

Audi 100 1991 ➤

Automatic Gearbox 01N									
Gearbox ID	CLF	CTA	CUW	DFG	DFH	DFJ	DMU	DMV	
Geartype	01N								

Edition 05.2002



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Repair GroupsList of Workshop Manual Repair Groups

Audi 100 1991 ➤

Automatic Gearbox 01N

Repair Group

00 - Technical data

32 - Torque converter

37 - Controls, Housing

38 - Gears, Hydraulic controls

39 - Final drive, Differential



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

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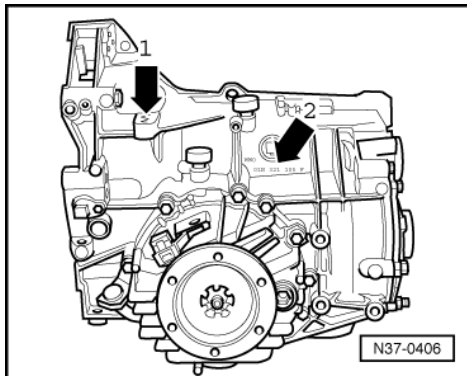


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00 - Technical data

1 - Gearbox identification

1.1 - Gearbox identification

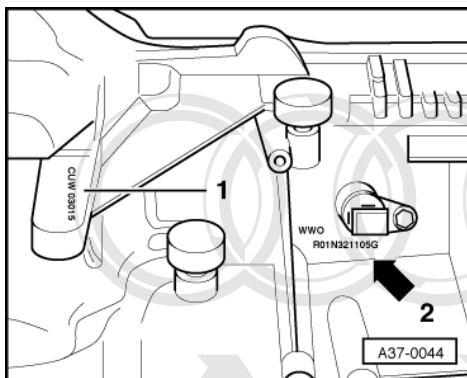


The "4-speed automatic gearbox 01N" is installed in the Audi 100 1991 ä in conjunction with 4-cylinder petrol or diesel engines. Allocation => Page 2 .

Location on gearbox

-> Code letters (arrow 1)

Automatic gearbox 01N (arrow 2)



-> Code letters and date of manufacture of gearbox

Example:	CUW	03	01	5
	Code	Day	Month	Year (1995)
				of manufacture

Additional data is production-related

Note:

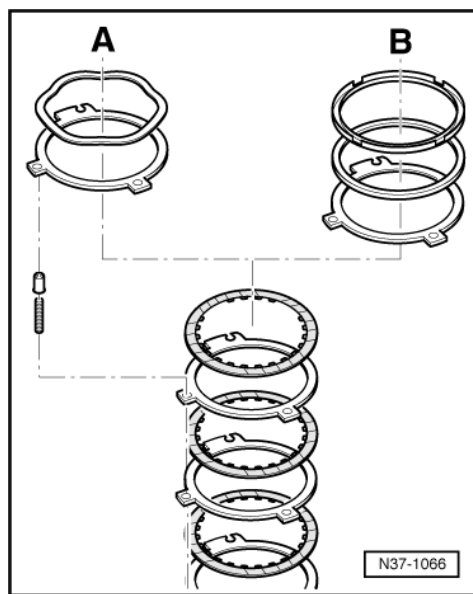
The code letters for the gearbox are also given on the vehicle data stickers.

2 - Information on "Automatic gearbox 01N"

2.1 - Information on "Automatic gearbox 01N"

Comprehensive information on 4-speed automatic gearboxes is given in self study programme No. 172

2.2 - Two gearbox generations



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-> A distinction is made between two types of gearbox:

- A - Gearboxes in which a corrugated spring washer is fitted onto the last outer plate in brake -B2- (code letters => from Page 2)
- B - Gearboxes in which a shim and a retaining ring are fitted in brake -B2- (code letters => from Page 2)

2.3 - Self-diagnosis

The self-diagnosis is described in a separate guideline:

=> Automatic Gearbox 01N, Self-diagnosis; Repair group 01

3 - Code letters, mechanical unit assignment, transmission ratios, equipment

3.1 - Code letters, mechanical unit assignment, transmission ratios, equipment

Automatic gearbox			01N	
Gearbox	Code		CLF 1)	CTA 1)
	Production	from to	01.95 10.95	01.95 10.95
Torque converter	Code		LCDB	LADB

Automatic gearbox			01N			
Valve body	Code		LCA		LCA	
	Production	from to	01.95 10.95		01.95 10.95	
Number of plates			Interior	Exterior	Interior	Exterior
	Clutch -K1-		5	5	5	5
	Clutch -K2-		5	5	5	5
	Clutch -K3-		6	5	5	4
	Brake -B1-		5	5	5	5
	Brake -B2-		6	7	6	7
Allocation	Model		Audi 100 1991 ä		Audi 100 1991 ä	
	Engine		1.9 l TDI - 66 kW		2.0 l - 85 kW	

1) Brake -B2- with corrugated spring washer on the last outer plate

Gearbox	Code	CLF	CTA
Ratios	1st gear	2.714	2.714
	2nd gear	1.441	1.441
	3rd gear	1.000	1.000
	4th gear	0.742	0.742
	Reverse gear	2.884	2.884
Intermediate drive	No. of teeth	Input gear	44
		Output gear	51
	Ratio		1.159
Final drive	No. of teeth	Drive shaft	11
		Crown wheel	35
	Ratio		3.182
Drive shaft	Flange ø mm	130	130

Automatic gearbox			01N			
Gearbox	Code		CUW 1)		DFG 1)2)	
	Production	from to	09.95 10.95		10.95	
Torque converter	Code		LADB		LADC	
Valve body	Code		LCA		LCA	
	Production	from to	09.95 10.95		10.95	
Number of plates			Interior	Exterior	Interior	Exterior
	Clutch -K1-		5	5	5	5
	Clutch -K2-		5	5	5	5
	Clutch -K3-		5	4	5	4
	Brake -B1-		5	5	5	5
	Brake -B2-		6	7	6	7
Allocation	Model		Audi 100 1991 ä		Audi 100 1991 ä	



Automatic gearbox	01N	
Engine	1.8 l - 92 kW	1.8 l - 92 kW

- 1) Brake -B2- with corrugated spring washer on the last outer plate
- 2) Multi-function switch -F125 altered

Gearbox	Code		CUW	DFG
Ratios	1st gear		2.714	2.714
	2nd gear		1.551	1.551
	3rd gear		1.000	1.000
	4th gear		0.679	0.679
	Reverse gear		2.111	2.111
Intermediate drive	No. of teeth	Input gear	44	44
		Output gear	51	51
	Ratio		1.159	1.159
Final drive	No. of teeth	Drive shaft	9	9
		Crown wheel	40	40
	Ratio		4.444	4.444
Drive shaft	Flange ø mm		130	130

Automatic gearbox		01N			
Gearbox	Code	DFH 1)2)		DFJ 1)2)	
	Production	from	10.95	10.95	
Torque converter	Code	LCDC		LADC	
Valve body	Code	LCA		LCA	
	Production	from	10.95	10.95	
Number of plates		Interior	Exterior	Interior	Exterior
	Clutch -K1-	5	5	5	5
	Clutch -K2-	5	5	5	5
	Clutch -K3-	6	5	5	4
	Brake -B1-	5	5	5	5
	Brake -B2-	6	7	6	7
	Allocation	Model	Audi 100 1991 ä		Audi 100 1991 ä
	Engine	1.9 l TDI - 66 kW		2.0 l - 85 kW	

- 1) Brake -B2- with corrugated spring washer on the last outer plate
- 2) Multi-function switch -F125 altered

Gearbox	Code		DFH	DFJ
Ratios	1st gear		2.714	2.714
	2nd gear		1.441	1.441
	3rd gear		1.000	1.000
	4th gear		0.742	0.742
	Reverse gear		2.884	2.884
Intermediate drive	No. of teeth	Input gear	44	44

Gearbox	Code	DFH	DFJ
	Output gear	51	51
	Ratio	1.159	1.159
Final drive	No. of teeth	11	11
	Crown wheel	35	43
	Ratio	3.182	3.910
Drive shaft	Flange ø mm	130	130

Automatic gearbox		01N			
Gearbox	Code	DMU 3)		DMV 3)	
	Production from to	10.96		01.97	
Torque converter	Code	LADC		LCDC	
Valve body	Code	LEA		LEA	
	Production from to	10.96		01.97	
Number of plates		Interior	Exterior	Interior	Exterior
	Clutch -K1-	5	5	5	5
	Clutch -K2-	4	4	4	4
	Clutch -K3-	5	4	5	4
	Brake -B1-	5	5	5	5
	Brake -B2-	4	5	4	5
Allocation	Model	Audi 100 1991 ä		Audi 100 1991 ä	
	Engine	1.8 l - 92 kW		1.9 l TDI - 66 kW	

3) Brake -B2- with shim and retaining ring

Gearbox	Code	DMU	DMV
Ratios	1st gear	2.714	2.714
	2nd gear	1.551	1.441
	3rd gear	1.000	1.000
	4th gear	0.679	0.742
	Reverse gear	2.111	2.884
Intermediate drive	No. of teeth	Input gear	44
		Output gear	51
	Ratio	1.159	1.159
Final drive	No. of teeth	Drive shaft	9
		Crown wheel	40
	Ratio	4.444	3.182
Drive shaft	Flange ø mm	130	130



4 - Filling quantities

4.1 - Filling quantities

Planetary gearbox

Filling quantities	Planetary gear-box	Automatic Gear-box
Fresh fill	5.5 l	01N
Change	approx. 3.5 l (1)	
Lubricant	ATF	

- 1) Filled for life: Change only after repair, with dismantling of oil pan up to 3.5 litres.

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ATF is available as a replacement part (also designated VW ATF).

- ♦ 0.5 l - Part no. G 052 162 A1
- ♦ 1.0 l - Part no. G 052 162 A2
- ♦ 20 l - Part no. G 052 162 A6

Note:

In the automatic gearbox 01N, only the ATF available as a replacement part may be used.

Check and adjust ATF => Page **60**

Final drive

Filling quantities	Final drive	Automatic Gear-box
Fresh fill	1.0 l	01N
Change	Filled for life, no change	
Lubricant	Gear oil SAE 75 W 90 (synthetic oil)	

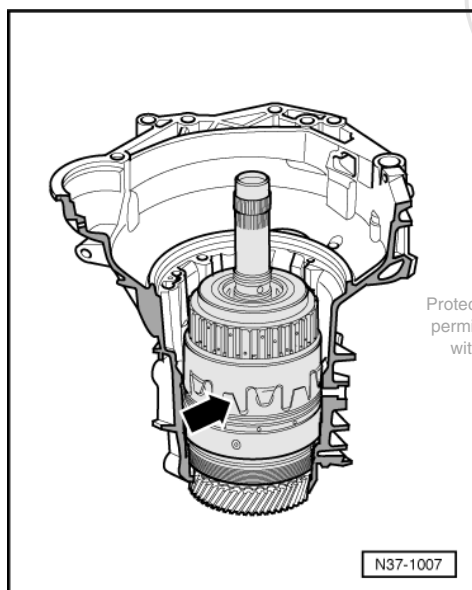
Gear oil SAE 75 W 90 (synthetic oil) is available as a replacement part in following container sizes:

- ♦ 0.5 l - Part no. G 052 145 A1
- ♦ 1.0 l - Part no. G 052 145 S2

Checking oil level in final drive =>Page **194**

5 - Repairs using an exchange component

5.1 - Repairs using an exchange component



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-> The exchange component -arrow- is an inexpensive replacement part set. It contains all clutches, all brakes, the ATF-pump, the planetary gearbox and the valve body of the particular gearbox.

The exchange component is allocated to the gearbox according to its code letters=>from Page **2**.

Scope of supply of the exchange component => from Page **8**.

Not included are:

- ◆ O-rings for ATF-radiator, ATF-filler pipe, multi-function switch -F125, senders -G68 and -G38
- ◆ Oil pan gasket, cover gasket of intermediate drive
- ◆ Conductor strip of valve body

Removing

- Removing exchange component => from Page **77** (Dismantling planetary gearbox).

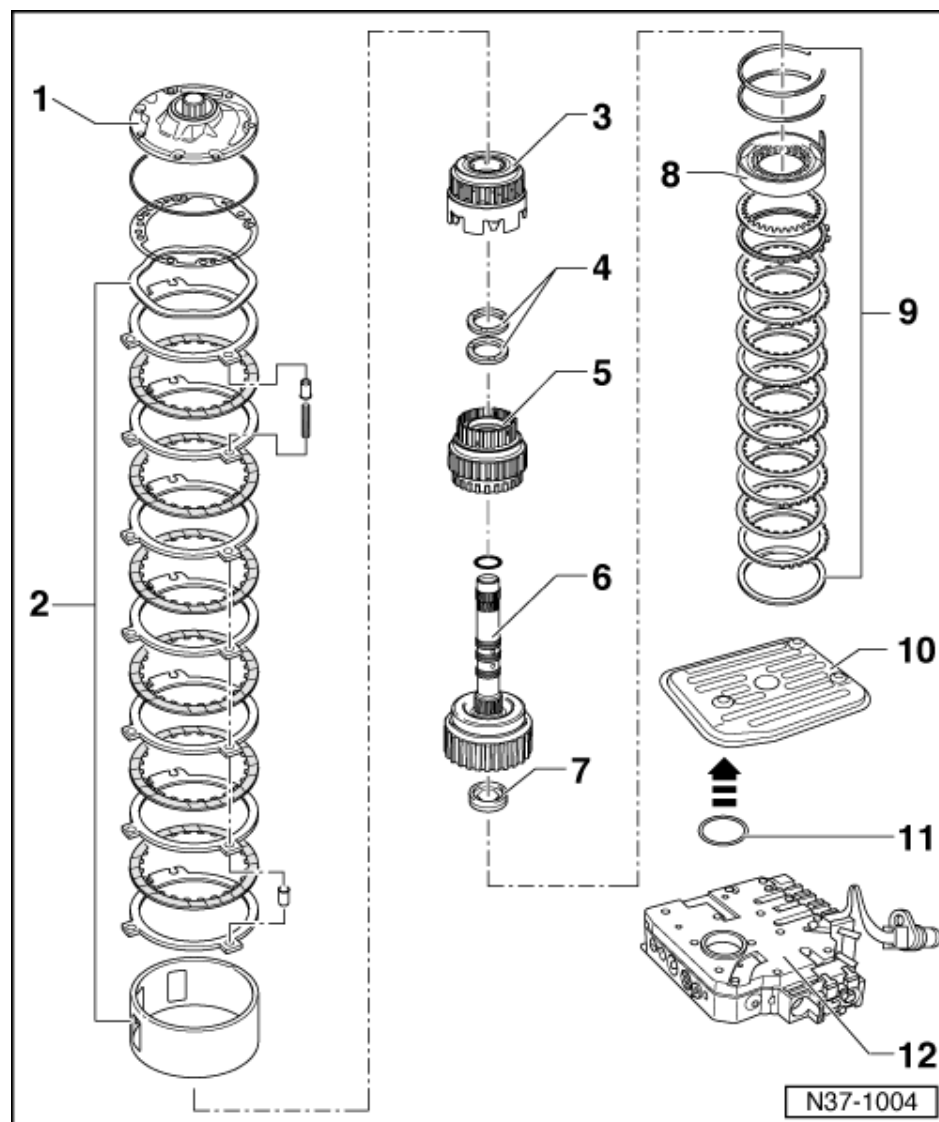
Installing

- Installing exchange component => from Page **87** (Assembling planetary gearbox).

Note:

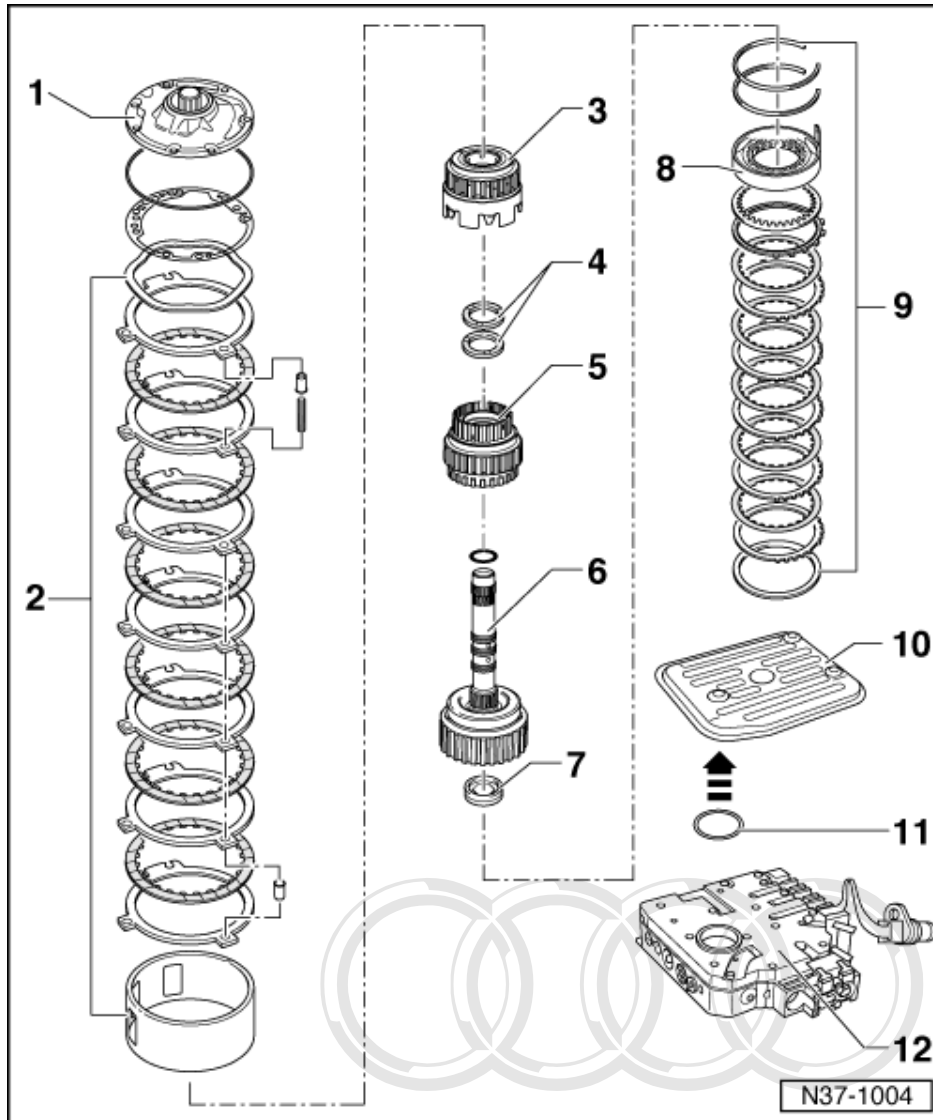
When installing an exchange component, use all the new parts of the exchange component, do not re-used old parts.

5.2 - Scope of supply of the exchange components



- 1 ATF pump with piston -B2-
- 2 Components of -B2-
 - ♦ =>Page 11
- 3 Reverse gear clutch -K2-
- 4 Shims for clutch play
 - ♦ Different coloured shims, different thickness
- 5 1st to 3rd gear clutch -K1-
 - ♦ The clutches -K1- and -K3- may be pressed together
- 6 3rd and 4th gear clutch -K3- with turbine shaft
 - ♦ The clutches -K1- and -K3- may be pressed together

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7 Axial needle bearing with washer

8 Freewheel with piston -B1-

9 Components of -B1-

♦ =>Page 10

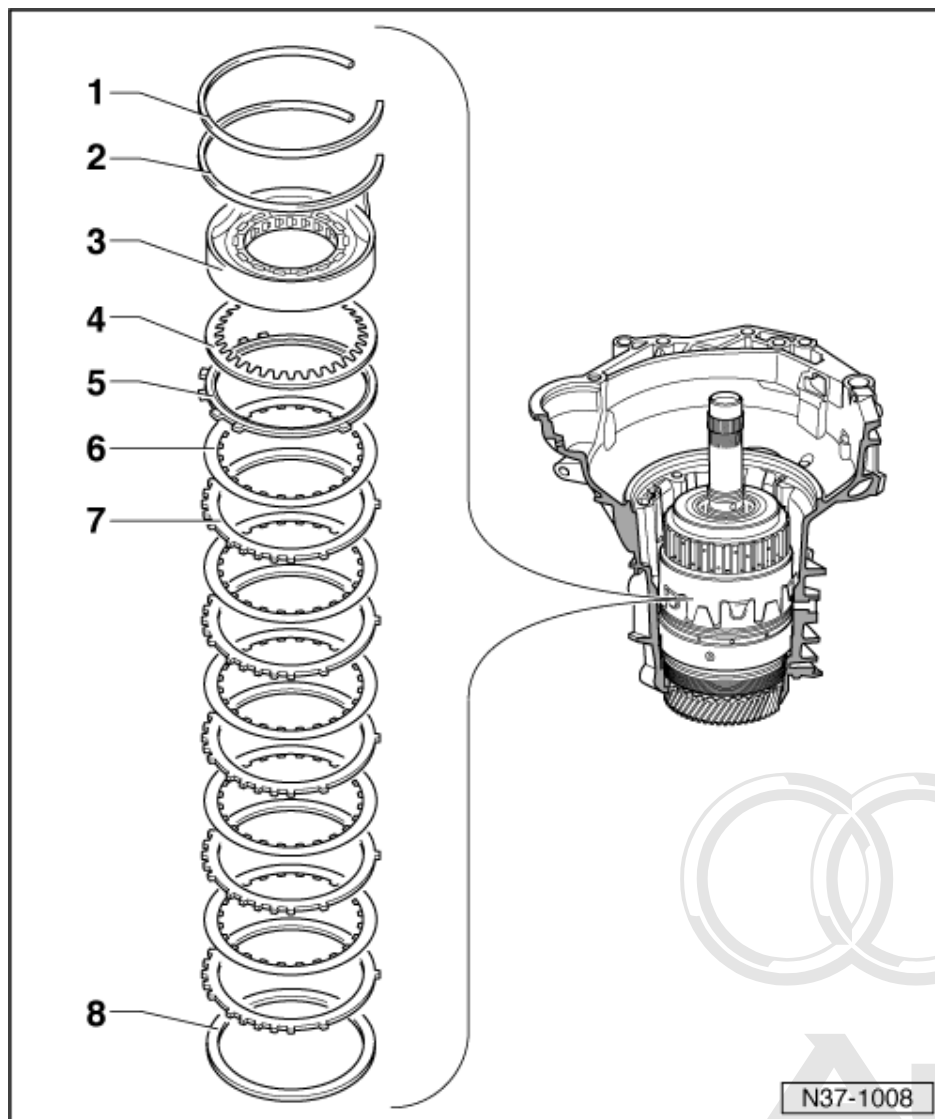
10 Oil strainer

11 Seal

♦ Press onto suction collar of oil strainer -arrow- by hand

12 Valve body

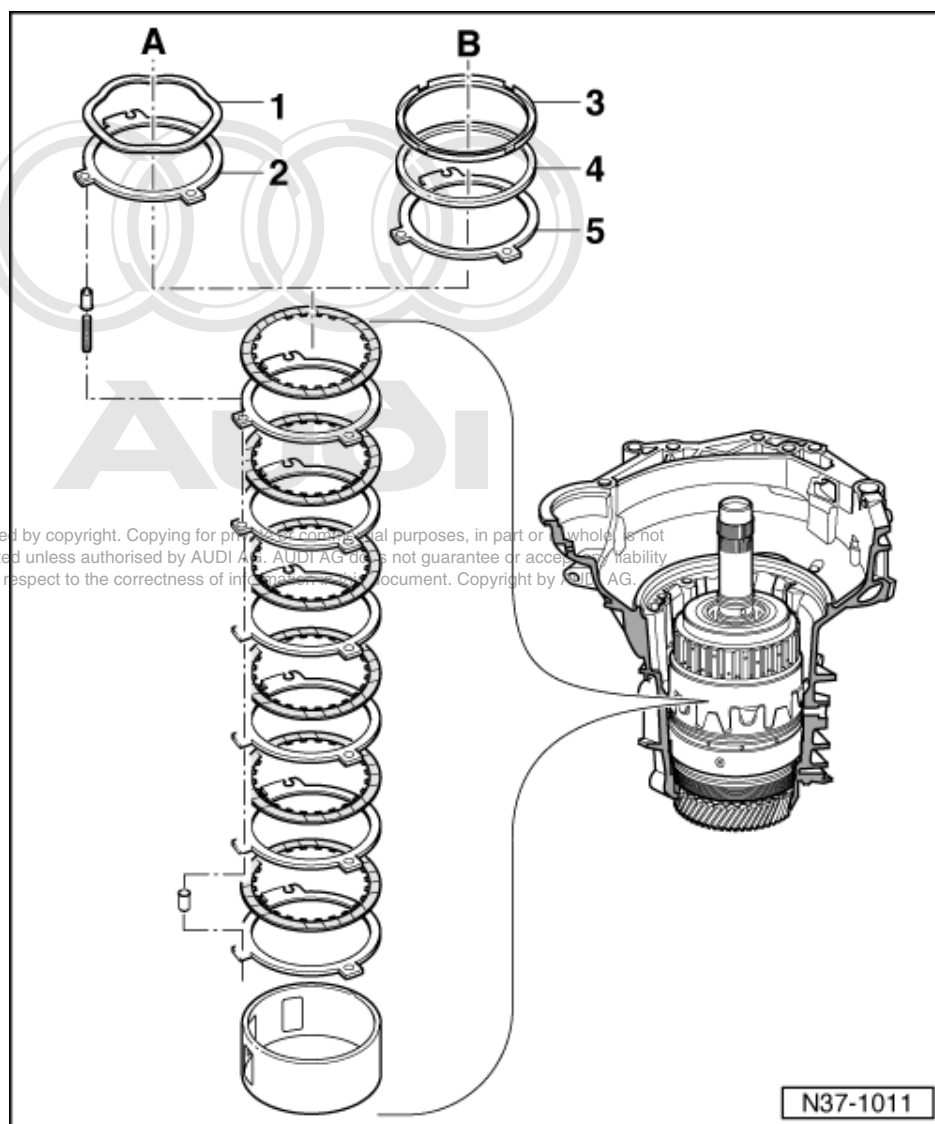
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Components of -B1-

- 1 Circlip
 - ◆ For supporting tube -B2-
- 2 Circlip
 - ◆ For freewheel
- 3 Freewheel with piston -B1-
- 4 Dished washer
- 5 Thrust plate -B1-
- 6 Inner plate -B1-
- 7 Outer plate -B1-
- 8 Shim

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Components of -B2-

There are two different versions of this brake.

A - Brake -B2- with corrugated spring washer

- ◆ Code letters =>from Page 2

- 1 Corrugated washer
- 2 Outer plate -B2-

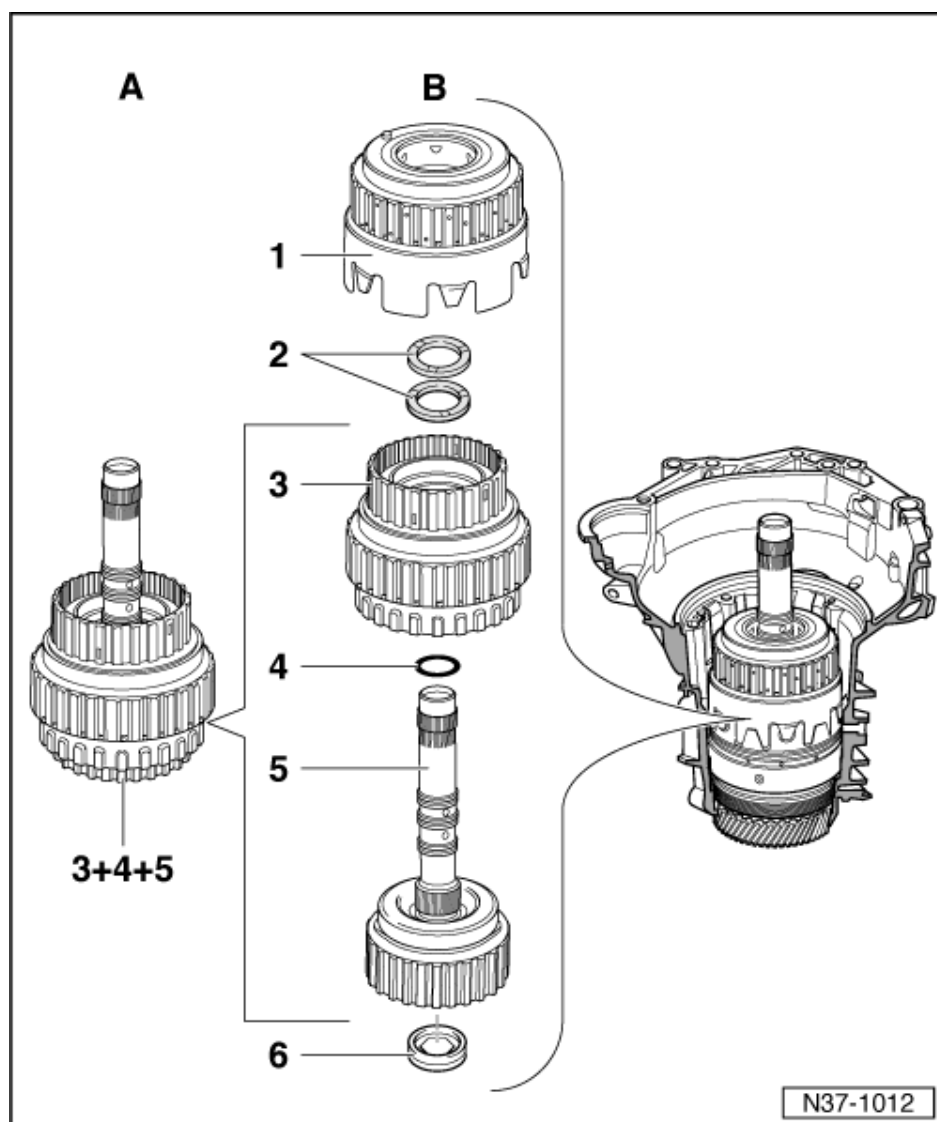
or

B - Brake -B2- with retaining ring

- ◆ Code letters =>from Page 2

- 3 Retaining ring
- 4 Shim
- 5 Outer plate -B2-

- ♦ 3 mm thick



Clutches

Note:

The clutches -K1- and -K3- are available in two versions.

A - Clutches are pressed together -Item 3+4+5-

- ♦ Clutches do not need to be pressed apart

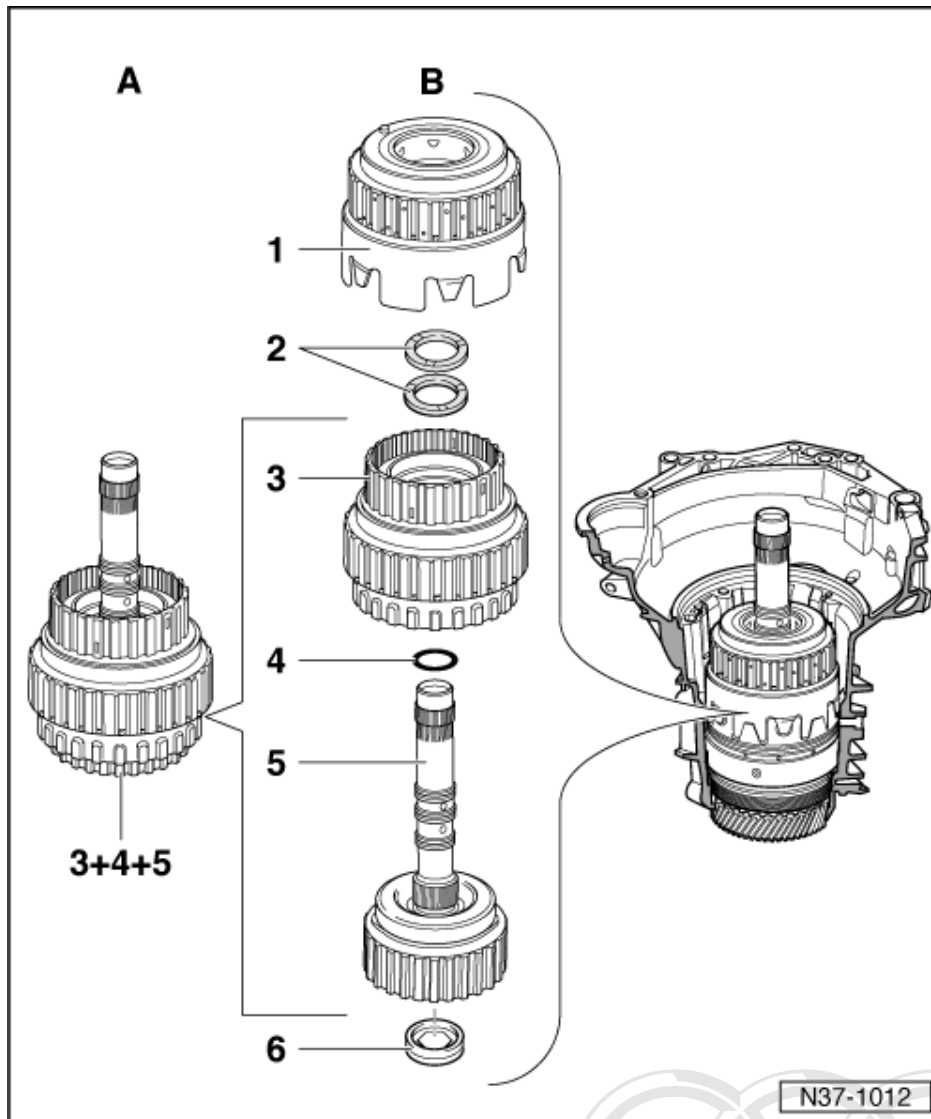
B - Clutches can be loosely inserted into each other

1 Reverse gear clutch -K2-

2 Shims for clutch play

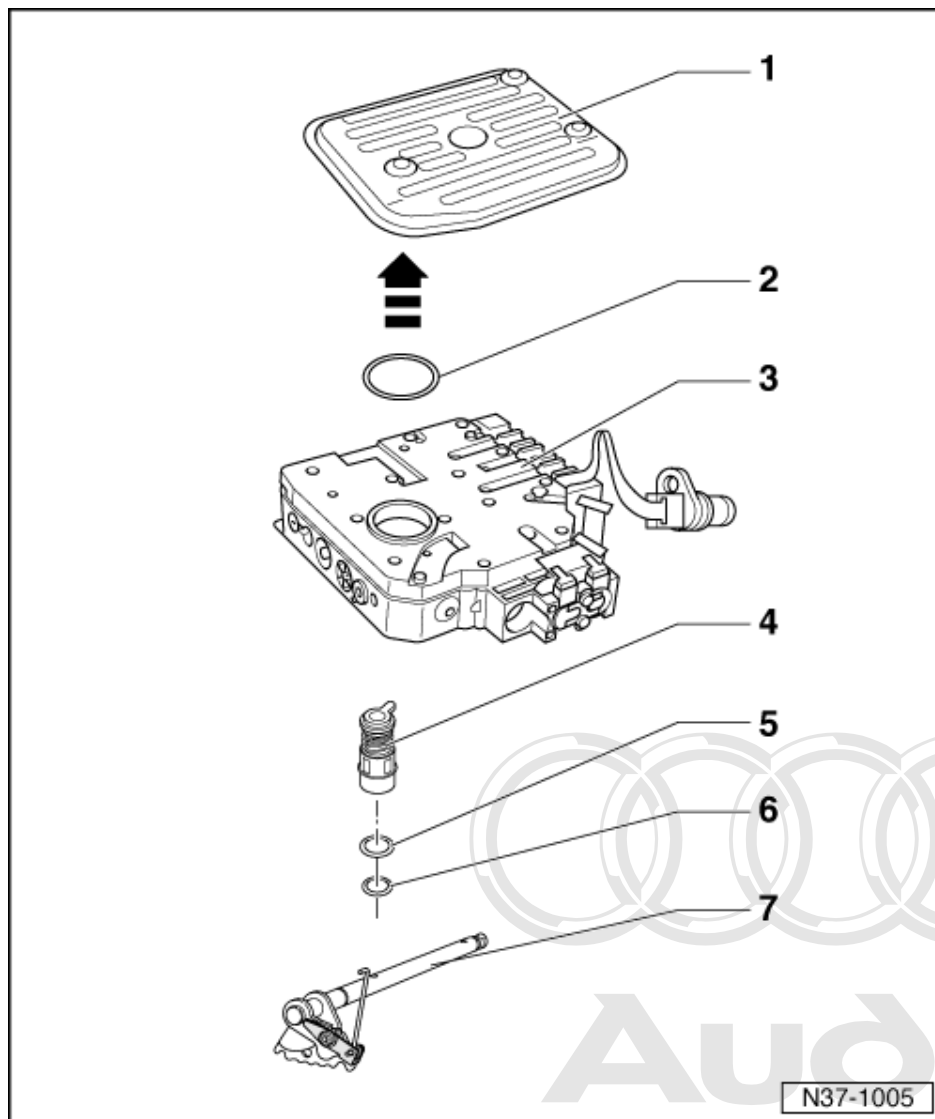
- ♦ Up to 3 shims can be installed

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- 3 1st to 3rd gear clutch -K1-
- 4 O-ring
- 5 3rd and 4th gear clutch -K3- with turbine shaft
- 6 Axial needle bearing with washer

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Valve body with oil strainer

- 1 Oil strainer
- 2 Seal
 - ◆ Press onto suction collar of oil strainer -arrow- by hand
- 3 Valve body
 - ◆ Without conductor strip; must be ordered separately as needed
- 4 Sealing plug of freewheel
 - ◆ Must be ordered separately as needed
- 5 O-ring
- 6 O-ring
- 7 Operating rod for manual selector valve
 - ◆ With steel spring and bolt

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6 - General repair instructions

6.1 - 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 summarised here. They apply to this Workshop Manual.

Special tools

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

=> Binder; Special Tools, Workshop Equipment

Gearbox

- ◆ Rules for cleanliness when working on the automatic gearbox => Page 69
- ◆ Do not run engine or tow vehicle with oil pan removed or when there is no ATF in the gearbox.
- ◆ If the gearbox is removed from the vehicle, secure the torque converter to prevent it dropping out.
- ◆ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ◆ Check the installation depth of the torque converter before installing the gearbox => Page 24
- ◆ When installing gearbox, ensure that the dowel sleeves are fitted correctly.
- ◆ Place removed parts on a clean surface and cover. Use sheeting and paper. Use lint-free cloths.
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components: do not remove replacement parts from their wrapping until you are ready to install them.
- ◆ Check and if necessary correct the following levels on replacing automatic gearbox: ATF in the planetary gearbox => Page 6 onwards.

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O-rings, seals, gaskets

- ◆ Always renew O-rings, seals and gaskets.
- ◆ After removing gaskets and seals, always inspect the contact surface on the housing or shaft for burrs resulting from removal or for other signs of damage.
- ◆ Thoroughly clean housing joint surfaces before assembling.
- ◆ The open side of the sealing rings faces toward the side with fluid filling.
- ◆ Before installing, lightly lubricate outer circumference of seal and sealing lips with ATF or gear oil, depending on fitting location.
- ◆ Lightly lubricate O-rings with ATF before inserting to prevent them being trapped and damaged when assembling.
- ◆ Use only ATF in the parts of the gearbox where ATF is the specified lubricant. Other types of lubricant can cause problems with the hydraulic actuation of the gearbox.
- ◆ When replacing sealing rings, always vary the point at which the sealing lips make contact (use insertion depth tolerances).
- ◆ After installation, check and if necessary correct the following levels in the area affected: ATF in the planetary gearbox => Page 6 onwards.

Nuts, bolts

- ◆ Loosen the bolts in reverse sequence to the specified tightening sequence.
- ◆ Nuts and bolts which secure covers and housings should be loosened and tightened crosswise in stages if no tightening sequence is specified.
- ◆ Parts which are particularly sensitive to distortion (e.g. valve body) must be kept straight when removing and installing; loosen or tighten diagonally in stages.
- ◆ The tightening torques stated apply to non-oiled nuts and bolts.
- ◆ Replace self-locking bolts and nuts.
- ◆ The threads of bolts which are secured by a locking compound should be cleaned with a wire brush. Then apply AMV 185 101 A1 when inserting.

- ◆ Threaded holes into which self-locking bolts or bolts coated with locking compound are screwed, must be cleaned (e.g. with a tap). Otherwise there is a danger of bolts shearing when subsequently being removed.

Locking elements

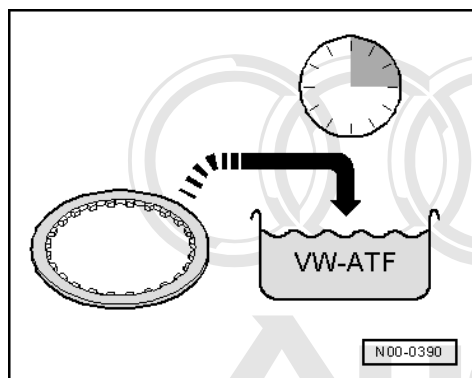
- ◆ Do not over-stretch circlips.
- ◆ Always renew circlips which have been damaged or over-tensioned.
- ◆ Circlips must be properly seated in the base of the groove.

Mounting

- ◆ Attach the needle bearing with the written side (greater plate thickness) to the installing tool.
- ◆ Lubricate bearings with gear oil or ATF, depending on fitting location.
- ◆ Do not interchange inner or outer 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 up to stop when installing so there is no axial clearance.

Shims

- ◆ Use a micrometer to measure the shims at several points. Different tolerances make it possible to obtain exact shim thickness required.
- ◆ Check for burrs and damage.
- ◆ Only install perfect, undamaged shims.



Inner plates

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- ◆ -> **Soak inner plates in ATF for 15 minutes before installing.**

Valve body

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

Clutches

- ◆ Clutches -K1-, -K2- and -K3- are only to be dismantled for cleaning purposes; replace clutch if components are defective. Clutches are assigned by way of gearbox code letters.

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 01N, Self-diagnosis; Repair group 01; Performing self-diagnosis Performing self-diagnosis

32 - Torque converter

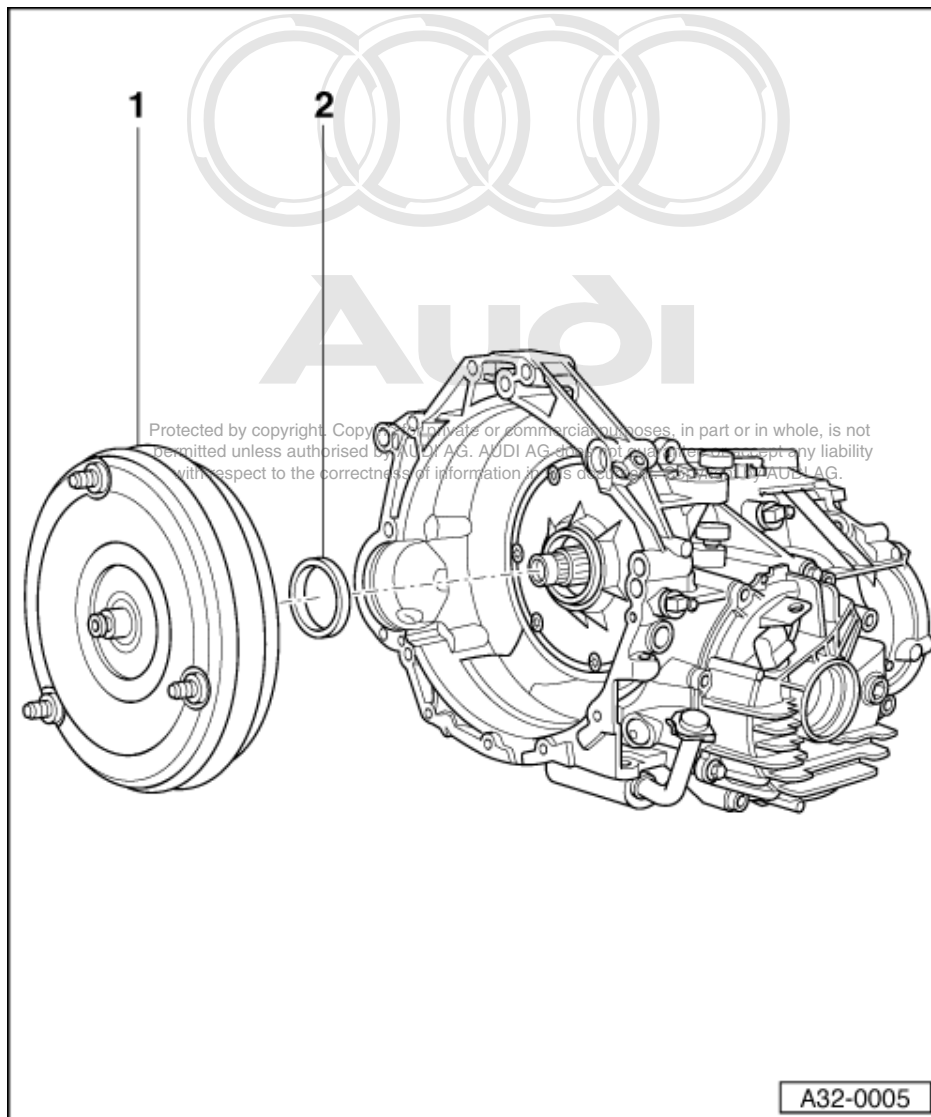
1 - Torque converter

1.1 - Torque converter

Important
Check the installation depth of the torque converter before installing the gearbox =>

Notes:

- ◆ Rules for cleanliness when working on the automatic gearbox => Page 69
- ◆ General repair instructions => Page 15
- ◆ Coat oil seals thinly with ATF. Other types of lubricant can cause problems with the hydraulic actuation of the gearbox.
- ◆ There are two torque converter versions, allocation =>Page 18
- ◆ If installing a new torque converter with integrated needle bearing in a gearbox with a slide bearing in the turbine shaft, the slide bearing must be removed =>Page 19



1 Torque converter

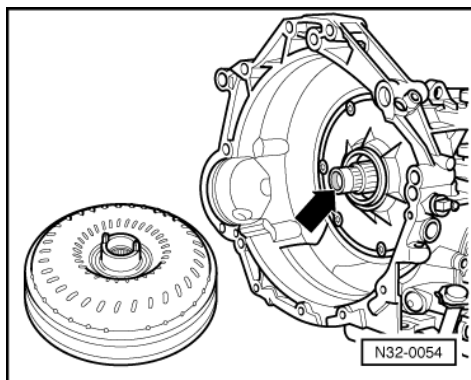
- ◆ Secure to prevent it falling out when gearbox is removed
- ◆ Code=> from Page 2 onwards
- ◆ Allocation =>Page 18
- ◆ Checking => Page 23
- ◆ Installing =>Page 23
- ◆ Installation depth => Page 24

2 Sealing ring

- ◆ Replacing =>Page 21

1.2 - Allocation of torque converter

There are two torque converter versions, allocation is according to gearbox code letters =>Page 2



-> Old design torque converter:

- ◆ With slide bearings -arrow- in the gearbox turbine shaft

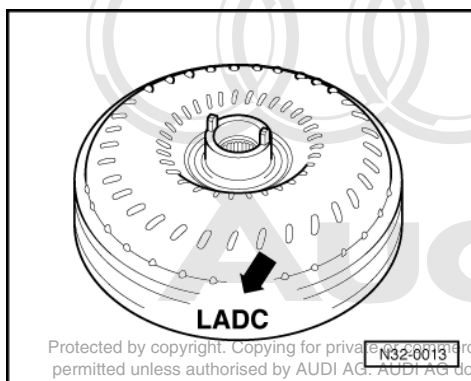
New design torque converter:

- ◆ With integrated needle bearing. With this version, there must be no slide bearing -arrow- installed in the gearbox turbine shaft.

Note:

If installing a new torque converter with integrated needle bearing in a gearbox with a slide bearing in the turbine shaft, the slide bearing must be removed =>Page 19

1.3 - Identification of torque converter



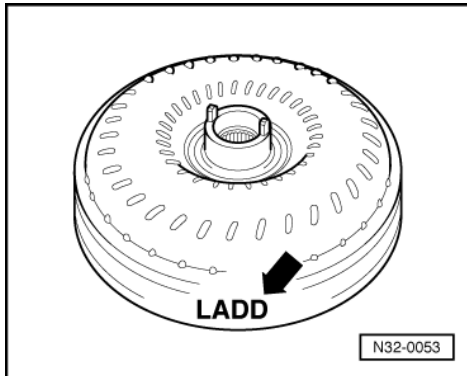
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Identification is via the code letters.

-> Old design torque converter:

A torque converter of the old design must only be installed in gearboxes with a slide bearing in the turbine shaft.

- ◆ Distinguishing feature: The fourth letter in the code is a "B" or a "C".



-> New design torque converter:

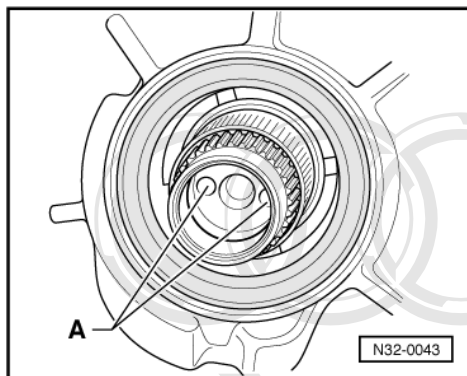
A torque converter of the new design must only be installed in gearboxes without a slide bearing in the turbine shaft.

- ◆ Distinguishing feature: The fourth letter in the code is a "D".

Note:

If installing a new torque converter with integrated needle bearing in a gearbox with a slide bearing in the turbine shaft, the slide bearing must be removed =>Page 19

1.4 - Removing slide bearing from the turbine shaft



Note:

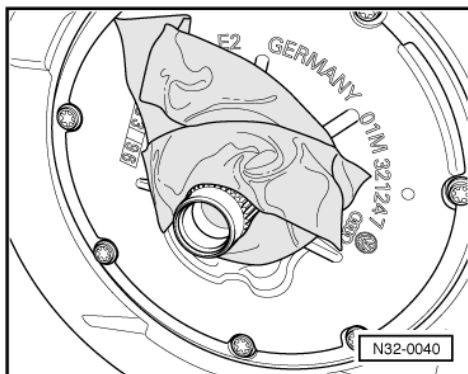
If installing a new torque converter with integrated needle bearing in a gearbox with a slide bearing in the turbine shaft, the slide bearing must be removed.

Position gearbox in installation position on the gearbox oil pan.

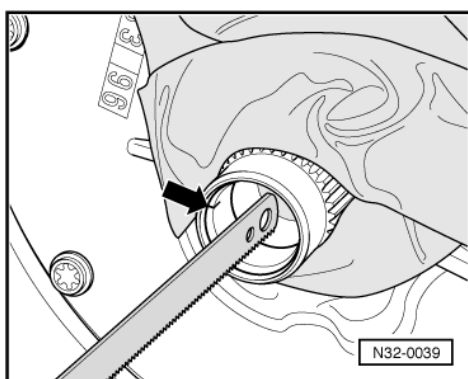
- Remove the torque converter.



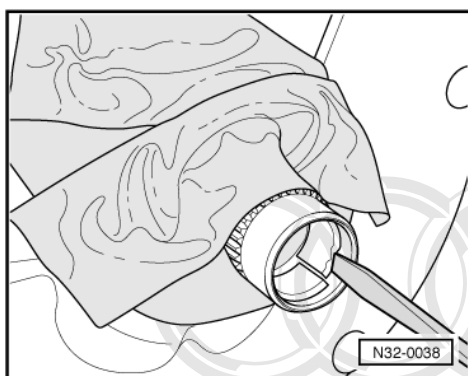
- -> Place the bores -A- of the turbine shaft in a horizontal position.



- -> Protect the gearbox by carefully closing off the turbine shaft bores using adhesive tape.



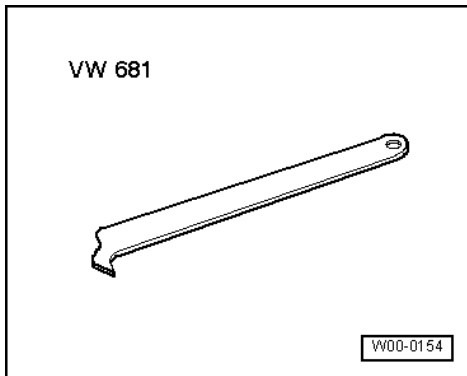
- -> Saw the slide bearing open using a saw blade. Do not apply the saw blade on the joint of the slide bearing -arrow-.
- Ensure that no swarf penetrates into the gearbox.



- -> Lever the sawed-open slide bearing off carefully using a screwdriver, without damaging the turbine shaft.
- Remove the swarf and the adhesive tape.
- Replace the torque converter sealing ring => Page 21

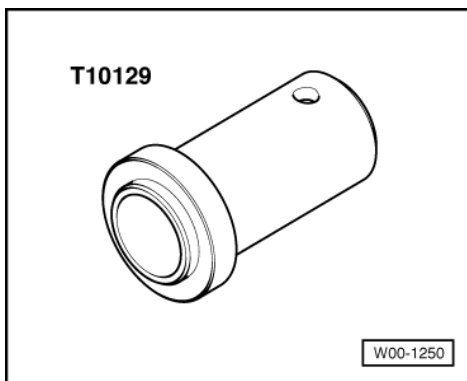
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1.5 - Replacing torque converter sealing ring

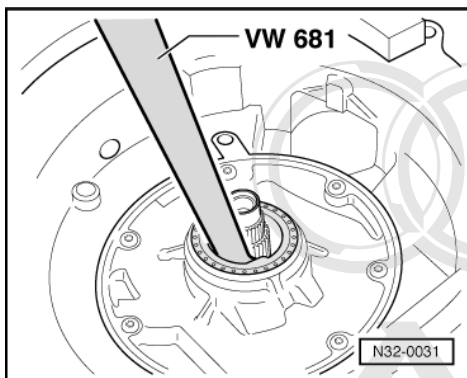


Special tools and workshop equipment required

- ♦ Extractor lever VW 681

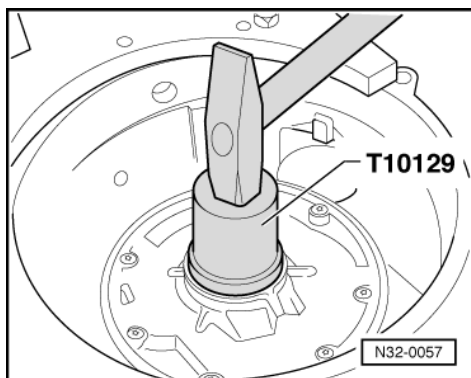


- ♦ Thrust piece T10129



Removing

- Removing gearbox => Page 45
- Remove torque converter.
- Attach the gearbox to the assembly stand => Page 55 or place on a level surface.
- -> Use extraction lever VW 681 to remove the sealing ring for the torque converter.



Installing

- Lubricate the outer circumference and the sealing lips of the new sealing ring with ATF.
- Installation position: The open side of the sealing ring faces toward the gearbox.
- -> Use the thrust piece T10129 to push on the sealing ring for the torque converter up to the stop.

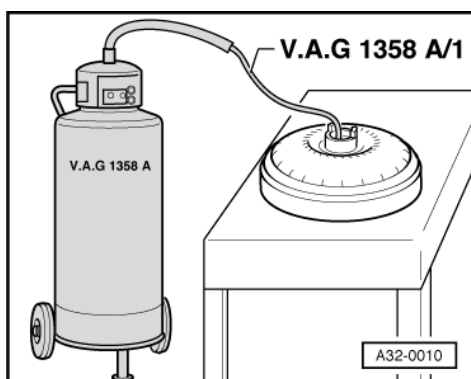
1.6 - Draining torque converter



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Special tools and workshop equipment required

- ♦ V.A.G 1358 A or V.A.G 1782

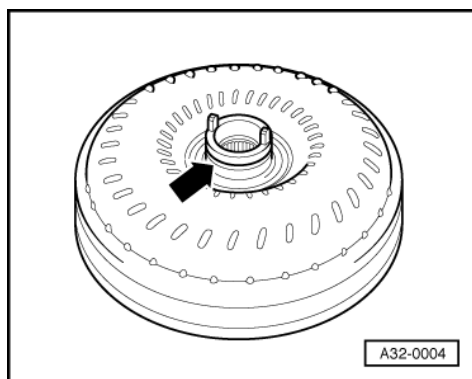


Procedure

If the torque converter has become fouled by abrasion or when performing a major overhaul of the gearbox, drain the torque converter as follows:

- -> Extract ATF from torque converter using V.A.G 1358 A or V.A.G 1782.

1.7 - Checking torque converter



- -> Check torque converter hub -arrow- for scoring.

Note:

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

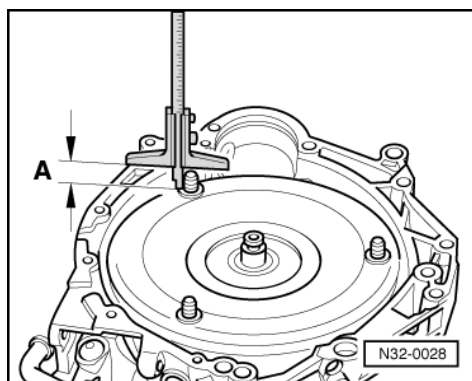
1.8 - Installing torque converter

Special tools and workshop equipment required

- ♦ Depth gauge

Procedure

- Press torque converter hub through sealing ring 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.



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Installation depth

-> If the torque converter has been fitted correctly in the gearbox, the distance -A- between the contact surfaces at the base of the threaded studs on the torque converter and the contact surface of the torque converter bell housing should be approx. 23 mm.

If the torque converter has not been completely inserted, this distance will be approx. 13 mm.

Important

If the torque converter is not installed correctly, the torque converter drive plate or the ATF pump will be seriously damaged when the gearbox is joined to the engine.



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37 - Controls, Housing

1 - Servicing shift mechanism

1.1 - Servicing shift mechanism

Important

Before performing operations when engine is running, move selector lever into position "P" and apply hand-brake.

1.2 - Dismantling and assembling shift mechanism

The following work is necessary before dismantling the shift mechanism:

- ♦ To work on selector housing (shift gate), remove solenoid for selector lever lock or centre console locking cable

=> General Body Assembly; Repair group 70, Dash Panel

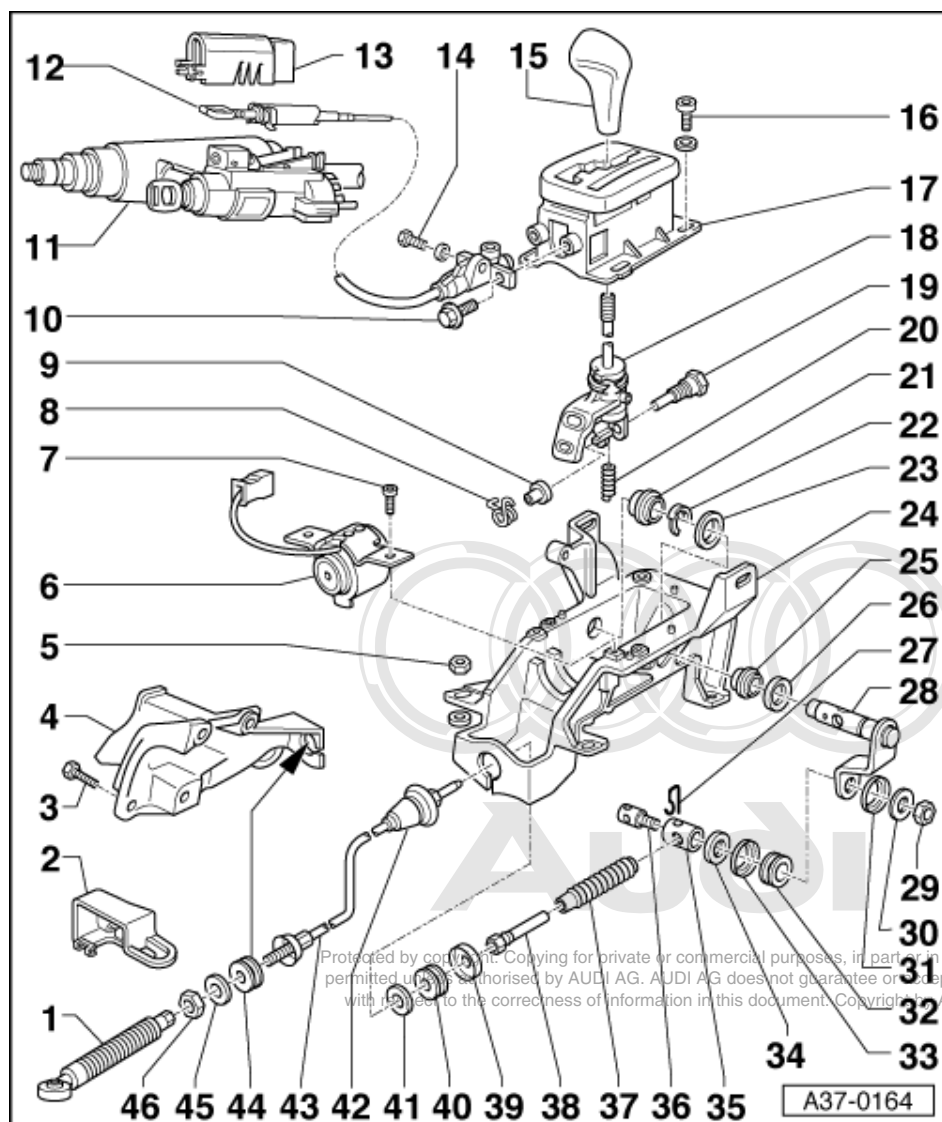
- ♦ When replacing locking cable, also remove steering wheel and dash panel insert

=> Electrical System; Repair group 90; Dash panel; Removing and installing dash panel insert Dash panel
Removing and installing dash panel insert

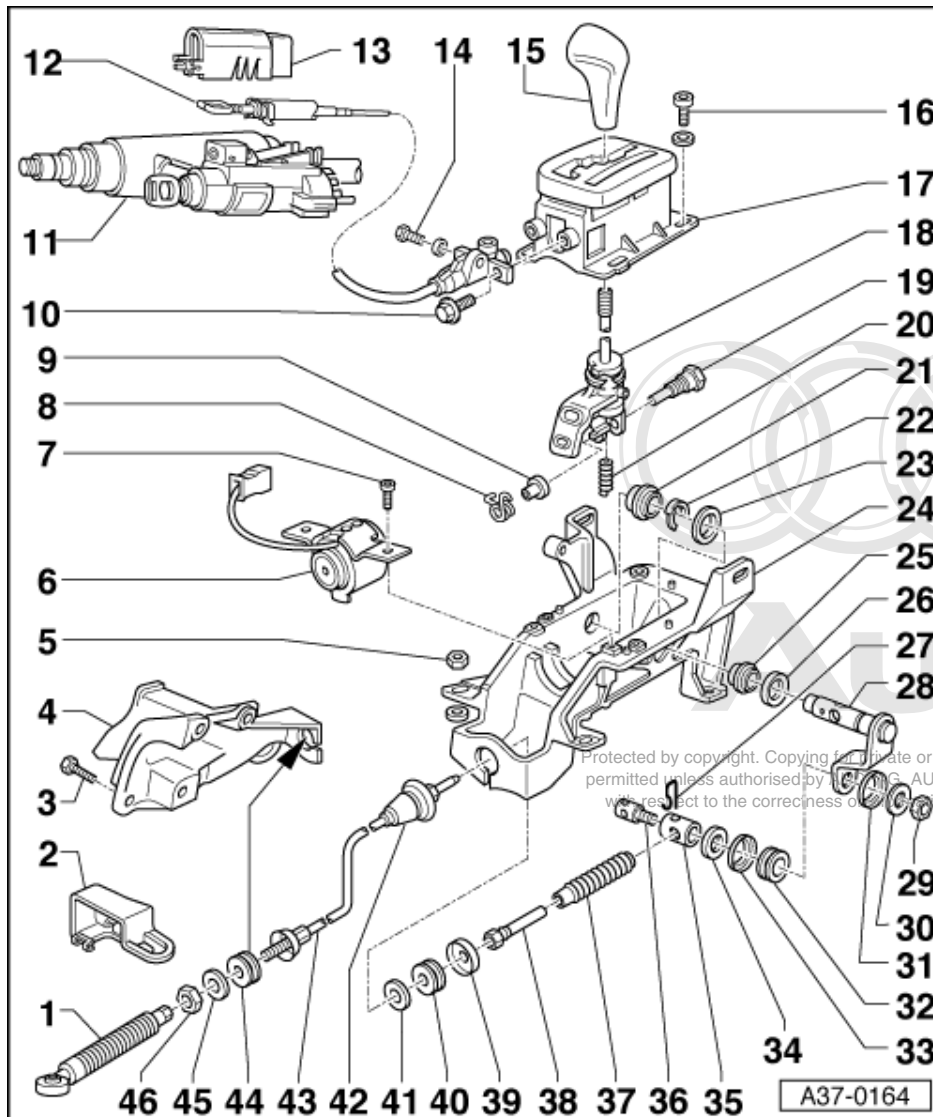
- ♦ The entire shift mechanism is removed upwards.



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- 1 Front bellows**
 - ♦ If damaged, renew selector lever cable
- 2 Bracket**
 - ♦ For ball socket
 - ♦ Not fitted after about 06.95
- 3 Bolt - 40 Nm**
- 4 Final drive support**
 - ♦ With attachment for selector lever cable
- 5 Nut - 10 Nm**
 - ♦ Before installing mounting bracket for shift mechanism, fit a washer (18 x 6.1 x 2) on each of the two studs at the front

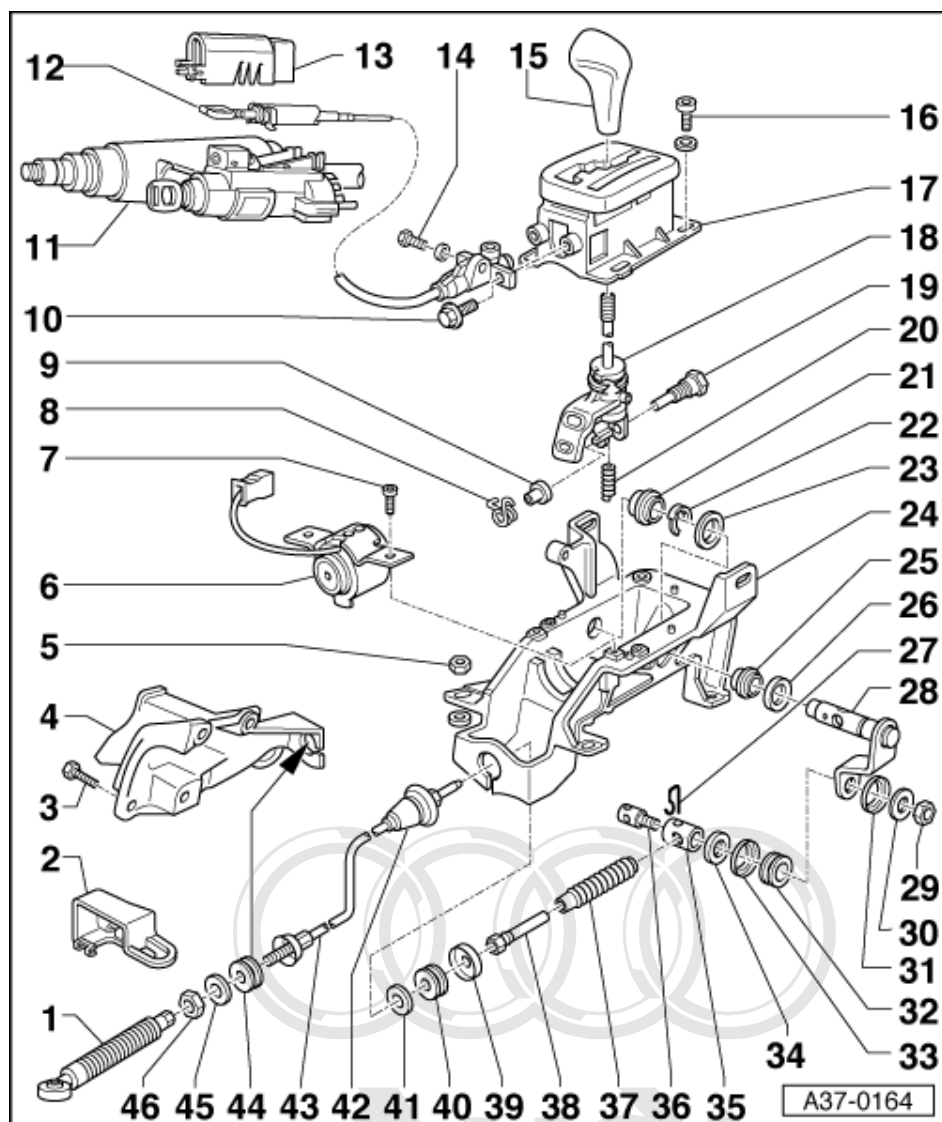


6 Solenoid for selector lever lock -N110

- ♦ Can be checked in electrical test and in measured value block

=> Automatic Gearbox 01N, Self-diagnosis; Repair group 01, Performing self-diagnosis; Read measured value block Read measured value block

- ♦ Installing:
 - Press solenoid with locking mechanism in axial direction against mounting bracket for shift mechanism, and tighten solenoid securing bolts
 - After installing shift mechanism switch on ignition. The solenoid blocks the selector lever in position "P" and position "N". The selector lever can be moved out of positions "P" and "N" when the brake pedal is pressed
 - Checking gap between selector lever and solenoid => Fig. 36



7 Bolt - 10 Nm

8 Torsion spring

9 Bush

- ♦ For torsion spring item 8 –
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10 Bolt - 10 Nm

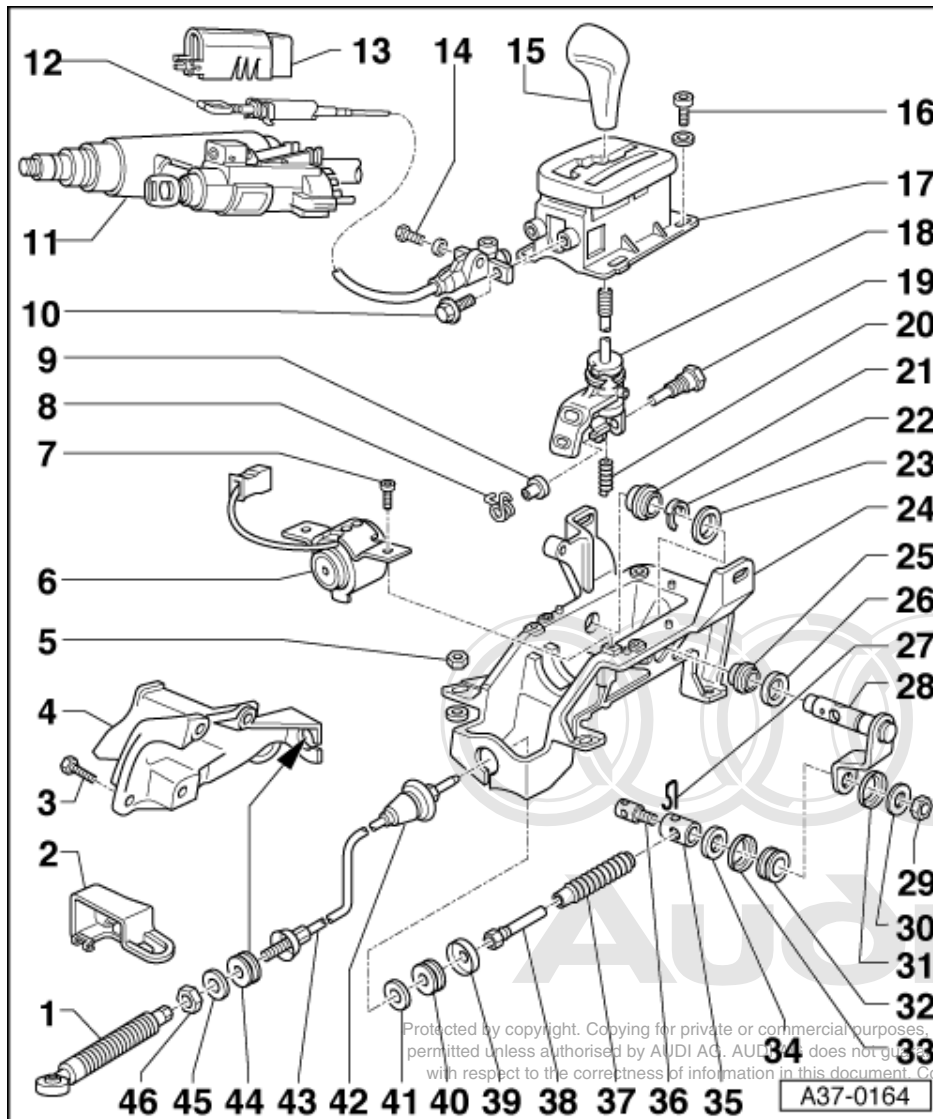
11 Ignition/starter switch

12 Locking cable

- ♦ For ignition key removal lock
- ♦ Removing and installing=>Page 39
- ♦ Must not be kinked
- ♦ Adjusting => Page 40

13 Trim cap

14 Bolt - 10 Nm



15 Handle for selector lever

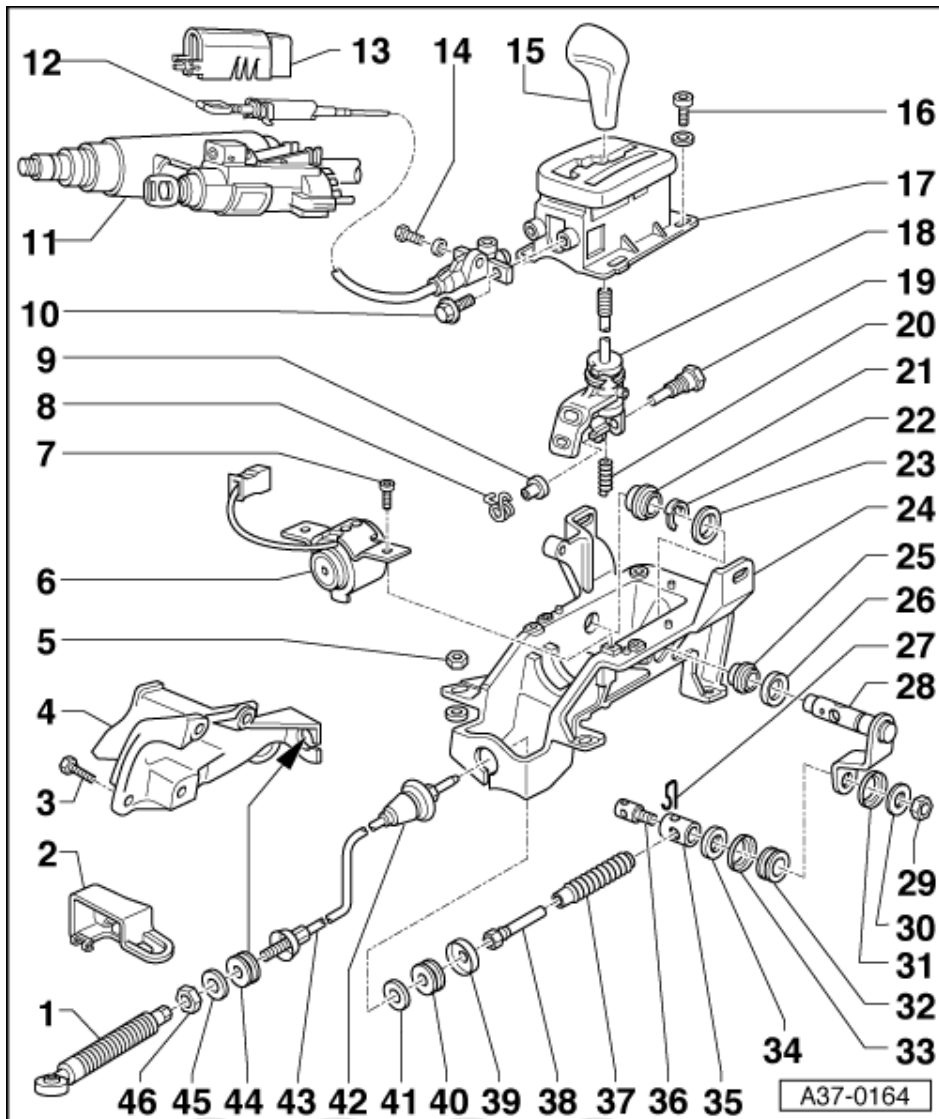
16 Bolt - 10 Nm

17 Selector housing (shift gate)

- ◆ Before removing selector housing, unbolt locking cable from selector housing
- ◆ Install selector housing after adjusting selector lever lock solenoid -N110
- ◆ Aligning=> Fig. 36

18 Selector lever

- ◆ With clevis to lock selector lever in positions "P" and "N" and mechanism to release ignition key in position "P" via locking cable
- ◆ Checking gap between selector lever and solenoid for selector lever lock -N110 => Fig. 36



19 Guide pin - 22 Nm

- ♦ Install after fitting compression spring -Item **20** -

20 Spring

- ♦ Insert into selector lever before installing guide pin -Item **19** -

21 Bush

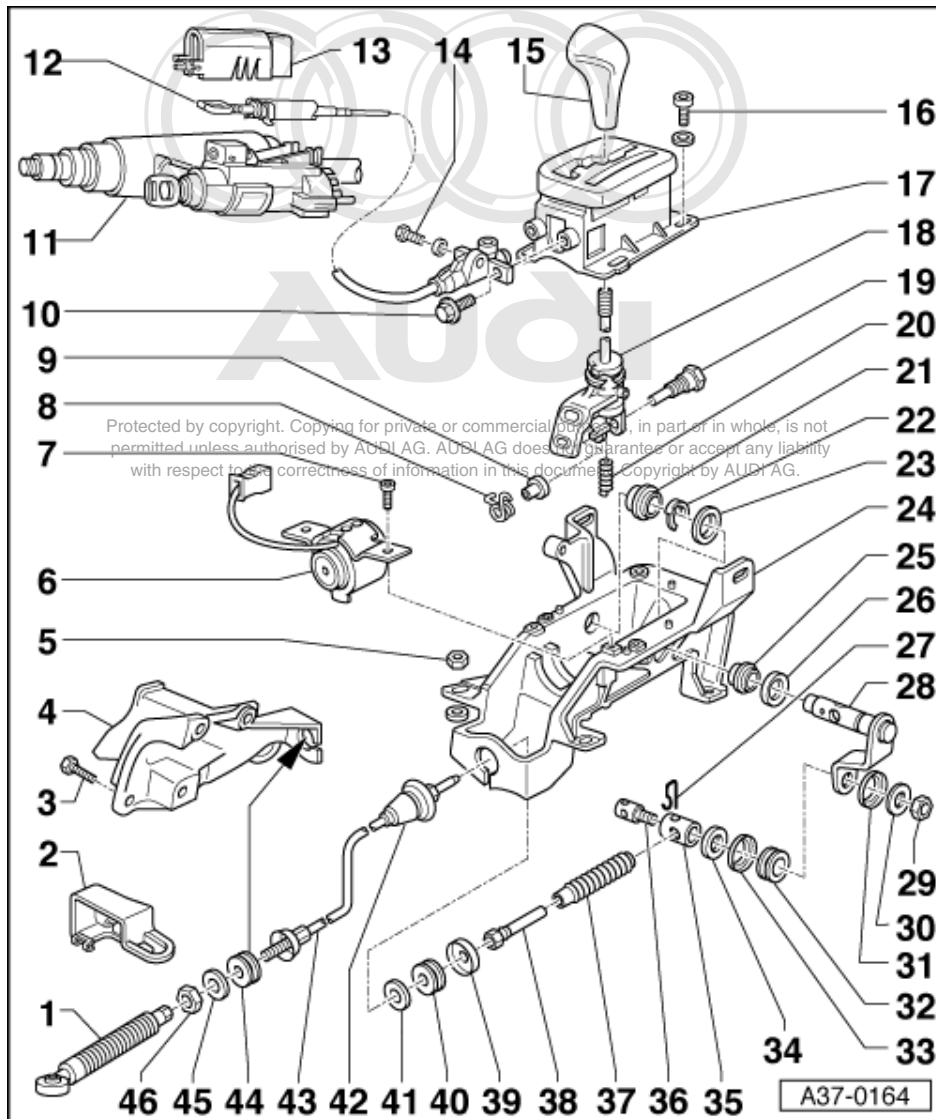
- ♦ Grease with G 000 660 after installing

22 Locking plate

- ♦ Install after fitting lever for shift mechanism -Item **28** -

23 Washer

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24 Mounting bracket for shift mechanism

- ♦ Before installing mounting bracket for shift mechanism, fit a washer (18 x 6.1 x 2) on each of the two studs at the front

25 Bush

- ♦ Grease with G 000 660 after installing

26 Sealing collar

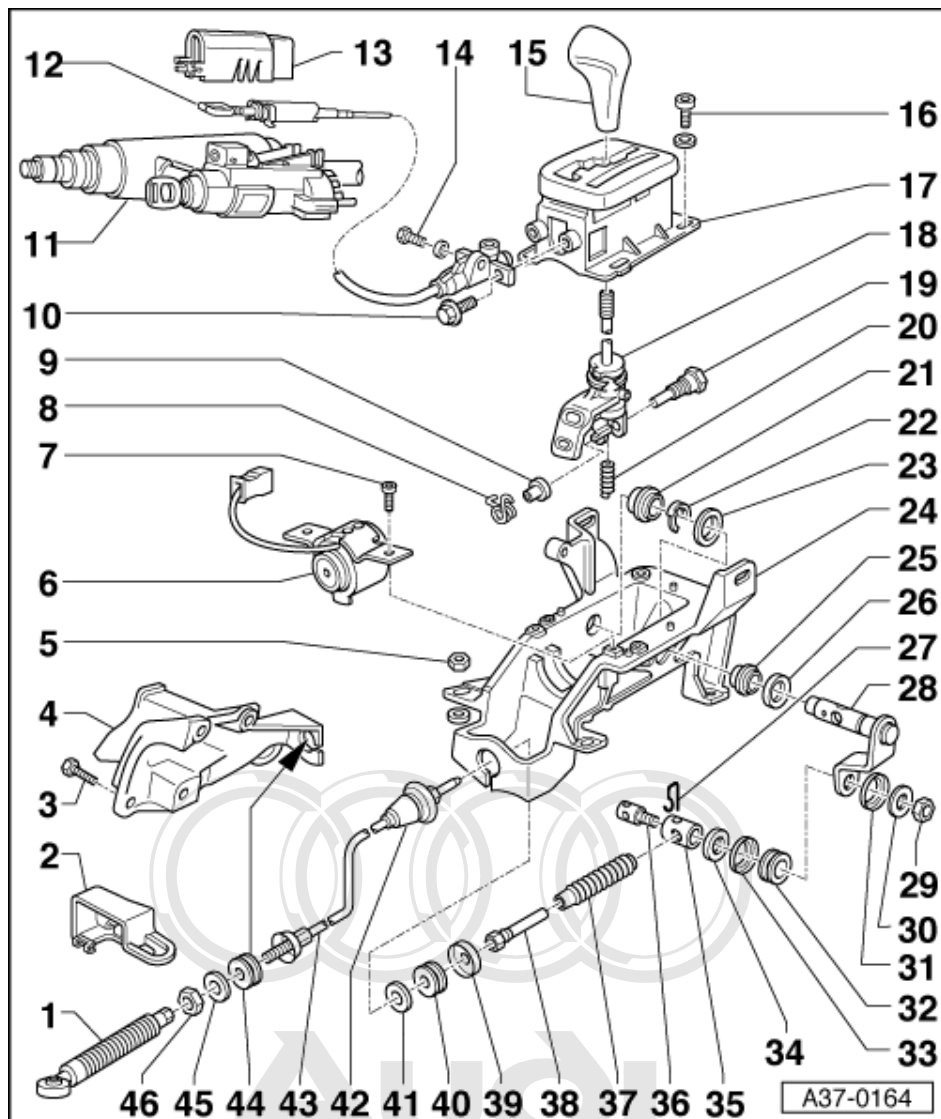
27 Spring clip

28 Lever for shift mechanism

29 Nut - 20 Nm

30 Washer

31 Sealing collar

**32 Bush**

- ♦ Insert into lever for shift mechanism - Item **28**.

33 Sealing collar**34 Washer****35 Clamp**

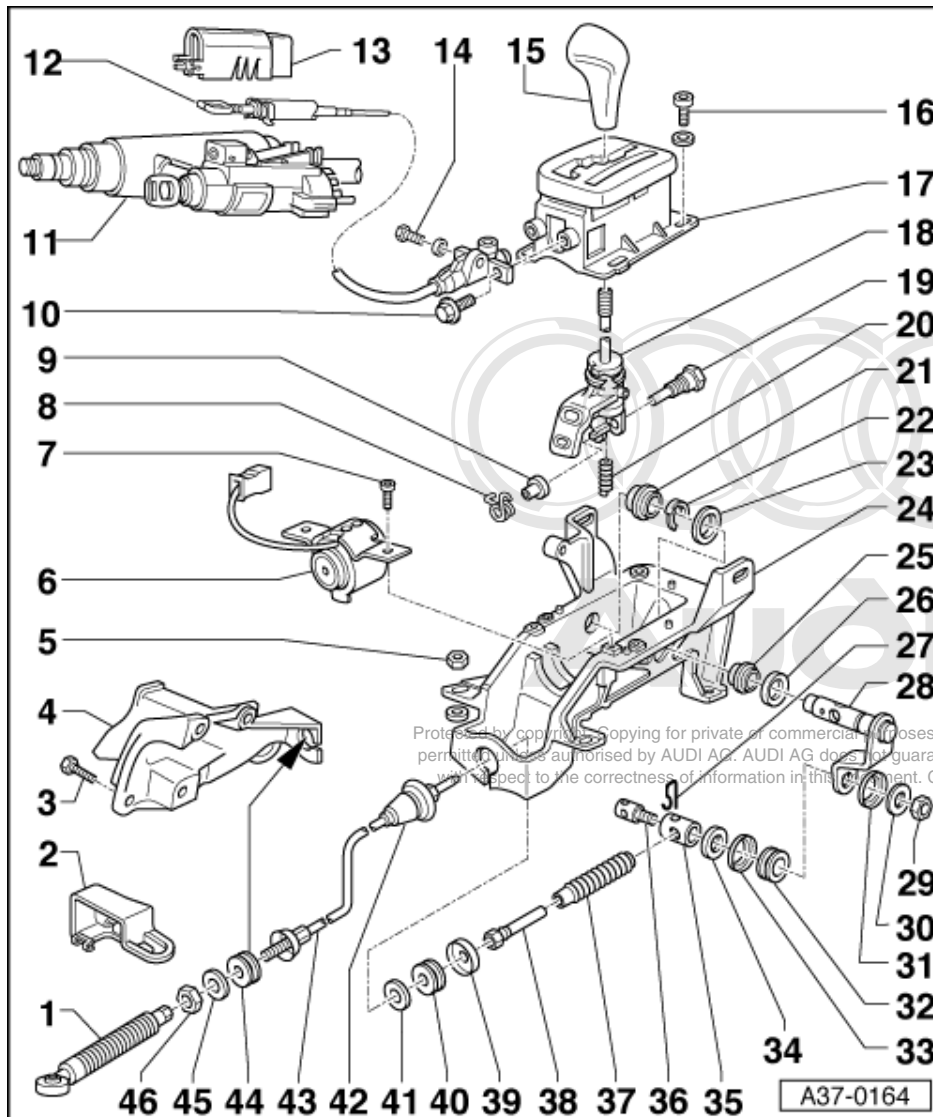
- ♦ For selector lever cable

36 Clamping pin

- ♦ For selector lever cable

37 Rear bellows

- ♦ Replace if damaged
- ♦ Ensure correct installation position



38 Nut and guide tube - 12 Nm

- ◆ Insert with locking compound AMV 185 101 A1
- ◆ Ensure guide tube is properly secured

39 Washer

- ◆ Collar faces in direction of travel

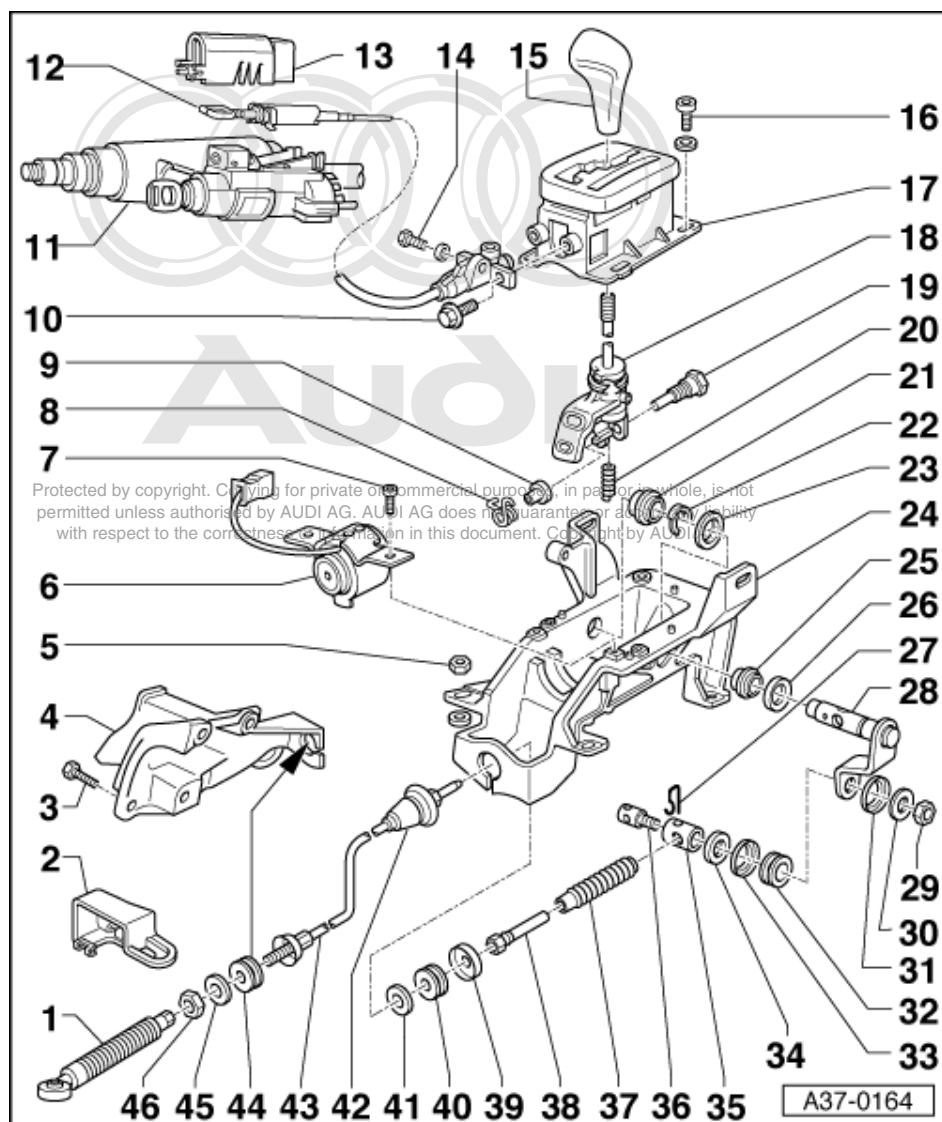
40 Bush

- ◆ Consists of two rubber rings and a metal collar
- ◆ Fit in mounting bracket for shift mechanism

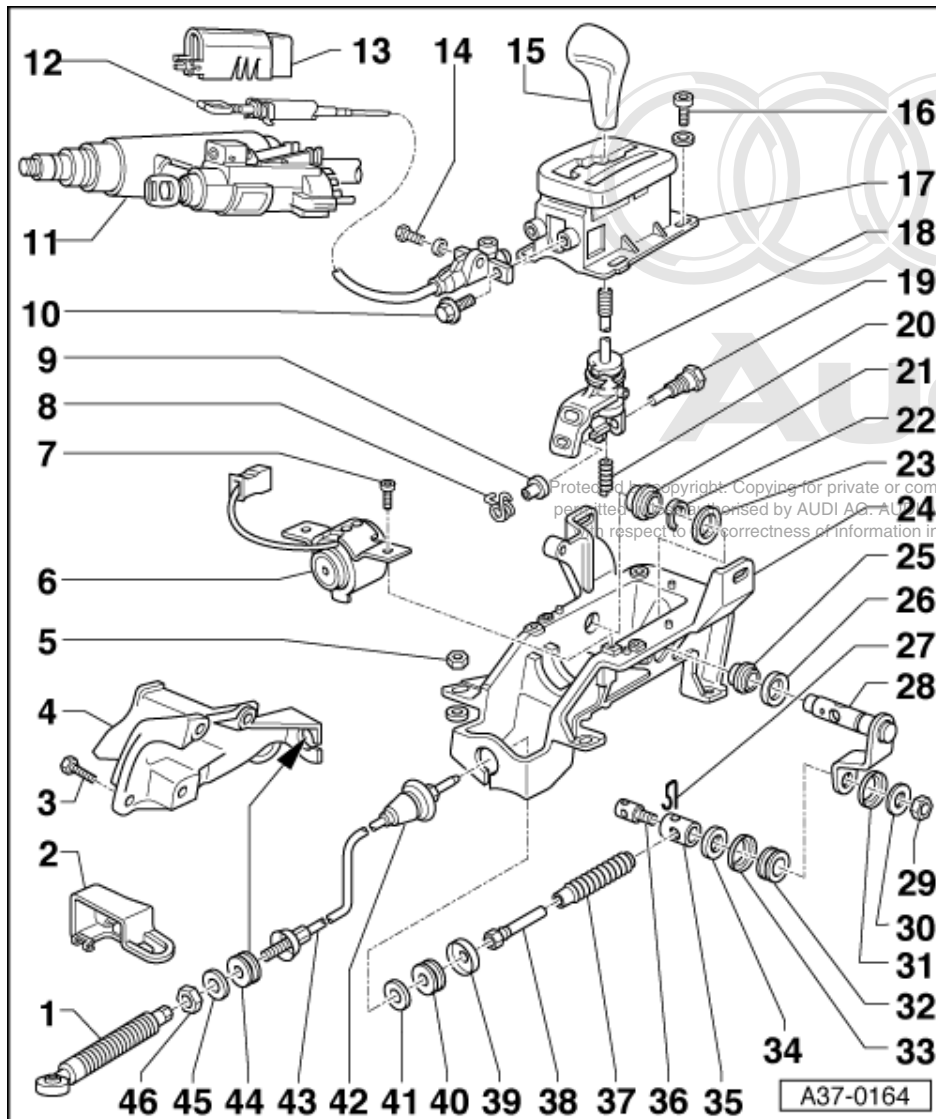
41 Washer

42 Grommet

- ◆ Replace if damaged
- ◆ Ensure correct installation position

**43 Selector lever cable**

- ◆ With guide and bush
- ◆ Ensure that bellows for selector lever cable is fitted correctly, otherwise water can enter selector lever cable assembly
- ◆ Ensure guide tube is properly secured
- ◆ Do not bend or kink, lightly grease cable eye and ball socket before installing.
- ◆ Adjusting:
 - Move selector lever to position "P".
 - Slacken nut on clamp for selector lever cable.
 - Move selector lever on gearbox into position "P" (move back as far as it will go).
 - In this position with selector cable free of tension tighten nut -Item 29 - on clamping pin to 20 Nm.



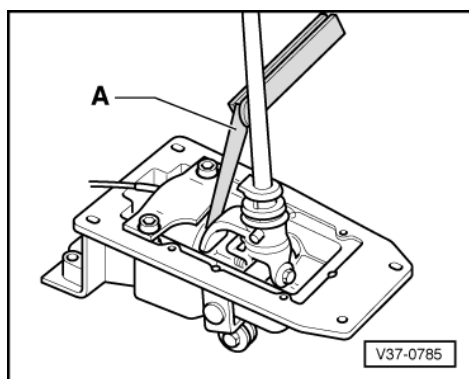
44 Bush

- ◆ Consists of two rubber rings and a metal collar
- ◆ Fit in mounting bracket for shift mechanism

45 Washer

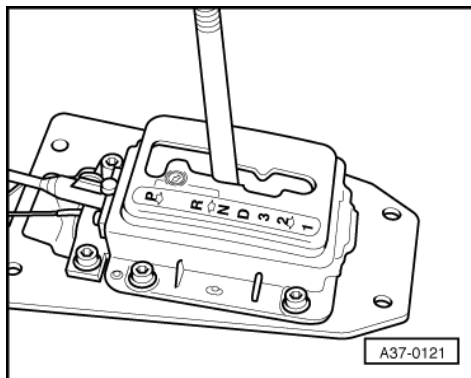
46 Nut - 12 Nm

- ◆ Insert with locking compound AMV 185 101 A1



-> Fig.1 Checking gap between selector lever and solenoid for selector lever lock -N110

- With selector lever in position "R", measure clearance between selector lever and selector lever lock solenoid using a feeler gauge-A-.
- Specification: 0.6...1.4 mm
- Adjust clearance, if necessary by moving solenoid in holes in mounting bracket.

**-> Fig.2 Aligning selector housing with selector lever**

- After installing selector lever lock solenoid, align bottom hole of clevis centrally with solenoid and energise solenoid.
- Fit selector housing (shift gate) in position. Selector lever should now be aligned with position "N" on selector housing.
- After tightening selector housing mountings, shift selector lever through all positions and check that it reaches end stops at "P" and "1".

1.3 - Removing, installing and adjusting selector lever cable

Note:

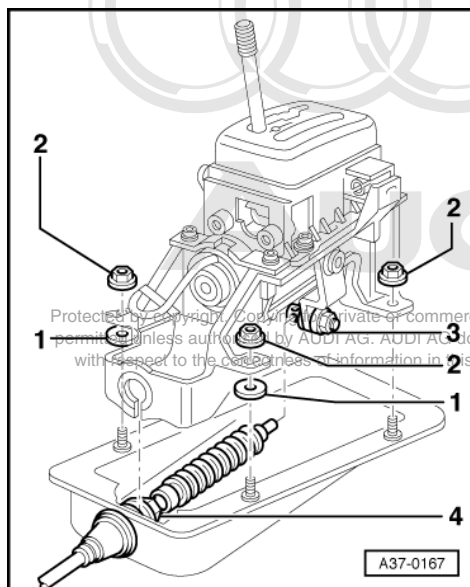
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The selector lever cable must be adjusted after installation => Page 38

Removing

- Unbolt heat shield for exhaust system below mounting bracket for shift mechanism and lower onto the exhaust system.
- Remove the right gearbox support => Page 57
- Slacken bolt for selector lever cable at gearbox support, release selector lever cable.
- Press off retaining clip (not fitted after about 06.95) at end of selector lever cable and press ball socket of selector lever cable off selector lever at gearbox.
- Removing centre console.

=> General Body Assembly; Repair group 70; Dash Panel Dash Panel



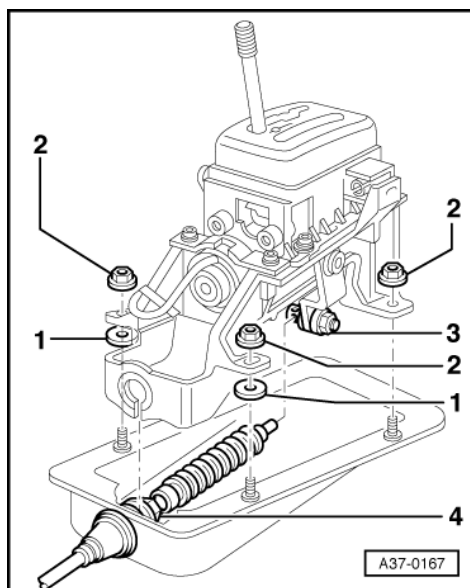
- -> Unscrew nuts -2- and lift mounting bracket for shift mechanism slightly.
- Slacken nut -3- on clamp.
- Push back bellows, unscrew nut and guide tube -4-, then pull off mounting bracket for shift mechanism.
- Pull selector lever cable below vehicle away to front.

Installing

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

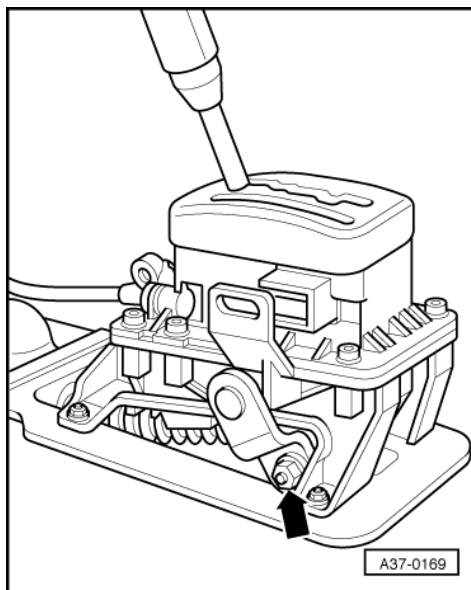
Notes:

- ◆ Do not bend or kink selector lever cable.
 - ◆ Lightly grease ball socket before installing.
 - ◆ Bellows for selector lever cable must be fitted correctly, otherwise water can enter selector cable assembly.
 - ◆ Check bellows for damage; rear bellows can be replaced separately; front bellows can only be replaced together with complete selector lever cable.
- Use locking compound AMV 185 101 A1 on bolts for support brackets.
 - Bolt selector lever cable onto the two support brackets with 12 Nm.



- -> Before installing mounting bracket for shift mechanism fit a washer -1- on each of the two studs at the front => Item **31**

- Tighten nuts -2- for mounting bracket for shift mechanisms to 10 Nm.



Adjusting

- Move selector lever to position "P".
- -> Slacken nut -arrow- on clamping pin for selector lever cable.
- Also move gearbox selector lever to position "P" (rear stop).
- Check that selector lever cable is routed without tension.
- Tighten nut -arrow- on clamping pin of selector lever cable (20 Nm).

1.4 - Checking shift mechanism

With the ignition switched on, shift the selector lever to "P":

- Brake pedal not depressed:

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Selector lever is locked and cannot be shifted out of "N" position. The solenoid for the selector lever lock locks the selector lever.

- Brake pedal depressed:

- Solenoid for selector lever lock releases selector lever. It is possible to shift into a driving gear. Slowly shift the selector lever from "P" through "R, N, D, 3, 2" checking whether the selector lever position in the dash panel insert corresponds to the selector lever position.

With the ignition switched on, shift the selector lever to "N":

- Brake pedal not depressed:

- Selector lever is locked and cannot be shifted out of "N" position. The solenoid for the selector lever lock locks the selector lever.

- Brake pedal depressed:

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

Notes:

- ♦ It is only possible to shift the selector lever out of position "N" to position "R" with the locking button in the selector lever handle pressed down and the brake pedal depressed.
- ♦ The starter must not operate in the selector lever positions "1", "2", "3", "D" and "R".
- ♦ In the case of RHD vehicles, it should only be possible to actuate the starter with the selector lever set to "P" or "N" if the lock button in the handle of the selector lever has not been actuated.
- ♦ At speeds over 5 km/h and with the selector lever set to "N", the solenoid for the selector lever lock should not engage and should lock the selector lever. Selector lever can be shifted into a driving gear.

- ♦ When travelling at speeds below 2 km/h (almost stopped) and shifting into selector lever position "N", solenoid for selector lever lock must not engage until after approx. 1s. Selector lever cannot be shifted out of "N" position until brake pedal is depressed.

1.5 - Removing, installing and adjusting locking cable

Note:

Adjust locking cable after securing locking cable to ignition/starter switch => Page 40 and then secure to selector housing.

Removing

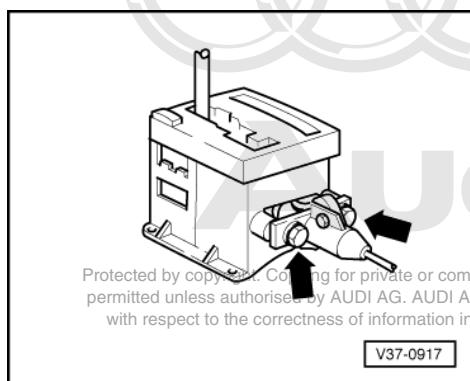
- Removing centre console.

=> General Body Assembly; Repair group 70, Dash Panel

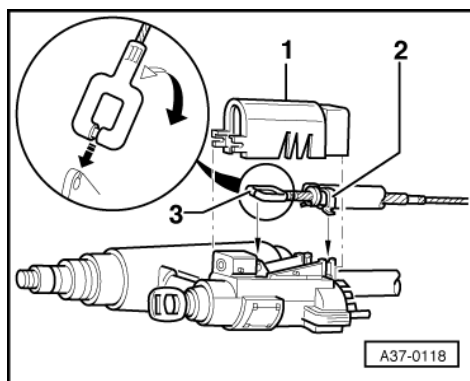
- Remove steering wheel and dash panel insert

=> Electrical System; Repair group 90; Dash panel; Removing and installing dash panel insert Dash panel
Removing and installing dash panel insert

- Shift selector lever into position "N".



- -> Unscrew bolts -arrows-.



- -> Take off cap -1-.
- Release spring clip -2-.
- Turn end of locking cable -3- up through about. 90° and pull up and out of retaining eye on ignition/starter switch.

Note:

Do not kink the locking cable when turning it upwards.

Installing

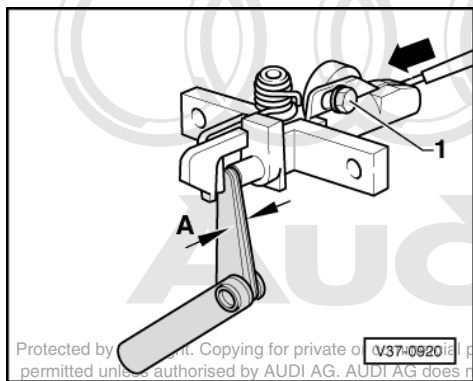
Installation is carried out in the reverse order; note the following:

- Insert locking cable into top of retaining eye on ignition/starter switch (flat parts of locking cable and retaining eye must be aligned) and turn locking cable down through about 90°.
- Insert spring clip.

Note:

The spring clip must be engaged properly, otherwise the cap cannot be fitted.

- Fit cap on ignition/starter switch.



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Adjustment**Note:**

The adjustment of the locking cable is performed in the installed position.

- -> Loosen bolt -1-.
- Turn key in ignition/starter switch to "ignition on" position.
- Locate locking cable support bracket on selector housing (shift gate) and secure in position for bolting on.
- Insert feeler gauge -A- 1.5 mm between locking arm and locking pin.
- Adjust locking cable by moving in direction of arrow so that locking pin is pushed against feeler gauge.
- Tighten bolt in this position to 10 Nm.
- Turn key in ignition/starter switch several times backwards and forwards between "ignition on" and "ignition off" positions.
- Check gap between locking pin and locking arm once again.
 - Specification: 1.2...1.7 mm
- Shift selector lever into position "N".
- Install locking cable on selector housing (shift gate).
- Ensure that locking cable is not kinked.
- For left-hand drive vehicles, secure locking cable with cable clip on heater housing.
- On RHD vehicles, secure locking cable to steering column console with cable clamp.

1.6 - Checking ignition key lock

- Turn ignition key to "ignition on" position.
- Press and hold brake pedal.
- When button in selector lever handle is pressed it must be possible to move selector lever out of position "P" without "catching".

- The ignition key must not be able to be removed in any selector lever setting other than "P".
- Move selector lever to position "P".
- It must be possible to move ignition key to removal position without "sticking".
- Pull out ignition key.
- It should only be possible to remove the ignition key when the selector lever is in the "P" position.
- Selector lever cannot be shifted out of "P" position with locking button and foot brake pressed.

2 - Checking gearbox

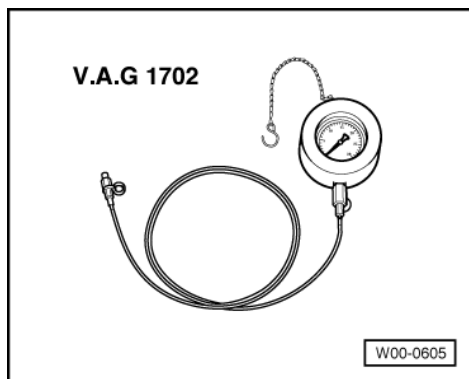
2.1 - Checking gearbox

Always perform self-diagnosis as a first step when tracing the cause of faults.

=> Automatic Gearbox 01N, 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 found and rectified using self-diagnosis.

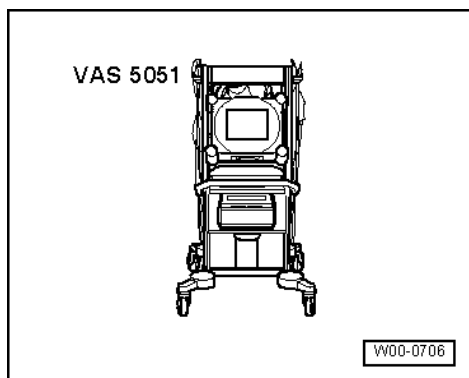
2.2 - Measuring main pressure



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Special tools and workshop equipment required

- ♦ Pressure tester V.A.G 1702





- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2
- ♦ Container

The main pressure should be tested where possible on a roller test stand.

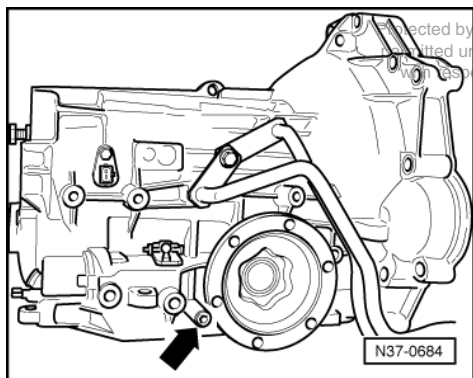
Prerequisite:

- Vehicle diagnostic, testing and information system VAS 5051 connected, "Vehicle self-diagnosis and vehicle system "02 - gearbox electronics" selected.

=> Automatic Gearbox 01N, Self-diagnosis; Repair group 01; Performing self-diagnosis Performing self-diagnosis

- No faults stored in fault memory

=> Automatic Gearbox 01N, Self-diagnosis; Repair group 01; Performing self-diagnosis Performing self-diagnosis

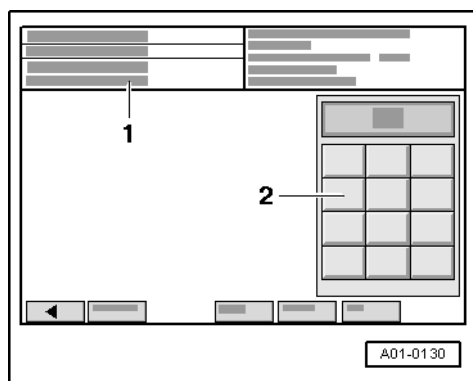


- -> Remove screw -arrow- for main pressure bore, always replace screw.
- Connect pressure tester V.A.G 1702 and tighten knurled screw.
- Start engine and run at idling speed.
- Bleed pressure tester V.A.G 1702; for this purpose, release knurled screw and re-tighten after bleeding.



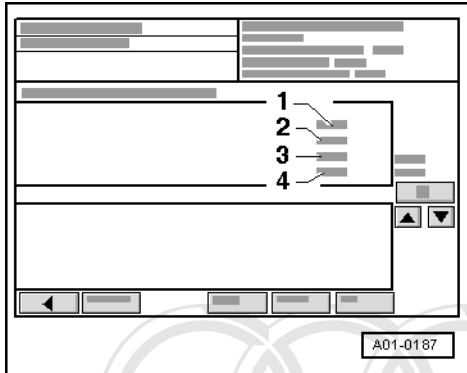
-> Display on VAS 5051:

- Under -1- select diagnostic function "08 - Read measured value block".



-> Display on VAS 5051:

- 1 - Enter display group
- Enter "005" for "display group number 005" in zone -2- and confirm the entry by pressing the Q key.



-> Display on VAS 5051:

- Read off ATF temperature in display zone 1.
- Bring ATF-temperature to 60 °C.
- Exit function "08 - Read measured value block" by pressing the ◀ key.

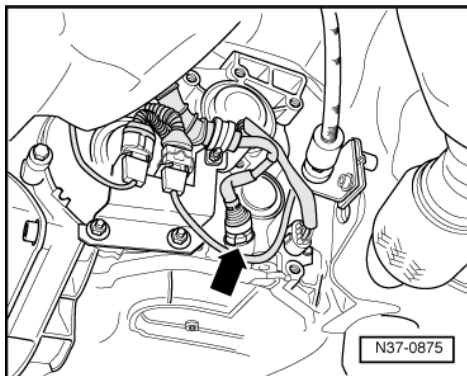
Specified main pressure values in neutral

	Selector lever positions	
	D	R
	Idling	Idling
Main pressure in bar	3.4...3.8	5...6

If specification not attained or exceeded:

Possible causes	Rectification measures
Idling speed too high	Adjust engine
ATF pump defective	Check ATF pump, replace if necessary
Clamp slide valve in valve body	Replace valve body

- Switch ignition off.



- -> Unplug connector -arrow- for solenoid valves.
- Start the engine.

**Specified main pressure values at 2000 rpm**

	Selector lever positions and measurement conditions	
	D	R
	Engine speed approx. 2000 rpm	Engine speed approx. 2000 rpm
Main pressure in bar	12.4...13.2	23.0...24.0

If specification not attained or exceeded:

Possible causes	Rectification measures
ATF pump defective	Check ATF pump, replace if necessary
Clamp slide valve in valve body	Replace valve body

After the measurement:

- Remove pressure tester V.A.G 1702.
 - Install new bolt for main pressure bore and tighten to 12 Nm.
 - Plug in the connector.
 - To interrogate fault memory.
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=> Automatic Gearbox 01N, Self-diagnosis; Repair group 01; Performing self-diagnosis Performing self-diagnosis

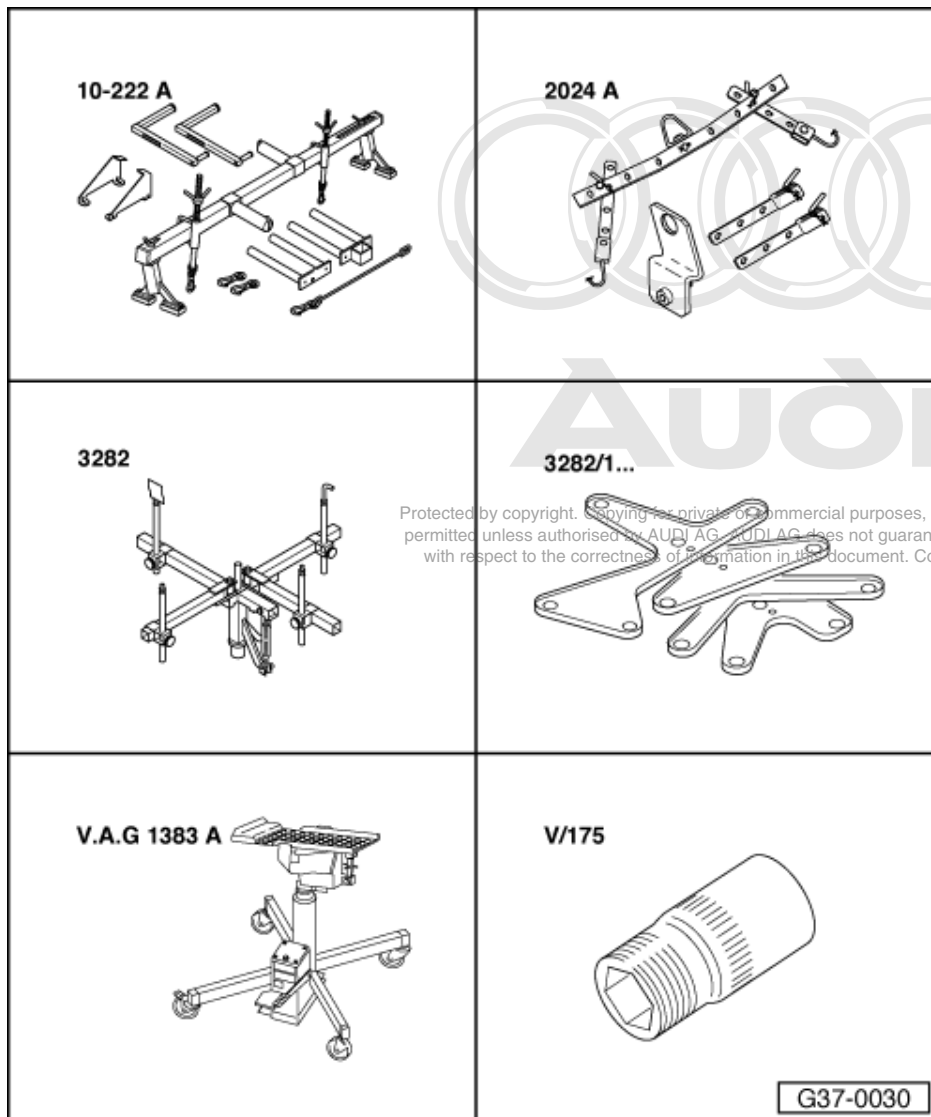
Note:

Faults will have been recorded in the fault memory due to the detached connector. Interrogate and, if necessary, erase fault memory after completing the check.

- Press "06 - End output".
- Switch off ignition and detach diagnostic connector.

3 - Removing and installing gearbox

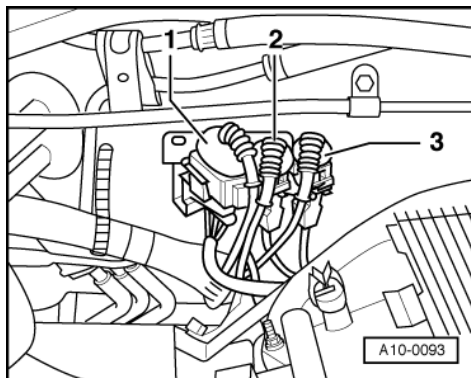
3.1 - Removing and installing gearbox



- ◆ Engine support bracket 10-222 A with legs 10-222 A/1
- ◆ Lifting tackle 2024 A
- ◆ Gearbox support 3282
- ◆ Adjustment plate 3282/3
- ◆ Engine/gearbox lifter V.A.G 1383 A
- ◆ 15 mm socket insert Matra V/175

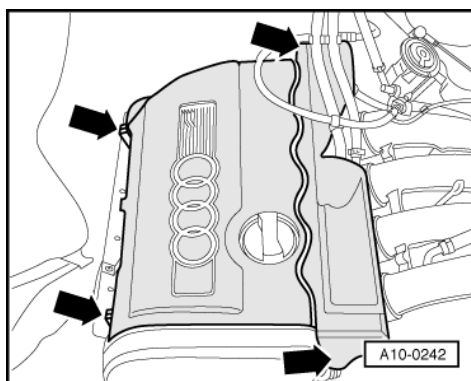
Removing

- Observe or obtain radio code on vehicles with coded radio.
- Disconnect earthing strap at battery with ignition switched off.



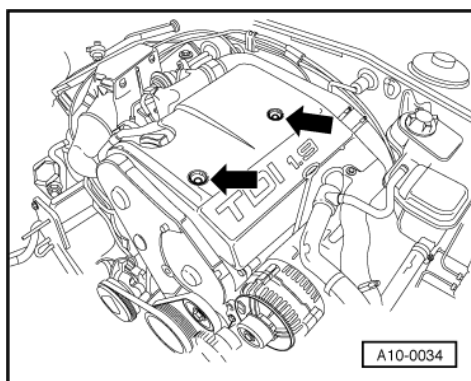
2.0 I Engine:

- -> Detach connector -1- for Lambda probe from retainers, unplug connector and set wiring aside.



1.8 I Engine:

- -> Remove cover over injectors -arrows on right-.

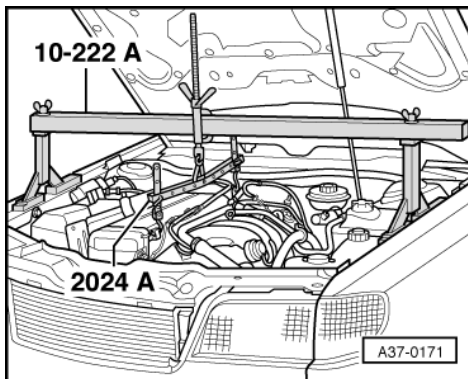


1.9 I TDI-Engine:

- -> Remove engine cover panel -arrows-.

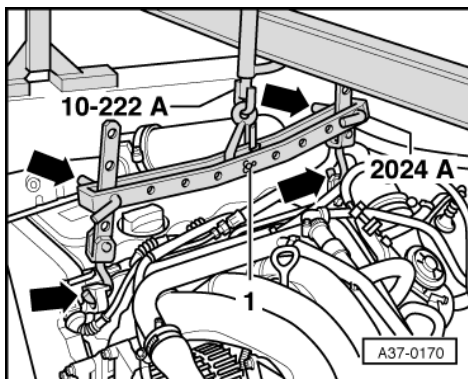


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All models:

- Unscrew engine/gearbox securing bolts accessible from above
- Pull off buffer for engine bonnet.
- -> Set up support bar 10-222 A on wing panel flanges. Spindle is at front.

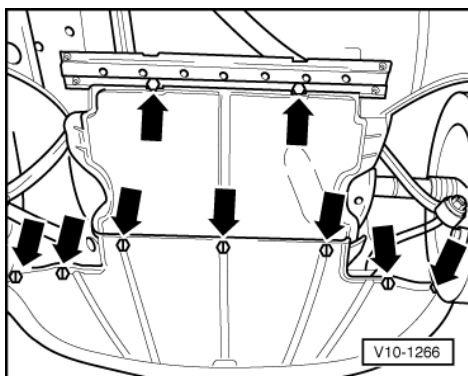


- -> Remove lifting eye from lifting tackle 2024 A. Insert pin -1- in centre hole of lifting tackle again and secure with split pin.
- 2.0 l Engine: Unbolt fuel feed line and fuel return line from retainer at cylinder head.
- Engage pin on lifting tackle 2024 A on spindle of support bar 10-222 A.
- Engage lifting tackle 2024 A in front and rear lifting eyes on engine.

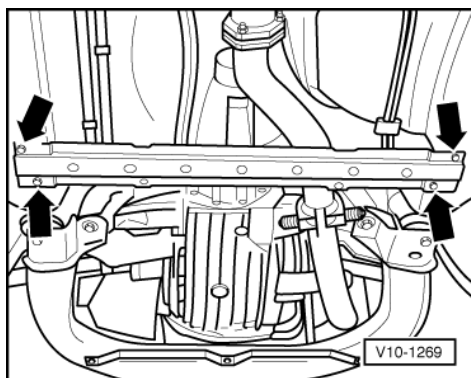
Important

The hooks and locating pins of the lifting tackle must be secured with locking pins -arrows in illustration-.

- Take up weight on of support bracket 10-222 A.
- Detach both front wheels.



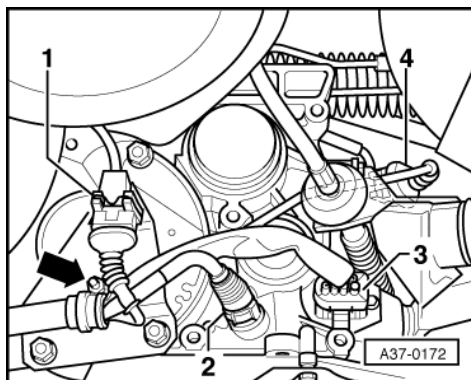
- -> Remove noise insulation (in 2 sections on vehicles with diesel engine) -arrows-.



- -> Remove retainer for noise insulation -arrows-.
- Unbolt front exhaust pipe from exhaust manifold.
- 2.0 I Engine: Unbolt retainer(s) for exhaust system at gearbox.
- Remove front section of exhaust system.

Note:

Avoid excessive bending of the flexible pipe connection (decoupling element) on the front exhaust pipe. The angle between the catalytic converter and the front exhaust pipe must not exceed 10 °, otherwise the flexible connection will be damaged.

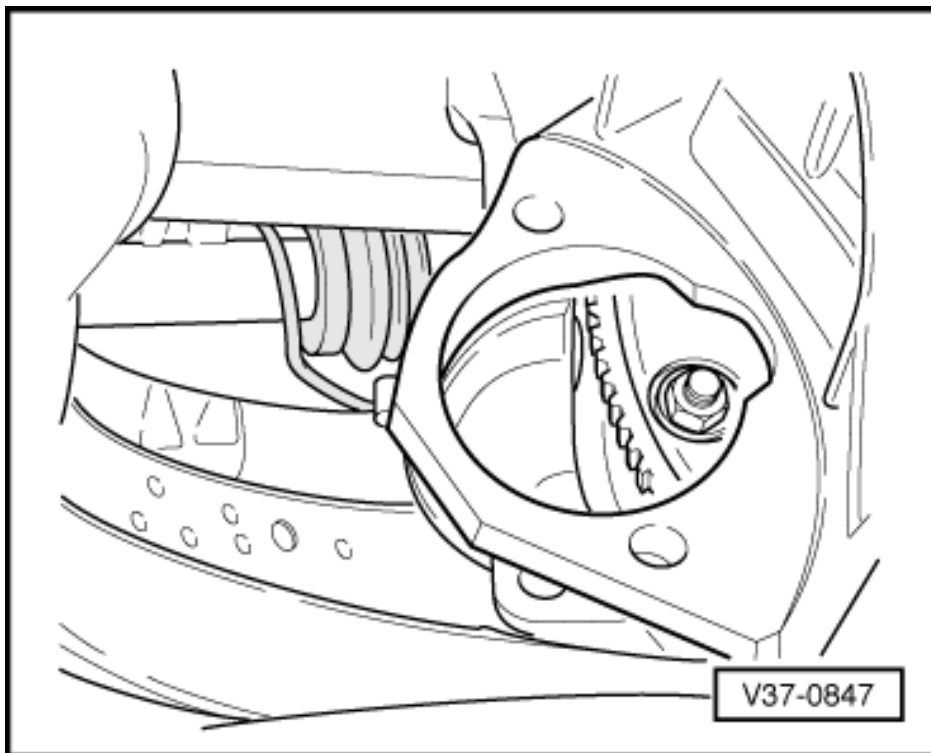


- Remove protective cover from connector.
- -> Mark connectors -1...4- at rear of gearbox so they can be identified when reinstalling and then disconnect.
- Detach clamp for wiring harness-arrow-.
- Disconnect speedometer connector at gearbox.
- Unbolt the heat shield for right drive shaft.
- Detach left/right drive shaft from gearbox flange.

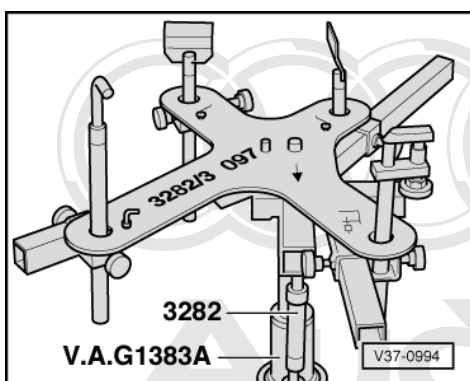
=> Running Gear, Front and Four-wheel Drive; Repair group 40; Servicing drive shafts Servicing drive shafts

- Lift drive shafts up as high as possible and tie to body.

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- Remove starter.
- -> Use Matra V/175 socket attachment (15 mm A/F) to screw out 3 nuts of torque converter in opening in removed starter (give crankshaft 1/3 of a turn in each case).

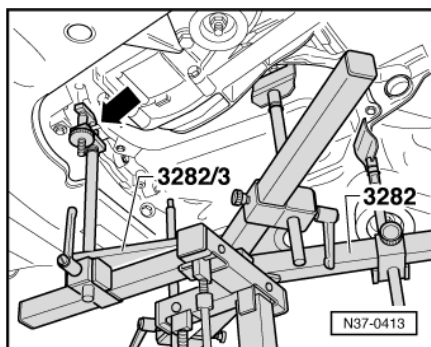


- -> Fit the adjustment plate 3282/3 to the gearbox support 3282 used to remove the automatic gearbox 01N and place the entire assembly on the jack V.A.G 1383 A.

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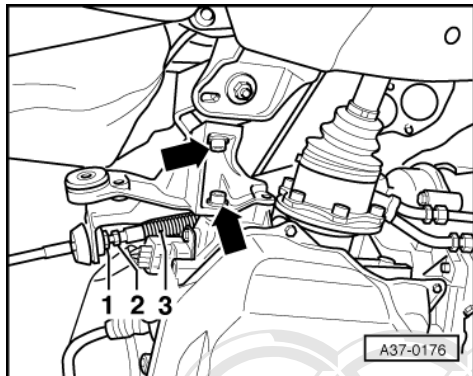
The symbols on the adjustment plate mark the positions of the attachments required for automatic gearbox 01N (arrow points towards front of vehicle).



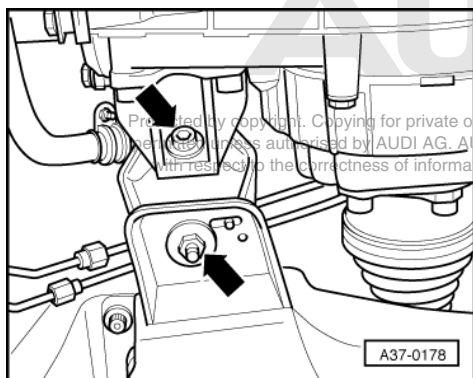
- -> Move jack V.A.G 1383 A with gearbox support 3282 under the gearbox and support gearbox.
- Align adjustment plate parallel to gearbox and lock safety support -arrow- on gearbox.

Note:

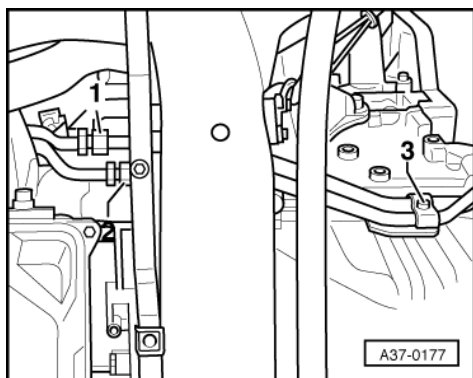
If gearbox support 3282 is not available, gearbox can be removed and installed using gearbox lifter V.A.G 1383 A and universal support V.A.G 1359/2.



- -> Push bellows -3- forward; unscrew nut and take off guide tube -2-.
- Detach selector lever cable from gearbox support.
- Unscrew nut -1- for selector lever cable.
- Dismantle and remove right-hand gearbox support -arrows-. The gearbox mounting must be removed at the same time => Page 59
- Press off retaining clip (not fitted after about 06.95) at end of selector lever cable and press ball socket of selector lever cable off selector lever at gearbox.
- Move selector lever cable clear to the side.



- -> Remove gearbox mounting -arrows-.

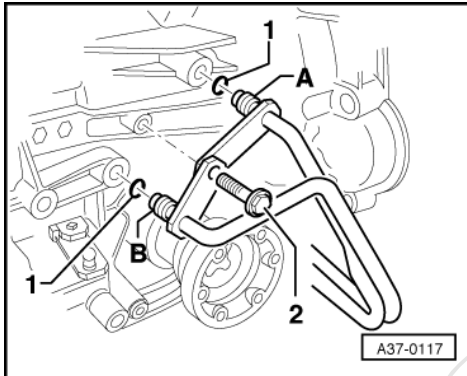


Notes:

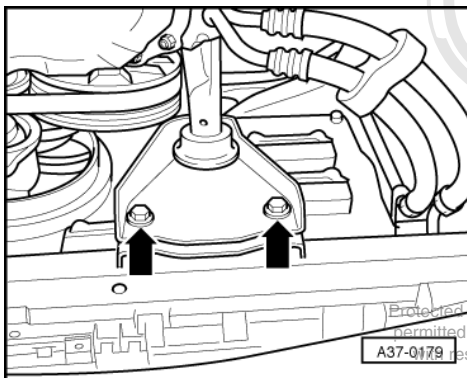
- ♦ When disconnecting ATF lines observe rules for cleanliness for automatic gearbox => Page 69
- ♦ Clean connections of ATF lines before disconnecting.

♦ Note layout of ATF lines => from Page 70

- Unbolt brackets for front ATF lines on engine. Illustration of various brackets => from Page 70
- -> Disconnect ATF-lines at connections -1- and -2- unbolt attachment -3- (illustration shows 2.0-I-Engine).



- -> Unscrew bolt -2-. Pull ATF-lines -A- and -B- away from gearbox and detach.



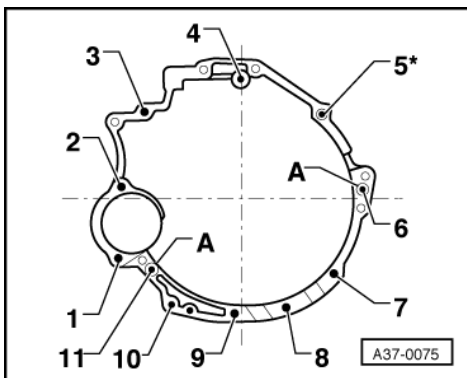
- -> Lower the gearbox slightly at the rear. It may be necessary to remove the bracket for the torque reaction support at the front of the engine -arrows-.

Note:

If necessary slacken spindle on support bracket 10-222 A or insert pins of lifting tackle in appropriate positions.

- Remove cable holder for procon-ten-system from gearbox

=> General Body Assembly; Repair group 68; Servicing procon-ten-system Audi 100 > 05.94 Servicing procon-ten-system Audi 100 > 05.94



- -> Remove bolts from engine/gearbox flange -1...11-
- Remove the gearbox from the engine.
- Use the assembly lever to remove the converter from the driving disc of the engine.

- Press gearbox slightly to the right and lower out of vehicle.

Notes:

- ♦ If necessary, reduce the pre-tensioning at the spindle of support bar 10-222 A.
- ♦ Ensure that there is sufficient room between the body bulkhead and engine.
- Secure the torque converter to prevent it from falling out.

Installing

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

Notes:

- ♦ Before installing a replacement gearbox, clean the ATF lines and the ATF cooler =>Page 75
- ♦ Replace self-locking nuts, bolts tightened to a specified torque angle, as well as sealing rings and seals when performing assembly operations.
- ♦ If installing a new torque converter with integrated needle bearing in a gearbox with a slide bearing in the turbine shaft, the slide bearing must be removed =>Page 19
- Before installing the gearbox, ensure that the torque converter has been correctly inserted into the gearbox => Page 23
- Before installing the gearbox, ensure that the dowel sleeves are correctly seated on cylinder block.
- Fit intermediate plate onto dowel sleeves.
- When pushing the engine and gearbox together, ensure that no cables, lines, etc. can become trapped.
- To secure the torque converter on the drive plate only use the correct nuts as specified in the parts catalogue.

=> Parts List

- Secure nuts of torque converter with special tool Matra V/175.
- Fit drive shafts to gearbox.

=> Running Gear, Front and Four-wheel Drive; Repair group 40; Servicing drive shafts Servicing drive shafts

- Adjust selector lever cable => Page 38

Notes:

- ♦ When the battery is reconnected make sure that the vehicle equipment (radio, clock, electrical window lifter) is activated according to the operating instructions.
- ♦ Further measures after reconnection of voltage supply:

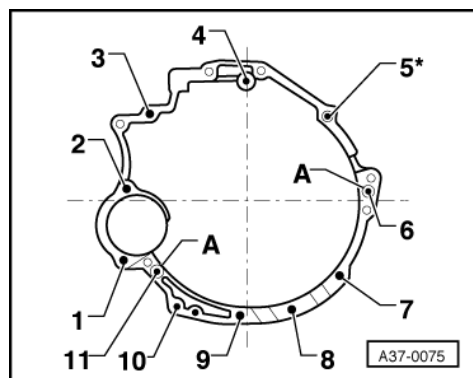
=> Motronic Injection and Ignition System; Repair group 24

- Start the basic setting.

=> Automatic Gearbox 01N, Self-diagnosis; Repair group 01; Performing self-diagnosis; Initiating basic setting Performing self-diagnosis Initiating basic setting

- Check oil level in the final drive of the automatic gearbox => Page 194
- Checking ATF level => Page 59

Tightening torques



-> Fastening engine to gearbox

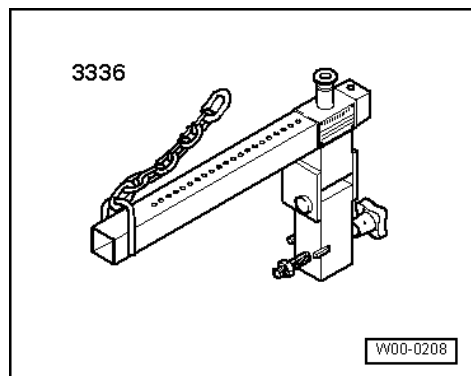
Item	Bolt	Nm
1	M12 x 50	65
2...4	M12 x 67	65
5, 6	M12 x 90	65
7...10	M10 x 45	45
11	M12 x 67	65

A. Centring sleeves

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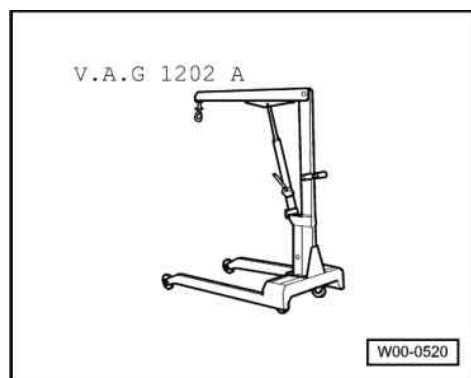
Component	Nm
Drive plate to torque converter	85
ATF lines to gearbox	20
Brackets for ATF lines	10
ATF line to ATF line	25
Gearbox support to gearbox	40
Gearbox support to gearbox support	40
Gearbox mounting to subframe	40
Bracket for noise insulation to body	20
Bracket for torque reaction support to engine	40

3.2 - Transporting the automatic gearbox



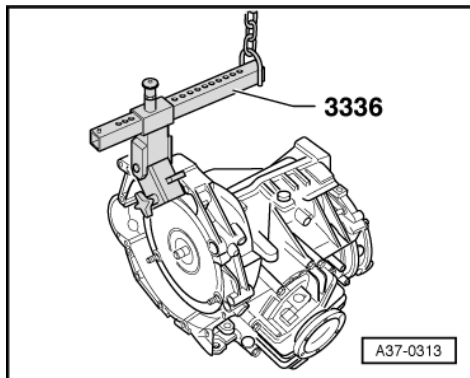
Special tools and workshop equipment required

- ♦ Gearbox lifting beam 3336





- ♦ Workshop crane V.A.G 1202 A



Procedure

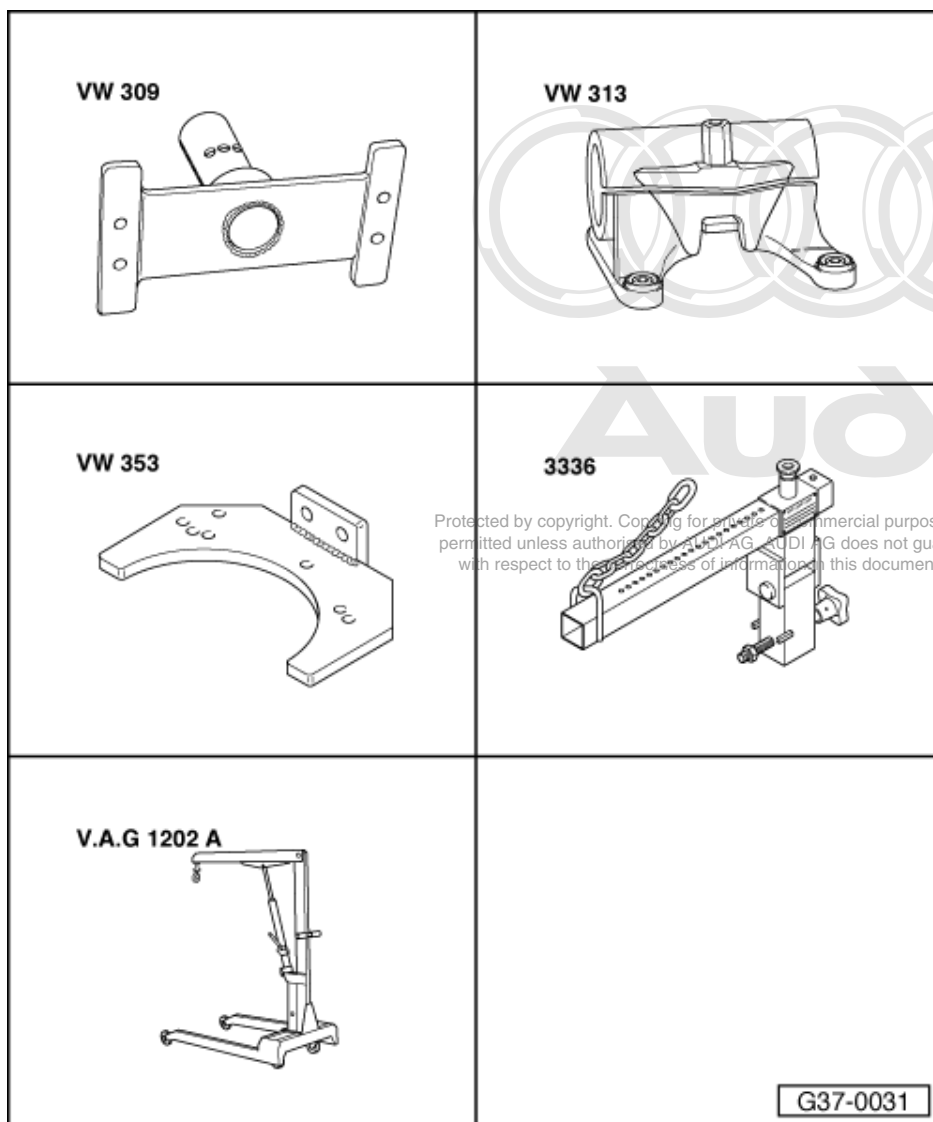
The gearbox lifting beam 3336 can be used to transport the automatic gearbox and when setting up gearbox support 3282.

- -> Secure gearbox lifting beam 3336 to the flange of the gearbox housing.
- Position pins so that 12 holes are visible in chain direction.
- Lift gearbox with workshop crane V.A.G 1202 A and gearbox lifting beam 3336.



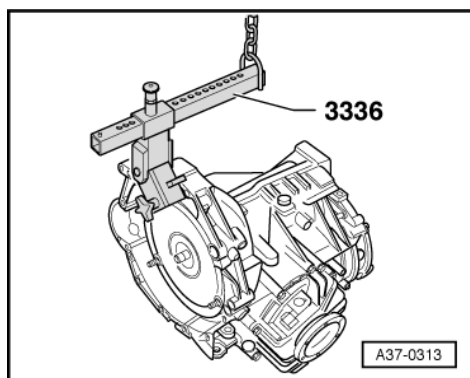
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3.3 - Mounting gearbox on assembly stand



Special tools and workshop equipment required

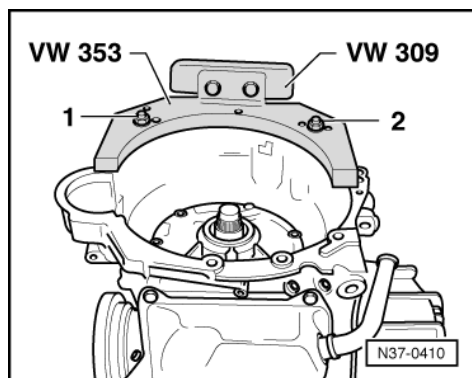
- ◆ Holding plate VW 309
- ◆ Support clamp VW 313
- ◆ Gearbox support VW 353
- ◆ Gearbox lifting beam 3336
- ◆ Workshop crane V.A.G 1202 A





Procedure

- Drain ATF => Page 65
- Removing gearbox => Page 45
- Remove the torque converter or secure so that it cannot fall out.
- -> Secure gearbox lifting beam 3336 to the flange of the gearbox housing.
- Position pins so that 8 holes are visible in chain direction.
- Secure gearbox with retaining plate VW 309 with the aid of the workshop crane V.A.G 1202 A in support clamp VW 313.



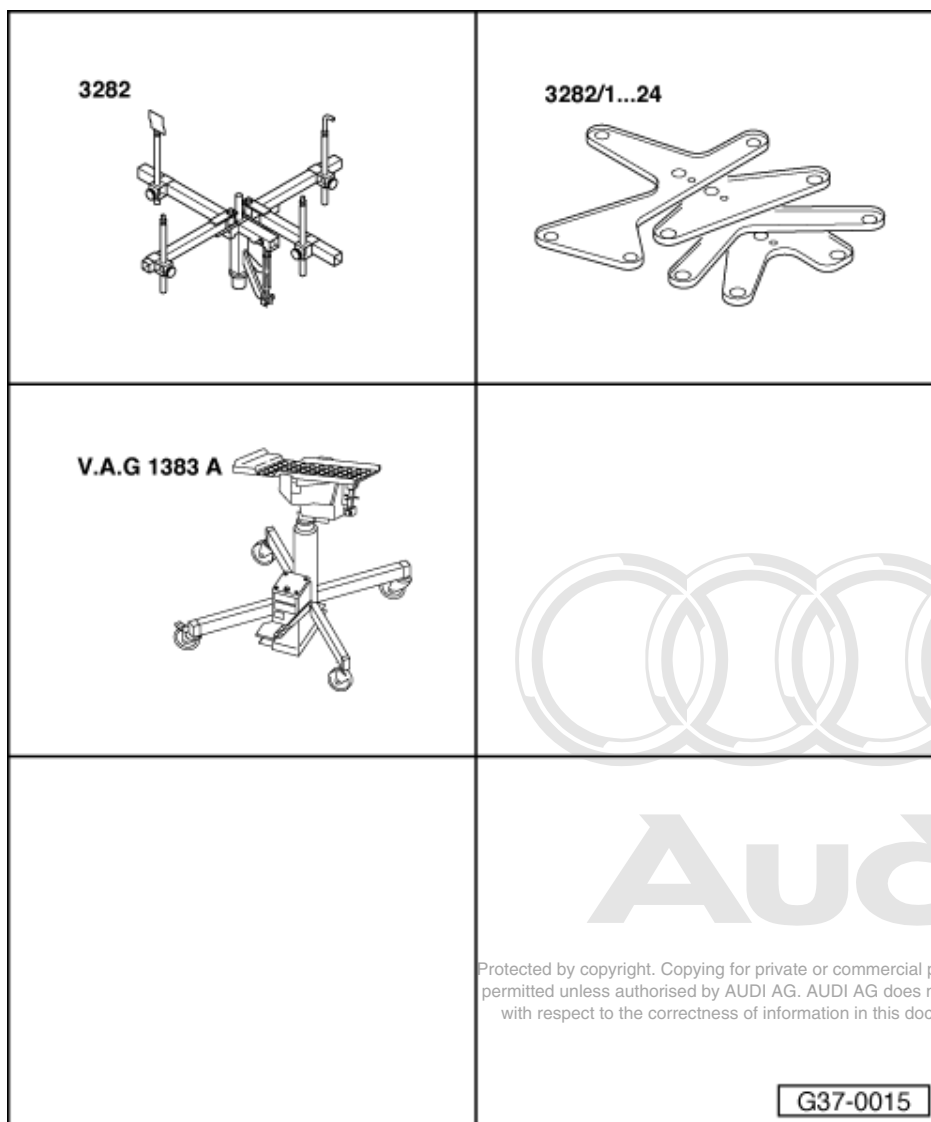
- -> Secure gearbox to assembly support with bolts -1- and -2-.

Important

The centre of gravity of the gearbox is outside the pivot centre of the clamping support. A second fitter has to hold the gearbox housing when it is being turned to prevent it from swinging round.

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3.4 - Removing and installing gearbox support



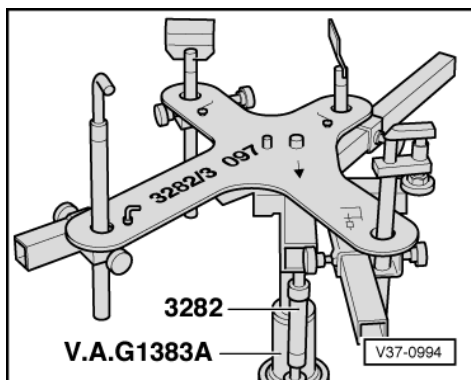
Special tools and workshop equipment required

- ◆ Gearbox support 3282
- ◆ Adjustment plate 3282/3
- ◆ Engine/gearbox lifter V.A.G 1383 A

Removing

Notes:

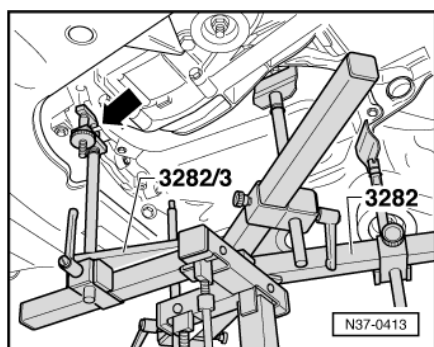
- ◆ If both gearbox supports have been removed, the gearbox must be supported as described.
- ◆ If only one of the gearbox supports has been removed, the jack does not have to be used to support the gearbox.



- -> Fit the adjustment plate 3282/3 to the gearbox support 3282 used to remove the automatic gearbox 01N and place the entire assembly on the jack V.A.G 1383 A.

Note:

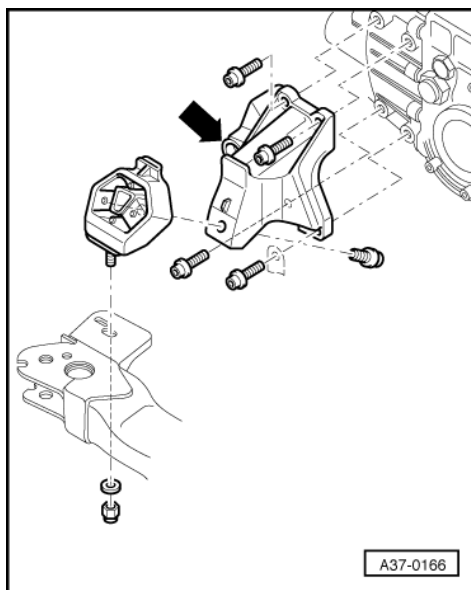
The symbols on the adjustment plate mark the positions of the attachments required for automatic gearbox 01N (arrow points towards front of vehicle).



- -> Move jack V.A.G 1383 A with gearbox support 3282 under the gearbox and support gearbox.
- Align adjustment plate parallel to gearbox and lock safety support -arrow- on gearbox.

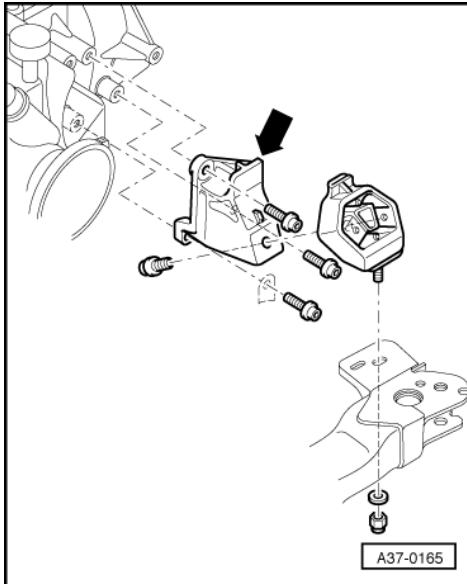
Note:

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



Right-hand gearbox support:

- Unbolt the heat shield for the right drive shaft.
- Unbolt selector lever cable and unhook.
- 2.0 l Engine: Unbolt retainer(s) for exhaust system at gearbox.
- -> Remove right-hand gearbox support -arrow-.



Left-hand gearbox support:

- -> Remove left-hand gearbox support -arrow-.

Installing

Installation is in reverse order.

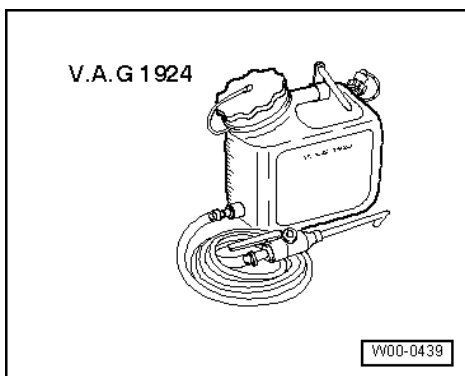
Tightening torques

Component	Nm
Gearbox support to gearbox	40
Gearbox support to gearbox support	40
Gearbox mounting to subframe	40
Heat shield for drive shaft to gearbox	25

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4 - Checking and topping up ATF level

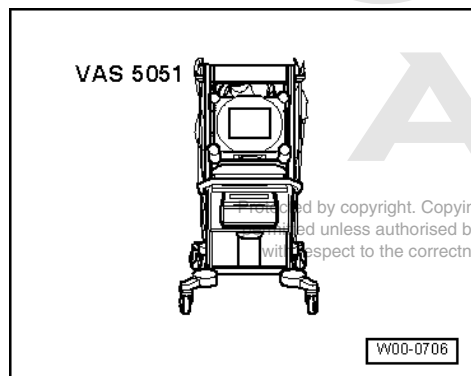
4.1 - Checking and topping up ATF level





Special tools and workshop equipment required

- ♦ ATF filling system V.A.G 1924 and protective goggles



- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2
- ♦ Container

4.2 - Checking ATF level

Test requirements:

- Vehicle must be level (horizontal)
- Gearbox not in emergency running mode.
- At the beginning of the test, the ATF temperature must not be higher than 35 °C.
- Selector lever at position "P", engine idling.
- The air conditioner and heating system must be switched off.

Note:

Use only ATF "G 052 162 A." (colour: clear/yellow). Do not use any additives!

Container:

- ♦ 0.5 l - Part no. G 052 162 A1
- ♦ 1.0 l - Part no. G 052 162 A2
- ♦ 20 l - Part no. G 052 162 A6

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.
- ♦ Both overfilling and underfilling have a detrimental effect on the functioning of the gearbox.
- ♦ The ATF temperature is read from the vehicle diagnostic, testing and information system VAS 5051.

Prerequisite:

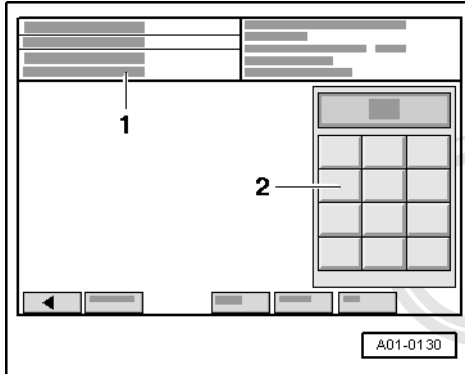
- Vehicle diagnostic, testing and information system VAS 5051 connected, "Vehicle self-diagnosis and vehicle system "02 - gearbox electronics" selected.

=> Automatic Gearbox 01N, Self-diagnosis; Repair group 01; Performing self-diagnosis Performing self-diagnosis



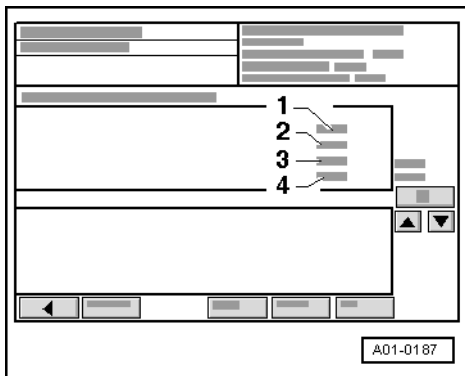
Test sequence

- Shift selector lever to position "P" and allow engine to run at idling speed.
- > Display on VAS 5051:
- Under -1- select diagnostic function "08 - Read measured value block".



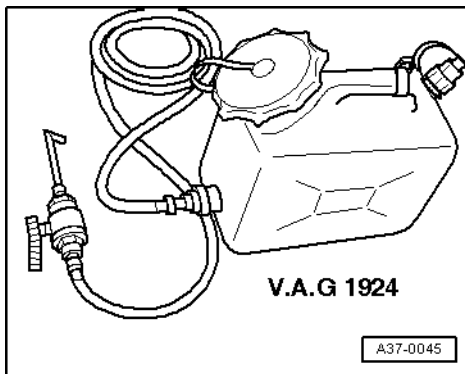
-> Display on VAS 5051:

- 1 - Enter display group
 - Enter "005" for "display group number 005" in zone 2, and confirm the entry by pressing the Q key.
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-> Display on VAS 5051:

- Read off ATF temperature in display zone 1.





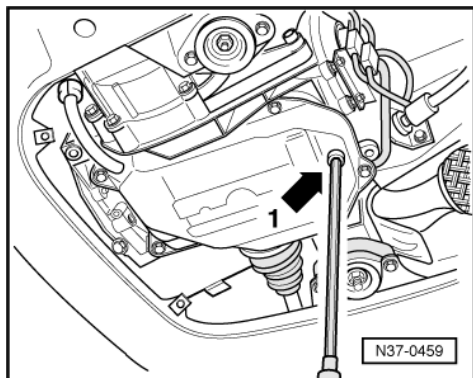
Notes:

- ♦ The ATF level is checked at the ATF inspection hole.
- ♦ The ATF level is correct if at an ATF temperature between 35 ° and 45 °C 1) there is still a slight leakage of fluid at the ATF inspection hole (caused by the rise in fluid level due to heating).

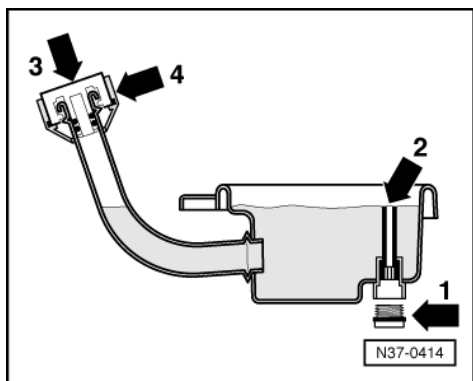
1) 50 °C for tropical countries

- -> Mount the reservoir of the ATF filler system V.A.G 1924 as high as possible on the vehicle.
- Raise vehicle.
- Place container under the gearbox.

Important
Wear protective goggles.



- -> If an ATF temperature of 35 °C is reached, unscrew the screw plug for ATF-check -arrow 1-.



- > The ATF present in the overflow pipe runs out first -arrow 2-.

Note:

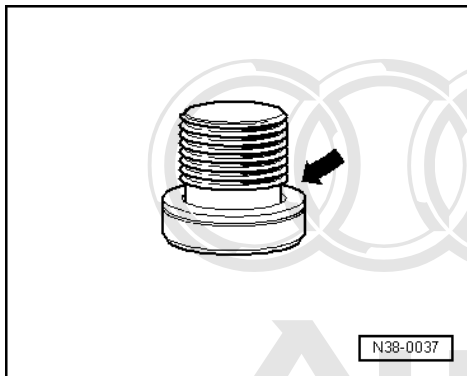
There is always a small amount of ATF in the overflow pipe. This should not be confused with the small quantity of ATF which will emerge if the ATF level is correct.

- Check that the overflow pipe is screwed in to the stop (2 Nm; 5 mm hexagon socket).
- If ATF emerges from the ATF-level hole before the ATF has reached 40 °C the ATF level is OK.

Note:

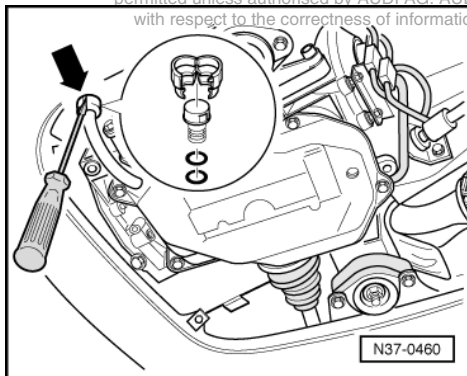
The screw plug for ATF check must be screwed in again before the ATF reaches a temperature of 45 °C 1).

1) 50 °C for tropical countries

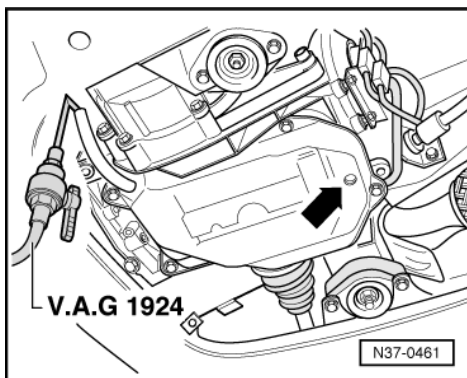


- -> Cut sealing ring -arrow- for screw plug with side-cutting pliers and replace.
- Tighten screw plug to 15 Nm.

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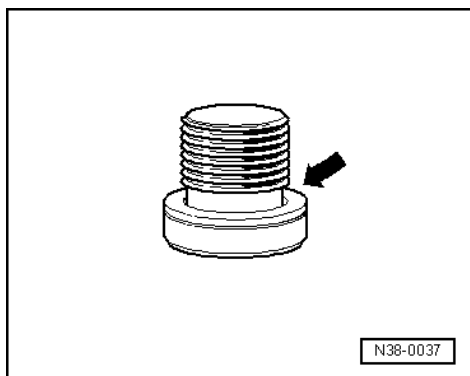


- If no ATF emerges from the ATF-level hole by the time the ATF has reached 40 °C, the ATF must be topped up.
- -> Lever off plug securing cap -arrow- with a screwdriver. The cap locking device will be destroyed, when doing this therefore always renew cap.
- Pull plug out of filler pipe.

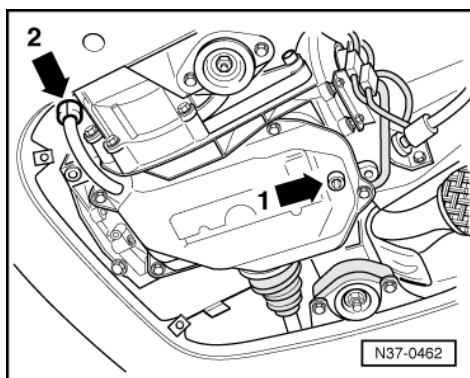


- -> Fill with ATF using V.A.G 1924. until ATF runs out of level hole -arrow-.

Important
An insufficient ATF filling as well as filling to excess affects the function of the gearbox.



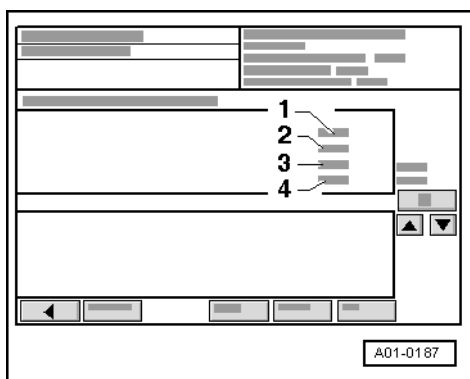
- -> Cut sealing ring -arrow- for screw plug with side-cutting pliers and replace.



- -> Tighten screw plug -arrow 1- to 15 Nm.
- Fit plug on filler pipe and secure with a new cap -arrow 2-.
- Lock cap.

Important

Always renew cap. The cap secures the sealing plug.



-> Display on VAS 5051:

- Exit function "08 - Read measured value block" by pressing the ◀ key.
- Press "06 - End output".
- Switch off ignition and detach diagnostic connector.

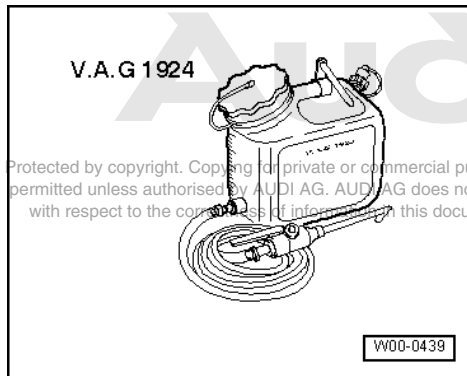


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4.3 - Changing ATF or filling up after repairs

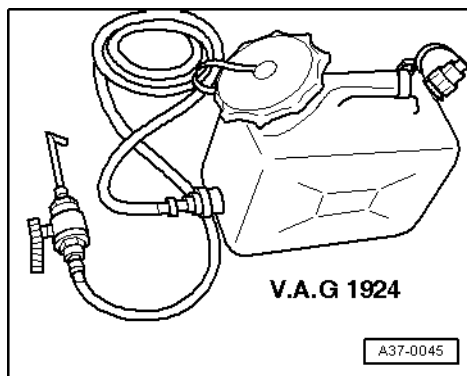
Notes:

- ◆ Always observe the relevant environmental regulations for disposal.
- ◆ The engine must not be started or towed without ATF in gearbox.



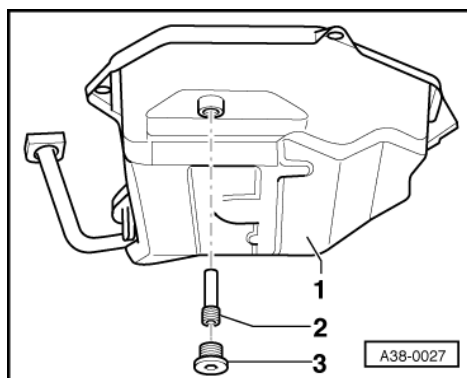
Special tools and workshop equipment required

- ◆ Filler system V.A.G 1924
- ◆ Container



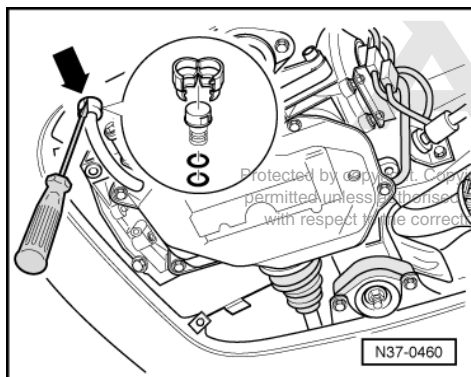
Procedure

- Engine switched off.
- -> Mount the reservoir of the ATF filler system V.A.G 1924 as high as possible on the vehicle.
- Raise vehicle.

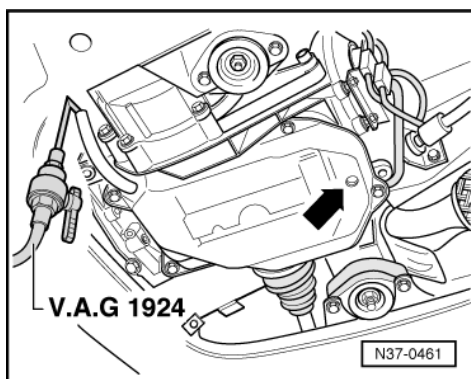




- Place container under the gearbox.
- -> Remove screw plug for ATF check -3- and overflow pipe -2- (5 mm hexagon socket).
- Allow the ATF to drain out.
- Screw in overflow pipe -2- as far as stop (2 Nm).



- -> Lever off plug securing cap -arrow- with a screwdriver. The cap locking device will be destroyed, when doing this therefore always renew cap.
- Pull plug out of filler pipe.



Filling ATF

Note:

When filling is started, the ATF temperature must not be higher than 35 °C.

- -> Fill with ATF using V.A.G 1924. until ATF runs out of level hole -arrow-.
- Move selector lever to position "P".
- Start the engine.
- With engine running continue adding ATF until ATF emerges at hole.

Important

An insufficient ATF filling as well as filling to excess affects the function of the gearbox.

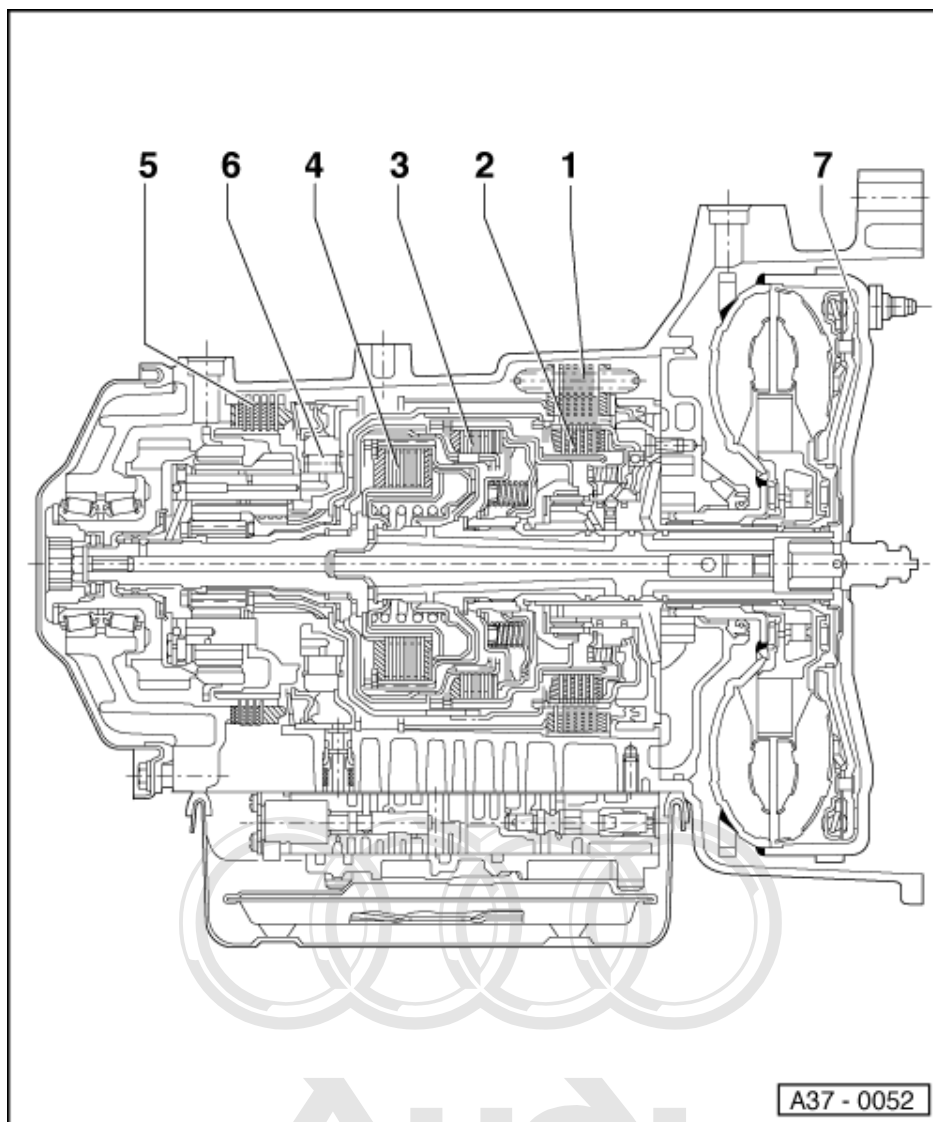
- With the engine idling press the brake pedal and shift the selector lever through all the selector lever positions leaving the selector lever 2...3 seconds in each position.
- Move selector lever to position "P".
- Checking ATF level and topping up => Page 60

Note:

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

5 - Gearbox with selector elements

5.1 - Gearbox with selector elements



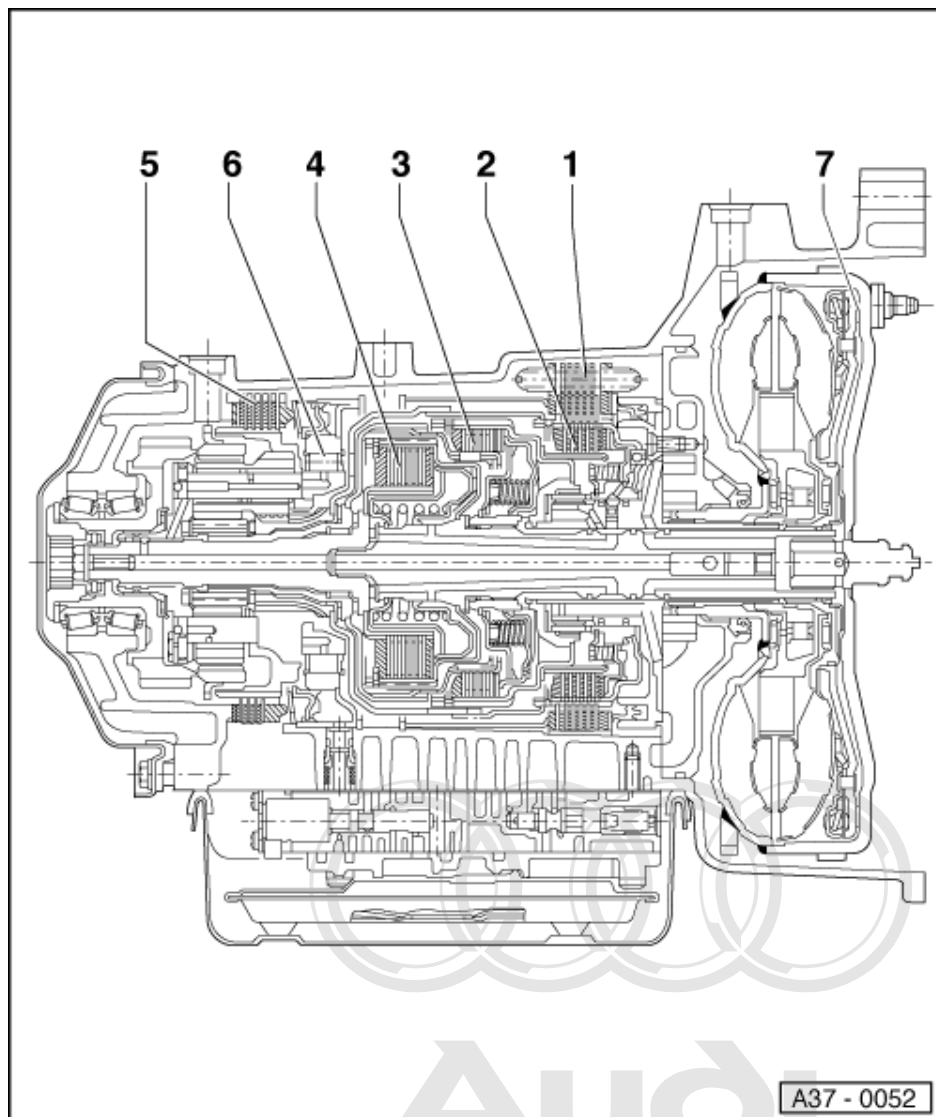
Position of selector elements

- 1 = 2nd and 4th gear brake -B2-
- 2 = Reverse gear clutch -K2-
- 3 = 1st to 3rd gear clutch -K1-
- 4 = 3rd and 4th gear clutch -K3-
- 5 = Reverse gear brake -B1-
- 6 = Free wheel clutch
- 7 = Torque converter lock-up clutch Wk



The following table shows which selector elements are operated in the individual gears to help you deal with complaints regarding poor acceleration and speed performance or generally with drive train faults. It is thus possible to establish which selector elements are not functioning correctly.

5.2 - Position of selector elements



Gear	B1	B2	K1	K2	K3	F	Wk
R	X			X			
1H			X			X	
1M			X			X	X
2H		X	X				
2M		X	X				X
3H			X		X		
3M			X		X		X
4H		X			X		
4M		X			X		X

X = clutches, brakes or free wheel engaged
H = hydraulic

X = clutches, brakes or free wheel engaged M = mechanical
--

Before starting repairs to the gearbox, first carry out the self-diagnosis.

=> Automatic Gearbox 01N, Self-diagnosis; Repair group 01; Performing self-diagnosis Performing self-diagnosis

6 - Dismantling and assembling gearbox

6.1 - Dismantling and assembling gearbox

- Observe general repair instructions=> Page 15

6.2 - Rules for cleanliness when working on the automatic gearbox

- ◆ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ◆ Place removed parts on a clean surface and cover. Use sheeting and paper. Use lint-free cloths.
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components: do not remove replacement parts from their wrapping until you are ready to install them.
- ◆ Always renew O-rings, seals and gaskets.
- ◆ Lightly lubricate O-rings with ATF before inserting to prevent them being trapped and damaged when assembling.
- ◆ Do not use any other lubricants in or on components that are lubricated with ATF. Otherwise, problems may occur with the hydraulic actuation of the gearbox.
- ◆ After installation, check and if necessary top up gear oil and ATF.

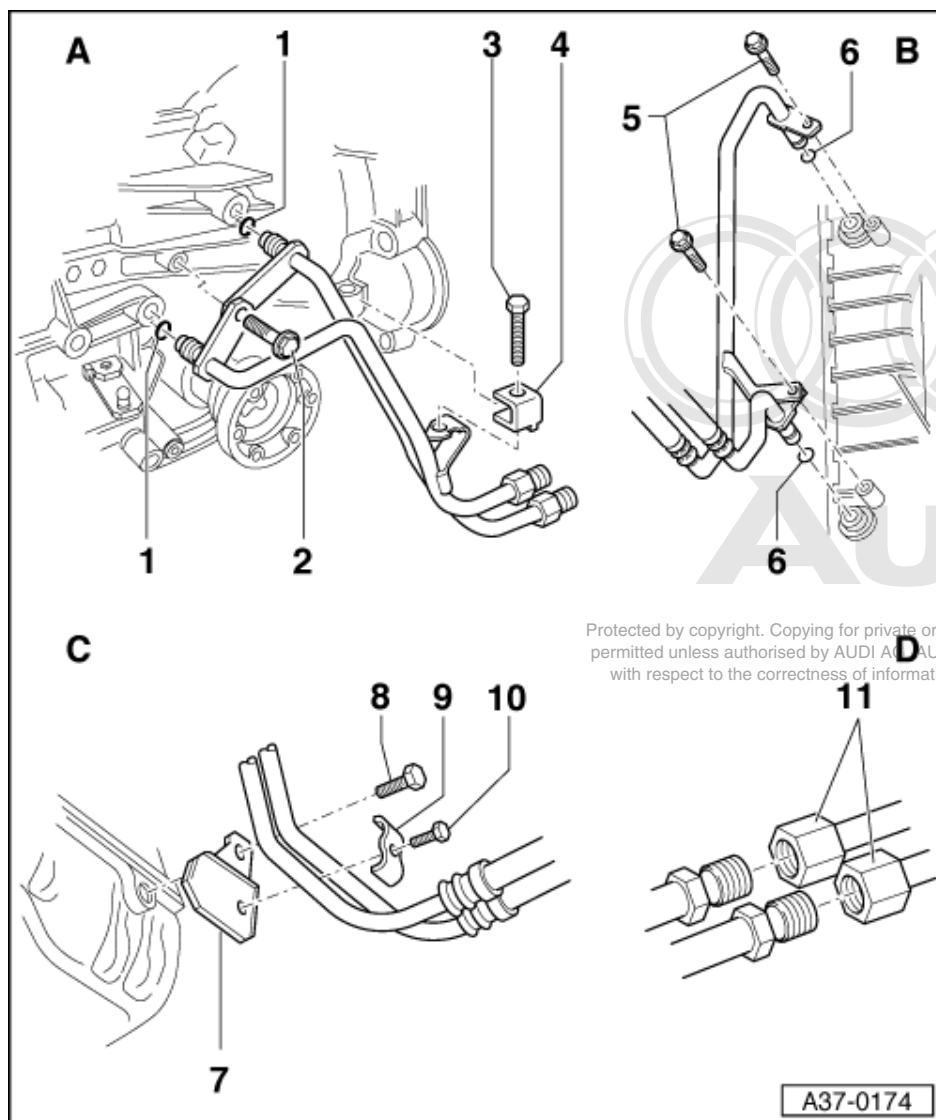
6.3 - Removing and installing ATF lines

Notes:

- ◆ Observe rules for cleanliness when working on the automatic gearbox=> Page 69
- ◆ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ◆ Insert ATF lines completely by hand up to stop in gearbox or cooler and then screw on.
- ◆ After Replacing ATF lines check ATF level =>Checking ATF level and topping up, Page 59

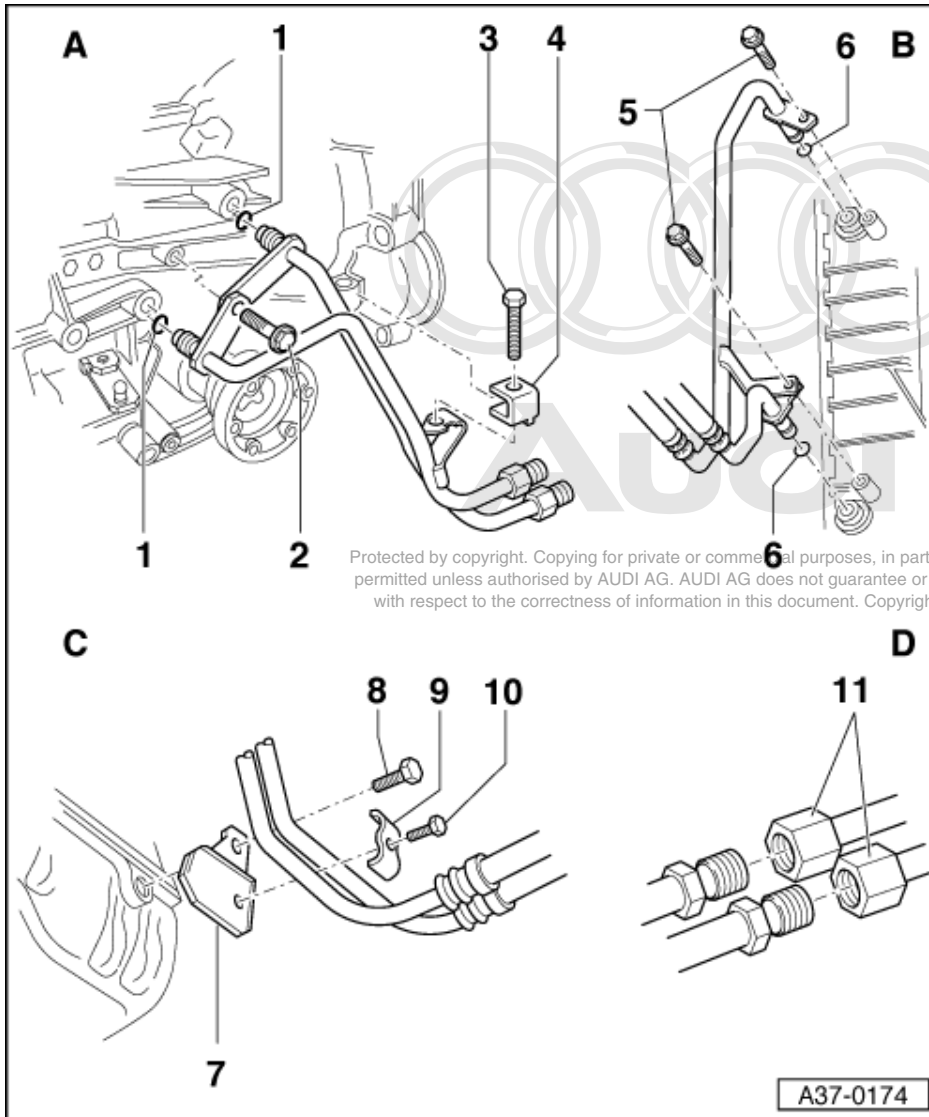
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6.4 - 1.8 | Engine



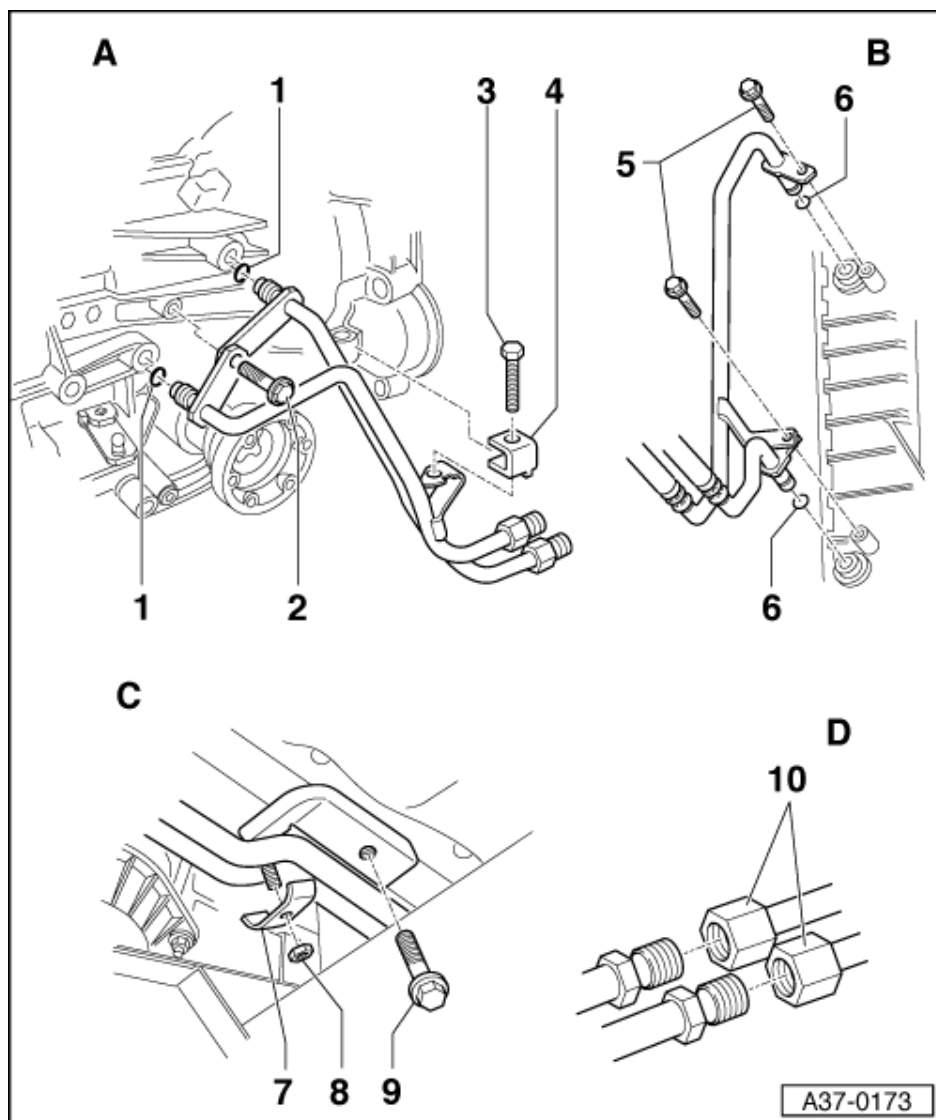
- A - Attachment of ATF line to gearbox**
- B - Attachement of ATF line to ATF cooler**
- C - Attachment of ATF line to engine**
- D - Threaded unions: ATF line to ATF line**

- 1 O-ring**
 - ◆ Replace
 - ◆ Insert with ATF
- 2 Bolt - 20 Nm**
 - ◆ Insert lines completely first and then tighten



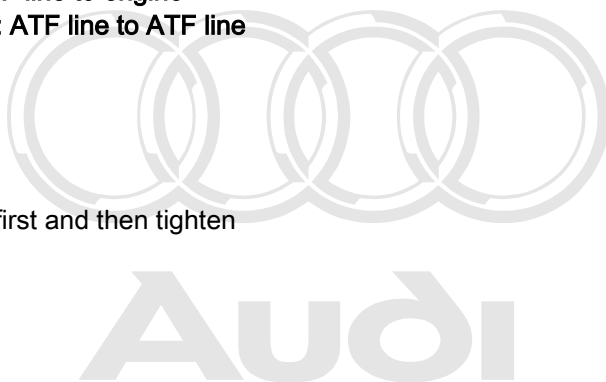
- 3 Bolt - 10 Nm
- 4 Bracket
- 5 Bolt - 5 Nm
 - ♦ Insert lines completely first and then tighten
- 6 O-ring
 - ♦ Replace
 - ♦ Insert with ATF
- 7 Bracket
- 8 Bolt - 25 Nm
- 9 Clip
- 10 Bolt - 10 Nm
- 11 Union nut - 25 Nm

6.5 - 2.0 I Engine

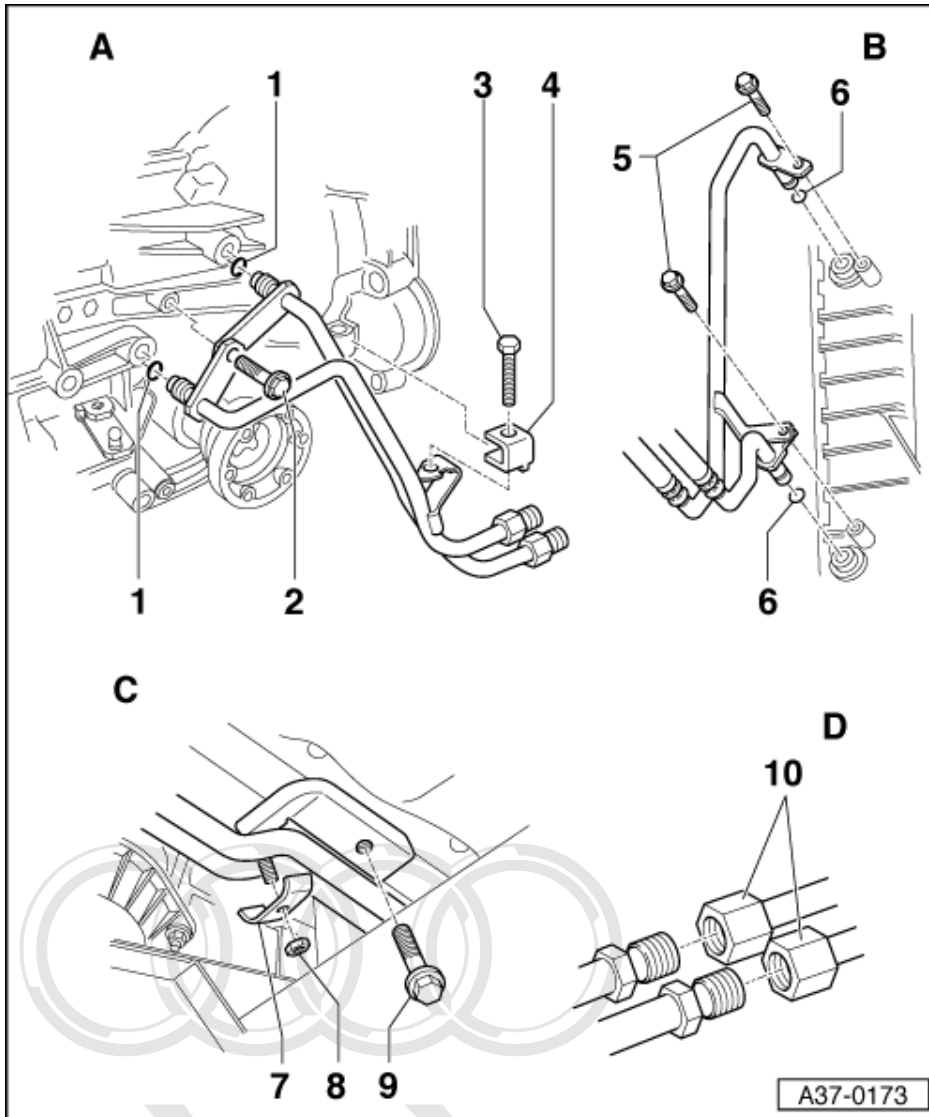


- A - Attachment of ATF line to gearbox
- B - Attachment of ATF line to ATF cooler
- C - Attachment of ATF line to engine
- D - Threaded unions: ATF line to ATF line

- 1 O-ring
 - ◆ Replace
 - ◆ Insert with ATF
- 2 Bolt - 20 Nm
 - ◆ Insert lines completely first and then tighten



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3 Bolt - 10 Nm

4 Bracket

5 Bolt - 5 Nm

♦ Insert lines completely first and then tighten

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6 O-ring

♦ Replace

♦ Insert with ATF

7 Clip

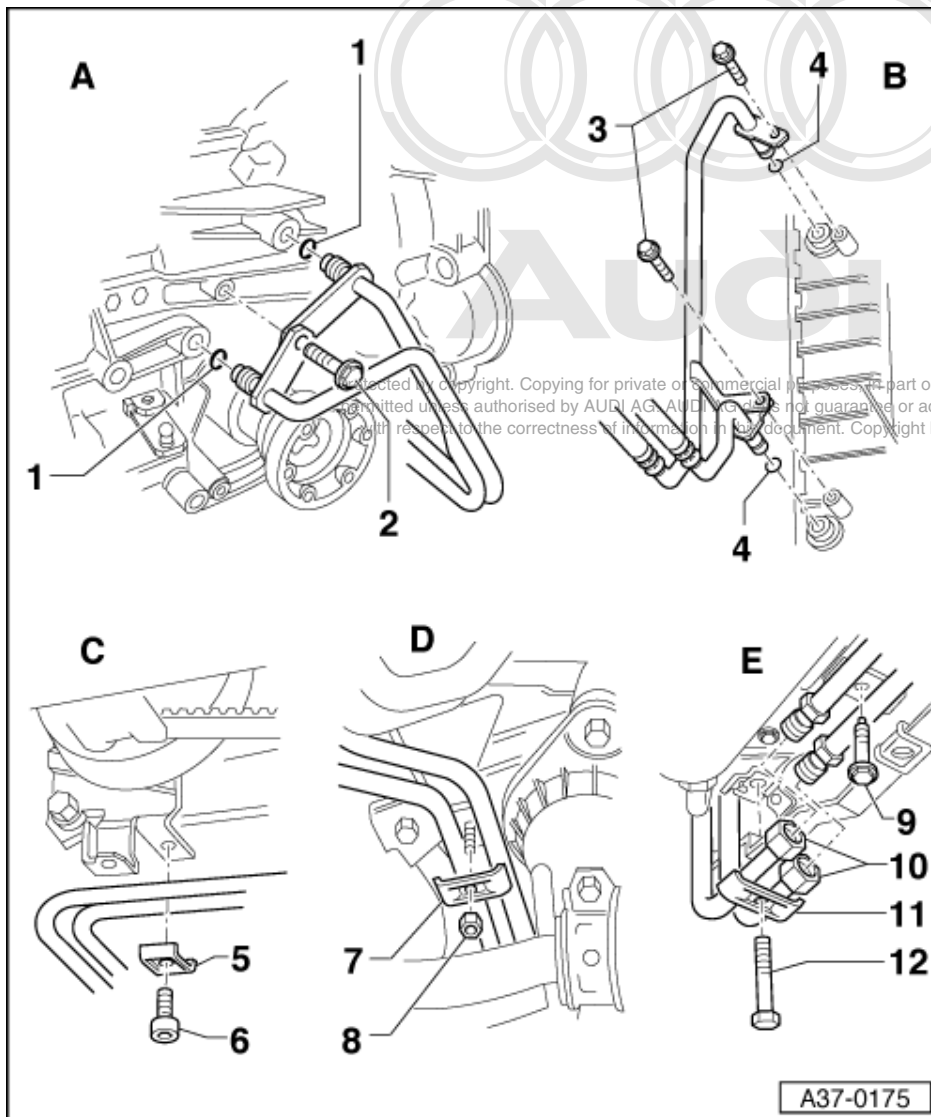
8 Nut - 5 Nm

9 Bolt - 20 Nm

10 Union nut - 25 Nm



6.6 - Diesel engine



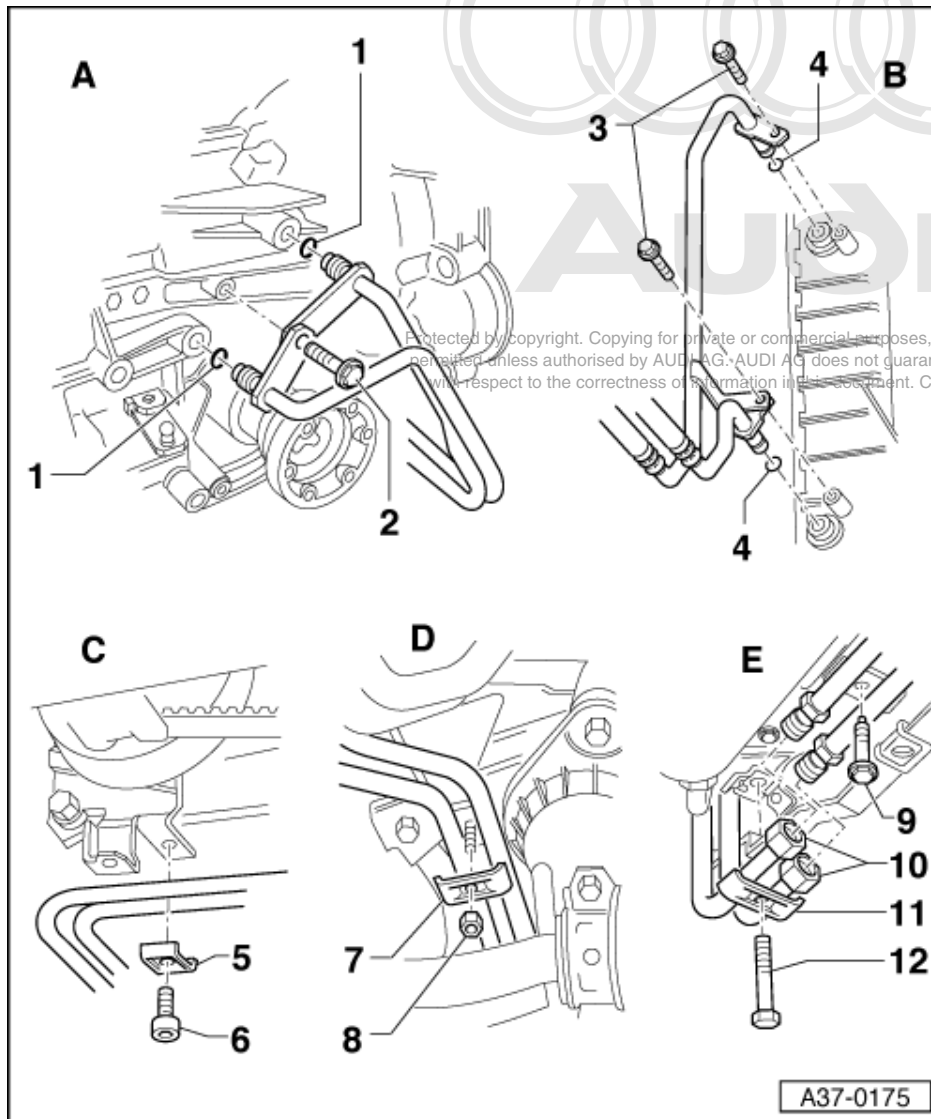
- A - Attachment of ATF line to gearbox
- B - Attachment of ATF line to ATF cooler
- C - Attachment of ATF line at front right of engine
- D - Attachment of ATF line to front left of engine
- E - Attachment of ATF line to rear of engine; threaded unions, ATF line to ATF line

1 O-ring

- ◆ Replace
- ◆ Insert with ATF

2 Bolt - 20 Nm

- ◆ Insert lines completely first and then tighten



- 3 Bolt - 5 Nm
 - ◆ Insert lines completely first and then tighten
- 4 O-ring
 - ◆ Replace
 - ◆ Insert with ATF
- 5 Clip
- 6 Bolt - 5 Nm
- 7 Clip
- 8 Nut - 5 Nm
- 9 Bolt - 10 Nm
- 10 Union nut - 25 Nm
- 11 Clip
- 12 Bolt - 5 Nm

6.7 - Cleaning ATF lines and ATF cooler

Special tools and workshop equipment required

- ◆ Commercially available compressed air gun
- ◆ Protective goggles

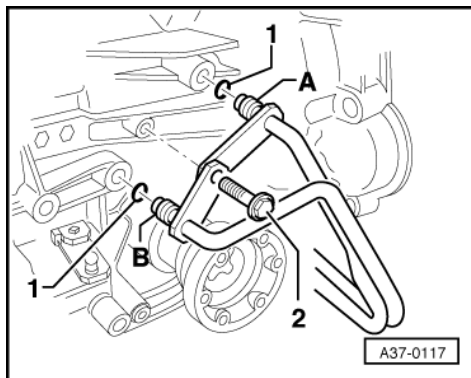
- ♦ Container

Notes:

- ♦ See notes on "Removing and installing ATF lines" => Page 69
- ♦ Before fitting a replacement gearbox, always blow through the ATF cooler and ATF lines with compressed air (not more than 10 bar).
- ♦ To install, first insert ATF lines into gearbox or cooler by hand as far as they will go, then bolt on.

Procedure

- Place drip container underneath to collect oil.
- Unbolt bracket for ATF lines => from Page 70



- -> Unscrew bolt -2-.
- Detach ATF lines from gearbox.
- Connect a hose to ATF line -A- and secure with a hose clamp. Hang other end of hose in a suitable container.

Important

Wear protective goggles.

- Blow through ATF line -B- with a compressed air gun.
- Change hose from ATF line -A- over to ATF line -B- and repeat sequence.
- Secure ATF lines again.
- Check and top up ATF level =>from Page 59

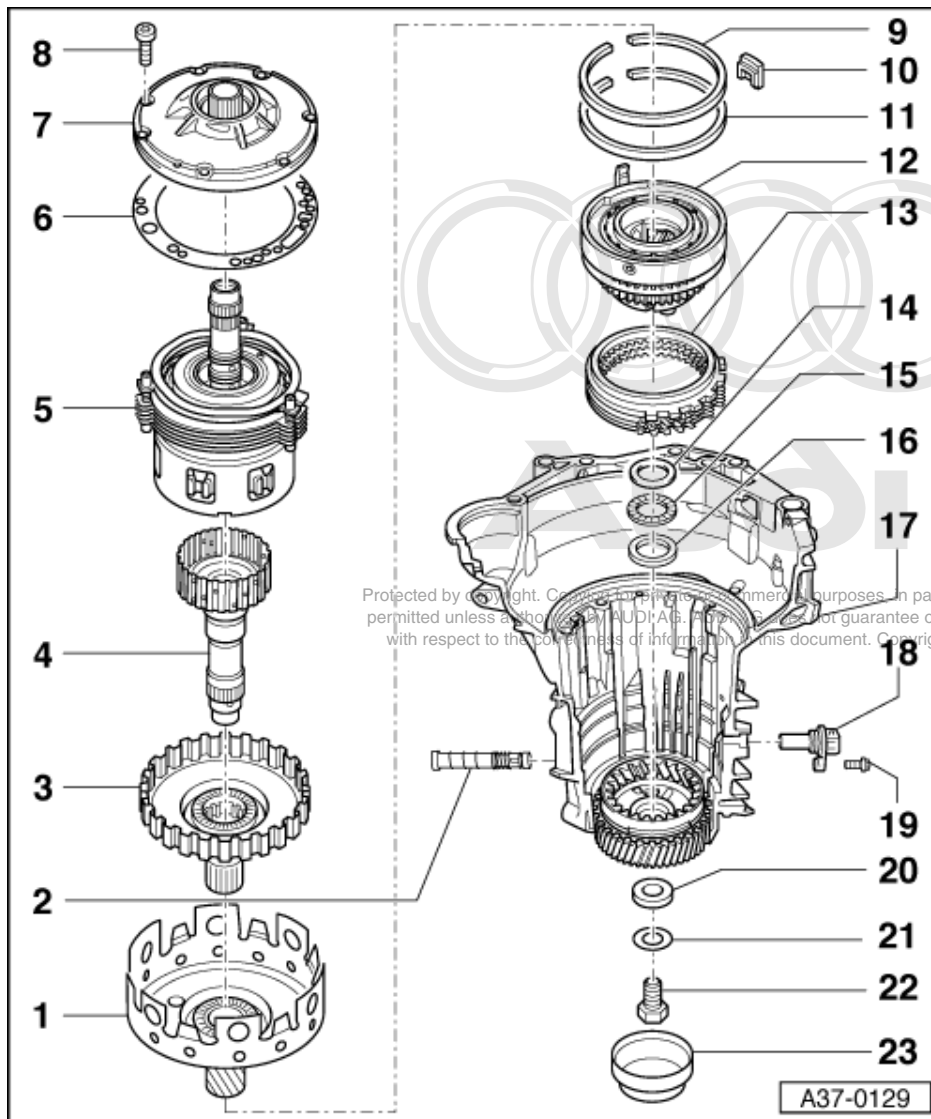
7 - Dismantling and assembling planetary gearbox

7.1 - Dismantling and assembling planetary gearbox

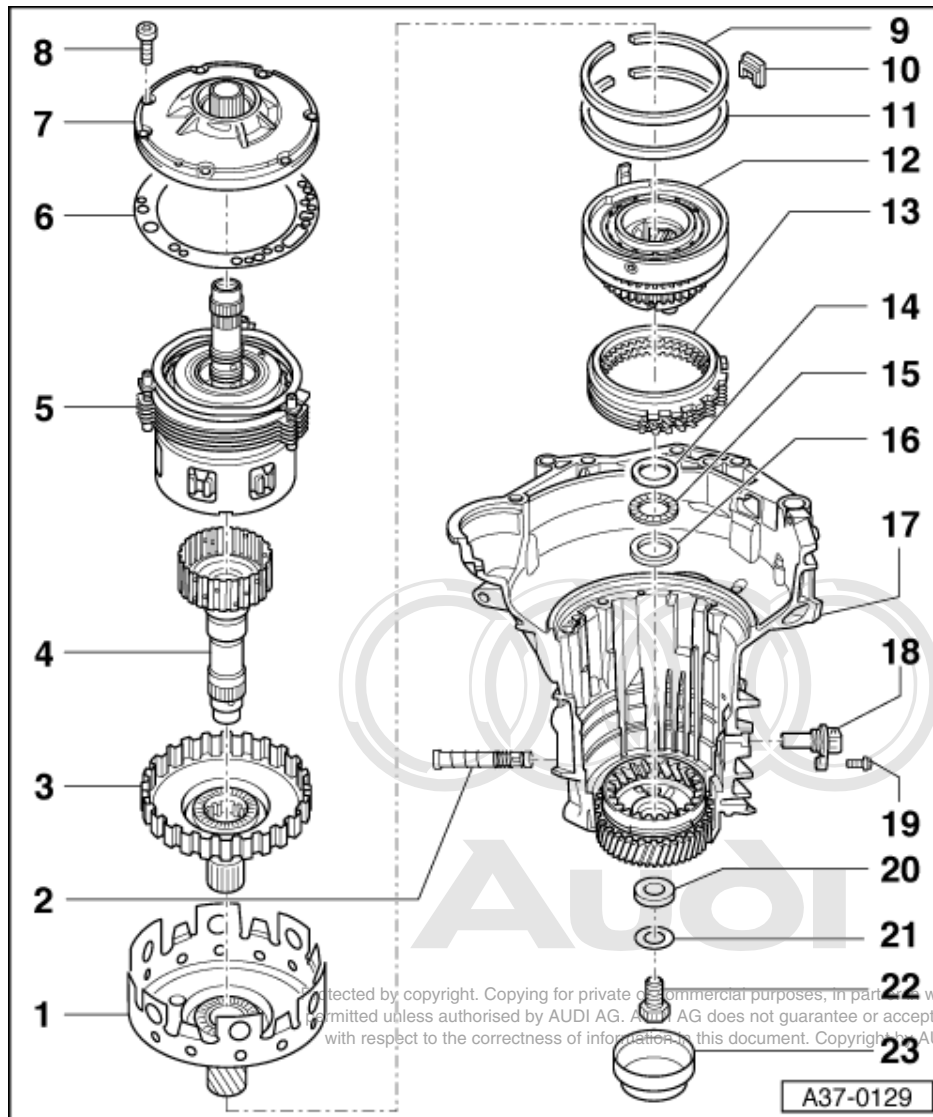
Notes:

- ♦ An exchange component which contains all the selector elements and the valve body is available for the repair of the automatic gearbox 01N => Page 7
- ♦ The exchange component is assigned to the gearbox code letters => from Page 2.
- ♦ Installation description=>from Page 87 (Assembling planetary gearbox).
- ♦ Order of removal: Item 2, 19, 18, 23, 8, 7, 6, 5, 22, 21, 20, 4, 3, 1, 9, 10, 11, 12, 13, 14, 15, 16

7.2 - Dismantling planetary gearbox - overview



- 1 **Large bevel gear**
 - ◆ Lift up and out
- 2 **Sealing plug**
 - ◆ Remove before removing the freewheel => Removing valve body, Page 178
- 3 **Large input shaft**
 - ◆ Lift up and out
- 4 **Small input shaft**
 - ◆ To remove, unscrew bolt -Item 22 -
 - ◆ Lift up and out



5 Assembly

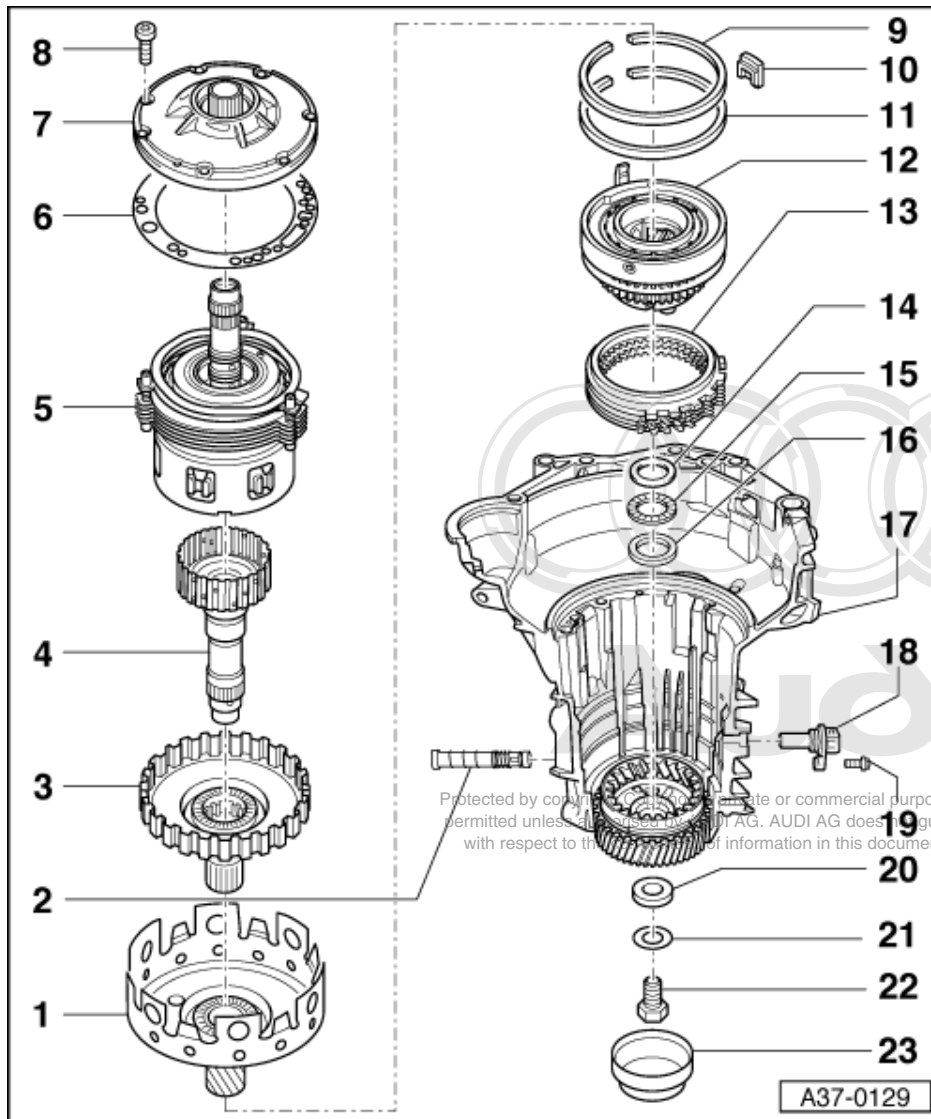
- ◆ With 1st to 3rd gear clutch -K1-
- ◆ With 3rd and 4th gear clutch -K3- with turbine shaft
- ◆ On some gearboxes the clutches -K1- and -K3- may be pressed together
- ◆ -K1- off -K3- => Page 87
- ◆ With reverse gear clutch -K2-
- ◆ With 2nd and 4th gear brake -B2-
- ◆ With supporting tube for -B2-
- ◆ Lift up and out together at the turbine shaft

6 Seal

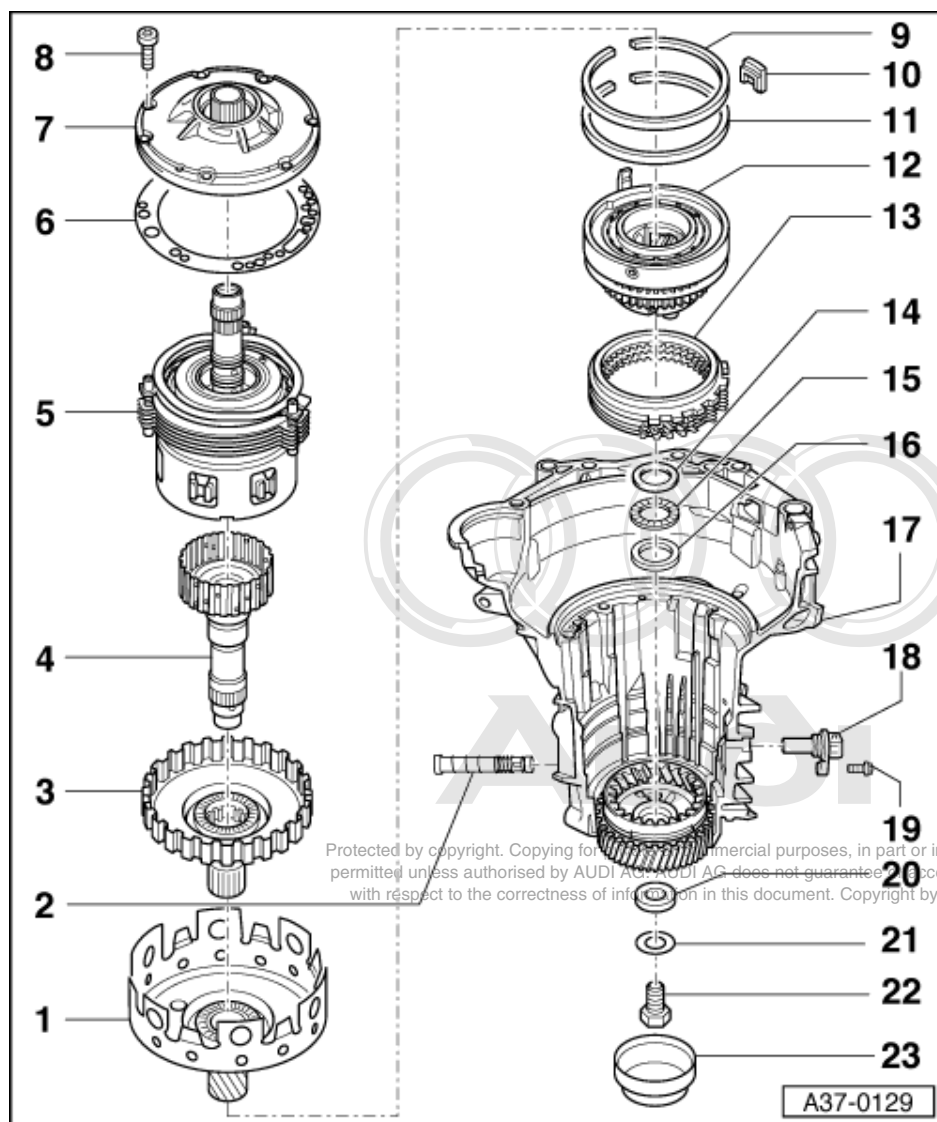
- ◆ Remove

7 ATF pump

- ◆ To remove, unscrew all the bolts -Item 8 -
- ◆ To press off the pump, screw two M8 bolts evenly into the two threaded holes



- 8 Bolt**
- ♦ For ATF pump
- 9 Circlip**
- ♦ For supporting tube for -B2-
 - ♦ Lift out
- 10 Baffle plate**
- ♦ Remove after lifting out circlip -Item **9** -
- 11 Circlip**
- ♦ For freewheel
 - ♦ Lift out
- 12 Free wheel**
- ♦ With planet carrier
 - ♦ Before removing free wheel, remove valve body and sealing plug -Item **81** and remove gearbox speed sender -G38 -Item **18** -
 - ♦ The small sun gear can only be removed from the planet carrier in gearboxes with code letters DMU or DMV



13 Reverse gear brake -B1-

- ◆ Remove pressure plate together with plates and shim(s) from the top

14 Axial needle bearing washer

- ◆ Remove

15 Axial needle bearing

- ◆ Remove

16 Axial needle bearing washer

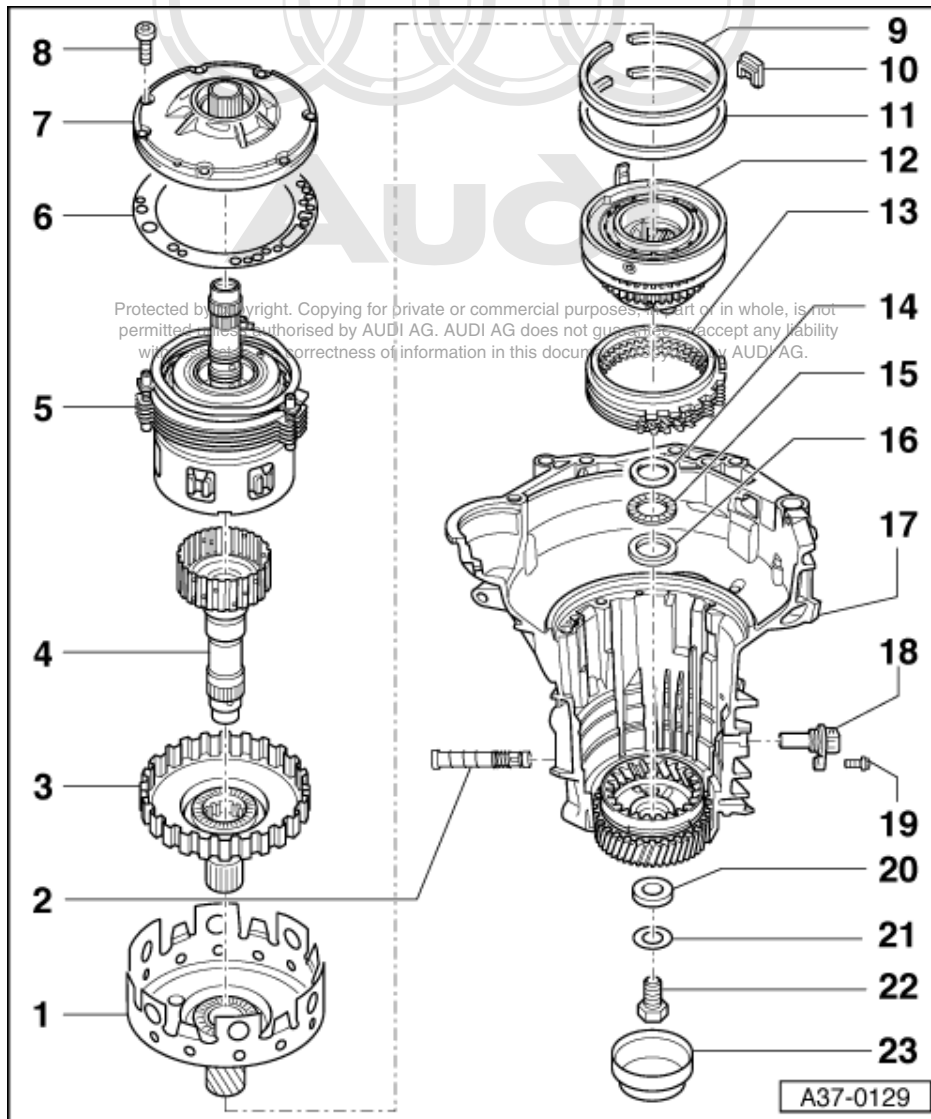
- ◆ Remove

17 Gearbox housing with input gear

- ◆ Input gear does not have to be removed when dismantling planetary gearbox
- ◆ Removing and installing input gear => Page 203

18 Gearbox speed sender -G38

- ◆ Take out before removing the free wheel



19 Bolt

20 Planet carrier shim

- ♦ Take off after slackening the bolt -Item **22** -

21 Washer

- ♦ Take off after slackening the bolt -Item **22** -

22 Bolt

- ♦ For small input shaft
- ♦ Unscrew to remove

23 Cap

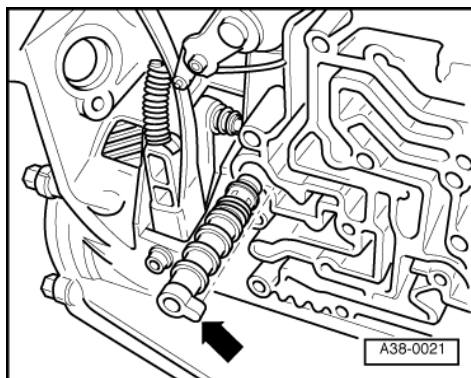
- ♦ Drive out using chisel
- ♦ Cannot be removed without being damaged

7.3 - Dismantling planetary gearbox

- Drain ATF => Page **65**
- Remove gearbox => Page **45**
- Take out torque converter.
- Secure gearbox to repair stand => Page **55**



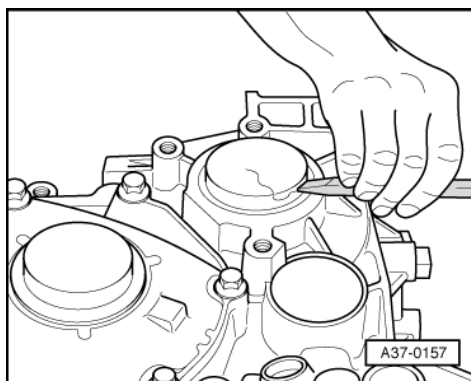
- Remove valve body => Page 178



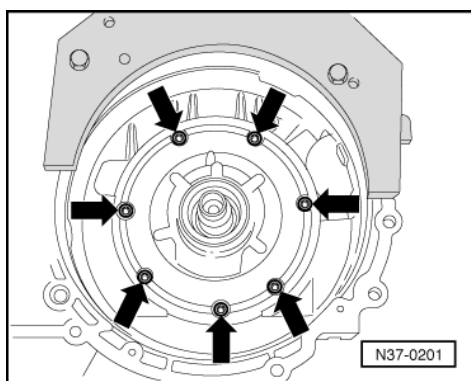
- -> Take out sealing plug -arrow-.
- Remove gearbox speed sender -G38 => Page 192

Note:

The sealing plug and gearbox speed sender must be removed to prevent them from being damaged.



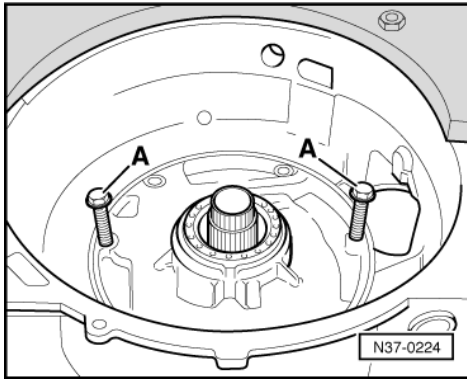
- -> Remove sealing cap.



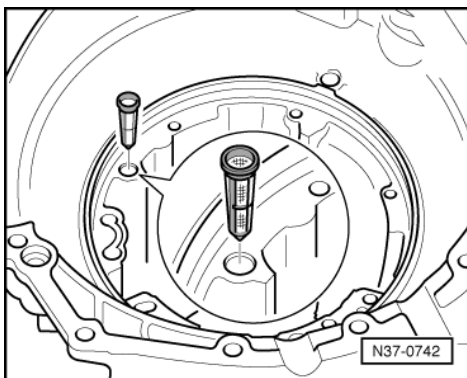
- -> Remove bolts -arrows- for ATF pump.



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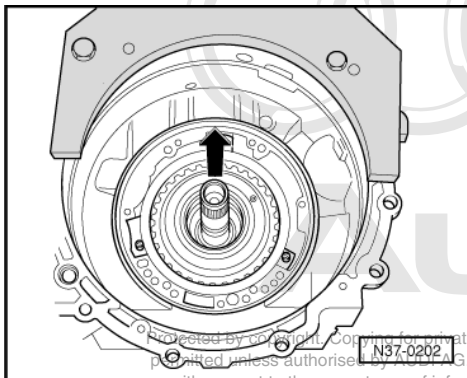
- -> To remove ATF pump screw in two M8 bolts -A- into the tapped holes of the ATF pump.
- Tighten the bolts -A- evenly to press ATF pump off gearbox housing and remove.
- Remove gasket, retaining ring and shim.



- -> Remove screen, if fitted.

Note:

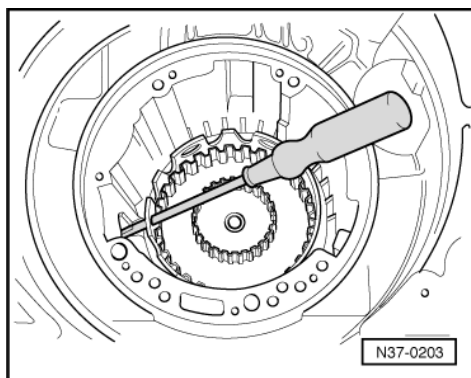
The screen sits in the return of the ATF cooler. It cannot be retrofitted in older gearboxes.



- -> Take hold of turbine shaft and pull out all the clutches together with supporting tube for -B2-, -B2- plates, springs and spring caps -arrow-.

Notes:

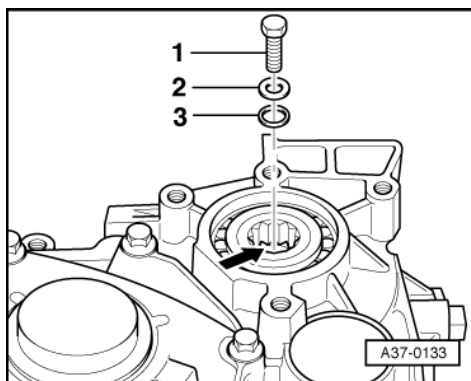
- ◆ On some gearboxes the clutches -K1- and -K3- may be pressed together.
- ◆ Clutch -K1- must only be pressed off -K3- if one of the clutches is to be dismantled or renewed.
- ◆ Pressing -K1- off -K3- => Page 87



- Engage parking lock.
- -> To loosen the bolt for the small input shaft, insert a screwdriver through one of the holes of the large sun gear.

Note:

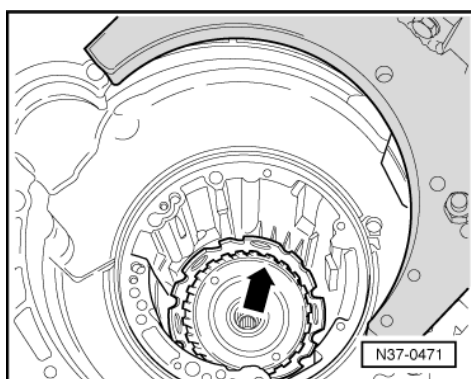
If the parking lock cannot be engaged, use a second screwdriver to hold the large input shaft.



- -> Loosen bolt -1- for "small input shaft".
- Remove bolt with washer -2- and shim -3- for "small input shaft".
- Pull out small input shaft.

Note:

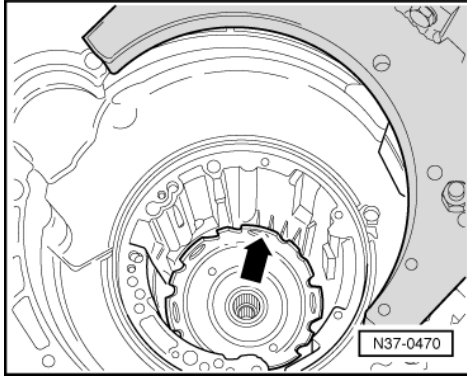
Planet carrier axial needle bearing remains in gearbox/input gear.



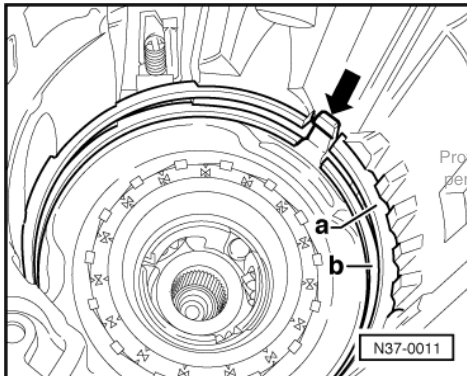
- -> Pull out large input shaft -arrow-.



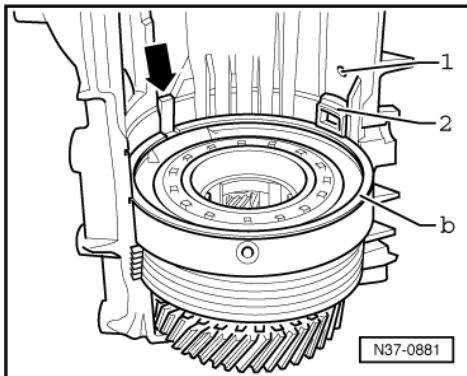
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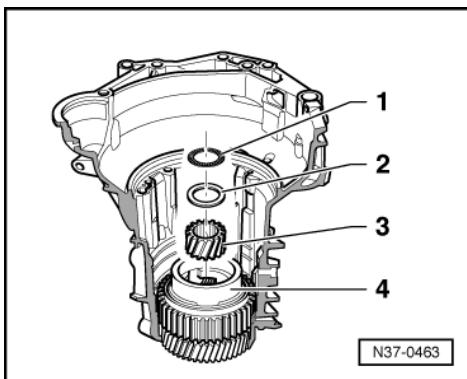
- -> Pull out large sun gear -arrow-.



- -> Remove circlip -a- for supporting tube for -B2-.



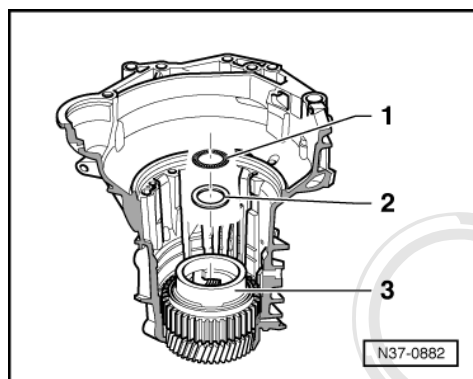
- -> Pull off baffle block -2-.
- Remove freewheel circlip -b-.
- Pull freewheel out of the gearbox housing at the retaining wedge -arrow- using pliers.



Gearbox with code letters DMU, DMV:

- -> Remove small sun gear with washer and axial needle bearing from planet carrier.

- 1 - Axial needle bearing
- 2 - Washer for axial needle bearing
- 3 - Small sun gear
- 4 - Planet carrier

**Gearbox with other code letters:**

- -> Remove axial bearing and washer from small sun gear of planet carrier.

- 1 - Axial needle bearing
- 2 - Washer for axial needle bearing
- 3 - Install planet carrier (with small sun gear fitted)

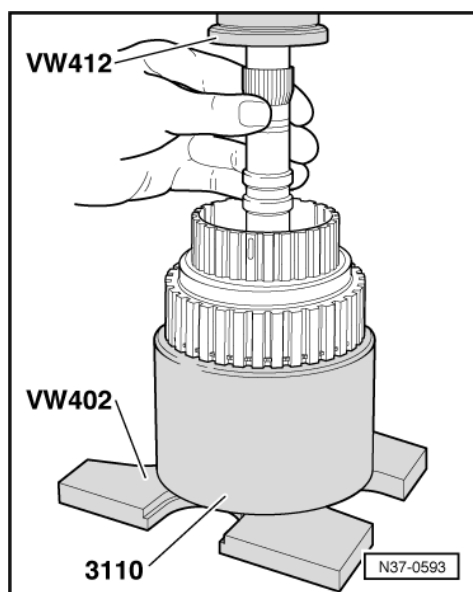
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All models:

- Take hold of the inside of the planet carrier and pull it out together with free wheel and dished washer.
- Remove pressure plate, plates and shim(s) of the reverse gear brake -B1-.
- Take off axial bearing and washers.

Note:

Assembling planetary gearbox => Page 87



Pressing clutch -K1- off -K3-

Notes:

- ◆ On some gearboxes the clutches -K1- and -K3- may be pressed together.
- ◆ Clutch -K1- must only be pressed off -K3- if one of the clutches is to be dismantled or renewed.
- Ensure the tool press surface is flat and not damaged.
- The pin of tube 3110 faces to plate VW 402.
- -> Hold turbine shaft when pressing off.

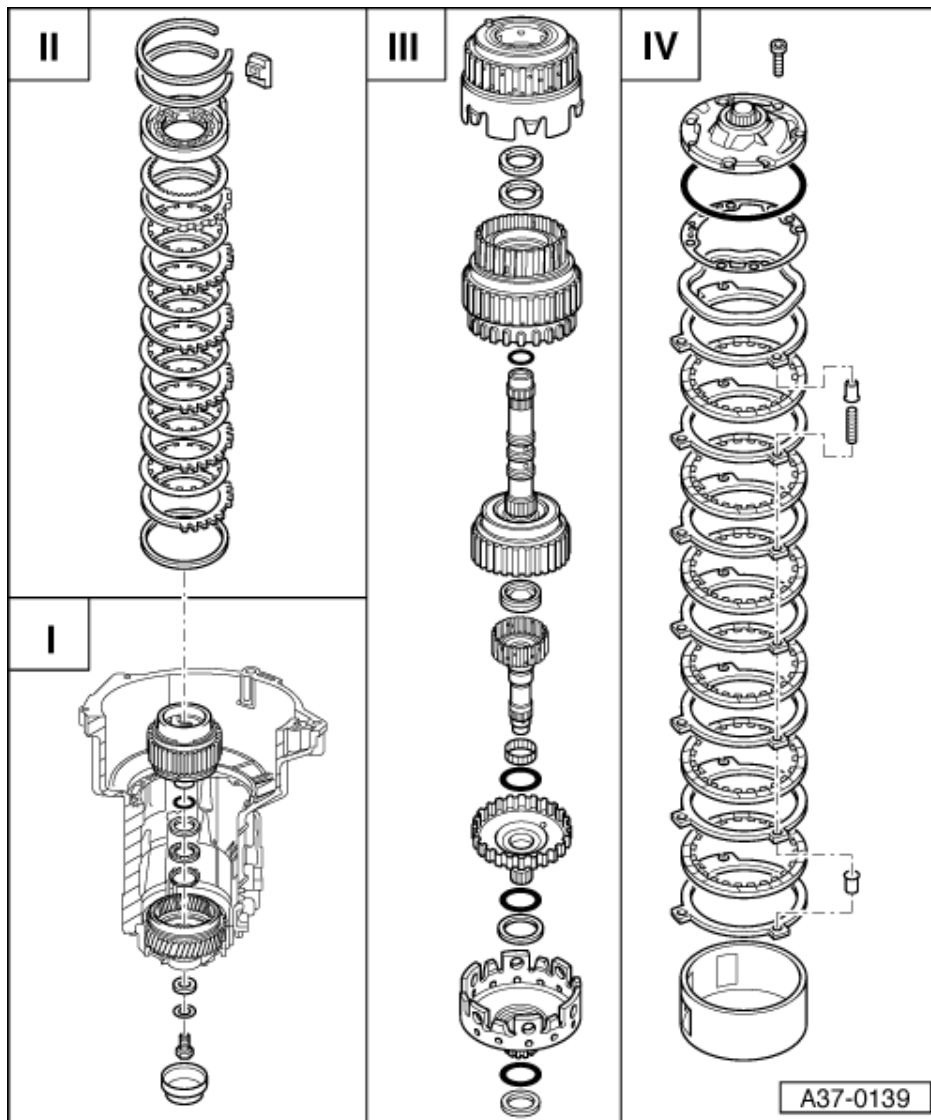
Note:

Pressing clutch -K1- onto -K3- => Page 113

7.4 - Assembling planetary gearbox -overview-

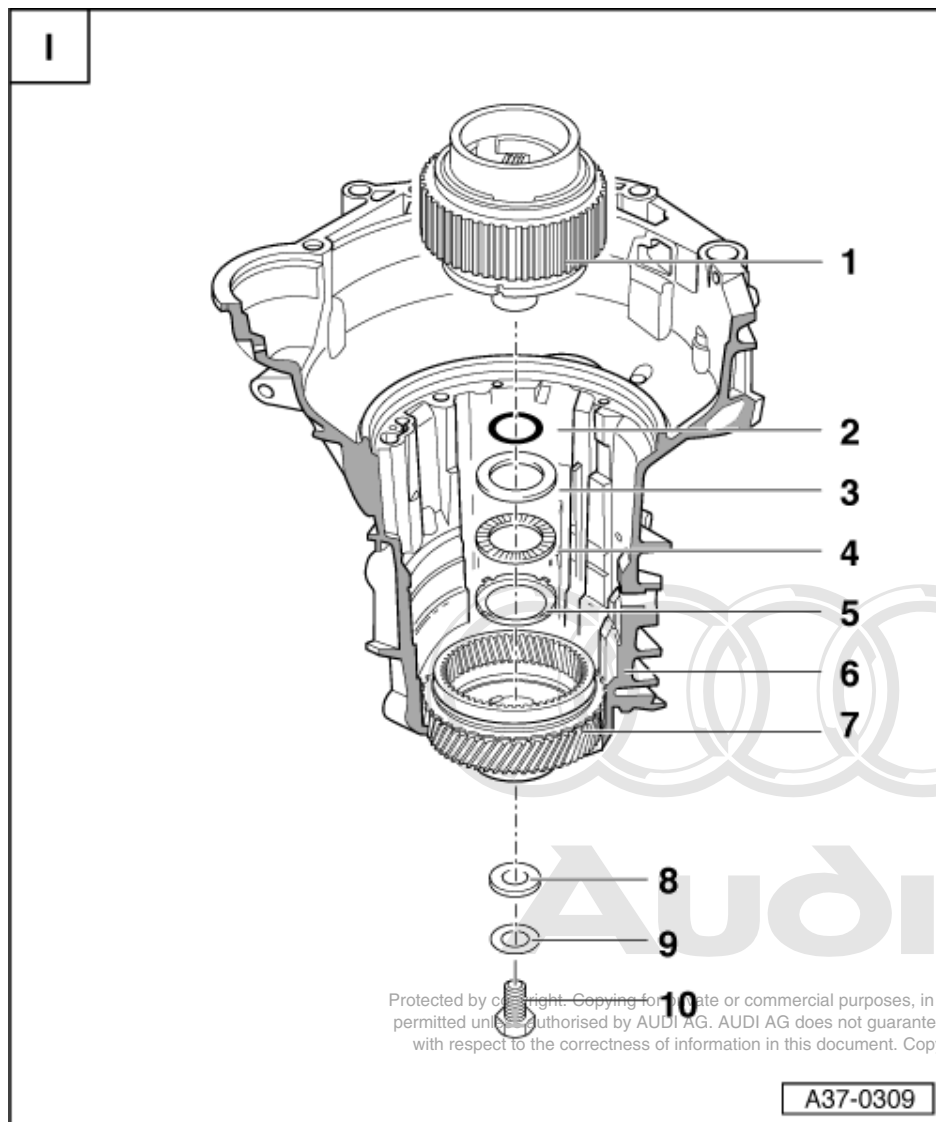
Notes:

- ◆ An exchange component which contains all the selector elements and the valve body is available for the repair of the automatic gearbox 01N => Page 7
- ◆ The exchange component is assigned to the gearbox code letters => from Page 2



- I - Installing planet carrier => Page 88
- II - Installing components from reverse gear brake -B1- up to circlip for -B2- supporting tube => Page 90
- III - Installing components from large sun gear up to reverse gear clutch -K2- => Page 93
- IV - Installing components from supporting tube for -B2- up to ATF pump => Page 98

7.5 - I - Installing planet carrier



=> Overview, Page 87

Note:

Assembling planetary gearbox => Page 102

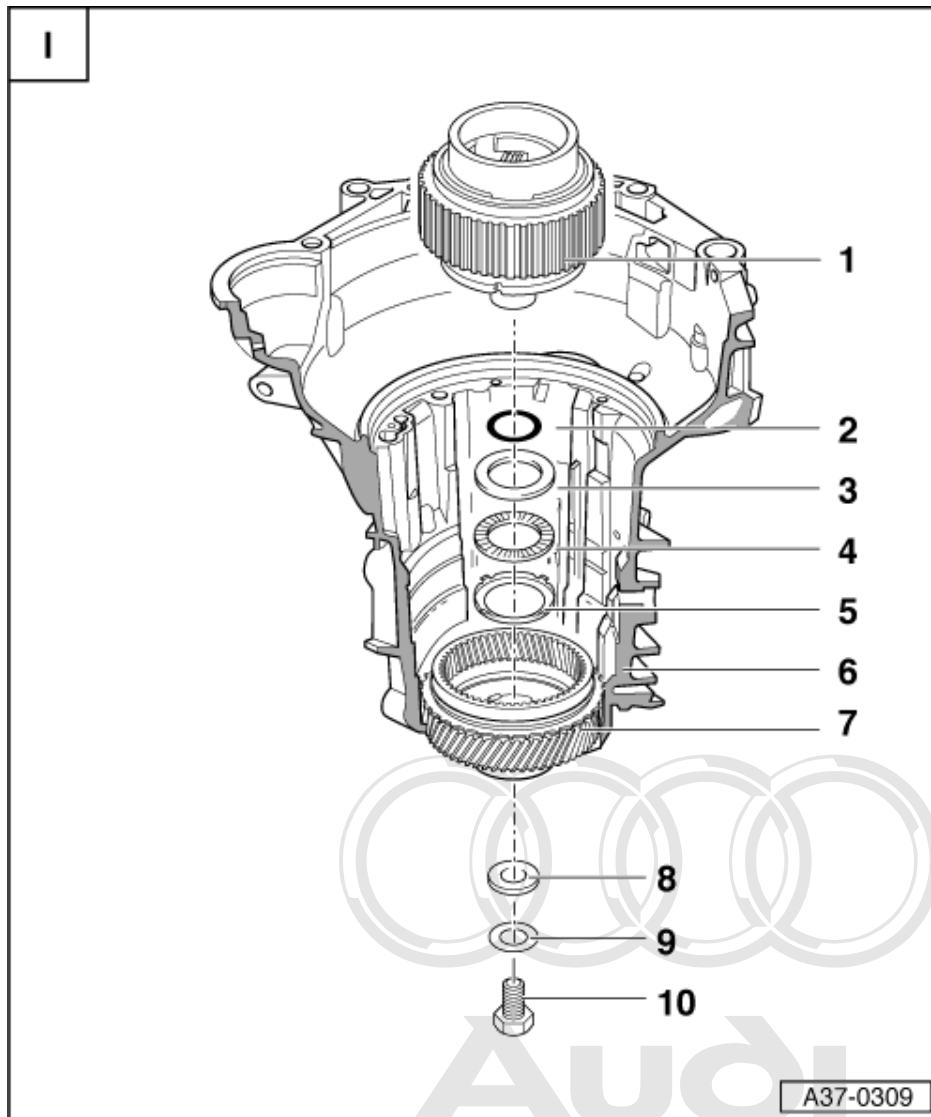
1 Planet carrier

- ♦ Adjusting => Page 116
- ♦ The small sun gear can only be removed from the planet carrier in gearboxes with code letters DMU or DMV

2 O-ring

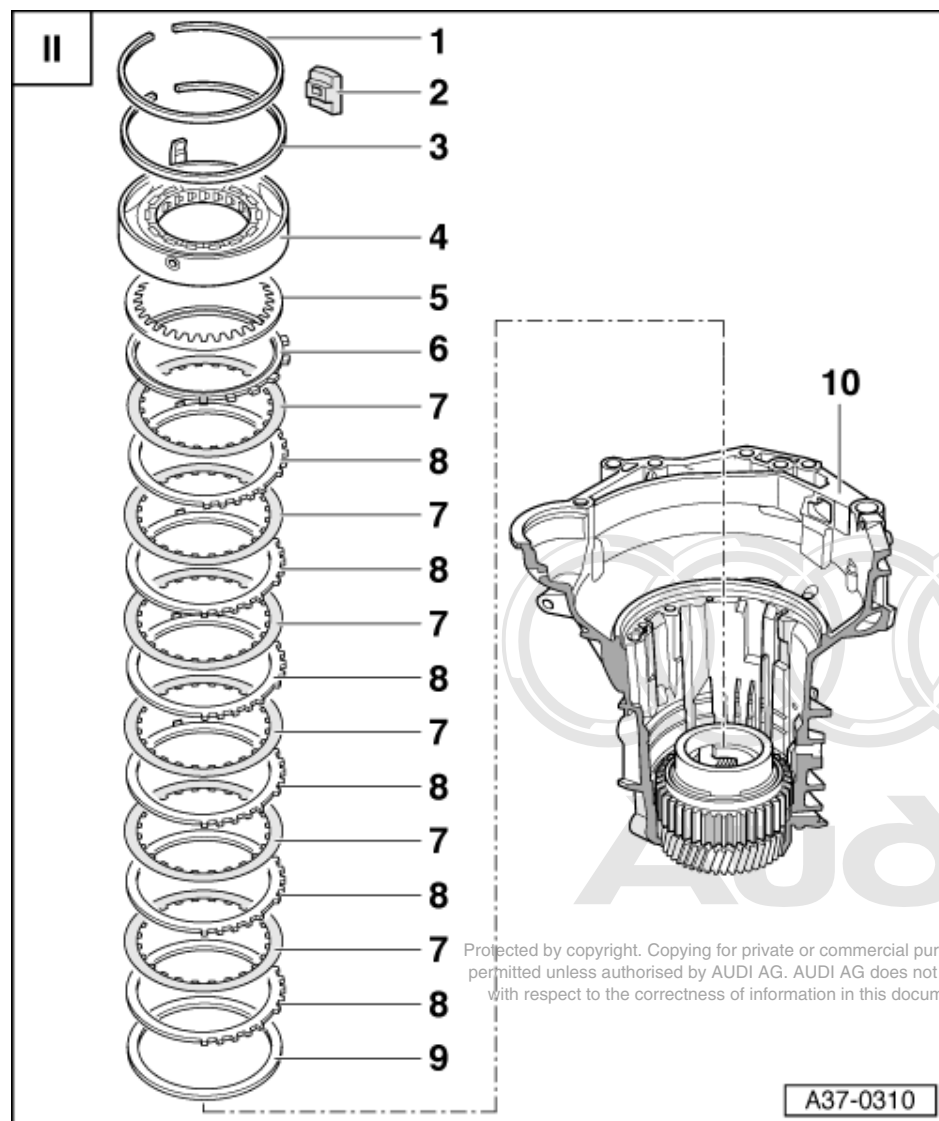
- ♦ Replace
- ♦ Insert in planet carrier

3 Axial needle bearing washer



- 4 Axial needle bearing
- 5 Axial needle bearing washer
- ♦ Installation position: Flat side faces toward input gear
- 6 Gearbox housing with input gear installed
- 7 Input gear
- ♦ Do not remove to dismantle planetary gearbox
 - ♦ Removing and installing input gear or axial needle bearing for planet carrier => Page 203
- 8 Planet carrier shim
- ♦ Determining thickness => Adjusting planet carrier, Page 116
- 9 Washer
- 10 Bolt - 30 Nm
- ♦ For small input shaft

7.6 - II - Installing components from reverse gear brake -B1- up to circlip for -B2- supporting tube



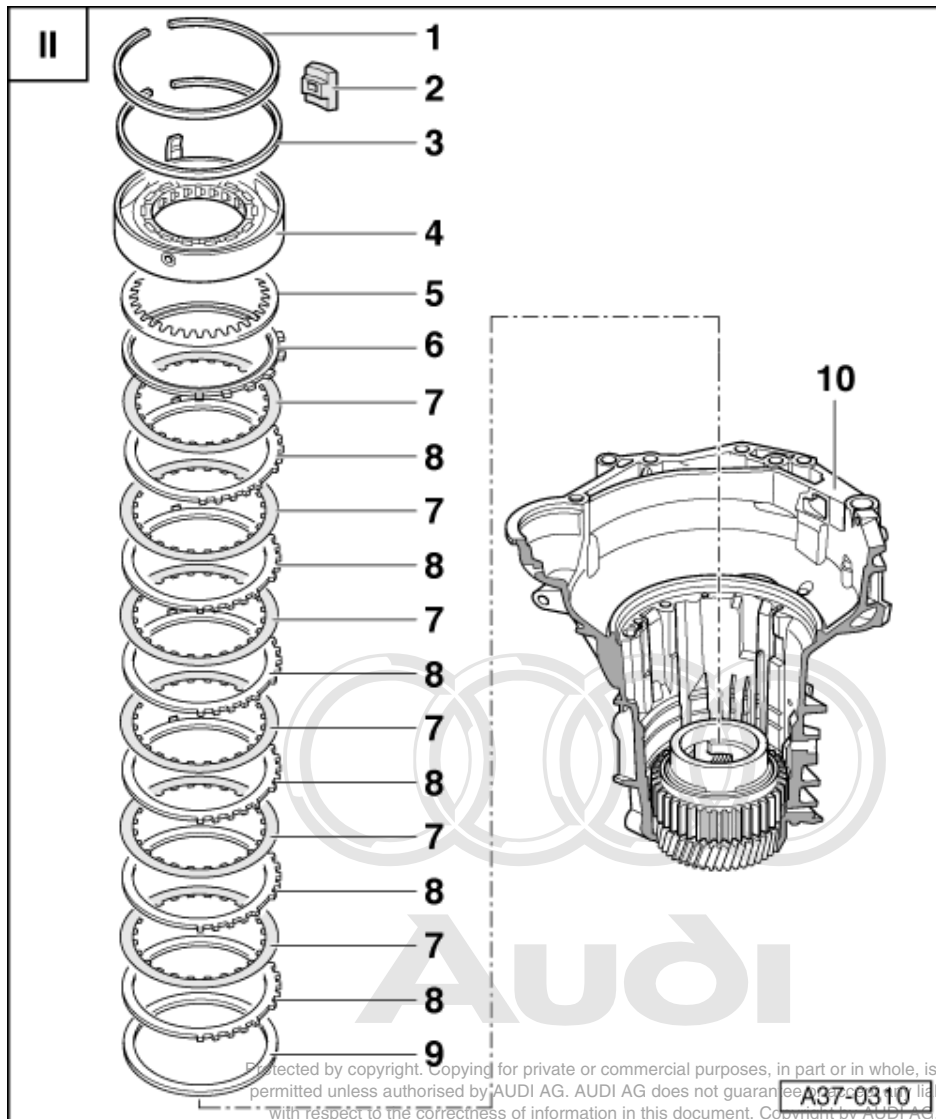
=> Overview, Page 87

Note:

Assembling planetary gearbox => Page 102

1 Circlip

- ◆ For supporting tube -B2-
- ◆ Insert baffle block before fitting circlip
- ◆ Installation position: Circlip open ends faces free wheel retaining wedge



2 Baffle plate

- ♦ Insert before inserting circlip (Item 1)

3 Circlip

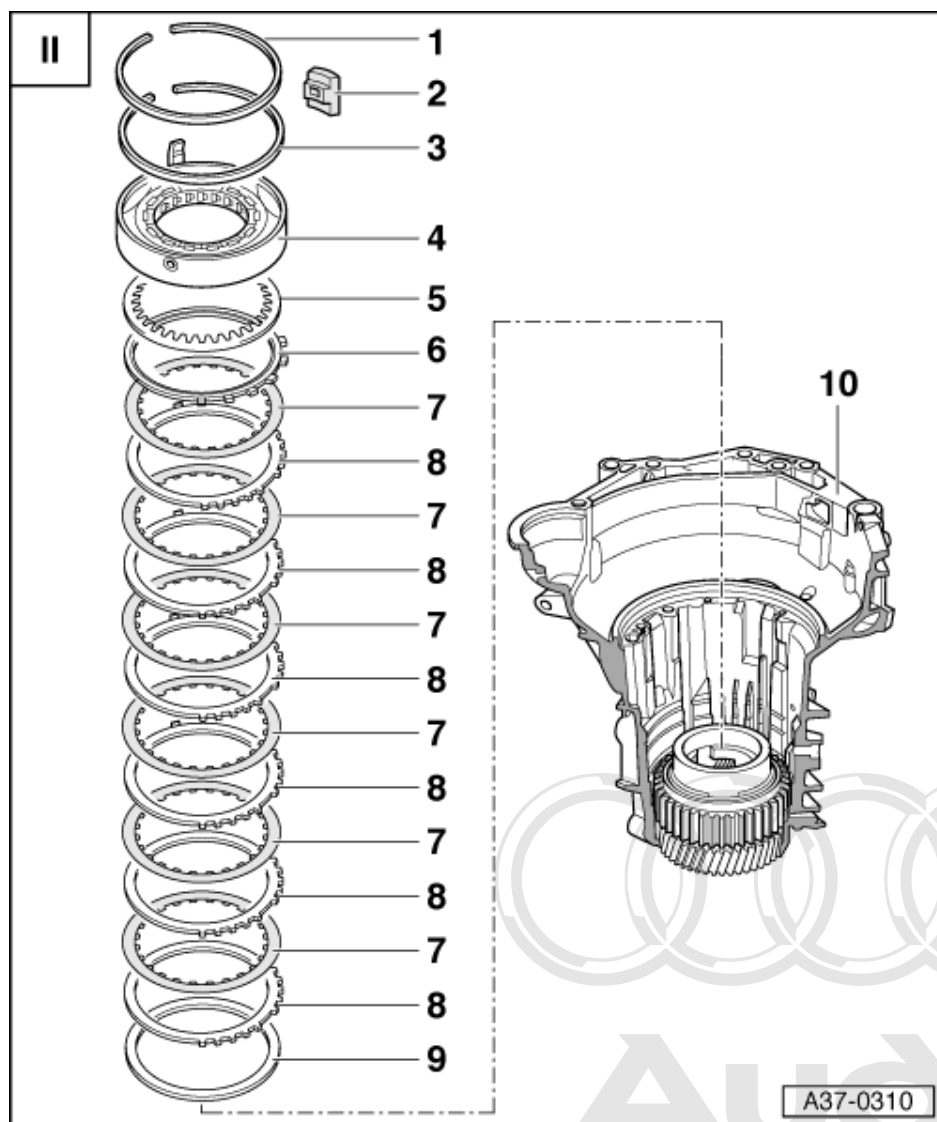
- ♦ For freewheel
- ♦ Installation position: open ends of circlip face toward retaining wedge of free wheel

4 Freewheel with piston -B1-

- ♦ Before removing freewheel, remove valve body and sealing plugs => Page 170
- ♦ Dismantling and assembling => Page 150
- ♦ Use assembly ring 3267 for installing

5 Dished washer

- ♦ Installation position: Convex side faces toward free wheel



6 Pressure plate -B1-

- ◆ Installation position: Flat side faces toward plates
- ◆ As a replacement part it is allocated according to gearbox code letters

7 Inner plate -B1-

- ◆ =>from Page 2
- ◆ Soak new inner plates in ATF for 15 minutes before installing

8 Outer plate -B1-

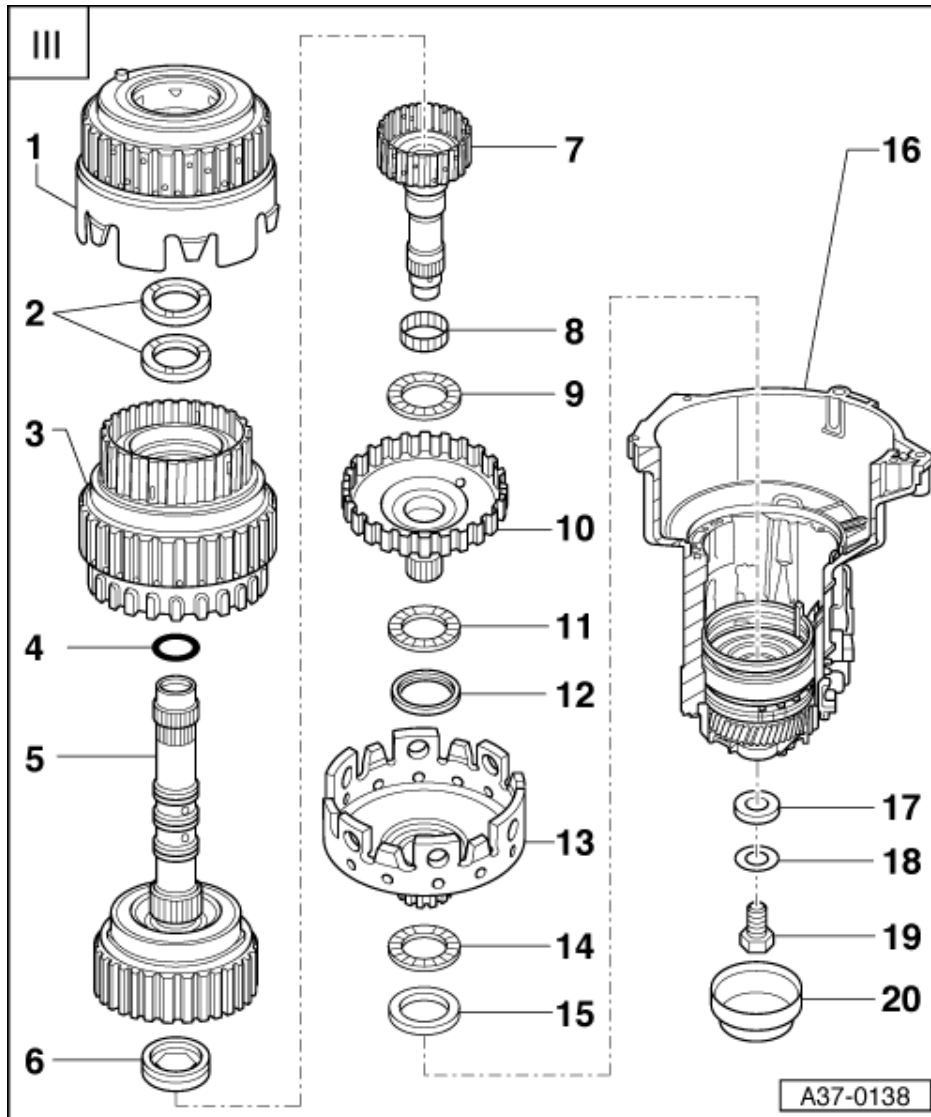
- ◆ =>from Page 2

9 Shim

- ◆ Determining thickness => Adjusting reverse gear brake -B1-, Page 122
- ◆ 1 or 2 shims can be installed

10 Gearbox housing with planet carrier installed

7.7 - III - Installing components from large sun gear up to reverse gear clutch -K2-



=> Overview, Page 87

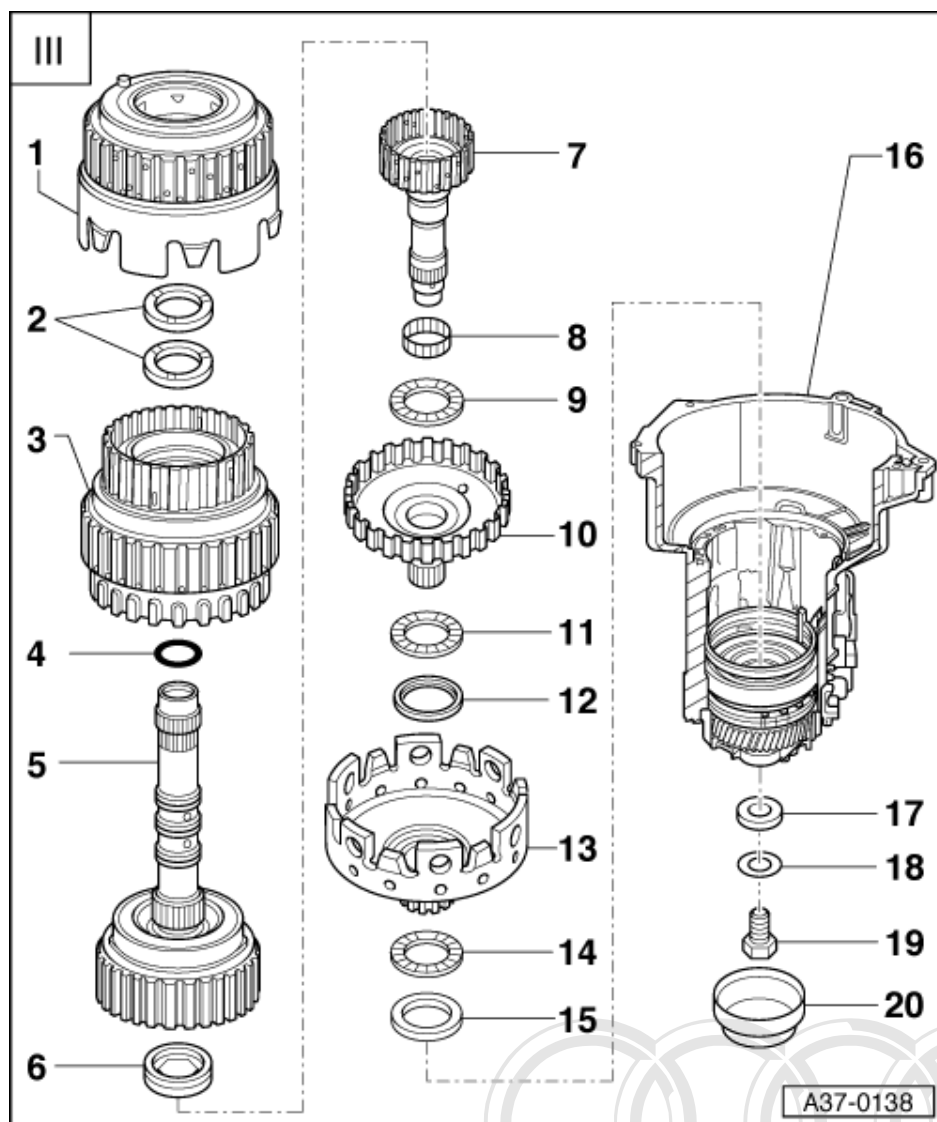
Note:

Assembling planetary gearbox => Page 102

1 Reverse gear clutch -K2-

- ◆ When installing, rotate clutch until all the inner plates have meshed
- ◆ Dismantling and assembling => Page 159

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2 Shim

- ◆ Determining thickness => Adjusting clutch play between -K1- and -K2-, Page 127
- ◆ Up to 3 shims can be installed

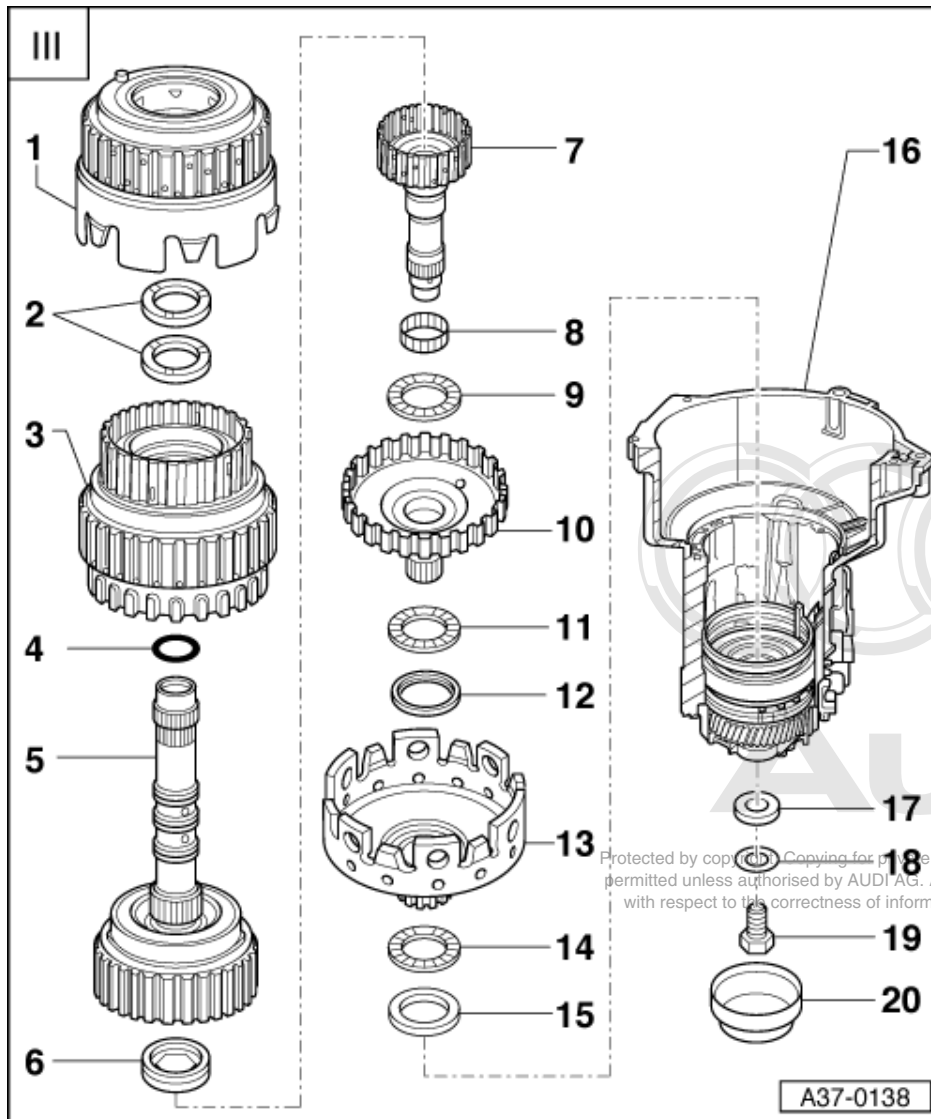
3 1st to 3rd gear clutch -K1-

- ◆ On some gearboxes the clutches -K1- and -K3- may be pressed together
- ◆ Pressing on -K1- and -K3- => Page 113
- ◆ Dismantling and assembling => Page 153

4 O-ring

- ◆ Replace

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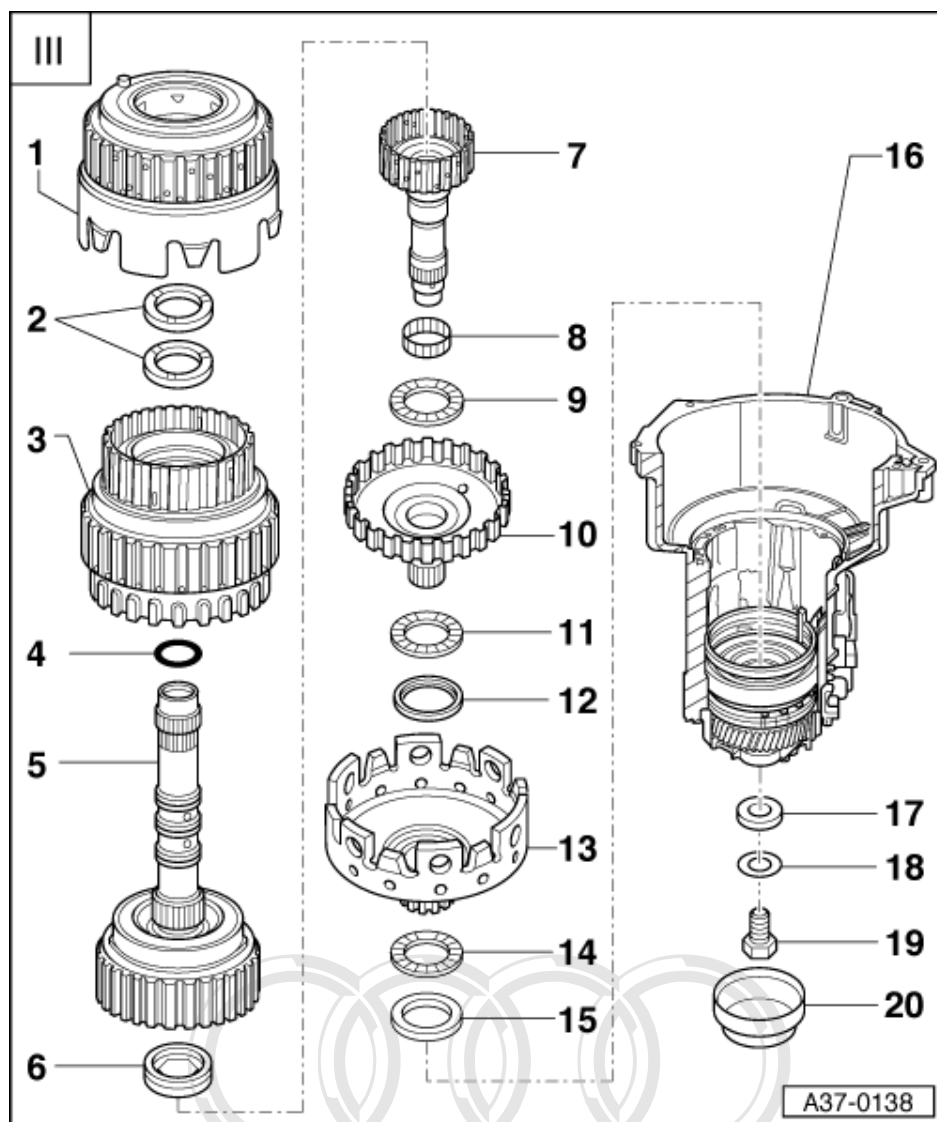
5 3rd and 4th gear clutch -K3- with turbine shaft

- ◆ On some gearboxes the clutches -K1- and -K3- may be pressed together
- ◆ Pressing on -K1- and -K3- => Page 113
- ◆ When installing, rotate clutch until all the inner plates have meshed
- ◆ Dismantling and assembling => Page 164

6 Axial needle bearing with washer

- ◆ Lightly lubricate washer with ATF so that bearing sticks to 3rd and 4th gear clutch
- ◆ Installation position: Axial needle bearing faces towards small input shaft

7 Small drive shaft



8 Needle bearing

9 Axial needle bearing

10 Large drive shaft

11 Axial needle bearing

12 Axial needle bearing washer

♦ With collar

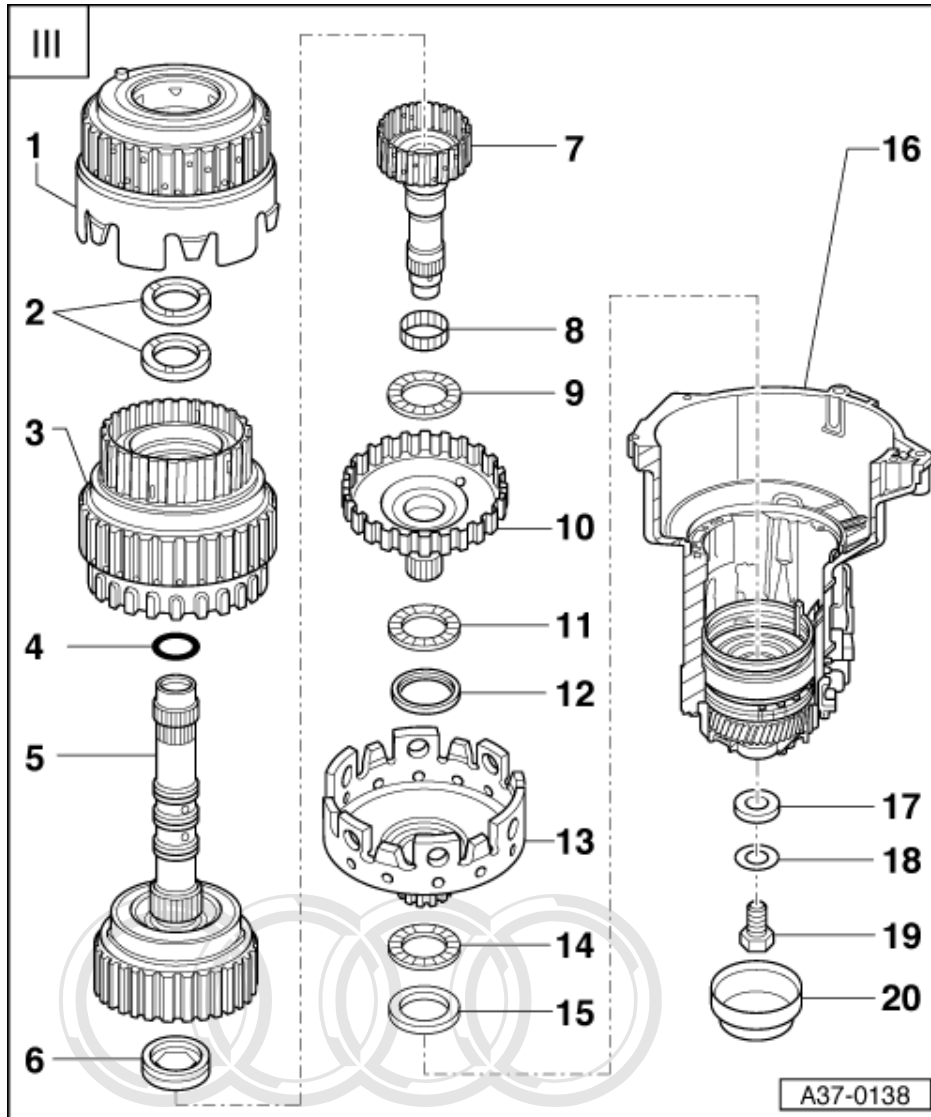
♦ Installation position: Shoulder faces toward large sun gear

13 Large sun gear

14 Axial needle bearing

15 Axial needle bearing washer

16 Gearbox housing with free wheel and circlips installed



17 Planet carrier shim

- ♦ Determining thickness => Adjusting planet carrier, Page 116

18 Washer

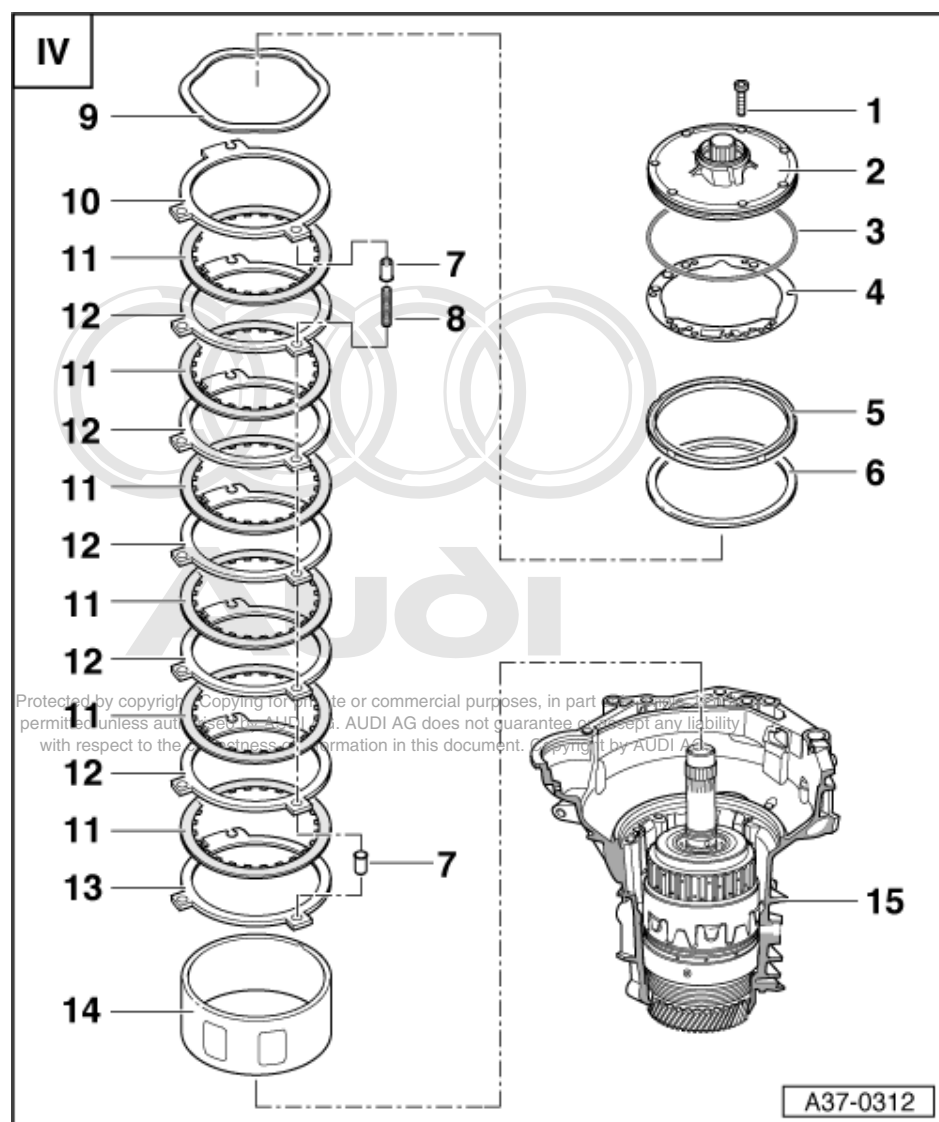
19 Bolt - 30 Nm

- ♦ For small input shaft

20 Cap

- ♦ Drive in with fitting sleeve 40-20

7.8 - IV - Installing components from supporting tube for -B2- up to ATF pump

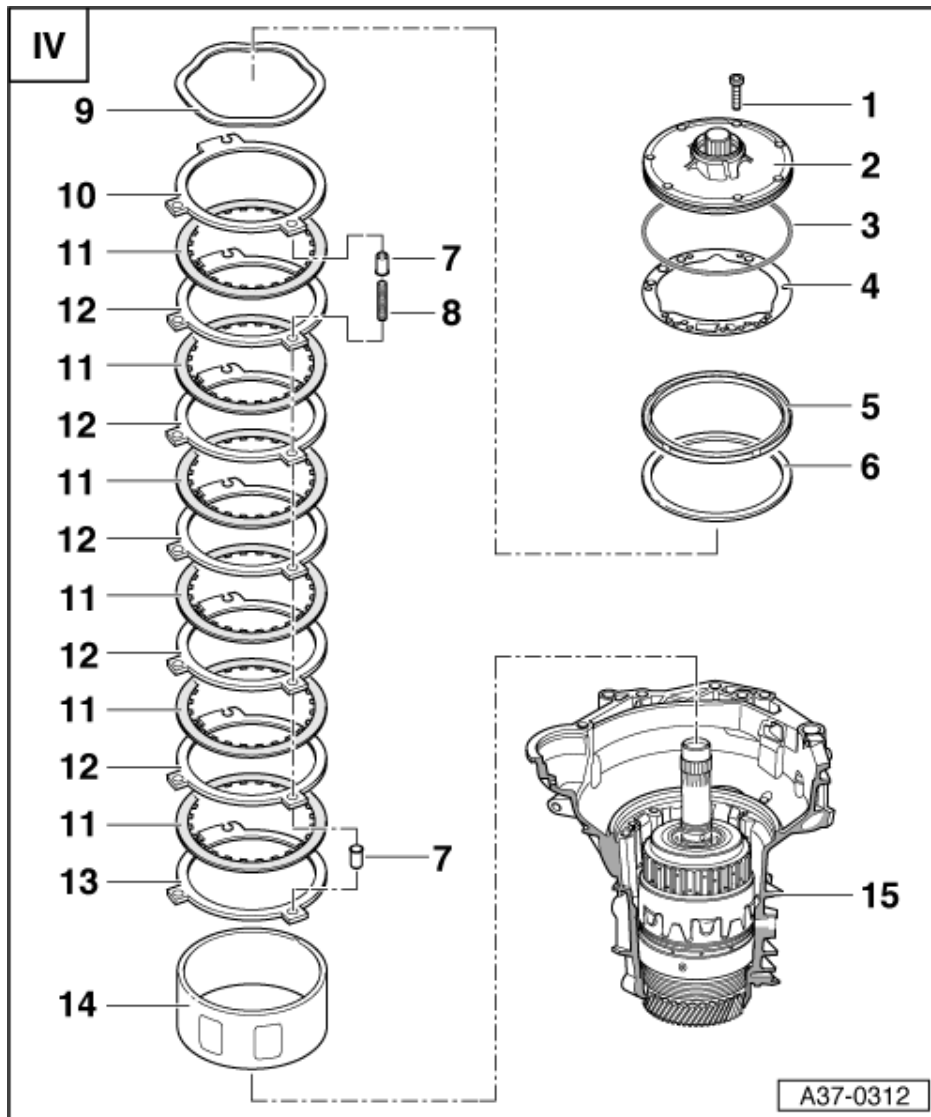


=> Overview, Page [87](#)

Note:

Assembling planetary gearbox => Page [102](#)

- 1 Bolt
 - ◆ 7 off
 - ◆ Tighten to 8 Nm and turn 90° further
 - ◆ The turning further of 90° may be done in several stages
- 2 ATF pump with piston -B2-
 - ◆ Dismantling and assembling => Page [146](#)
- 3 O-ring
 - ◆ Replace
- 4 Seal
 - ◆ Replace



5 Retaining ring

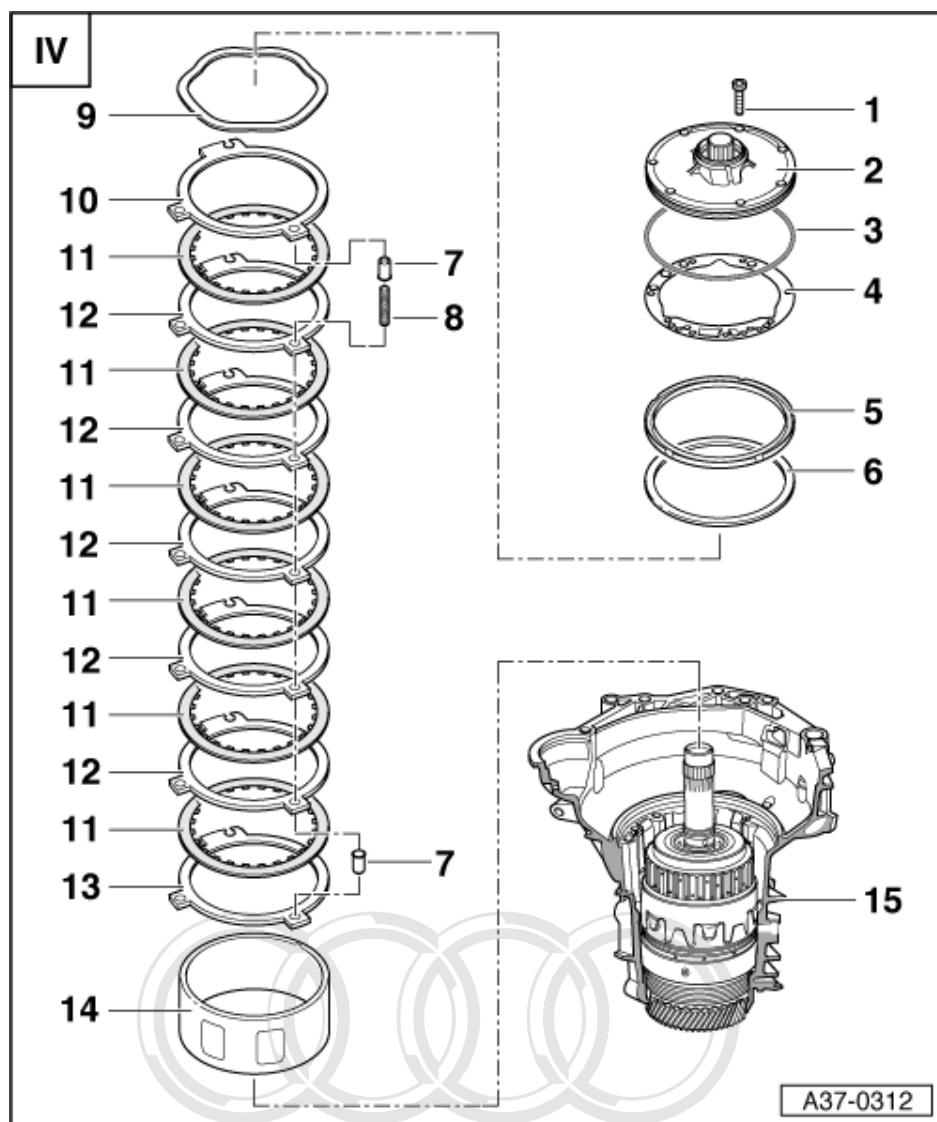
- ◆ Not installed for gearboxes with corrugated spring washer on the last outer plate for brake -B2- (code letters => from Page 2)

6 Shim

- ◆ Not installed for gearboxes with corrugated spring washer on the last outer plate for brake -B2- (code letters => from Page 2)
- ◆ Determine thickness of shims => Adjusting 2nd and 4th gear brake -B2-, Page 132

7 Spring cap

- ◆ 6 off
- ◆ Install 3 spring caps after installing first outer plate
- ◆ Install 3 spring caps before installing last outer plate



8 Spring

- ♦ 3 off

9 Corrugated washer

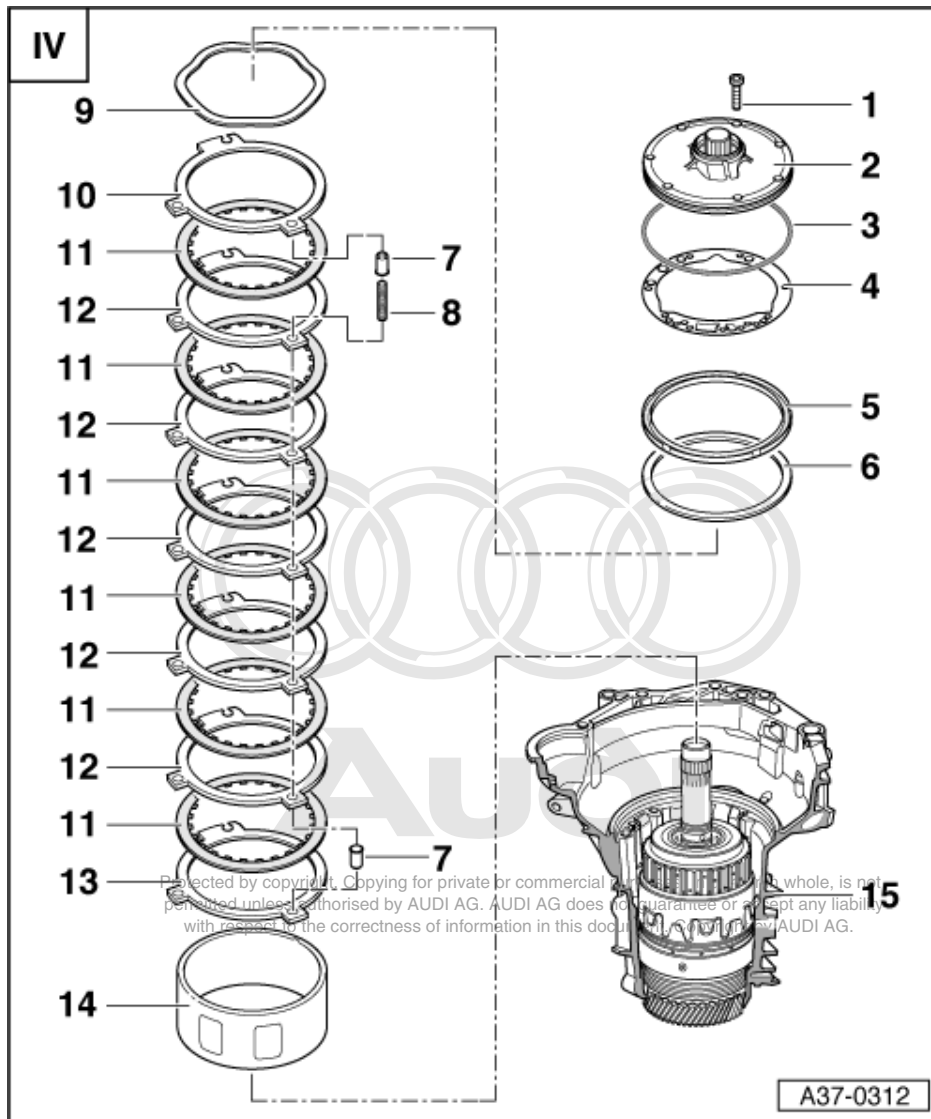
- ♦ Not installed for gearboxes with shim and retaining ring for brake -B2- (code letters => from page 2)

10 Outer plate -B2-

- ♦ =>from Page 2
- ♦ Only on gearboxes with corrugated spring washer (item 133)

11 Inner plate -B2-

- ♦ =>from Page 2
- ♦ Soak new inner plates in ATF for 15 minutes before installing



12 Outer plate -B2-

- ♦ Always install 2 mm thick outer plates
- ♦ =>from Page 2

13 Outer plate -B2-

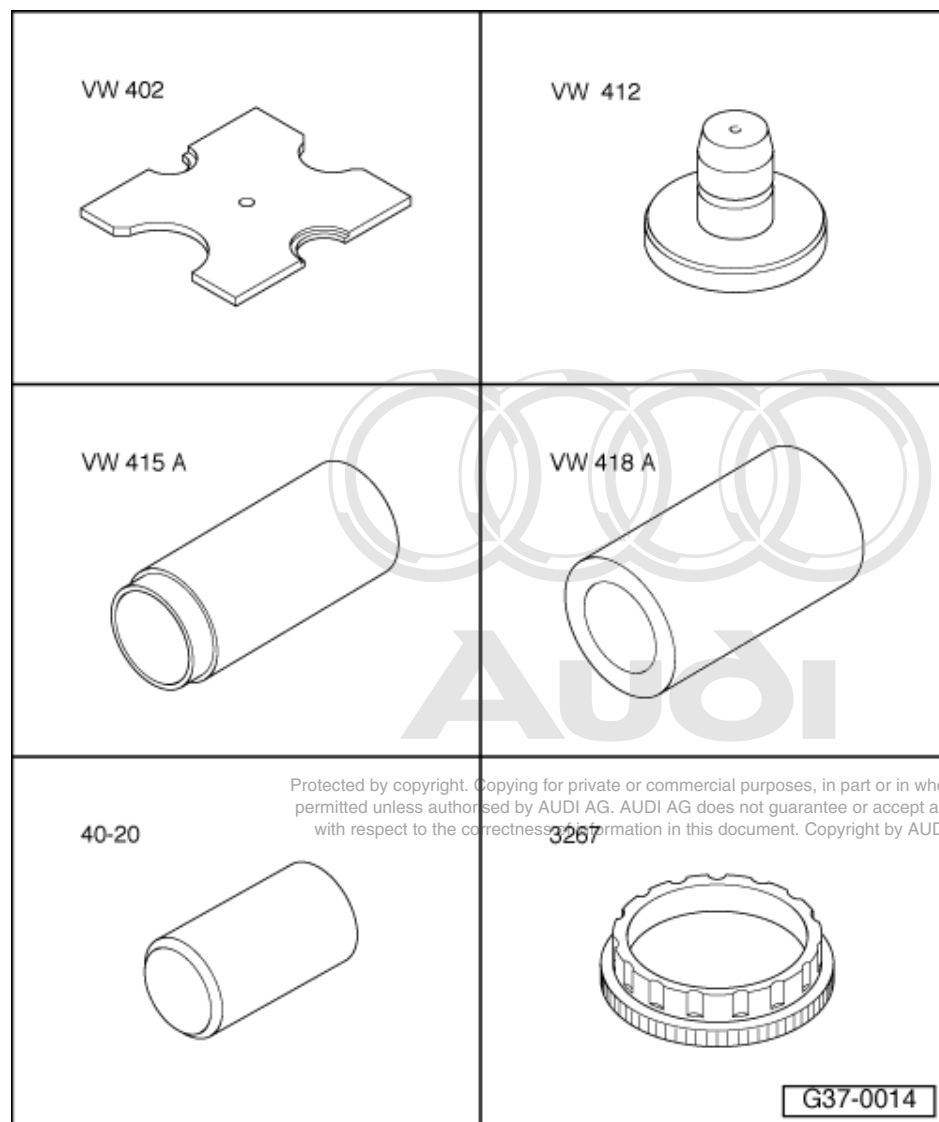
- ♦ Fit 3 mm thick outer plate to supporting tube -B2-

14 For supporting tube -B2-

- ♦ For the -B2- plate package
- ♦ Installation position: Insert so that bottom groove engages on wedge of free wheel
- ♦ As a replacement part it is allocated according to gearbox code letters

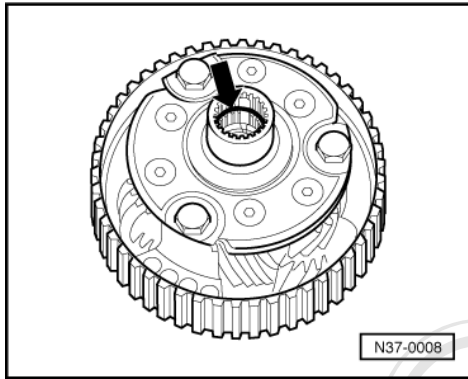
15 Gearbox housing with clutches installed

7.9 - Assembling planetary gearbox



Special tools and workshop equipment required

- ♦ Thrust plate VW 402
- ♦ Press tool VW 412
- ♦ Tube VW 415 A
- ♦ Tube VW 418 A
- ♦ Sleeve 40-20
- ♦ Assembly ring 3267

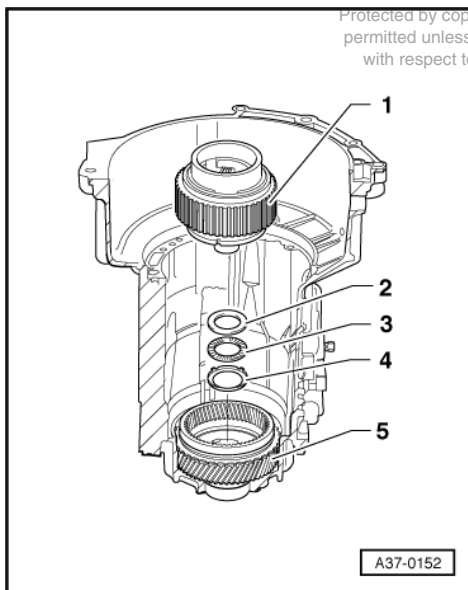


Assembling planetary gearbox

- -> Fit O-ring -arrow- into planet carrier.

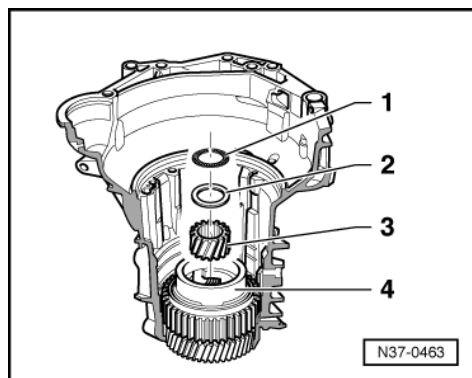
Notes:

- ♦ When installing an exchange component, use all the new parts of the exchange component, do not re-used old parts.
- ♦ The planet carrier must be adjusted after replacing planet carrier, large sun gear, large input shaft or small input shaft => Page 116



- -> Insert axial needle bearing with washers and planet carrier in the input gear.

- 1 - Install planet carrier with O-ring fitted
- 2 - Washer for axial needle bearing
- 3 - Axial needle bearing
- 4 - Washer for axial needle bearing; install with smooth side facing toward input gear
- 5 - Input gear; is fitted in gearbox housing => Page 80

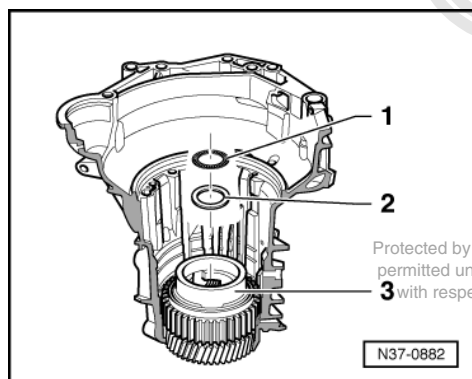


Gearbox with code letters DMU, DMV:

- -> Inserting small sun gear with washer and axial needle bearing into planet carrier.

- 1 - Axial needle bearing
- 2 - Washer for axial needle bearing
- 3 - Small sun gear
- 4 - Planet carrier

- Centralise washer and axial needle bearing in the small sun gear.



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Gearbox with other code letters:

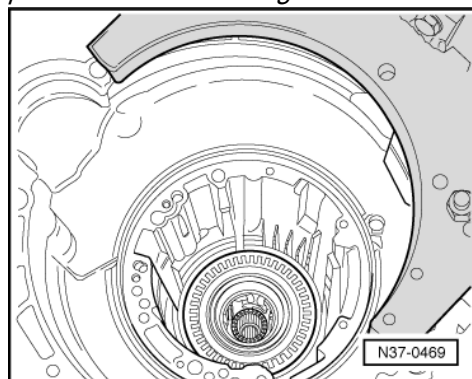
- -> Place washer -2- and axial needle bearing -1- on the small sun gear in the planet carrier -3-.
- Centralise washer and axial needle bearing in the small sun gear.

All models:

- Insert shim(s).
- Insert inner and outer -B1- plates.
- Insert pressure plate of -B1- with flat side facing plates.

Note:

The thickness of the pressure plate varies depending on the number of plates => Page 92 and as a replacement part is allocated to the gearbox code letters.

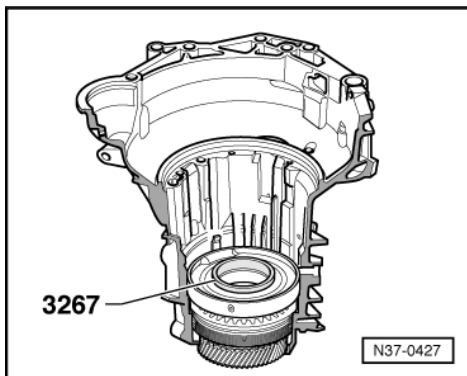


- -> Insert dished washer with convex facing towards freewheel.

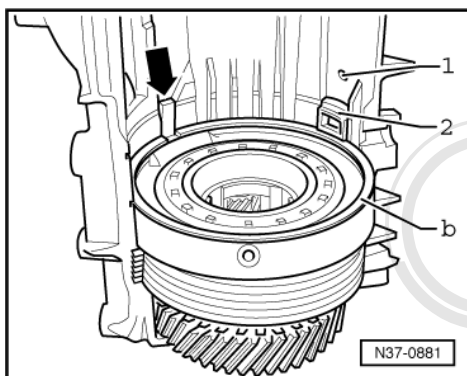
Note:

When replacing the following components adjust the reverse gear brake -B1- => Page 122 :

- ◆ Free wheel
- ◆ Piston for reverse gear brake -B1-
- ◆ Plates
- ◆ Gearbox housing

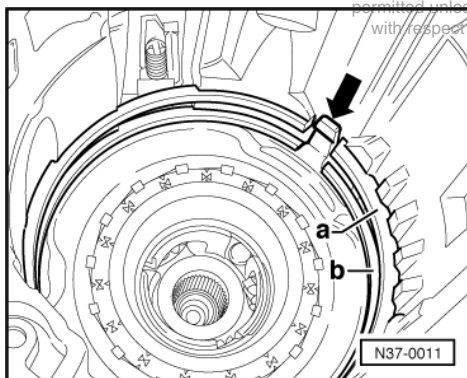


- -> Preload freewheel rollers with assembly ring 3267 and insert free wheel.



- -> Installation position of free wheel: The retaining wedge -arrow- must be seated in the machined groove on gearbox housing.
- Insert freewheel circlip -b-.
- Insert circlip gaps over freewheel retaining wedge -arrow-.
- Insert baffle block -2- in gearbox housing groove, where ATF breather hole -1- is located.

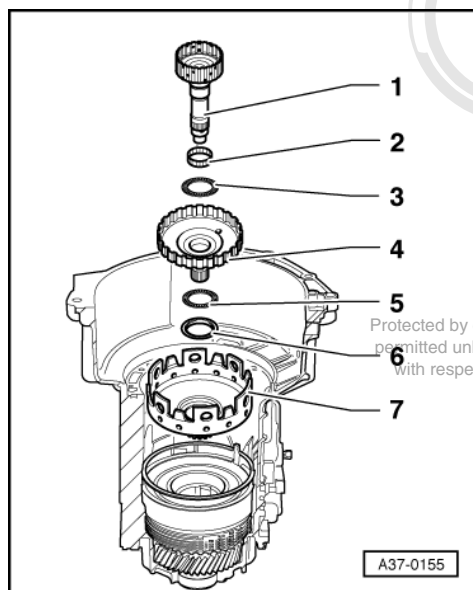
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- -> Install circlip -a- for supporting tube for -B2- with open ends of circlip facing toward retaining wedge -arrow- of free wheel.
- Perform check measurement of -B1- => Page 126

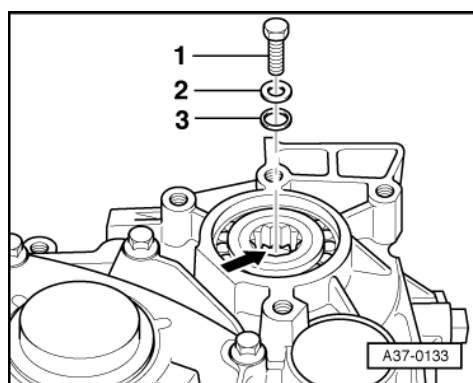


- Install gearbox speed sender -G38 => Page 192



- -> Install the parts in the gearbox housing in the reverse order of the numbering:

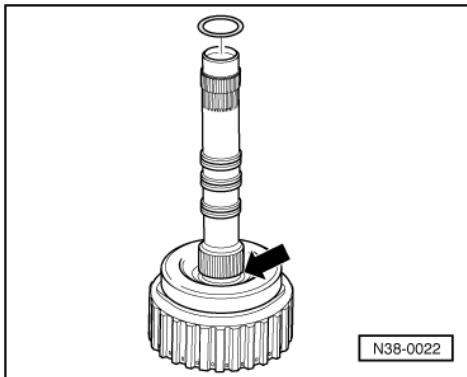
- 1 - Small input shaft
- 2 - Needle bearing
- 3 - Axial needle bearing
- 4 - Large input shaft
- 5 - Axial needle bearing
- 6 - Washer for axial needle bearing
(collar faces towards large bevel gear)
- 7 - Large sun gear



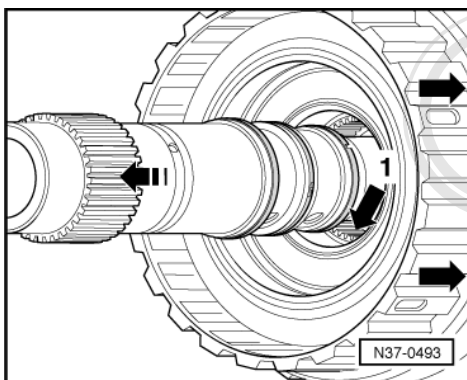
- -> Install bolt -1- for small input shaft with washer -2- and shim -3-.
- Tighten bolts to 30 Nm.

Notes:

- ♦ Insert shim -3- onto small input shaft shoulder -arrow-.
- ♦ Determining shim thickness => Adjusting planet carrier, Page 116
- Carry out planet carrier check measurement =>Page 121



- -> Insert new O-ring in the recess in the turbine shaft (arrow).
- Moisten O-ring with ATF.

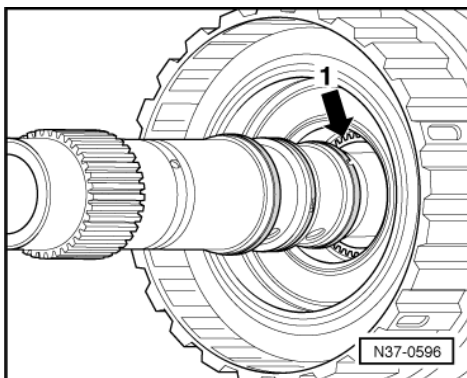


Note:

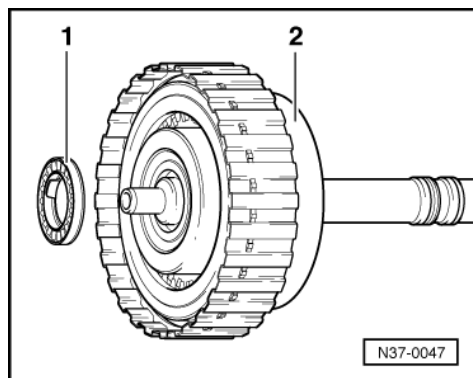
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On some gearboxes the clutches -K1- and -K3- must be pressed together before installing.

- Check that clutch -K1- can be fitted completely onto turbine shaft splines of -K3-.
- Do this by fitting -K1- onto -K3- by hand.
 - -> If the splines -arrow 1- are visible in the -K1- hub, then both clutches must be pressed together first
=> Page 113



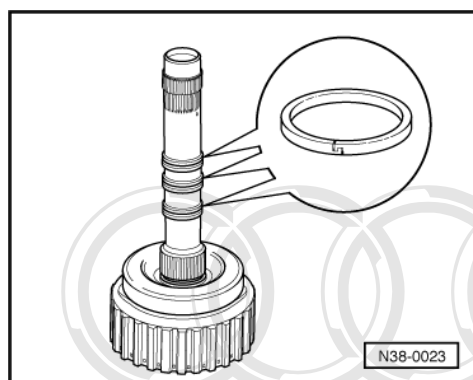
- -> If resistance of O-ring is overcome when connecting together (manually), the spline -arrow 1- in -K1- is no longer visible. In this case the clutches do not need to be pressed together. Continue to assemble the gearbox.



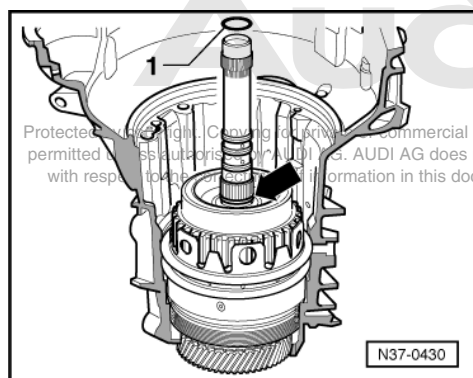
- -> Fit axial needle bearing with washer -1- onto 3rd- and 4th gear clutch -K3- -Item 2-.
- Installation position: Bearing washer faces toward -K3-.

Notes:

- ♦ Moisten axial bearing washer with ATF, so that it sticks to the -K3-.
- ♦ In the Fig. illustrated on non-pressed clutches.



- -> Ensure piston rings seat correctly on -K3-.
- Ensure that the ends of the piston rings are hooked together.

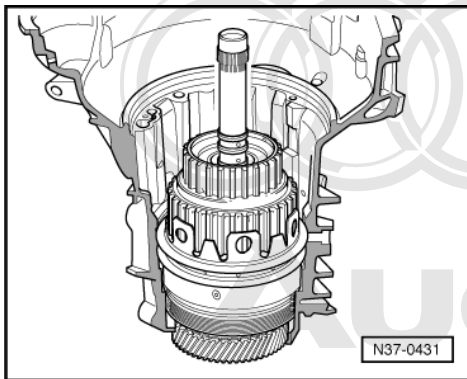


- -> Install 3rd and 4th gear clutch -K3-

Note:

When installing, rotate 3rd and 4th gear clutch -K3- until all the plates have meshed.

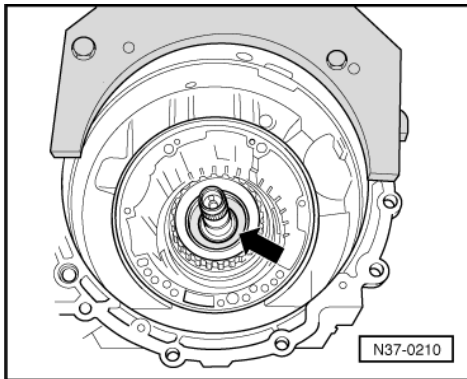
- Fit seal -1- in the groove -arrow-.
- Moisten O-ring with ATF.



- -> Inserting 1st to 3rd gear clutch -K1-

Note:

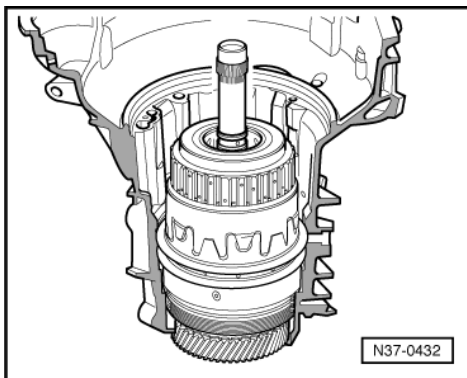
If -K1- and -K3- are pressed together, both clutches can only be inserted together.



- -> Insert shim(s) -arrow- in -K1-.

Notes:

- ◆ When replacing -K1-, -K2-, the small input shaft or the ATF pump the shim must be measured again => Adjust clutch play between -K1- and -K2- Page 127
- ◆ 1, 2 or 3 shims can be installed.



- -> Insert reverse gear clutch -K2-.

Note:

When installing, rotate reverse gear clutch -K2- until all the plates have meshed.

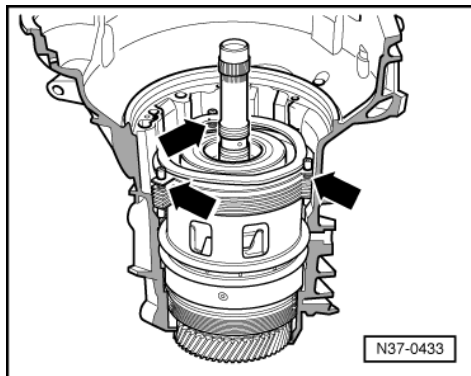
- Insert supporting tube for plate set of 2nd and 4th gear brake -B2- so that recess on lower part of supporting tube engages in retaining wedge of free wheel.

Note:

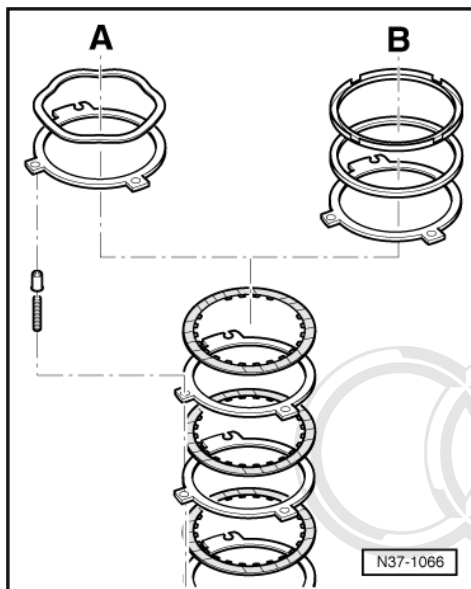
When replacing the following components adjust the 2nd and 4th gear brake -B2-:

- ◆ Gearbox housing
- ◆ Supporting tube
- ◆ ATF pump
- ◆ Corrugated washer
- ◆ Retaining ring
- ◆ Plates

These components are allocated as replacement parts according to gearbox code letters.



- -> Install plates of the 2nd and 4th gear brake -B2- in the following sequence:
 - First insert a 3 mm thick outer plate.
 - Insert three spring caps in outer plate.
 - Insert compression springs (arrows).
 - Insert all, but the last outer plate.
 - Fit three spring caps onto the compression springs.



-> There are two versions of the brake -B2-:

- A - Brake with corrugated spring washer
- B - Brake with retaining ring

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Gearboxes in which a corrugated spring washer is fitted onto the last outer plate in brake -B2- (code letters => from Page 2):

Note:

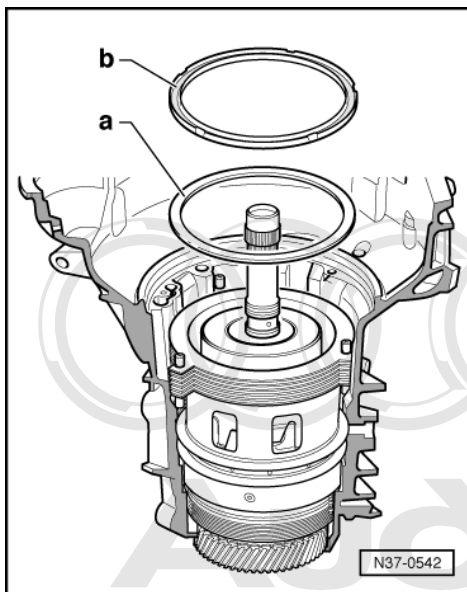
With these gearboxes, the thickness of the last outer plate determines the clearance of the brake -B2-. Determining thickness of this plate => Page 133

- Insert last measured outer plate.

Note:

If it is necessary to fit two outer plates because of the results of the measurement these should be fitted together on the spring caps.

- Install corrugated washer



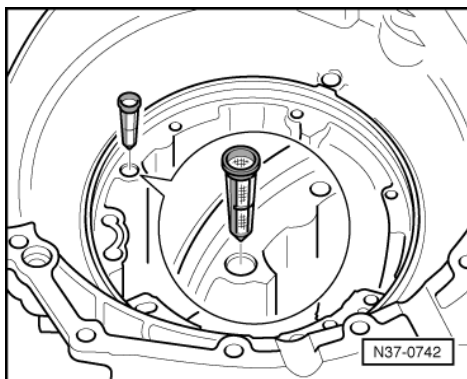
Gearboxes in which a shim and a retaining ring are fitted in brake -B2- (code letters => from Page 2):

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Note:

-> With these gearboxes, the last outer plate is always 3 mm thick. The clearance of brake -B2- is determined by a shim -a-, on which the retaining ring -b- seats.

- Insert last outer plate -3 mm thick-.
- Determine shim => Page 132 and insert.
- Insert retaining ring onto shim.
 - Installation position: Smooth side facing shim



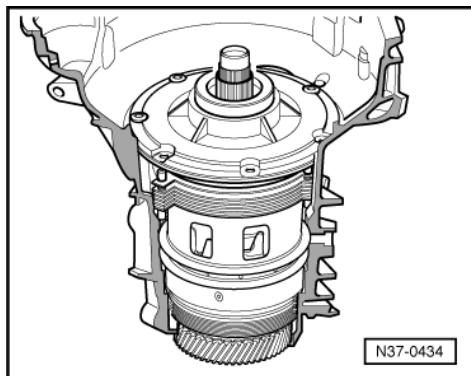


All models:

- -> If fitted, clean screen and install.

Note:

The screen sits in the return of the ATF cooler. It cannot be retrofitted in older gearboxes.



- Install ATF pump gasket, noting position of holes.
- Fit O-ring on ATF pump.

Note:

Ensure the piston rings are properly seated.

- -> Install ATF pump. The installation position is given by the position of the holes for the fixing bolts.
- Tighten bolts in diagonal sequence to 8 Nm.

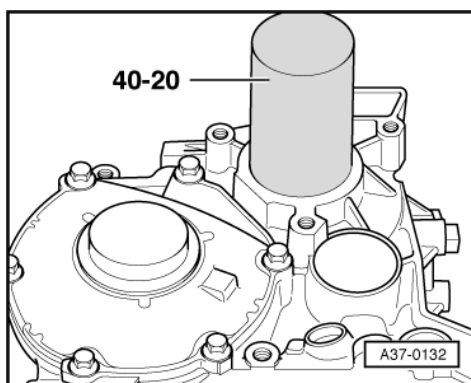
Note:

Ensure that the O-ring is not damaged.

- Then turn bolts 90° further.

Turning further can be done in several stages.

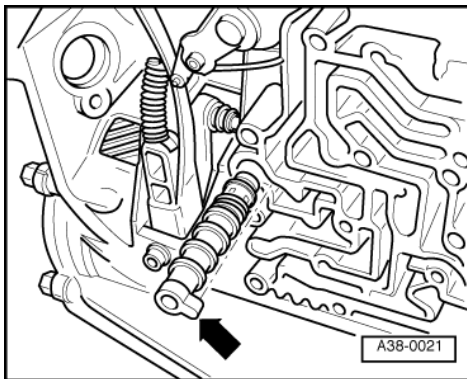
- Carry out check measurement of clutch play => Page 131



- -> Drive in cover with drive sleeve 40-20.
- Install gearbox speed sender -G38 => Page 192

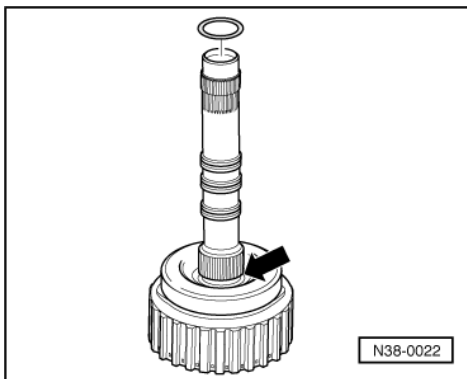


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- -> Insert sealing plugs with O-rings.
- Installation position: Lug -arrow- engages in oil channel
- Install valve body with conductor strip => from Page 170
- Install sump => from Page 170
- Install torque converter => from Page 23
- Install gearbox => Page 52
- Fill up with ATF and check ATF level => Page 59

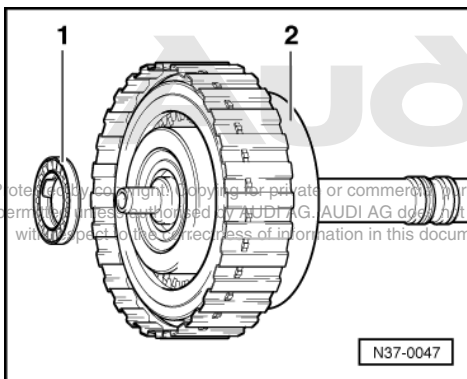
7.10 - Pressing clutch -K1- onto -K3-



Note:

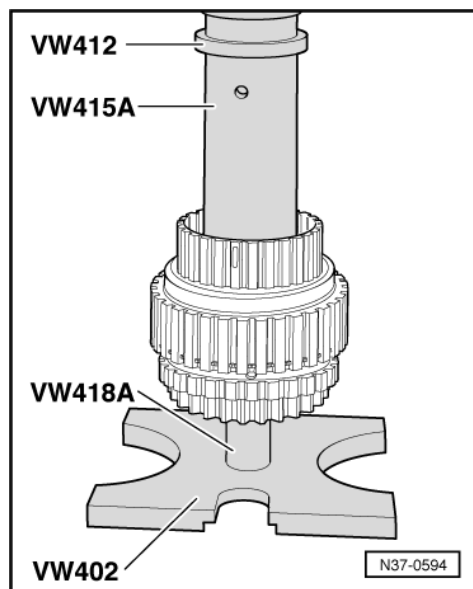
On some gearboxes the clutches -K1- and -K3- must be pressed together before installing. If with such a gearbox -K1- and -K3- were delivered separately for repair or separately as replacement parts, pressing the clutches is performed as follows:

- Coat O-ring with ATF.
- -> Insert new O-ring in the recess in the turbine shaft -arrow-.

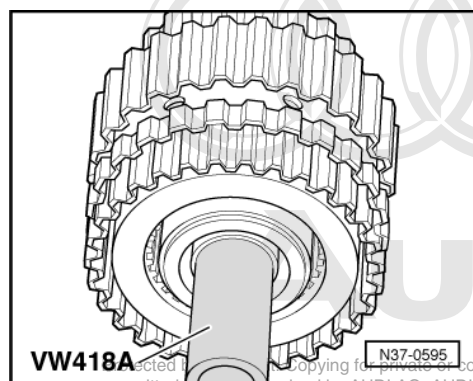


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- -> Unclip axial needle bearing (1) with washer from the 3rd and 4th gear clutch -K3- (2).

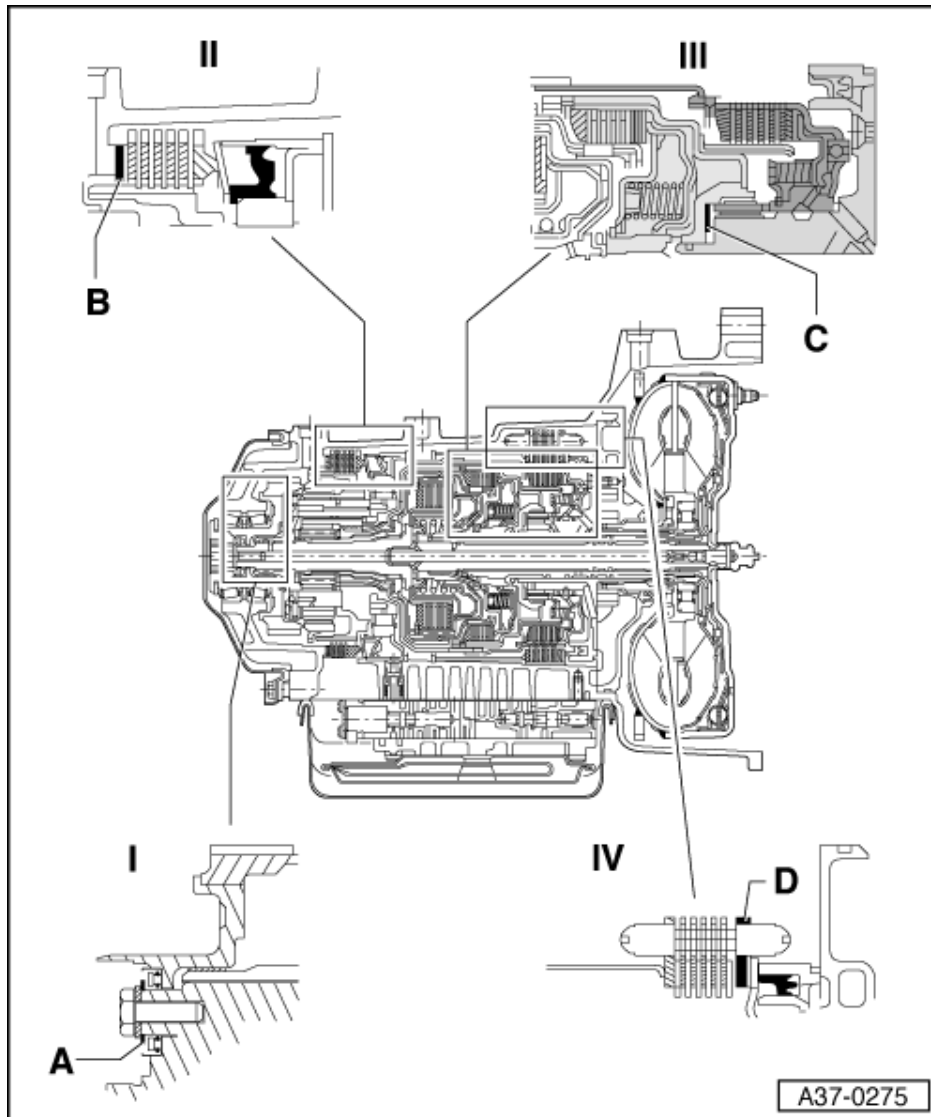


- Ensure the tool press surface is flat and not damaged.
- -> Prepare -K1- and -K3- for pressing as illustrated.



- -> Before pressing on, align VW 418 A centrally onto surface for axial needle bearing (this illustration shows -K3- from below).
- Press clutch -K1- on carefully until stop is perceptible.
- Do not exert further pressure onto clutches!
- Continued procedure => Page 108

7.11 - Planetary gearbox adjustments - overview



I - Planet carrier

- ♦ A - Shim
- ♦ Determining thickness => Adjusting planet carrier, Page 116

II - Reverse gear brake -B1-

- ♦ B - Shim
- ♦ Determining thickness => Adjusting reverse gear brake -B1-, Page 122

III - Clutch play

- ♦ C - Shim
- ♦ Determining thickness => Adjusting clutch play between -K1- and -K2-, Page 127

IV - 2nd and 4th gear brake -B2-

- ♦ D - Outer plate
- ♦ Determining thickness => 2nd and 4th gear brake -B2-, Page 132

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This diagram illustrates the exploded view of a mechanical assembly, likely a pump or valve component. The parts are numbered 1 through 20. The assembly is shown in two main sections: a top section (parts 1-11) and a bottom section (parts 12-20). The top section includes a large gear-like component (1) with a central shaft (2) and a flange (3). The bottom section includes a large gear-like component (11) with a central shaft (12) and a flange (13). The assembly is shown in a disassembled state, with parts 1 through 11 on the left and parts 12 through 20 on the right. A dashed line indicates the assembly path.

11

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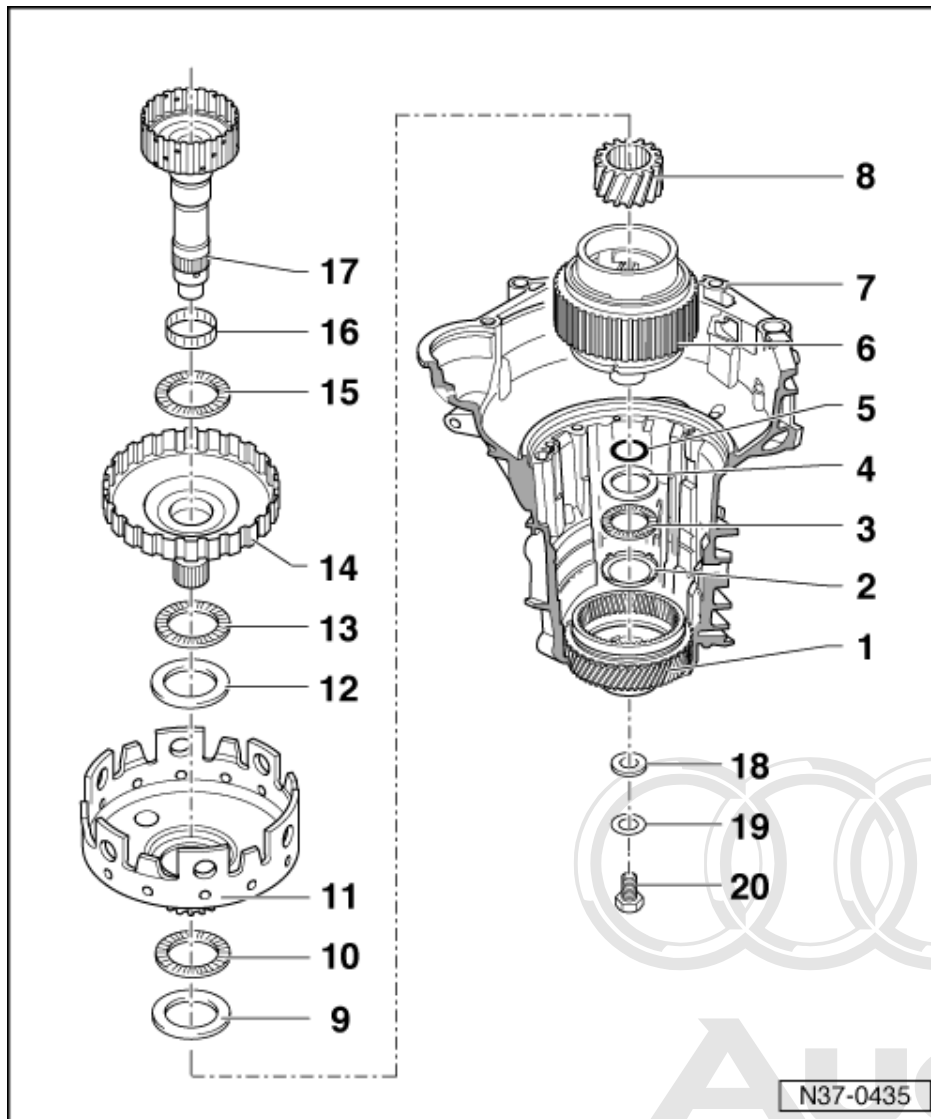
20

N37-0435

Note:

To adjust planet carrier, install components in gearbox housing without shim -Item 18 -.

- 116 37 - Controls, Housing



5 O-ring

- ◆ Replace
- ◆ Insert into planet carrier => Assembling planet carrier, Page 102

6 Planet carrier

7 Gearbox housing

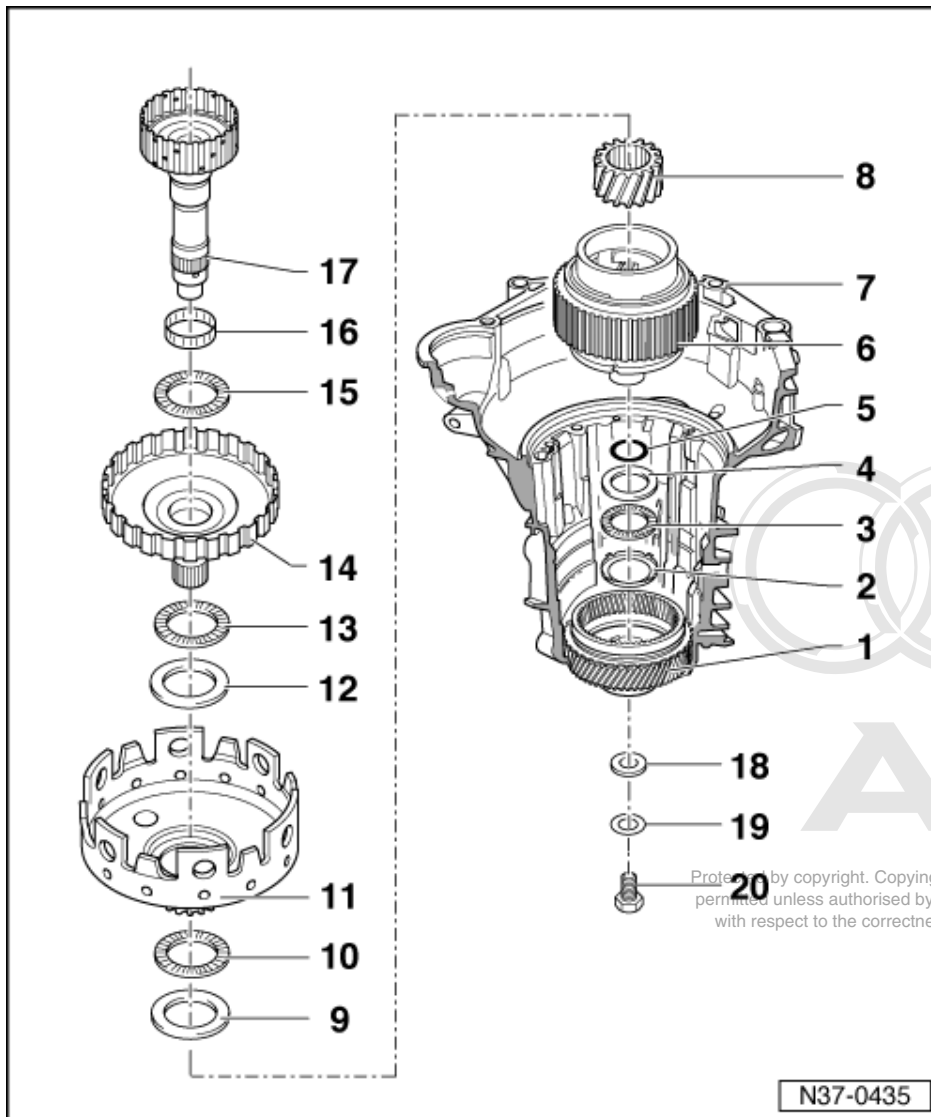
- ◆ With input gear and axial needle bearing
- ◆ Axial needle bearing remains in input gear
- ◆ If axial needle bearing is damaged => Removing and installing input gear, Page 203

8 Small sun gear

- ◆ Can only be removed from the planet carrier with gearboxes with code letters DMU and DMV

9 Washer

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10 Axial needle bearing

11 Large sun gear

12 Washer

- ♦ Insert into large sun gear => Assembling planetary gearbox, Page 102

13 Axial needle bearing

14 Large drive shaft

15 Axial needle bearing

16 Needle bearing

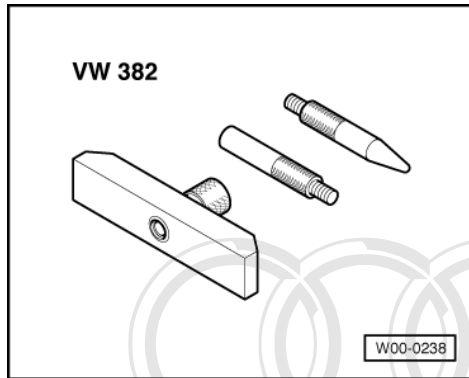
17 Small drive shaft

18 Shim

- ♦ Do not install in planet carrier when adjusting

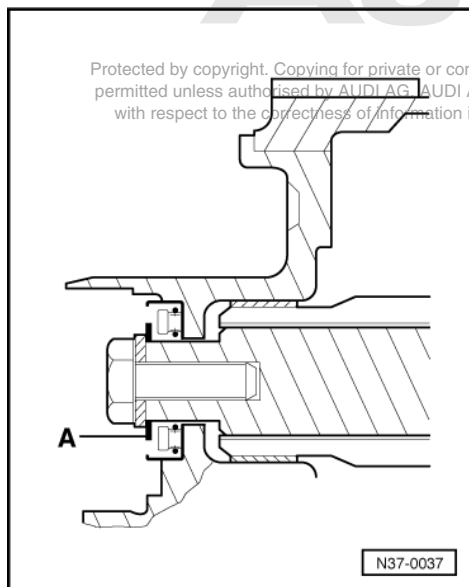
19 Washer

20 Small drive shaft bolt - 30 Nm



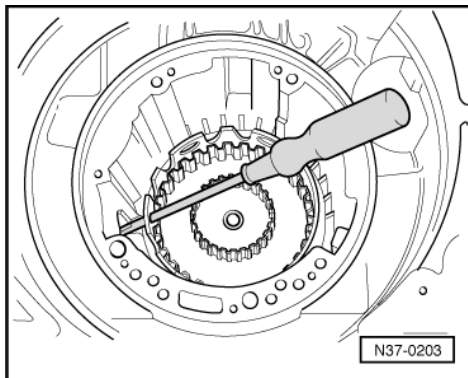
Special tools and workshop equipment required

- ◆ Measuring device VW 382
- ◆ Dial gauge



-> Determining shim -A-

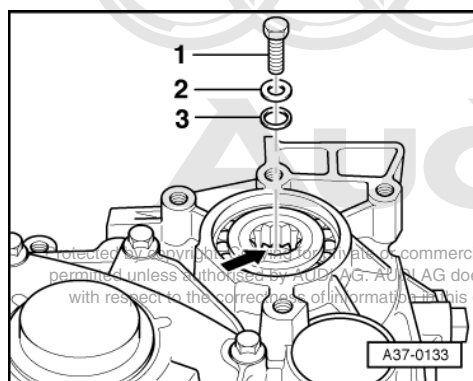
- Install all components (Items 1...9 and 14...18) => Page 116 to adjust planet carrier in gearbox housing.



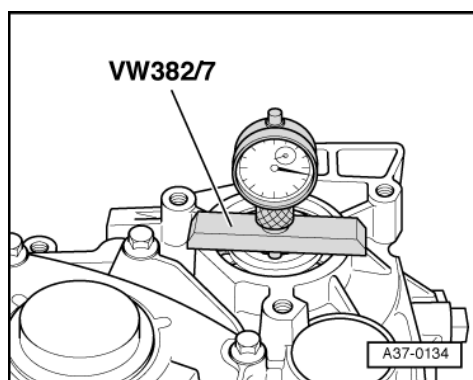
- Engage parking lock.
- -> To loosen the bolt for small input shaft, insert screwdriver in holes of large sun gear.

Note:

If the parking lock cannot be engaged, use a second screwdriver to hold the large input shaft.



- -> Install bolt -1- for small input shaft together with washer -2-. It is installed without shim -3-.
- Tighten bolts to 30 Nm.



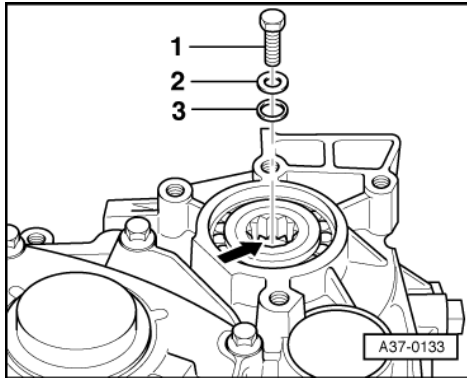
- -> Set up dial gauge so that tip of gauge is positioned on centre of bolt head with 1 mm preload.
- Zero dial gauge.
- Move small input shaft up and take reading.
- Measurement in following example: 2.00 mm.
- Determine shim from table. Part numbers

=> Parts List

Table of shims -A-

Gauge reading in mm	Shim(s) mm	Gauge reading in mm	Shim(s) mm
1.26...1.35	1.0	2.26...2.35	1.0 + 1.0
1.36...1.45	1.1	2.36...2.45	1.0 + 1.1
1.46...1.55	1.2	2.46...2.55	1.1 + 1.1
1.56...1.65	1.3	2.56...2.65	1.1 + 1.2
1.66...1.75	1.4	2.66...2.75	1.2 + 1.2
1.76...1.85	1.5	2.76...2.85	1.2 + 1.3
1.86...1.95	1.6	2.86...2.95	1.3 + 1.3
1.96...2.05	1.7	2.96...3.05	1.3 + 1.4
2.06...2.15	1.8	3.06...3.15	1.4 + 1.4

Gauge reading in mm	Shim(s) mm	Gauge reading in mm	Shim(s) mm
2.16...2.25	1.9	3.16...3.25	1.4 + 1.5

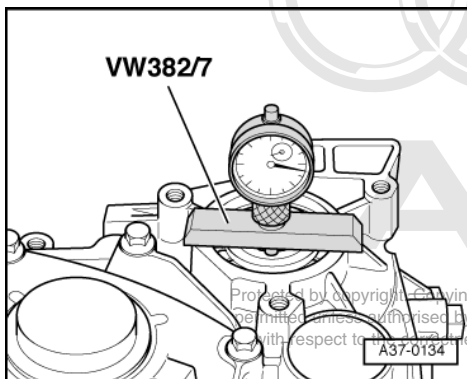


- Remove small input shaft bolt.
- -> Fit determined shim -3- onto small input shaft -arrow-.

Example:

If the reading is 2.00 mm use a shim with a thickness of 1.7 mm.

- Insert bolt -1- for small input shaft together with washer -2-.
- Tighten bolts to 30 Nm.
- Carry out planet carrier check measurement =>Page 121



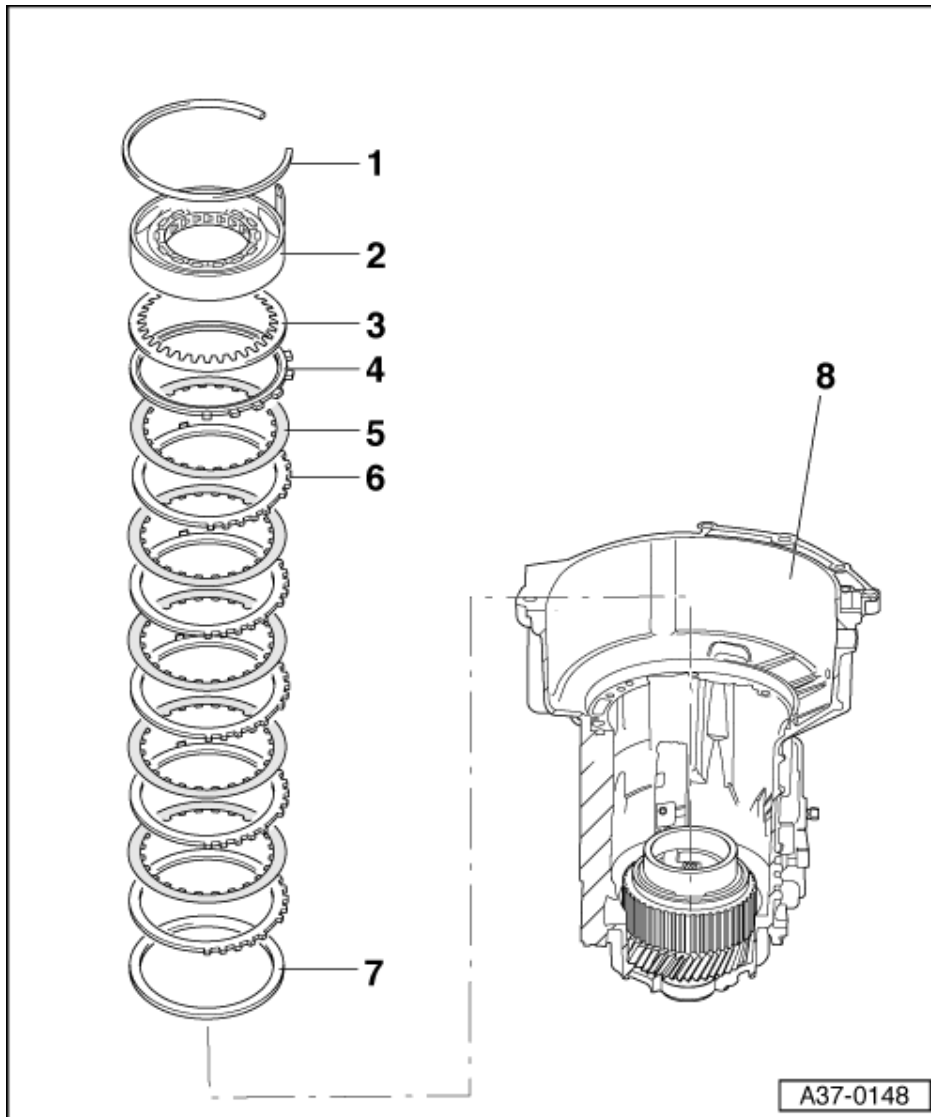
Planet carrier check measurement

- -> Insert dial gauge in VW 382/7 and place the tip on the bolt of the small input shaft.
- Move small input shaft up and down and take reading of play on dial gauge.
- Play: min. = 0.23 mm; max. = 0.37 mm.

Note:

If the planet carrier has been adjusted with reverse gear brake -B1- and free wheel removed then before installing planet carrier install reverse gear brake -B1- => Assembling planetary gearbox, Page 102

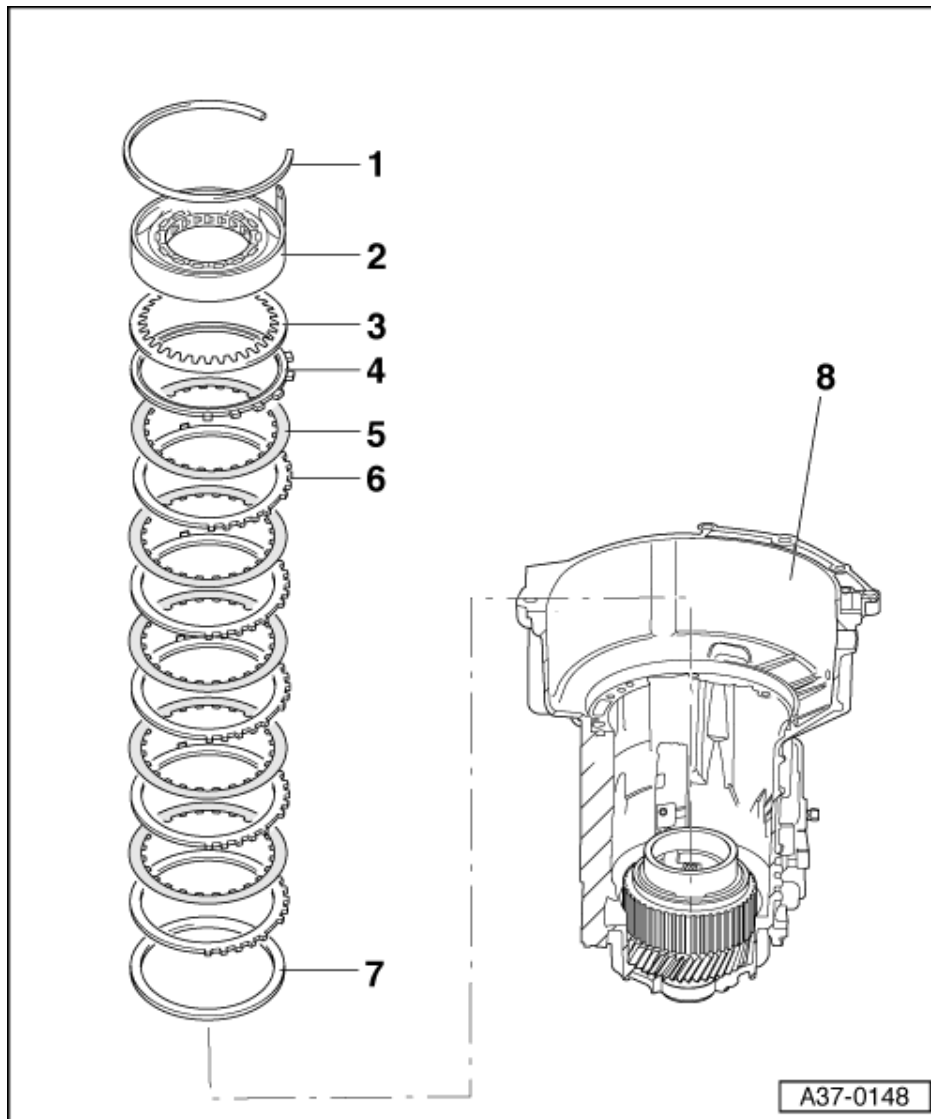
7.13 - II - Adjusting reverse gear brake -B1- - overview



Overview of components

- 1 Circlip
- 2 Freewheel with piston -B1-
- 3 Dished washer
 - ◆ Installation position: Convex side faces toward free wheel
- 4 Pressure plate
 - ◆ Installation position: Flat side faces toward plates
 - ◆ As a replacement part it is allocated according to gearbox code letters (different identifications)

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5 Inner plate -B1-

- ◆ =>from Page 2

6 Outer plate -B1-

- ◆ =>from Page 2

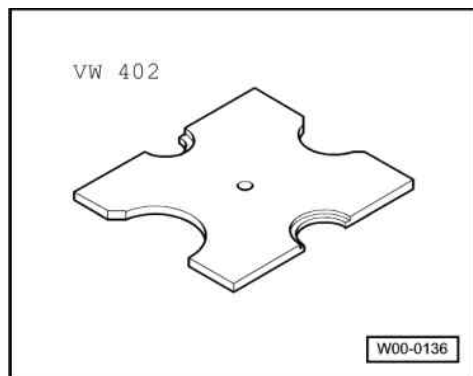
7 Shim

- ◆ 1 or 2 shims can be installed

8 Gearbox housing

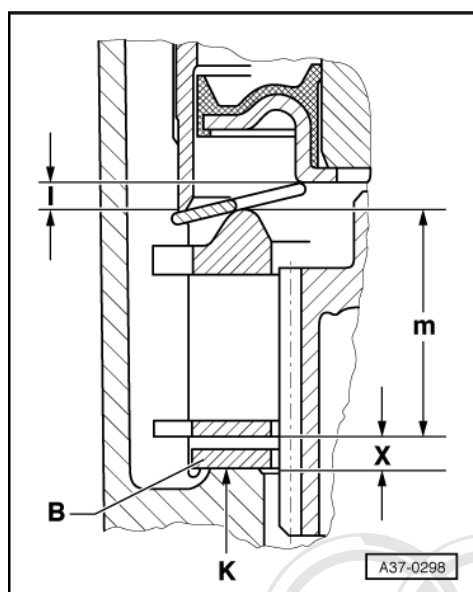
- ◆ With input gear and planet carrier installed

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Special tools and workshop equipment required

- ♦ Thrust plate VW 402



-> Determining thickness of shim -B-

The thickness of the shim depends on the size of gap "x". Gap "x" is calculated using the following formula:

$$x = K + (l : 2) - m$$

B = Shim

x = Size of gap

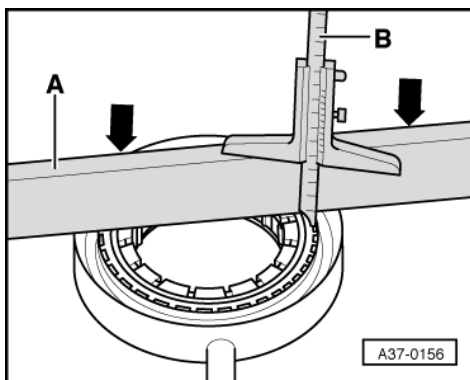
l = Position of piston in free wheel, calculating =>

Page 125

m = Height of plate set including pressure plate, calculating =>

Page 125

K = Constant value of 30.5 mm; "K" is determined by installation height in gearbox housing and is not adjustable.

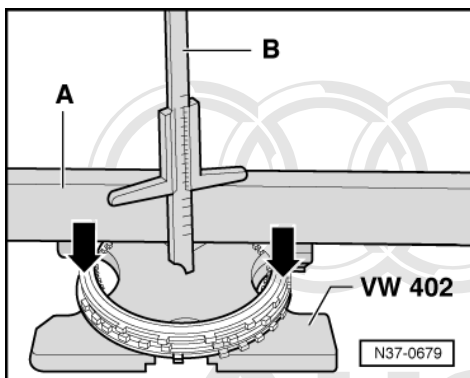


Calculating "l"

- Press piston into free wheel as far as stop.
- -> Place straightedge -A- onto outer race of free wheel and hold in position -arrows-.
- Use depth gauge -B- to measure down inner edge of piston.

Example:

Measured value	51.8 mm
- Straightedge	48.2 mm
= Calculated size "l"	3.6 mm



Calculating "m"

- -> Place straightedge "A" on thrust plate.
- Compress set of plates including pressure plate in direction of arrow and measure the thickness of plate set with depth gauge "B".

Example:

Measured value	77.2 mm
- Straightedge	48.2 mm
= Calculated size "m"	29.0 mm

Example for calculating gap:

$$x = K + (l : 2) - m$$

$$x = 30.5 + (3.6 : 2) - 29.0 = 3.3 \text{ mm}$$

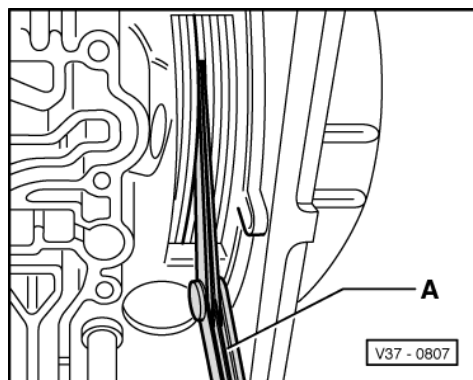
- Determine shim from table. Part numbers

=> Parts List

Table of shims -B-

Gap "x" in mm	Shim(s) mm	Gap "x" in mm	Shim(s) mm
2.36...2.45	1.0	3.36...3.45	1.0 + 1.0
2.46...2.55	1.1	3.46...3.55	1.0 + 1.1
2.56...2.65	1.2	3.56...3.65	1.1 + 1.1
2.66...2.75	1.3	3.66...3.75	1.1 + 1.2
2.76...2.85	1.4	3.76...3.85	1.2 + 1.2
2.86...2.95	1.5	3.86...3.95	1.2 + 1.3
2.96...3.05	1.6	3.96...4.05	1.3 + 1.3
3.06...3.15	1.7	4.06...4.15	1.3 + 1.4
3.16...3.25	1.8	4.16...4.25	1.4 + 1.4
3.26...3.35	1.9		

- After determining shim for -B1- carry out check measurement.

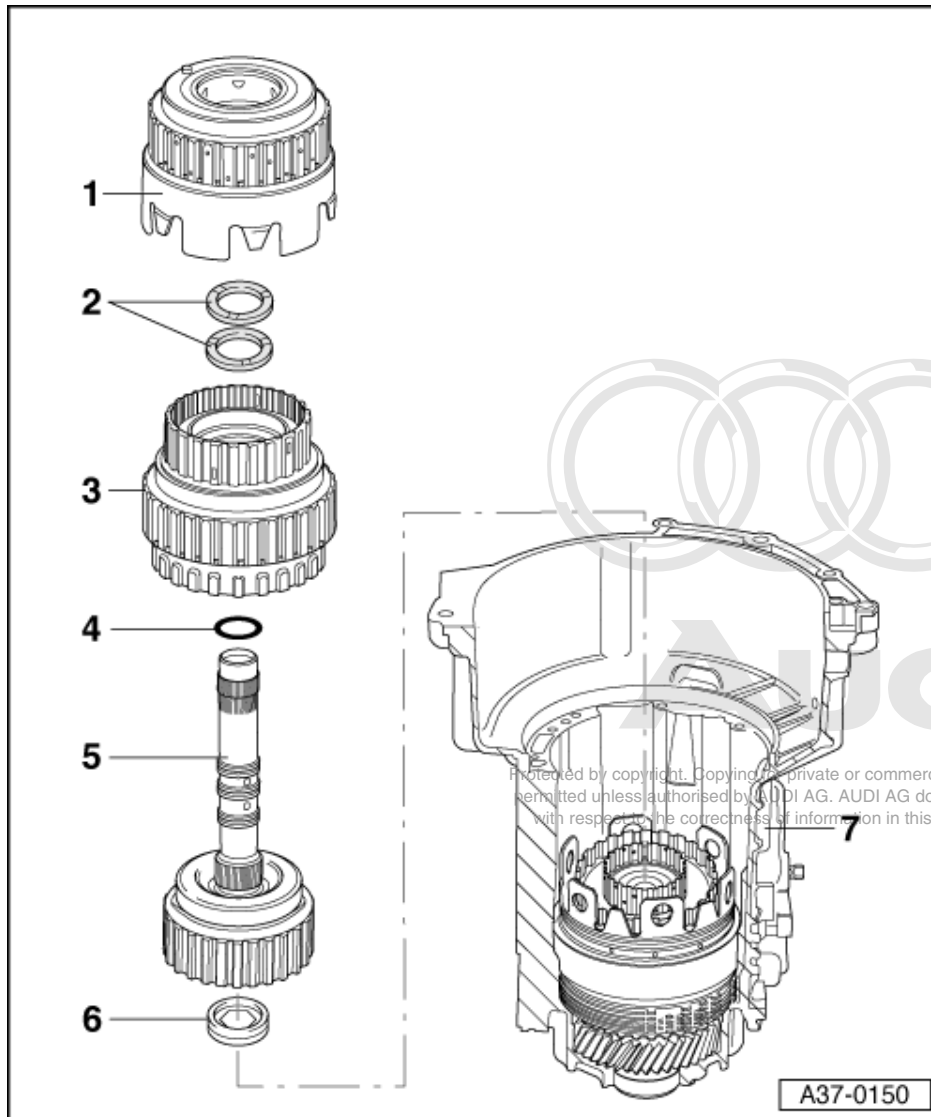


Reverse gear brake -B1- check measurement

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- Install parts up to free wheel and secure with circlip => Assembling planetary gearbox, Page 102
- -> Use a feeler gauge -A- to measure play between the plates (accessible through gap next to valve body flange).
- Play: min. = 1.25 mm; max. = 1.55 mm.

7.14 - III - Adjusting clutch play between -K1- and -K2-



Overview of components

Note:

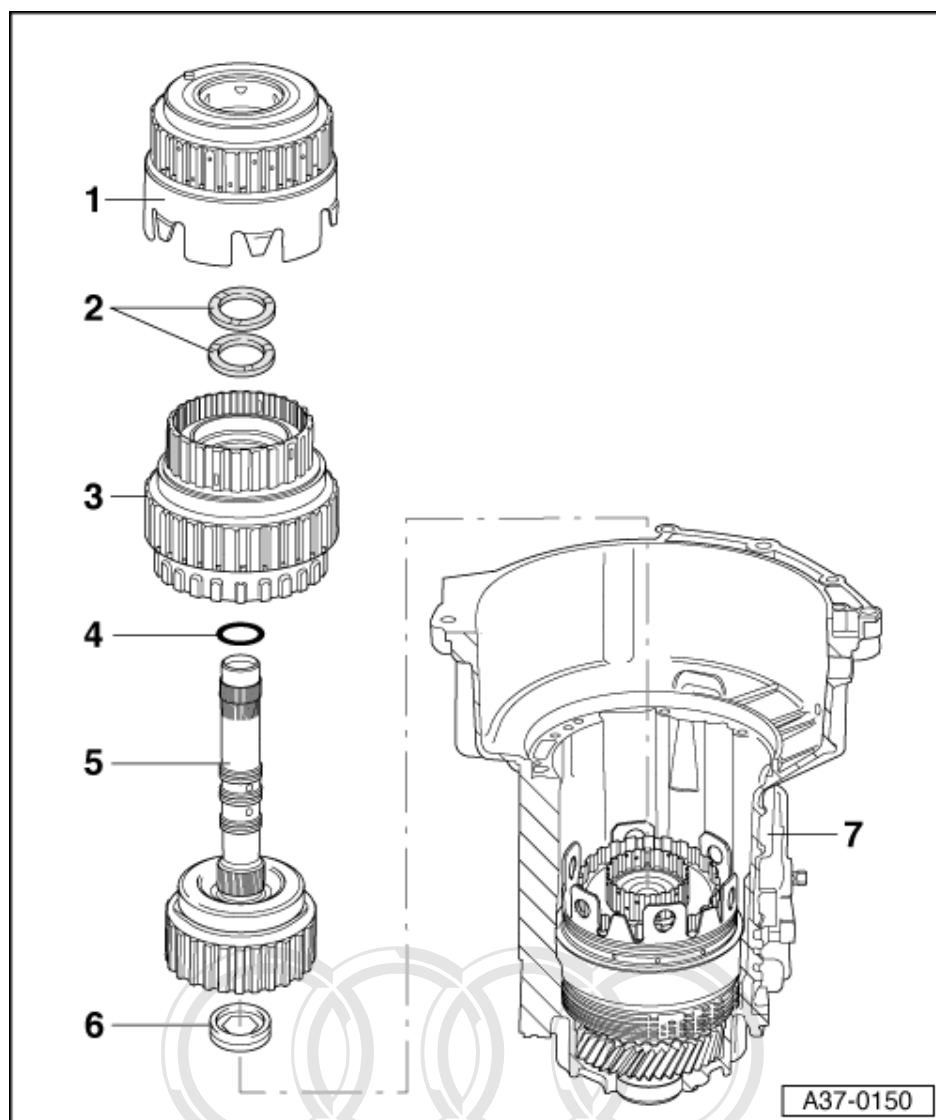
To adjust the clutch play, install components without shim(s) -Item. 102

1 Reverse gear clutch -K2-

- ◆ Does not need to be installed to determine shim(s)
- ◆ Install for check measurement

2 Shims

- ◆ Do not install when adjusting clutch play
- ◆ Up to 3 shims can be installed



3 1st to 3rd gear clutch -K1-

4 O-ring

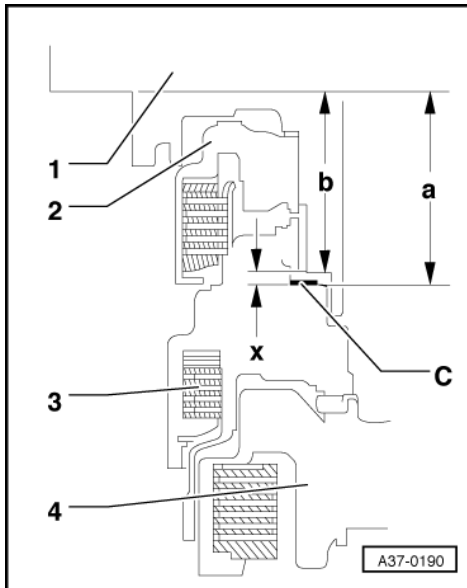
5 3rd and 4th gear clutch -K3- with turbine shaft

6 Axial needle bearing with washer

- ♦ Axial needle bearing faces towards small input shaft
- ♦ Washer faces towards -K3-

7 Gearbox housing

- ♦ Planetary gearbox installed up to small input shaft => Assembling planetary gearbox, Page 102



Determining thickness of shim(s) -C-

Preconditions:

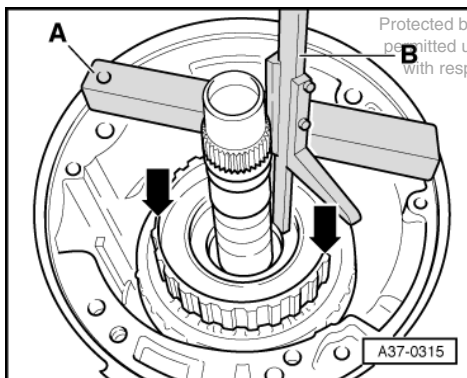
- Planet carrier has been installed and adjusted => Assembling planetary gearbox, Page 102
- To perform measurement, gearbox housing must be turned on assembly stand so that input gear is facing downwards, as shown on => Page 127

-> The thickness of the shim(s) depends on the size of gap width "x". Gap "x" is calculated using the following formula:

$$x = a - b$$

- 1 - ATF pump
- 2 - Reverse gear clutch -K2-
- 3 - 1st to 3rd-gear clutch -K1-
- 4 - 3rd and 4th-gear clutch -K3-

C = Shim(s)
 x = Size of gap
 a = Installation depth of clutch -K1-; Calculating => Page 130
 b = Size of ATF pump housing; Calculating => Page 130



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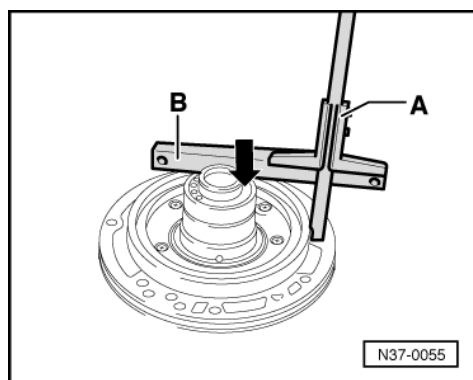
Calculating "a"

- -> Place short straightedge "A" onto pump flange on gearbox housing.
- Press -K1- down in direction of arrow and measure distance into -K1- with depth gauge "B".

Example:	
Measured value	73.7 mm

Example for calculating "a":

Measured value	73.7 mm
- Straightedge	19.5 mm
= Calculated size "a"	54.2 mm



Calculating "b"

- Place paper gasket onto ATF Pump.
- -> Place straightedge -B- onto stator support -arrow- and measure with depth gauge -A- to gasket of pump flange.

Example:

Measured value	70.5 mm
- Straightedge	19.5 mm
= Calculated distance "b"	51.0 mm

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Example for calculating "x":

$$\text{Gap } x = a - b$$

$$= 54.2 \text{ mm} - 51.0 \text{ mm} = 3.2 \text{ mm}$$

- Determine shim from table. Part numbers

=> Parts List

Table of shims -C-

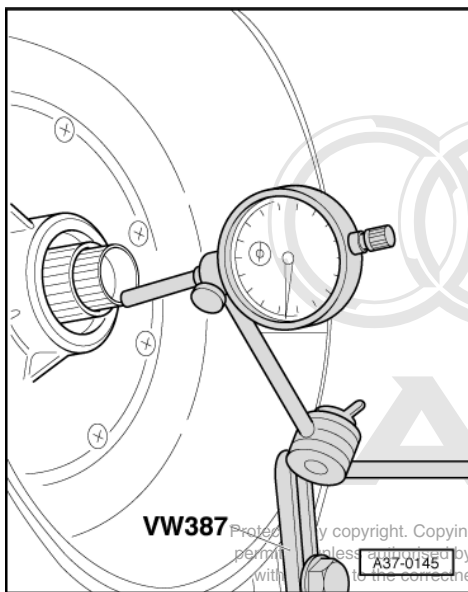
Gap "x" in mm	Shim(s) mm
...2.54	1.4
2.55...3.09	1.0 + 1.0
3.10...3.49	1.2 + 1.2
3.50...3.89	1.4 + 1.4

Gap "x" in mm	Shim(s) mm
3.90...4.29	1.6 + 1.6
4.30...4.69	1.8 + 1.8
4.70...5.04	1.2 + 1.2 + 1.6
5.05...5.25	1.2 + 1.2 + 1.8

The shims are of different thicknesses:

Blue	=	1.0 mm
Green	=	1.2 mm
White	=	1.4 mm
Black	=	1.6 mm
Grey	=	1.8 mm

- Carry out clutch play check measurement after installing ATF pump.



Check measurement (clutch play)

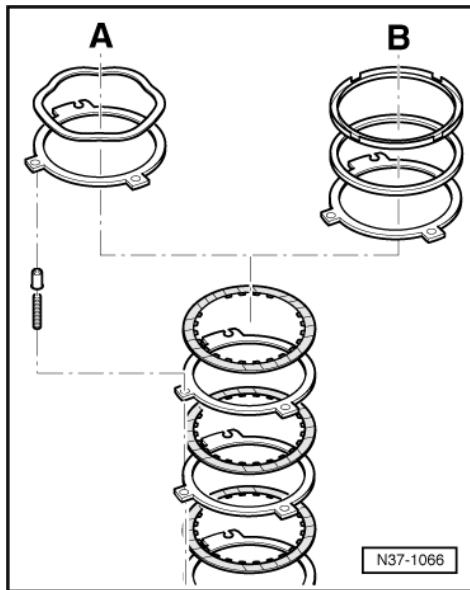
- The clutch play cannot be measured until the ATF pump has been installed.
- Reverse gear clutch -K1- must be installed.
- Attach dial gauge holder to gearbox housing and place dial gauge on turbine shaft with a preload of 1 mm.

Notes:

- ◆ Gearbox must be moved to installation position to enable turbine shaft to move.
- ◆ Turbine shaft is only to be moved by hand as pliers would damage the splines.
- -> Pull turbine shaft out and push it in (shaft will be difficult to move) and read off play on dial gauge.
- Play: min. = 0.5 mm; max. = 1.2 mm.



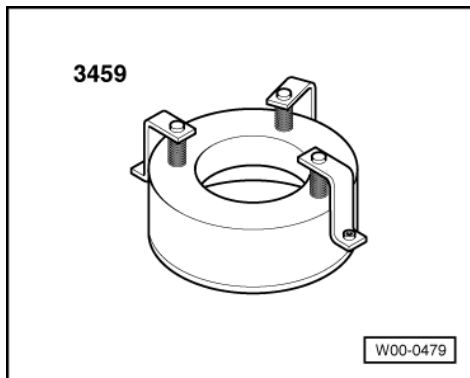
7.15 - IV - 2nd and 4th gear brake -B2-



-> A distinction is made between two types of gearbox:

A - Gearboxes in which a corrugated spring washer is fitted onto the last outer plate in brake -B2- (code letters => from Page 133

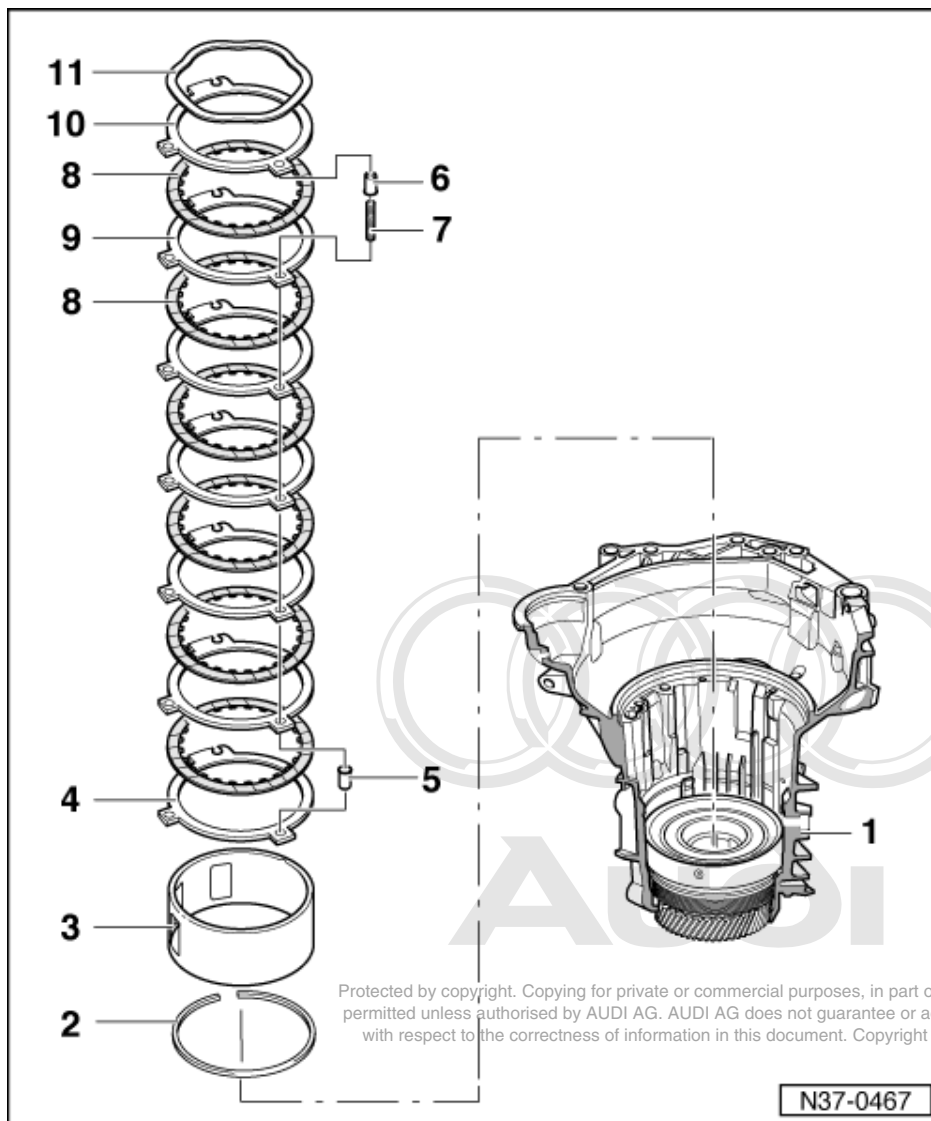
B - Gearboxes in which a shim and a retaining ring are fitted in brake -B2- (code letters => from Page 140



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Special tools and workshop equipment required

- ♦ Adjustment appliance 3459



Adjusting 2nd and 4th gear brake -B2-

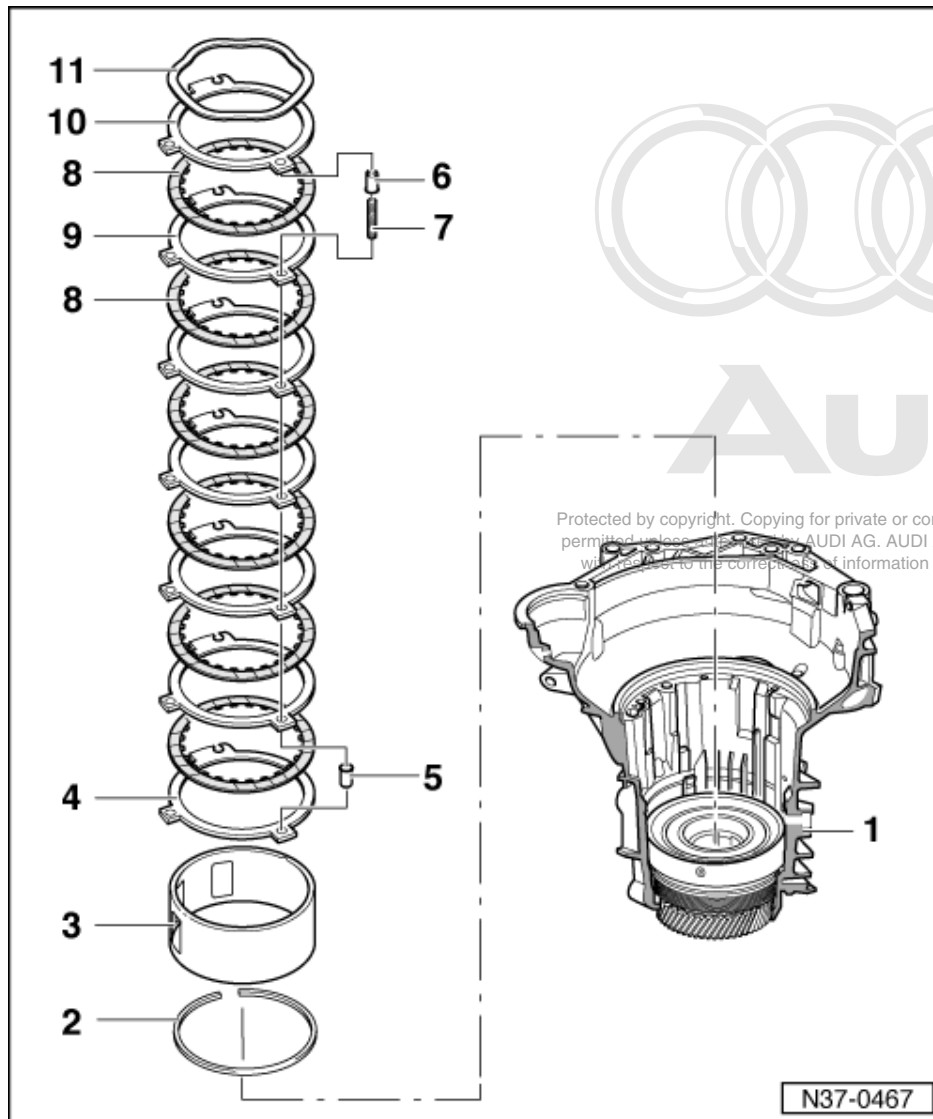
This adjustment instruction is only valid for gearboxes where a corrugated spring washer in brake -B2- on the last outer plate is installed (=> Items **10** and **11**).

Gearbox-code letters =>from Page **2** .

On these gearboxes the clearance of brake -B2- is determined by the thickness of the last outer plate(s) - Item **10** -.

Note:

*Adjustment procedure for gearbox without corrugated spring washer => Page **140***



- To adjust, install components without corrugated washer (Item **11**), without last outer plate (Item **10**) and without spring caps (Item **6**).

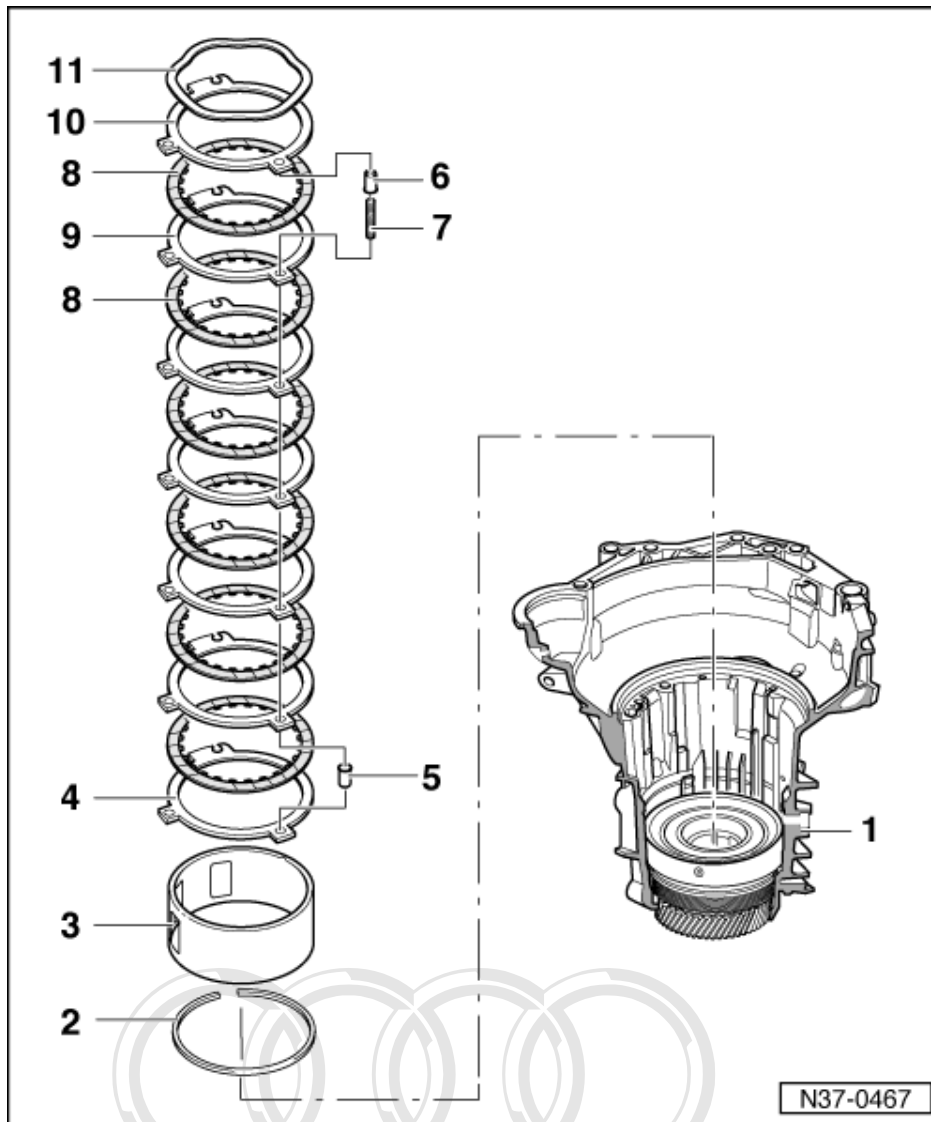
1 Gearbox housing

2 Circlip

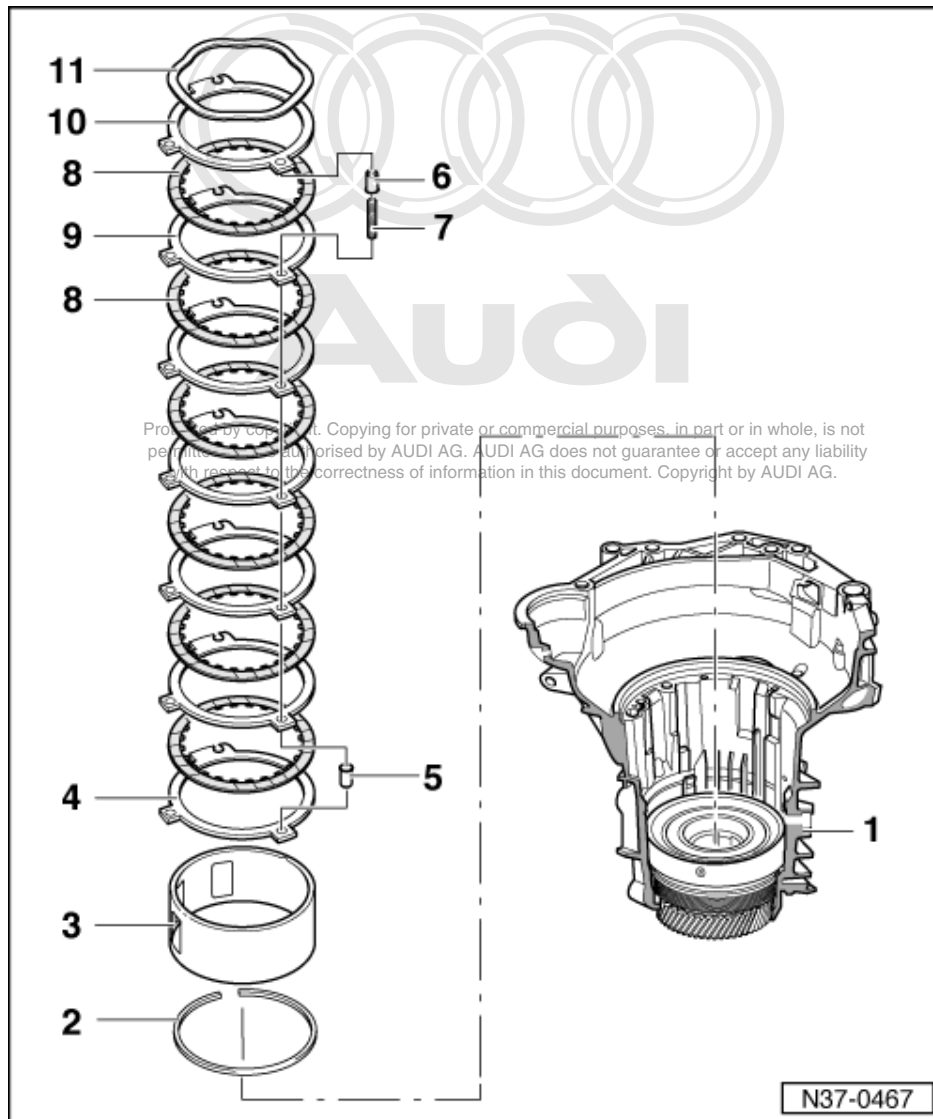
- ◆ For supporting tube
- ◆ Installation position: Open ends face toward retaining wedge of free wheel

3 Supporting tube -B2-

- ◆ As a replacement part it is allocated according to gearbox code letters
- ◆ Insert so that notch locates on freewheel wedge



- 4 **Outer plate -B2-**
- ♦ 3 mm thick
- 5 **Spring cap**
- ♦ Install after installing first outer plate (Item 4)
- 6 **Spring cap**
- ♦ Do not install to adjust -B2-
 - ♦ Install before installing last outer plate
- 7 **Spring**
- 8 **Inner plate -B2-**
- ♦ =>from Page 2
 - ♦ As a replacement part it is allocated according to gearbox code letters



9 Outer plate -B2-

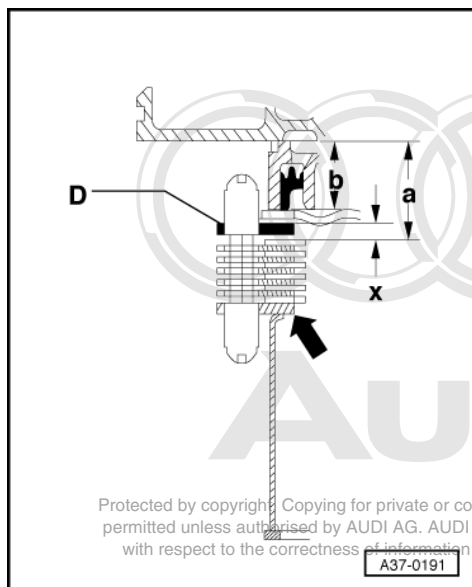
- ◆ Always install 2 mm thick outer plates
- ◆ =>from Page 2

10 Outer plate -B2-

- ◆ Do not install to adjust -B2-
- ◆ To adjust, 2 outer plates can be installed

11 Corrugated washer

- ◆ Do not install to adjust -B2-



Calculating thickness of last outer plate -D-

-> The thickness of the outer plate(s) depends on the size of gap "x". Gap "x" is calculated using the following formula:

$$x = a - b - 3.6 \text{ mm}$$

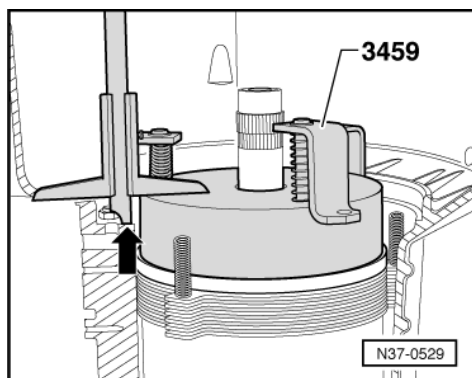
D = Outer plate(s)
 x = Size of gap
 a = Adjusting installation depth of 2nd and 4th gear brake -B2-; Calculating => Page 138
 b = Size of ATF pump housing; Calculating =>Page 138

The illustration shows a cross section of the brake -B2- in assembled form. Special tool 3459 which exerts a force on the pack of plates, is not illustrated.

3.6 mm - This amount allows for the settling caused by the force exerted by special tool 3459.

Note:

First outer plate -arrow- is always 3 mm thick.



Determining dimension "a"

Assemble planetary gearbox up to the last inner plate of -B2- => Page 102. The last outer plate, the last 3 spring caps and the corrugated spring washer are not installed.

- Place special tool 3459 onto the last inner plate and turn so that the 3 clips align with the holes for the ATF pump.
- Bolt special tool to flange for ATF pump and tighten to 5 Nm.

Note:

The plate packet for -B2- is now pressed together for the measurements.

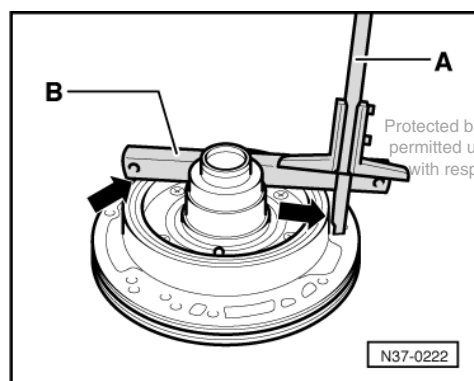
- -> Measure from pump flange/gearbox housing -arrow- to 3459 with depth gauge.

Dimension a = Height of 3459 in mm - measured value

Example:

Height of 3459	60.0 mm
- Measured value	29.8 mm
= Calculated size "a"	30.2 mm

- Remove special tool 3459.



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Determining dimension "b"

- Push piston into ATF pump up to stop.
- Place paper gasket onto ATF Pump.
- -> Place straightedge "B" onto stator support (arrow) and measure with depth gauge "A" to gasket of pump flange.

Example:

Measured value	40.1 mm
- Straightedge	19.5 mm
= Calculated distance "b"	20.6 mm

$$x = a - b - 3.6 \text{ mm}$$

$$= 30.2 \text{ mm} - 20.6 \text{ mm} - 3.6 \text{ mm} = 6.0 \text{ mm}$$

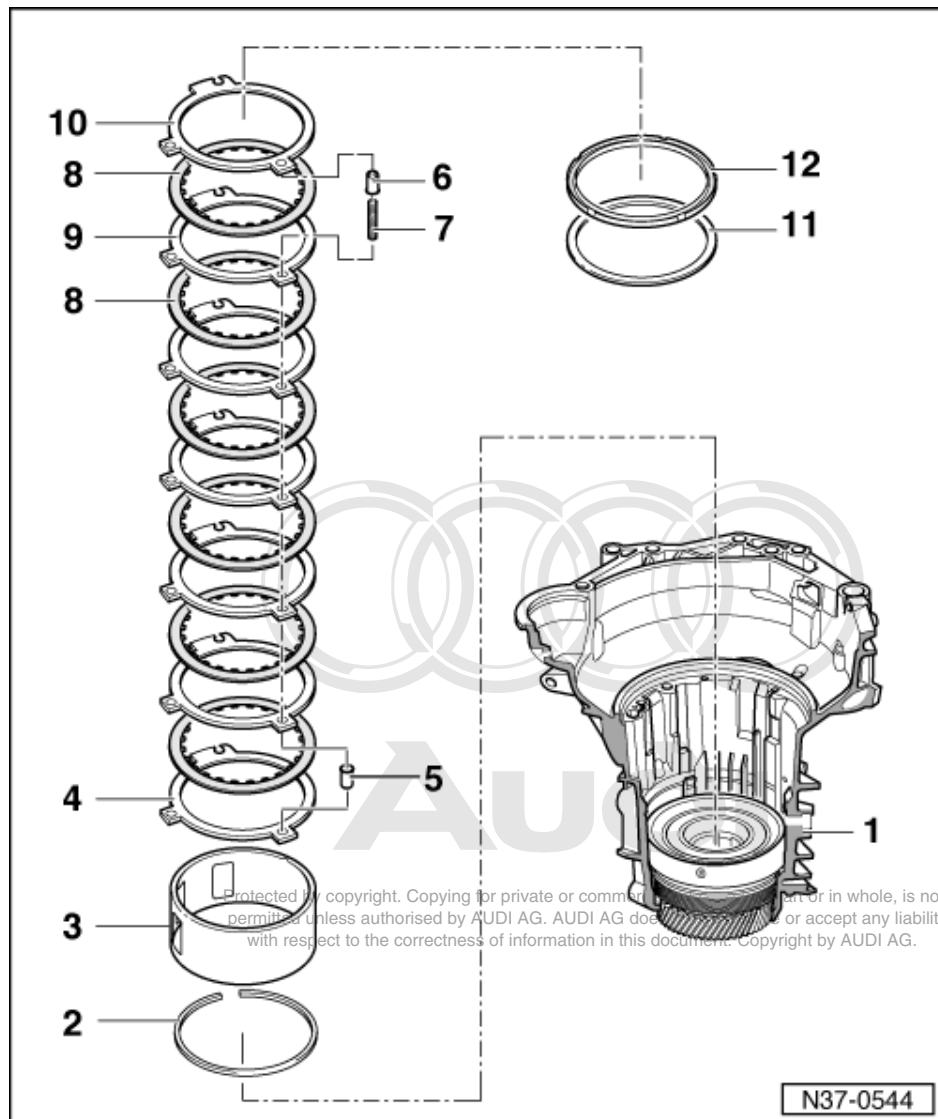
- Determine outer plate(s) from table. Part numbers

=> Parts List

Table of outer plates -D-

Gap "x" in mm	Outer plate(s) mm
4.25...4.49	2.75
4.50...4.74	3.00
4.75...4.99	3.25
5.00...5.24	3.50
5.25...5.49	3.75
5.50...5.74	2.00 + 2.00
5.75...5.99	2.00 + 2.25
6.00...6.24	2.25 + 2.25
6.25...6.49	2.25 + 2.50
6.50...6.74	2.50 + 2.50
6.75...7.00	2.50 + 2.75

- Fit three spring caps onto the compression springs.
- Install determined last outer plate(s).
- Install corrugated washer
- Continued assembly => Page **112**



Adjusting 2nd and 4th gear brake -B2-

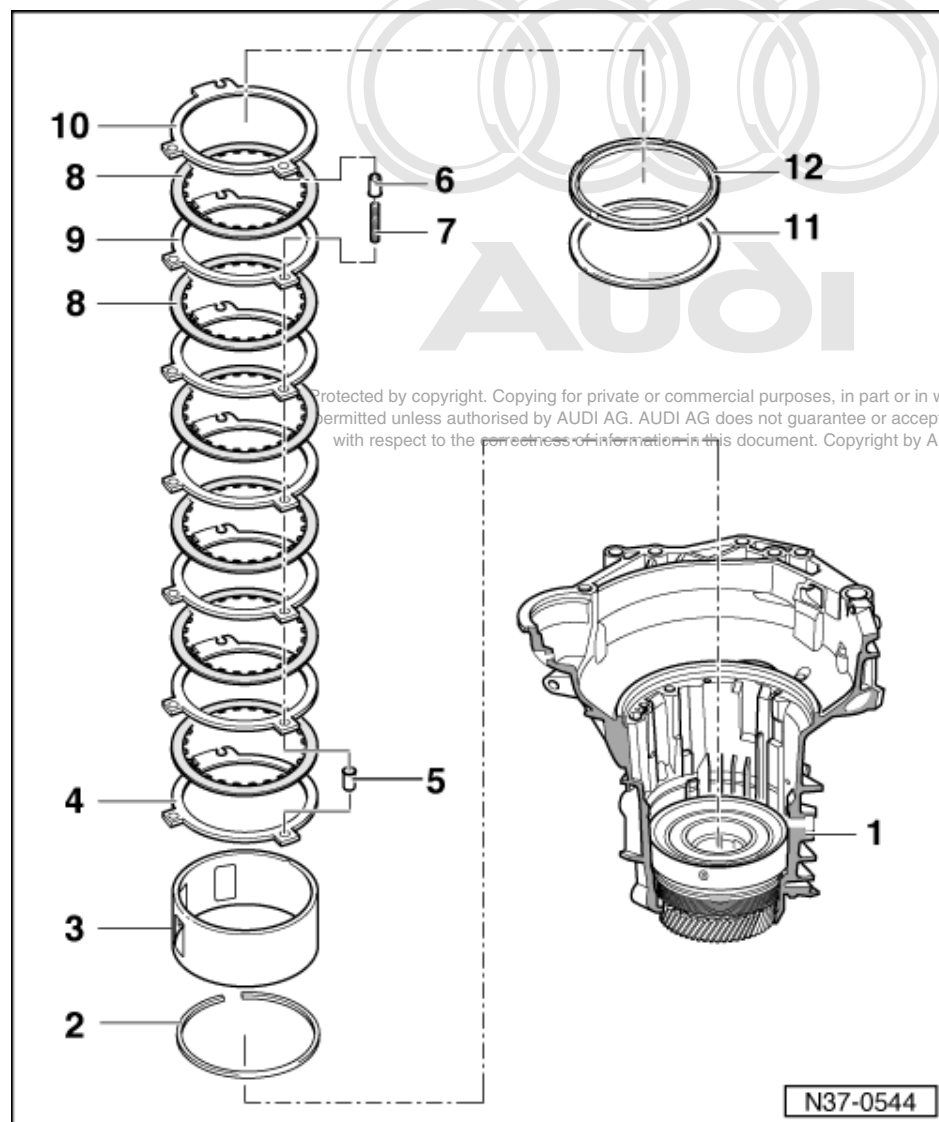
These adjustment procedures are only valid for gearboxes with a shim and retaining ring installed in brake -B2- (=> Items **11** and **12**).

Gearbox-code letters =>from Page **2**

With these gearboxes the brake -B2- clearance is determined by the thickness of the shim.-Item **11** -.

Note:

Adjustment procedure for gearbox with corrugated spring washer => Page **133**



- To adjust, install components without shim (Item **11**), without last outer plate (Item **10**) and without spring caps (Item **6**).

1 Gearbox housing

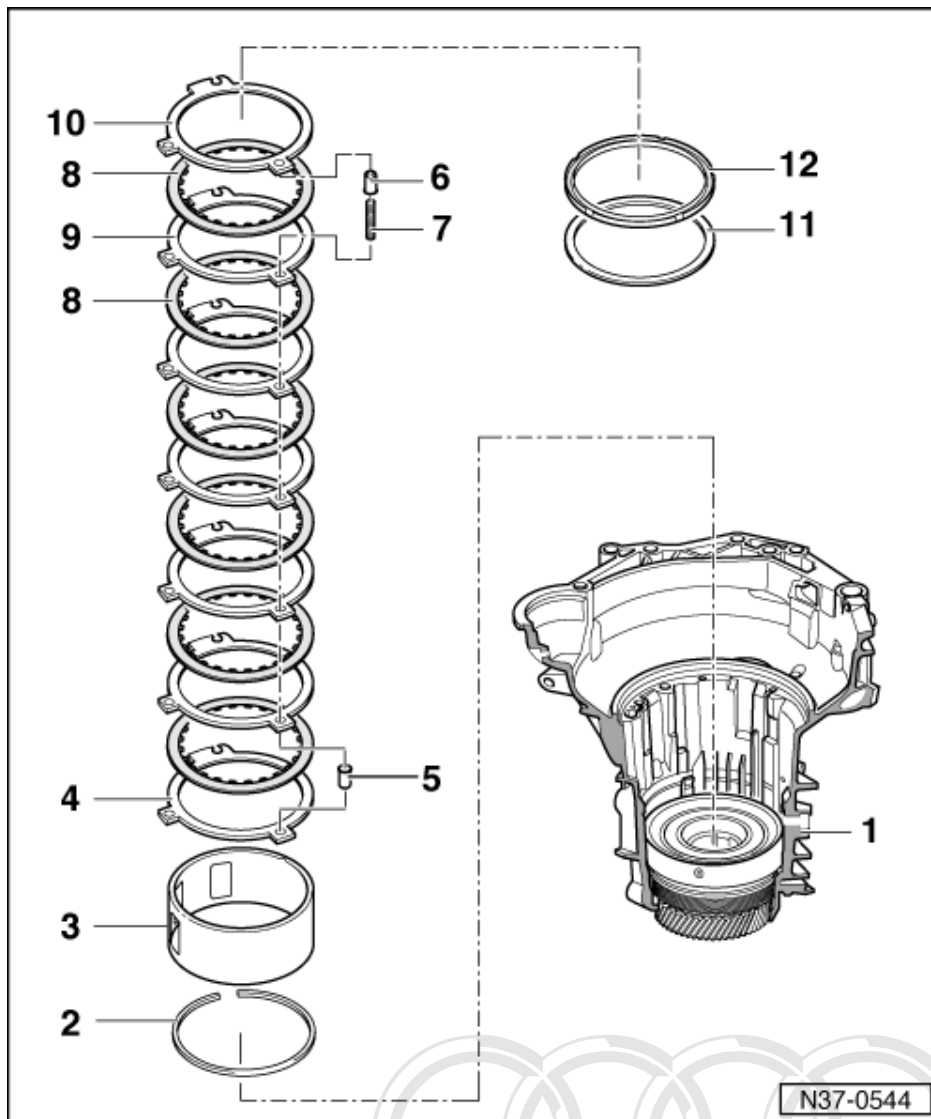
2 Circlip

- ♦ For supporting tube
- ♦ Installation position: Open ends face toward retaining wedge of free wheel

3 Supporting tube -B2-

- ♦ As a replacement part it is allocated according to gearbox code letters

- ♦ Insert so that notch locates on freewheel wedge



4 Outer plate -B2-

- ♦ 3 mm thick

5 Spring cap

- ♦ Install after installing first outer plate (Item 4)

6 Spring cap

- ♦ Do not install to adjust -B2-
- ♦ Install before installing last outer plate

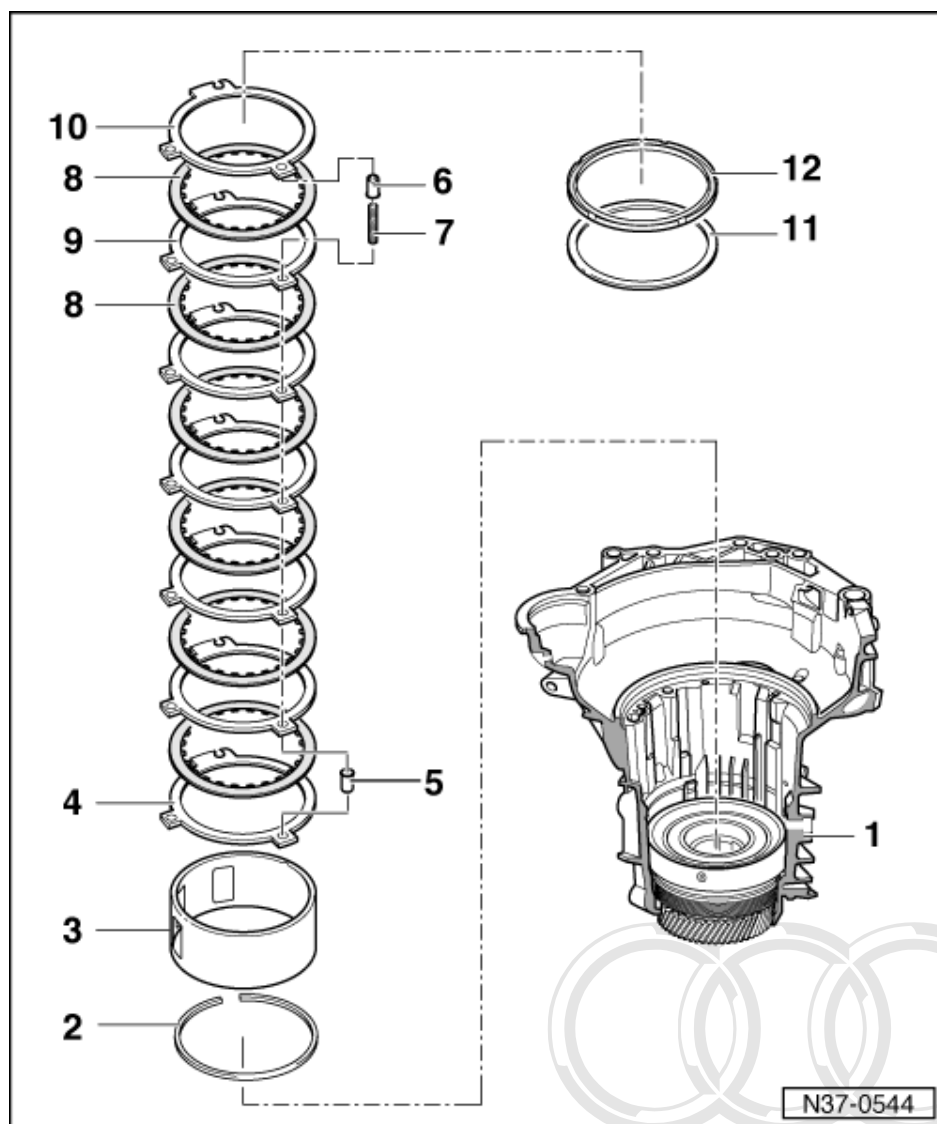
7 Spring

- ♦ As a replacement part it is allocated according to gearbox code letters

8 Inner plate -B2-

- ♦ =>from Page 2
- ♦ As a replacement part it is allocated according to gearbox code letters

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9 Outer plate -B2-

- ◆ Always install 2 mm thick outer plates
- ◆ => from Page 2

10 Outer plate -B2-

- ◆ 3 mm thick
- ◆ Do not install to adjust -B2-

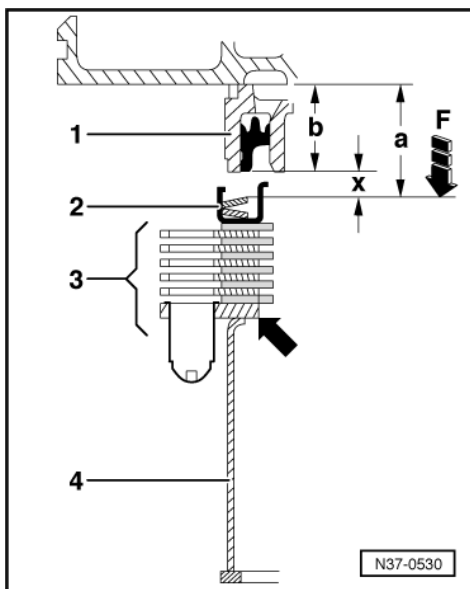
11 Shim

- ◆ Do not install to adjust -B2-

12 Retaining ring

- ◆ Inserted with smooth side facing last inner plate (Item 8) when adjusting -B2-

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-> Determining thickness of shim(s)

The thickness of the shim depends on the size of gap "x". Gap "x" is calculated using the following formula:

$$x = a - b - 2.65 \text{ mm}$$

x = Size of gap

a = Adjusting installation depth of 2nd and 4th gear brake-B2-; Calculating => Page 144

b = Size of ATF pump housing; Calculating =>Page 144

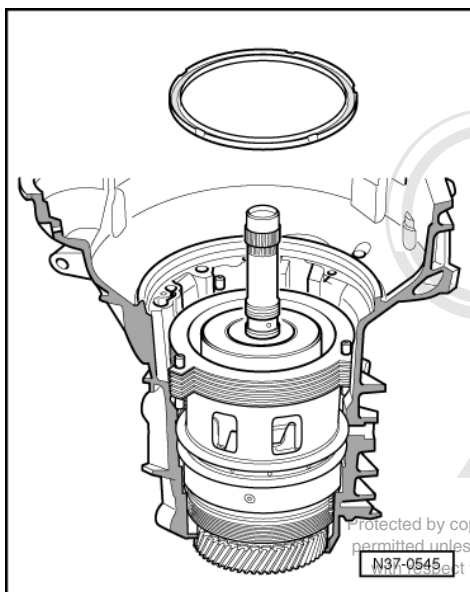
The illustration shows a cross section of the brake -B2- in assembled form. Special tool 3459 which exerts a force -F- on the pack of plates, is not illustrated.

2.65 mm - The amount for settling is taken into account by force -F-.

- 1 - ATF pump
- 2 - Retaining ring
- 3 - Plates for -B2- without last outer plate
- 4 - Supporting tube

Notes:

- ◆ First outer plate -arrow- is always 3 mm thick.
- ◆ Do not install last outer plate for measuring!



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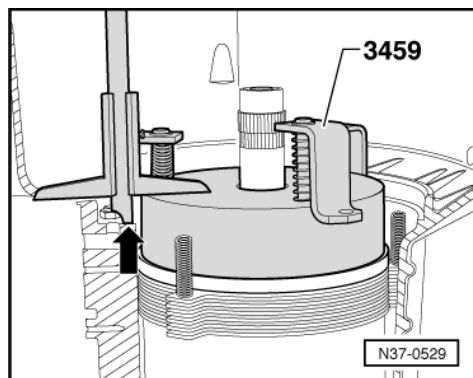
Determining dimension "a"

Assemble planetary gearbox up to the last inner plate of -B2- => Page 102. Do not fit last outer plate and shim.

- -> Place retaining ring with smooth side onto last inner plate.
- Place 3459 onto retaining ring and turn so that the 3 clips align with the 3 holes for the ATF pump.
- Bolt special tool to flange for ATF pump and tighten to 5 Nm.

Note:

The plate packet for -B2- is now pressed together for the measurements.



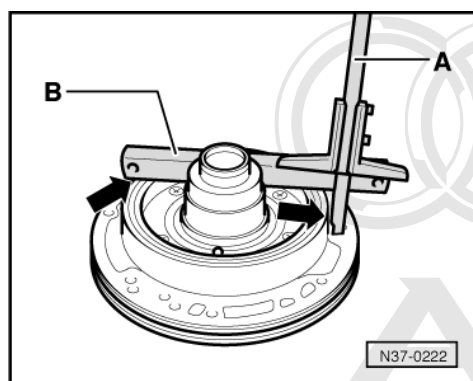
- -> Measure from pump flange/gearbox housing -arrow- to 3459 with depth gauge.

Dimension a = Height of 3459 in mm - Measured value

Example:

Height of 3459	60.0 mm
- Measured value	32.3 mm
= Calculated size "a"	27.3 mm

- Remove special tool 3459.
- Remove retaining ring.



Determining dimension "b"

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- Push piston into ATF pump up to stop.
- Place paper gasket onto ATF Pump.
- -> Place straightedge "B" onto stator support (arrow) and measure with depth gauge "A" to gasket of pump flange.

Example:

Measured value	39.8 mm
- Straightedge	19.5 mm
= Calculated distance "b"	20.3 mm

$$x = a - b - 2.65 \text{ mm}$$

$$= 27.3 - 20.3 - 2.65 \text{ mm} = 4.35 \text{ mm}$$

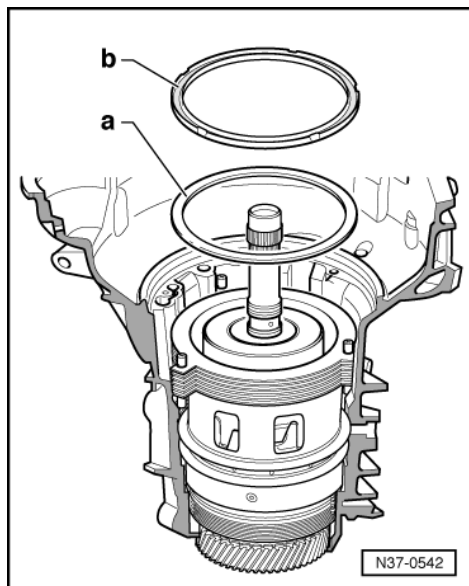
- Determine shim from table. Part numbers

=> Parts List

Table of "shims":

Gap "x" in mm	Shim(s) mm
3.25...3.50	1.0
3.51...3.75	1.25
3.76...4.00	1.50
4.01...4.25	1.75
4.26...4.50	1.00 + 1.00
4.51...4.75	1.00 + 1.25
4.76...5.00	1.25 + 1.25
5.01...5.25	1.25 + 1.50
5.26...5.50	1.50 + 1.50
5.51...5.75	1.50 + 1.75
5.76...6.00	1.75 + 1.75

- Fit three spring caps onto the compression springs.
- Insert last outer plate -3 mm thick-

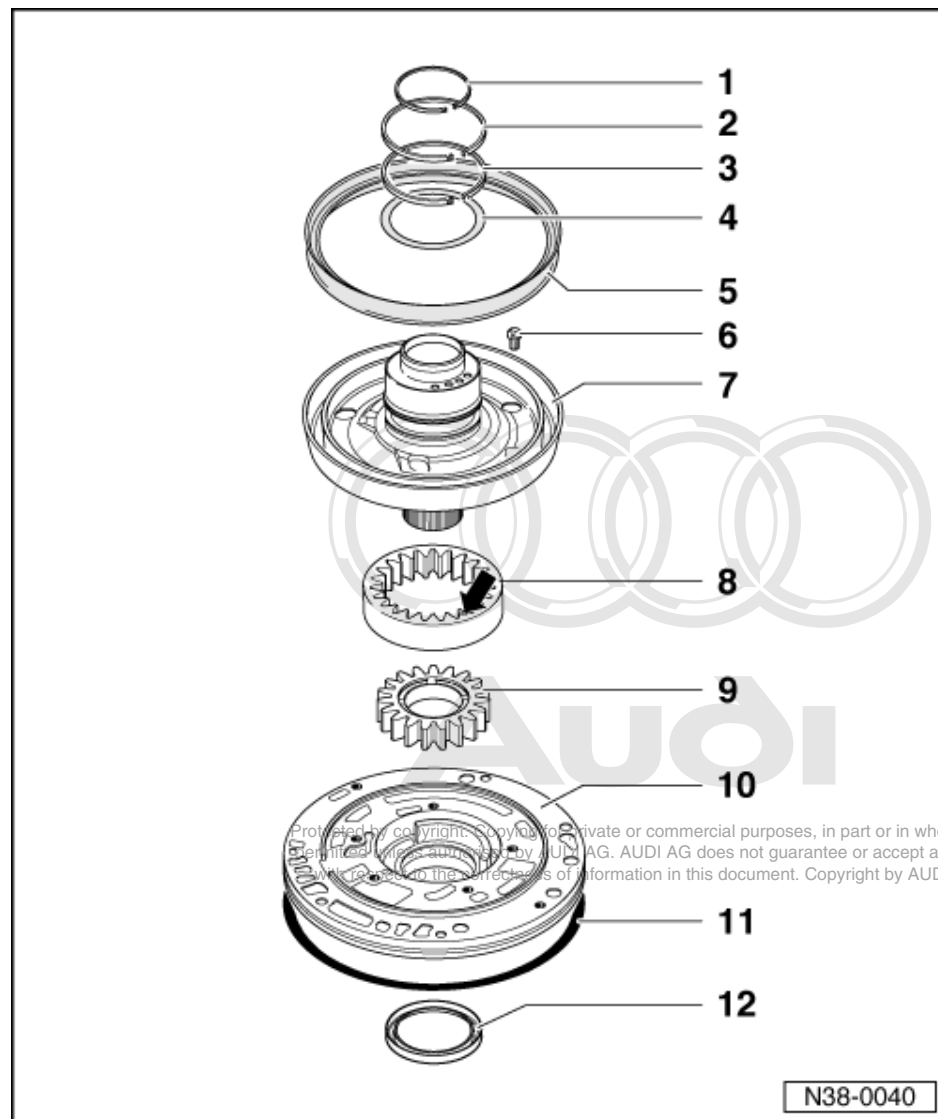


- -> Install determined shim(s) -a-.
- Place retaining ring -b- onto shim(s). Smooth side facing shim.
- Continued assembly => Page 111

38 - Gears, Hydraulic controls

1 - Dismantling and assembling ATF pump

1.1 - Dismantling and assembling ATF pump

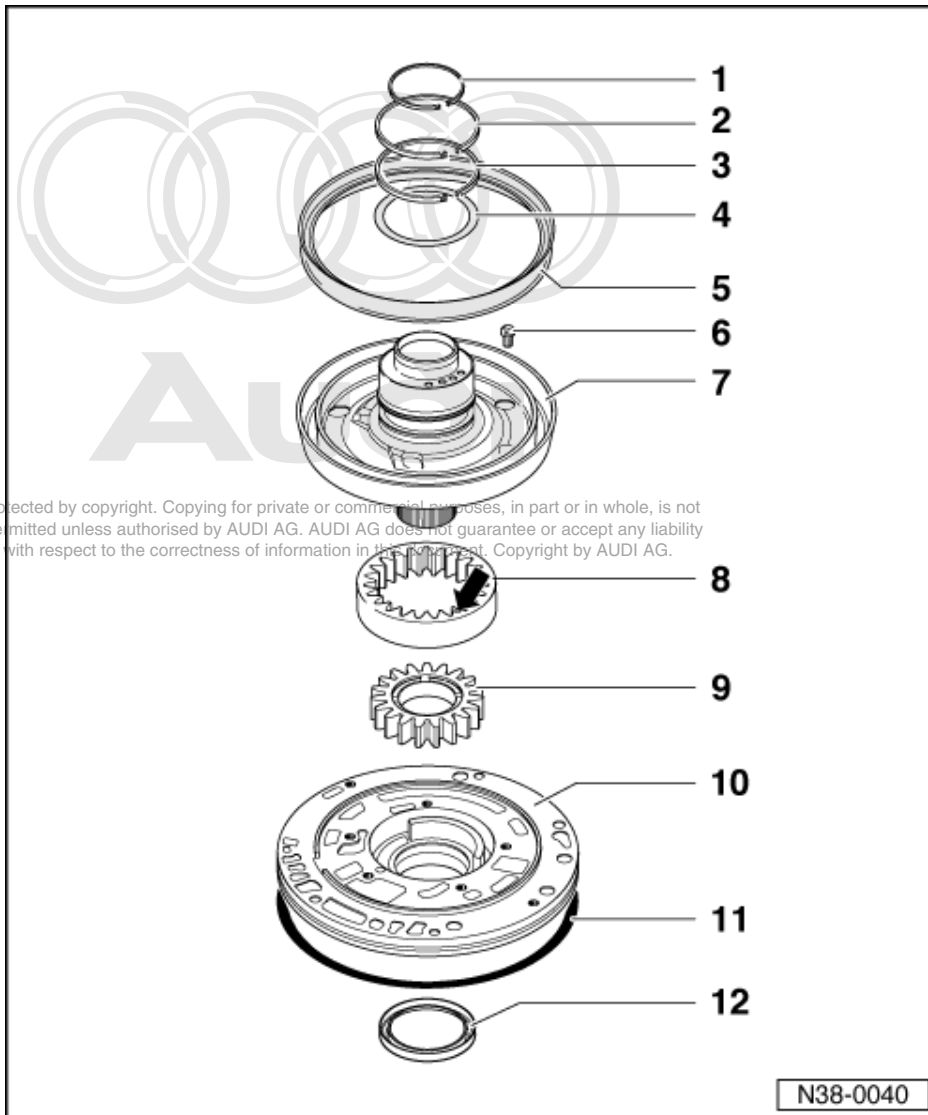


Note:

Replacement ATF pump parts and the ATF pump are allocated according to gearbox code.

- 1 **Piston ring**
 - ♦ Check correct seating => Fig. 149
 - ♦ Removing and installing => Fig. 149
- 2 **Piston ring**
 - ♦ Check correct seating=> Fig. 149
 - ♦ Removing and installing => Fig. 149
- 3 **Piston ring**
 - ♦ Check correct seating=> Fig. 149

- ♦ Removing and installing => Fig. 149



4 Thrust washer

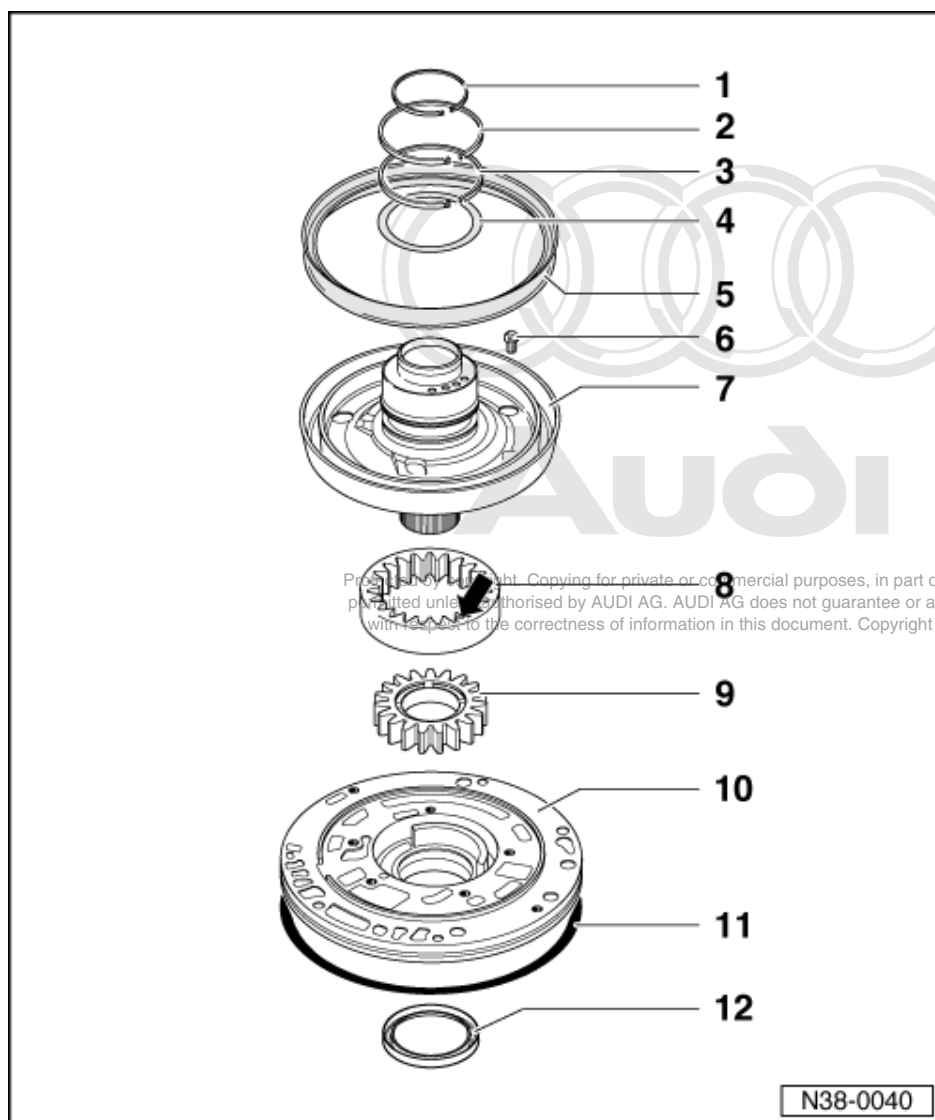
5 Piston

- ♦ Sealing lips are vulcanised to piston
- ♦ To remove piston use screwdriver to lever out of stator support at several points
- ♦ Moisten sealing lips with ATF before installing
- ♦ Installation position: Sealing lip faces toward stator support
- ♦ Turn piston slightly when installing

6 Bolt - 10 Nm

- ♦ Then turn 45° further

7 Stator support



8 Outer gear

- ◆ Installation position: Manufacturer's mark -arrow- faces stator support
- ◆ If outer gear is incorrectly installed, the ATF pump may not operate freely in the installed position

9 Inner gear

- ◆ Installation position: Larger shoulder faces towards stator support

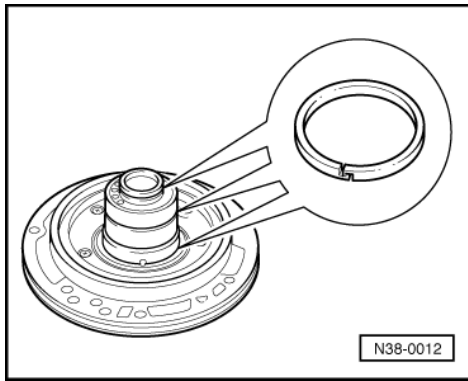
10 Housing for ATF pump

11 O-ring

- ◆ Replace

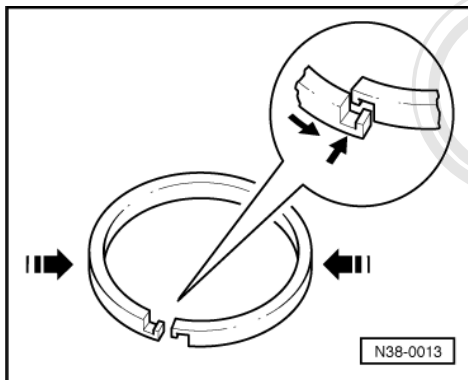
12 Torque converter oil seal

- ◆ Removing and installing=>Page 21



-> Fig.1 Checking seating of piston rings

- Ensure that the ends of the piston rings are hooked together.



-> Fig.2 Removing and installing piston ring

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Removing

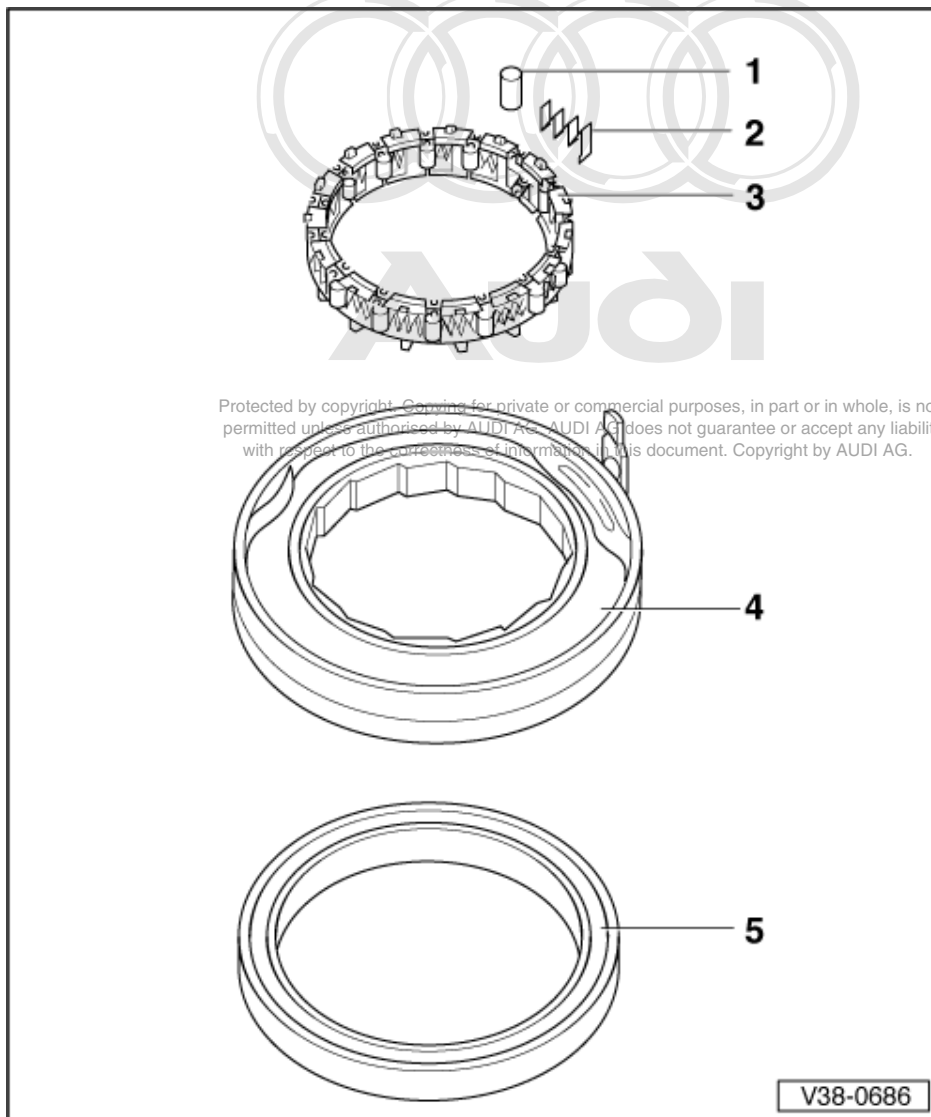
- Press ends of piston ring together and release by hand.
- Press two ends of piston ring apart and remove; do not twist piston ring out of groove on one side.

Installing

- Place piston ring in groove.
- To hook ends together press sides of ring in and guide ends over one another.

2 - Dismantling and assembling freewheel with -B1- piston

2.1 - Dismantling and assembling freewheel with -B1- piston



1 Rollers

- ♦ Installing=> Fig. 151

2 Springs

- ♦ Installing=> Fig. 151

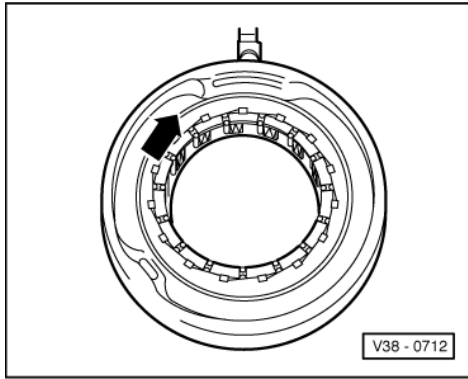
3 Cage

- ♦ Removing and installing=> Fig. 151
- ♦ Installation position=> Fig. 152

4 Outer ring

5 Piston

- ♦ Sealing lips are vulcanised to piston
- ♦ To remove use screwdriver to lever out of outer ring at several points
- ♦ Moisten sealing lips with ATF before installing
- ♦ Installation position=> Fig. 152



-> Fig.1 Removing and installing cage

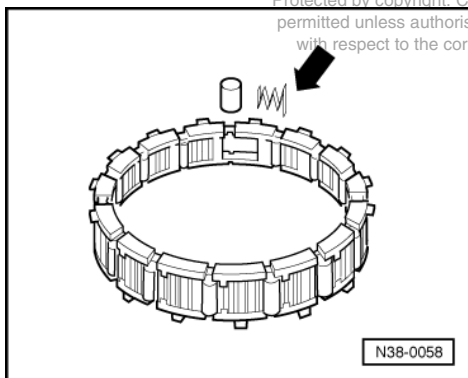
Removing

- Turn cage to the left as far as the stop.
- Remove cage by pressing it up and out of outer ring.

Installing

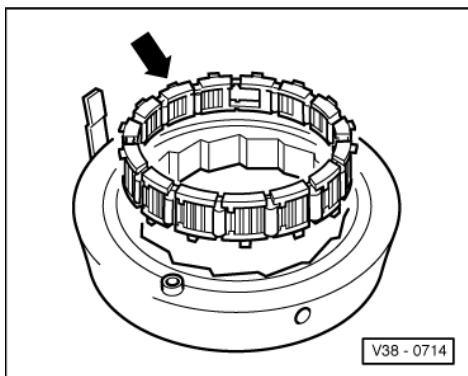
- Insert cage into outer ring.
- Installation position => Fig. 152
- To secure cage turn it to the right as far as the stop -arrow-.

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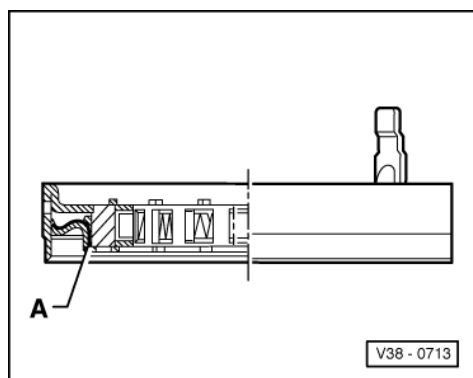
-> Fig.2 Installing rollers and springs

- Insert springs so that the long spring end -arrow- engages in the cage.
- Then insert roller between cage and spring.



-> Fig.3 Installation position of cage in outer ring

- Install with larger lugs -arrow- facing up.

**-> Fig.4 Installation position of piston**

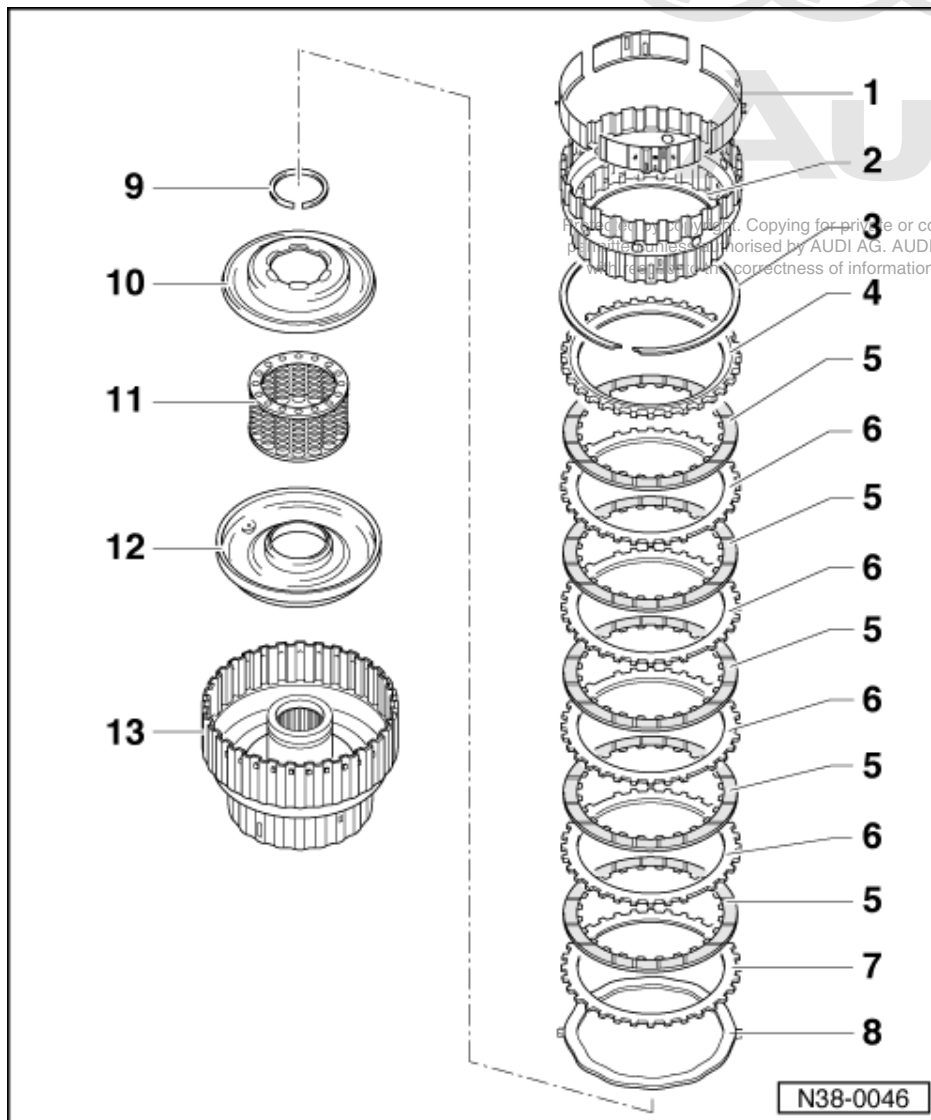
- Insert piston -A- as shown.



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3 - Dismantling and assembling 1st to 3rd gear clutch -K1-

3.1 - Dismantling and assembling 1st to 3rd gear clutch -K1-



Note:

Only when cleaning or carrying out visual check the clutch must be dismantled.

1 Supporting ring

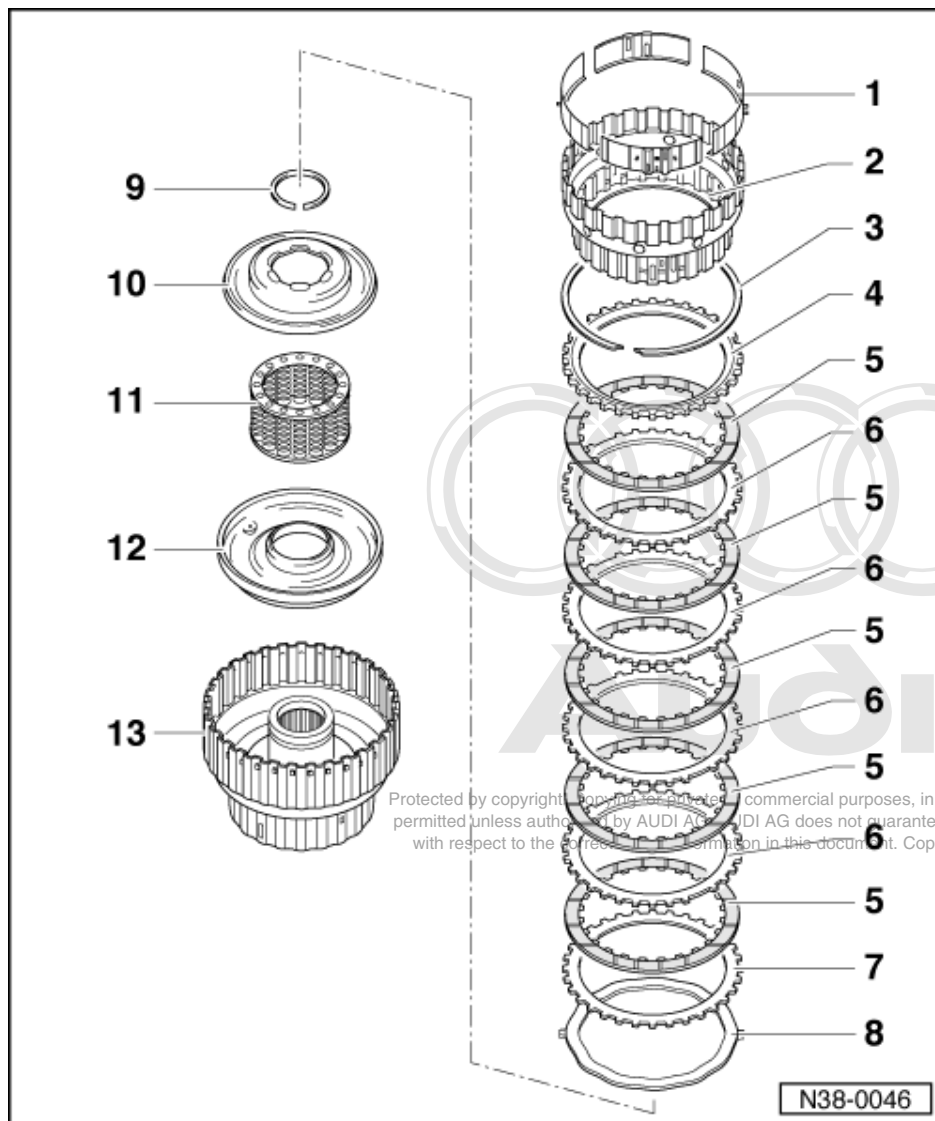
- ◆ Unclip in 4 pieces from inner plate carrier
- ◆ Inserting => Fig. 158

2 Inner plate carrier

- ◆ Inserting => Fig. 159
- ◆ Assembling => Fig. 158

3 Circlip

- ◆ Different thickness
- ◆ Do not mix up circlips for different clutches
- ◆ Mark after removing and insert at same point



4 Thrust plate

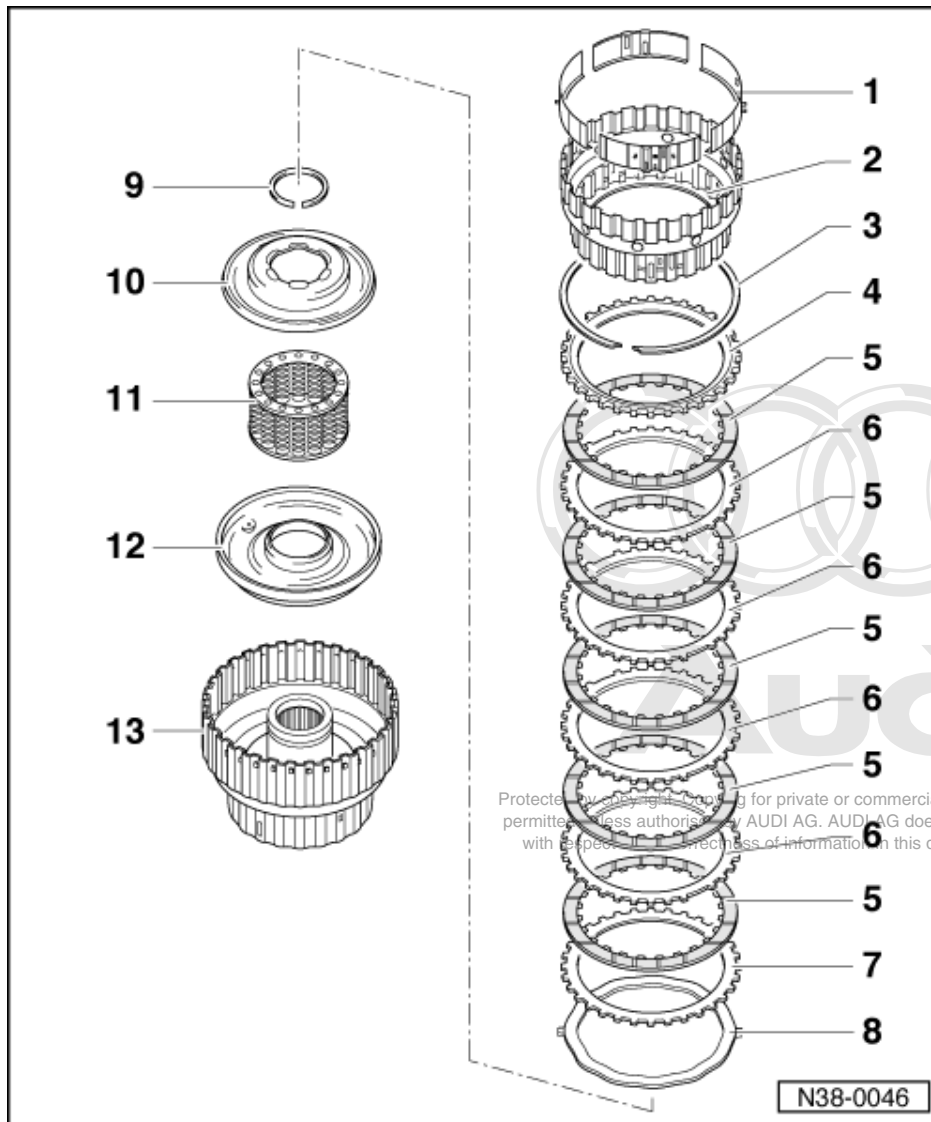
- ◆ Installation position: Smooth side faces inner plate
- ◆ Insert together with inner plate carrier => Fig. 158

5 Inner plate

- ◆ =>from Page 2
- ◆ Installing => Fig. 158
- ◆ Soak inner plates in ATF for 15 minutes before installing

6 Outer plate

- ◆ 1.5 mm thick
- ◆ =>from Page 2
- ◆ Installing => Fig. 158



7 Outer plate

- ◆ 2.0 mm thick
- ◆ Installing => Fig. 158

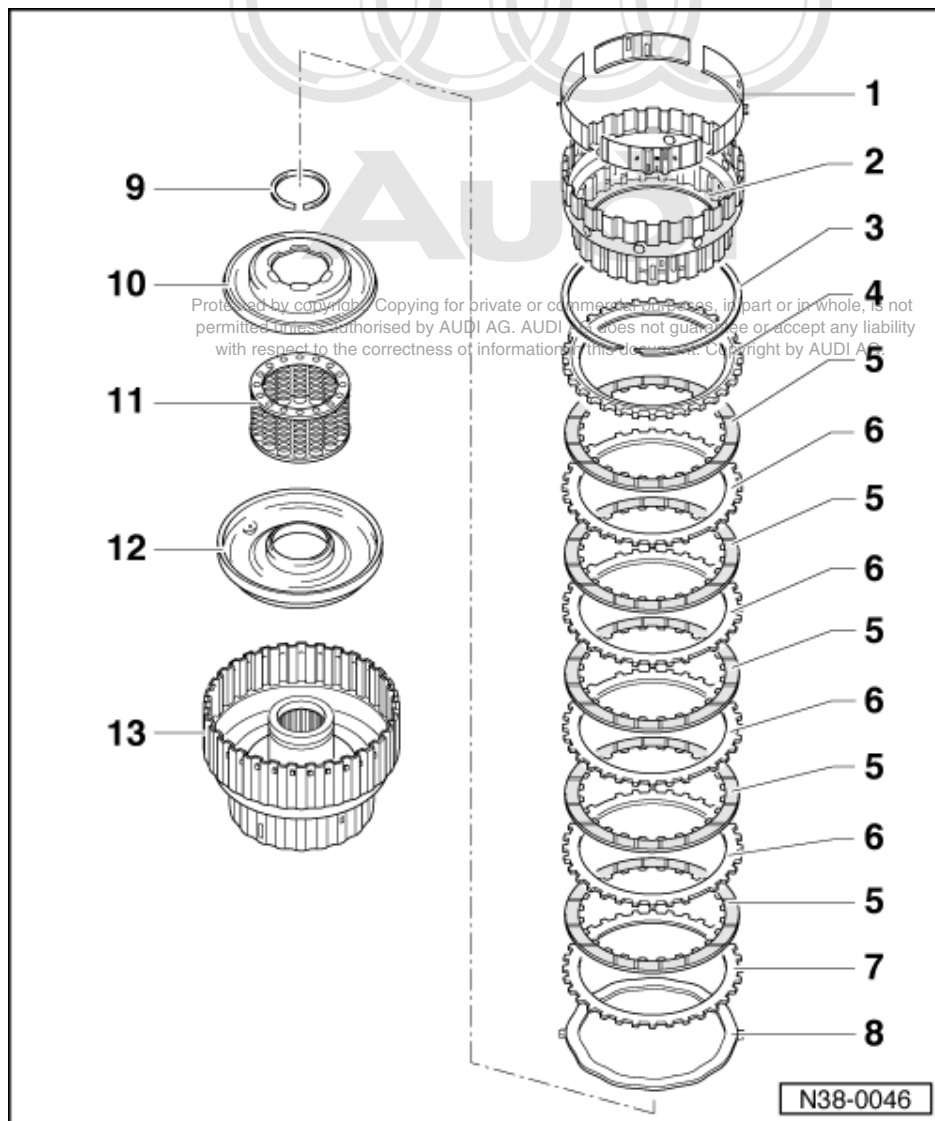
8 Corrugated washer

9 Circlip

- ◆ Removing and installing => Fig. 158
- ◆ Do not mix up circlips for different clutches
- ◆ Mark after removing and insert at same point

10 Piston cap

- ◆ Sealing lips are vulcanised to cap
- ◆ Moisten sealing lips with ATF before installing
- ◆ Turn cap slightly when installing



11 Intermediate spring ring

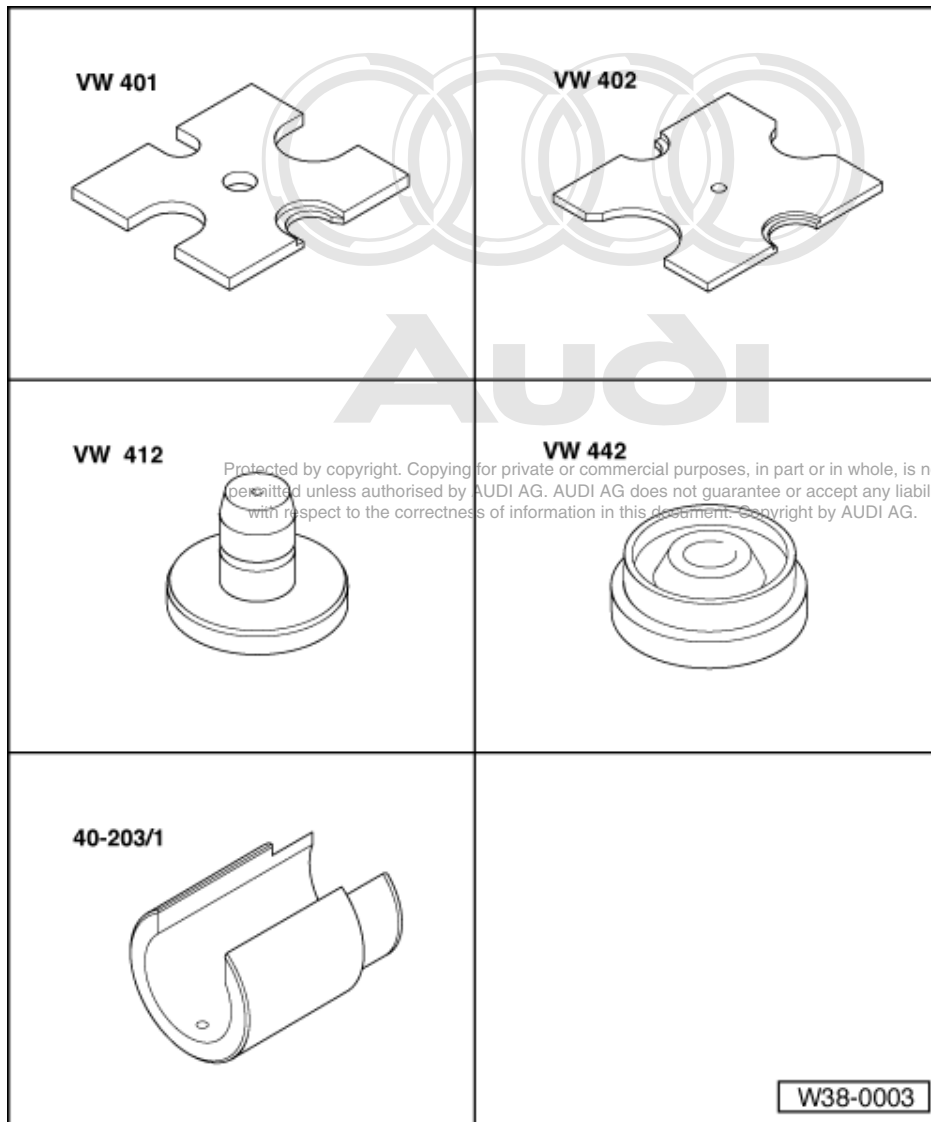
- ◆ With spring supporting shell and compression springs

12 Piston

- ◆ To remove piston use screwdriver to lever out of clutch housing at several points
- ◆ Sealing lips are vulcanised to piston
- ◆ Moisten sealing lips with ATF before installing
- ◆ Turn piston slightly when installing

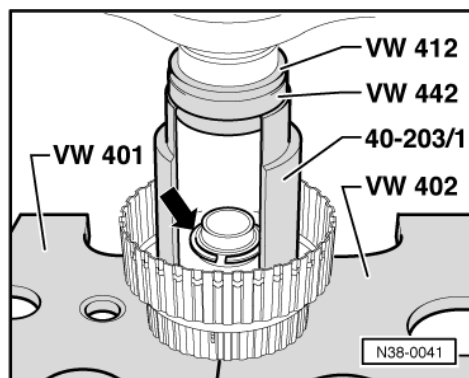
13 Clutch housing

- ◆ Before fitting inner plate carrier, insert corrugated washer (Item 158



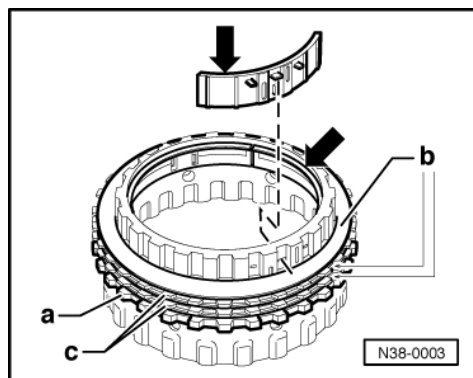
Special tools and workshop equipment required

- ◆ Thrust plate VW 401
- ◆ Thrust plate VW 402
- ◆ Press tool VW 412
- ◆ Thrust piece VW 442
- ◆ Pipe piece 40-203/1



-> Fig.1 Removing and installing circlip

- Press piston cap with intermediate spring ring down far enough for the circlip -arrow- to be inserted in the groove.



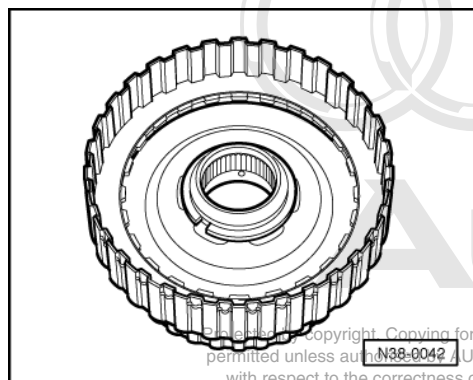
-> Fig.2 Position thrust plate and plates onto inner plate carrier

- Install thrust plate -a- with smooth side facing inner plate and stepped side towards inner plate carrier.
- Install 3 inner plates -b- and 2 outer plates -c- (1.5 mm).
- Clip in supporting ring with step facing upwards (arrows).

Note:

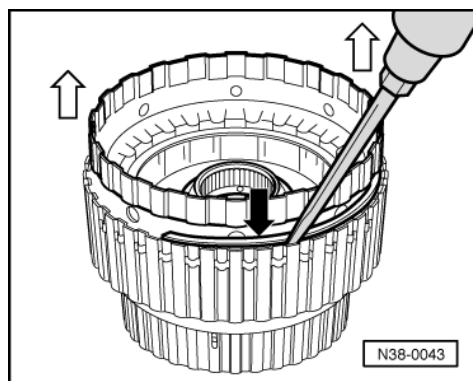
Locate locating lugs correctly.

- Install corrugated washer and remaining plates in clutch housing => Fig. 158



-> Fig.3 Inserting corrugated washer and outer and inner plates into clutch housing

- First insert corrugated spring washer.
- Insert 2 mm thick outer plate.
- Insert remaining inner and outer plates.

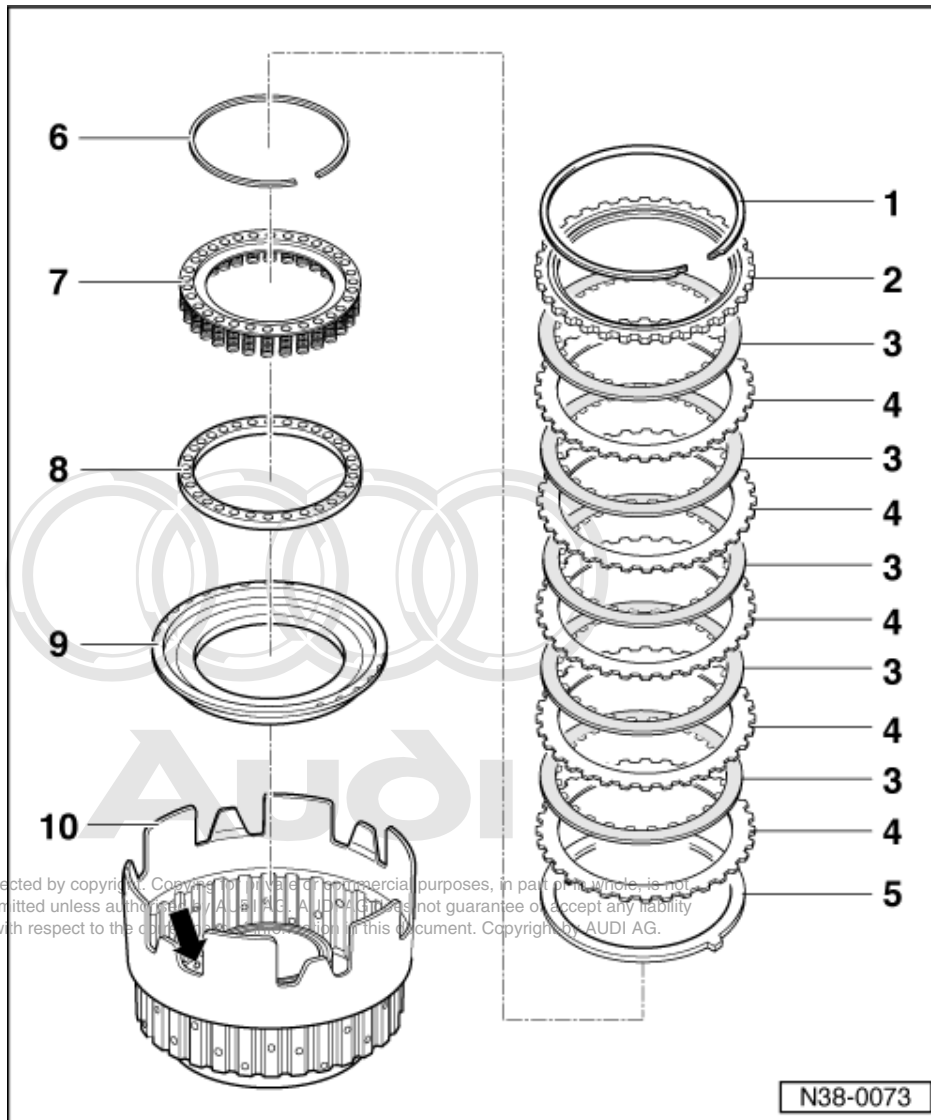


➔ Fig.4 Inserting inner plate carrier and install circlip

- Lift inner plate carrier slightly -white arrows- to install circlip -black arrow-.

4 - Dismantling and assembling reverse gear clutch -K2-

4.1 - Dismantling and assembling reverse gear clutch -K2-



Notes:

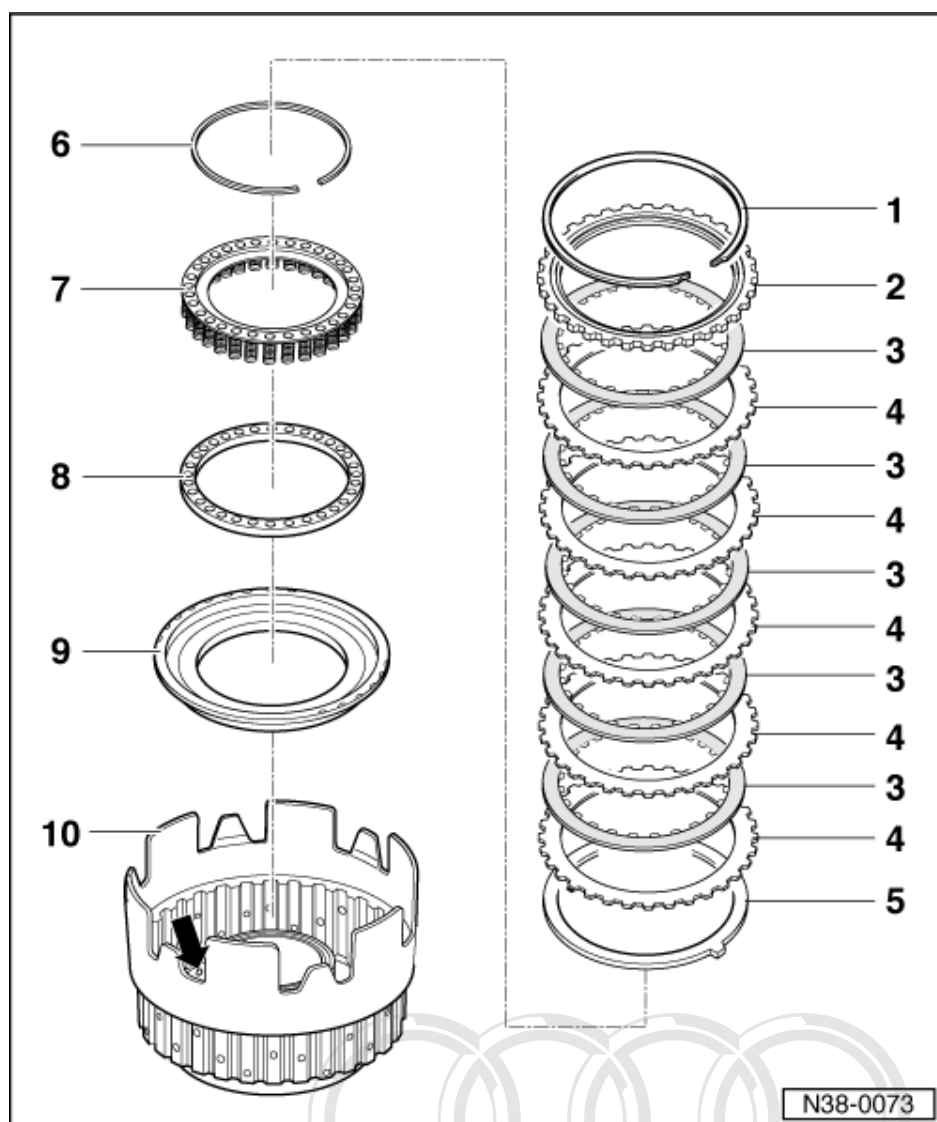
- ◆ Only when cleaning or carrying out visual check the clutch must be dismantled.
- ◆ Be careful not to damage the ball valve --arrow- when repairing the clutch.

1 Circlip

- ◆ Different thickness
- ◆ Do not mix up circlips for different clutches
- ◆ Mark after removing and insert at same point

2 Thrust plate

- ♦ Installation position: Smooth side faces toward plates



3 Inner plate

- ♦ =>from Page 2
- ♦ Soak new inner plates in ATF for 15 minutes before installing

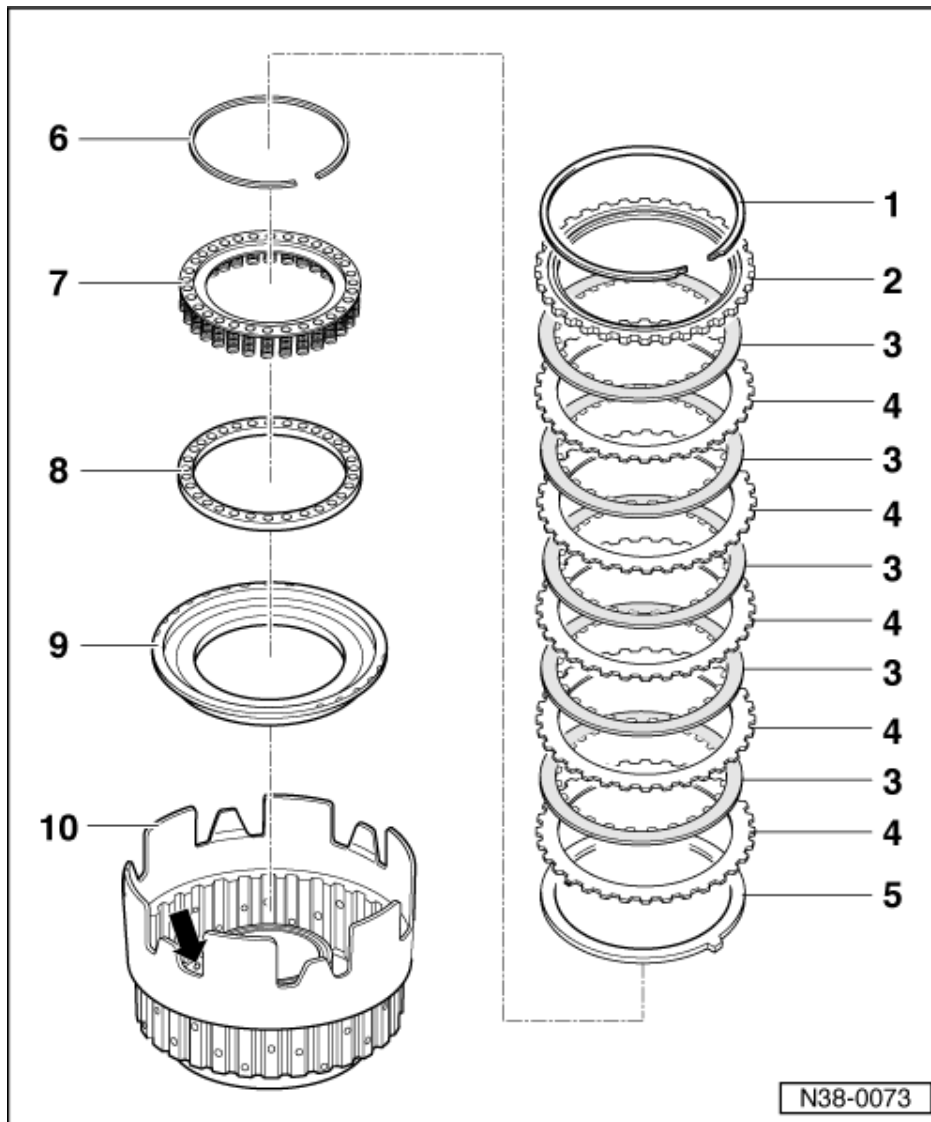
4 Outer plate

- ♦ =>from Page 2

5 Corrugated washer

6 Circlip

- ♦ Removing and installing => Fig. 163
- ♦ Installation position => Fig. 163
- ♦ Different thickness
- ♦ Do not mix up circlips for different clutches
- ♦ Mark after removing and insert at same point



7 Spring supporting plate

- ◆ With springs
- ◆ Installation position => Fig. 163
- ◆ Before installing fit together with spring supporting ring. Ensure that springs are seated correctly

8 Spring supporting ring

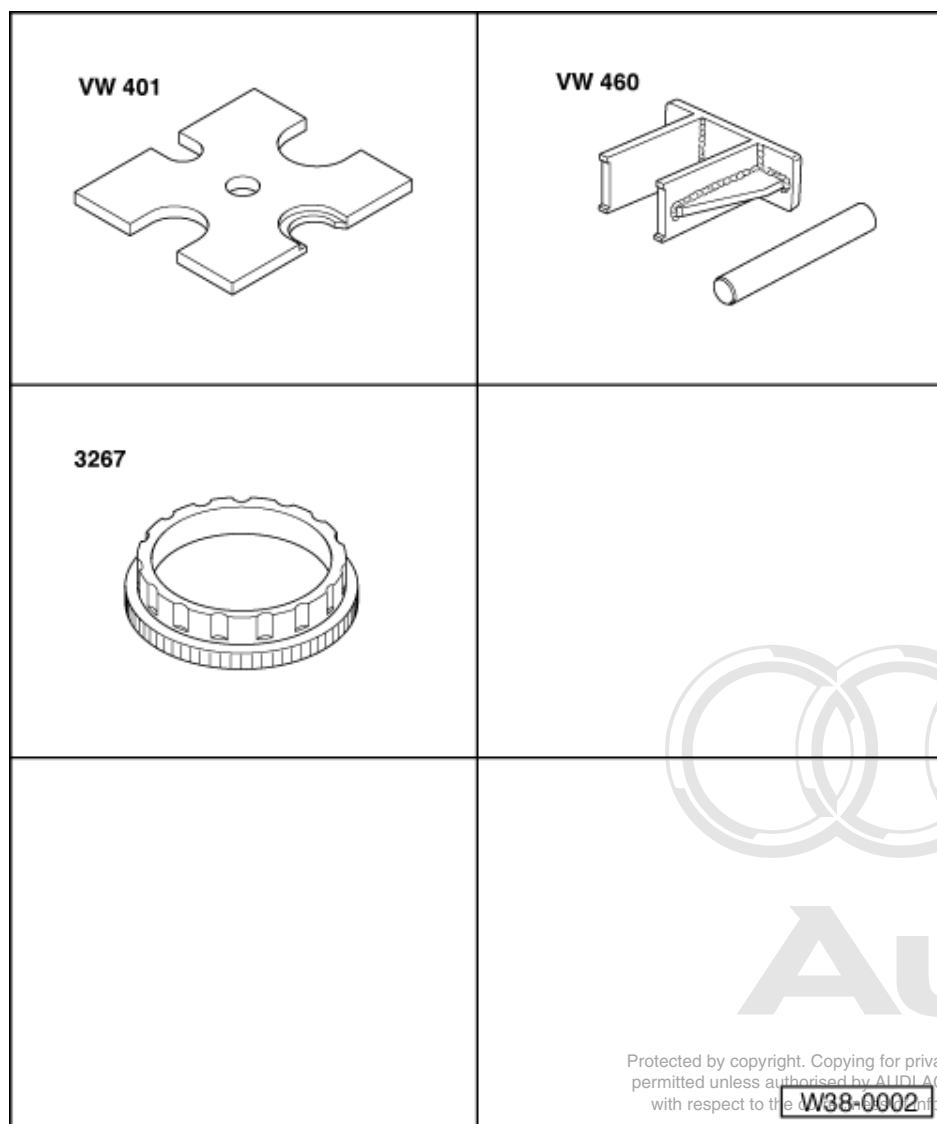
9 Piston

- ◆ To remove piston use screwdriver to lever out of clutch housing at several points
- ◆ Sealing lips are vulcanised to piston
- ◆ Moisten sealing lips with ATF before installing
- ◆ Turn piston slightly and keep straight when installing

10 Clutch housing

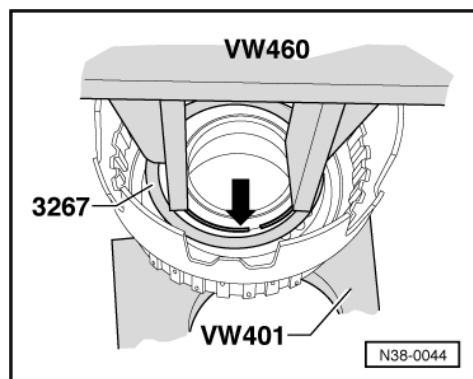
- ◆ With ball valve -arrow-

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Special tools and workshop equipment required

- ♦ Thrust plate VW 401
- ♦ Removal device VW 460
- ♦ Assembly ring 3267

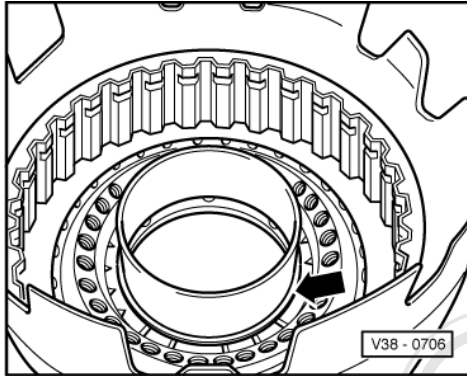


-> Fig.1 Removing and installing circlip

- Press spring supporting plate down with 3267 just sufficient to be able to remove and install the circlip-arrow-.

Note:

Do not damage clutch housing ball valve.



-> Fig.2 Checking installation position spring supporting plate, bracket

Circlip -arrow- must be seated in the groove of clutch housing. Spring supporting plate must be centred relative to hub.

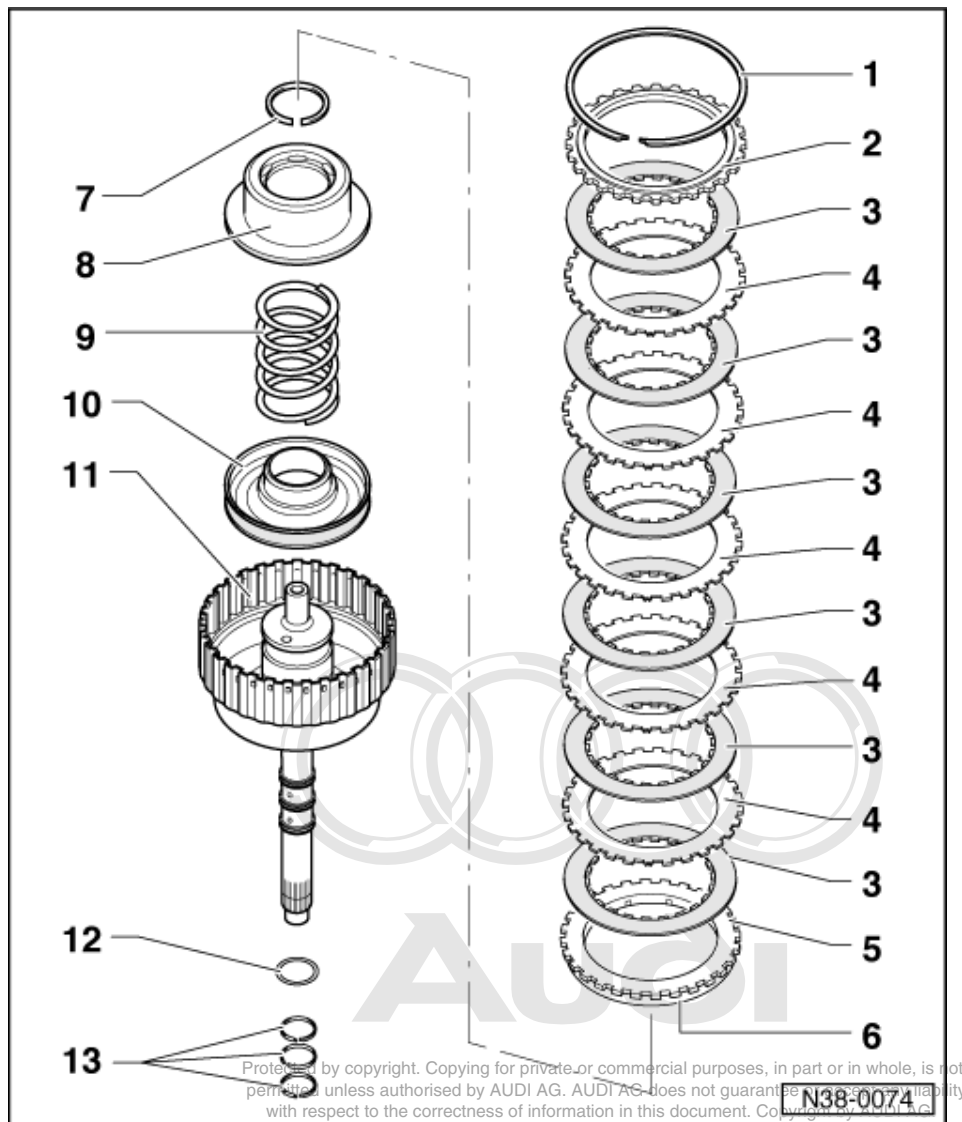
Note:

Do not confuse the groove in the clutch housing with the shoulder on the shaft.

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5 - Dismantling and assembling 3rd and 4th gear clutch -K3- with turbine shaft

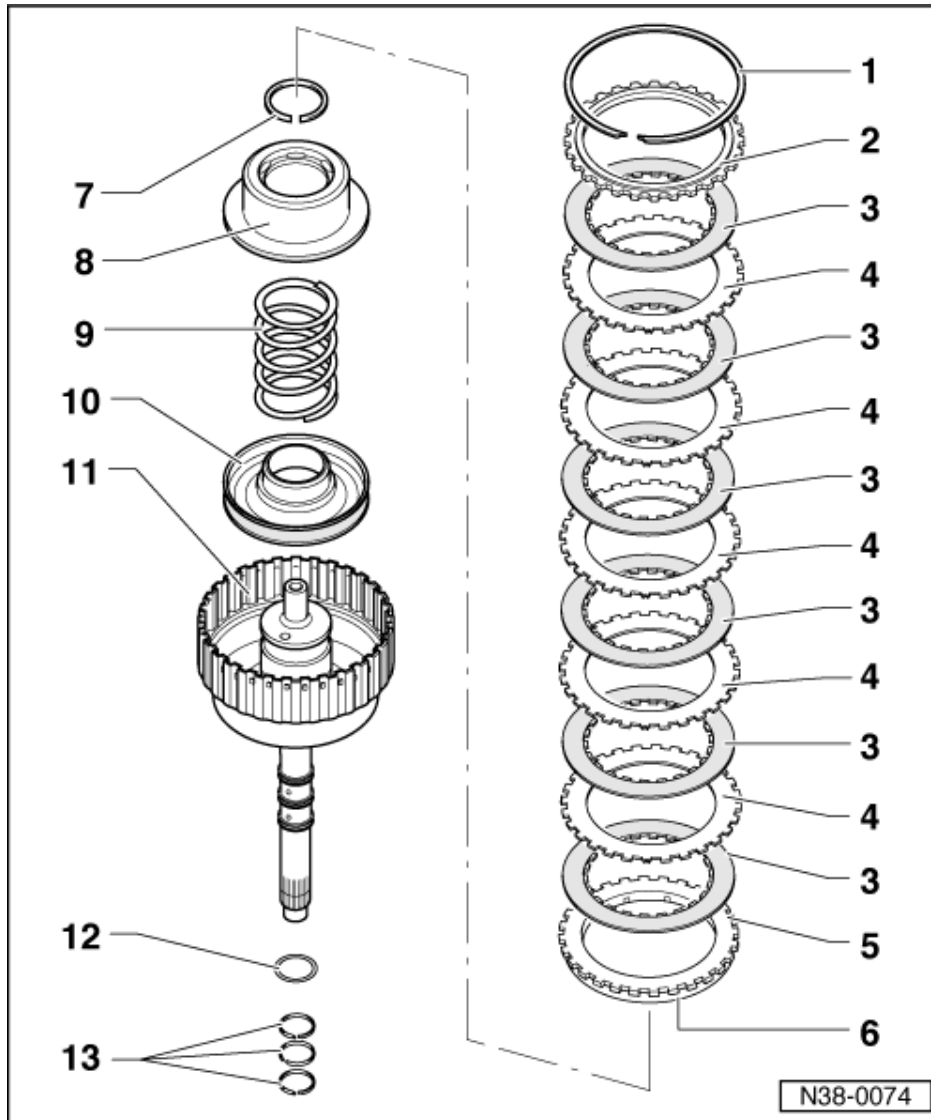
5.1 - Dismantling and assembling 3rd and 4th gear clutch -K3- with turbine shaft



Note:

The clutch must only be dismantled when cleaning or carrying out visual check.

- 1 Circlip
 - ♦ Different thickness
 - ♦ Do not mix up circlips for different clutches
 - ♦ Mark after removing and insert at same point
- 2 Thrust plate
 - ♦ Installation position: Smooth side faces toward plates
- 3 Inner plate
 - ♦ =>from Page 2
 - ♦ Soak new inner plates in ATF for 15 minutes before installing



4 Outer plate

- ♦ =>from Page 2

5 Pressure plate

- ♦ Peened to corrugated washer(Item 6)
- ♦ Installation position: Peened corrugated washer facing piston

6 Corrugated washer

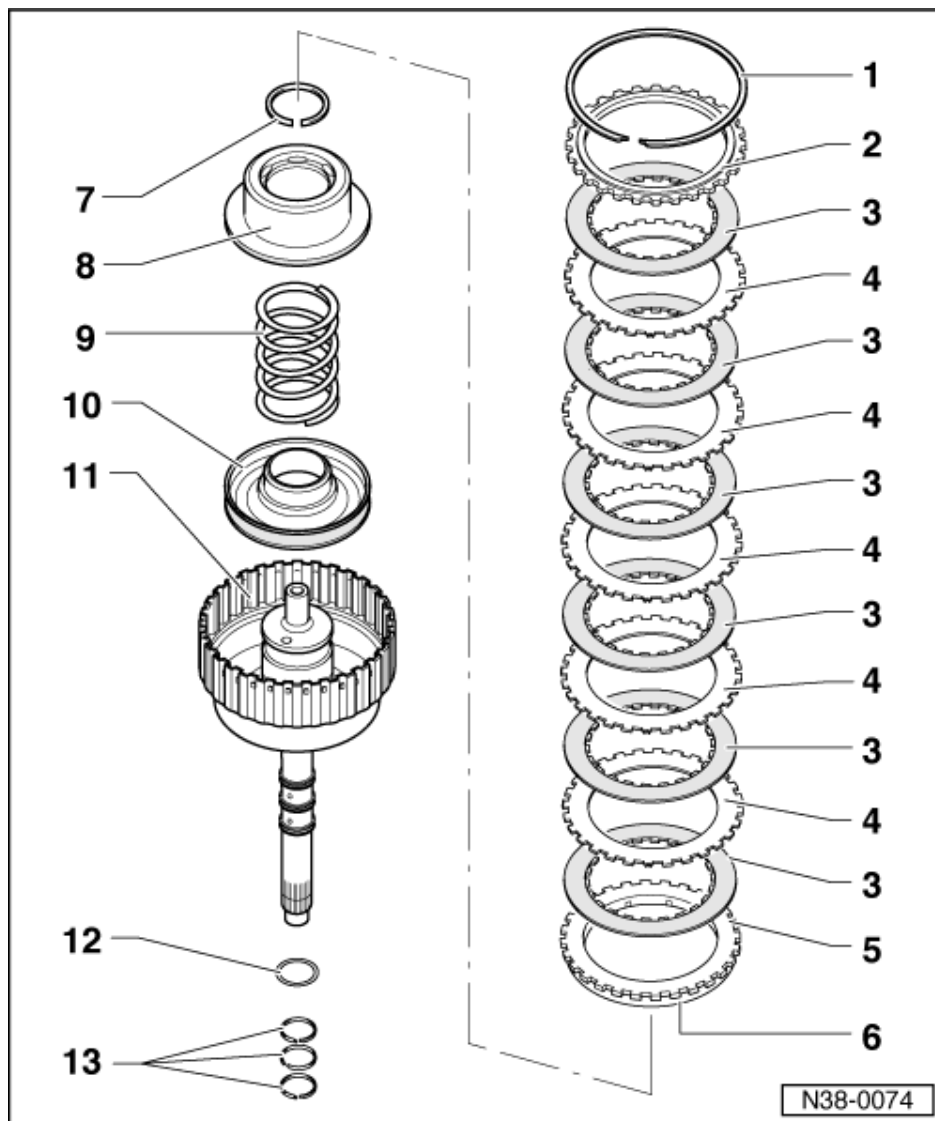
- ♦ Peened to pressure plate (Item 5)

7 Circlip

- ♦ Removing and installing=> Fig. 169
- ♦ Different thickness
- ♦ Do not mix up circlips for different clutches
- ♦ Mark after removing and insert at same point

Audi

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8 Piston cap

- ◆ Is under strong spring pressure
- ◆ Sealing lips are vulcanised to piston cap
- ◆ Moisten sealing lips with ATF before installing
- ◆ When removing and installing press down and fit circlip (Item 7)
- ◆ Removing and installing=> Fig. 169

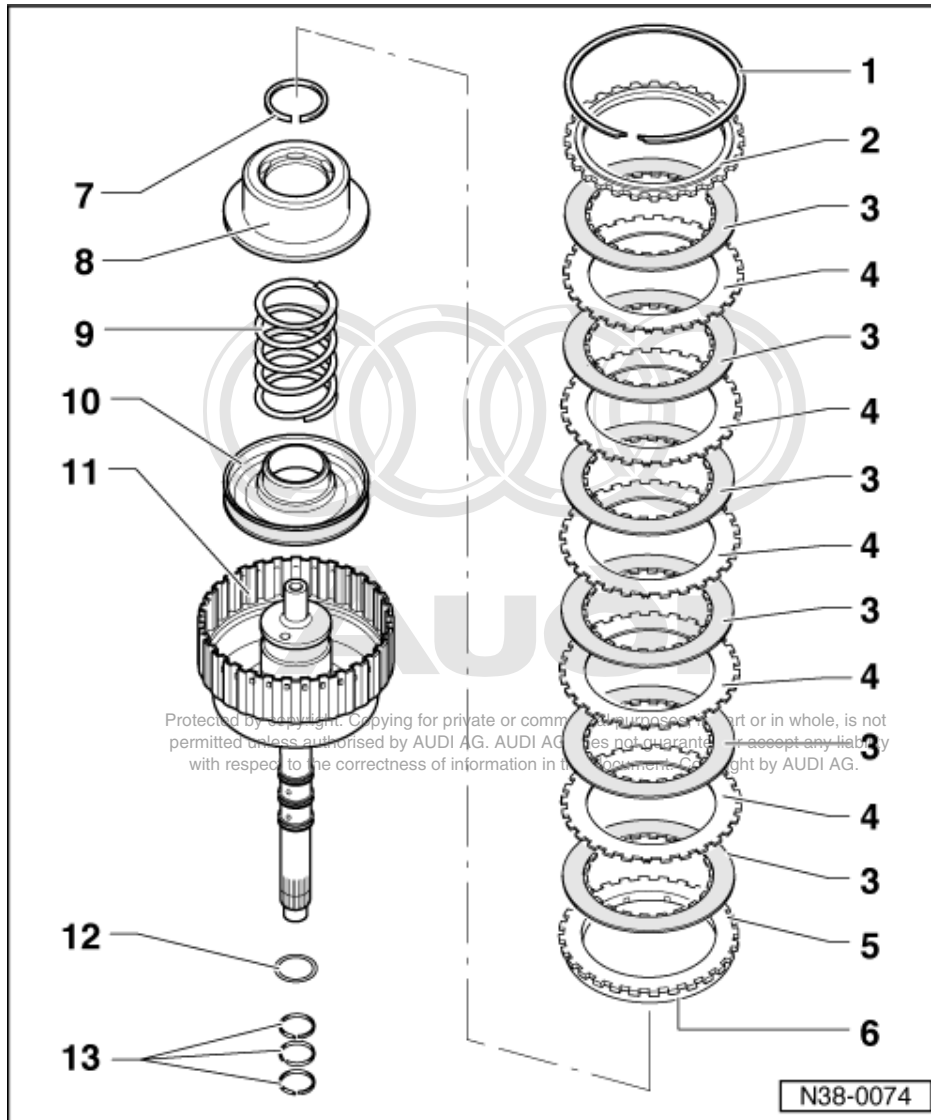
9 Spring

- ◆ Seat between piston and piston cap

10 Piston

- ◆ Sealing lips are vulcanised to piston
- ◆ Moisten sealing lips with ATF before installing
- ◆ Turn piston slightly when installing

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11 Clutch housing with turbine shaft

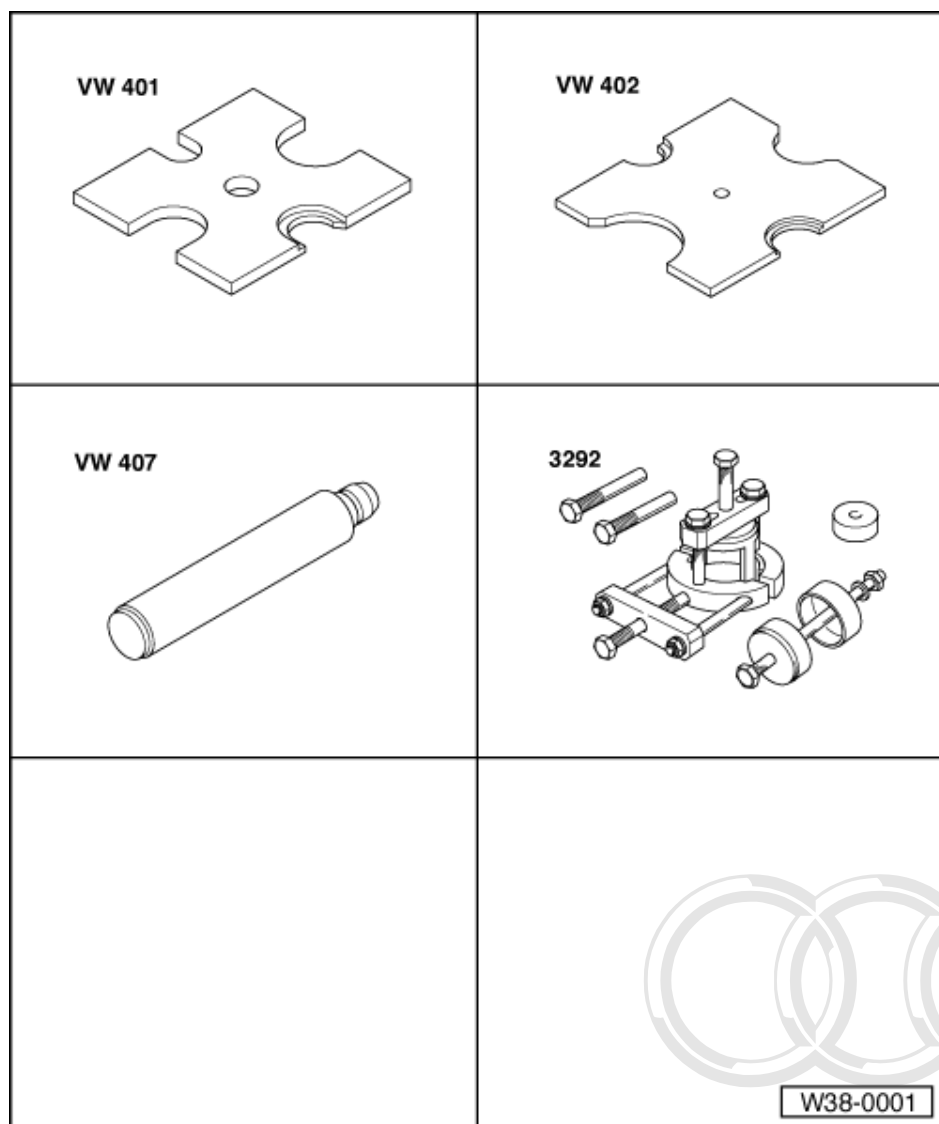
- ♦ Height varies according to number of inner and outer plates
- ♦ Different versions according to gearbox code letters

12 O-ring

- ♦ Replace
- ♦ Installing => Fig. 170

13 Piston ring

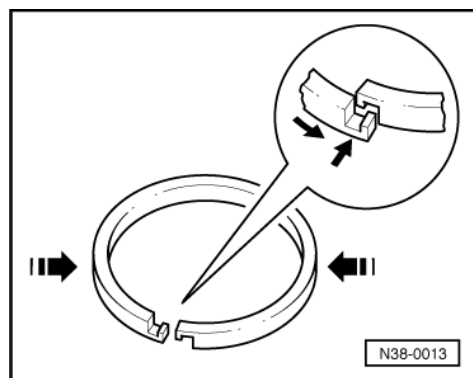
- ♦ Removing and installing=> Fig. 169
- ♦ Check correct seating=> Fig. 169



Special tools and workshop equipment required

- ◆ Thrust plate VW 401
- ◆ Thrust plate VW 402
- ◆ Press tool VW 407
- ◆ 3292/1 From assembly tool 3292

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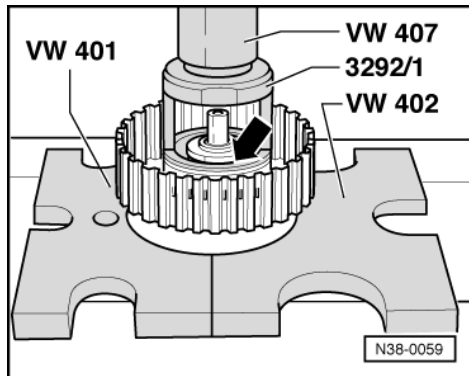
-> Fig.1 Removing and installing piston ring

Removing

- Press ends of piston ring together and release by hand.
- Press two ends of piston ring apart and remove; do not twist piston ring out of groove on one side.

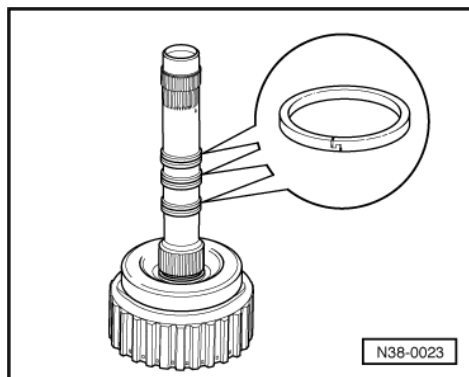
Installing

- Place piston ring in groove.
- To hook ends together press sides of ring in and guide ends over one another.



-> Fig.2 Removing and installing circlip

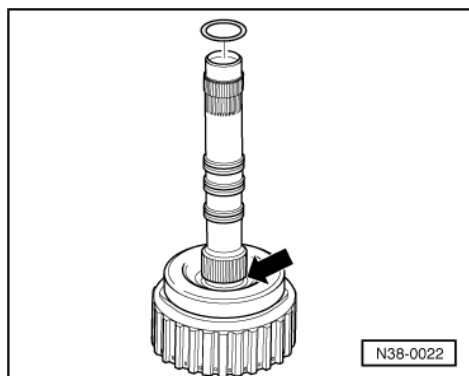
- Press piston cap down carefully until the circlip -arrow- can be removed or installed.
- Mark circlip after removing and reinstall in same position.



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-> Fig.3 Checking seating of piston rings

- Ensure that the ends of the piston rings are hooked together.





-> Fig.4 Installing O-ring

- Insert O-ring in the groove of the turbine shaft -arrow-.

6 - Removing and installing valve body

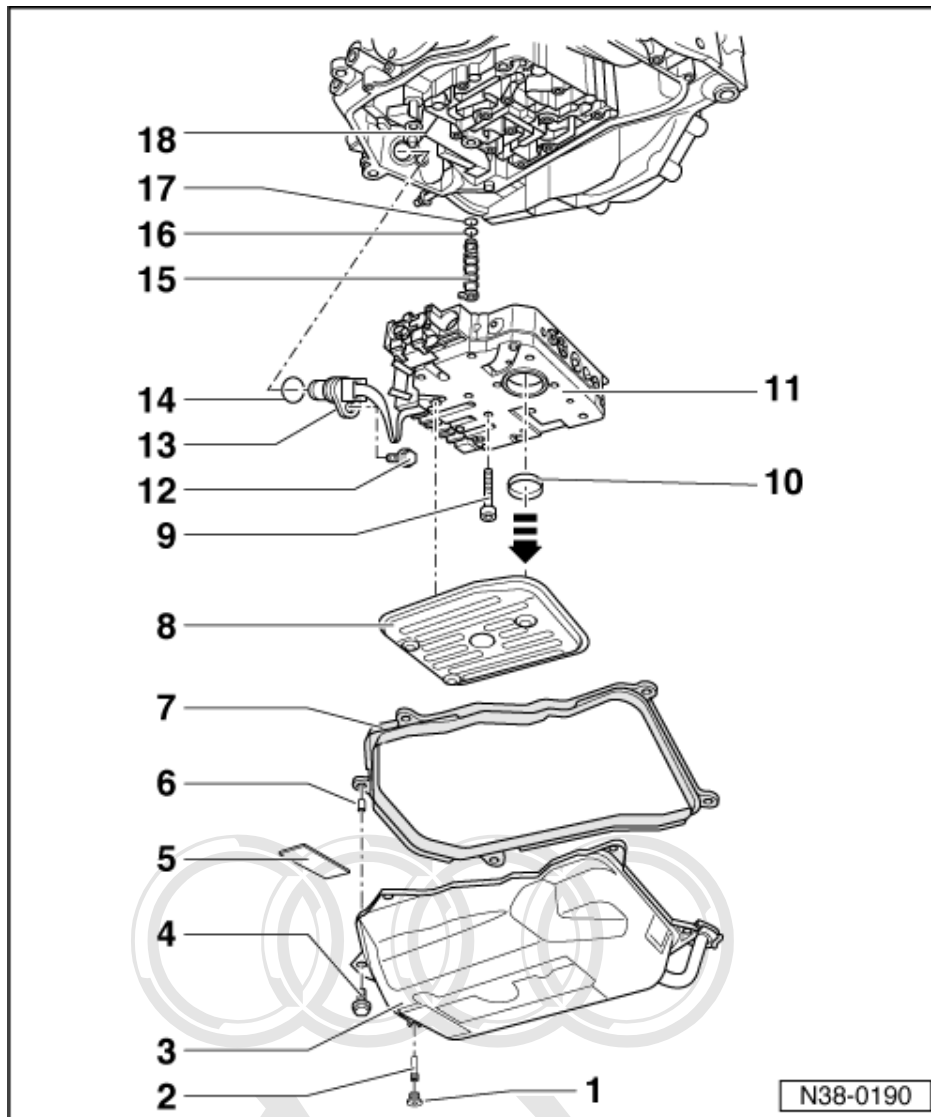
6.1 - Removing and installing valve body

Important

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

Notes:

- ♦ An exchange component which contains all the selector elements and the valve body is available for the repair of the automatic gearbox 01N => Page 7
- ♦ The exchange component is assigned to the gearbox code letters => from Page 2
- ♦ Installation description=>from Page 87 (Assembling planetary gearbox).
- ♦ The parts shown in the following illustration can be removed with the gearbox installed.
- ♦ Always renew the valve body if it is dirty or defective.
- ♦ Rules for cleanliness when working on the automatic gearbox => Page 69
- ♦ General repair instructions =>Page 15
- ♦ Lubricate O-rings with ATF. Other types of lubricant can cause problems with the hydraulic actuation of the gearbox.



1 Screw plug

- ♦ Always renew seal => Fig. 175
- ♦ Checking ATF level and topping-up => Page 59

2 Overflow pipe

- ♦ Remove to drain ATF => Fig. 175
- ♦ Checking ATF level and topping-up => Page 59

3 Oil pan

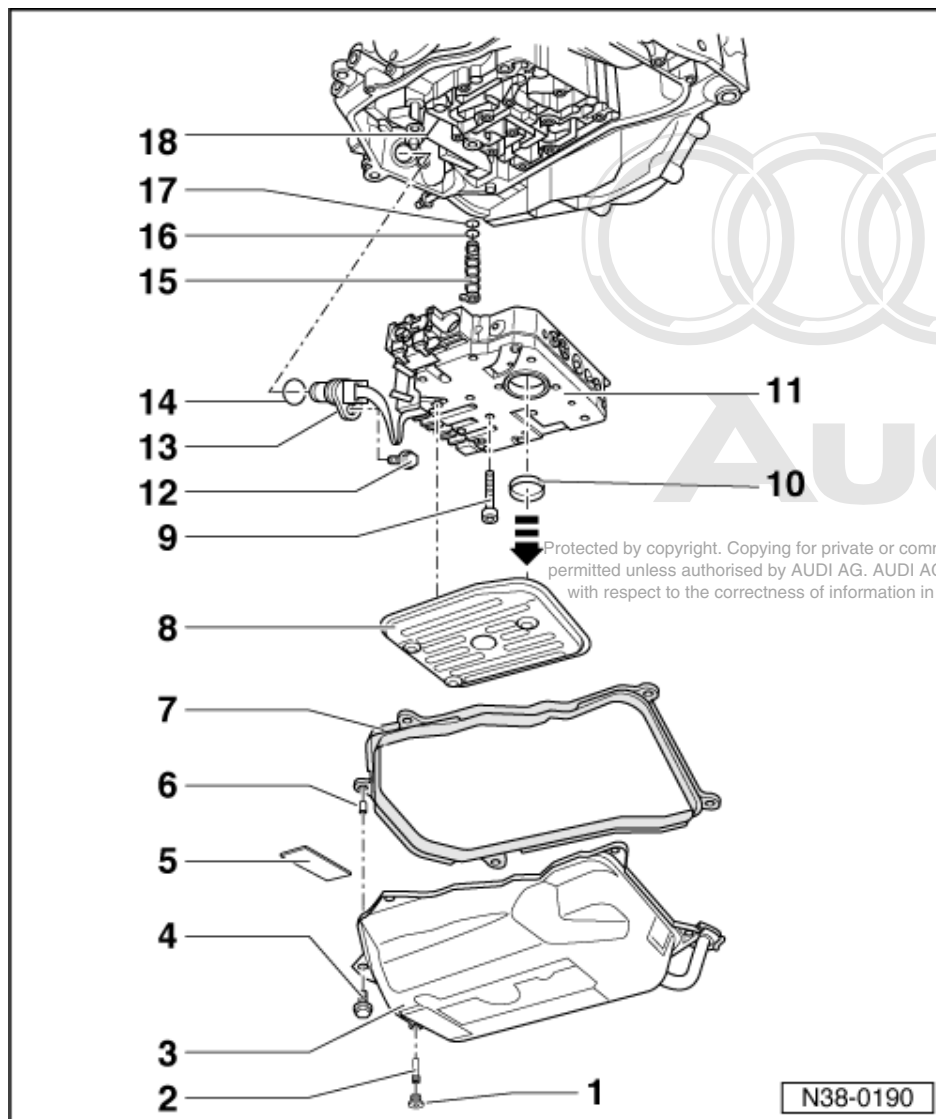
- ♦ Removing and installing => Page 176

4 Bolt - 12 Nm

- ♦ Tighten the bolts for the oil pan in several steps and in a diagonally opposite sequence.

5 Solenoid

- ♦ Insert in the recess in oil pan



6 Spacer bush

- ◆ Press into gasket

7 Seal

- ◆ Replace
- ◆ Press spacer bushes -item 6 - into gasket

8 ATF screen

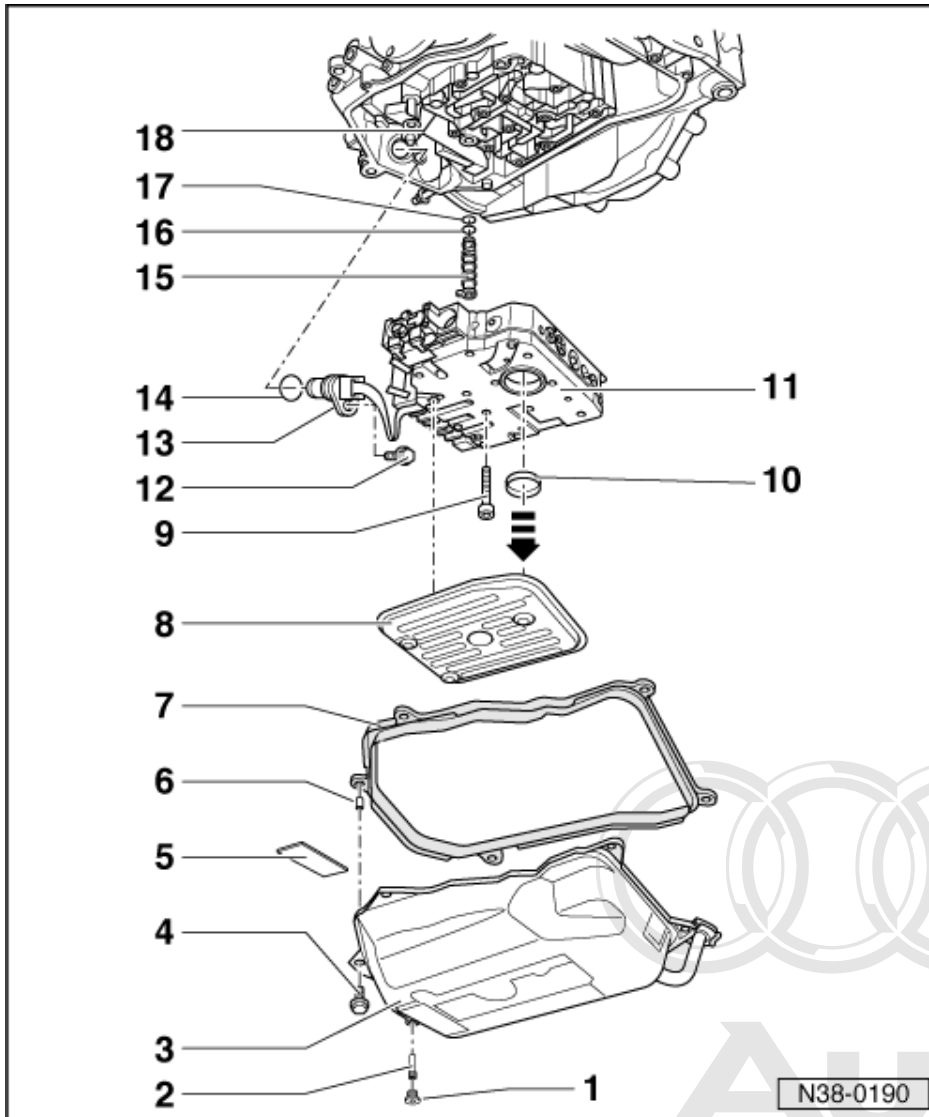
- ◆ Removing and installing=>Page 177

9 Bolt - 5 Nm

- ◆ For attaching valve body
- ◆ Removing => Page 178
- ◆ Installing => Page 178

10 Seal

- ◆ Replace
- ◆ Press onto suction collar of oil strainer -arrow- by hand =>Fig. 5



11 Valve body

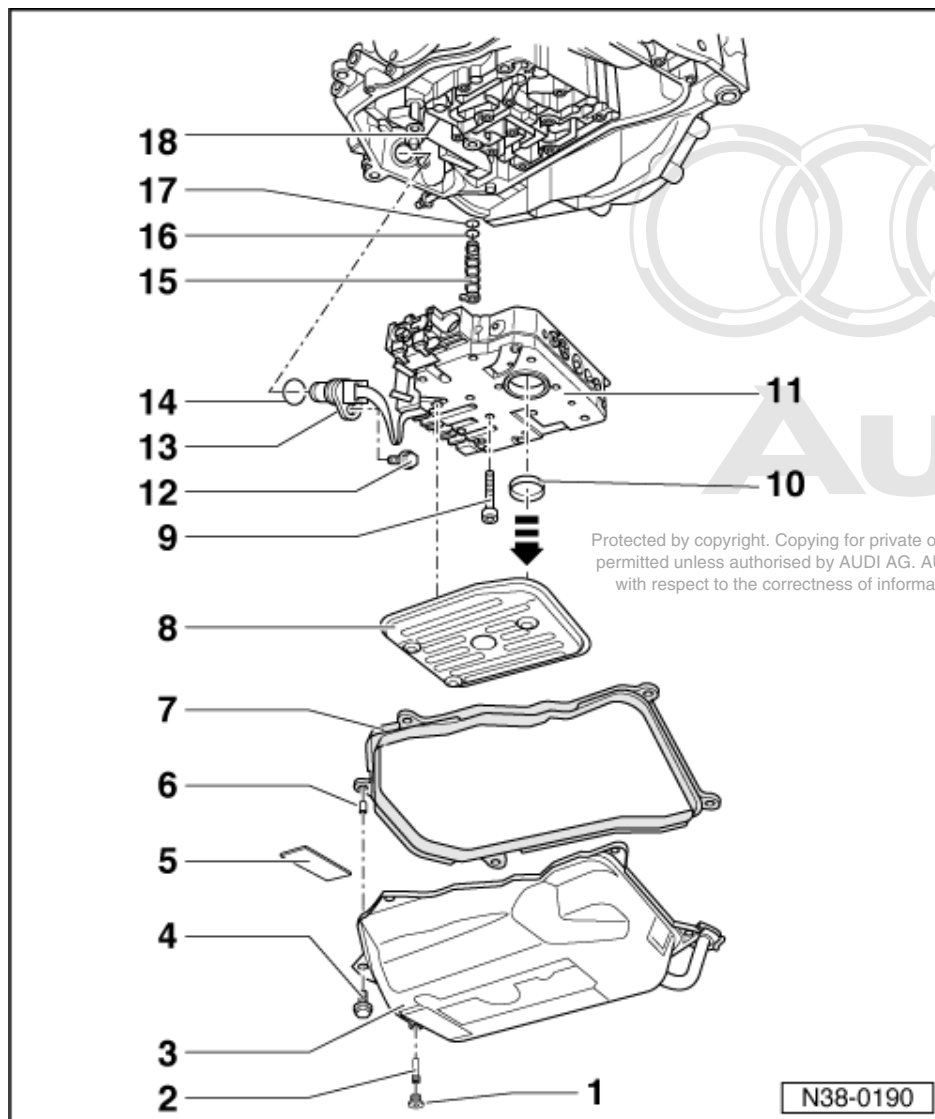
- ◆ Identification=> Fig. 175
- ◆ Removing and installing=>Page 178

12 Bolt - 10 Nm

13 Conductor strip with connector for solenoid valves

- ◆ With cable transition piece and 10-pin connector
- ◆ The gear oil temperature (ATF) sender -G93 is integrated in the conductor strip.
- ◆ Removing and installing=>Page 181
- ◆ After installing a new conductor strip, initiate basic setting

=> Automatic Gearbox 01N, Self-diagnosis; Repair group 01, Performing self-diagnosis; Initiating basic setting
Initiating basic setting



14 O-ring

- ◆ For cable transition piece
- ◆ Replace

15 Sealing plug

- ◆ Take out before removing and installing free wheel
- ◆ Installation position=> Fig. 176
- ◆ Place O-rings onto sealing plug

16 O-ring

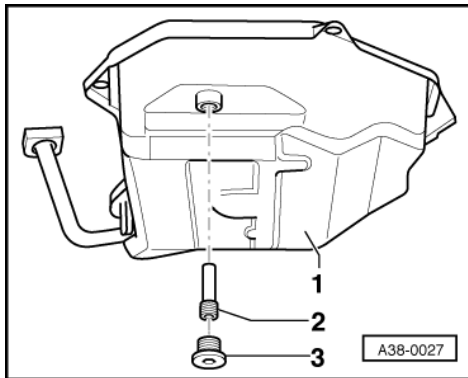
- ◆ Replace

17 O-ring

- ◆ Replace

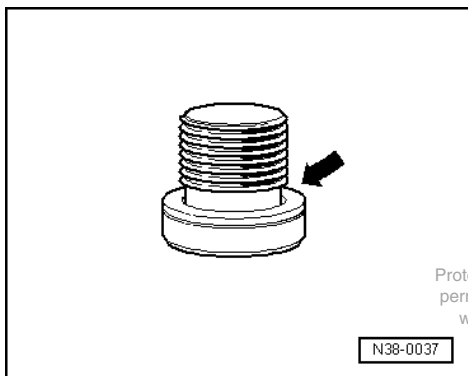
18 Operating rod for manual selector valve

- ◆ Adjusting => Page 181



-> Fig.1 Draining ATF

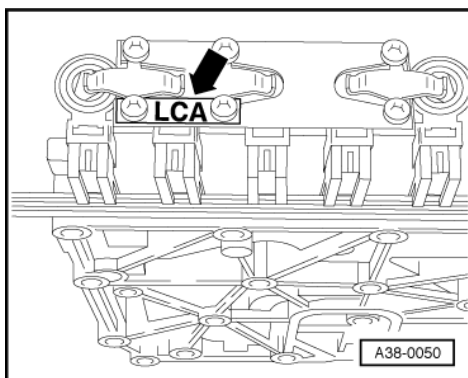
- Remove screw plug for ATF check -3- and overflow pipe -2- (5 mm hexagon socket).
- Allow the ATF to drain out.
- Screw in overflow pipe -2- as far as stop (2 Nm).



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-> Fig.2 Replacing plug seal of screw plug

- Cut sealing ring -arrow- for screw plug using side-cutting pliers.
- Change ATF or fill up after performing repairs; check ATF level and top up => Page 59



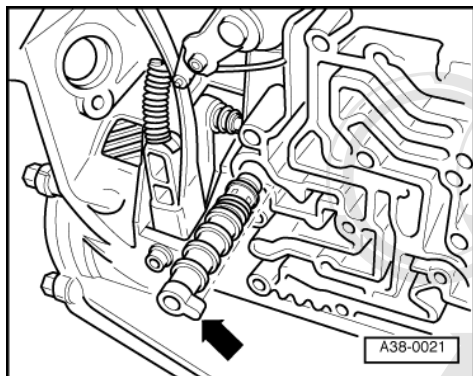
-> Fig.3 Identification of valve body

Code letters are stamped on an identifying tab. Metal tab must remain on the valve chest.

Allocation valve chest/gearbox =>from Page 2

Note:

If the valve body has no identifying tab it must remain together with the gearbox. If a new valve body is fitted, ensure that it is the correct version for the gearbox allocation => from Page 2.



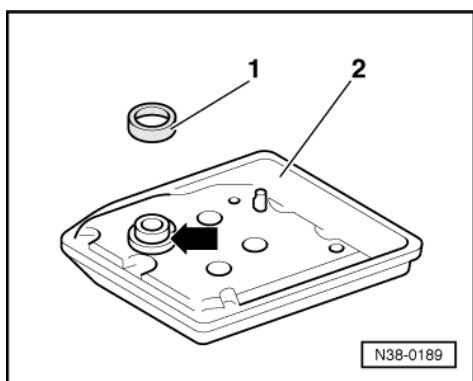
-> Fig.4 Installation position of sealing plug

- Insert sealing plug in hole in gearbox housing. The lug -arrow- is inserted into the oil channel.

Notes:

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- ♦ Pull sealing plug out of housing before removing and installing free wheel otherwise the sealing plug and the O-ring will be damaged.
- ♦ Insert sealing plugs with two O-rings.



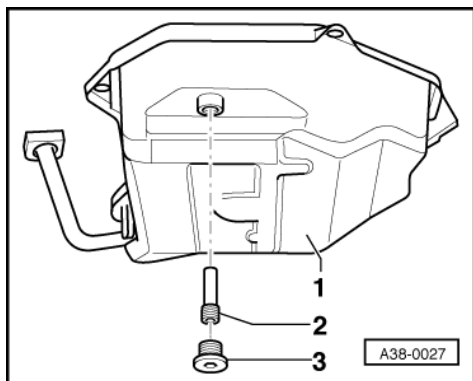
-> Fig.5 Installing gasket

- Push seal -1- onto the suction collar -arrow- of the oil strainer by hand.

6.2 - Removing and installing oil pan

Special tools and workshop equipment required

- ♦ Container



Removing

- Raise vehicle.
- Place container under the gearbox.
- -> Remove screw plug for ATF check -3- and overflow pipe -2- (5 mm hexagon socket).
- Allow the ATF to drain out.
- Unscrew oil pan bolts working diagonally.

Note:

Clean the magnet in the oil pan. Ensure that the magnet is in full contact with the oil pan.

Installing

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

- Replace gaskets and seals.
- Tighten oil pan bolts, working diagonally in several stages.
- Change ATF or fill up after performing repairs; check ATF level and top up => Page 59

Tightening torques

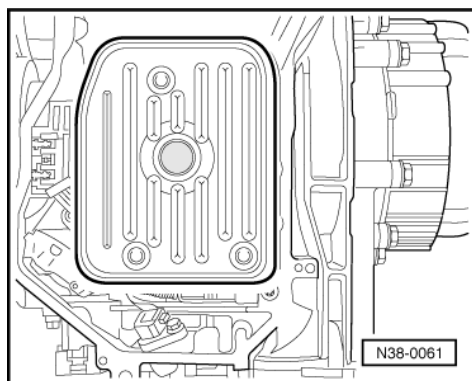
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Component	Nm
Overflow pipe to oil pan	2
Oil pan to gearbox housing (tighten in stages and in diagonal sequence)	8

6.3 - Removing and installing ATF screen

Removing

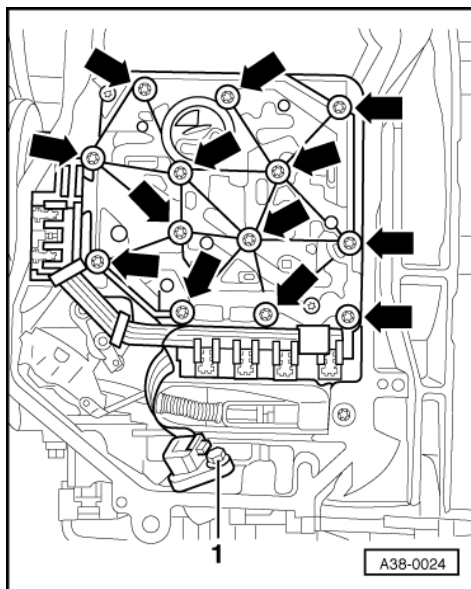
- Remove oil pan => Page 176
- Pull ATF screen off valve body.



Installing

- Press sealing ring onto suction collar on ATF strainer.
- -> Press ATF screen into valve body approx. 3 mm (not up to stop).
- When installing oil pan the ATF screen will be pushed into correct installation position.
- Installing oil pan => Page 177
- Change ATF or fill up after performing repairs; check ATF level and top up => Page 59

6.4 - Removing and installing valve body

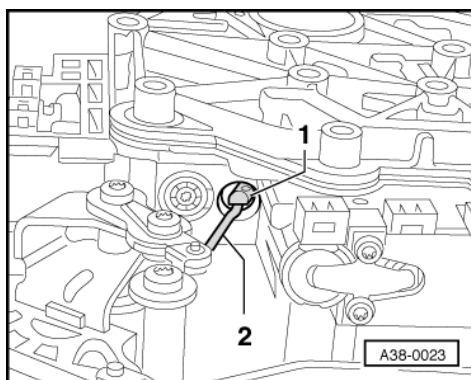


Removing

- Shift selector lever into position "1".
- Remove oil pan => Page 176
- Remove ATF screen => Page 177
- -> Remove securing bolt -1- for 10-pin connector.
- Press 10-pin connector out of gearbox housing from outside to inside.
- Slacken bolts -arrows-.

Notes:

- ♦ Only slacken the securing bolts indicated in the illustration.
- ♦ If other bolts are slackened, this may affect the operation of the valve body or the valve body will come apart.



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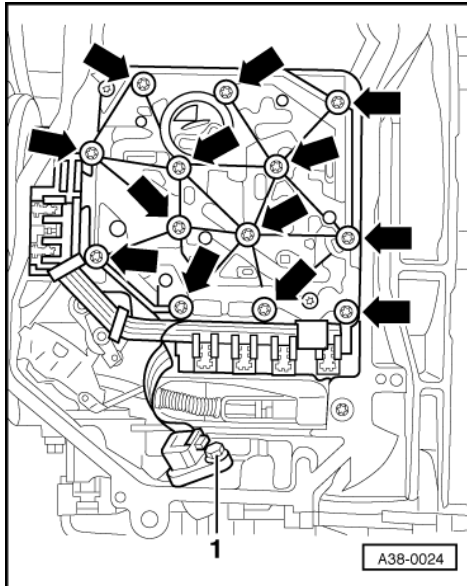
- -> Take valve body off gearbox; when performing this step, carefully unhook operating rod -2- for manual selector valve from manual selector valve -1-.
- Secure manual selector valve so that it cannot fall out.

Installing

- Fit valve body on gearbox without using any force.
- Engage operating rod -2- into manual selector valve -1-.
- Guide operating rod -2- with manual selector valve into valve body.

Note:

Installation position of manual selector valve: The flat on the manual selector valve -1- faces toward the gearbox.

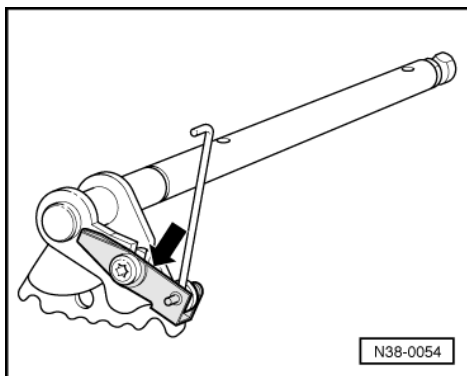


- -> First tighten valve body bolts -arrows- lightly.
- Then tighten alternately crosswise from inside to outside to 5 Nm.
- Route conductor strip so that it is not kinked or twisted when installing.
- Guide 10-pin connector through gearbox housing and tighten securing bolt -1-.
- Adjusting operating rod for manual selector valve => Page 181
- Remove ATF screen => Page 177
- Installing oil pan => Page 177
- Change ATF or fill up after performing repairs; check ATF level and top up => Page 59

Tightening torque

Component	Nm
Valve body to gearbox housing (from inside to outside)	5

6.5 - Operating rod for manual selector valve



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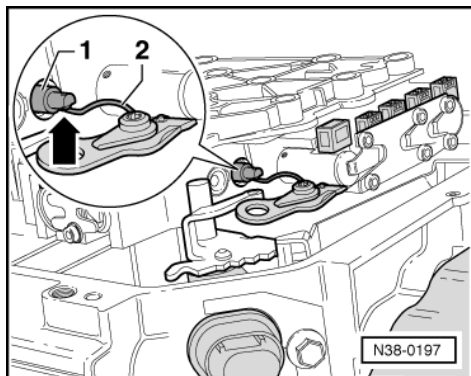
Replacing steel spring and screw for selector shaft

- Valve body installed
- -> Unscrew screw of steel spring -arrow-.
- Detach steel spring with operating rod and lever from the selector shaft in the gearbox.

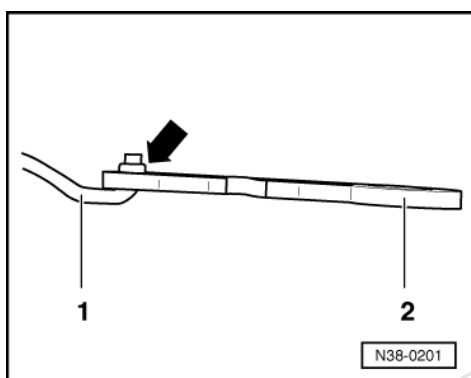
- Detach the operating rod at the manual selector valve.

Notes:

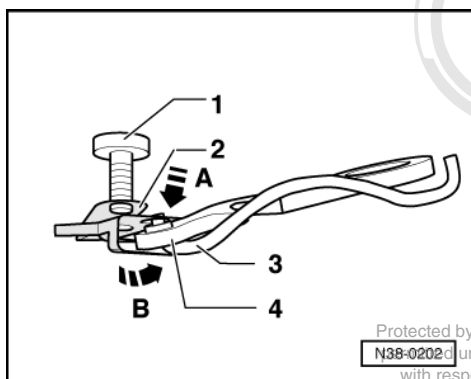
- ♦ Ensure that the manual selector valve does not fall out of the valve body.
- ♦ The screw with steel spring must be renewed every time after being dismantled.
- Move shift segment/selector shaft to position "1".
- Slightly pull manual selector valve out of the valve body.



- -> Turn manual selector valve -1- so that the shoulder -arrow- is to operating rod -2-.
- Attach operating rod with lever in manual selector valve as shown.



- -> Insert operating rod -1- from below into the collar -arrow- of the lever -2- at the selector shaft.

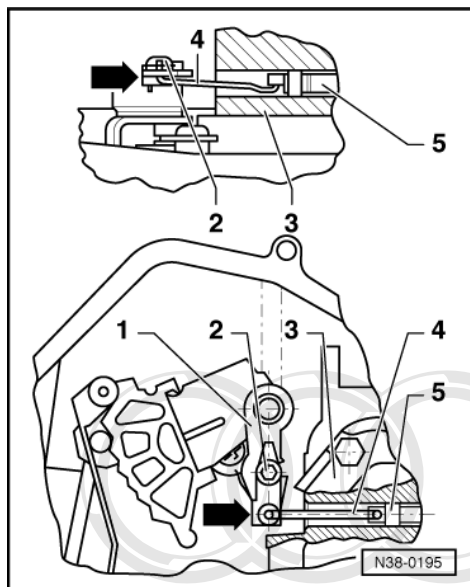


- -> Attach new steel spring -2- with new screw -1- over the end of the operating rod -3- -arrow A- and push over the operating rod with the retaining lug at the bottom -arrow B-. Centre the steel spring at the collar at the top of the lever -arrow A-.
- Pivot steel spring over the lever to the stop.
- Screw in screw further until it is flush with the bottom edge of the lever.

Note:

The screw is not finally tightened until after the operating rod has been adjusted.

- Adjusting operating rod for manual selector valve => Page 181



Adjusting operating rod for manual selector valve

Note:

The screw with steel spring must be renewed each time after being dismantled=>Page 179

- Move selector shaft to position "P".
- -> Push operating rod -4- with manual selector valve -5- into the valve body -3- as far as the stop -direction of arrow- and tighten bolt -2- for lever to 4 Nm.

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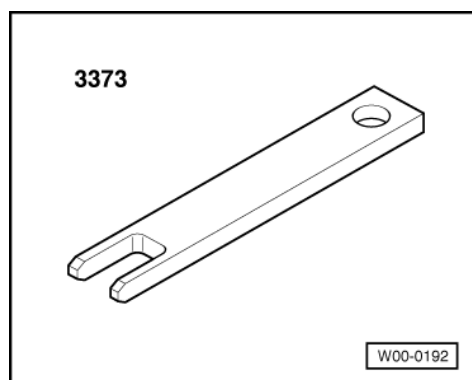
Notes:

- ♦ The manual selector valve must rest against the stop in the valve body when adjusting. Counterhold in direction of arrow when tightening bolt.
- ♦ Do not press on the small limiting lever of the steel spring as this will interfere with the adjustment.
- ♦ To test: When selector lever is in position "1", manual selector valve must be flush with outside of valve body.

6.6 - Removing and installing conductor strip with 10-pin connector

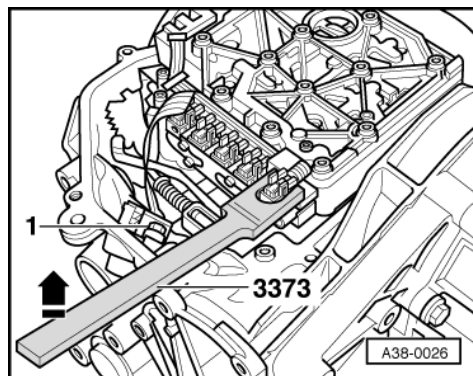
Notes:

- ♦ The gear oil temperature (ATF) sender -G93 is integrated in the conductor strip.
- ♦ Valve body installed or removed.



Special tools and workshop equipment required

- ♦ Lever for conductor strip 3373

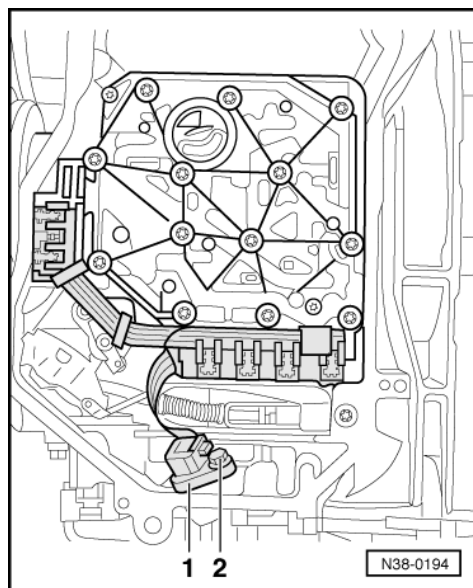


Removing

- Remove oil pan => Page 176
- Remove ATF screen => Page 177
- -> Remove securing bolt -1- for 10-pin connector.
- Press 10-pin connector out of gearbox housing from outside to inside.
- Use 3373 to lever conductor strip off the solenoid valves in direction of arrow.

Note:

If the retaining catches on the solenoid valves are damaged, the valve body must be renewed.



Installing

- -> Route conductor strip so that it is not kinked or twisted when installing.
- Press the individual connectors of the conductor strip onto the solenoid valves so that they engage properly.
- Place new O-ring on the connector -1- and coat with ATF.
- Insert connector of conductor strip into the gearbox housing and bolt on securing bolt -2- to 10 Nm.
- Remove ATF screen => Page 177
- Installing oil pan => Page 177

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7 - Dismantling and assembling parking lock

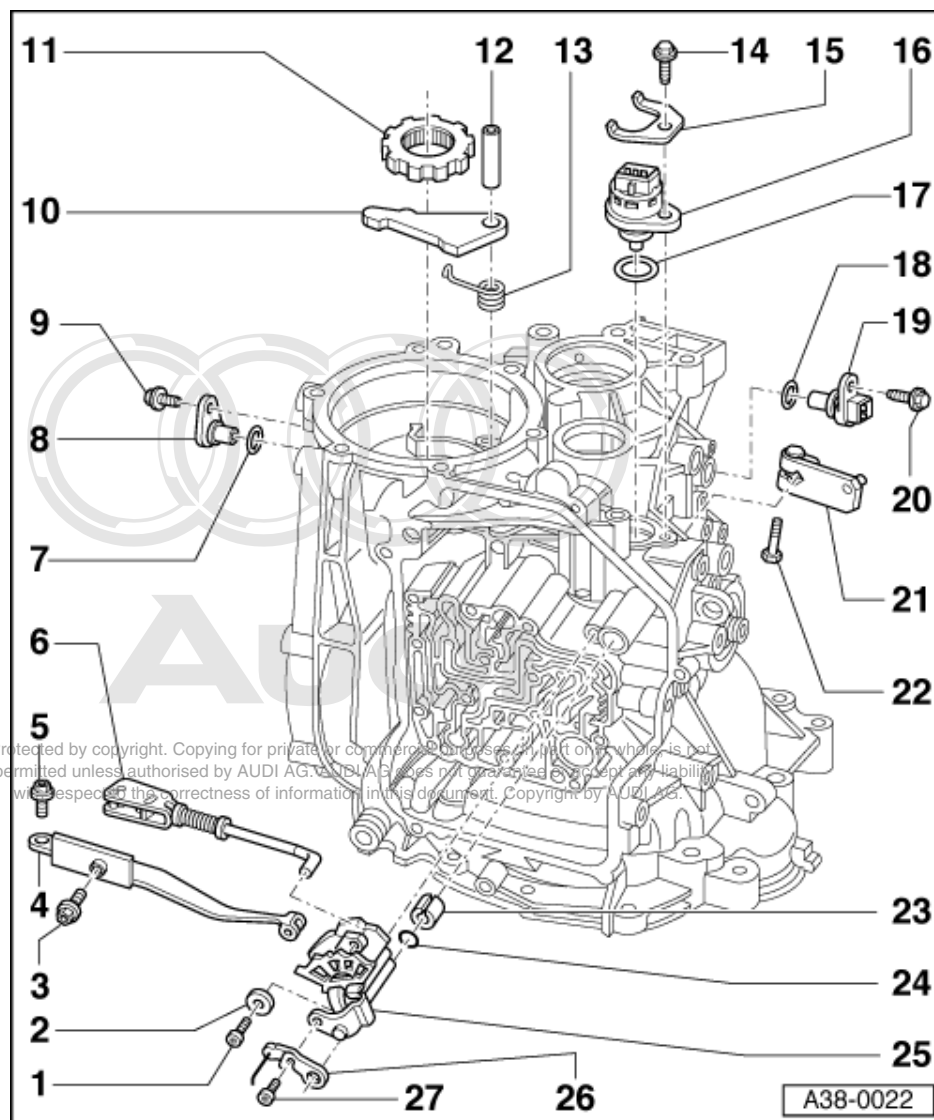
7.1 - Dismantling and assembling parking lock

Important

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

Notes:

- ◆ Rules for cleanliness when working on the automatic gearbox => Page 69
- ◆ General repair instructions =>Page 15
- ◆ Lubricate O-rings with ATF. Other types of lubricant can cause problems with the hydraulic actuation of the gearbox.
- ◆ The output gear has to be removed in order to dismantle and assemble the parking lock => Removing and installing drive pinion, Page 211
- ◆ Shim "S4" for the drive pinion must be re-measured if the parking lock gear is renewed=> Page 250
- ◆ Removing and installing planetary gearbox/final drive breather => Fig. 191

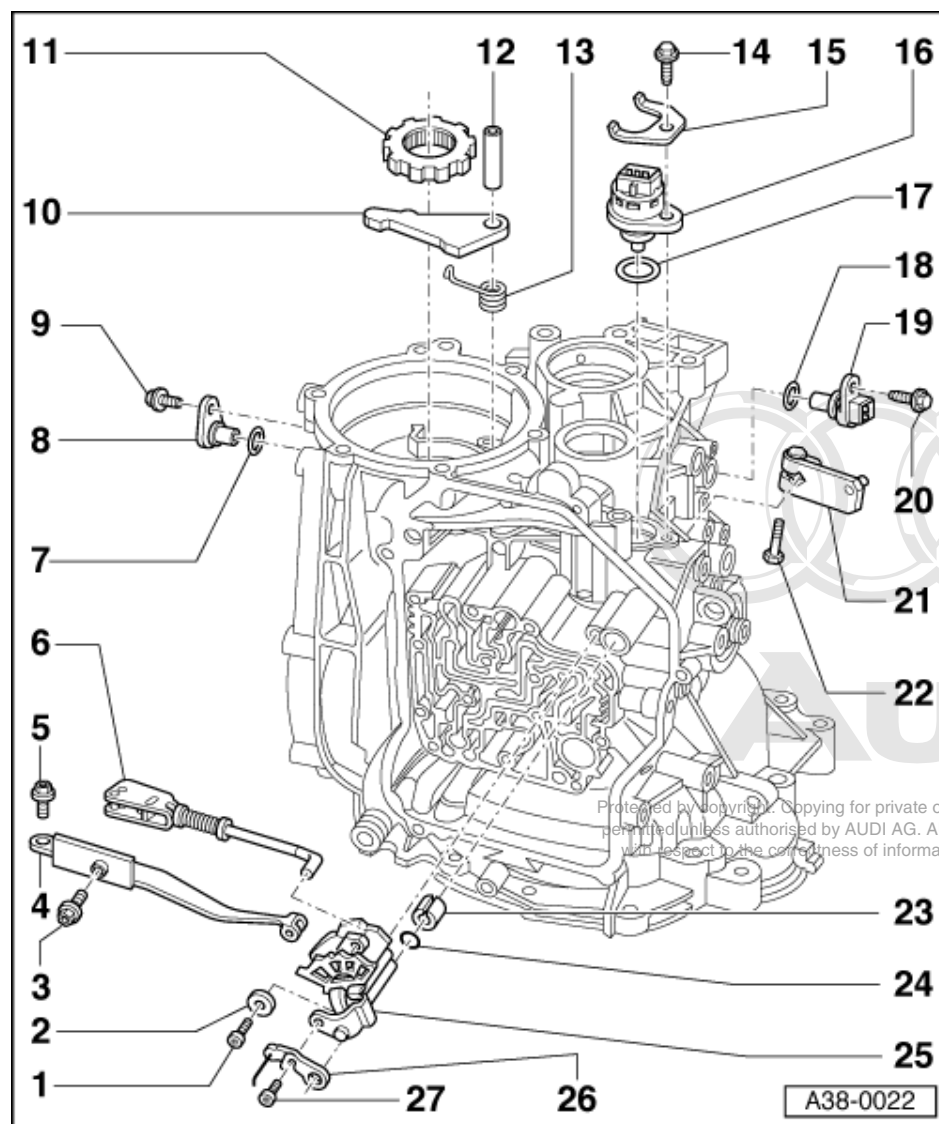


1 Bolt - 10 Nm

- ◆ Secures selector shaft
- ◆ Installing => Fig. 190

2 Locking plate

- ♦ Inserting => Fig. 190
- 3 Bolt - 10 Nm**
 - ♦ Observe correct assembly sequence => Fig. 191
- 4 Detent spring**
 - ♦ To remove, remove drive pinion cover and output => Page 211 onwards
 - ♦ To remove, remove bolts -Item 3 and 5 - and lift parking lock detent lever -Item 10 - by hand.
- 5 Bolt - 10 Nm**
 - ♦ Observe correct assembly sequence => Fig. 191
- 6 Engaging lever**
 - ♦ Insert together with selector shaft and detent segment



- 7 O-ring**
 - ♦ Replace
- 8 Gearbox speed sender -G38**
 - ♦ Tested in the vehicle by self-diagnosis

=> Automatic Gearbox 01N, Self-diagnosis; Repair group 01; Performing self-diagnosis; Read measured value block Performing self-diagnosis Read measured value block

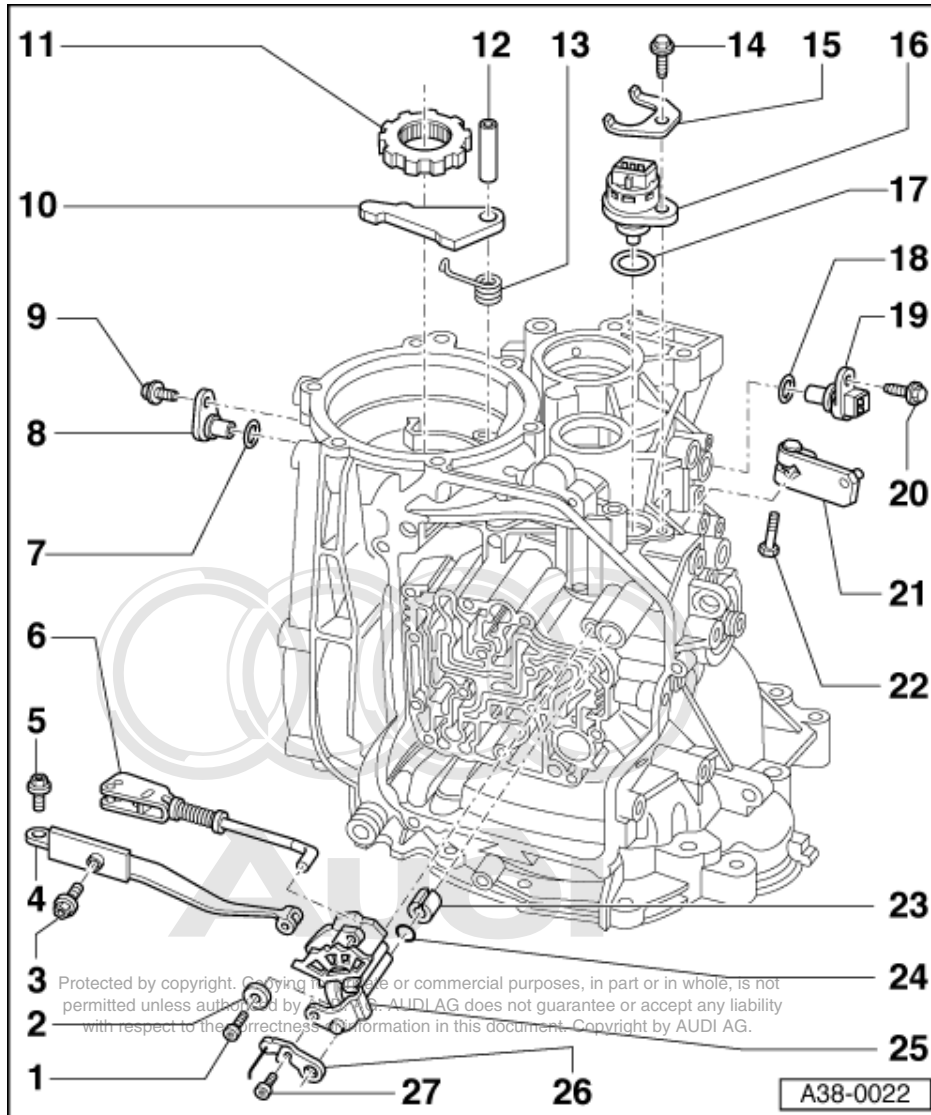
- ♦ Functioning is impaired by dirt; clean if necessary

- ♦ Removing and installing=>Page 192

9 Bolt - 10 Nm

10 Detent lever

- ♦ To remove, remove drive pinion cover and output => from Page 211
- ♦ To remove, pull out detent lever shaft -Item 12 -
- ♦ Insert with return spring
- ♦ Installation position: Must be aligned centrally with parking lock gear



11 Parking lock gear

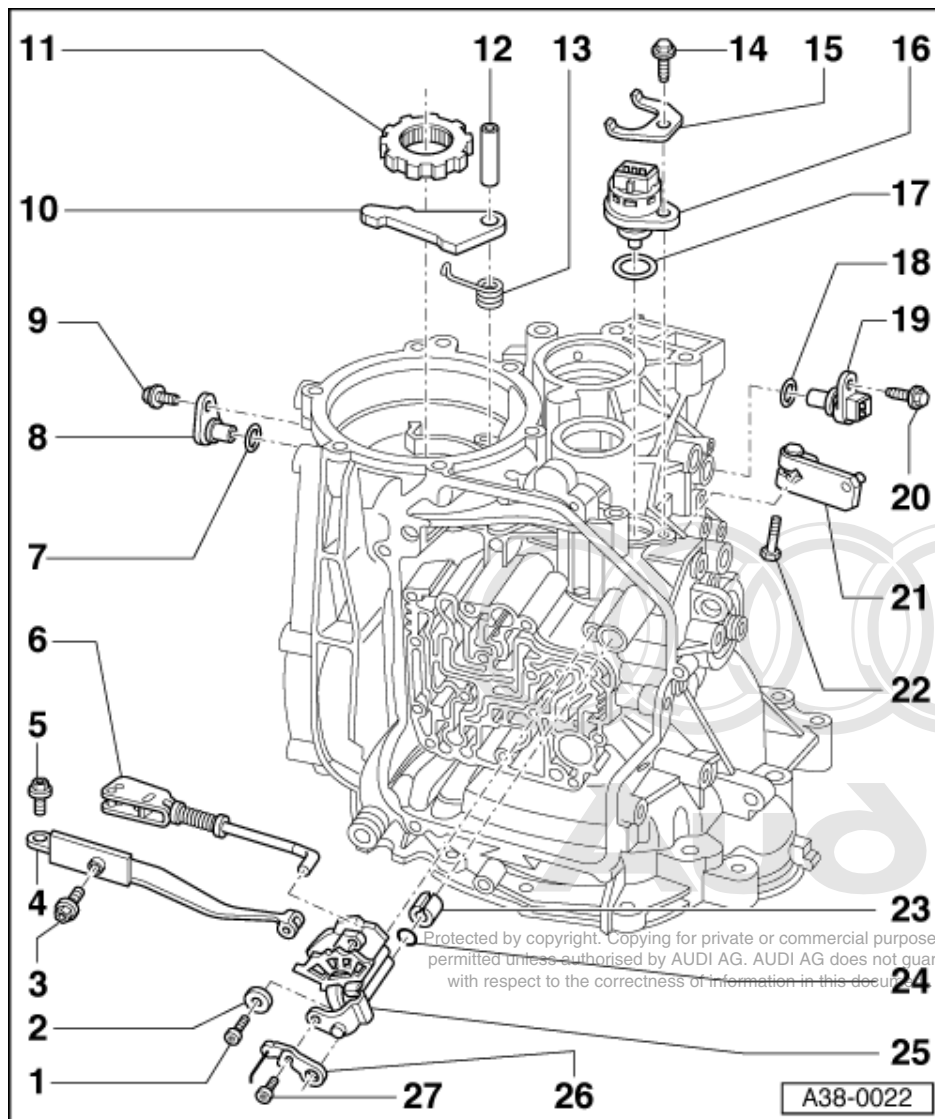
- ♦ To remove, remove drive pinion cover and output => from Page 211
- ♦ Installation position:
Rounded side of parking lock gear faces drive pinion cover
- ♦ If parking lock gear is renewed, thickness of shim "S4" for drive pinion must be re-determined=>Page 250

12 Shaft for detent lever

- ♦ Pulling out => Fig. 189
- ♦ Drive in with a drift
- ♦ Peening => Fig. 190

13 Return spring

- ♦ Supported on gearbox housing and hooked into detent lever



14 Bolt - 10 Nm

15 Bracket

16 Multi-function switch -F125

- ♦ Remove before removing selector shaft -Item 25 - remove.
- ♦ Tested in the vehicle by self-diagnosis

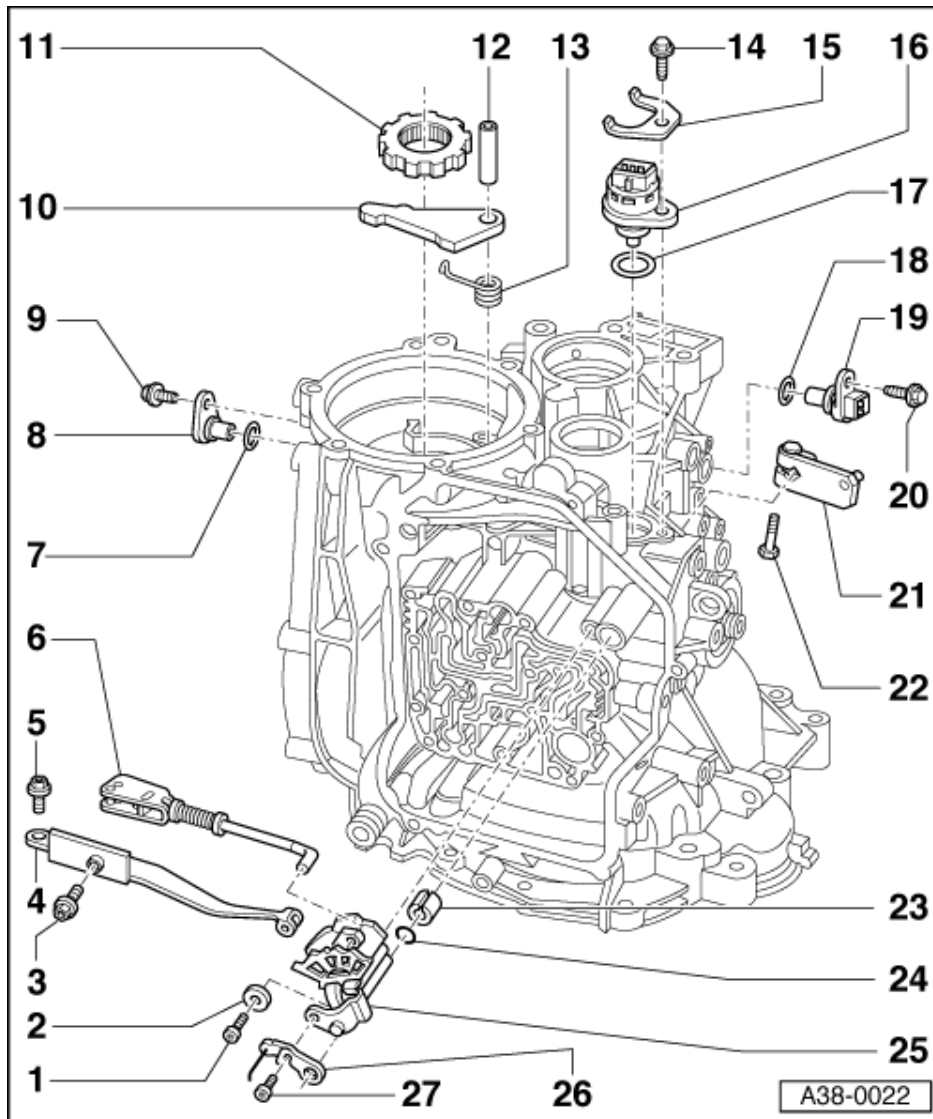
=> Automatic Gearbox 01N, Self-diagnosis; Repair group 01; Performing self-diagnosis; Read measured value block Performing self-diagnosis Read measured value block

17 O-ring

- ♦ Replace

18 O-ring

- ♦ Replace



19 Road speed sender -G68

- ♦ Tested in the vehicle by self-diagnosis

=> Automatic Gearbox 01N, Self-diagnosis; Repair group 01; Performing self-diagnosis; Read measured value block Performing self-diagnosis Read measured value block

- ♦ Functioning is impaired by dirt; clean if necessary
- ♦ Removing and installing=>Page **193**

20 Bolt - 10 Nm

21 Lever

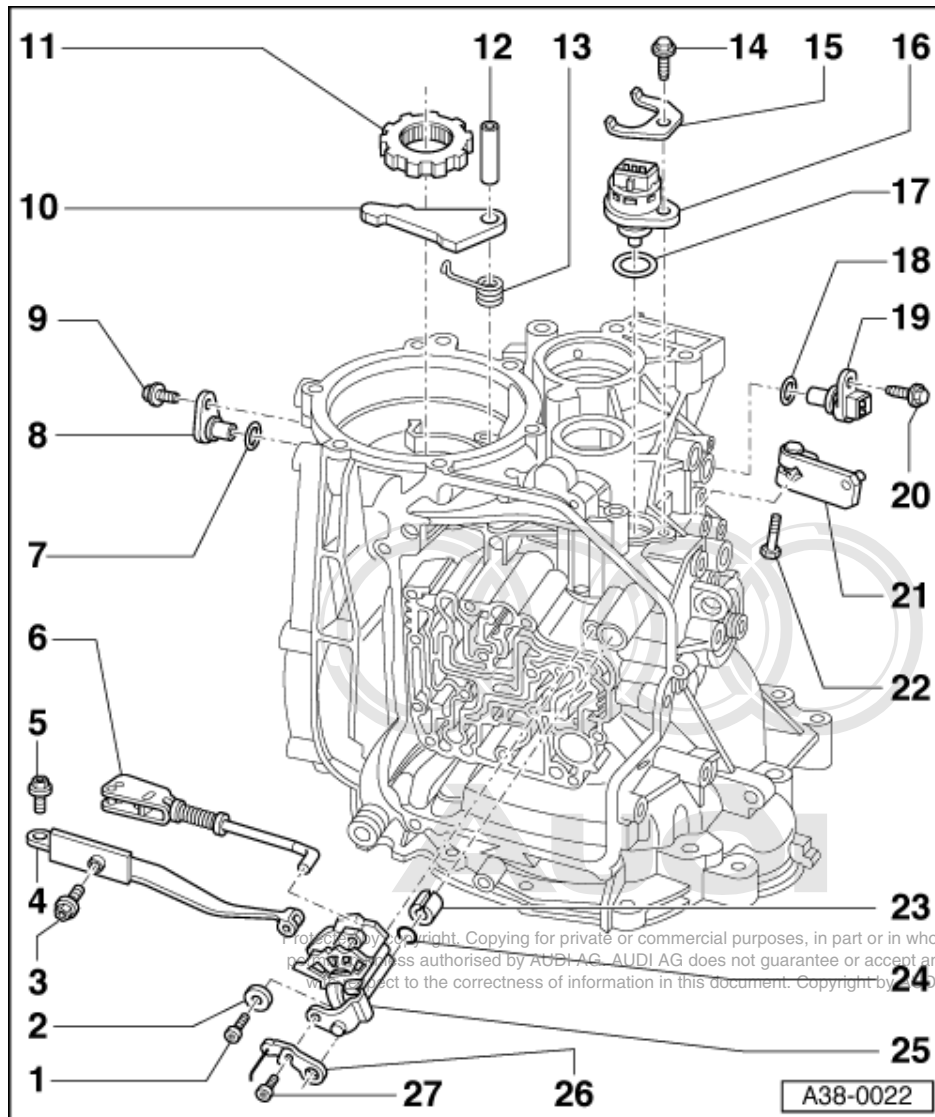
- ♦ For selector shaft

22 Bolt - 10 Nm

23 Bush

- ♦ Drive in and drive out with drift
- ♦ Insert before installing selector shaft

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24 O-ring

- ◆ Replace
- ◆ Seat in selector shaft groove
- ◆ Installation position => Fig. 190

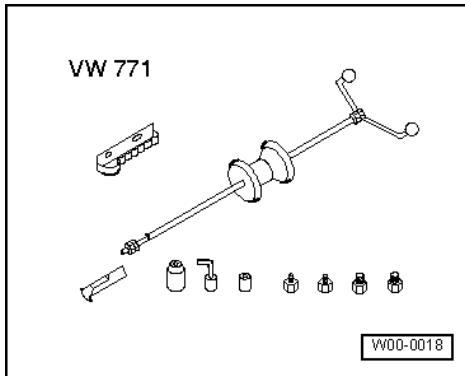
25 Selector shaft

- ◆ Before removing selector shaft remove multifunction switch -F125 -Item 16 - and detent spring -Item 4 - remove.
- ◆ When installing, insert together with engaging lever -item 6 - install
- ◆ Secure with locking washer -Item 190
- ◆ Note positions of components => Fig. 190

26 Operating rod for manual selector valve

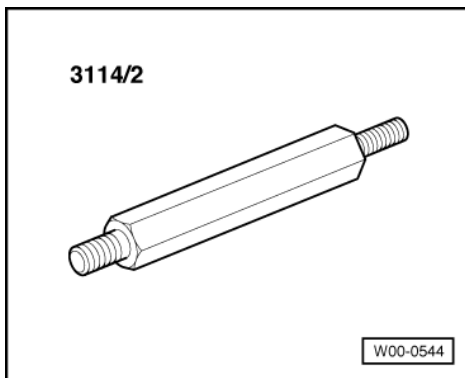
- ◆ Adjusting => Page 181

27 Bolt - 5 Nm

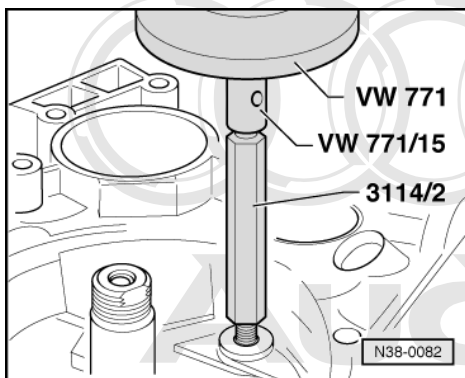


Special tools and workshop equipment required

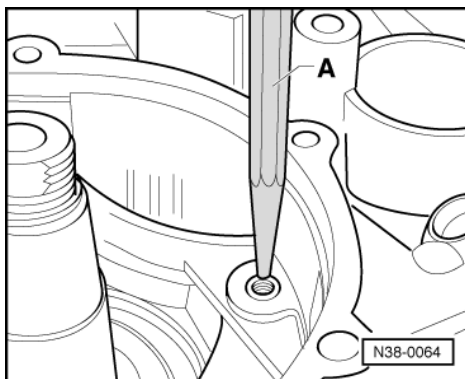
- ♦ Multipurpose tool VW 771



- ♦ Pin 3114/2

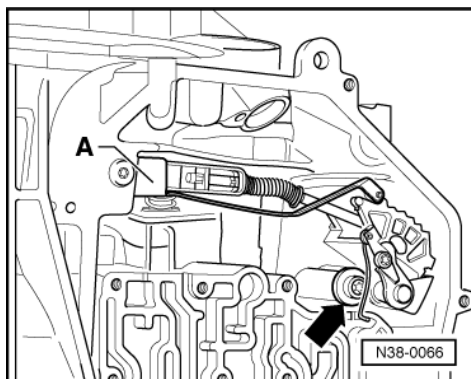


-> Fig.1 Removing axle for detent lever
 - Pull out axle with multi-purpose tool VW 771.



-> Fig.2 Peening axle for detent lever

- Drive in axle with threaded hole upwards.
- Secure axle by peening gearbox housing to axle using a centre punch -A-.

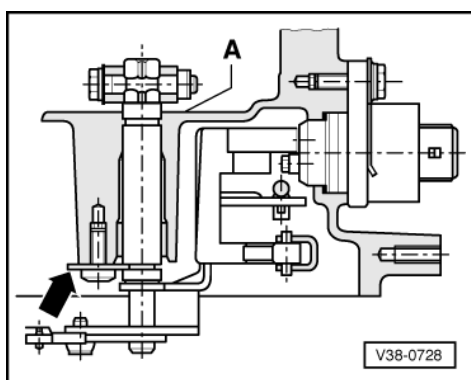


-> Fig.3 Removing and installing selector shaft

- Remove bolt -arrow- and take out locking washer.

Note:

The selector shaft can be removed or installed after taking out the detent spring -A-.

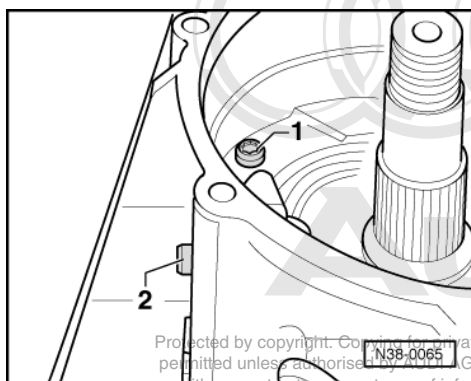


-> Arrow points to locking washer.

A - O-ring

Note:

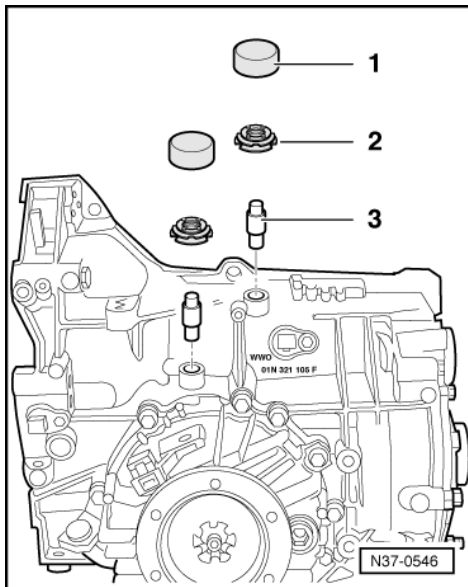
Fig. shows sectional view of selector shaft.



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→ Fig.4 Inserting screws for detent spring

- Screw in bolts -1- and -2- approx. 3 turns.
- Tighten bolt -2- to 10 Nm and then tighten bolt -1- to 10 Nm.



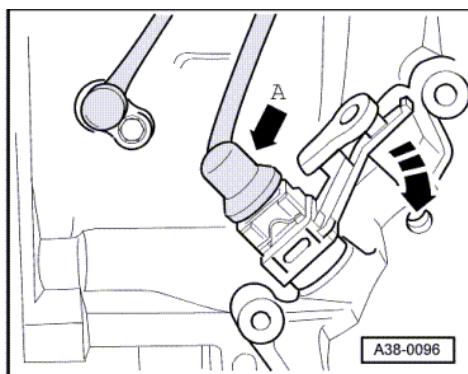
→ Fig.5 Removing and installing breather for planetary gearbox/final drive

- 1 - Breather cap
- 2 - Breather
- 3 - Breather pipe
- Removing using pliers
- Drive in up to stop with copper drift

8 - Removing and installing gearbox housing sender

8.1 - Removing and installing gearbox housing sender

8.2 - Removing and installing speedometer sender -G22

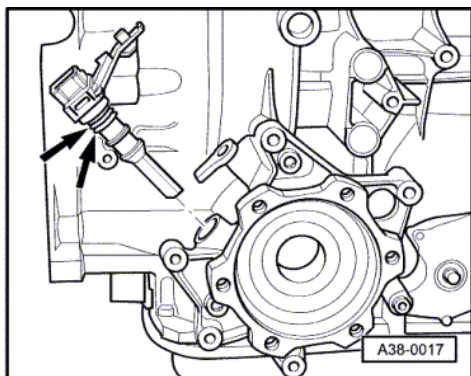


Removing

- Remove front left wheel.
- → Detach connector -arrow A- from sender.



- Push down the clip holding the sender and rotate -arrow-.
- Pull out sender.

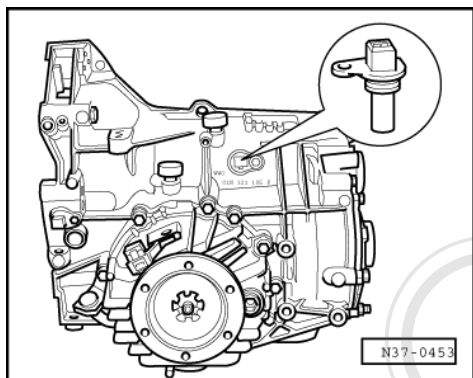


Installing

Installation is in reverse order. Note the following when doing so:

- -> Renew the O-rings -arrows-.
- Insert new O-rings with gear oil.
- Install sender.
- Engage retaining bracket for bearing bracket for flange shaft.

8.3 - Removing and installing gearbox speed sender -G38



-> Fitting location The gearbox speed sender is located at the top left on the gearbox.

- Detach connector.
- Unscrew the retaining bolt.
- Pull out sender.
- Always renew O-ring.
- Coat O-ring with ATF.

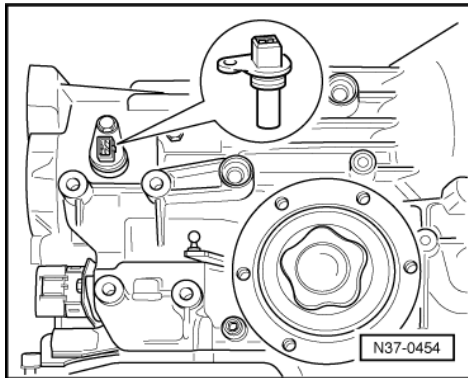
Installation is in reverse order.

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Tightening torque

Component	Nm
Sender -G38 on gearbox housing	10

8.4 - Removing and installing road speed sender -G68



-> Fitting location The road speed sender is located at the top right on the gearbox.

- Detach connector.
- Unscrew the retaining bolt.
- Pull out sender.
- Always renew O-ring.
- Coat O-ring with ATF.

Installation is in reverse order.

Tightening torque

Component	Nm
Sender -G68 on gearbox housing	10

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39 - Final drive, Differential

1 - Checking oil in final drive

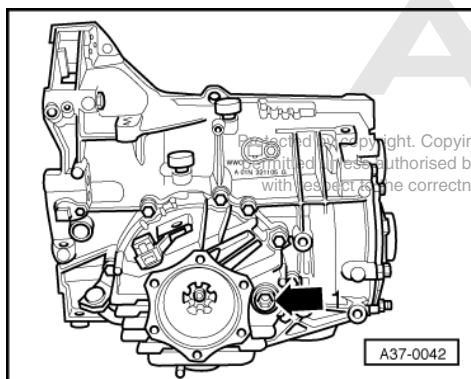
1.1 - Checking oil in final drive

Special tools and workshop equipment required

- ♦ Container

Test sequence

- Perform a short test drive in order to warm up the gear oil.
- Drive the vehicle onto a four-column lifting platform or over an inspection pit to ensure a horizontal position.



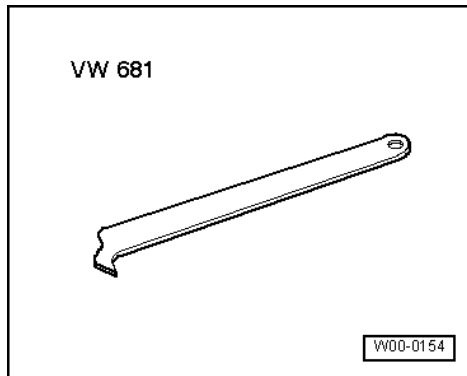
- Place drip container underneath to collect oil.
- -> Unscrew oil filler plug -arrow-.
- Specification: oil level up to lower edge of filler hole
- Top up gear oil, if necessary. Specification => Page 6 .
- Clean the magnet of the plug.
- Fit oil filler plug.

Tightening torque	Nm
Oil filler plug	25

2 - Replacing flange shaft sealing rings

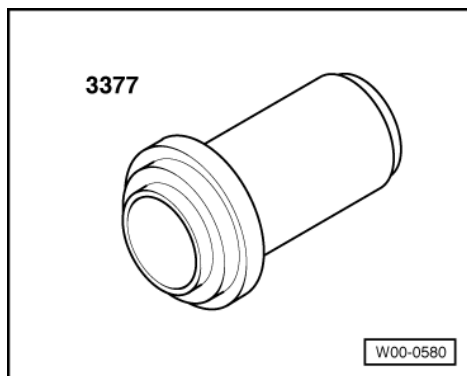
2.1 - Replacing flange shaft sealing rings

2.2 - Replacing left flange shaft sealing ring

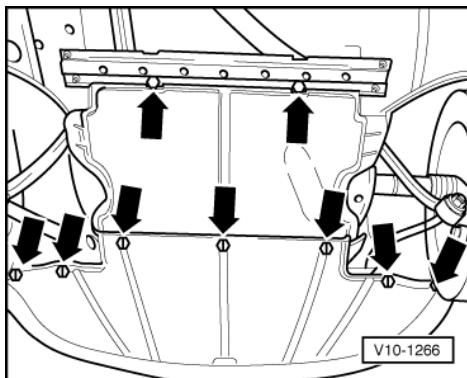


Special tools and workshop equipment required

- ♦ Extractor lever VW 681

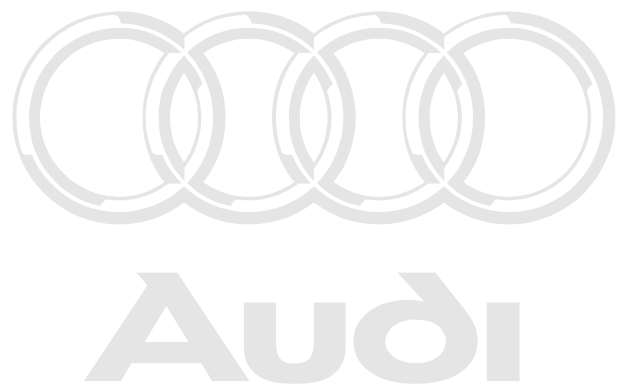


- ♦ Thrust piece 3377
- ♦ Container



Removing

- Gearbox installed



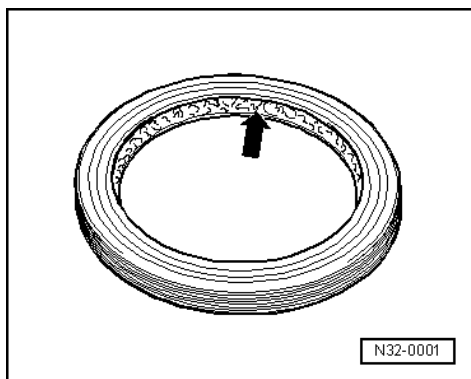
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- Loosen drive shaft/wheel hub nut when vehicle is still standing on its own wheels, at first by 90°.
- Remove front left wheel.
- -> Diesel-Engine: Unscrew noise insulation on side and beneath gearbox.
- Remove the left drive shaft

=> Running Gear, Front and Four-wheel Drive; Repair group 40; Servicing drive shafts Servicing drive shafts

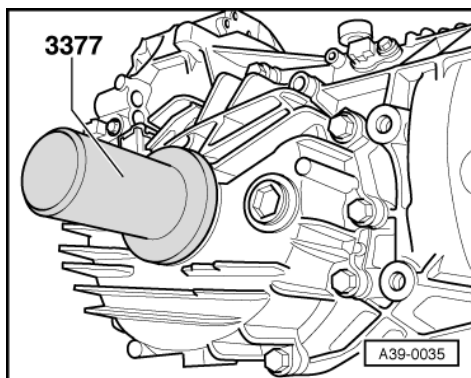
- Place container under the gearbox.
- Unscrew central bolt for left flange shaft (use pin to prevent flange shaft from turning).
- Pull out flange shaft.
- Pull out flange shaft sealing ring with VW 681.



Installing

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

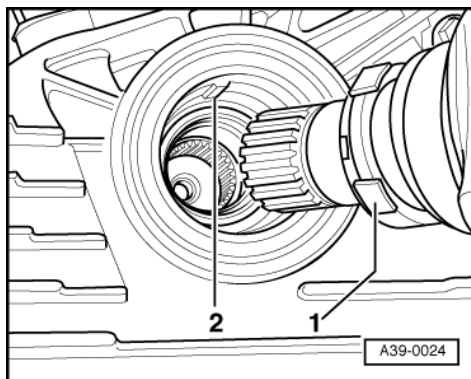
- Coat outer circumference of sealing ring with gear oil.
- -> Pack the space between sealing and dust lips -arrow- half-full with sealing grease G 052 128 A1.



Note:

Sealing ring must be seated in housing at uniform depth all round.

- -> Drive in new sealing ring to stop; for this purpose, do not cant sealing ring.
- Installation position: The open side of the sealing ring faces toward the gearbox.
- Install flange shaft with spring, thrust washer, tapered ring and circlip.



- -> Both lugs -2- on drive gear for speedometer sender must engage between support rings tabs -1-.

Note:

Conical thrust surface on tapered ring faces towards differential.

- Insert the left flange shaft into the gearbox.
- Install left drive shaft.

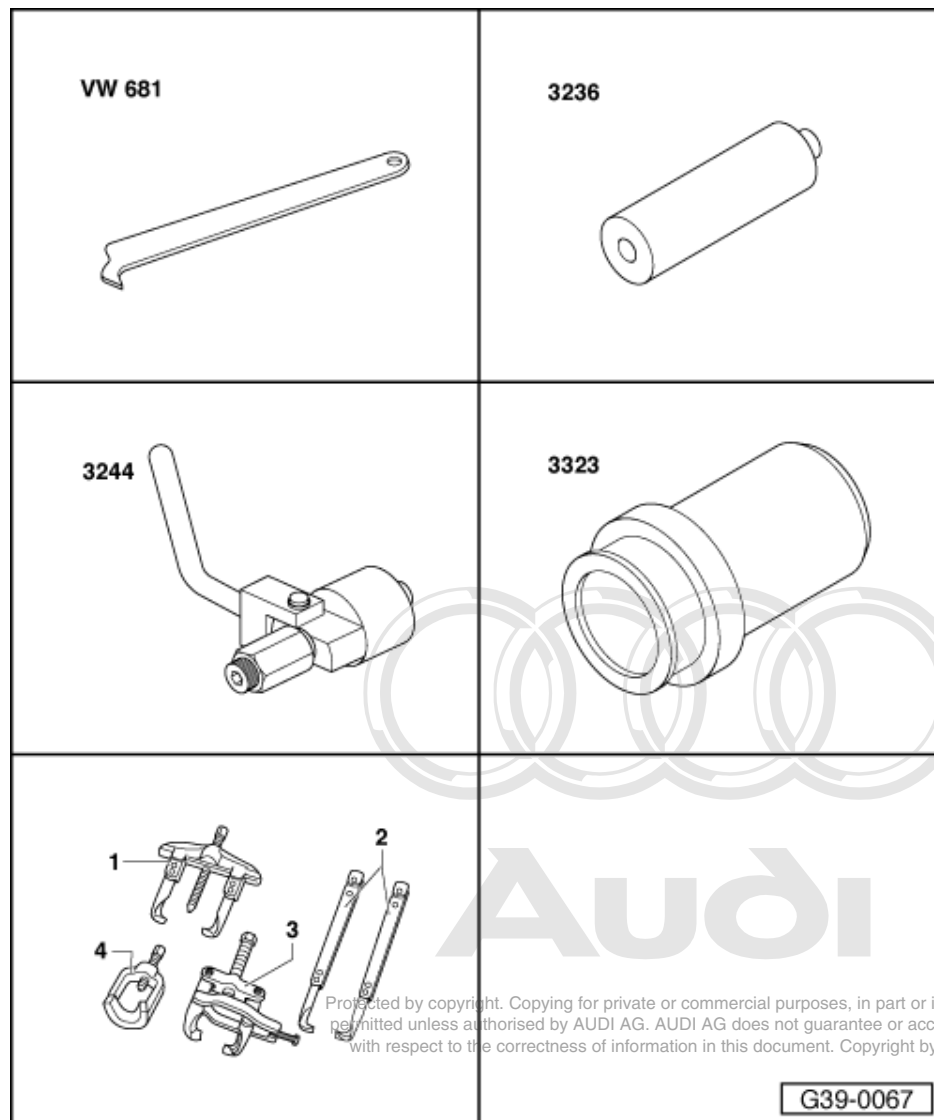
=> Running Gear, Front and Four-wheel Drive; Repair group 40; Servicing drive shafts Servicing drive shafts

- Check oil level in the final drive of the automatic gearbox => Page **194**

Tightening torque

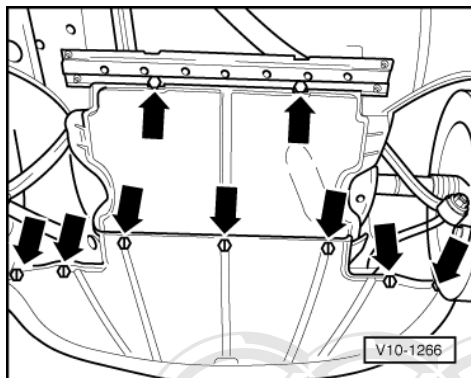
Component	Nm
Central bolt for left flange shaft	30

2.3 - Replacing right flange shaft sealing ring



Special tools and workshop equipment required

- ♦ Extractor lever VW 681
- ♦ Thrust piece 3236
- ♦ Press on piece 3244
- ♦ Thrust piece 3323
- ♦ 2 - Kukko 18/1 Puller
- ♦ Container



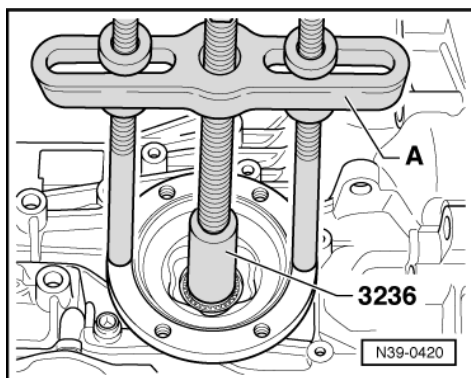
Removing

- Gearbox installed
- Loosen drive shaft/wheel hub nut when vehicle is still standing on its own wheels, at first by 90°.
- Remove the front right wheel.
- -> Diesel-Engine: Unscrew noise insulation on side and beneath gearbox.
- Unbolt the heat shield for the right drive shaft.
- Removing right drive shaft

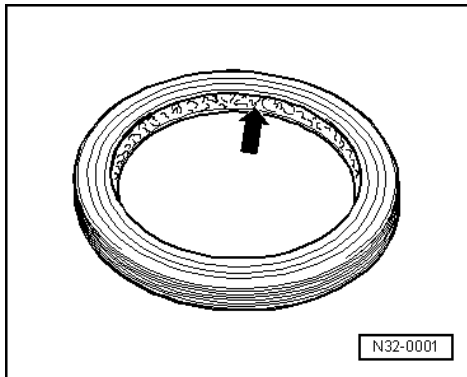
=> Running Gear, Front and Four-wheel Drive; Repair group 40; Servicing drive shafts Servicing drive shafts

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- Pierce sealing cap in drive flange with a screwdriver and lever out.
- Lever off circlip.
- Place container under the gearbox.



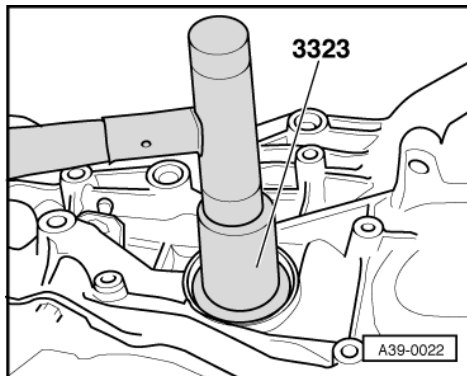
- -> Remove drive flange with press piece 3236 and two-arm puller Kukko 18/1 -A-.
- Pull out flange shaft sealing ring with VW 681.



Installing

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

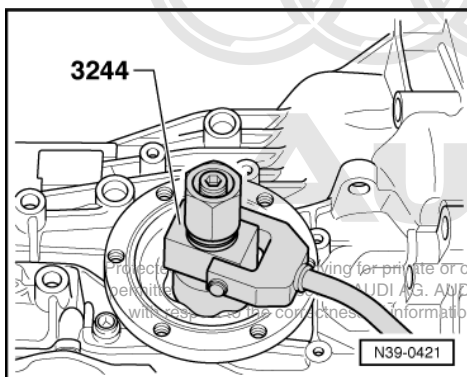
- Coat outer circumference of sealing ring with gear oil.
- -> Pack the space between sealing and dust lips -arrow- half-full with sealing grease G 052 128 A1.



Note:

Sealing ring must be seated in housing at uniform depth all round.

- -> Drive in new sealing ring to stop; for this purpose, do not cant sealing ring.
- Installation position: The open side of the sealing ring faces toward the gearbox.



- -> Pull in drive flange.
- Fit new circlip.
- Drive new sealing cap into drive flange using 30 mm wrench socket.



- Install right drive shaft

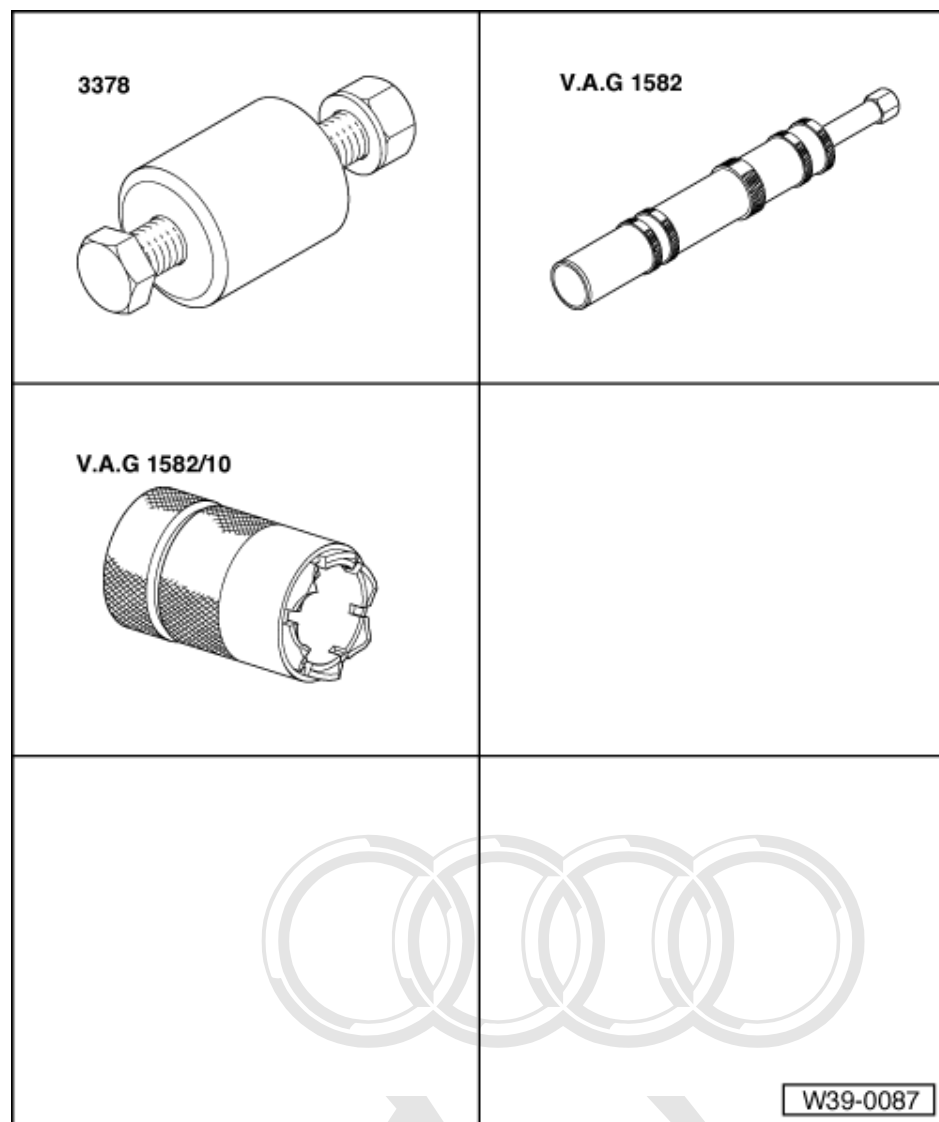
=> Running Gear, Front and Four-wheel Drive; Repair group 40; Servicing drive shafts Servicing drive shafts

- Check oil level in the final drive of the automatic gearbox => Page 194

Tightening torque

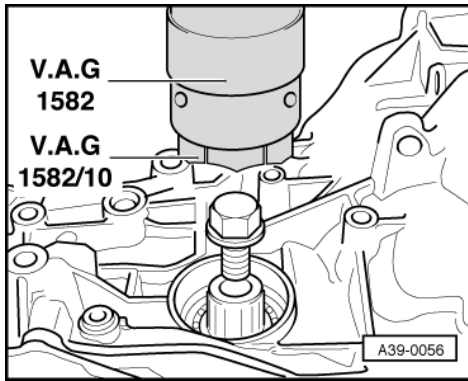
Component	Nm
Heat shield for drive shaft to gearbox	25

2.4 - Removing and installing grooved ball bearing for output shaft of drive flange



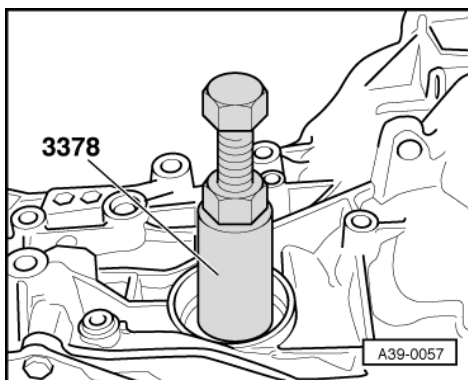
Special tools and workshop equipment required

- ♦ Insertion sleeve 3378
- ♦ Taper roller bearing puller V.A.G 1582
- ♦ Clamping piece V.A.G 1582/10



Removing

- Differential is installed.
- Remove right-hand drive flange sealing ring => Page 198
- Lever out circlip for grooved ball bearing.
- -> Insert M12 x 20 hexagon bolt with washer in drive flange output shaft hole.
- Tension claws of grip piece V.A.G 1582/10 between balls on grooved ball bearing inner race.
- Pull out grooved ball bearing with puller V.A.G 1582.



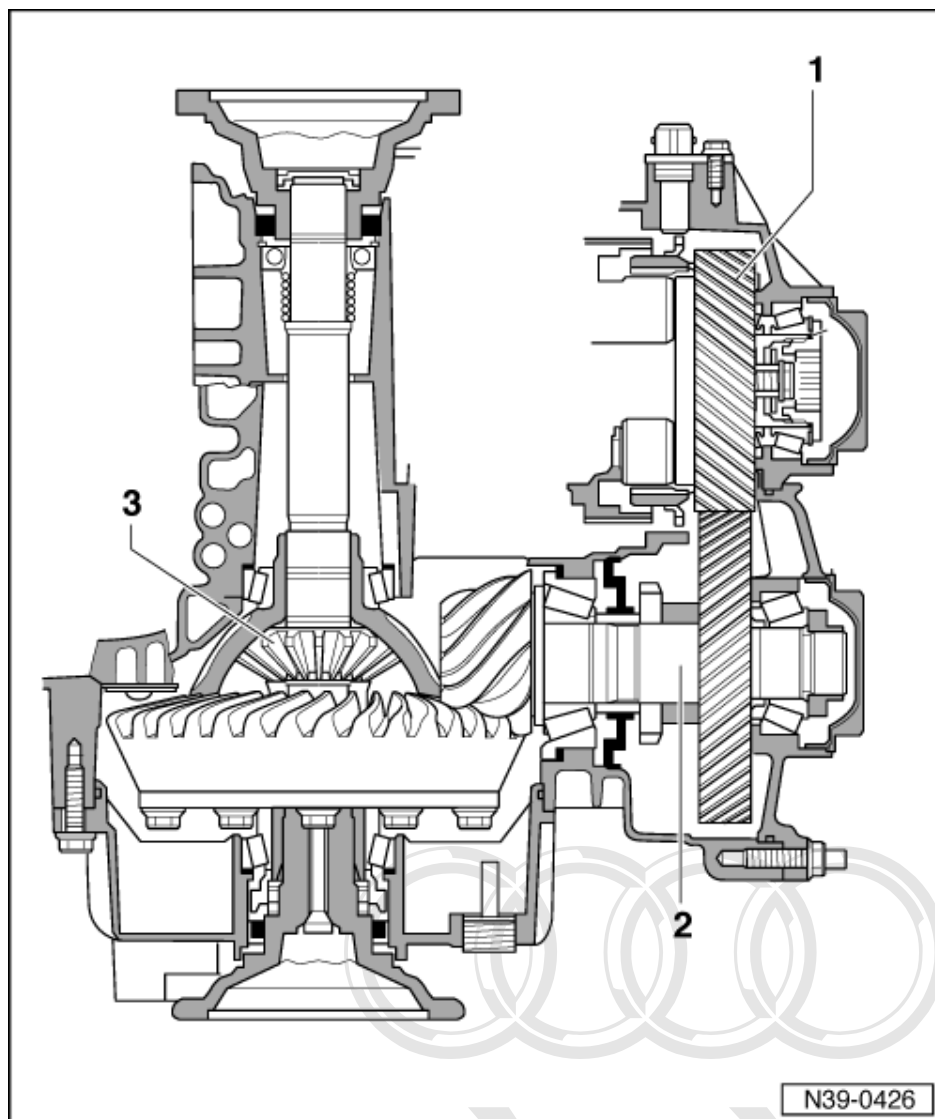
Installing

- -> Pull in grooved ball bearing together with tapered ring and spring.
- Insert circlip for grooved ball bearing.
- Drive in right-hand drive flange sealing ring => Page 199

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3 - Dismantling and assembling final drive

3.1 - Dismantling and assembling final drive



3.2 - Repair overview of final drive

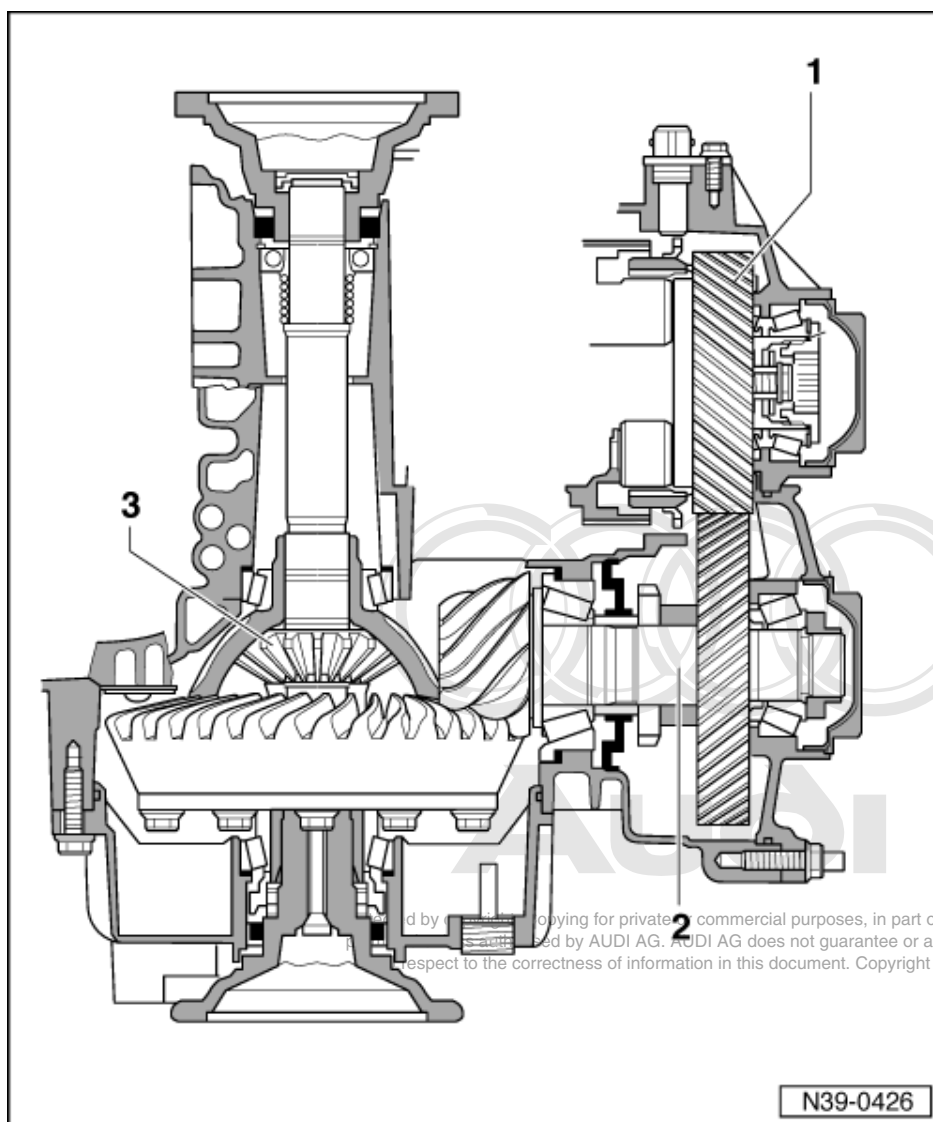
1 Input gear

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- ◆ Removing and installing=>Page 203
- ◆ Adjusting => Page 242
- ◆ Adjusting final drive (overview) => Page 239
- ◆ Repairs on the input gear can only be performed after the individual components of the planetary gearbox have been removed.

2 Drive pinion

- ◆ Removing and installing=>Page 211
- ◆ Adjusting drive pinion and crown wheel => Page 244
- ◆ Adjusting final drive (overview) => Page 239



3 Differential

- ◆ Removing and installing => Page 223
- ◆ Dismantling and assembling => Page 228
- ◆ Adjusting drive pinion and crown wheel => Page 244
- ◆ Adjusting final drive (overview) => Page 239

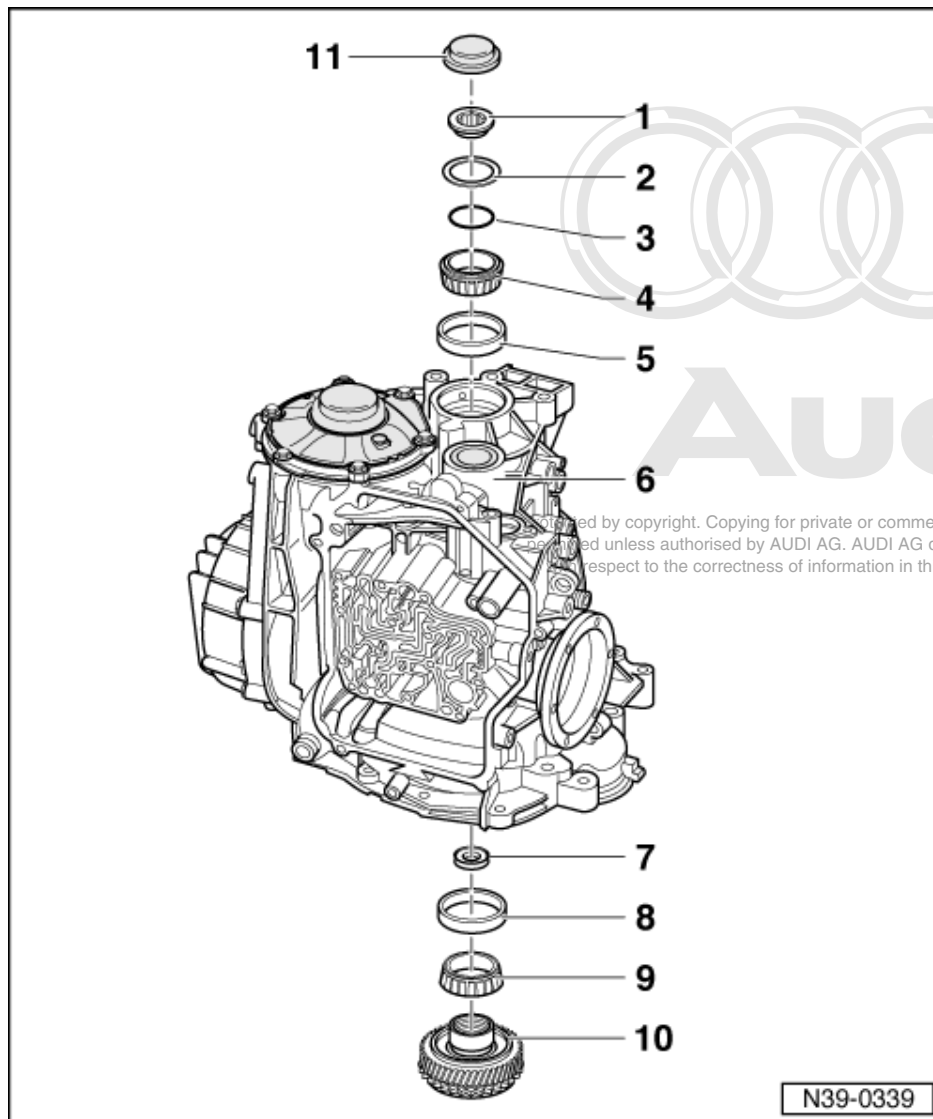
3.3 - Removing and installing input gear

Notes:

- ◆ The input gear can only be removed once the planetary gearbox has been removed => Page 77
- ◆ If taper roller bearings are not renewed, set to previously measured friction torque again.
- ◆ The drive pinion and differential do not need to be removed in order to remove input gear.
- ◆ Always replace input gear and output gear together.
- ◆ After replacing the taper roller bearings, the input gear, planet carrier and clutch play between -K1- and -K2- must be adjusted. => Page 127
- ◆ After replacing input gear (together with output gear), the input gear, "S4" shim, drive pinion, planet carrier and clutch play between -K1- and -K2- must be adjusted => Page 127
- ◆ Always replace the taper roller bearings on one shaft together and use new bearings from a single manufacturer.



- ♦ Do not interchange inner or outer races of bearings of the same size.



1 Socket head fastener - 250 Nm

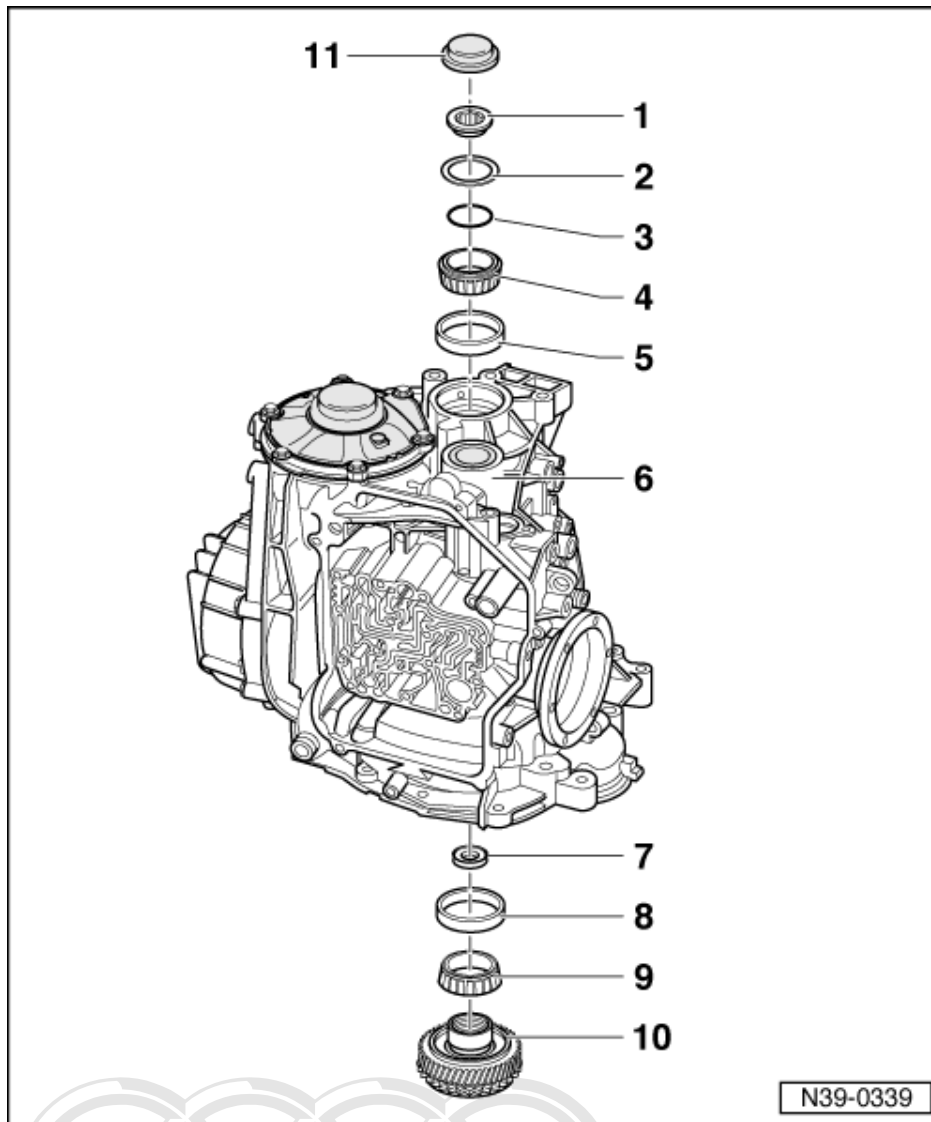
- ♦ Engage parking lock to remove and install
- ♦ Removing and installing=> Fig. 210
- ♦ Before installing socket head fastener insert axial needle bearing (Item 7)

2 Dished washer

- ♦ Installation position: Convex side faces toward socket head fastener

3 Shim

- ♦ Determining thickness => Adjusting input gear, Page 242



4 Taper roller bearing inner race

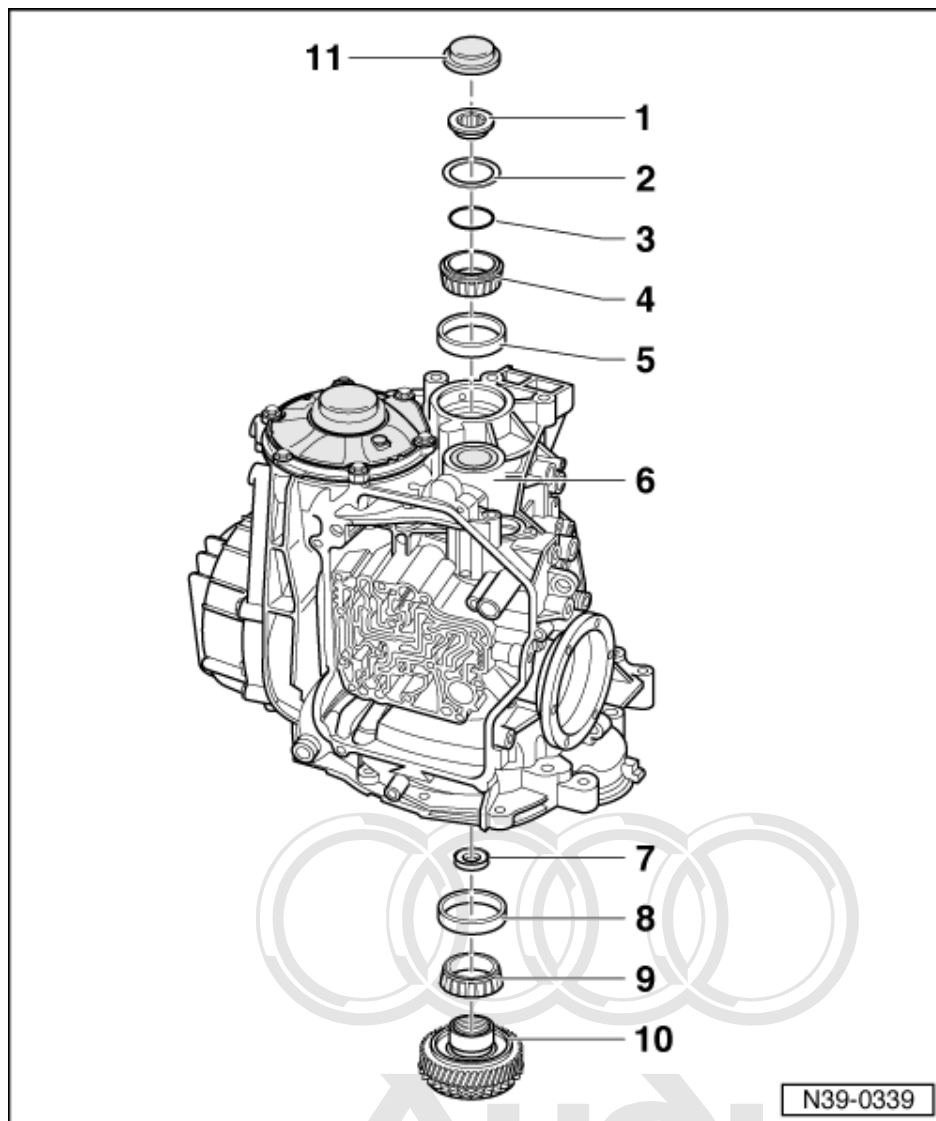
- ◆ With roller cage
- ◆ Remove together with input gear -Item 10 -
- ◆ Determine thickness of shim item 3 apply locking compound AMV 185 101 A1 to taper roller bearing.
- ◆ To install, drive several millimetres onto input gear -Item 10 -, then pull down with socket head fastener -Item 1 -

5 Taper roller bearing outer race

- ◆ Drive out with drift
- ◆ Insert with locking compound AMV 185 101 A1
- ◆ Drive in with 30-205

6 Gearbox housing

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7 Axial needle bearing

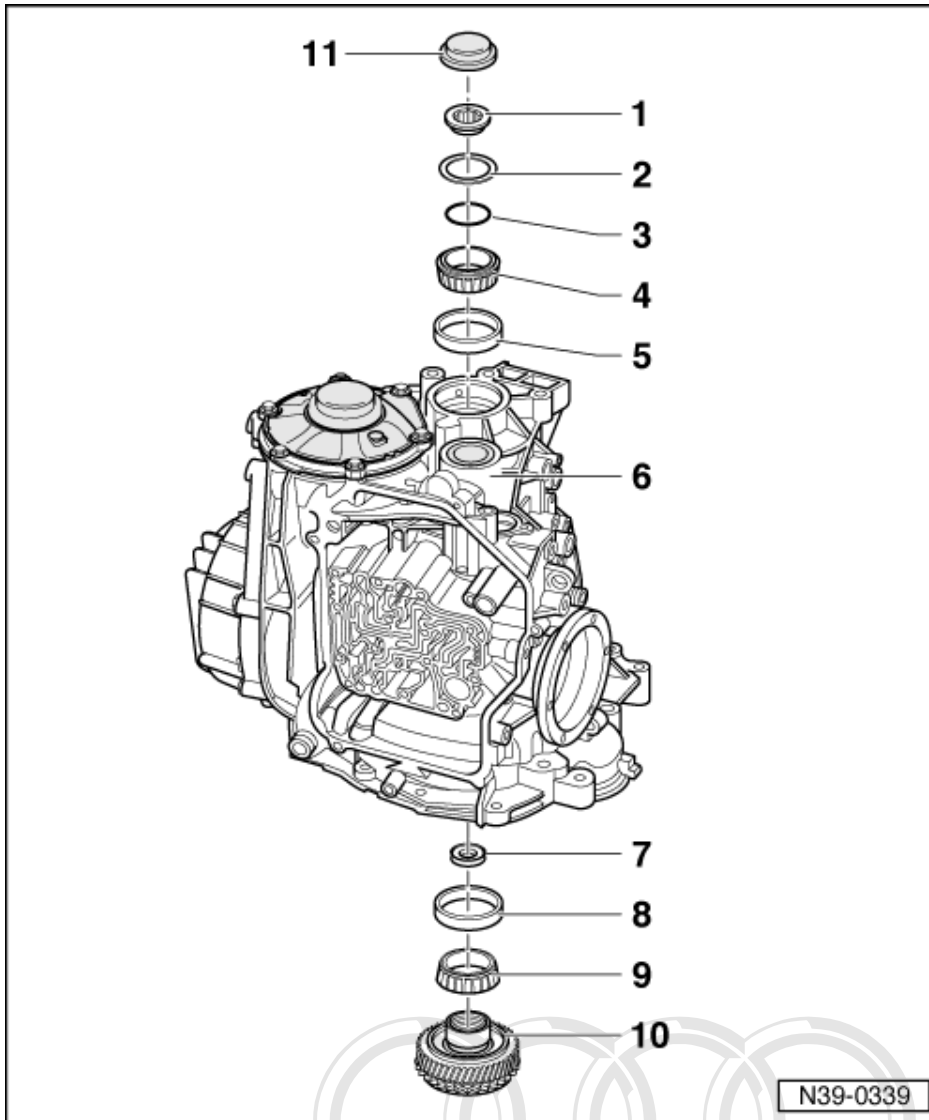
- ◆ Insert into input gear before installing socket head fastener -Item **1** -
- ◆ Installation position: Flat side faces toward input gear

8 Taper roller bearing outer race

- ◆ Drive out with drift
- ◆ Insert with locking compound AMV 185 101 A1
- ◆ Drive in with 30-205 and appropriately long drift

9 Taper roller bearing inner race

- ◆ With roller cage
- ◆ Pulling off=> Fig. **210**
- ◆ Insert with locking compound AMV 185 101 A1
- ◆ Pressing on=> Fig. **211**



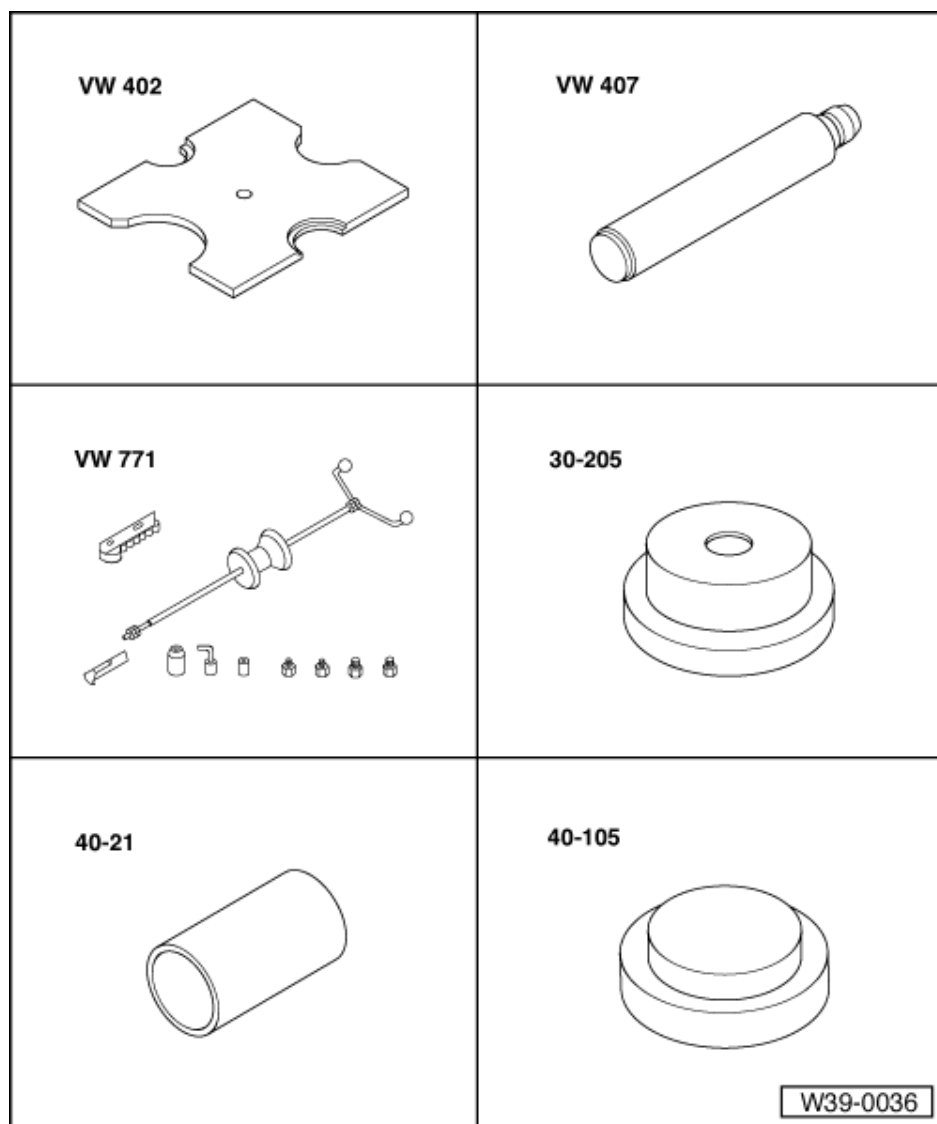
10 Input gear

- ◆ With impulse wheel for road speed sender -G68
- ◆ Removing => Fig. 211
- ◆ Number of teeth => from Page 2
- ◆ Adjusting => Page 242
- ◆ If signs of damage exist, always replace input gear and output gear together
- ◆ If input gear is renewed, adjust planet carrier => Page 116

11 Cap

- ◆ Driving out => Fig. 210
- ◆ Installing => Fig. 211

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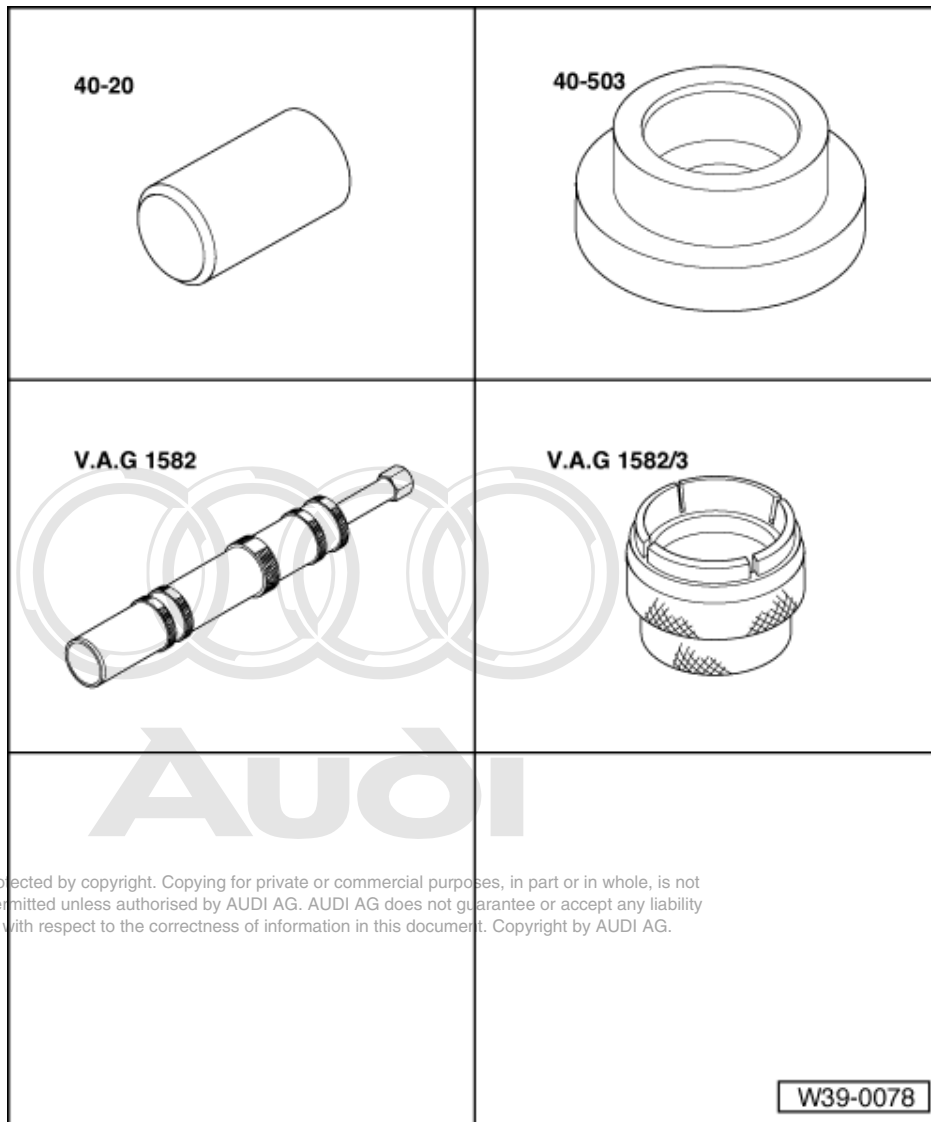


Special tools and workshop equipment required

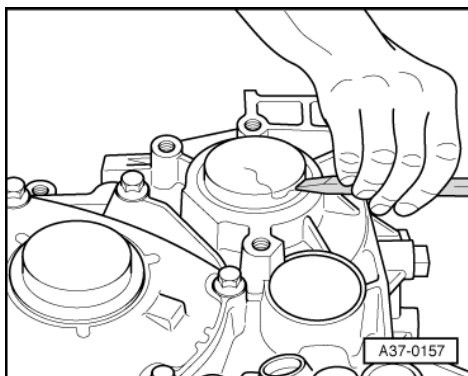
- ♦ Thrust plate VW 402
- ♦ Press tool VW 407
- ♦ Multipurpose tool VW 771
- ♦ Thrust plate 30-205
- ♦ Sleeve 40-21
- ♦ Thrust plate 40-105



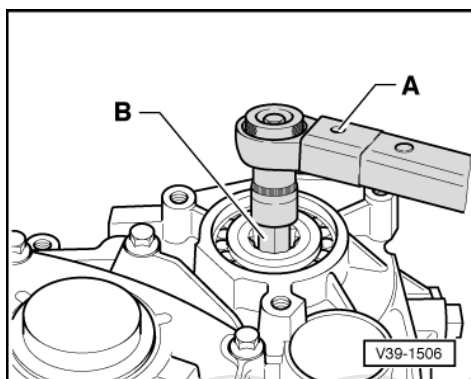
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- ◆ Sleeve 40-20
- ◆ Press tool 40-503
- ◆ Taper roller bearing puller V.A.G 1582
- ◆ Clamping piece V.A.G 1582/3



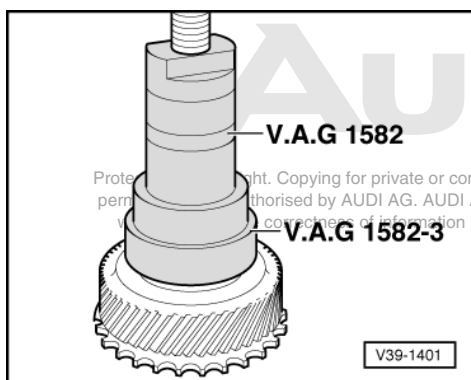
-> Fig.1 Driving off cover



-> Fig.2 Removing and installing socket head fastener

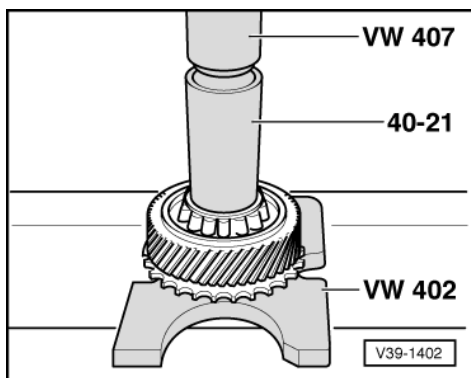
- A - Torque wrench
- B - Socket, A/F 22

- Engage parking lock to loosen and tighten.



-> Fig.3 Detaching inner race for taper roller bearing

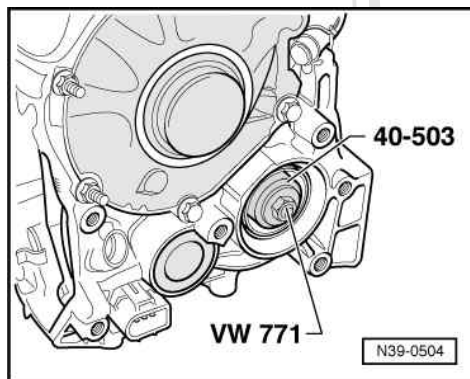
- Place thrust piece on input gear.



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

Note:

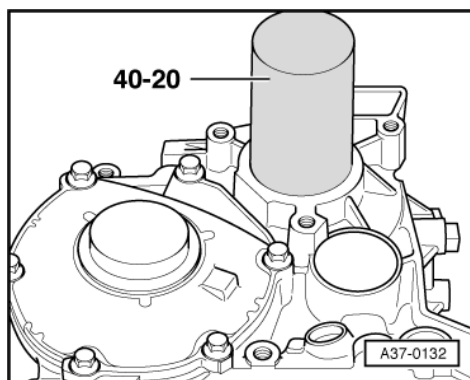
A thrust piece must be placed below the hub of the input gear to avoid damaging the input gear.



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-> Fig.5 Removing input gear

- Fit thrust tool 40-503 with shoulder in threaded hole of input gear.
- Join thrust tool with VW 771 through hole of input gear.
- Drive out input gear carefully.



-> Fig.6 Driving in sealing cap

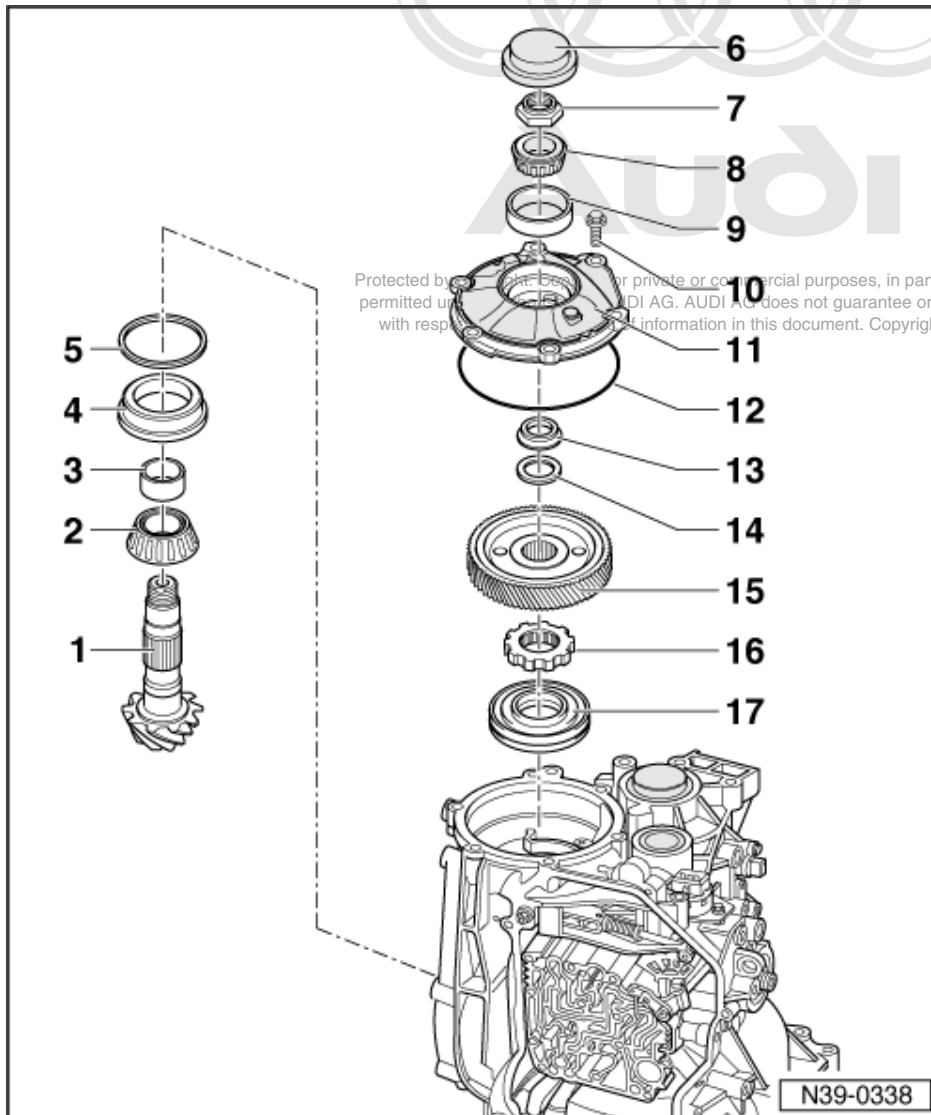
3.4 - Removing and installing drive pinion

Notes:

- ◆ Drive pinion and crown wheel may only be replaced together.
- ◆ If the drive pinion cover, spacer tube, input gear or parking lock gear are renewed, re-determine thickness of shim "S4" for the drive pinion => Page 250
- ◆ If the taper roller bearings or the bush for the drive pinion are renewed, re-determine thickness of shims "S3" and "S4" for the drive pinion => Page 250
- ◆ If the drive pinion (with crown wheel) is replaced, re-determine thickness of shims "S3" and "S4" and shims "S1" and "S2" (for final drive) => Page 257
- ◆ Taper roller bearings fitted to one shaft must be replaced as a set.
- ◆ The O-ring -Item 215 can be replaced with the gearbox installed. Remove gearbox for other repair work.
- ◆ Insert seal for drive pinion -Item 216 in dry condition. Do not grease sealing lips.



- ♦ Adjustments are required when replacing components marked 1) => Adjustment overview, Page 242



1 Drive pinion 1)

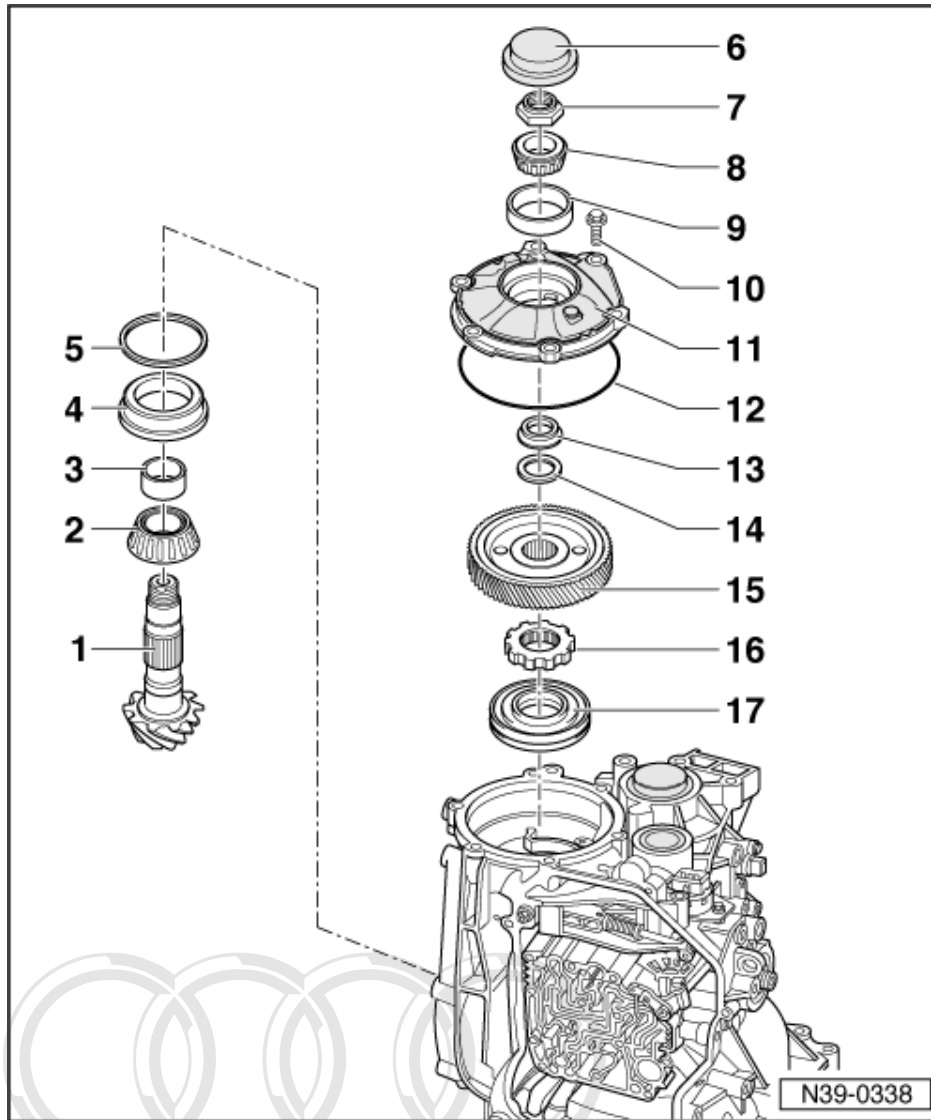
- ♦ To remove differential=>Page 223
- ♦ Is mated to crown wheel. Renew complete drive set if damaged.
- ♦ Number of teeth => from Page 2
- ♦ Adjusting drive pinion and crown wheel => Page 244
- ♦ Install=> Fig. 220

2 Inner race for small taper roller bearing 1)

- ♦ With roller cage
- ♦ Pulling off=> Fig. 220
- ♦ Pressing on=> Fig. 220

3 Bush for drive pinion 1)

- ♦ Pulling off=> Fig. 220
- ♦ Pressing on=> Fig. 220



4 Outer race for large taper roller bearing 1)

- ◆ Drive out with 3138
- ◆ Pulling in=> Fig. 220

5 Shim "S3"

- ◆ Note thickness
- ◆ Adjustment overview=>Page 242

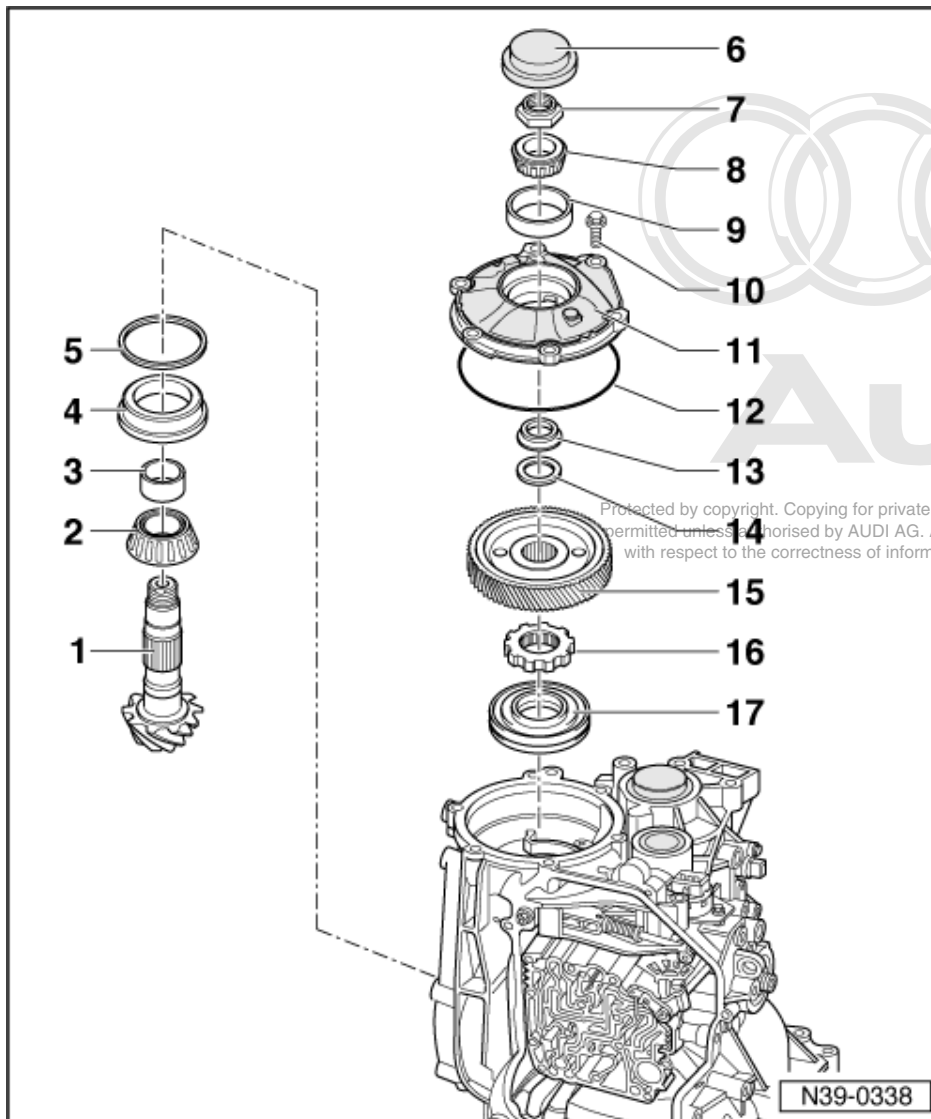
6 Cap

- ◆ Driving out=> Fig. 222
- ◆ Installing=> Fig. 222

7 Hexagon nut

- ◆ Replace
- ◆ Engage parking lock to loosen and tighten
- ◆ Tightening torque => Adjusting drive pinion, Page 250
- ◆ Peening => Fig. 222

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8 Inner race for small taper roller bearing 1)

- ♦ With roller cage

9 Outer race for large taper roller bearing 1)

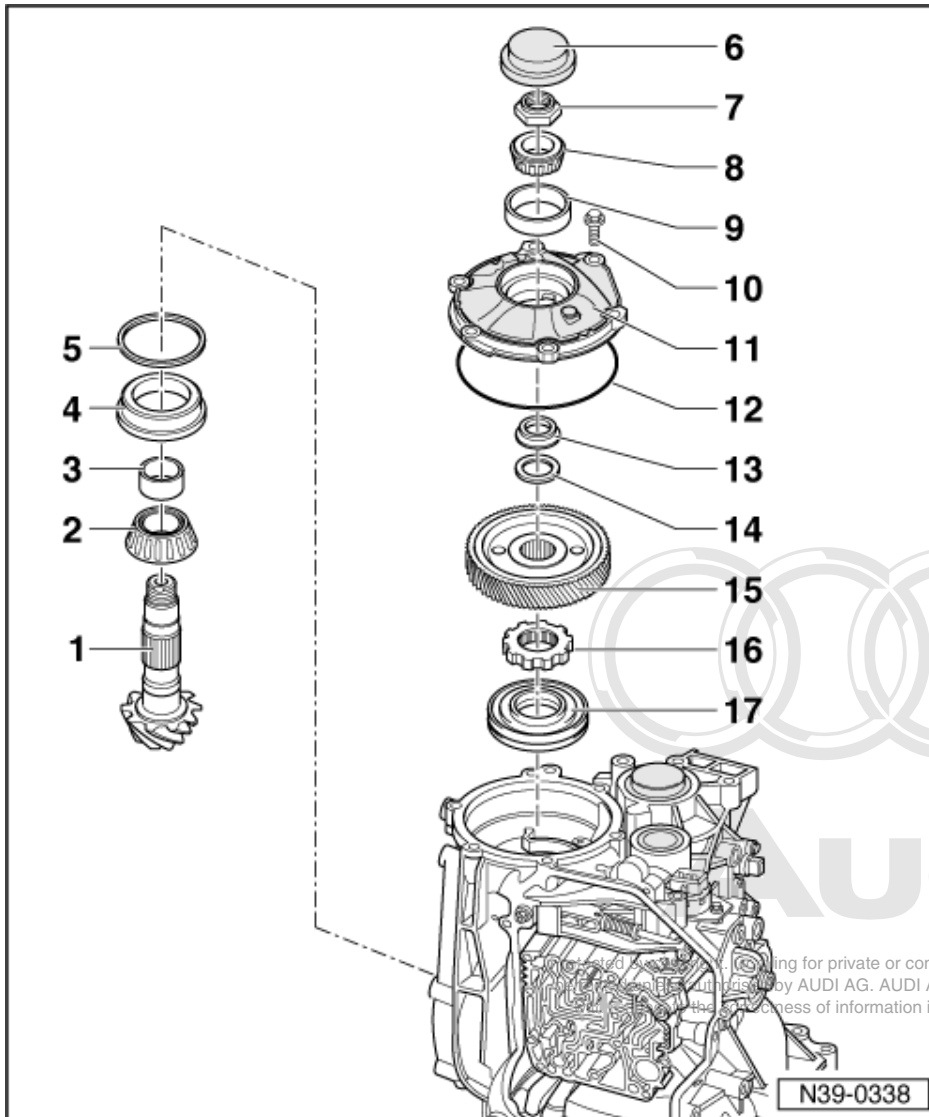
- ♦ Drive out with drift
- ♦ Pressing in=> Fig. 221

10 Bolt - 25 Nm

- ♦ Install with sealant AMV 188 200 03
- ♦ Tighten in stages and diagonally

11 Cover for drive pinion 1)

- ♦ To remove with gearbox installed unbolt retainer for connectors. Also remove rear gearbox support => Page 57



12 O-ring

- ◆ Replace
- ◆ Can be replaced without removing gearbox

13 Spacer tube 1)

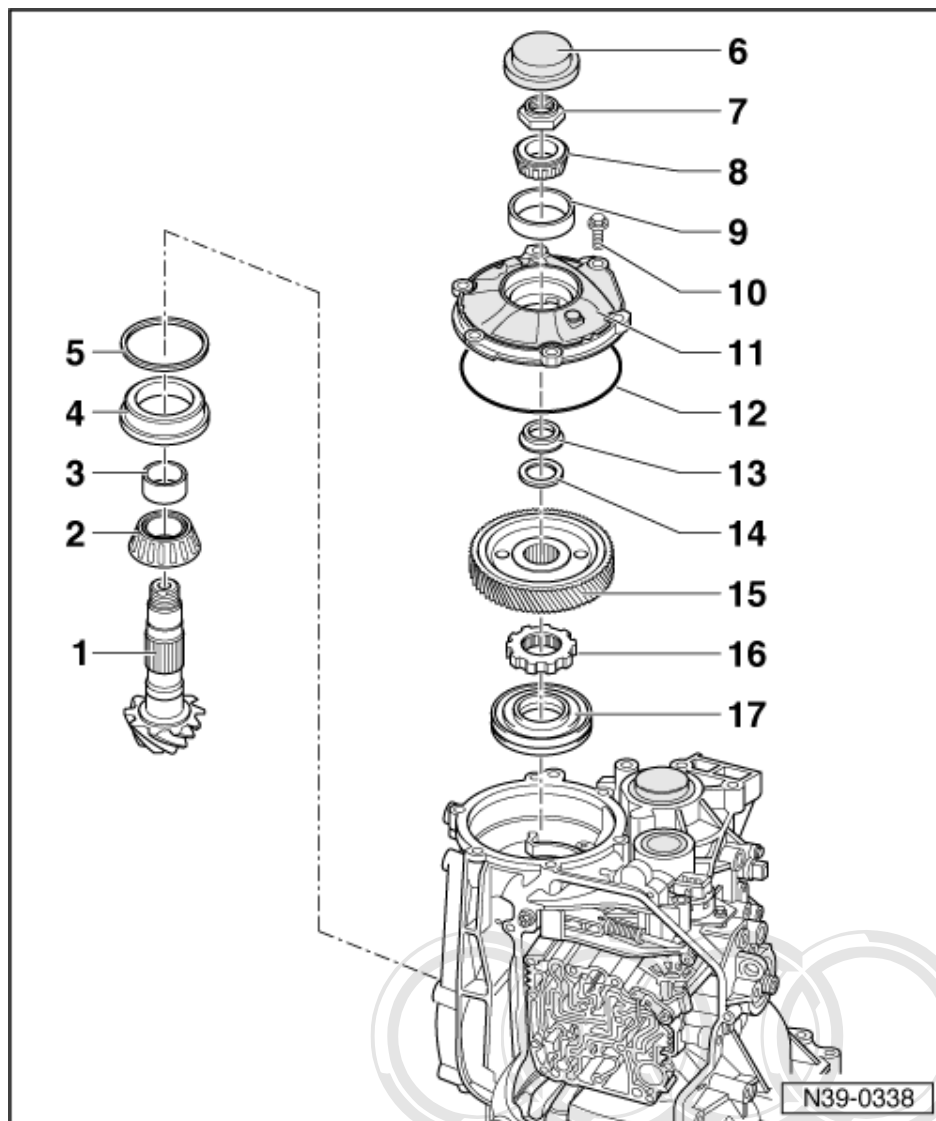
- ◆ Installation position: Wider contact surface faces output wheel.

14 Shim "S4"

- ◆ Note thickness
- ◆ Adjustment overview=>Page 242

15 Output gear 1)

- ◆ Number of teeth =>from Page 2
- ◆ Pulling off=> Fig. 221
- ◆ Install heated
- ◆ If signs of damage exist, always replace input gear and output gear together
- ◆ Installation position: Raised collar faces towards parking lock gear



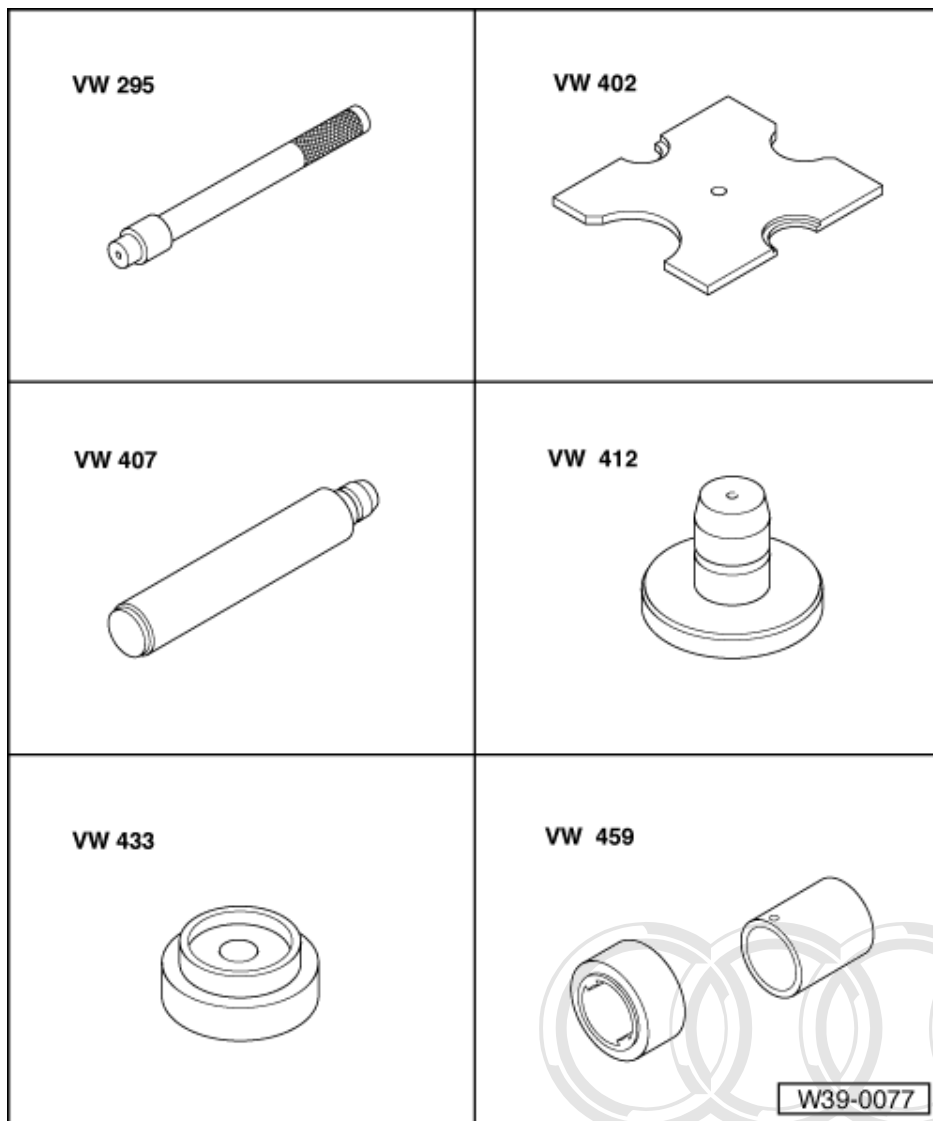
16 Parking lock gear 1)

- ◆ Installation position: The rounded end faces toward output gear

17 Sealing ring for drive pinion

- ◆ Drive out with drift
- ◆ Replace
- ◆ Install dry
- ◆ Do not oil or grease sealing lips
- ◆ Installing=> Fig. 221

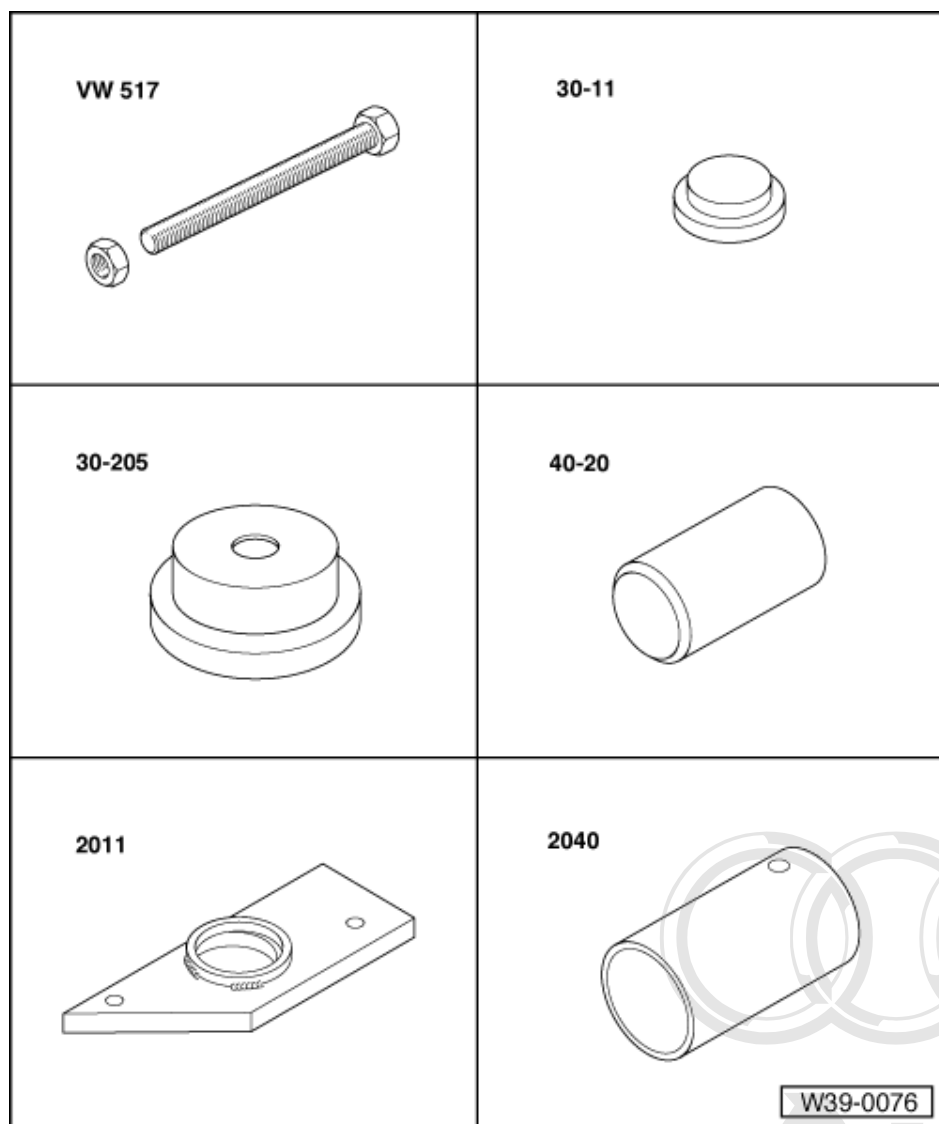
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Special tools and workshop equipment required

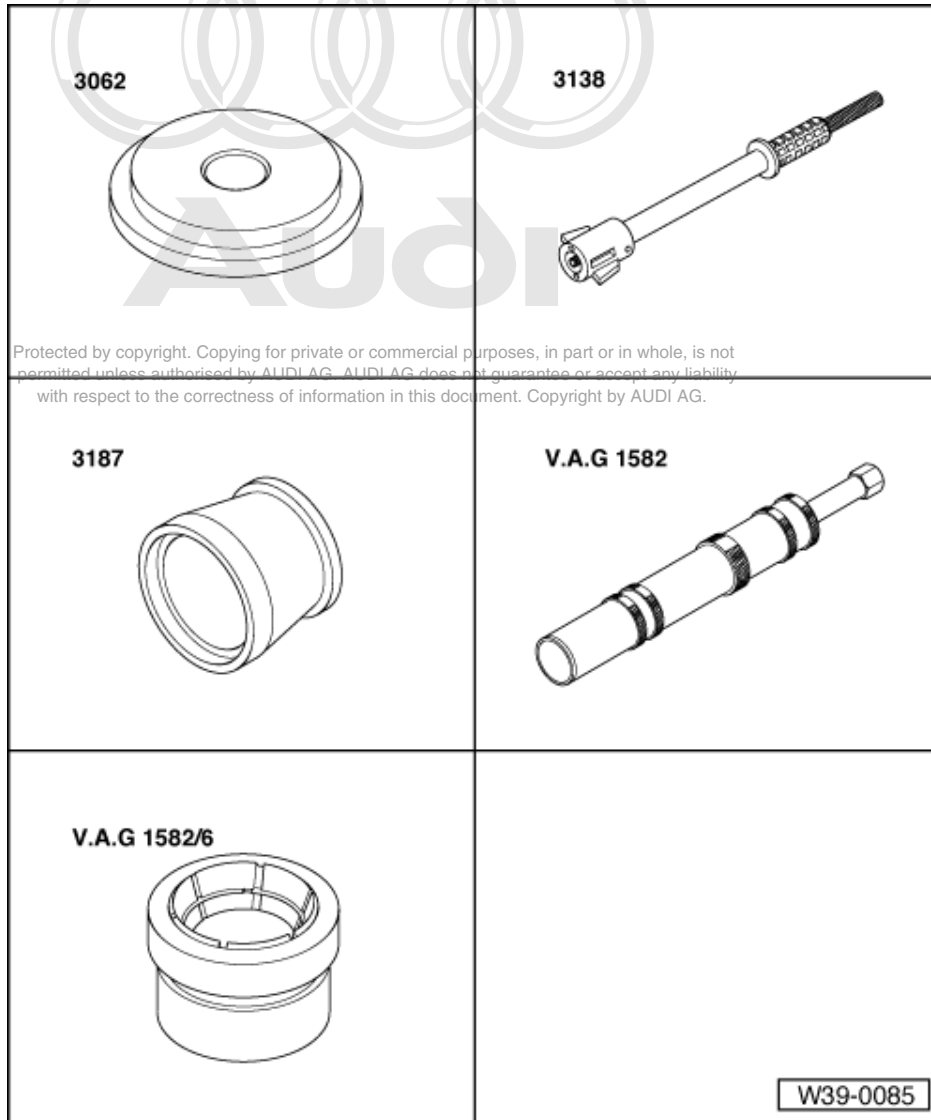
- ◆ Drift VW 295
- ◆ Thrust plate VW 402
- ◆ Press tool VW 407
- ◆ Press tool VW 412
- ◆ Thrust piece VW 433
- ◆ Installation and removal tool VW 459

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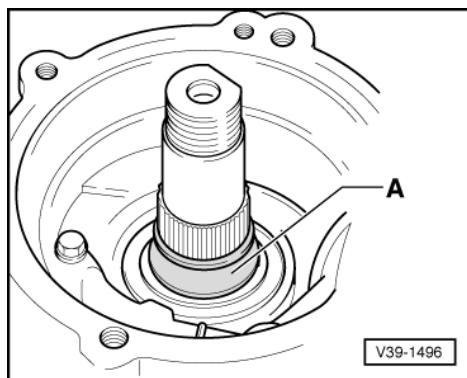


- ◆ Threaded stem VW 517
- ◆ Thrust plate 30-11
- ◆ Thrust plate 30-205
- ◆ Sleeve 40-20
- ◆ Support bridge 2011
- ◆ Tube 2040

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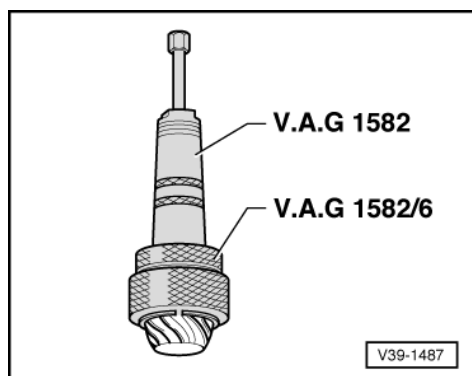
- ◆ Thrust pad 3062
- ◆ Drift 3138
- ◆ Assembly sleeve 3187
- ◆ Taper roller bearing puller V.A.G 1582
- ◆ Clamping piece V.A.G 1582/6



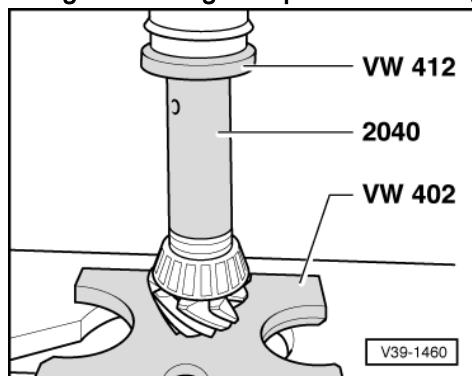
-> Fig.1 Inserting drive pinion

Use assembly sleeve 3187 when inserting drive pinion to avoid damaging the sealing lips.

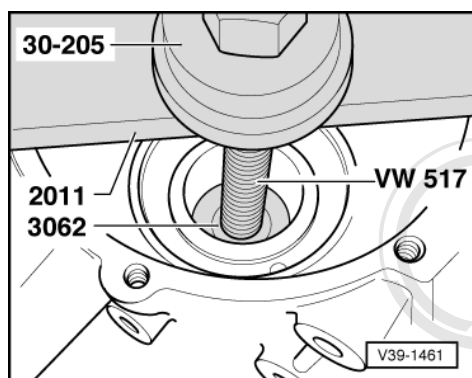
A - Assembly sleeve 3187



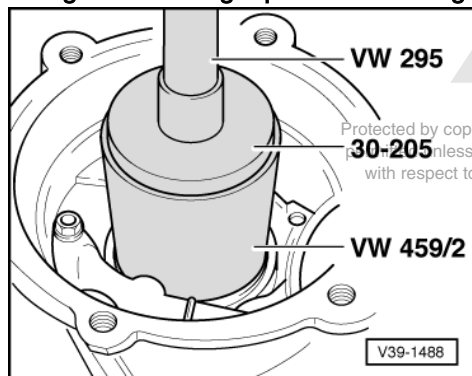
-> Fig.2 Pulling off taper roller bearing inner race with bush for drive pinion



-> Fig.3 Pressing on taper roller bearing inner race with bush for drive pinion



-> Fig.4 Drawing taper roller bearing outer race into gearbox housing



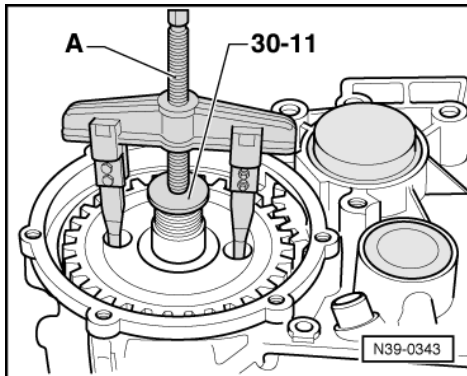
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-> Fig.5 Driving in sealing ring for drive pinion to stop

Note:

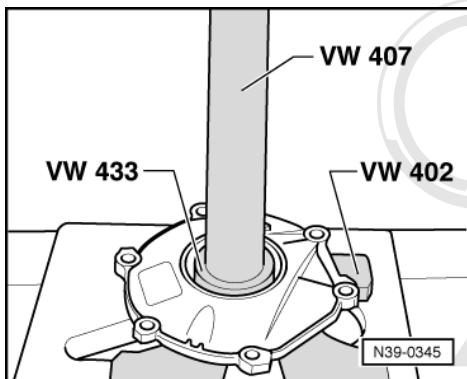
Install sealing ring dry; do not oil or grease sealing lips.

- Drive in sealing ring as far as stop.
- Installation position: Raised collar (inner) faces parking lock gear.



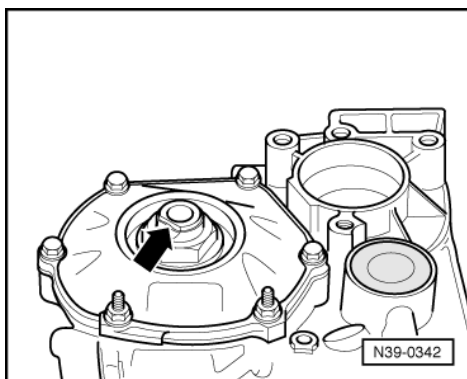
-> Fig.6 Pulling off output gear from drive pinion

A - Kukko 20-10 and pulling hook Matra V 172



-> Fig.7 Pressing in outer race for taper roller bearing

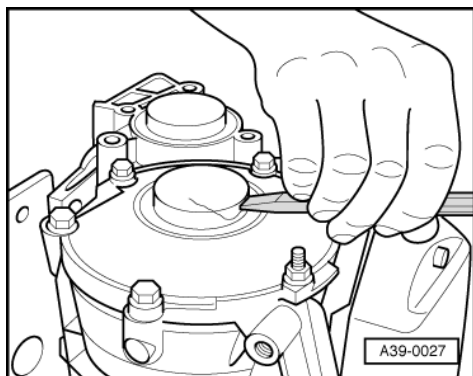
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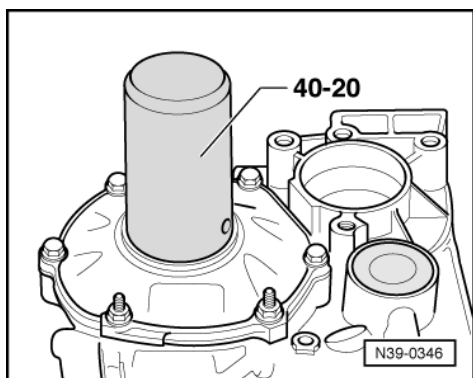
-> Fig.8 Peening hexagon nut

- Secure hexagon nut collar against flat face of drive pinion -arrow- using a drift.



-> Fig.9 Driving off cover

The cover is damaged when it is removed.



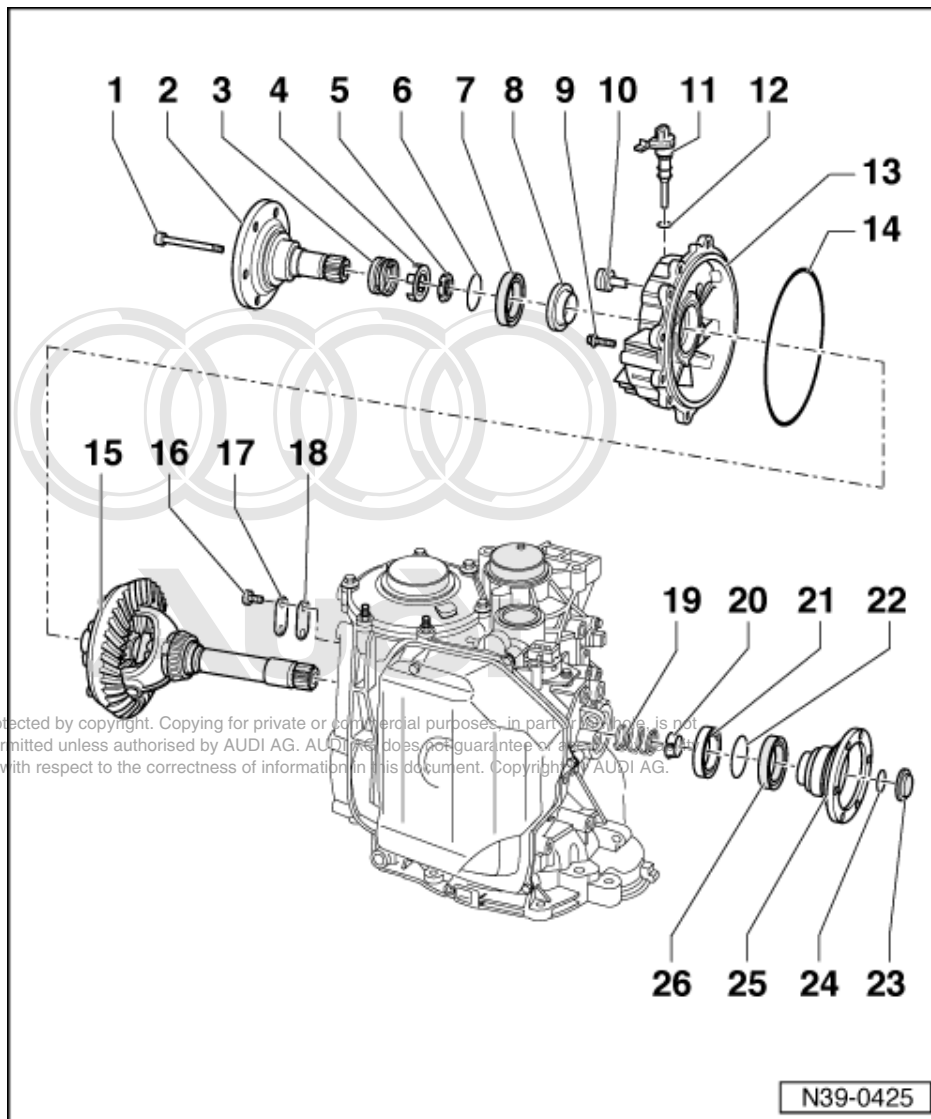
-> Fig.10 Driving in cover

- Drive in new cover with 40-20 as far as stop.



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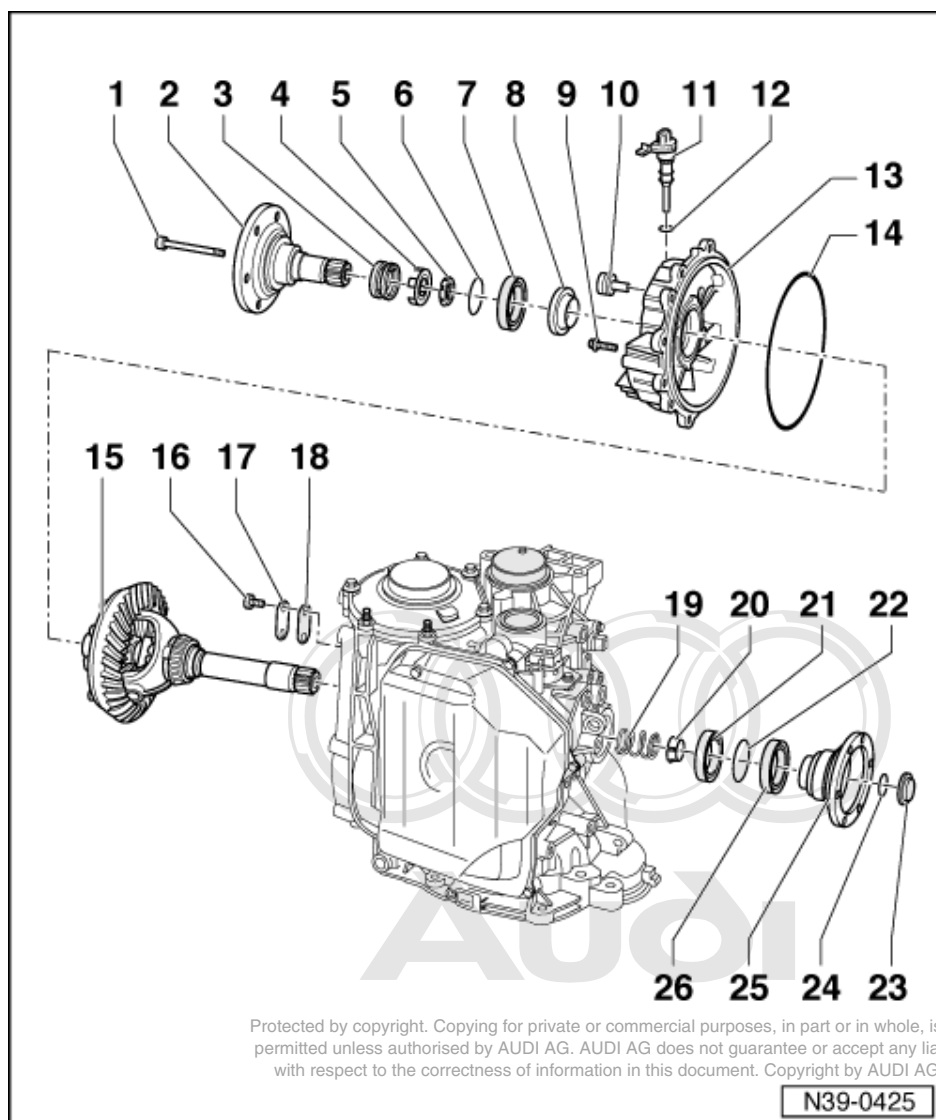
3.5 - Removing and installing differential



Notes:

- ◆ The drive pinion does not need to be removed in order to remove and install the differential.
- ◆ With the exception of the differential and the cover for axle breather, all the components shown in the illustration can be removed with the gearbox installed.

- 1 Bolt - 30 Nm
- 2 Flange shaft
 - ◆ Removing and installing => from Page 195
- 3 Spring
- 4 Thrust washer
 - ◆ Installation position:
Collar towards spring, tongue to tapered ring



5 Tapered ring

- ◆ With grooves to secure thrust washer
- ◆ Installation position: Taper towards differential housing

6 Circlip

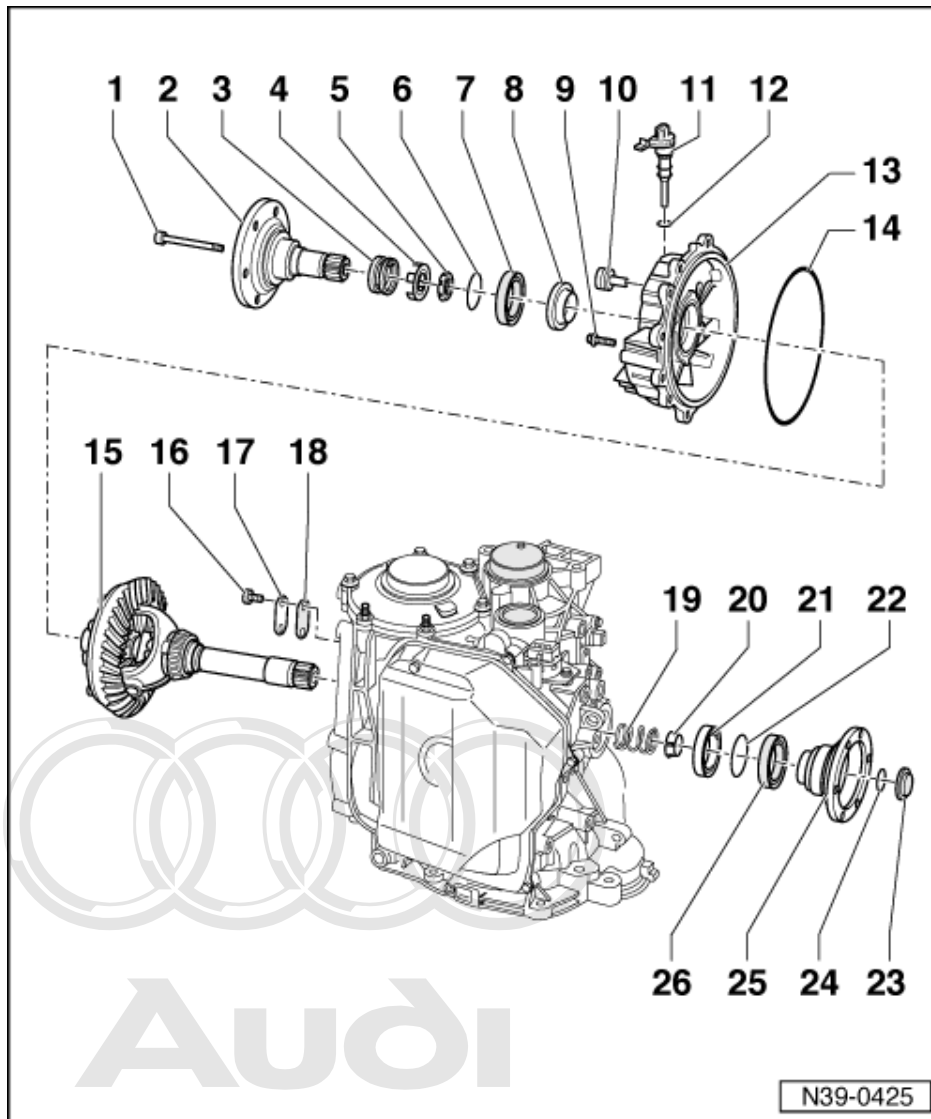
- ◆ Holds taper ring, thrust washer and spring in position when flange shaft is removed

7 Sealing ring for flange shaft

- ◆ Can be replaced without removing gearbox=>Page 195

8 Input gear

- ◆ For speedometer sender -G22
- ◆ Remove oil seal for flange shaft before removing and installing
- ◆ Installation position: Lugs on inner circumference face flange shaft, the taper faces differential gearbox.



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9 Bolt - 25 Nm

- ◆ Install with sealant AMV 188 200 03
- ◆ Tighten in stages and diagonally

10 Oil filler plug - 25 Nm

- ◆ Clean metal particles off magnet

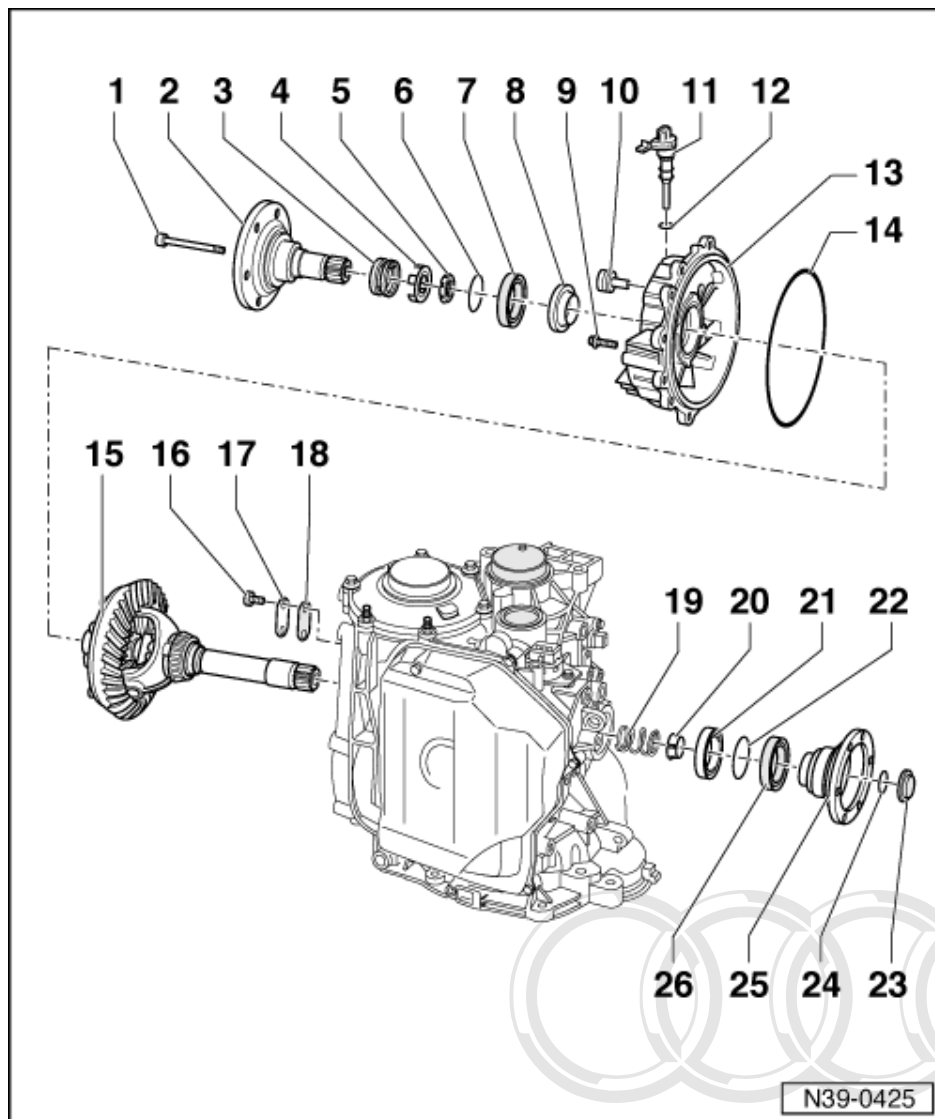
11 Speedometer sender -G22

12 O-ring

- ◆ Replace

13 Cover for differential

- ◆ When replacing redetermine shim "S1" for crown wheel => from Page 257
- ◆ To remove with gearbox installed remove input shaft, left flange shaft and left gearbox support => Page 57

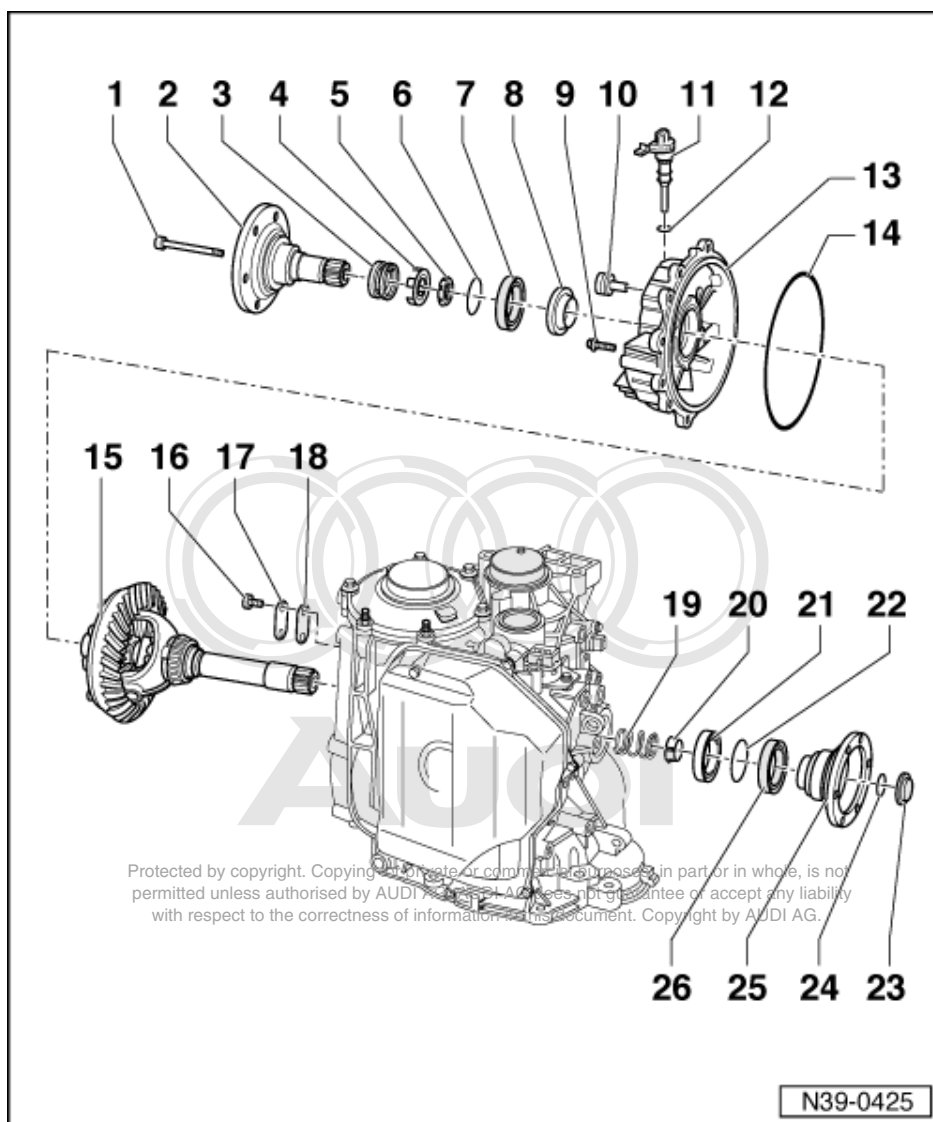


14 O-ring

- ◆ Replace
- ◆ Can be replaced without removing gearbox

15 Differential

- ◆ Remove with gearbox removed
- ◆ Remove cover for differential and right drive flange to remove differential
- ◆ Dismantling and assembling => Page 228
- ◆ The tapered ring has to be removed before installing
- ◆ Redetermine shims "S1", "S2" and also shims "S3" and "S4" (for drive pinion) after replacing differential



16 Bolt - 10 Nm

- ◆ Install with sealant AMV 188 200 03

17 Cover

- ◆ For axle breather

18 Seal

- ◆ Replace

19 Spring

- ◆ When differential is installed pull in together with grooved ball bearing -Item 201

20 Tapered ring

- ◆ Installation position: Stepped collar faces grooved ball bearing
- ◆ When differential is installed pull in together with grooved ball bearing and spring => Page 201



26 25 24 23

N39-0425

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and prise off

- ◆ Removing and installing => from Page 200
- ◆ Remove before removing the differential

Circlip

- ◆ Lever out with screwdriver

Sealing cap

- ◆ Replace
- ◆ To remove sealing cap pierce with screwdriver and prise off
- ◆ Drive in with socket attachment 30 mm A/F

Circlip

Drive flange

- ◆ Removing and installing => from Page 198

Oil seal for drive flange

- ◆ Removing and installing => from Page 198

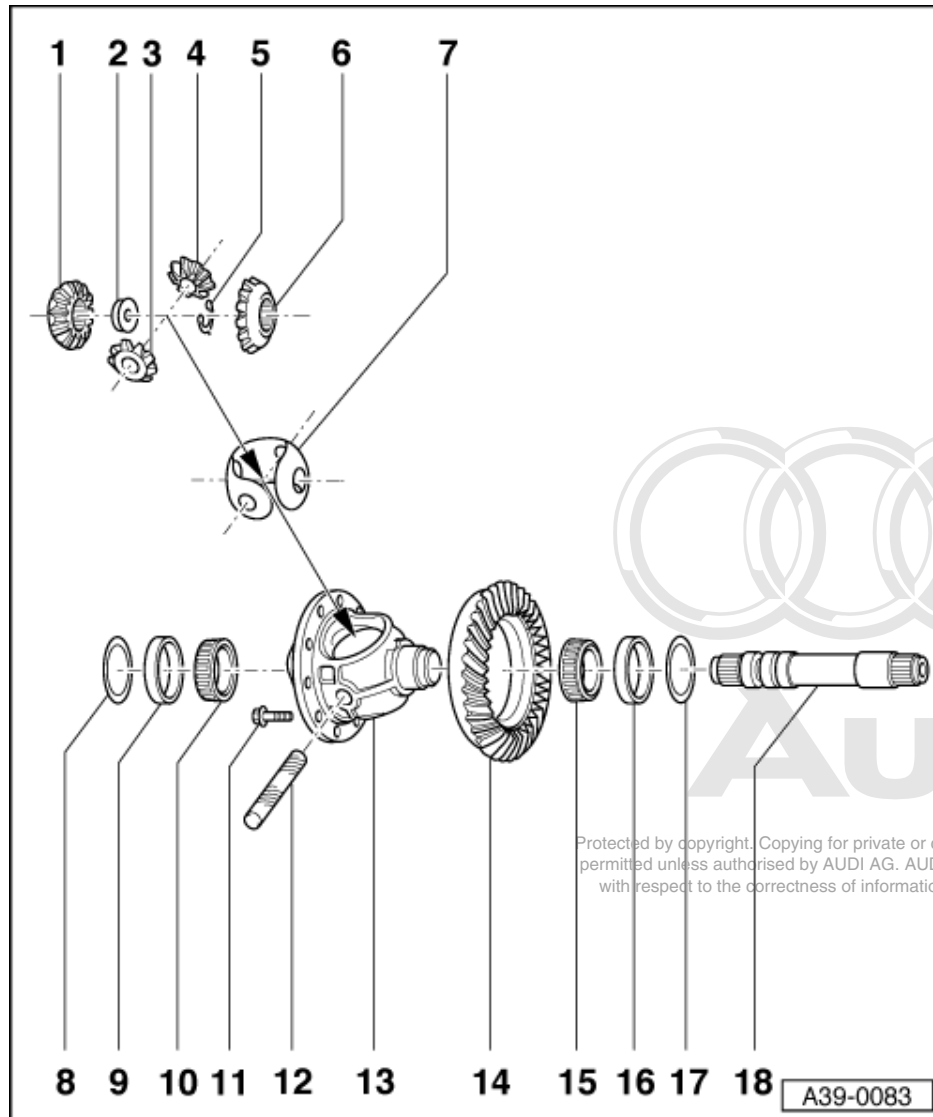
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3.6 - Dismantling and assembling differential

Notes:

- ◆ Crown wheel and drive pinion may only be replaced together.

- ♦ If the differential taper roller bearings, differential housing or differential cover are replaced, re-determine thickness of shims "S1" and "S2" for differential => Page 257
- ♦ After replacing the crown wheel (in conjunction with drive pinion), re-determine thickness of shims "S1" and "S2" and shims "S3" and "S4" (for drive pinion) => Page 250
- ♦ Always replace the taper roller bearings on one shaft together and use new bearings from a single manufacturer.
- ♦ Do not interchange inner or outer races of bearings of the same size.
- ♦ Adjustments are required when replacing components marked 1) => Adjustment overview, Page 242



1 Large bevel gear

- ♦ Removing and installing=> from Page 238

2 Threaded piece

- ♦ When installing, fit lugs in large bevel gear
- ♦ Insert before inserting shaft for bevel gears

3 Small bevel gear

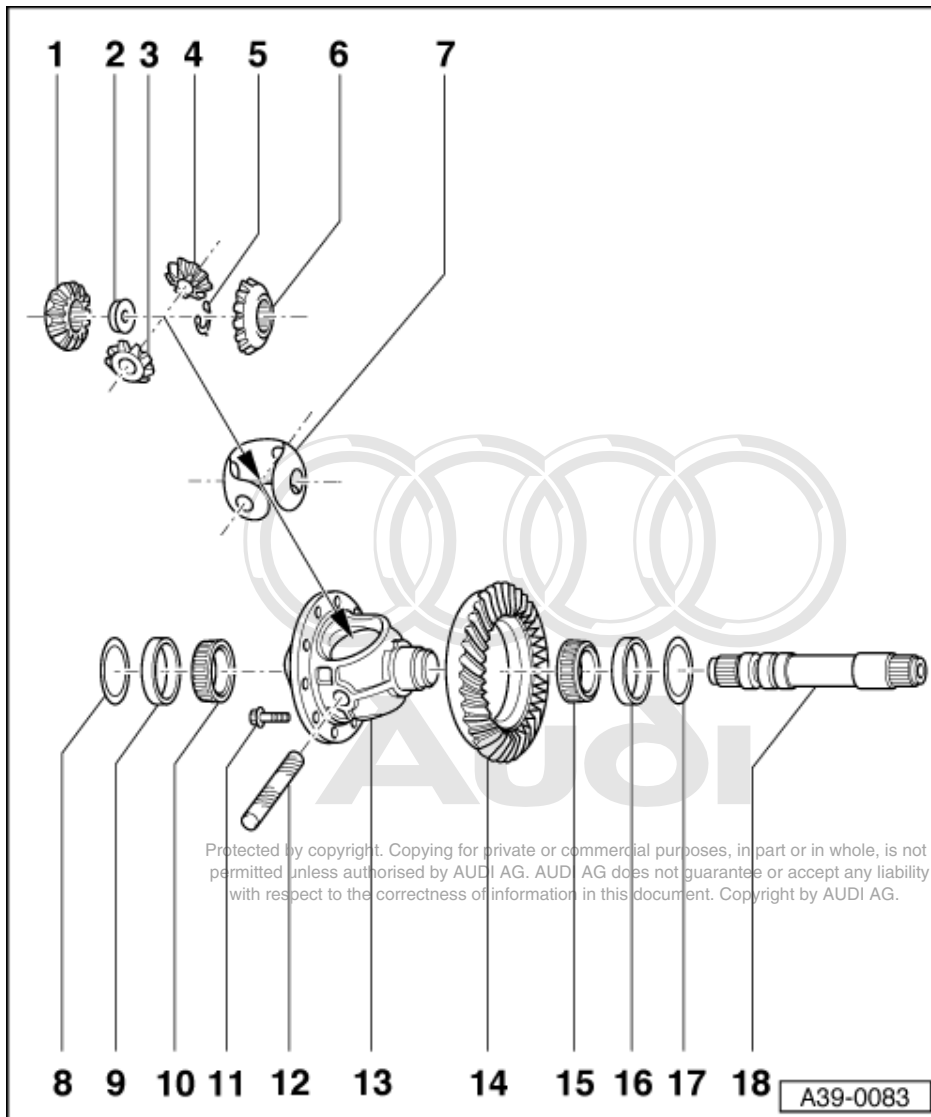
- ♦ Removing and installing=> from Page 238

4 Small bevel gear

- ♦ Removing and installing=> from Page 238

5 Circlip

- ♦ For output shaft -Item 18 -



6 Large bevel gear

- ◆ Removing and installing=> from Page 238

7 One-piece thrust washer

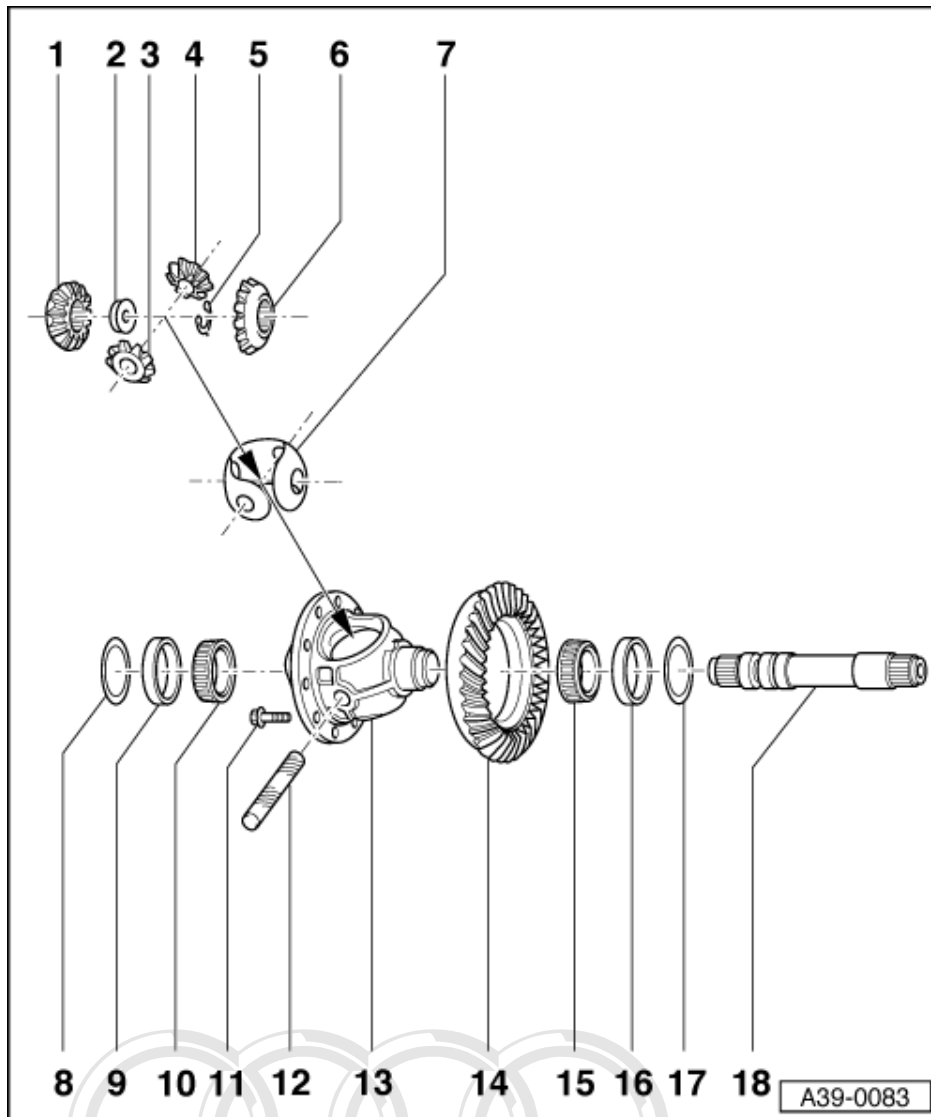
- ◆ Removing and installing=> from Page 238
- ◆ Lubricate with gear oil and insert in gearbox housing before installing bevel gears

8 Shim "S1"

- ◆ Note thickness
- ◆ Adjustment overview=>Page 242

9 Outer race for large taper roller bearing 1)

- ◆ Drive out with 3138
- ◆ Pressing in=> Fig. 236



10 Inner race for small taper roller bearing 1)

- ◆ With roller cage
- ◆ Pulling off=> Fig. 236
- ◆ Pressing on=> Fig. 236

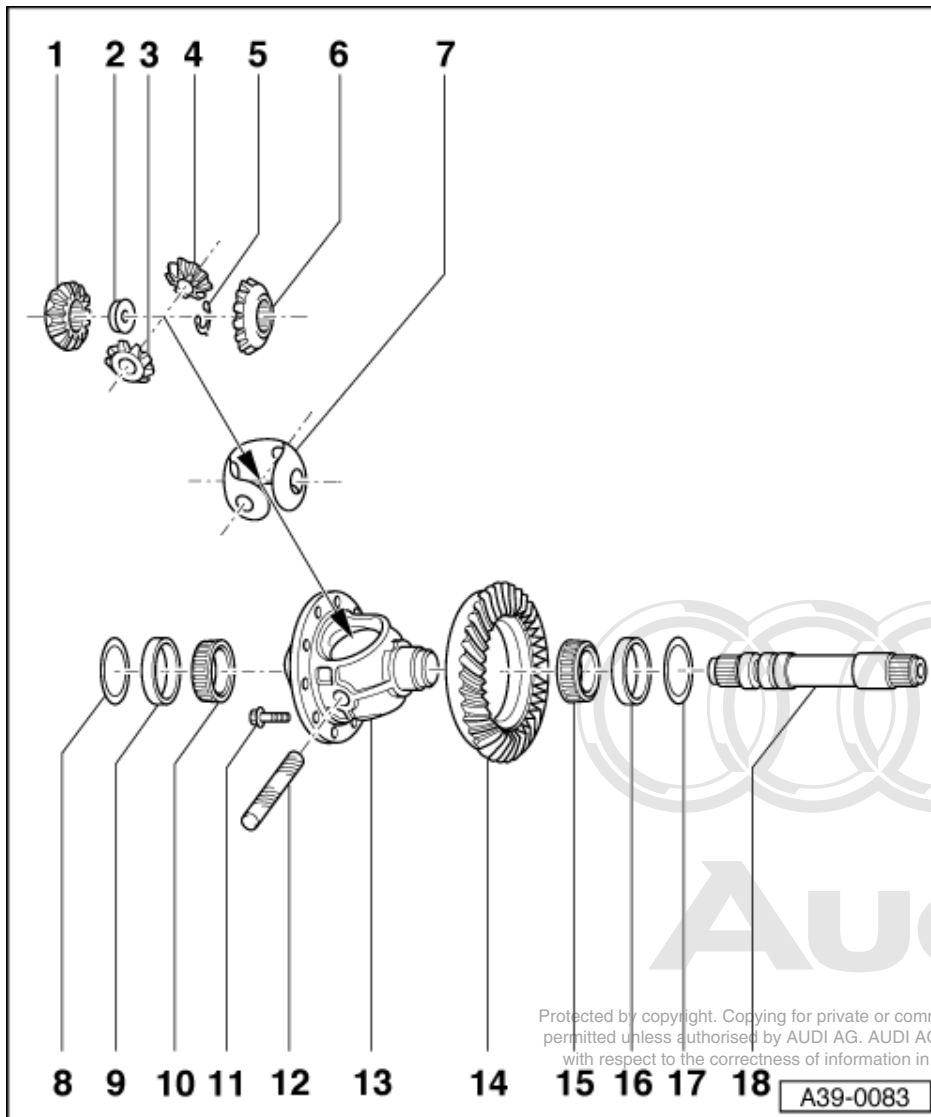
11 Ribbed bolt - 80 Nm + 60°

- ◆ Replace

12 Shaft for bevel gears

- ◆ Removing and installing=> from Page 238
- ◆ Check for wear; renew if necessary
- ◆ When driving in, do not damage one-piece thrust washer

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13 Differential housing 1)

- ◆ When replaced, re-determine thickness of shims "S1" and "S2" for differential=> from Page 257

14 Crown wheel 1)

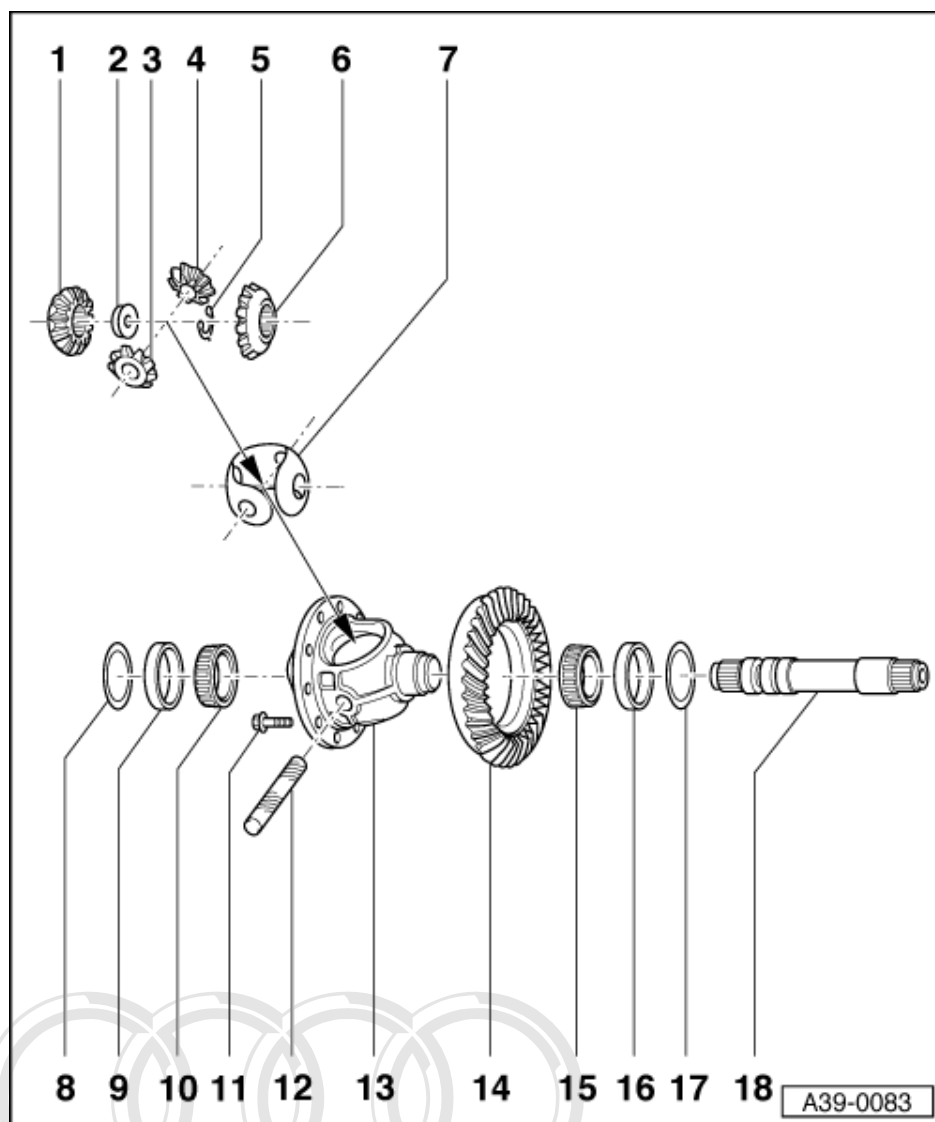
- ◆ Paired with drive pinion (final drive set)
- ◆ Allocation based on gearbox code letters

=> Parts List

- ◆ Number of teeth =>from Page 2
- ◆ Drive off differential with a drift
- ◆ Installing on differential housing => Fig. 237

15 Inner race for small taper roller bearing 1)

- ◆ Pulling off=> Fig. 236
- ◆ Pressing on=> Fig. 236



16 Outer race for large taper roller bearing 1)

- ◆ Drive out with drift
- ◆ Pulling in=> Fig. 237

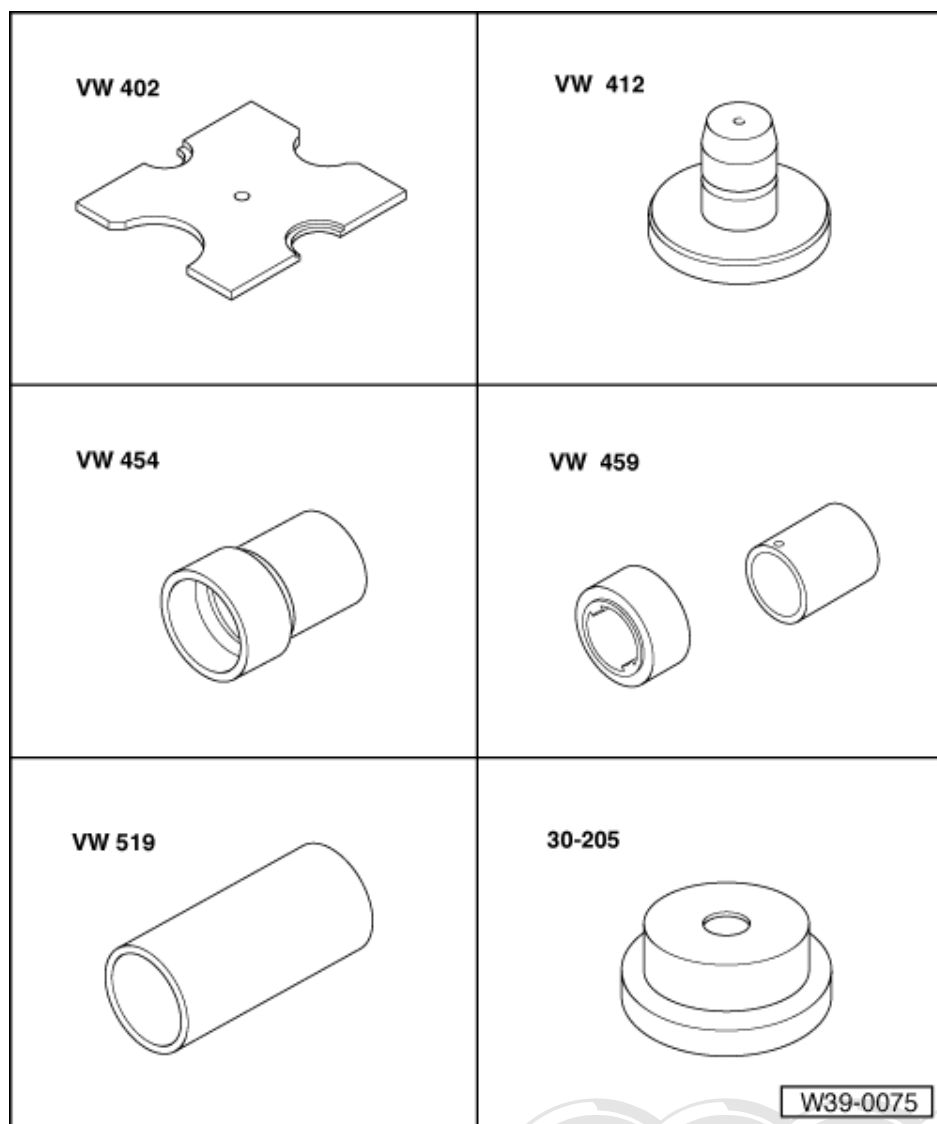
17 Shim "S2"

- ◆ Note thickness
- ◆ Adjustment overview=>Page 242

18 Output shaft for drive flange

- ◆ Removing and installing=> from Page 238

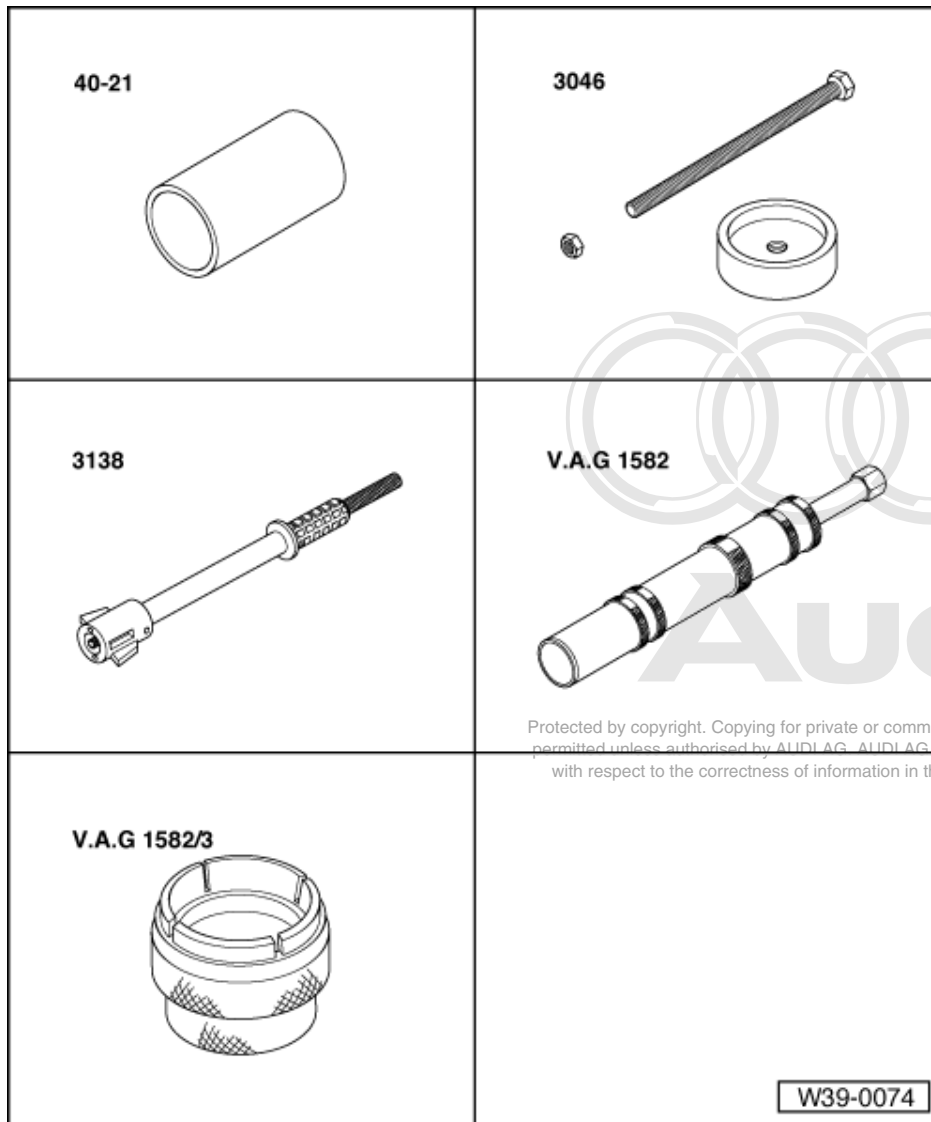
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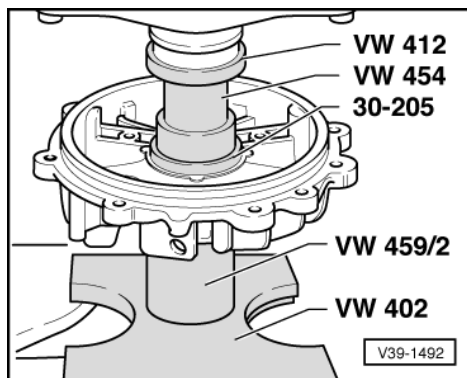
Special tools and workshop equipment required

- ♦ Thrust plate VW 402
- ♦ Press tool VW 412
- ♦ Thrust piece VW 454
- ♦ Installation and removal tool VW 459
- ♦ Tube VW 519
- ♦ Thrust plate 30-205

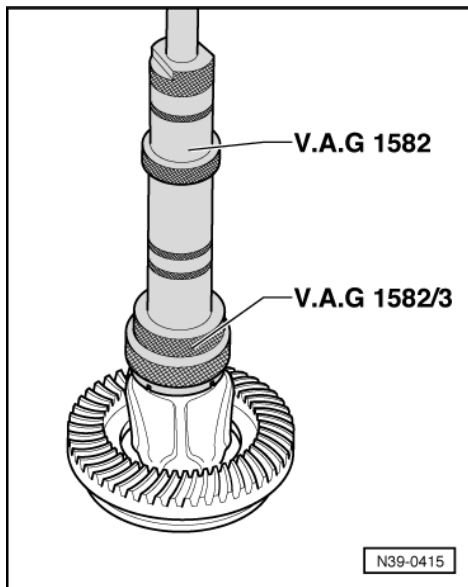
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- ◆ Sleeve 40-21
- ◆ Fitting tool 3046
- ◆ Drift 3138
- ◆ Taper roller bearing puller V.A.G 1582
- ◆ Clamping piece V.A.G 1582/3

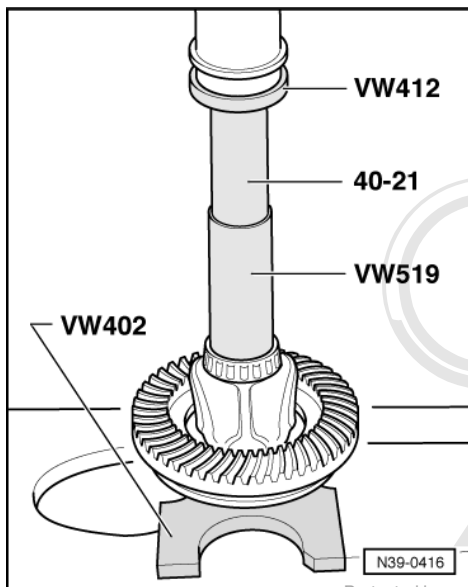


-> Fig.1 Pressing in outer race for taper roller bearing



-> Fig.2 Detaching inner race for taper roller bearing

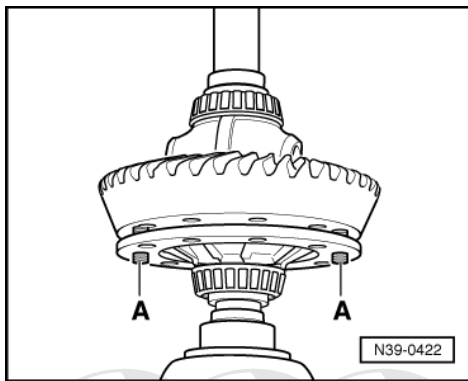
- Place thrust piece 40-105 on differential housing.



-> Fig.3 Pressing on inner race for taper roller bearing

Important
Wear protective gloves.

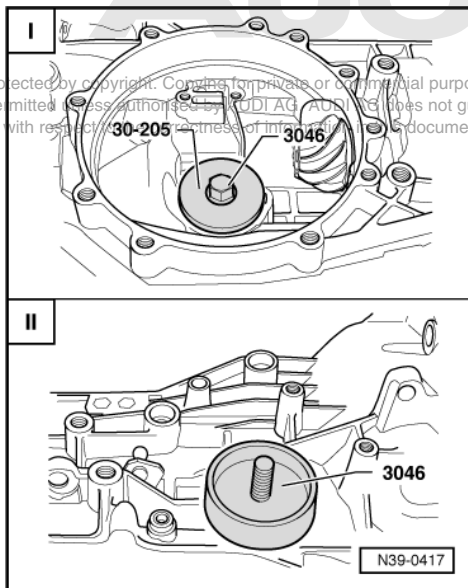
- Heat the inner race to approx. 100 °C, position and push to final position.



-> Fig.4 Fitting crown wheel

Important
Wear protective gloves.

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



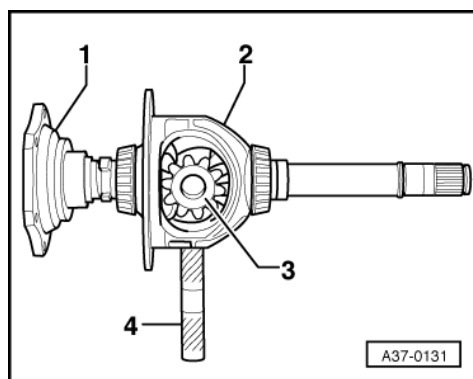
-> Fig.5 Pulling in outer race for taper roller bearing

- I - Insert taper roller bearing outer race into gearbox housing with thrust plate 30-205.
- II - Connect thrust piece of installing tool 3046 to spindle and pull in outer race.

Note:

To ensure that bearing race is pulled in straight, drive it in a short distance with a brass drift before applying thrust plate 30-205.

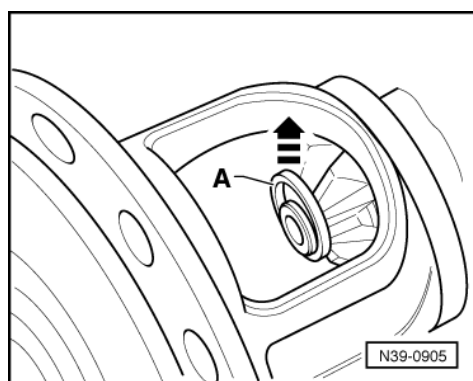
3.7 - Removing and installing differential bevel gears



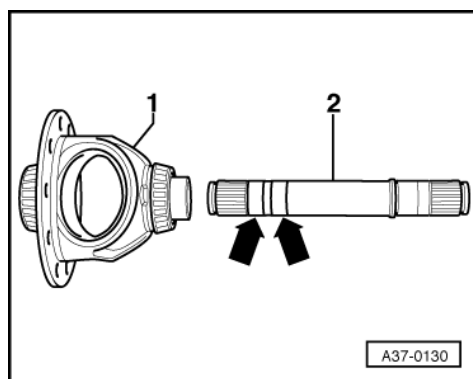
- Differential removed.

Dismantling

- Remove bolts on crown wheel and drive crown wheel off differential housing with a drift.
- -> Drive out shaft for bevel gears small -4-.
- Remove threaded piece.
- Remove 3 differential bevel gears from differential housing.



- -> Removing circlip -A- from output shaft for drive flange -arrow-.
- Remove 4th differential bevel gear.
- Pull out output shaft for right-hand drive flange.
- Remove one-piece thrust washer from differential housing

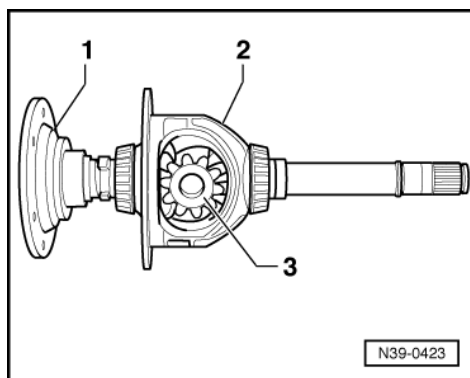


Assembling

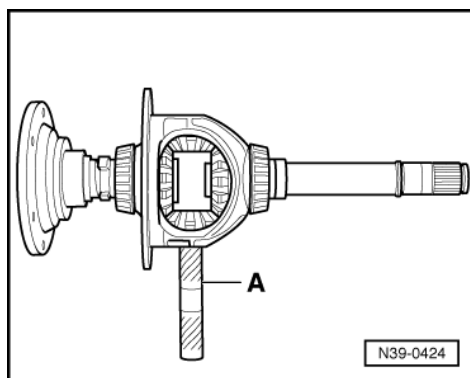
- -> Lubricate one-piece thrust piece with gear oil and insert in differential housing -1-.
- Insert output shaft -2- for drive flange in differential housing -1-.
- Note correct installation position: The end with two bearing seats -arrows- faces toward the differential.



- Fit large bevel gear on output shaft -2-, and secure on shaft with circlip.



- -> Insert left flange shaft -1-, as an assembly aid, into differential housing -2-.
- Secure large bevel gear to left-hand flange shaft using bolt and threaded piece.
- Insert bevel gear -3- spaced 180° apart in openings in differential housing and hold in place by hand.
- Rotate bevel gears -3- into final position by turning output shaft for drive flange.



- -> Carefully drive in shaft -A- for planetary pinions. Ensure one-piece thrust washer is seated properly.
- Install crown wheel => Fig. 237

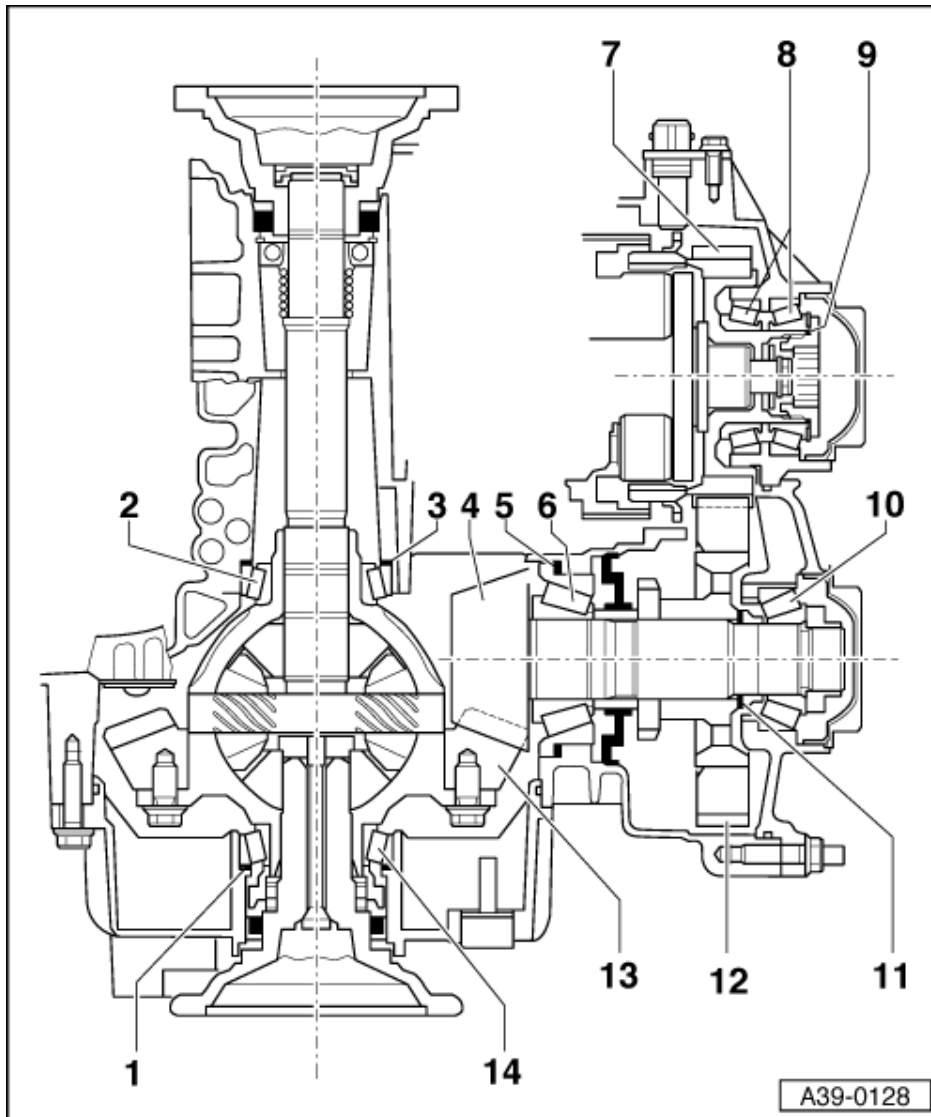
4 - Adjusting final drive

4.1 - Adjusting final drive

Notes:

- ◆ Adjustment overview when replacing individual components of gearbox =>Page 242
- ◆ Lubricate all bearings with either ATF or gear oil before fitting, depending on which lubricant they run in when installed.
- ◆ Do not interchange inner or outer races of bearings of the same size.
- ◆ Inspect shims for burrs or damages. Install only adjustment shims which are in perfect condition.
- ◆ Check thickness of shims by measuring at several points with a micrometer.

4.2 - Overview of adjustments

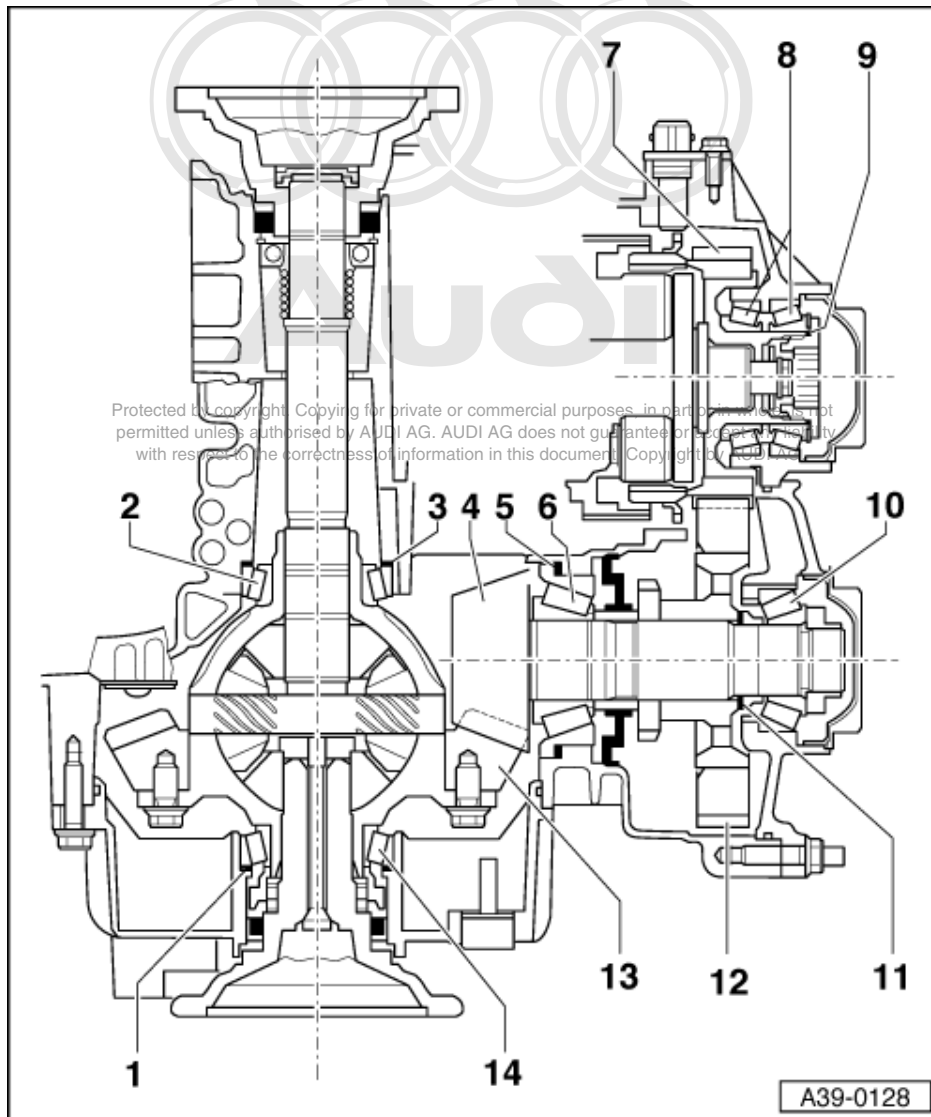


To avoid unnecessary adjustments after assembly operations, observe the table on Page [242](#).

- 1 Shim "S1" for crown wheel
- 2 Taper roller bearing for differential
- 3 Shim "S2" for crown wheel
- 4 Drive pinion
 - ♦ Adjusting drive pinion and crown wheel => Page [244](#)
- 5 Shim "S3" for drive pinion
- 6 Large taper roller bearing for drive pinion



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- 7 Input gear**
 - ♦ Adjusting => Page **242**
- 8 Taper roller bearing for input gear**
- 9 Shim for input gear**
- 10 Small taper roller bearing for drive pinion**
- 11 Shim "S4" for drive pinion**
- 12 Output gear**
 - ♦ Only replace together with input gear
- 13 Crown wheel**
 - ♦ Adjusting drive pinion and crown wheel => Page **244**
- 14 Taper roller bearing for differential**

4.3 - Adjustment overview

Note:

When performing assembly work on gearbox the following components only require adjustment if individual components have been replaced that directly affect the final drive adjustment. To avoid unnecessary adjustments observe following table:

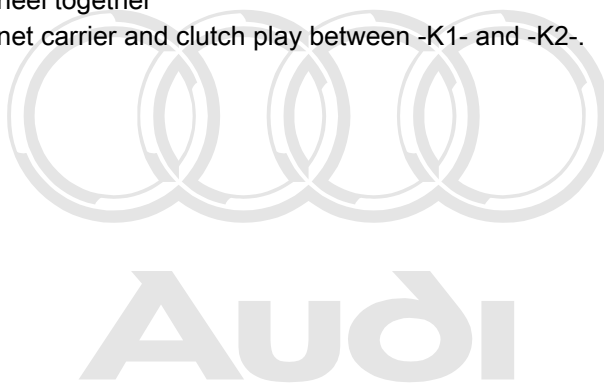
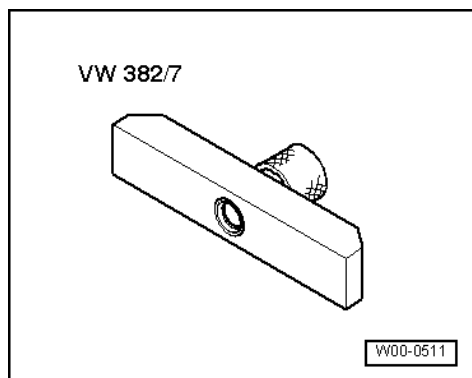
Component being re- placed: ▼	To adjust:				
	Crown wheel "S1"+"S2" =>Page 244	Crown wheel "S1" =>Page 257	Drive pinion "S3"+"S4" over "r" =>Page 244	Drive pinion "S4" =>Page 250	Adjusting input gear 1)3) =>Page 242
Gearbox housing	X		X		X
Taper roller bearing for input gear					X
Input gear 1), output gear 1)				X	X
Drive pinion 2), crown wheel 2)	X		X		
Differential housing with- out crown wheel	X				

- 1) Always replace drive pinion and crown wheel together
- 2) Only replace drive pinion and crown wheel together
- 3) If input gear was readjusted, readjust planet carrier and clutch play between -K1- and -K2-.

Component being re- placed: ▼	To adjust:				
	Crown wheel "S1"+"S2" =>Page 244	Crown wheel "S1" =>Page 257	Drive pinion "S3"+"S4" over "r" =>Page 244	Drive pinion "S4" =>Page 250	Adjusting input gear 1)3) =>Page 242
Taper roller bearings for drive pinion			X		
Taper roller bearing for differential	X				
Cover for differential		X			
Drive pinion cover, drive pinion bush, parking lock wheel, spacer tube				X	

- 1) Always replace drive pinion and crown wheel together
- 3) If input gear was readjusted, readjust planet carrier and clutch play between -K1- and -K2-.

4.4 - Adjusting input gear



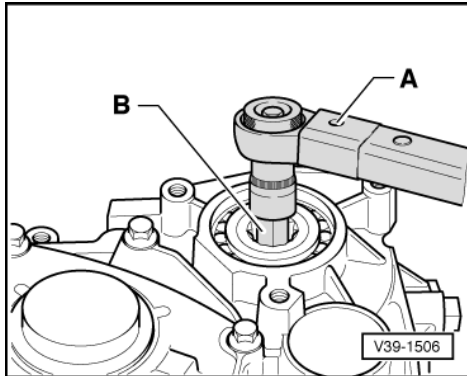
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Special tools and workshop equipment required

- ◆ Bridge from measurement tool VW 382/7

Procedure

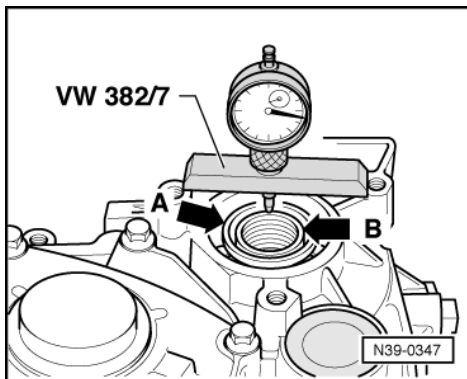
- Planetary gearbox removed
- Insert outer races of both taper roller bearings and inner race of inner taper roller bearing with locking compound AMV 185 101 A1=> -Item **206**
- Insert input shaft with inner race of inner taper roller bearing in gearbox housing.



- Engage parking lock.
- -> Tighten socket head fastener to 100 Nm without dished washer and without shim.

A - Torque wrench
B - Socket, A/F 22

- Remove socket head fastener.



- Insert dial gauge and set to "0" with 3 mm preload.
- -> Measure distance between input gear -B- and inner race -A- of taper roller bearing, and note dial gauge reading.
- Measurement in following example: 1.00 mm.

The specified bearing pretension is established by adding the thickness of the dished washer (1.50 mm) to the measured value (1.00 mm) and subtracting the pretension of the bearing (0.18 mm).

Determining thickness of shim

Example:

Measured value	1.00 mm
+ Dished washer	1.50 mm
- Bearing preload	0.18 mm

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= Thickness of shim	2.32 mm
---------------------	---------

- Determine shim from table. Part numbers

=> Parts List

Table of shims for input gear

Measured thickness in mm	Shim mm	Measured thickness in mm	Shim mm
1.575...1.599	1.600	2.075...2.099	2.100
1.600...1.624	1.625	2.100...2.124	2.125
1.625...1.649	1.650	2.125...2.149	2.150
1.650...1.674	1.675	2.150...2.174	2.175
1.675...1.699	1.700	2.175...2.199	2.200
1.700...1.724	1.725	2.200...2.224	2.225
1.725...1.749	1.750	2.225...2.249	2.250
1.750...1.774	1.775	2.250...2.274	2.275
1.775...1.779	1.800	2.275...2.299	2.300
1.800...1.824	1.825	2.300...2.324	2.325
1.825...1.849	1.850	2.325...2.349	2.350
1.850...1.874	1.875	2.350...2.374	2.375
1.875...1.899	1.900	2.375...2.399	2.400
1.900...1.924	1.925	2.400...2.424	2.425
1.925...1.949	1.950	2.425...2.449	2.450
1.950...1.974	1.975	2.450...2.474	2.475
1.975...1.999	2.000	2.475...2.499	2.500
2.000...2.024	2.025	2.500...2.524	2.525
2.025...2.049	2.050	2.525...2.549	2.550
2.050...2.074	2.075		

- Remove input gear again => Page 203
- Insert inner race of outer taper roller bearing with locking compound AMV 185 101 A1.
- Insert axial needle bearing for planet carrier.
- Put shim onto input gear.
 - Installation position: Flat side faces toward input gear
- Insert dished washer.
 - Installation position: Convex side faces toward socket head fastener
- Tighten socket head fastener to 250 Nm.

5 - Adjusting drive pinion and crown wheel

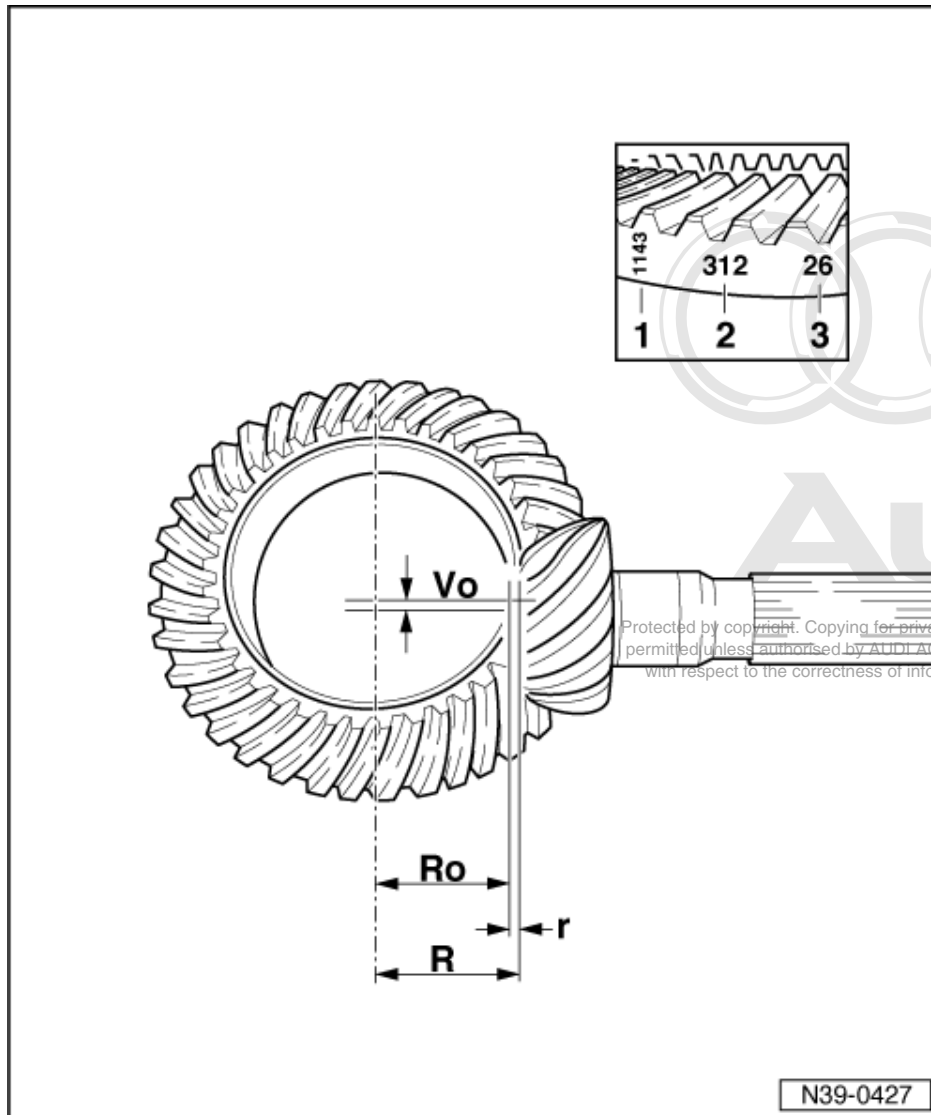
5.1 - Adjusting drive pinion and crown wheel

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.

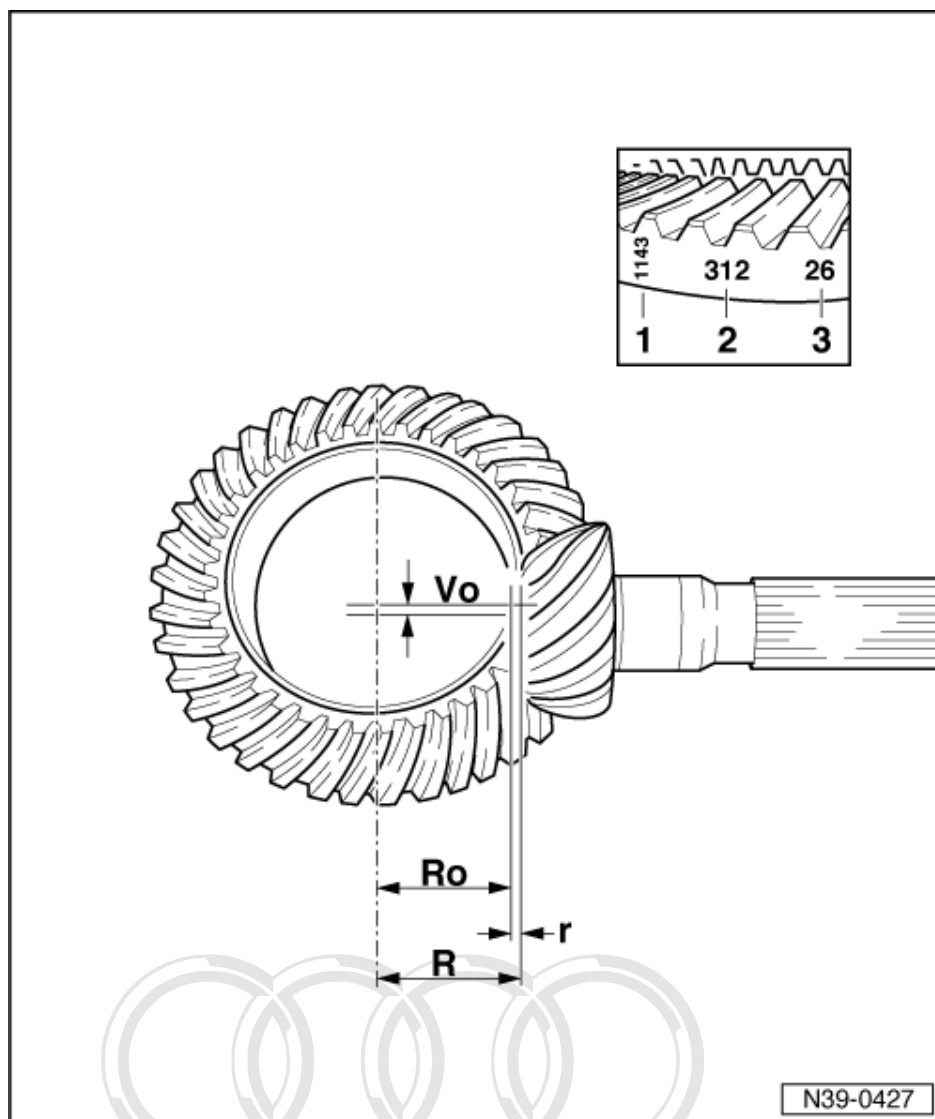
- ♦ The dimension "r", which is related to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the crown wheel. The final drive set (drive pinion and crown wheel) must only be replaced together as a matched pair.
- ♦ Observe the general repair instructions for taper roller bearings and shims.

5.2 - Adjusting and marking of final drive sets



- 1 Identification "1143" signifies Oerlikon gear set with a ratio of 43 : 11
- 2 Gear set pairing number (312)
- 3 Dimension "r" is based on the test machine master gauge used in production. The dimension "r" is always given in 1/100 mm. Example: "26" signifies $r = 0.26$ mm

R_o - Length of test machine master gauge used
 R_o - Crown wheel = 59.20 mm



N39-0427

R - Actual dimension between crown wheel and face of drive pinion at point with quietest running for this pinion set

V_o - Hypoid offset

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5.3 - Readjustment sequence for final drive set

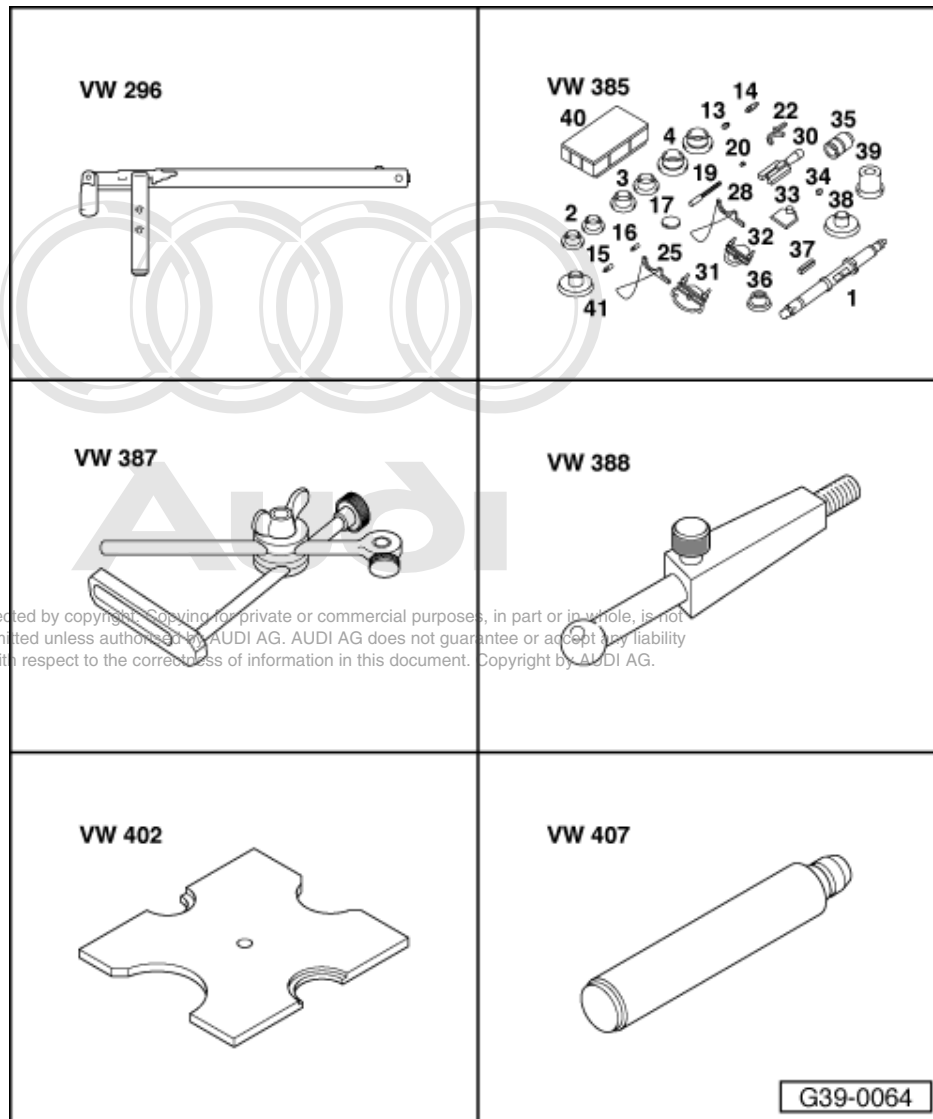
The following procedure is recommended to save time when the drive pinion and crown wheel have to be adjusted:

- 1.) Determine total shim thickness " S_{total} " for " S_1 " + " S_2 " (sets preload for taper roller bearings for differential) => from Page 257

- 2.) Determine total shim thickness "Stotal" for "S3" + "S4" (sets preload for taper roller bearings for drive pinion) => from Page 250
- 3.) Distribute total shim thickness "Stotal" for "S3" + "S4" so that the dimension from centre of crown wheel to face of drive pinion is the same as dimension "R" which was determined during production => from Page 255
- 4.) Distribute the total shim thickness "Stotal" for "S1" + "S2" so that the specified backlash between crown wheel and drive pinion is ensured => from Page 260

Note:

Overview of components and shims =>Page 240

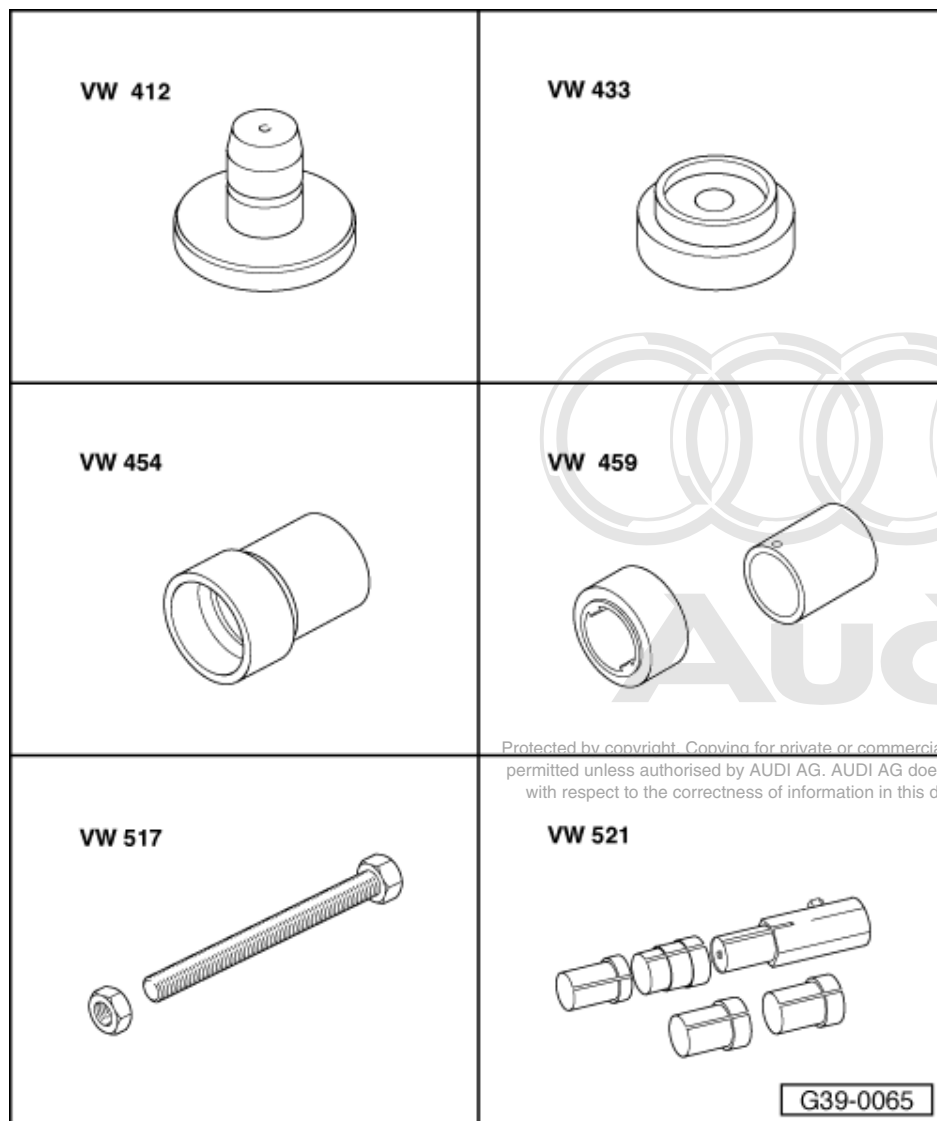


Special tools and workshop equipment required

- ◆ Extractor lever for gear set VW 296
- ◆ Universal measuring tool VW 385
- ◆ Universal dial gauge bracket VW 387
- ◆ Test lever, adjustable VW 388
- ◆ Thrust plate VW 402

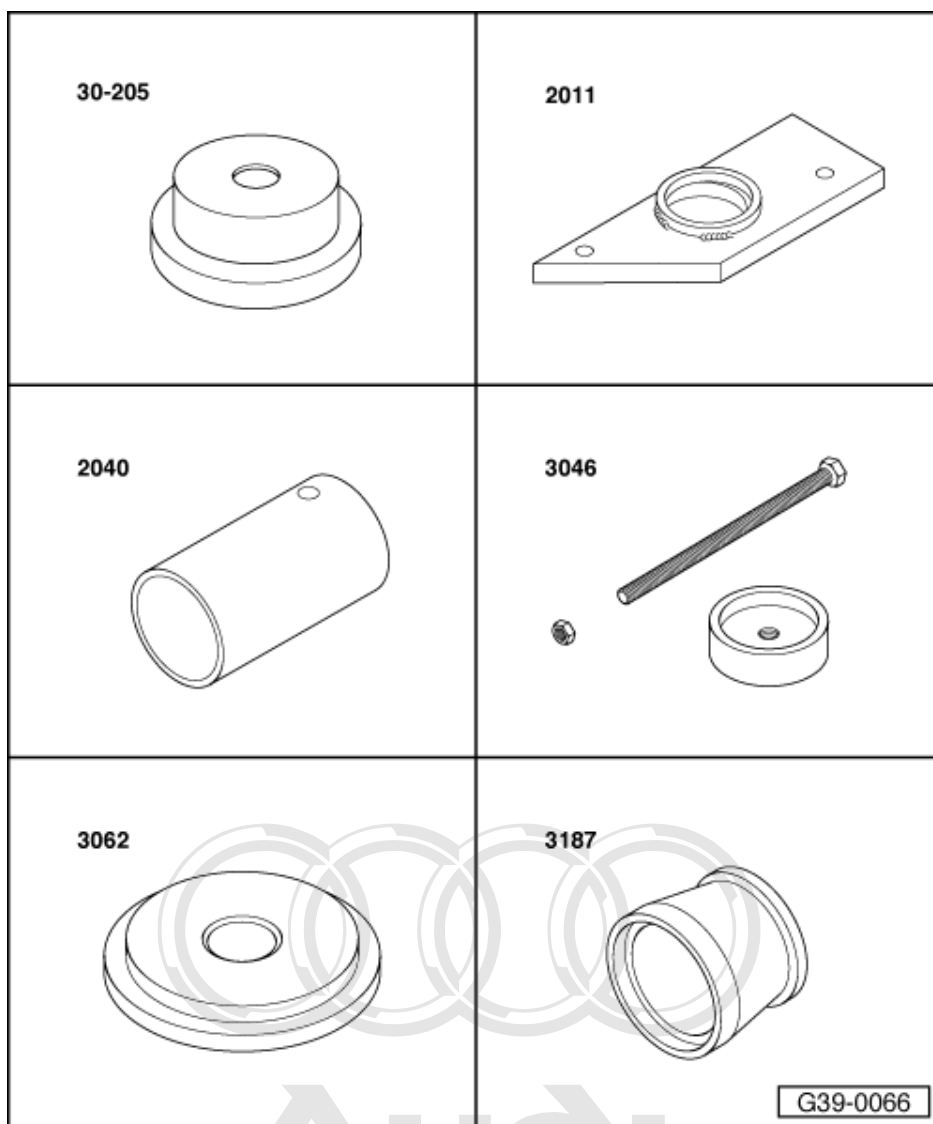


- ◆ Press tool VW 407

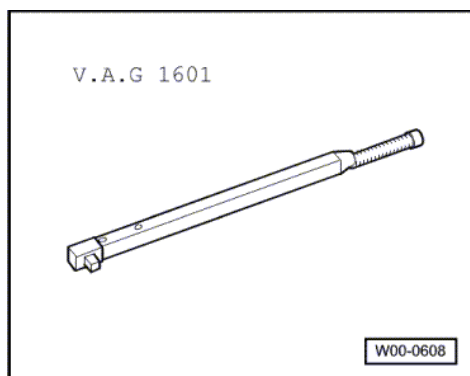


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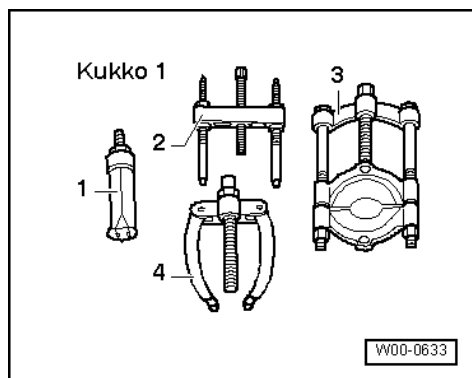
- ◆ Press tool VW 412
- ◆ Thrust piece VW 433
- ◆ Thrust piece VW 454
- ◆ Installation and removal tool VW 459
- ◆ Threaded stem VW 517
- ◆ Crown wheel adjustment device VW 521 with VW 521/4 and VW 521/8



- ◆ Thrust plate 30-205
 - ◆ Support bridge 2011
 - ◆ Tube 2040
 - ◆ Fitting tool 3046
 - ◆ Thrust pad 3062
 - ◆ Assembly sleeve 3187
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- ◆ Torque wrench V.A.G 1601 (150...800 Nm)



- ♦ Separating tool Kukko 17/2
- ♦ Wrench socket A/F 41
- ♦ Dial gauge

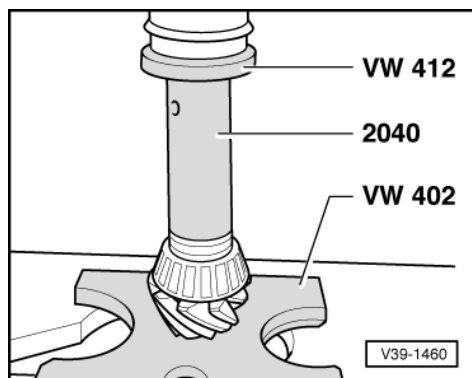
5.4 - Adjusting drive pinion

Note:

Installation position of components => from Page 211

Repairs after which the drive pinion must be adjusted => table on Page 242

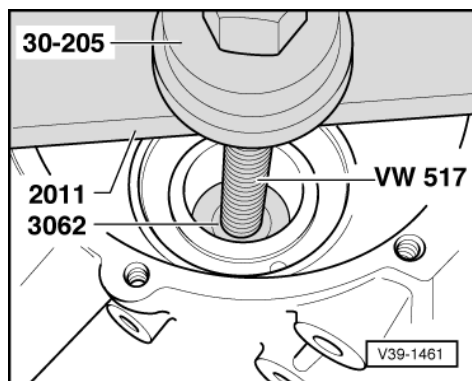
The table also indicates whether the two shims "S3" and "S4" have to be measured or only shim "S4".



Determining total shim thickness "Stotal" for shims "S3" + "S4"

(Setting preload of taper roller bearing for drive pinion)

- -> Press on large taper roller bearing inner race with bush for drive pinion.

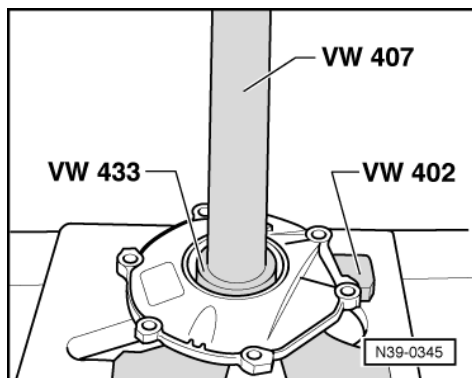


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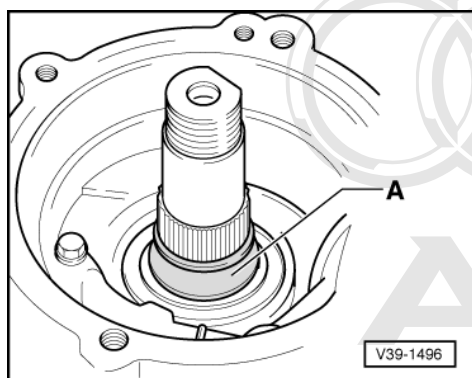
- -> Pull large taper roller bearing outer race with a 1.50 mm thick provisional shim "S3" in up to stop in the gearbox housing.

Note:

A shim "S3" with a thickness of 1.50 mm is inserted provisionally for measurement purposes. It is referred to in the following as "S3". After determining the measured value "e", "S3*" is replaced by the final shim "S3".*



- -> Press taper roller bearing outer race into cover for drive pinion.

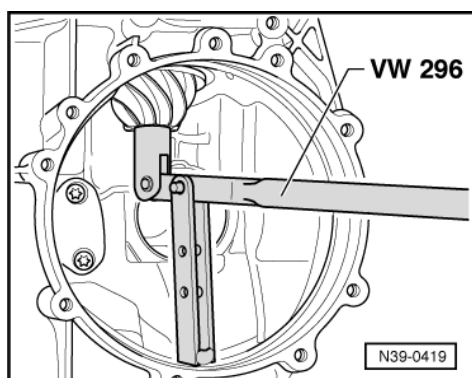


- -> Insert drive pinion in gearbox housing

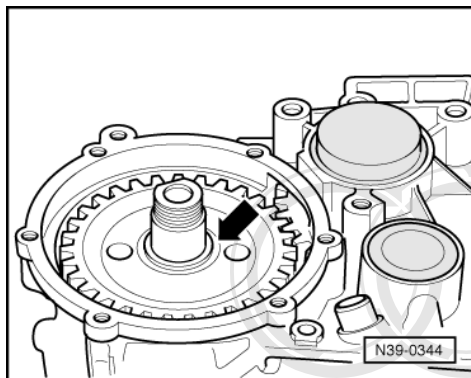
A - Assembly sleeve 3187

Note:

Use assembly sleeve 3187 when inserting drive pinion to avoid damaging the sealing lips.



- -> Press drive pinion against taper roller bearing outer race in gearbox housing using press lever VW 296 and hold in this position.

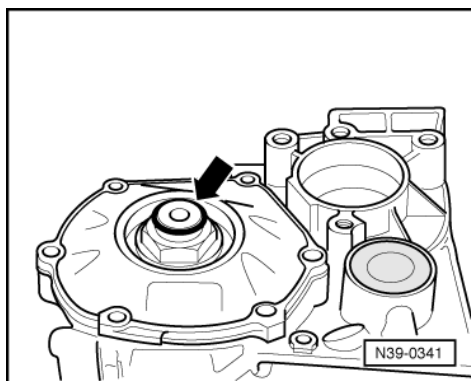


- -> Assemble parking lock gear, warmed output gear and 2.40 mm thick shim (use 2 shims with thickness of 1.20 mm) -arrow- in place of "S4".
- Push on spacer tube.

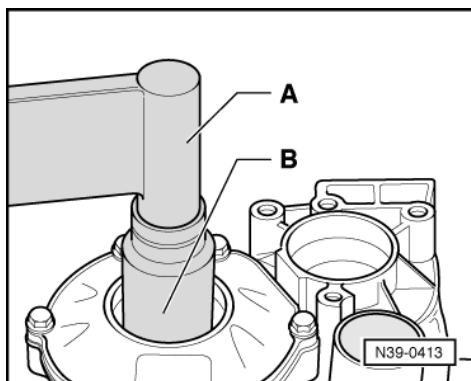
Note:

Installation position of parking lock gear, output gear and spacer tube => from Page 215

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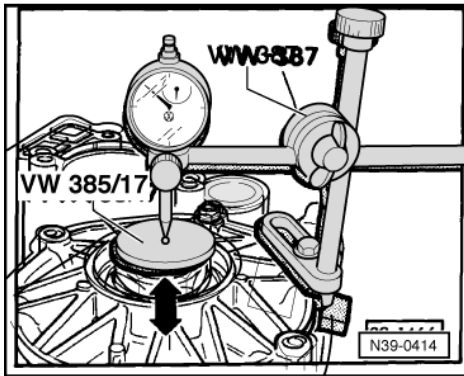
- Fit cover for drive pinion.
- -> Insert taper roller bearing inner race and screw hexagon nut -arrow- onto drive pinion.
- Tighten the four bolts for drive pinion cover to 25 Nm.



- Engage parking lock on lever for selector shaft.
- -> Pretighten new hexagon nut to 350 Nm.

A - Torque wrench V.A.G 1601
B - Socket, A/F 41

- Loosen hexagon nut and tighten to 240 Nm.



- -> Secure dial gauge bracket VW 387 to cover for drive pinion, place end measuring plate VW 385/17 onto drive pinion.
- Insert dial gauge and set to "0" with 1 mm preload.
- Move drive pinion up and down several times without turning it.

Note:

Do not turn the drive pinion when measuring, as otherwise the bearings settle and the result of the measurement is falsified.

- Read off axial play on dial gauge and note reading.
- Measurement in following example: 0.95 mm.

The specified bearing pretension is established by subtracting the measured value (0.95 mm), the pretension of the bearings (constant value: 0.15 mm) and the settling allowance (constant value: 0.10 mm).

Determining thickness of provisional shim "S4"

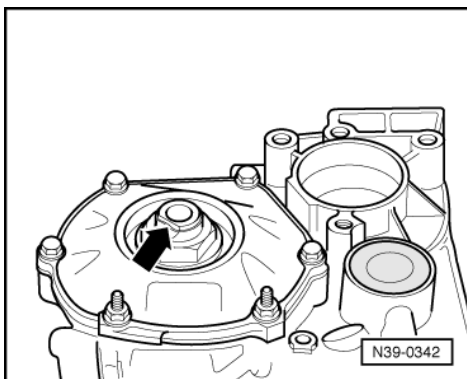
The preliminary shim "S4" will be replaced with the final shim "S4" after determining the measured value "e".*

Example:

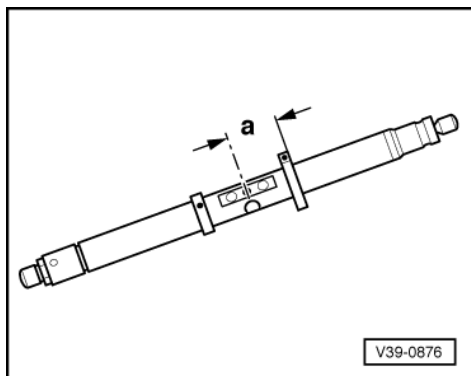
Inserted shims (in place of "S4")	2.40 mm
- Measured value	0.95 mm
- Pretension (constant value)	0.15 mm
- Settling allowance (constant value)	0.10 mm
= Thickness of shim "S4"	1.20 mm

- Remove cover for drive pinion, spacer tube and the 2.40 mm shims inserted for measurement purposes.

- Fit shim "S4*" of the calculated thickness (1.20 mm in example) onto drive pinion. Table of shims for "S4"
=> Page 256



- -> Install cover for drive pinion.
- Pretighten hexagon nut to 350 Nm, then loosen nut and tighten again to 240 Nm. Secure by peening with punch -arrow-.

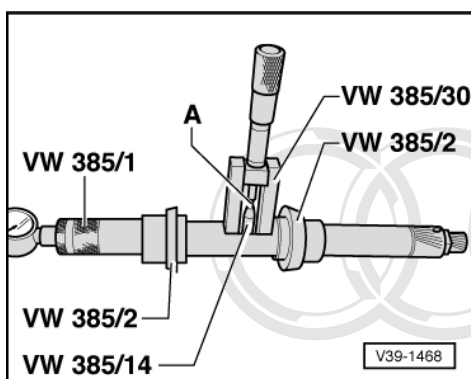


Determining dimension "e"

Note:

Measurement "e" is required to determine the final shim thickness of "S3" and "S4".

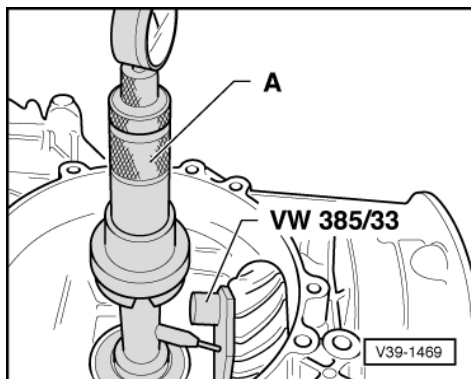
- -> Adjust setting ring of universal mandrel VW 385/1 to the following setting:
 - Dimension a = 70 mm



- -> Assemble universal mandrel VW 385/1 as shown in the illustration:

A - Dial gauge extension VW 385/16 = 12.3 mm long

- Set master gauge VW 385/30 to $R_o = 59.2$ mm (for crown wheel) and fit onto universal mandrel.
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.

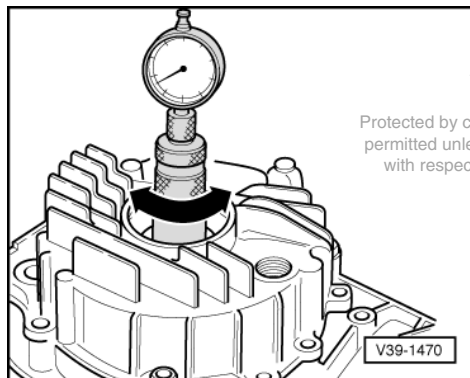


- -> Place end measuring plate on drive pinion head.

Note:

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

- Insert universal mandrel -A-.
- Fit cover for final drive and tighten the 4 bolts.
- Using sliding setting ring to pull 2nd centring disc outwards until mandrel can still just be turned by hand.



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- -> Turn mandrel until the dial gauge point touches the end measuring plate, then measure maximum deflection (return point). The value measured is dimension "e"
- Measurement in following example: "e" = 0.32 mm (in red scale on dial)
- Remove universal mandrel.

Note:

Then, check again that the dial gauge, with master gauge VW 385/30 fitted, indicates "0" with 2 mm pre-load. Otherwise, repeat measurement.

Determining thickness of shim "S3"

Notes:

- ♦ The dimension "r", in relation 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 => Page 245
- ♦ If dial gauge reading is in red scale, dimension "e" must be added.
- ♦ If dial gauge reading is in black scale, dimension "e" must be subtracted.

$\text{"S3"} = \text{"S3*" - "r" - "e"}$ ("e" in black scale on dial) or $\text{"S3"} = \text{"S3*" - "r" + "e"}$ ("e" in red scale on dial)

Example:	
Inserted shim "S3*"	1.50 mm
- The dimension "r" (marked on the outer circumference of the crown wheel)	0.26 mm
+ Determined value "e" (red scale on dial)	0.32 mm
= Thickness of shim "S3"	1.56 mm

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



=> Parts List

Determining thickness of shim "S4"

$$\text{"S4"} = \text{"S4*"} - \text{"r"} - \text{"e"}$$

("e" in black scale on dial)

or

$$\text{"S4"} = \text{"S4*"} - \text{"r"} + \text{"e"}$$

("e" in red scale on dial)

Example:

Inserted shim "S4*"	1.20 mm
- The dimension "r" (marked on the outer circumference of the crown wheel)	0.26 mm
+ Determined value "e" (red scale on dial)	0.32 mm
= Thickness of shim "S4"	1.26 mm



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

=> Parts List

Notes:

- ♦ If a thicker shim "S3" is required also install a thicker "S4" shim (add the same amount).
- ♦ If a thinner shim "S3" is required also install a thinner "S4" shim (add the same amount).

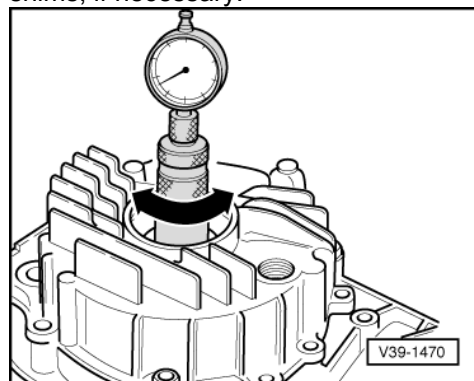
Table of shims "S3"

Thickness of shims in mm			
1.05	1.30	1.55	1.80
1.10	1.35	1.60	1.85
1.15	1.40	1.65	
1.20	1.45	1.70	
1.25	1.50	1.75	

Table of shims "S4"

Thickness of shims 1) in mm				
1.000	1.225	1.450	1.675	1.900
1.025	1.250	1.475	1.700	1.925
1.050	1.275	1.500	1.725	1.950
1.075	1.300	1.525	1.750	1.975
1.100	1.325	1.550	1.775	2.000
1.125	1.350	1.575	1.800	2.400
1.150	1.375	1.600	1.825	
1.175	1.400	1.625	1.850	
1.200	1.425	1.650	1.875	

1) Shim tolerance variations make it possible to find the exact thickness required for the "S4" shim; use 2 shims, if necessary.



Performing check measurement - checking dimension "r"

- Install drive pinion with shims "S3" and "S4".
- -> Insert universal mandrel (as described in "Determining dimension 'e'" => Page 254) and perform check measurement.
- Turn differential 5 turns in both directions so that the taper roller bearings settle.
- Read off dial gauge anti-clockwise (red range).
 - If the shims have been correctly selected, the dimension "r" (marked on outer circumference of crown wheel) must be shown within a tolerance of ± 0.04 mm.

5.5 - Adjusting crown wheel

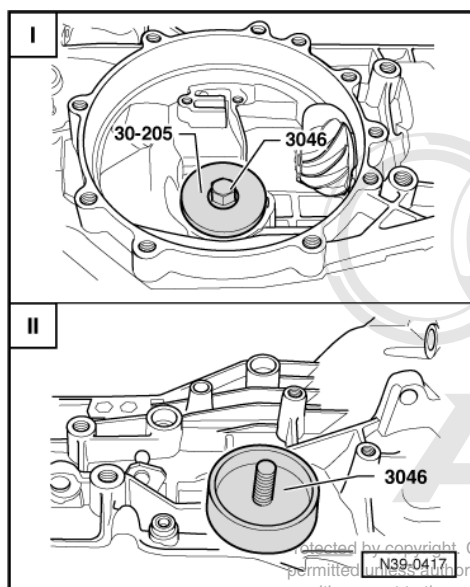
(Adjusting differential)

Repairs after which the crown wheel must be adjusted => adjustment overview on Page 242 .

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

(Setting preload of taper roller bearing for differential)

- Drive pinion and differential removed.

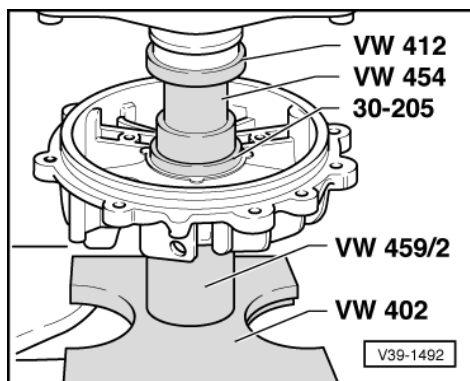


- Remove old shims "S1" and "S2" => Page 230
- Insert the 1.5 mm thick provisional shim "S2" (two 0.75 mm shims) in the taper roller bearing outer race seat.

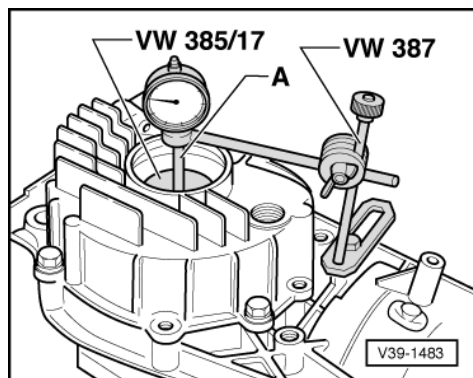
Note:

A shim "S2" with a thickness of 1.50 mm is inserted provisionally for measurement purposes. It is referred to in the following as "S2". After determining the measured value "e", "S2*" is replaced by the final shim "S2".*

- -> Pull taper roller bearing outer race with shim "S2*" up to stop in gearbox housing.



- -> Press taper roller bearing outer race without shim "S1" into cover for differential.
- Fit differential into gearbox housing.
- Fit cover for differential and tighten bolts to 25 Nm.



- -> Secure dial gauge bracket VW 387 to housing and place end dimension plate VW 385/17 on differential.
- Preload dial gauge to 1 mm and set to zero.
- Move differential up and down several times without turning it.

Note:

Do not turn the differential when measuring, as otherwise the bearings settle and the result of the measurement is falsified.

- Read off axial play on dial gauge and note reading.
- Measurement in following example: 0.60 mm.

$$\text{"Stotal"} = \text{"S2*"} + \text{Measurement} + \text{Bearing preload}$$

Example:

Inserted shim(s) "S2*"	1.50 mm
+ Measured value	0.60 mm
+ Bearing preload (constant value)	0.40 mm
= Determining total shim thickness "Stotal" for shims "S1" + "S2"	2.50 mm

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Determining thickness of shim "S1"

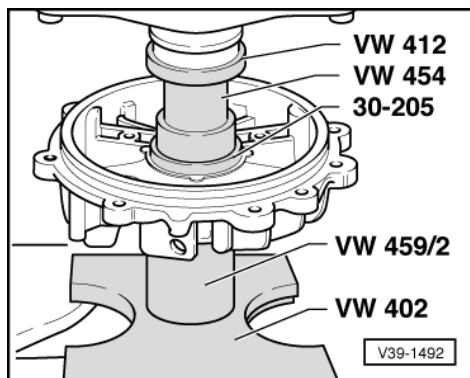
Notes:

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

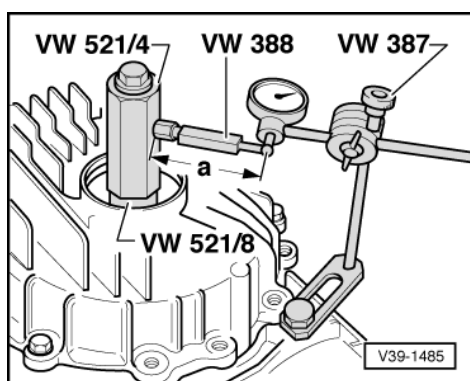
$$\text{"S1*"} = \text{"Stotal"} - \text{"S2*"} =$$

Example:

Determining total shim thickness "Stotal" for shims "S1" + "S2"	2.50 mm
- Inserted shim(s) "S2*"	1.50 mm
= Thickness of shim "S1"	1.00 mm



- -> Press shim taper roller bearing outer race with shim "S1" with calculated thickness (1.00 mm in example) into the differential cover. Table of shims for "S1" => Page 261
- Fit cover for differential and tighten bolts to 25 Nm.



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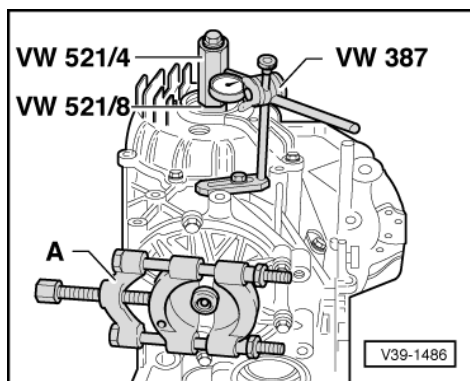
Adjusting backlash

(Position of crown wheel in gearbox housing)

- Drive pinion and shims "S3" and "S4" installed
- Install differential with shims "S1*" and "S2*".
- Fit cover for differential and tighten bolts to 25 Nm.
- Turn differential 5 turns in both directions so that the taper roller bearings settle.
- -> Secure dial gauge retainer VW 387 to the housing.
- Attach crown wheel adjusting device VW 521/4 and VW 521/8.
- Set measuring lever VW 388 to dimension "a" = 70 mm.

Measure play between teeth flanks (backlash) as follows:

- Turn crown wheel until it makes contact with a tooth flank (end of backlash travel).
- Preload dial gauge to 1 mm and set to zero.
- Turn crown wheel back until it makes contact with the opposite tooth flank.
- Read off backlash and note reading.





- -> If the drive pinion turns together with the differential, install separating device -A- (e.g. Kukko 17/2); so that backlash can be measured accurately.
- Loosen clamping screw of VW 521/4 and, after turning the crown wheel by 90°, repeat the measurement a further three times. Add the four measured values together and calculate the average backlash.

Determining average backlash

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

Example:	
1st Measured value	0.49 mm
+ 2nd Measured value	0.48 mm
+ 3rd Measured value	0.50 mm
+ 4th Measured value	0.49 mm
= Sum of measured values	1.96 mm

- Result: The average backlash is $1.96 : 4 = 0.49$ mm

If the individual measurements differ by more than 0.06 mm, this means that the installation of the crown wheel is not correct or that the final drive set itself is defective. Check installation; replace final drive set if necessary.

Determining thickness of shim "S2"

- Multiply the backlash figure by 1.17 (constant value), subtract the result from the thickness of the already inserted shim "S2" (1.50 mm in example), and add 0.20 mm for lift (constant value).

"S2" = "S2*" - backlash and + lift

Example:	
Inserted shim(s) "S2*"	1.50 mm
- Average backlash (0.49 mm) x 1.17	0.57 mm
+ Lift (constant value)	0.20 mm
= Thickness of shim "S2"	1.13 mm

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

=> Parts List

The following shims are available for "S2"

Shim thickness (mm) 1)		
0.55	0.75	0.95
0.60	0.80	1.00
0.65	0.85	1.05
0.70	0.90	

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

Determining thickness of shim "S1"

"S1" = "Stotal" - "S2"

Example:	
Total shim thickness "Stotal" for "S1" + "S2"	2.50 mm
- Thickness of shim "S2"	1.13 mm

= Thickness of shim "S1"	1.37 mm
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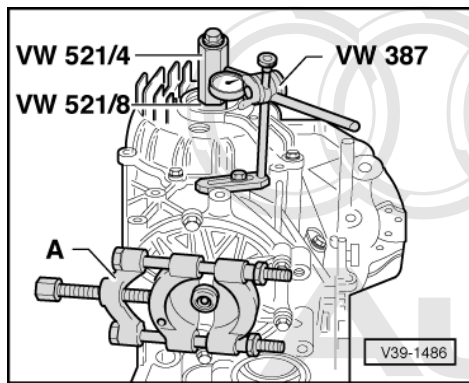
- Determine shim(s) as accurately as possible from table. Part numbers

=> Parts List

The following shims are available for "S1"

Shim thickness (mm) 1)		
0.55	0.75	0.95
0.60	0.80	1.00
0.65	0.85	1.05
0.70	0.90	

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



-> Performing check measurement - Measuring backlash

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- After installing shims "S1" and "S2", turn the differential 5 turns in both directions so that the taper roller bearings settle.
- Measure backlash four times on circumference.
 - Specification: 0.15...0.25 mm