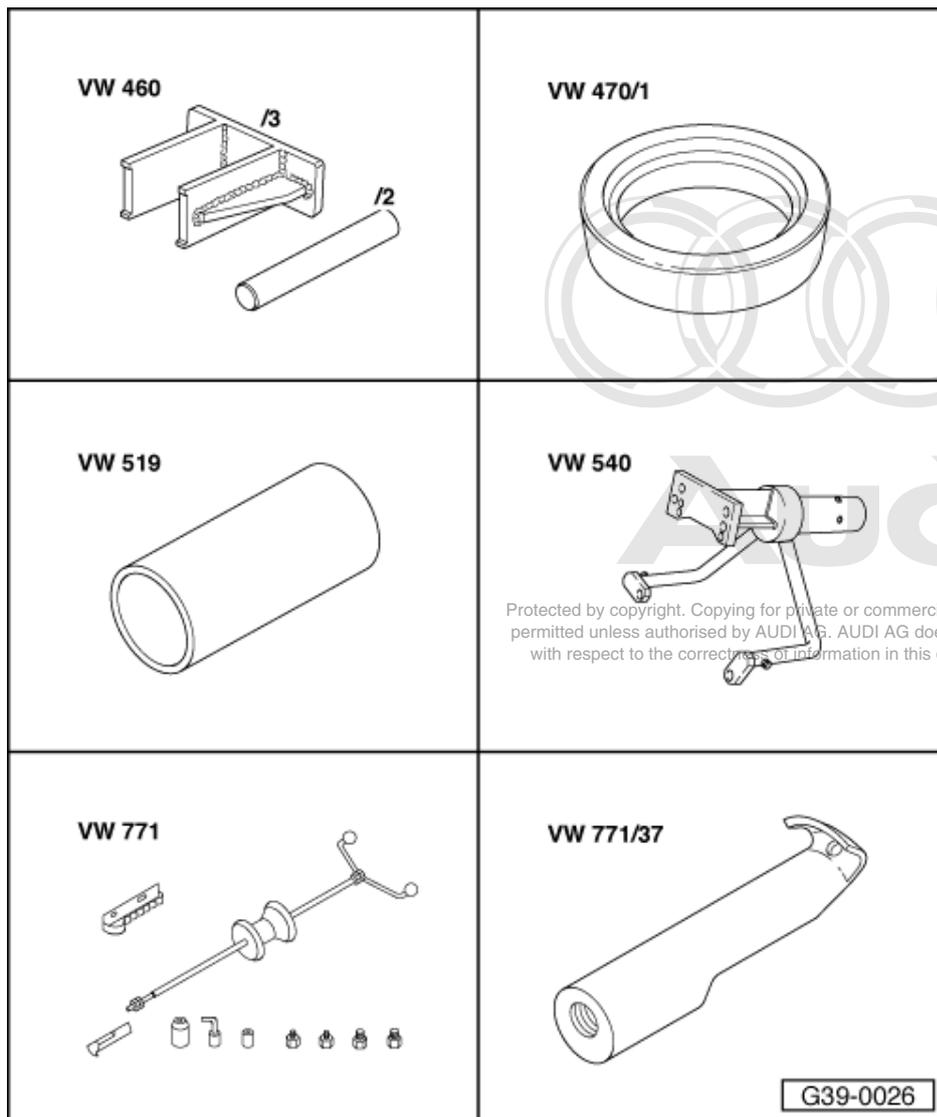


Special tools and workshop equipment required

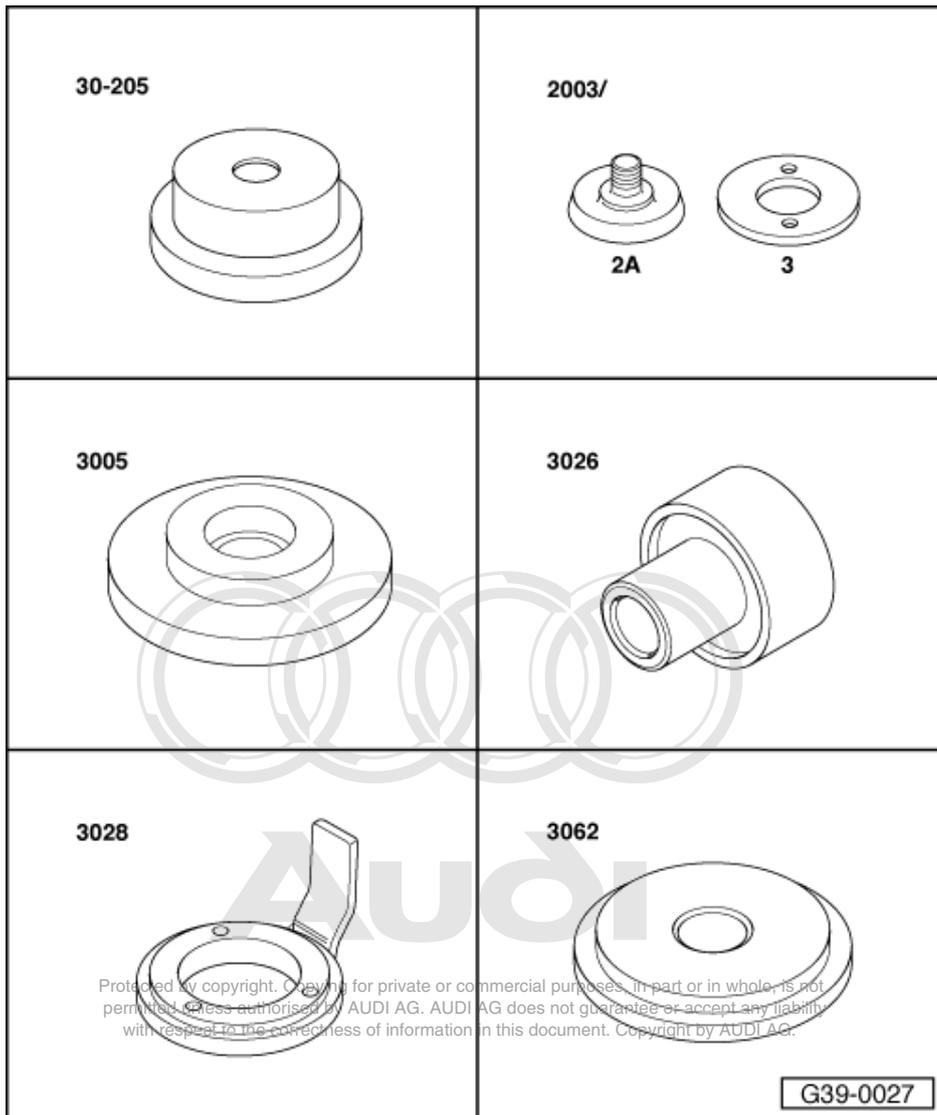
- ◆ Special tool VW 391
- ◆ Special tool VW 401
- ◆ Special tool VW 402
- ◆ Special tool VW 408 A
- ◆ Special tool VW 412
- ◆ Special tool VW 457



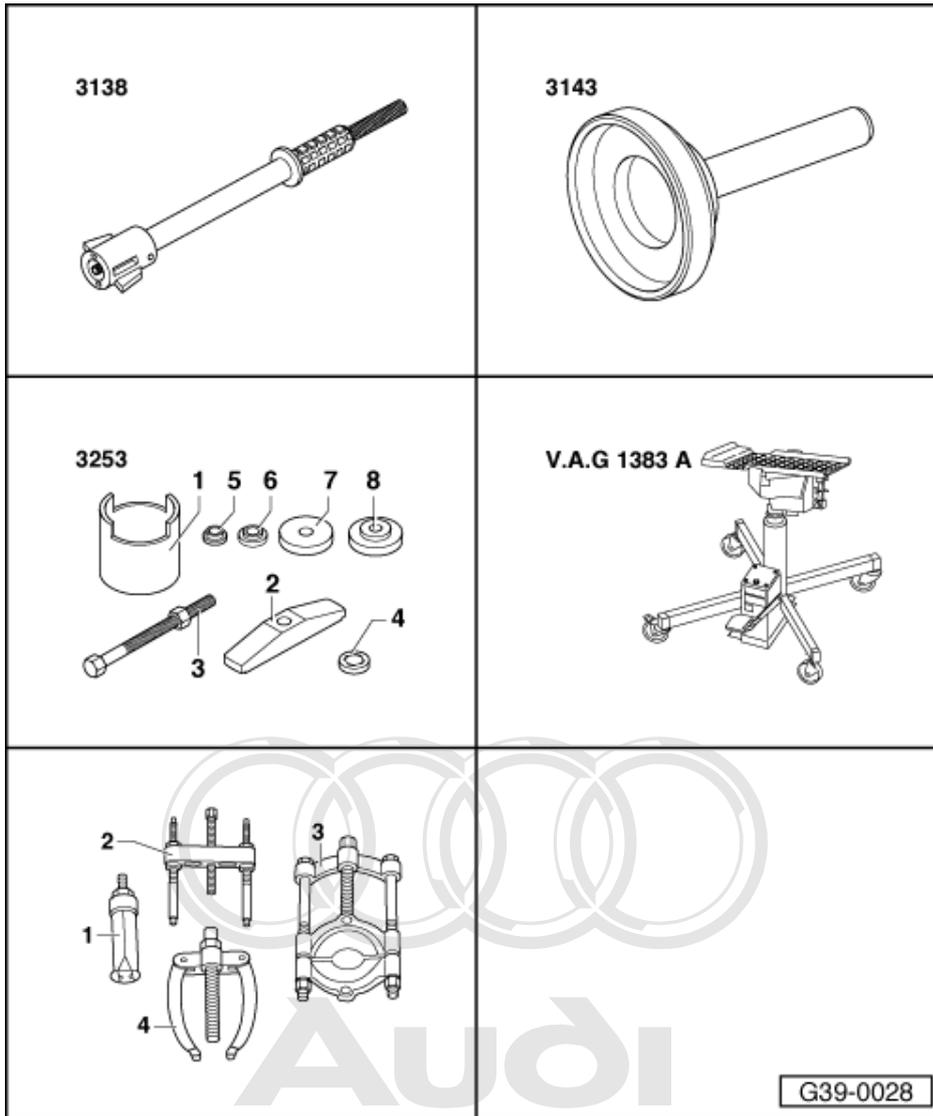
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- ◆ Special tool VW 460/2
- ◆ Special tool VW 470/1
- ◆ Special tool VW 519
- ◆ Special tool VW 540
- ◆ Special tool VW 771
- ◆ Special tool VW 771/37



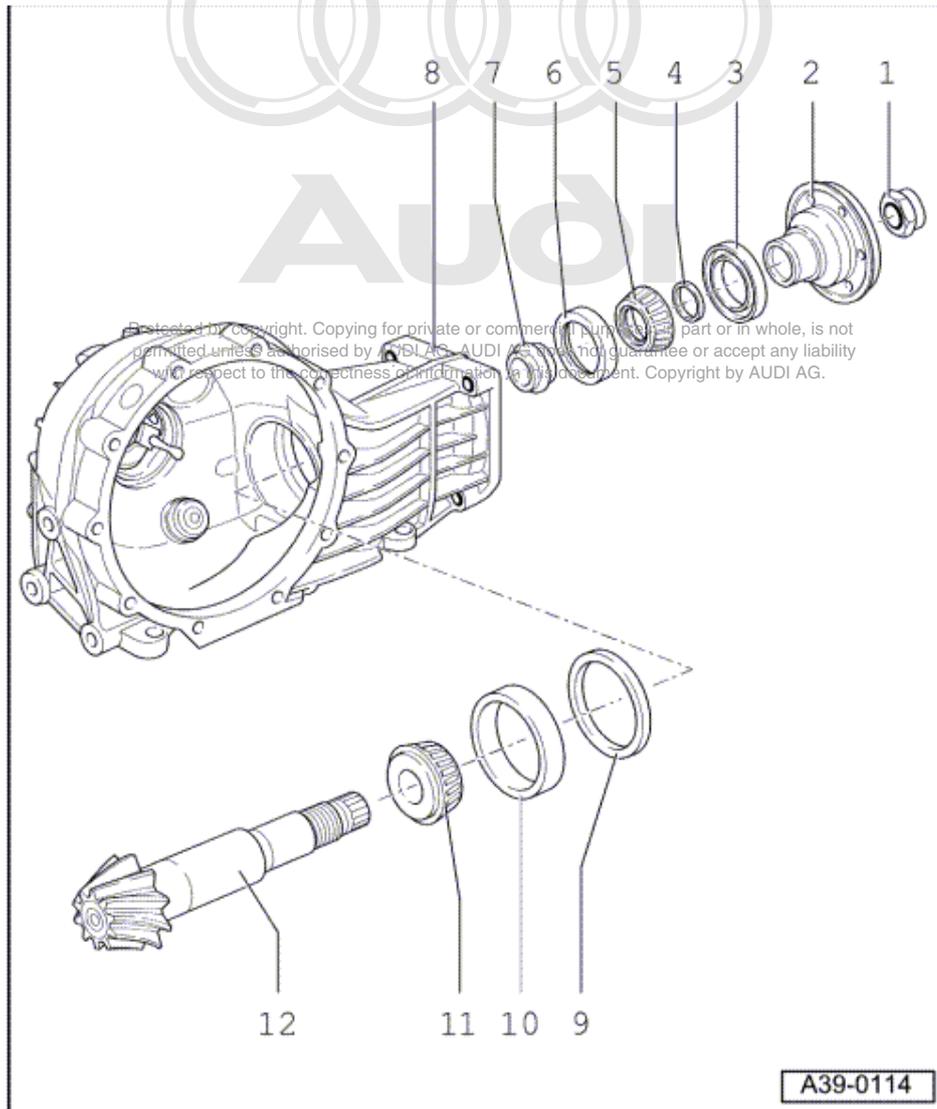
- ◆ Special tool 30-205
- ◆ Special tool 2003/3
- ◆ Special tool 3005
- ◆ Special tool 3026
- ◆ Special tool 3028
- ◆ Special tool 3062



- ◆ 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 39-142.
- ◆ Replace both taper roller bearings together. Use same make if possible.
- ◆ Do not additionally oil new taper roller bearings for frictional torque measurement. The bearings have already been treated with a special oil by the manufacturer.
- ◆ Removing differential => Page 191 .
- ◆ Adjustments are required when replacing components marked 1)
=>Adjustment overview, Page 225 .



1 Nut

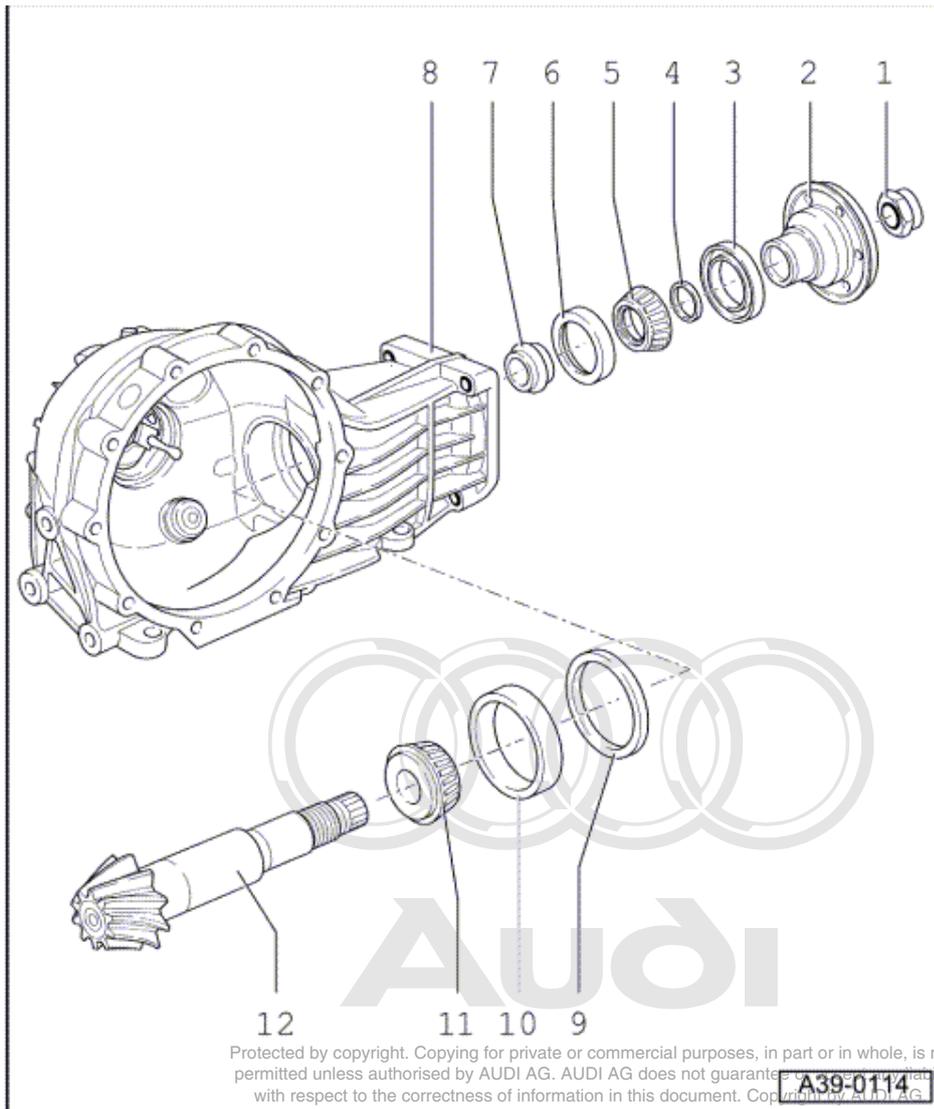
- ◆ Removing
=> Fig. 217
- ◆ Installing
=> Fig. 221
- ◆ Measuring friction torque
=> Fig. 222
- ◆ Securing
=> Fig. 222

2 Flange for propshaft

- ◆ Removing
=> Fig. 217
- ◆ Installing
=> Fig. 221

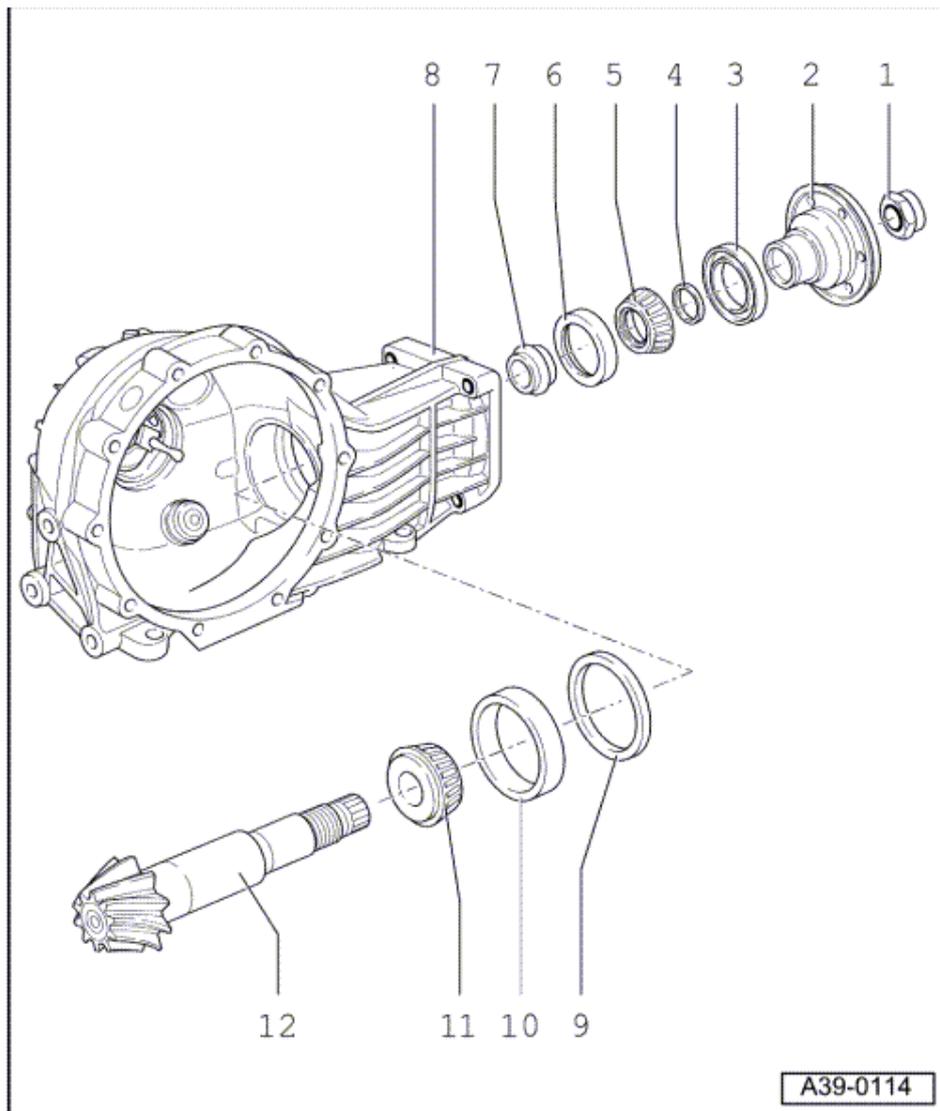
3 Oil seal

- ◆ Removing
=> Fig. 218
- ◆ Driving in
=> Fig. 221



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- 4 O-ring
 - ◆ Renew
 - ◆ Lubricate with gear oil when installing => Fig. 220
- 5 Inner race for small taper roller bearing 1)
 - ◆ Pressing out drive pinion
=> Fig. 218
 - ◆ Pressing on
=> Fig. 220
- 6 Outer race for small taper roller bearing 1)
 - ◆ Pulling out
=> Fig. 218
 - ◆ Pressing in
=> Fig. 220
- 7 Spacer sleeve 1)
 - ◆ Renew



8 Final drive housing 1)

9 Shim "S3"

- ◆ Note thickness
- ◆ Adjustment overview
=>Page 225

10 Outer race for large taper roller bearing 1)

- ◆ Driving out
=> Fig. 218
- ◆ Pulling in
=> Fig. 219

11 Inner race for large taper roller bearing 1)

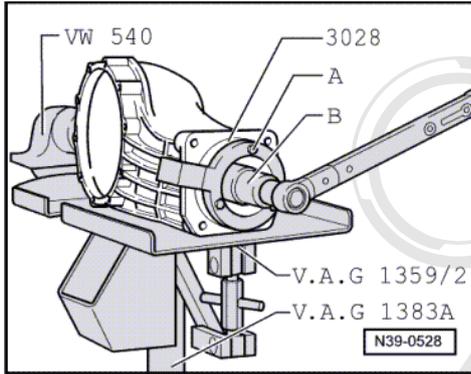
- ◆ Pulling off
=> Fig. 219
- ◆ Pressing on
=> Fig. 219

12 Drive pinion 1)

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

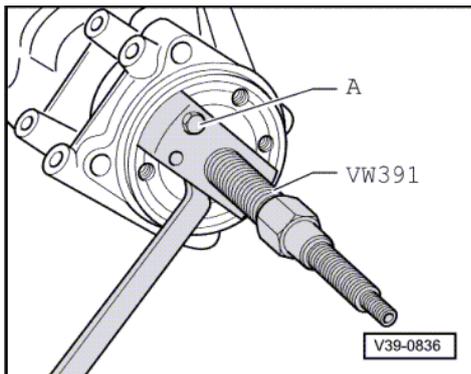


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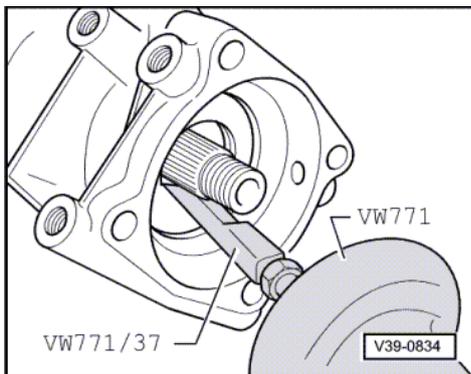
-> Fig.1 Removing nut for drive pinion

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



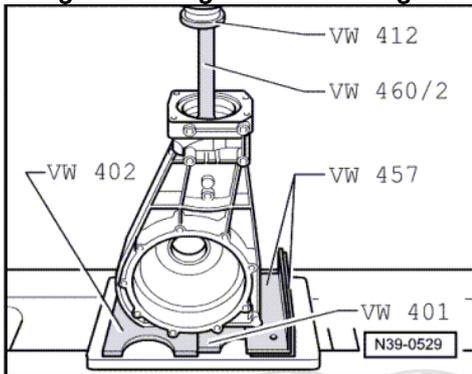
-> Fig.2 Pulling flange for propshaft off drive pinion

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

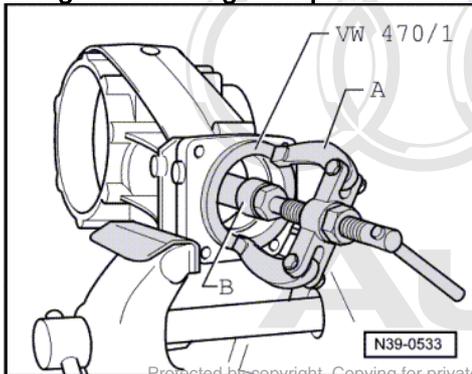




-> Fig.3 Pulling off seal for flange for propshaft

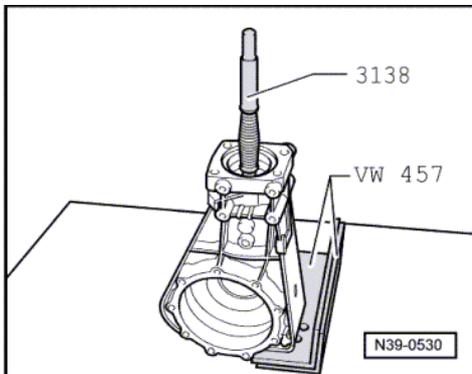


-> Fig.4 Pressing drive pinion out of inner race for small taper roller bearing



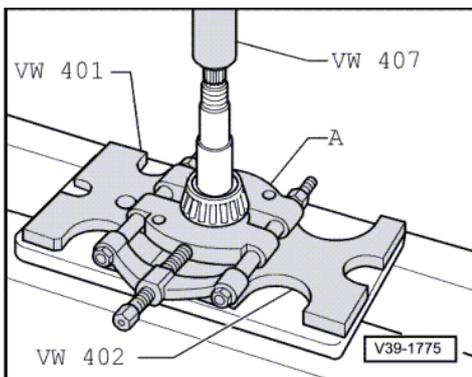
-> Fig.5 Pulling out outer race for small taper roller bearing

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



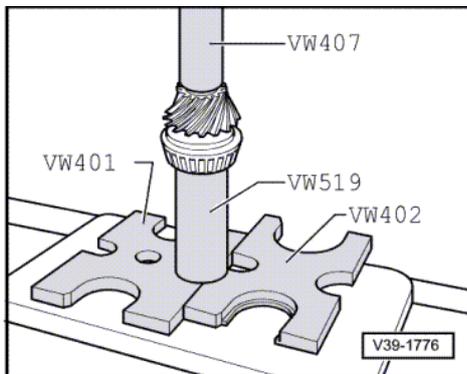
-> Fig.6 Driving out outer race for large taper roller bearing

- After removing check shims for damage.



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

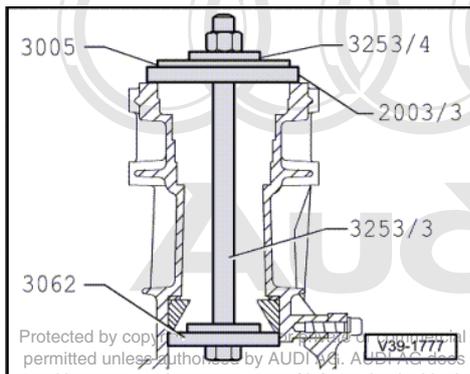
A - Separating device 22 ... 115 mm, e.g. Kukko 17/2



-> 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.



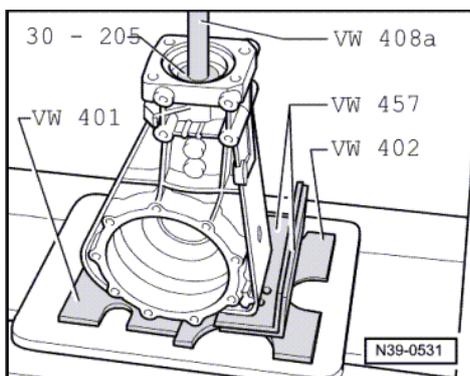
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-> Fig.9 Pulling in outer race for large taper roller bearing

- Insert predetermined shim "S3" for drive pinion => Page 229 .

Note:

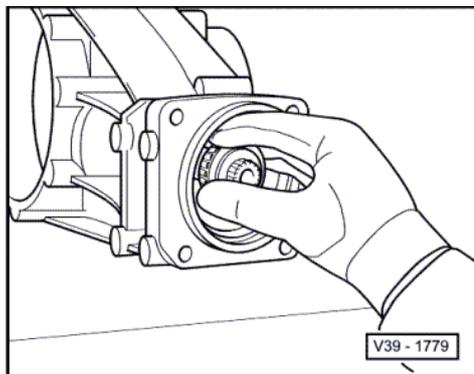
Inscription "Oben" faces the nut of the puller with thrust washer 3253/4.





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

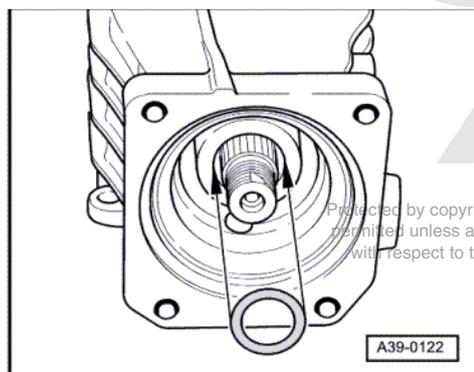
- Lubricate outer race with oil and fit using press tool VW 408 A and thrust plate 30-205.



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

Caution
Wear protective gloves.

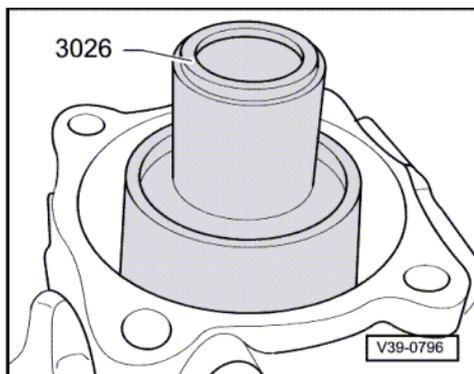
- Insert drive pinion with new spacer sleeve.
- Heat inner race for small taper roller bearing to approx. 100 °C and fit onto drive pinion.
- Press up drive pinion and insert bearing with thrust plate 40-21 onto stop.



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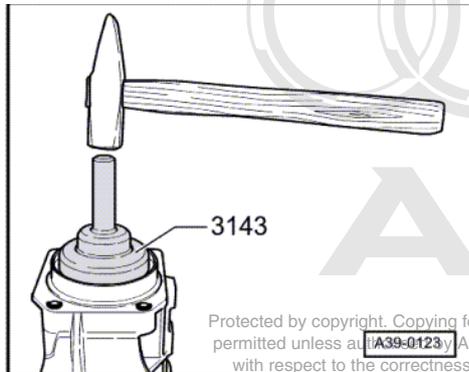
-> Fig.12 Installing O-ring

- Lubricate O-ring with gearbox oil and install.



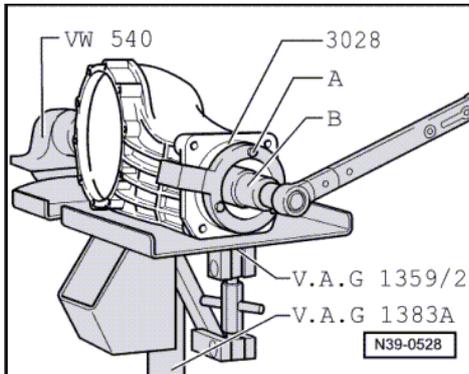
-> **Fig.13 Driving in seal for flange for propshaft**

- Lightly oil outer circumference of seal.
- Fill space between sealing and dust lips with multi-purpose grease.
- Drive in seal onto stop with drift 3026.



-> **Fig.14 Installing flange**

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

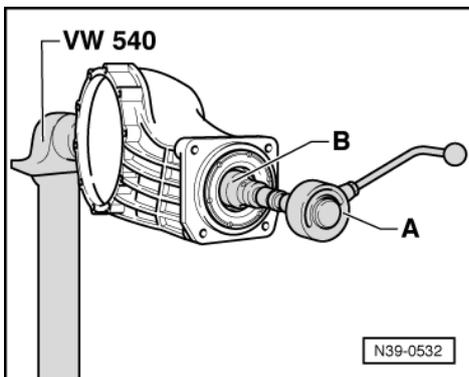


-> **Fig.15 Tightening nut for drive pinion and measuring friction torque**

- 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

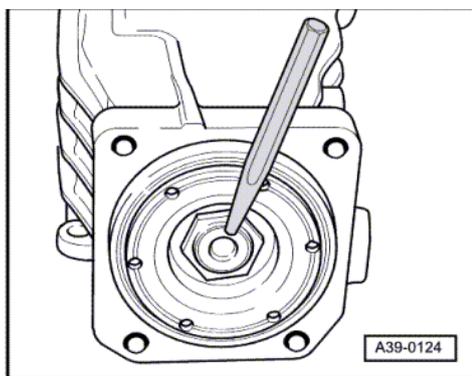
Note:

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

- The following frictional 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 187



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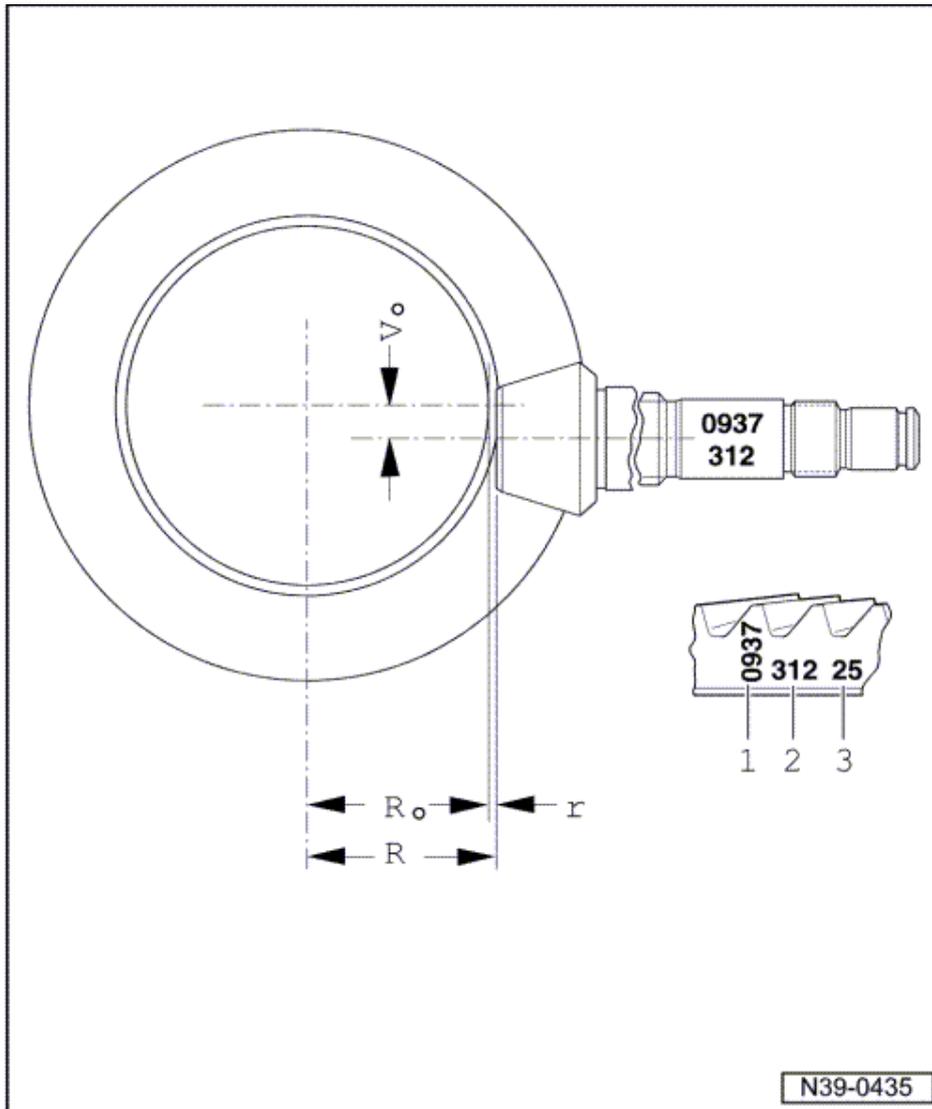
16 - Adjusting drive pinion and crown wheel

16.1 - 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.

16.2 - Adjusting final drive gear set; identification markings

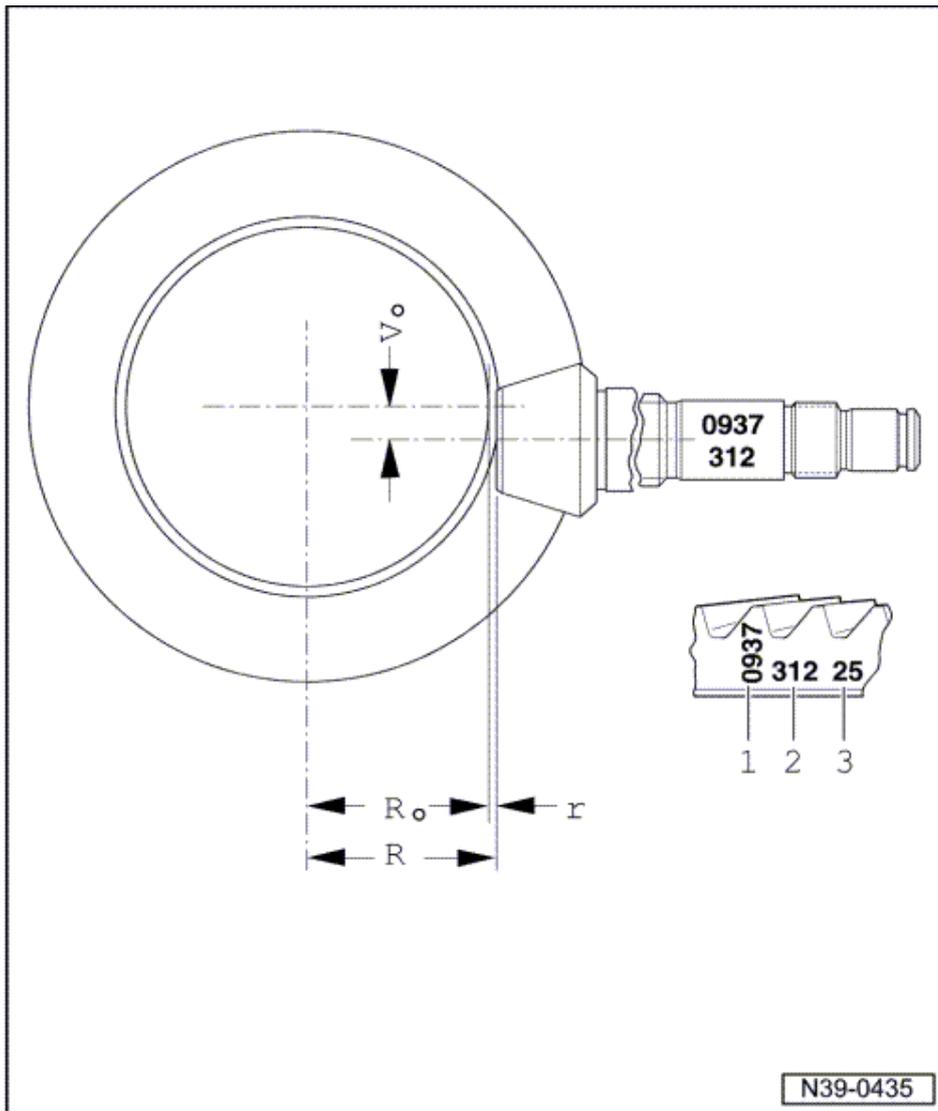


- 1 Identification "0937" signifies Oerlikon gear set with a ratio of 37:9.
- 2 Gear set pairing number (312).
- 3 Deviation (tolerance) "r" is based on the test machine master gauge used in the production. The deviation "r" is always given in 1/100 mm. Example: "25" signifies $r = 0.25$ mm

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

Audi

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

16.3 - 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.

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Note:

Overview of components and shims =>Page 226 .

16.4 - Adjustment overview

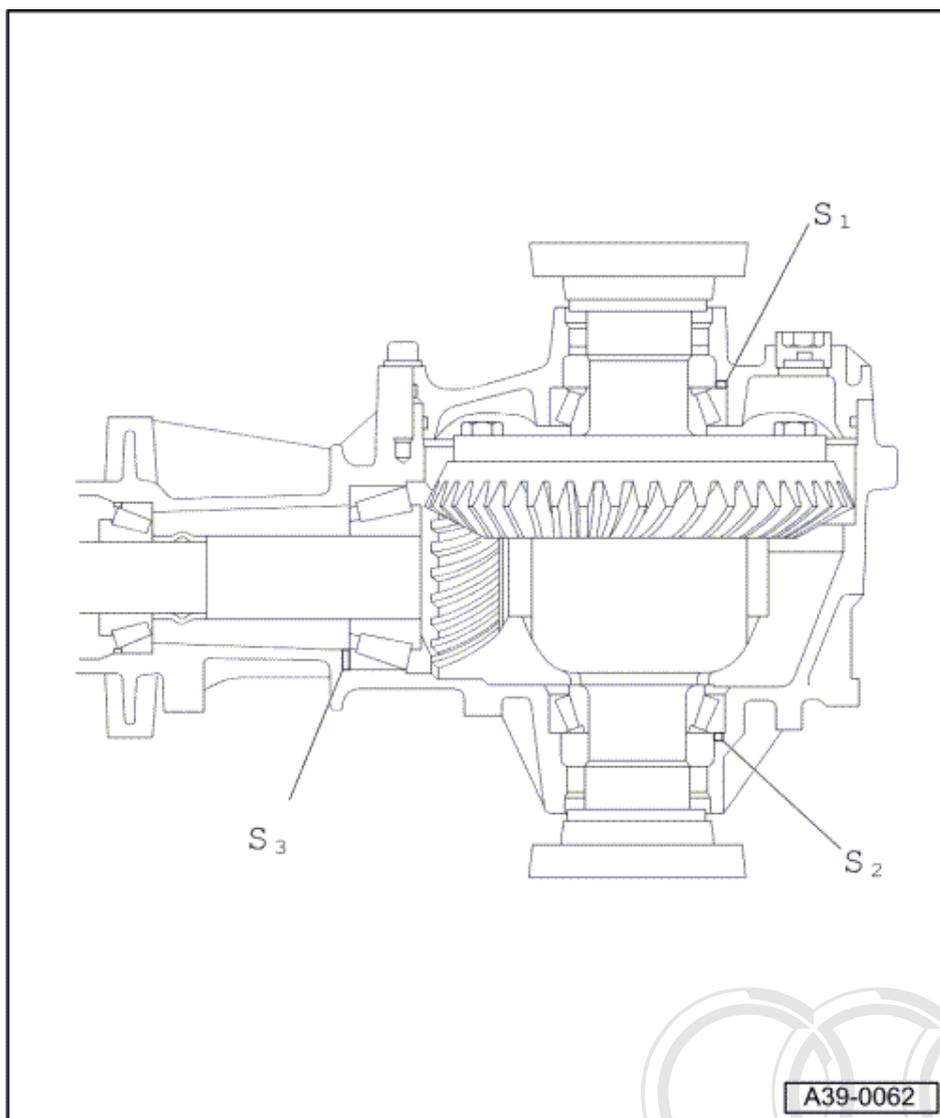
Note:

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 235	Drive pinion "S3" 1) via deviation "r" => Page 229	Check backlash => Page 238
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 226 .
- 2) Drive pinion and crown wheel; only renew together.

16.5 - Position of shims



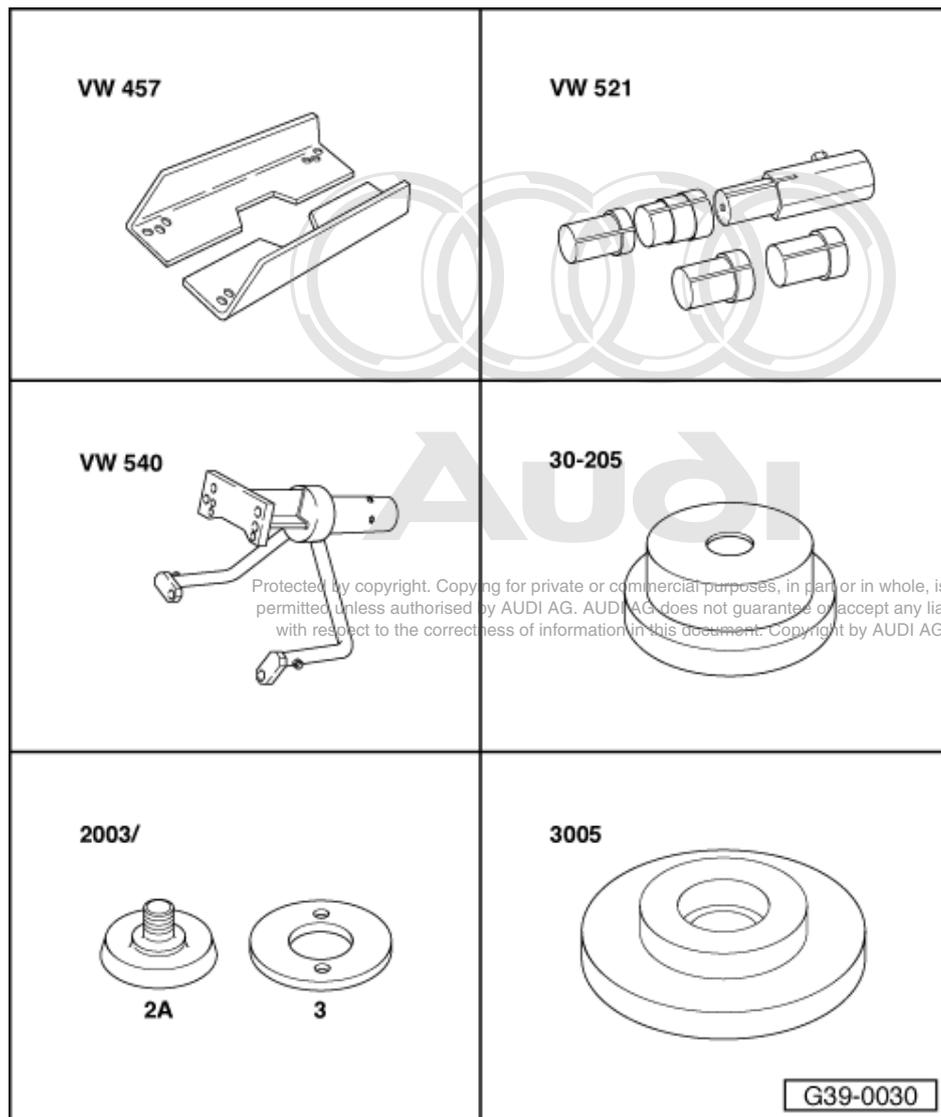
Note:

Adjustment overview when renewing individual components of final drive

=>Page 225.

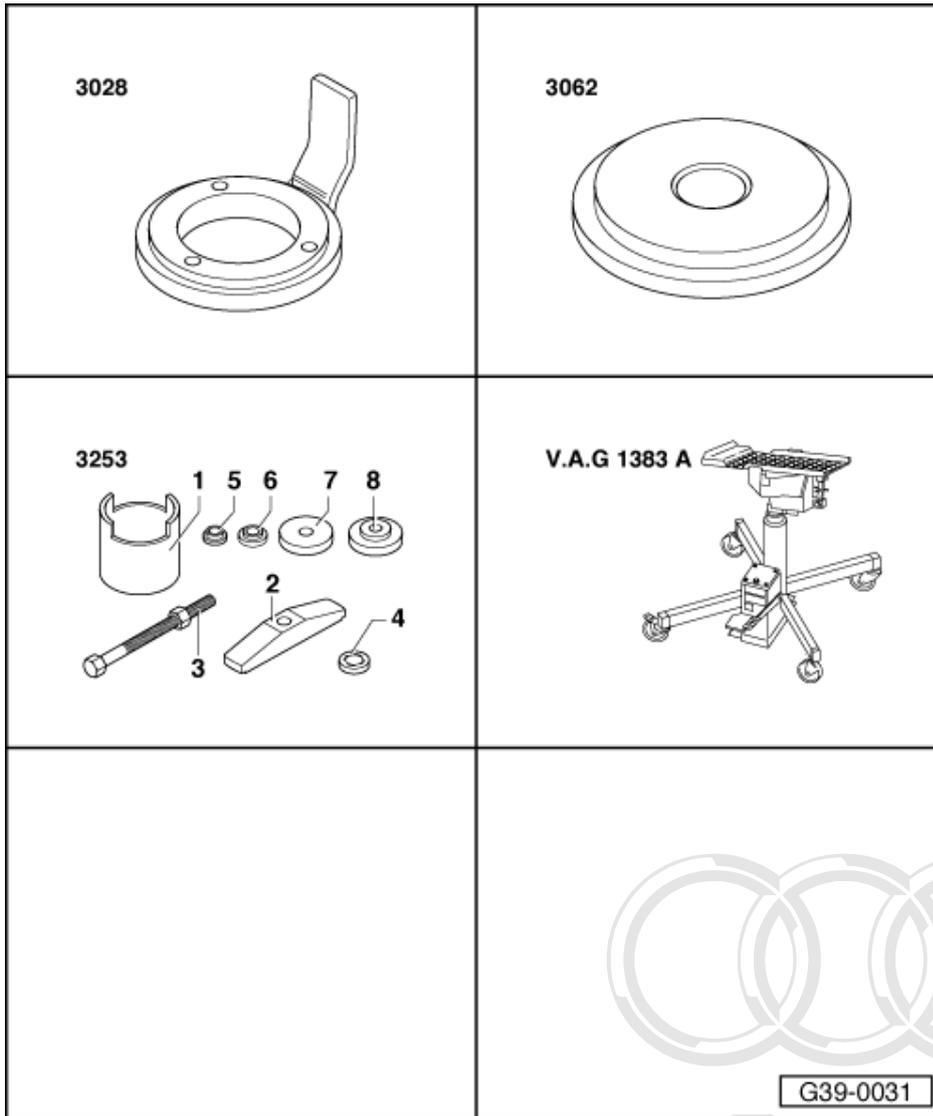
- S1 - Adjustment shim for crown wheel in cover for final drive**
- S2 - Adjustment shim for crown wheel in final drive housing**
- S3 - Adjustment shim for drive pinion in final drive housing**

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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



- ◆ 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

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16.6 - Adjusting drive pinion

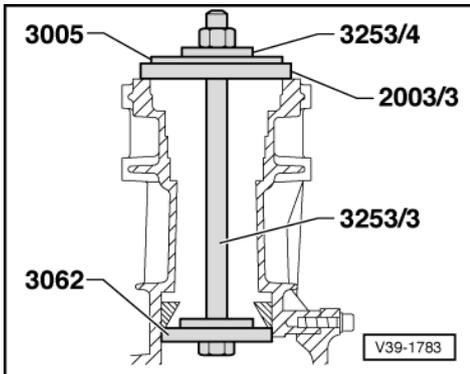
Notes:

- ◆ Before adjusting drive pinion, adjust crown wheel (determine total shim thickness "Stotal" for shims "S1" + "S2") =>Page 235 .
- ◆ 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 225 .
- ◆ 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"

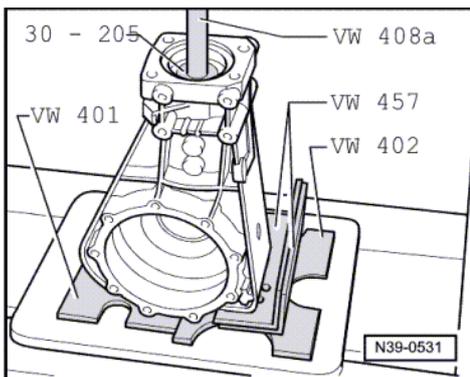
(Setting preload of taper roller bearing for drive pinion)



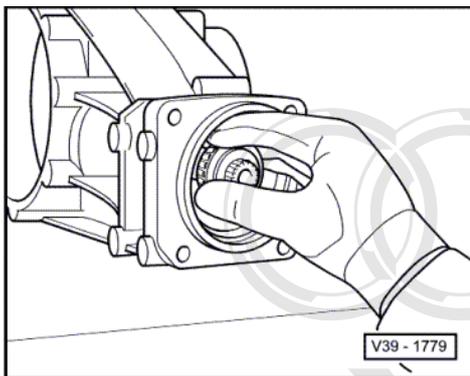
- Mount final drive on repair stand =>Page 179 .
- -> Pull outer race of large taper roller bearing into housing (without shim).

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.



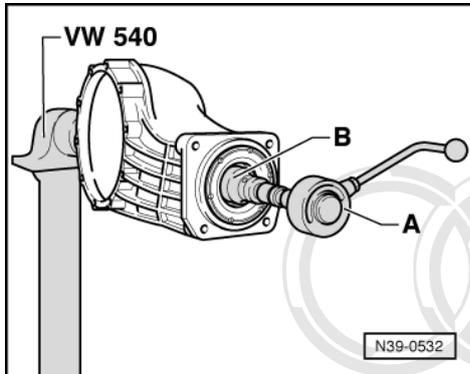
- -> Insert drive pinion without spacer sleeve.
- Heat inner race for taper roller bearing to approx. 100 °C and fit onto drive pinion.

Caution
Wear protective gloves.

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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.
- ◆ Only install spacer sleeve for final friction torque measurement (after determining shim "S3").

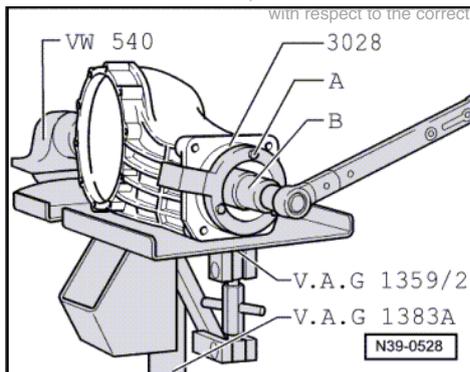


- A - -> Torque gauge, commercially available, 0 ... 600 Ncm
- B - Socket attachment, 36 mm A/F

Note:

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

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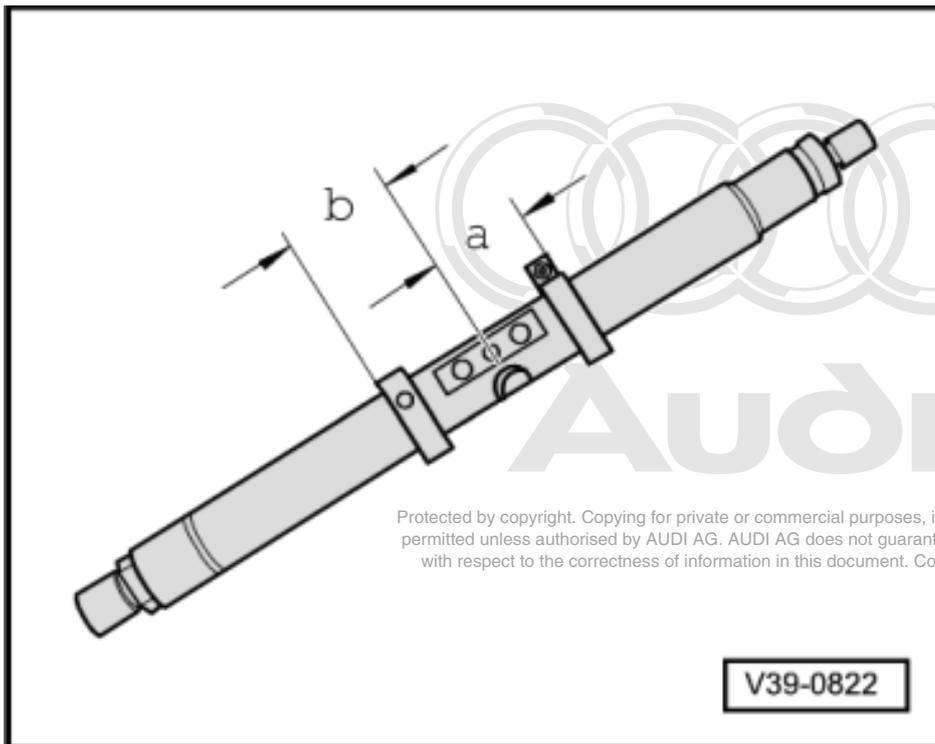


- Attach retainer 3028 with two M8 x 30 hexagon bolts -A-.
- B - Socket attachment (long) 36 mm A/F
- -> Tighten drive pinion nut until the following friction torque is obtained.

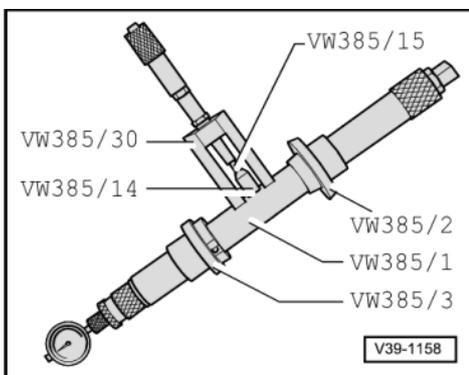
New bearings	Used bearings ¹⁾
200 ... 250 Ncm	30 ... 60 Ncm

1) run at least 50 km (30 miles)

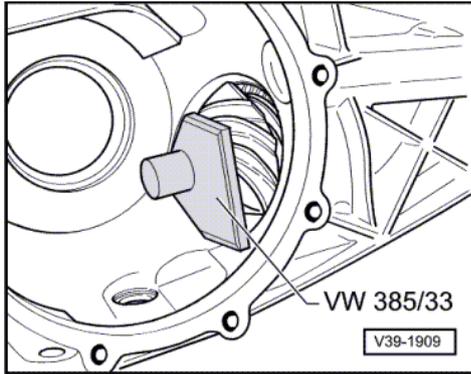
- The final drive must be supported when tightening the nut (e.g. using universal support V.A.G 1359/2 together with gearbox jack V.A.G 1383 A).



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



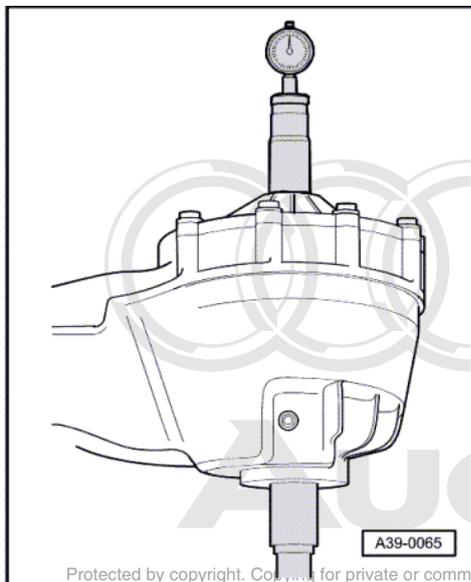
- -> Assemble universal mandrel as illustrated:
 - Dial gauge extension VW 385/15 = 9 mm long
- Set universal master gauge VW 385/30.
 - $R_o = 57.50$ mm
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.



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.

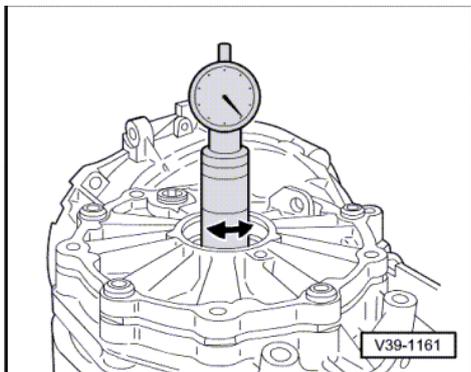
- -> Place end measuring plate VW 385/33 onto drive pinion head.



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- -> 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:	
"S3" = "e" - "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	

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

- 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 217 .
- Install inner race of small taper roller bearing and tighten nut for drive pinion until specified friction torque is obtained => Fig. 221 .

Notes:

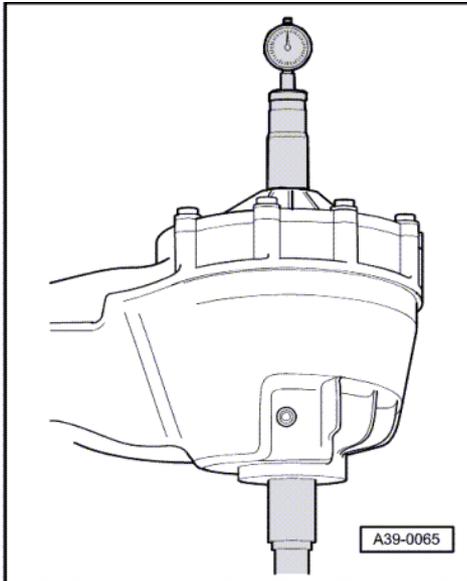
- ♦ Do not additionally oil new taper roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.
- ♦ Increase tightening torque slowly and check friction torque at regular intervals, if the specified friction torque is exceeded, the 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"



- 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 187 .

16.7 - Adjusting crown wheel

(Adjusting differential)

Repairs after which the crown wheel has to be adjusted
 =>Adjustment overview Page 225 .

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 197 .
- Press outer race of left-hand taper roller bearing for differential (housing side) with shim "S2" into housing =>Page 197. 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)

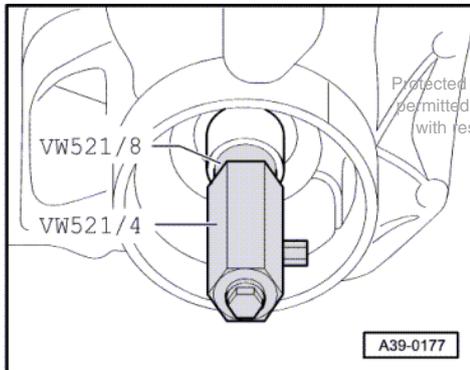
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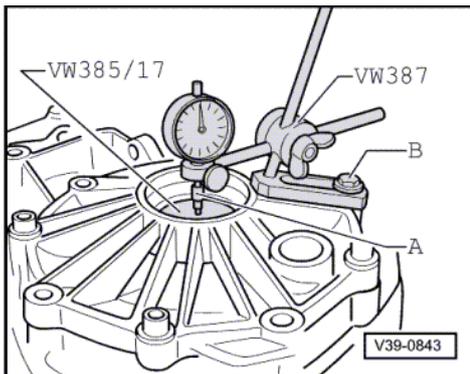
Note:

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 197 (install as far as the stop).
- Insert differential into housing. The crown wheel is positioned on the right side (cover side).



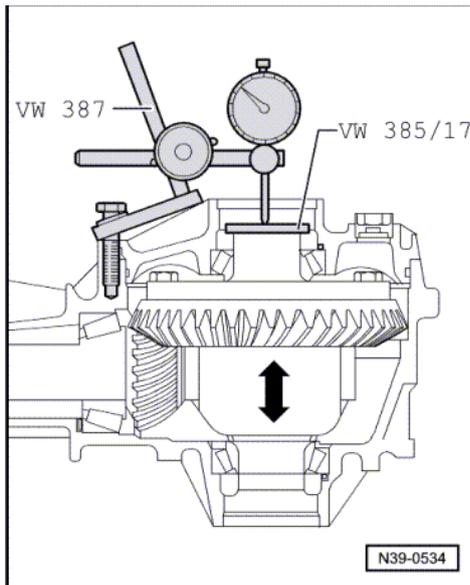
- Fit cover and tighten bolts to 25 Nm.
- -> Install special tools VW 521/4 and 521/8 onto housing side in differential housing.
- Turn cover side of differential housing upwards.



- 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 tapered roller bearing.

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

Example:

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

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Determining thickness of shim "S1"**

Notes:

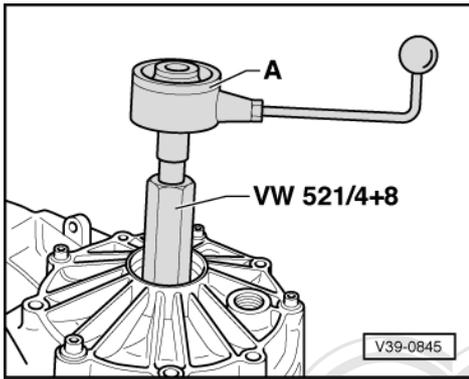
- ◆ The preliminary adjustment shim "S1**" will be replaced with the final shim "S1" after determining the backlash.
- ◆ The total shim thickness "Stotal" remains unchanged.

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 240 .



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

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

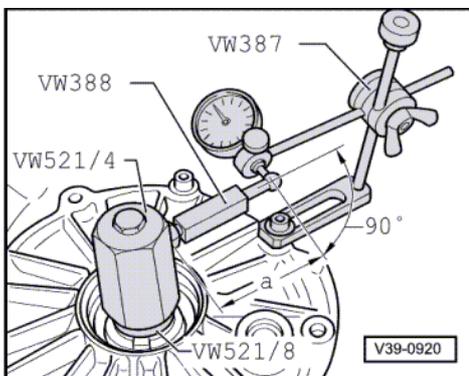
Notes:

- ♦ 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 229 .

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

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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

- 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

**Example:**

= Thickness of shim "S1" 0.94 mm

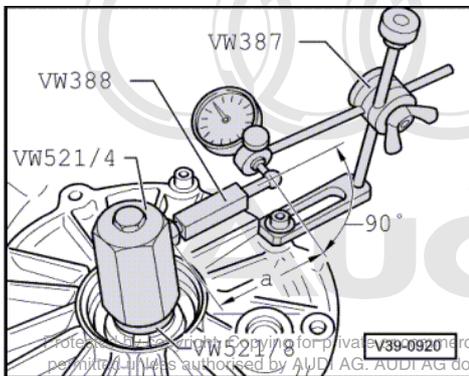
- Determine shim(s) as accurately as possible from table. Part numbers

=> 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.