

Workshop Manual

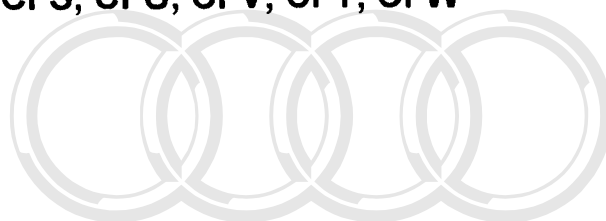
Audi 80 1992 ➤

Booklet **Automatic Gearbox 097**

Edition 03.98

Gearbox Code Letters:

**AEH, ARC, ATT, AZZ, CBT, CBV, CBW, CEB, CFR,
CFS, CFU, CFV, CFY, CFW**



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Audi 80 1992 ➤

Booklet Automatic Gearbox 097 Edition 03.98

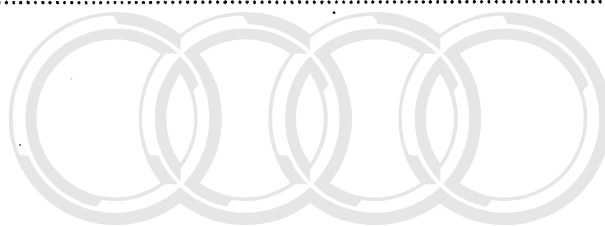
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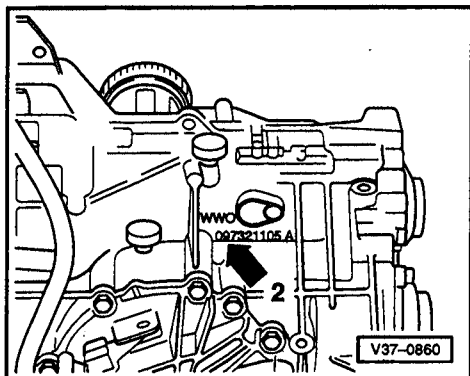
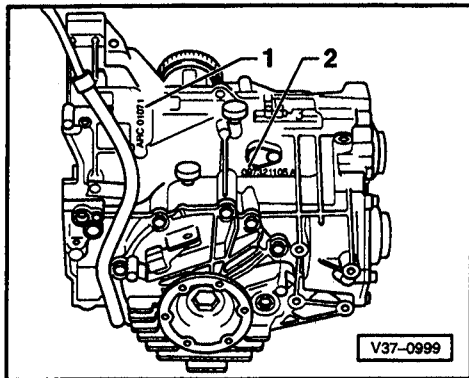
Gearbox identification

The "automatic 4-speed gearbox 097" is fitted in combination with the 4, 5 and 6-cyl. engine in the Audi 80 1992 ➤. Assignment ➔ Page 00-3.

Location on gearbox

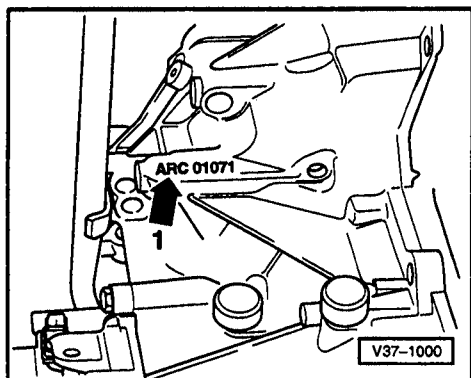
- ◀ Code letters (arrow 1)

Automatic gearbox 097 (arrow 2)



- ◀ Automatic gearbox 097 (arrow 2)

00-1



- ◀ Code letters and manufacturing data of gearbox (arrow 1)

Example:

ARC	01	07	1
Code letters	Day	Month	Year (1991) of manufacture

The gearbox code letters also appear on the vehicle data stickers.

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00-2

Code letters, assignment, ratios, equipment

Automatic gearbox			097					
Gearbox	Code letters		AEH		ARC		ATT	
	Manufactured	From To	07.91 12.92		07.91 09.91		08.92 12.92	
Torque converter	Code letters		LBCA		LBCA		LCCA	
Valve body	Code letters		LAC		LAC		LAC	
	Manufactured	From To	07.91 12.92		07.91 09.91		08.92 12.92	
No. of plates			Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-		5	4	5	4	5	4
	Clutch -K2-		5	5	5	5	5	5
	Clutch -K3-		5	4	5	4	5	4
	Brake -B1-		5	5	5	5	6	6
	Brake -B2-		6	7	6	7	6	7
Assignment	Type		Audi 80 1992 ➤		Audi 80 1992 ➤ Audi Coupé Audi Convertible		Audi 80 1992 ➤ Audi Coupé Audi Convertible	
	Engine		2.0 l - 66 kW		2.0 l - 85 kW		2.6 l - 110 kW	

00-3

Gearbox	Code letters		AEH	ARC	ATT
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.551	1.551	1.551
	3rd gear		1.000	1.000	1.000
	4th gear		0.679	0.679	0.679
	Reverse		2.111	2.111	2.111
Intermediate drive	No. of teeth	Input gear	42	42	44
		Output gear	53	53	51
	Ratio		1.261	1.261	1.159
Final drive	No. of teeth	Differential pinion	9	11	11
		Final drive gear	38	43	43
	Ratio		4.222	3.909	3.909
Drive shaft	Flange dia. mm		130	130	130

00-4

Automatic gearbox			097					
Gearbox	Code letters		AZZ		CBT		CBV	
	Manufactured	From To	07.91 12.92		09.91 12.91		07.91 12.92	
Torque converter	Code letters		LCCA		LACA		LCCA	
Valve body	Code letters		LAC		LAC		LAC	
	Manufactured	From To	07.91 12.92		09.91 12.92		07.91 12.92	
No. of plates			Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-		5	4	5	4	5	4
	Clutch -K2-		5	5	5	5	5	5
	Clutch -K3-		5	4	5	4	5	4
	Brake -B1-		6	6	6	6	6	6
	Brake -B2-		6	7	6	7	6	7
Assignment	Type		Audi 80 1992 ► Audi Coupé Audi Convertible		Audi 80 1992 ► Audi Coupé Audi Convertible		Audi 80 1992 ►	
	Engine		2.8 l - 129 kW		2.0 l - 85 kW		2.8 l - 129 kW	

00-5

Gearbox			AZZ		CBT		CBV	
Ratios	Code letters		AZZ		CBT		CBV	
	1st gear		2.714		2.714		2.714	
	2nd gear		1.551		1.551		1.551	
	3rd gear		1.000		1.000		1.000	
	4th gear		0.679		0.679		0.679	
Intermediate drive	Reverse		2.111		2.111		2.111	
	No. of teeth	Input gear	44		44		44	
		Output gear	51		51		51	
	Ratio		1.159		1.159		1.159	
Final drive	No. of teeth	Differential pinion	10		9		11	
		Final drive gear	37		38		38	
	Ratio		3.700		4.222		3.455	
Drive shaft	Flange dia. mm		130		130		130	

00-6

Automatic gearbox			097					
Gearbox	Code letters		CBW		CEB ¹⁾		CFR ¹⁾	
	Manufactured	From To	07.91 09.91		09.91 12.92		11.92	
Torque converter	Code letters		LBCA		LBCA		LACA	
Valve body	Code letters		LAC		LAC		LBA	
	Manufactured	From To	07.91 09.91		09.91 12.92		11.92	
No. of plates			Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-		5	4	5	4	5	4
	Clutch -K2-		5	5	5	5	5	5
	Clutch -K3-		5	4	5	4	5	4
	Brake -B1-		6	6	6	6	6	6
	Brake -B2-		6	7	6	7	6	7
Assignment	Type		Audi 80 1992 ► Audi Coupé Audi Convertible		Audi 80 1992 ► Audi Coupé Audi Convertible		Audi 80 1992 ►	
	Engine		2.3 l - 98 kW		2.3 l - 98 kW		2.0 l - 66 kW/85 kW	

¹⁾ Automatic gearbox for vehicles with modified selector elements, planetary gearbox and selection program

00-7

Gearbox	Code letters		CBW	CEB	CFR ¹⁾
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.551	1.551	1.441
	3rd gear		1.000	1.000	1.000
	4th gear		0.679	0.679	0.743
	Reverse		2.111	2.111	2.884
Intermediate drive	No. of teeth	Input gear	42	44	44
		Output gear	53	51	51
	Ratio		1.261	1.159	1.159
Final drive	No. of teeth	Differential pinion	11	9	9
		Final drive gear	43	38	38
	Ratio		3.909	4.222	4.222
Drive shaft	Flange dia. mm		130	130	130

¹⁾ Automatic gearbox for vehicles with modified selector elements, planetary gearbox and selection program

00-8

Automatic gearbox			097					
Gearbox	Code letters		CFS 1) 2)		CFU		CFV 1)	
	Manufactured	From To	11.92		11.92		11.92	
Torque converter	Code letters		LCCA		LBCA		LCCA	
Valve body	Code letters		LBA		LAC		LBA	
	Manufactured	From To	11.92		11.92		11.92	
No. of plates			Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-		5	4	5	4	5	4
	Clutch -K2-		5	5	5	5	5	5
	Clutch -K3-		6	5	5	4	6	5
	Brake -B1-		6	6	5	5	6	6
	Brake -B2-		6	7	6	7	6	7
Assignment	Type		Audi 80 1992 ► Audi Convertible		Audi 80 1992 ► Audi Coupé Audi Convertible		Audi 80 1992 ► Audi Coupé Audi Convertible	
	Engine		2.8 l - 129 kW		2.3 l - 98 kW		2.8 l - 129 kW	

1) Automatic gearbox for vehicles with modified selector elements, planetary gearbox and selection program

2) US version

00-9

Gearbox	Code letters		CFS 1) 2)	CFU	CFV 1)
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.441	1.441	1.441
	3rd gear		1.000	1.000	1.000
	4th gear		0.743	0.743	0.743
	Reverse		2.884	2.884	2.884
Intermediate drive	No. of teeth	Input gear	44	44	44
		Output gear	51	51	51
	Ratio		1.159	1.159	1.159
Final drive	No. of teeth	Differential pinion	11	11	11
		Final drive gear	35	43	38
	Ratio		4.181	3.909	3.455
Drive shaft	Flange dia. mm		130	130	130

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1) Automatic gearbox for vehicles with modified selector elements, planetary gearbox and selection program

2) US version



00-10

Automatic gearbox			097				
Gearbox	Code letters		CFY ¹⁾		CFW ¹⁾		
	Manufactured	From To	11.92		11.92		
Torque converter	Code letters		LCCA		LACA		
	Code letters		LBA		LBA		
Valve body	Code letters		11.92		11.92		
	Manufactured	From To					
No. of plates			Inner	Outer	Inner	Outer	
	Clutch -K1-		5	4	5	4	
	Clutch -K2-		5	5	5	5	
	Clutch -K3-		5	4	5	4	
	Brake -B1-		5	5	6	6	
	Brake -B2-		6	7	6	7	
Assignment	Type		Audi 80 1992 ► Audi Coupé Audi Convertible		Audi 80 1992 ► Audi Coupé		
	Engine		2.6 l - 110 kW		2.0 l - 85 kW		

¹⁾ Automatic gearbox for vehicles with modified selector elements, planetary gearbox and selection program

00-11

Gearbox			CFY ¹⁾		CFW ¹⁾		
Ratios	Code letters						
	1st gear		2.714		2.714		
	2nd gear		1.441		1.441		
	3rd gear		1.000		1.000		
	4th gear		0.743		0.743		
Intermediate drive	Reverse		2.884		2.884		
	No. of teeth	Input gear	44		44		
		Output gear	51		51		
	Ratio		1.159		1.159		
Final drive	No. of teeth	Differential pinion	10		11		
		Final drive gear	37		43		
	Ratio		3.700		3.909		
Drive shaft	Flange dia. mm		130		130		

¹⁾ Automatic gearbox for vehicles with modified selector elements, planetary gearbox and selection program



00-12

Quantities

Planetary gearbox

Quantities	Planetary gearbox	Automatic gearbox
Fresh fill	5.4 l	097
Change	approx. 2.3 l ¹⁾	
Lubricant	VW ATF	

¹⁾ ATF change interval for planetary gearbox
⇒ Maintenance Brochure

VW ATF can be ordered from the spare parts range.

0.5 l size - part no. G 052 162 A1

1.0 l size - part no. G 052 162 A2

Checking/changing ATF ⇒ Page 37-32

00-13

Final drive

Quantities	Final drive	Automatic gearbox
Fresh fill	1.0 l	097
Change	Permanent fill, no change required	
Lubricant	Axle oil SAE75 W90 (synthetic oil)	

Axle oil SAE 75 W90 (synthetic oil) is available from the spare parts range.

0.5 l size - part no. G 052 145 A1

1.0 l size - part no. G 052 145 A2

Checking oil level in final drive ⇒ Page 39-1

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00-14

General repair information

Notes:

- ♦ *An exchange component containing all selector elements and the valve body is available for repair work on the automatic gearbox 097.*
- ♦ *The exchange component is assigned to the gearbox code letters ⇒ Page 00-3 onwards.*
- ♦ *Description of installation:*
⇒ Special Information; Power Train; No. 10

Important prerequisites for proper workmanlike gearbox repairs are maximum care and cleanliness, as well as the use of tools which are in perfect condition. The generally accepted basic rules of safety naturally also apply to service work.

Generally valid information on individual repair operations is summarised in the following rather than being repeated throughout the Workshop Manual. The information given applies specifically to this Workshop Manual.

Special tools

The special tools used in conjunction with the Workshop Manual are listed in the
⇒ "Special workshop tools binder"

00-15

Gearbox

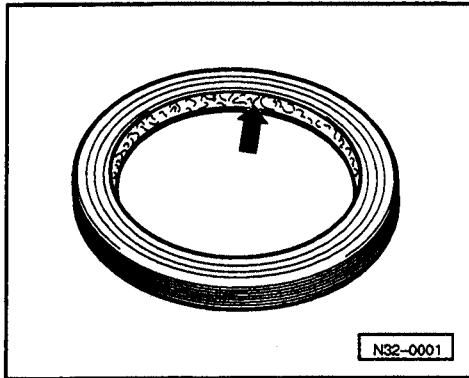
- ♦ Never run engine or tow vehicle with sump removed or with no ATF fill.
- ♦ After removing gearbox, secure torque converter to stop it dropping out.
- ♦ Thoroughly clean joints and surrounding areas before unfastening.
- ♦ Make sure dowel sleeves are properly positioned on installing gearbox.
- ♦ Set down parts removed on a clean surface and cover them over. Use sheeting and paper. Never employ fluffy cloths!
- ♦ Carefully cover over/seal open components if repairs are not to be performed immediately.
- ♦ Only install clean parts; leave replacement parts in their packaging until immediately prior to installation.
- ♦ Check and if necessary correct the following levels on replacing automatic gearbox: ATF in planetary gearbox ⇒ Page 37-32, axle oil in final drive ⇒ Page 39-1; quantities and specifications ⇒ Page 00-13 onwards.

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00-16

O-rings, sealing rings, gaskets

- ◆ Always replace O-rings, sealing rings and gaskets.
- ◆ After removing gaskets, examine contact surface at case/shaft for burr or damage caused by disassembly.
- ◆ Thoroughly clean case parting surfaces prior to assembly.
- ◀ ◆ Prior to installation, fill radial lip-type oil seals with grease in area between lips -arrow-.
- ◆ Open side of sealing rings points towards fluid to be sealed off.
- ◆ Depending on installation location, apply thin coat of ATF or axle oil to outer periphery and lip of sealing rings on installation.
- ◆ Lubricate O-rings slightly to prevent rings being squashed on installation.
- ◆ Only ever use ATF in ATF area. Other greases would cause malfunctioning of hydraulic control system.



00-17

- ◆ After installation, check and if necessary correct the following levels in the area affected: ATF in planetary gearbox ⇒ Page 37-32, axle oil in final drive ⇒ Page 39-1; quantities and specifications ⇒ Page 00-13 onwards.

Bolts, nuts

- ◆ Unfasten bolts in reverse order of tightening sequence.
- ◆ Unfasten and tighten bolts/nuts for securing covers and cases with no tightening sequence alternately and in stages.
- ◆ Take care not to tilt particularly sensitive parts such as valve body and unfasten/tighten alternately and in stages.
- ◆ Tightening torques are given for non-lubricated bolts and nuts.
- ◆ Always replace self-locking bolts and nuts.
- ◆ Use wire brush to clean threads of bolts to which locking compound is applied. Then coat bolts with AMV 185 101 A1 before fitting.

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00-18

- ◆ Tapped holes into which self-locking bolts or bolts with locking compound had been screwed must be cleaned using, for example, a thread-cutting tool. Otherwise there is a danger of the bolts shearing off on renewed disassembly.

Fastening elements

- ◆ Take care not to strain circlips.
- ◆ Always replace damaged or strained circlips.
- ◆ Circlips must rest in bottom of groove.

Bearings

- ◆ Position needle bearings with labelled side (thicker) facing mandrel.
- ◆ Depending on fitting location, apply axle oil or ATF to bearing before inserting. Lubricate with particular care for friction torque measurements.
- ◆ Never interchange outer and inner races of bearings of equal size.
- ◆ Always replace all taper roller bearings on one shaft at the same time and use the same make.

00-19

- ◆ When installing, heat inner races of taper roller bearings to approx. 100°C; press home on assembly such that there is no axial play.

Shims

- ◆ Re-measure shims at several locations with a micrometer. Different tolerances make it possible to precisely determine the required shim thickness.
- ◆ Check for burr/damage.
- ◆ Only fit shims which are in perfect condition.

Inner plates

- ◆ Immerse new inner plates in ATF for 15 minutes prior to installation.

Valve body

- ◆ Replace valve body if selector elements are scorched.

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00-20

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 servicing automatic gearbox, use self-diagnosis to determine cause of trouble as precisely as possible.

Self-diagnosis is described in the Booklet "Audi 80 1992 ➤, Automatic Gearbox 097, Self-diagnosis".

⇒ Automatic Gearbox 097 Self-diagnosis; Repair Group 01



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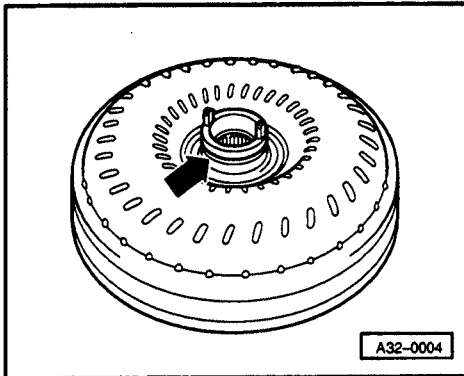
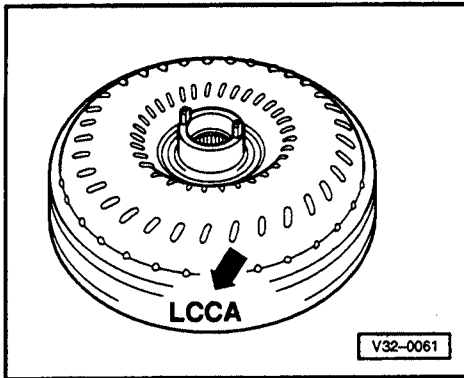
Torque converter

The ATF pump is driven by the torque converter.

Torque converter identification

- There are different torque converters. Identification is provided by the code letters (arrow).

Torque converter/gearbox assignment ⇒ Page 00-3 onwards.



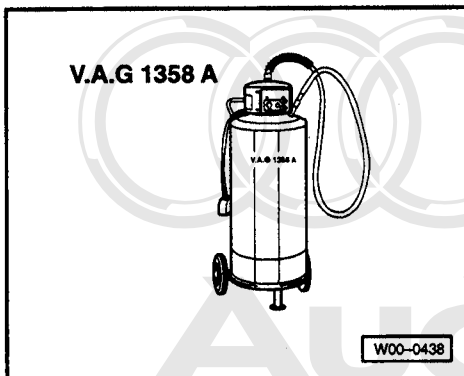
Checking torque converter

- Check hub -arrow- of converter for scoring.

Note:

The torque converter must be replaced as a complete unit in the event of damage or faults.

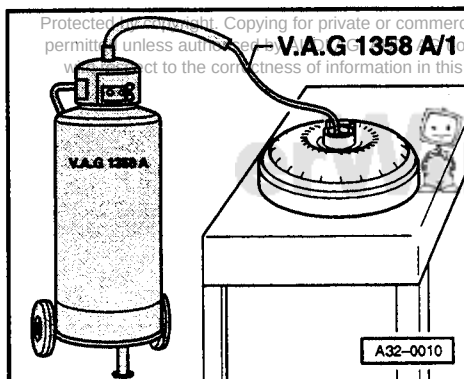
32-1



Draining torque converter

Special tools and workshop equipment required

- ♦ V.A.G 1358A: Oil extractor



Torque converter is to be drained as follows if abrasion has contaminated ATF or when performing general gearbox overhaul.

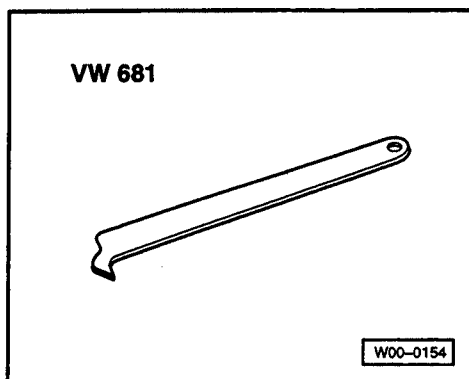
- Use V.A.G 1358A and probe V.A.G 1358A/1 to draw off ATF from torque converter.

32-2

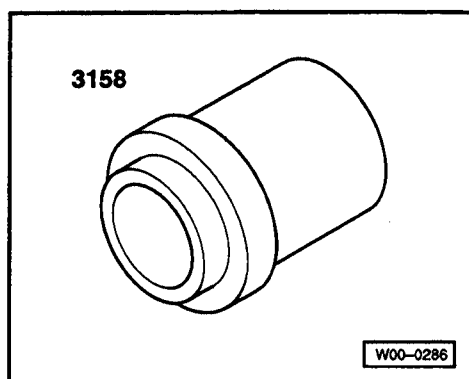
Replacing sealing ring for torque converter

Special tools and workshop equipment required

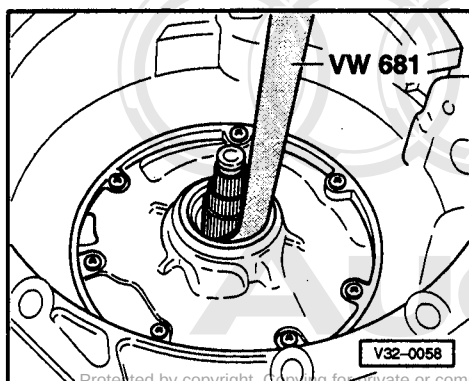
♦ VW 681: Pressing-out tool



♦ 3158: Thrust sleeve



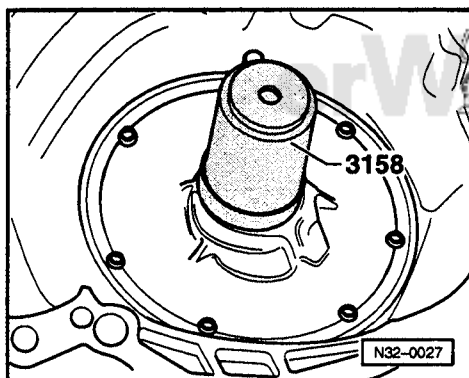
32-3



Removing

- Removing gearbox ⇒ Page 37-22.
- Remove torque converter.
- Attach gearbox to repair stand ⇒ Page 37-54 or set it down on a flat surface.
- ◀ - Use pressing-out tool VW 681 to remove sealing ring for torque converter.

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Installing

- Coat outer periphery and lips of sealing ring with ATF.
- ♦ Installation position: Open side of sealing ring faces gearbox.
- ◀ - Use thrust sleeve 3158 to drive home sealing ring for torque converter as far as thrust sleeve stop.

32-4

Installing torque converter

- Insert converter hub through sealing ring as far as first stop.
- Exerting slight pressure, turn converter inwards until converter hub recess engages in driver of pump gear and converter is felt to slide inwards.

Attention:

If converter has not been properly inserted, driver of converter or ATF pump will be destroyed on flange-mounting gearbox to engine.



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erWin 

Servicing shift mechanism

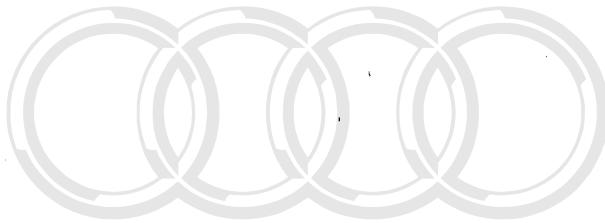
Attention:

Move selector lever to position "P" and apply handbrake before performing work with engine running.

Checking shift mechanism

Selector lever in position "P" and ignition key in removal position:

- It must only be possible to remove ignition key in this position.
- Selector lever cannot be shifted out of position "P" with ignition key removed.



37-1

Selector lever in position "P" and ignition on:

- Brake pedal not pressed:

Selector lever is locked and cannot be shifted out of position "P". Selector lever lock solenoid blocks selector lever.

- Brake pedal pressed:

Selector lever lock solenoid releases selector lever. Gear can be engaged. Slowly shift selector lever from position "P" through positions "R, N, D, 3, 2" and check whether selector lever position indicator in dash panel insert coincides with selector lever position.

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37-2

Selector lever in position "N" and ignition on:

- Brake pedal not pressed:

Selector lever is locked and cannot be shifted out of position "N". Selector lever lock solenoid blocks selector lever.

- Brake pedal pressed:

Selector lever lock solenoid releases selector lever. Gear can be engaged.

Notes:

- ♦ *It must not be possible to operate starter in selector lever positions "1", "2", "3", "D" and "R".*
- ♦ *At speeds of more than 5 km/h and shifting to selector lever position "N", selector lever lock solenoid must not engage and block selector lever. Selector lever can be shifted to drive position.*
- ♦ *At speeds below 5 km/h (virtually stopped) and shifting to selector lever position "N", selector lever lock solenoid may only engage after approx. 1 s. Selector lever cannot be shifted out of position "N" until brake pedal is pressed.*



37-3

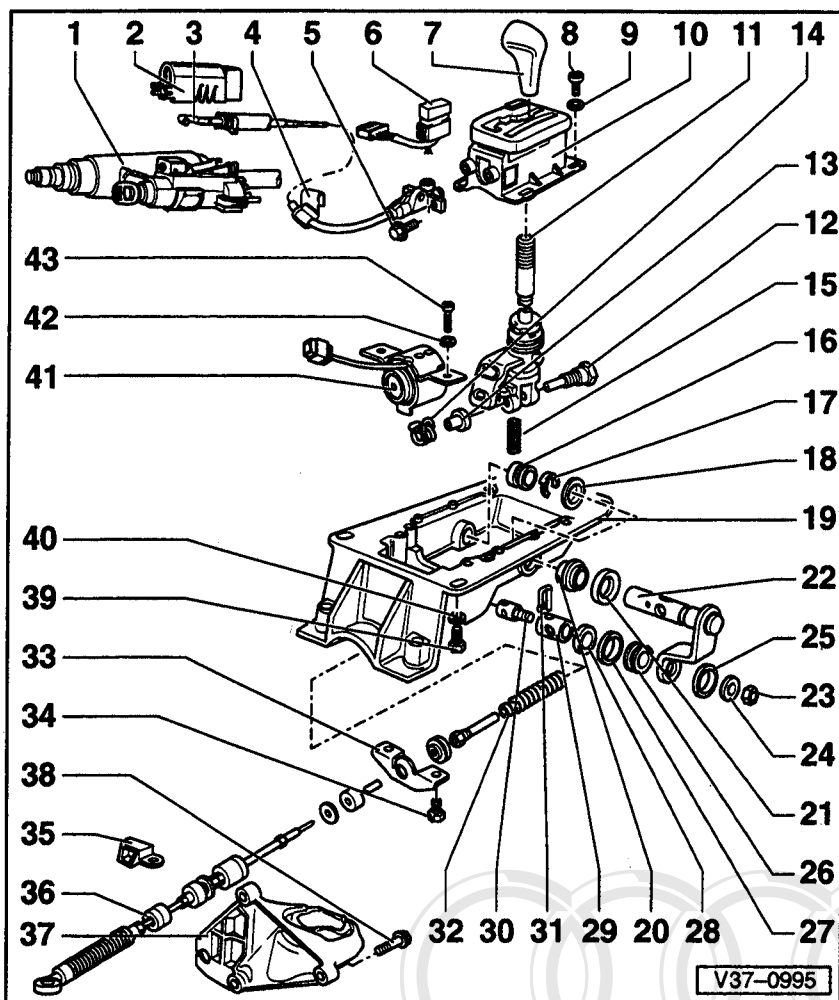
Dismantling and assembling shift mechanism

Dismantling the shift mechanism involves the following work:

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- ♦ Remove centre console for work on selector lever housing (gate), selector lever lock solenoid or locking cable
 - ⇒ General Body Repairs; Repair Group 70; Dash Panel; Removing and installing rear centre console
 - ⇒ General Body Repairs; Repair Group 70; Dash Panel; Removing and installing front centre console
- ♦ Additionally remove steering wheel and dash panel insert to replace locking cable
 - ⇒ Electrical System; Repair Group 94; Removing and installing steering column switch
 - ⇒ Electrical System; Repair Group 90; Dash Panel; Removing and installing dash panel insert
- ♦ The shift mechanism assembly is removed downwards.

37-4



1 - Ignition/starter switch

2 - Trim cap

3 - Locking cable

- ♦ For ignition key safety feature
- ♦ Take care not to kink
- ♦ Removing and installing
⇒ Page 37-17
- ♦ Adjusting ⇒ Page 37-19

4 - Clip

5 - Bolt, 9 Nm

6 - Program switch -E122

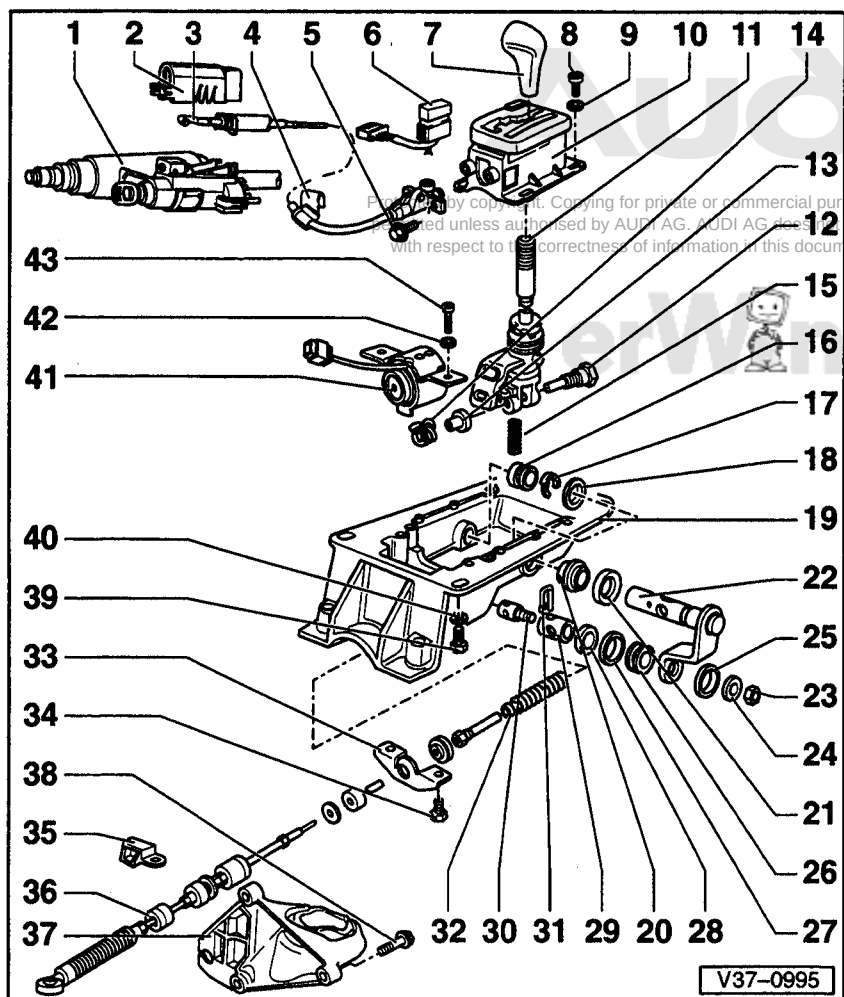
- ♦ Can be checked in vehicle by way of self-diagnosis

⇒ Automatic Gearbox 097 Self-diagnosis; Repair Group 01; Performing self-diagnosis

7 - Selector lever knob

8 - Bolt, 9 Nm

37-5



9 - Washer

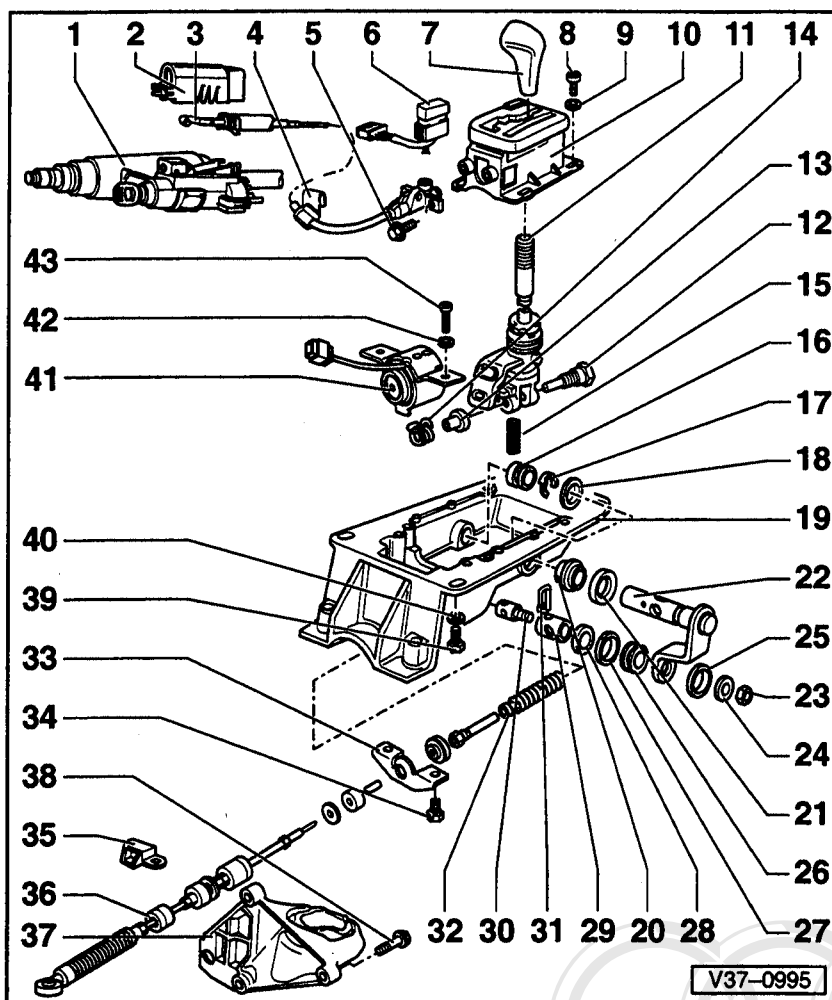
10 - Selector lever housing (gate)

- ♦ Unscrew locking cable at selector lever housing before removing selector lever housing
- ♦ Install after adjusting selector lever lock solenoid -N110
- ♦ Aligning ⇒ Fig. 2, Page 37-13

11 - Selector lever

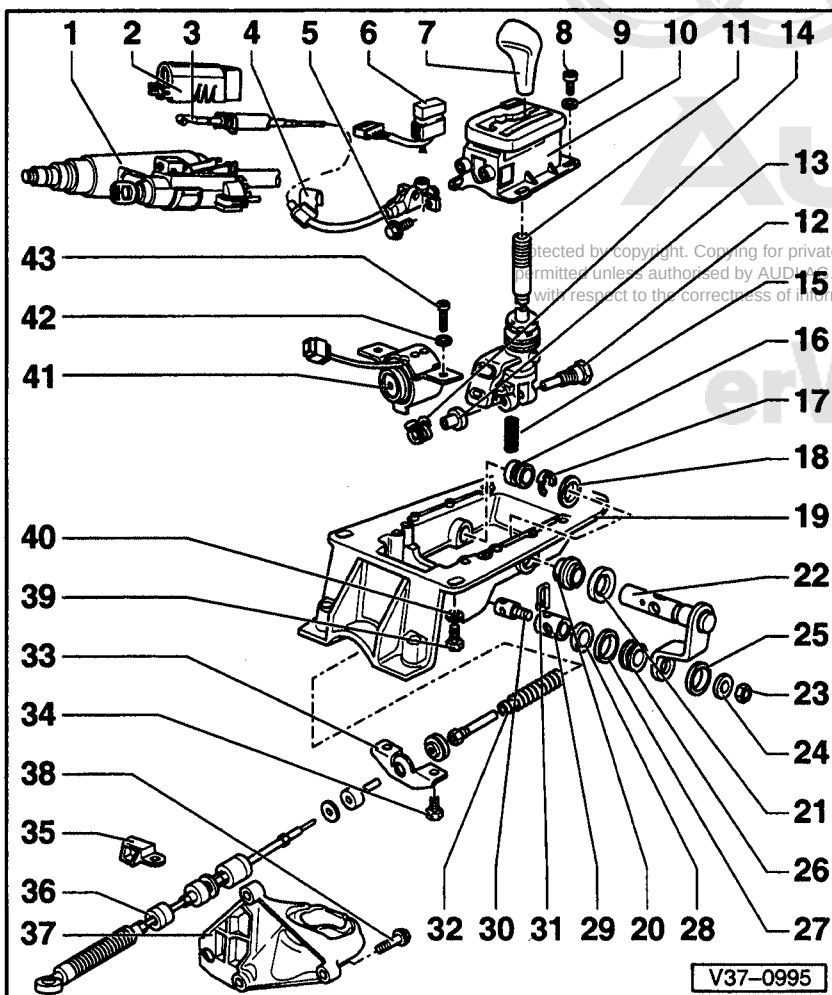
- ♦ With fork for locking selector lever position "P" and "N" as well as detent for releasing ignition key by means of locking cable in selector lever position "P".
- ♦ Checking gap between selector lever and selector lever lock solenoid -N110 ⇒ Fig. 1, Page 37-13

37-6



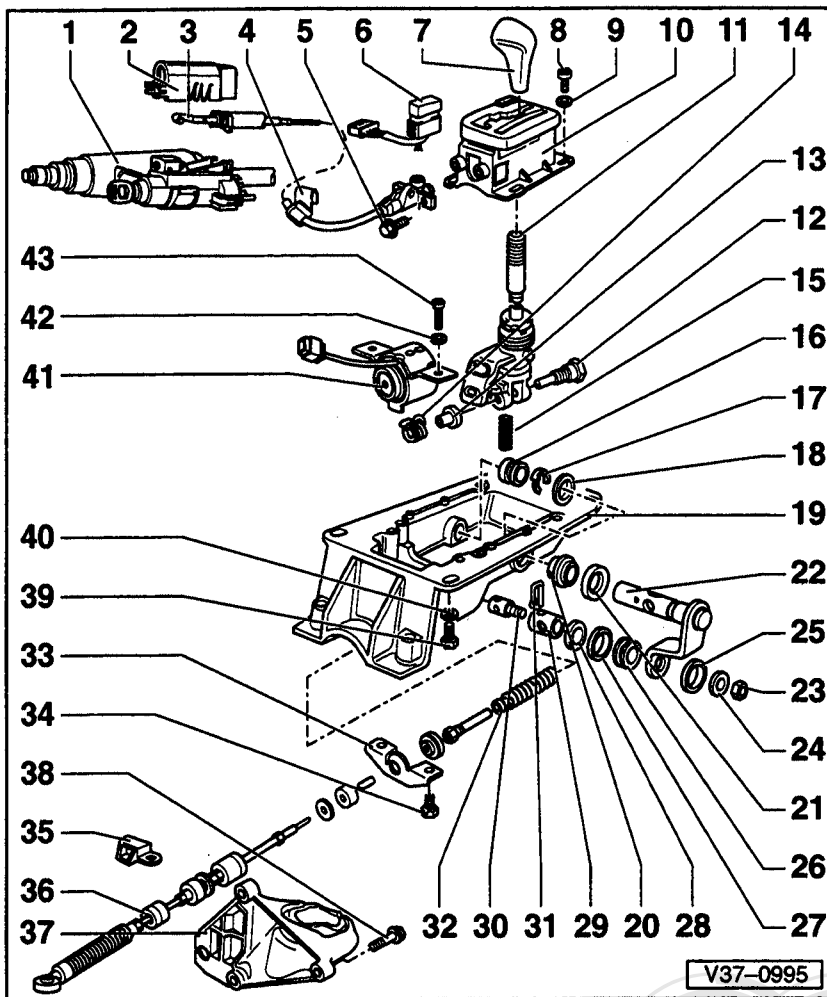
- 28 - Washer
- 29 - Clamping sleeve
 - ♦ For selector lever cable
- 30 - Clamping pin
 - ♦ For selector lever cable
- 31 - Spring clip
- 32 - Bellows
 - ♦ Replace if damaged
 - ♦ Pay attention to correct installation position
- 33 - Bracket for selector lever cable
 - ♦ Fit with offset end facing shift mechanism
- 34 - Bolt, 23 Nm
- 35 - Fastener
 - ♦ Remove before prising out selector lever cable
 - ♦ Always replace bent fastener

37-9



- 36 - Selector lever cable
 - ♦ With guide and bushing
 - ♦ Removing and installing ⇒ Page 37-14
 - ♦ Pay attention to correct installation of bellows for selector lever cable to prevent ingress of moisture into cable
 - ♦ Apply locking compound AMV 185 101 A1 to bolted joints at support brackets when fitting
 - ♦ Check tightness of guide tube
 - ♦ Take care not to bend or kink; grease ball socket slightly prior to installation
 - ♦ Adjusting ⇒ Page 37-16
- 37 - Gearbox support
 - ♦ With support bracket for selector lever cable
- 38 - Bolt, 40 Nm
- 39 - Hexagon bolt, 9 Nm
- 40 - Washer

37-10



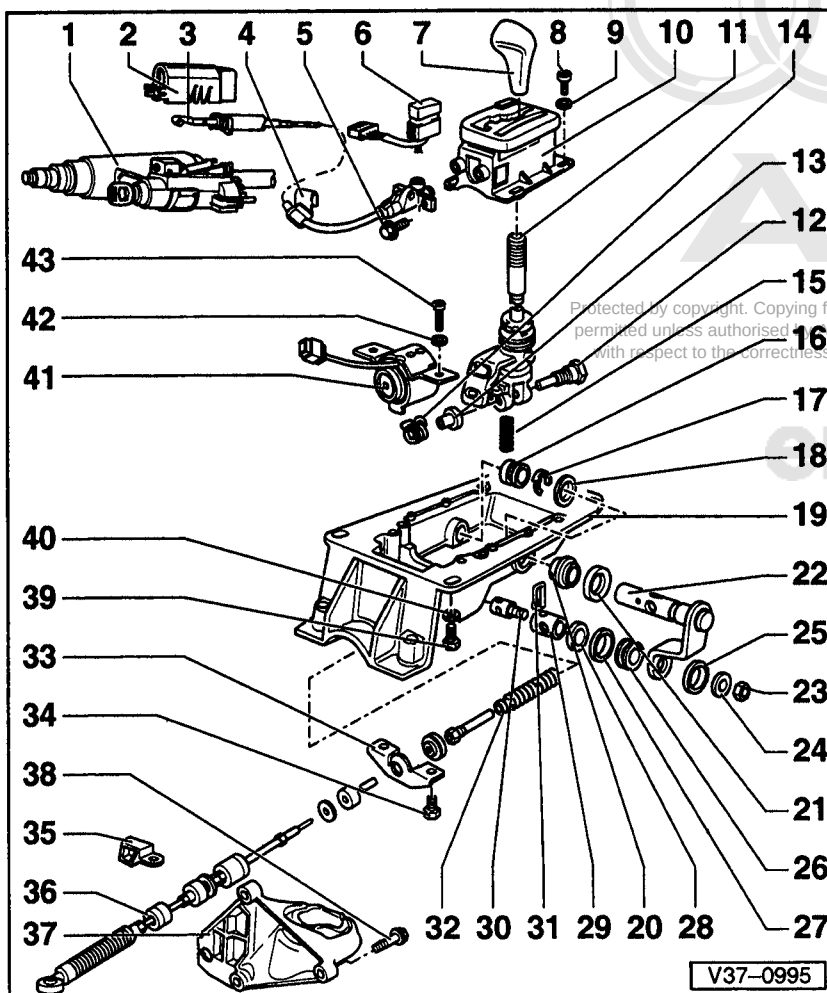
41 - Selector lever lock solenoid -N110

♦ Can be checked in electrical test and measured value block
 ⇒ Automatic Gearbox 097 Self-diagnosis; Repair Group 01; Performing self-diagnosis; Reading measured value block

♦ Installing:

- Press solenoid with catch in axial direction against shift mechanism mount and tighten bolts of solenoid
- Switch on ignition after installing shift mechanism; solenoid blocks selector lever in position "P" and "N"; selector lever can be shifted out of position "P" or "N" with brake pedal pressed
- Checking gap between selector lever and solenoid ⇒ Fig. 1, Page 37-13

37-11



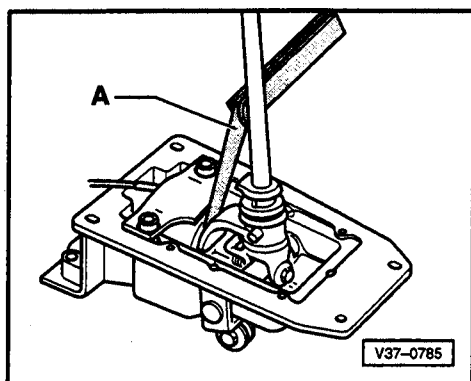
42 - Washer

43 - Bolt, 9 Nm

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37-12

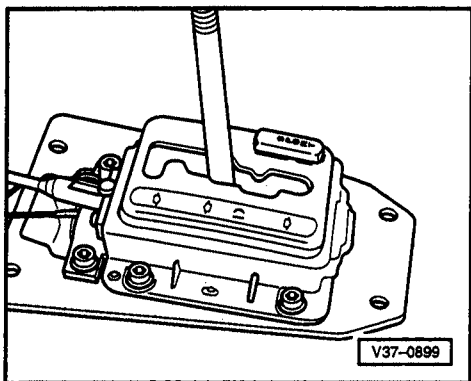


◀ **Fig. 1 Checking gap between selector lever and selector lever lock solenoid -N110**

- In selector lever position "R", use feeler gauge -A- to measure gap between selector lever and selector lever lock solenoid.

♦ Specified value: 0.6...1.4 mm

- Alter gap if necessary by moving solenoid in mounting holes.



◀ **Fig. 2 Aligning selector lever housing with selector lever**

- After installing selector lever lock solenoid, centrally align lower hole in fork with solenoid and apply voltage to solenoid.
- Fit selector lever housing (gate). Selector lever must be opposite position "N" on selector lever housing.
- After screwing on selector lever housing, shift selector lever through all positions and check whether "P" and "1" stops are reached.

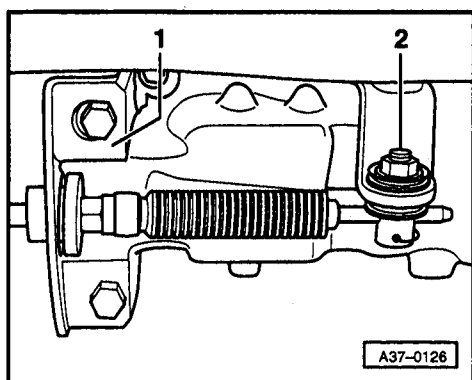
Removing/installing and adjusting selector lever cable

Note:

After installation, selector lever cable is to be adjusted ⇒ Page 37-16.

Removing

- Remove heat shield for exhaust system beneath shift mechanism mount.
- On 6-cyl. engine, remove right gearbox support.
- Unfasten bolted connection of selector lever cable at gearbox support and disengage selector lever cable.
- Press off fastener at end of selector lever cable and press ball socket of selector lever cable off gear selector lever.
- ◀ - Unscrew bracket -1- for selector lever cable beneath shift mechanism mount.
- Unfasten nut -2- and detach selector lever cable.



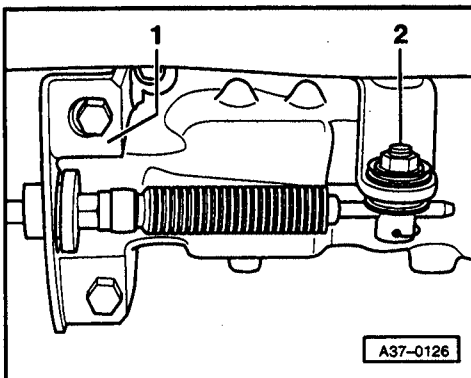
Installing

Install in reverse order, paying attention to the following:

Notes:

- ◆ Take care not to bend or kink selector lever cable.
 - ◆ Grease ball socket slightly before fitting.
 - ◆ Bellows of selector lever cable must be correctly fitted so as to prevent ingress of moisture into selector lever cable.
 - ◆ Check bellows for damage; rear bellows can be replaced separately, whereas front bellows can only be replaced together with selector lever cable.
-
- Apply locking compound AMV 185 101 A1 and make bolted connections at support brackets.
 - Screw (12 Nm) selector lever cable to support bracket on gearbox end.
 - Screw (25 Nm) bracket for selector lever cable to shift mechanism mount.

37-15



Adjusting

- Shift selector lever to position "P".
- ◀ – Unfasten nut -2- at clamping pin for selector lever cable.
- Move gear selector lever to position "P" as well (rear stop).
- Check for stress-free routing of selector lever cable.
- Tighten (20 Nm) nut -2- at clamping pin for selector lever cable.

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37-16

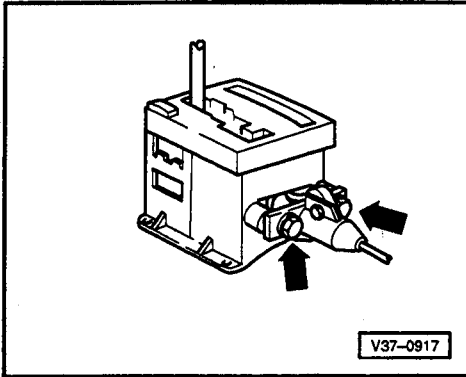
Removing/installing and adjusting locking cable

Note:

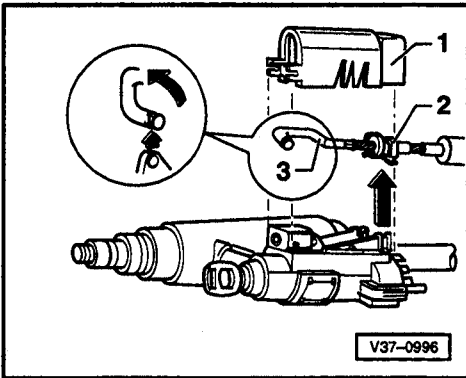
After attaching locking cable to ignition/starter switch, adjust locking cable ⇒ Page 37-19 and then fasten to selector lever housing.

Removing

- Removing centre console
⇒ General Body Repairs; Repair Group 70; Dash Panel; Removing and installing rear centre console
- ⇒ General Body Repairs; Repair Group 70; Dash Panel; Removing and installing front centre console
- Removing steering wheel and dash panel insert
⇒ Electrical System; Repair Group 94; Removing and installing steering column switch
- ⇒ Electrical System; Repair Group 90; Dash Panel; Removing and installing dash panel insert
- Shift selector lever to position "N".
- ◀ - Slacken off hexagon bolts -arrows-.



37-17



- ◀ - Remove trim cap -1-.
- Unfasten spring clip -2-.
- Swivel locking cable -3- by approx. 90° and lift out of fastening lug at ignition/starter switch.
- Detach clip for locking cable at air duct and remove locking cable.

Installing

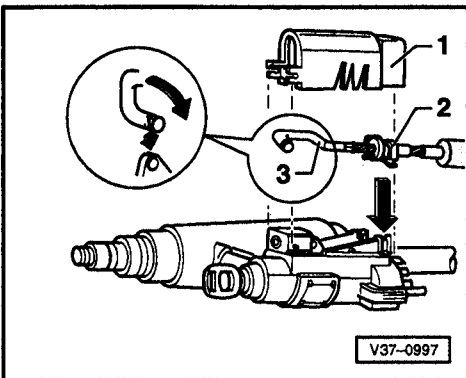
Install in reverse order, paying attention to the following:

- ◀ - Insert locking cable from above into fastening lug at ignition/starter switch (flattened side of locking cable and fastening lug must be aligned) and swivel locking cable downwards through approx. 90°.
- Fit spring clip.

Note:

Make sure spring clip engages properly, as otherwise cap cannot be fitted.

- Fit trim cap over ignition/starter switch.

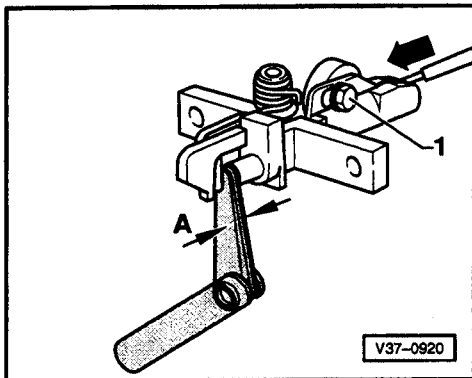


37-18

Adjusting

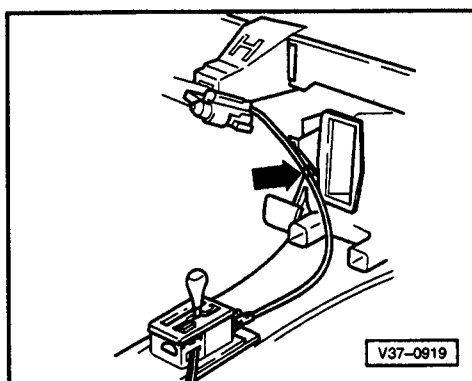
Note:

Locking cable must be adjusted in installation position.



- ◀ – Slacken off bolt -1-.
- Turn ignition/starter switch to "Drive" position.
- Fix locking-cable support bracket in front of selector lever housing (gate) in screw-on position.
- Position feeler gauge -A- (1.5 mm) between locking flap and locking pin.
- Adjust locking cable by moving it in arrow direction such that locking pin is pressed against feeler gauge.
- Tighten bolt -1- to 10 Nm in this position.
- Turn ignition/starter switch several times to removal/"drive" position.
- Re-check dimension between locking pin and locking flap.
- ♦ Specified value: 1.2...1.7 mm

37-19



- Shift selector lever to position "N".
- Install locking cable at selector lever housing (gate).
- ◀ – Make sure there are no kinks in locking cable.

Functional test

- Shift selector lever to position "P" and turn ignition key to removal position:
- Selector lever must be blocked in position "P".
- Ignition key can be removed.
- Turn ignition key to "drive" position and shift selector lever to position other than "P"; turn ignition key to removal position; press down selector lever and shift to position "P"; keep lever pressed down and shift back to position other than "P".
- It must not be possible to remove ignition key.

37-20

Checking gearbox

Performing self-diagnosis

Notes:

- ♦ Always start by performing self-diagnosis to determine cause of trouble
- ⇒ Automatic Gearbox 097 Self-diagnosis; Repair Group 01; Performing self-diagnosis
- ♦ Automatic gearbox is only to be checked as described in "Fault-finding. Power train" binder if performance of self-diagnosis did not permit location and elimination of cause of trouble.

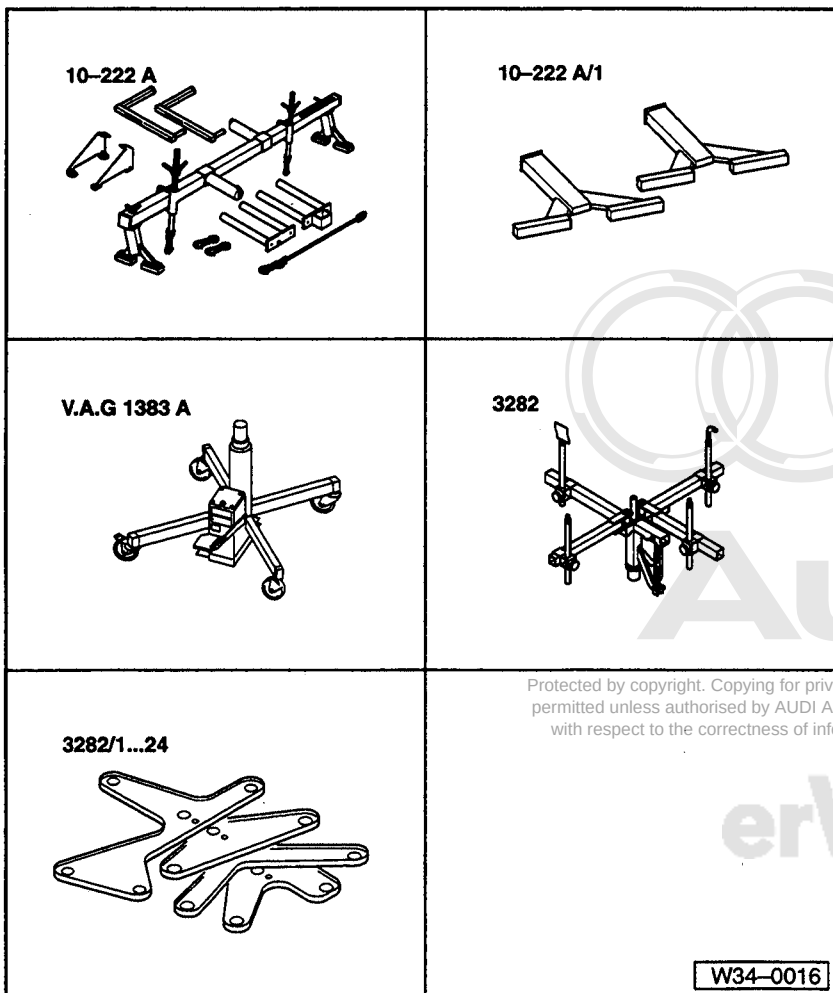
Checking shift points

⇒ "Fault-finding. Power train" binder No. 13

Fault-finding table for "automatic 4-speed gearbox"

⇒ "Fault-finding. Power train" binder No. 14

37-21



Removing and installing gearbox

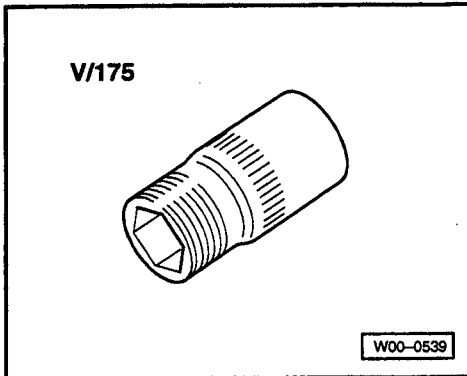
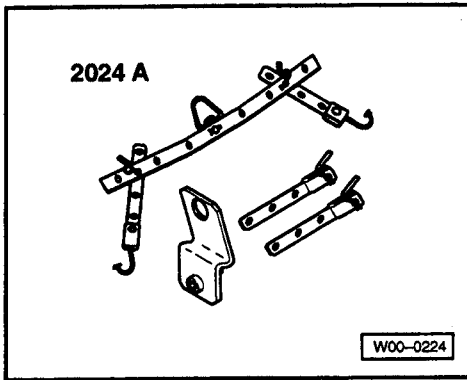
Special tools and workshop equipment required

- ♦ 10-222 A: Support bar
- ♦ 10-222 A/1: Supports
- ♦ V.A.G 1383 A: Gearbox lifter
- ♦ 3282: Gearbox rest
- ♦ 3282/3: Adjusting plate

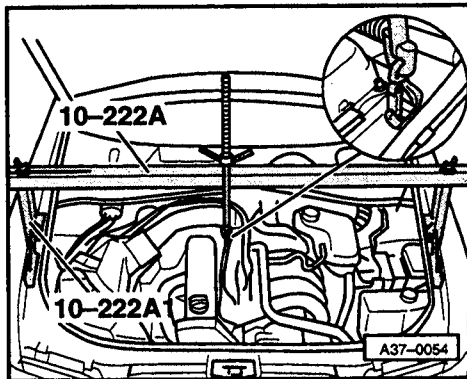
37-22

Special tools and workshop equipment required

- ♦ 2024 A: Hanger



37-23



Removing

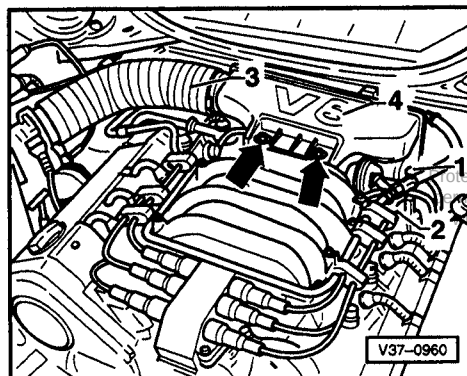
- Pay attention to/if necessary ask customer for code on vehicles with coded radio.
- Detach earthing strap at battery with ignition switched off.
- Pull speedometer connector off gearbox.

Vehicles with 4-cyl. engine:

- ◀ – Insert support bar 10-222 A with supports 10-222 A/1 and support engine/gearbox in this position.

Vehicles with 6-cyl. engine:

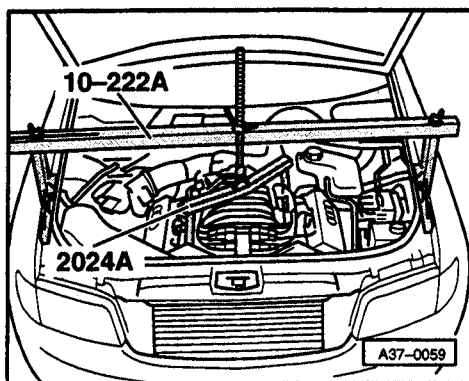
- Detach engine cover.
- ◀ – Pull off vacuum hoses -1- and -2-.
- Remove air duct hose -3- and screw out bolts -arrows-.
- Remove noise insulation -4-.



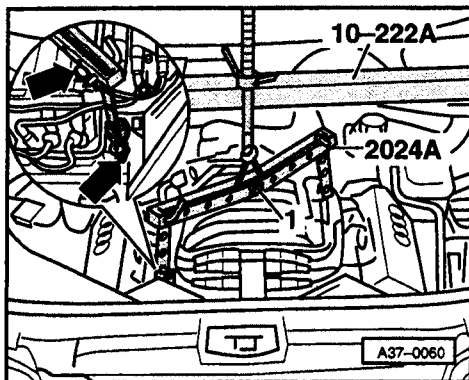
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37-24

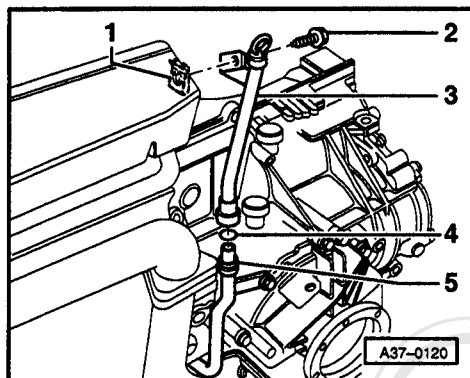


- - Mount support bar 10-222 A on wing attachment edge with spindle at front.



- - Dismantle eyelet of hanger 2024 A. Re-insert pin -1- in centre hole of hanger and secure with split pin.
- Engage pin of hanger 2024 A at spindle of support bar 10-222 A.
- Engage hanger 2024 A at front right and rear left of engine; to do so, pull spark-plug connectors off cylinders 1 and 6.
- Secure mounting hook and setting pins at hanger with plug-in fasteners -arrows in magnified view-.
- Pre-tension spindle of support bar 10-222 A.

_____ 37-25 _____

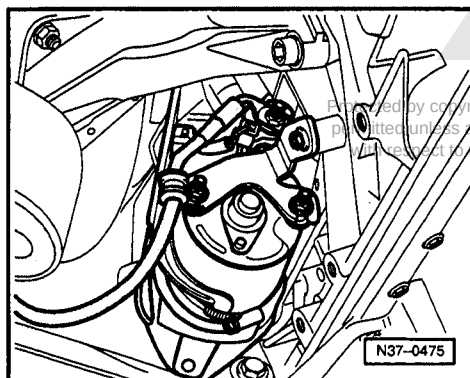


Vehicles with split ATF filler pipe:

- - Unfasten bolt -2- and pull upper ATF filler pipe -3- off lower ATF filler pipe -5-.
- Then seal off lower ATF filler pipe with clean, non-fibrous cloth.

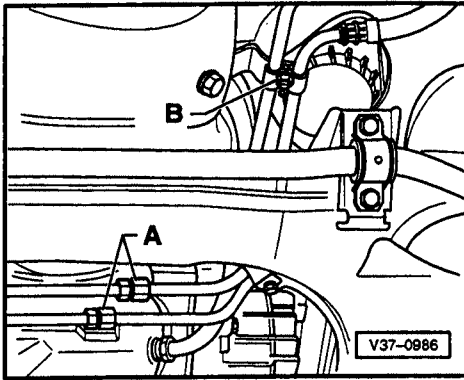
All vehicles:

- Remove engine/gearbox connecting bolts at top.
- Detach noise insulation tray.
- Detach holder for noise insulation tray.
- Remove shield for drive shaft.
- If fitted, remove bodywork cross piece beneath exhaust system.
- Removing front exhaust system with catalytic converter.
⇒ Engine, Mechanical Components; Repair Group 26;
Removing and installing exhaust system components
- Unscrew drive shafts from flanges and tie up.

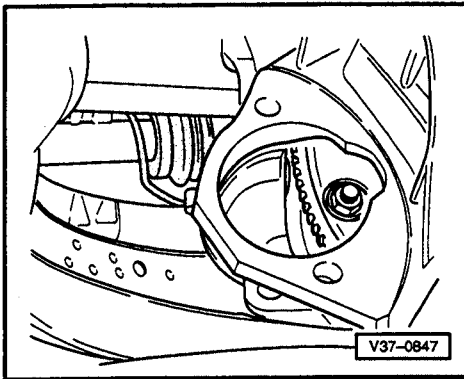


- - Remove starter.

_____ 37-26 _____

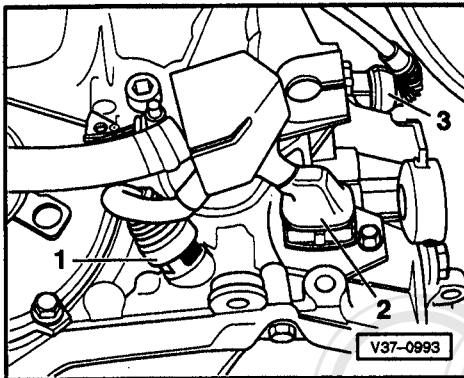


- Position collector V.A.G 1306 beneath gearbox.
- ◀ - Detach ATF pipes at connection point -A-.
- Unscrew bracket -B- and lay ATF pipes aside.

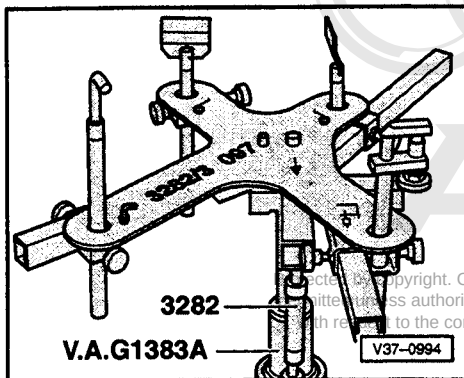


- ◀ - Use 15 mm wrench socket (Matra V175) to screw out 3 nuts of torque converter in opening of removed starter (give crankshaft a further 1/3 of a turn each time).

———— 37-27 ————



- Unscrew shield for multi-function switch.
- ◀ - Pull off connectors -1...3- at rear of gearbox.
- Unhook cable holders for procon-ten system at gearbox and press cables upwards.
- Unhook fastener at end of selector lever cable and press ball socket of selector lever cable off gear selector lever.
- Lay selector lever cable aside.



- ◀ - Set up gearbox rest 3282.

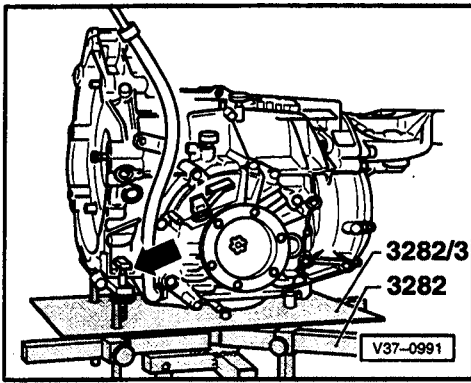
Gearbox rest 3282 is set up for automatic gearbox 097 with adjusting plate 3282/3.

The symbols on the adjusting plate show the rests required; the arrow faces in the direction of travel.

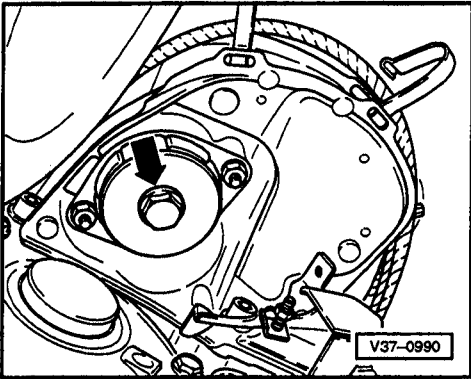
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———— 37-28 ————



- ◀ – Move lifter V.A.G 1383A with gearbox rest 3282 into position beneath gearbox and support gearbox.
- Align adjusting plate in parallel with gearbox and lock securing rest -arrow- on gearbox.



- ◀ – Remove hexagon bolt -arrow- from bonded rubber bush of rear gearbox support.
- Remove engine/gearbox connecting bolts at bottom.
- Press gearbox off engine and at the same time press torque converter out of drive plate.
- Press torque converter towards ATF pump.
- Lower gearbox slightly.
- Secure converter to stop it dropping out.

————— 37-29 —————

Installing

Install in reverse order, paying attention to the following:

Note:

Before installing exchange gearbox, clean ATF pipes and ATF cooler ⇒ Page 37-46.

- Before installing gearbox, make sure torque converter has been properly inserted in gearbox ⇒ Page 32-5.
- Pay attention to proper positioning of dowel sleeves at cylinder block before installing gearbox.
- Use genuine nuts to attach torque converter to drive plate
⇒ Parts list
- Use 15 mm wrench socket (Matra V175) to tighten torque converter nuts.
- Adjusting selector lever cable ⇒ Page 37-16.

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- Checking oil level in final drive of automatic gearbox ⇒ Page 39-1.



Checking ATF level ⇒ Page 37-32.

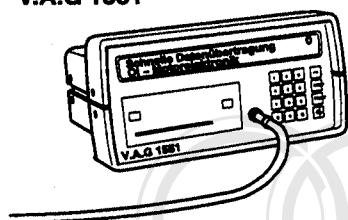
————— 37-30 —————

Tightening torques

Component		Nm
Drive plate to torque converter		60
Bracket for ATF pipes		10
ATF pipe to ATF pipe		40
Gearbox support to gearbox		40
Gearbox support to bodywork		110
Drive shaft to gearbox	M8	40
	M10	80
Gearbox to engine	M12	80
	M10	60

37-31

V.A.G 1551



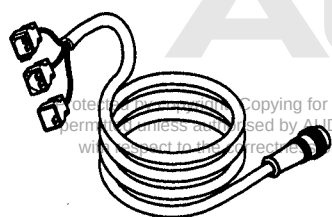
W00-0459

Checking ATF level and topping up

Special tools and workshop equipment required

- ◀ ♦ V.A.G 1551: Fault reader

V.A.G 1551/1



W00-0623

- ◀ ♦ V.A.G 1551/1: Lead

Additional information material required

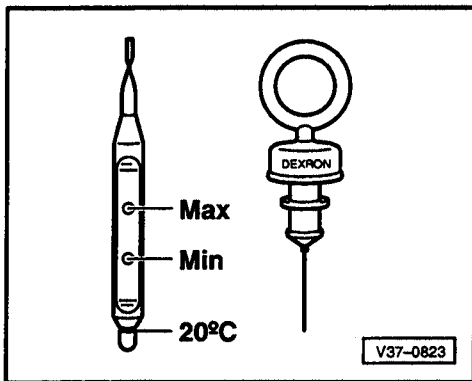
- ♦ Workshop Manual for Audi 80 1992 ➤, Automatic Gearbox 097 Self-diagnosis

37-32

Checking ATF level

Test prerequisites

- Vehicle standing on a flat surface
- Gearbox not in emergency running mode
- ◀ • ATF must be filled as far as 20°C mark when cold
- Selector lever set to "P", engine idling
- Connect up fault reader V.A.G 1551, enter address word "02 Gearbox electronics" and keep switching until "Select function XX" is displayed.
- ⇒ Automatic Gearbox 097; Repair Group 01; Performing self-diagnosis; Connecting fault reader V.A.G 1551 (or V.A.G 1552) and selecting functions



Rapid data transfer
Select function XX

HELP

Display:

- Enter "08" for "Reading measured value block" function and confirm with Q key.

37-33

Reading measured value block
Enter display group number XXX

Display:

- Enter "005" for display group "005" and confirm with Q key.

Reading measured value block 5 →
30°C 0011011 0 900 rpm

Display:

- Read off ATF temperature in display field 1.
- ATF must be at operating temperature (approx. 60°C).

Check ATF level again and top up/drain off.

ATF level must be between min. and max. mark.

Attention:

Overfilling and underfilling both impair the function of the gearbox. ATF level is therefore to be checked at regular intervals.

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37-34

Topping up ATF

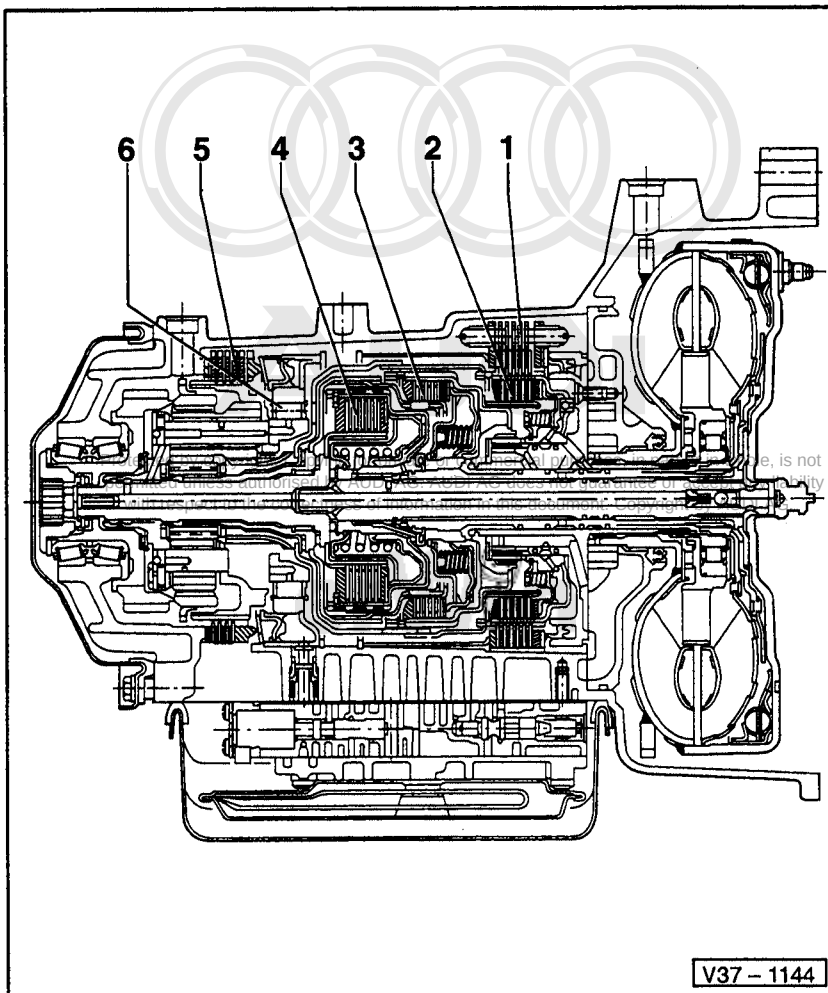
Note:

Excess ATF would cause malfunctions and must therefore be drawn off again. This can be done using probe V.A.G 1358 A/1 and V.A.G 1358 A.

- Pour in ATF using funnel (for new fill, initially approx. 3 l).
- Then start engine and shift once through all selector lever positions with vehicle stationary.
- Checking ATF level ⇒ Page 37-32.
- Use non-fibrous cloth to wipe over dipstick.

The ATF level changes with ATF temperature. The min. and max. marks on the ATF dipstick are referenced to an ATF temperature of 60°C.

37-35



Gearbox with selector elements up to 11.92

Layout of selector elements

1 = 2nd and 4th gear brake -B2-

2 = Reverse gear clutch -K2-

3 = 1st - 3rd gear clutch -K1-

4 = 3rd and 4th gear clutch -K3-

5 = Reverse gear brake -B1-

6 = Free wheel

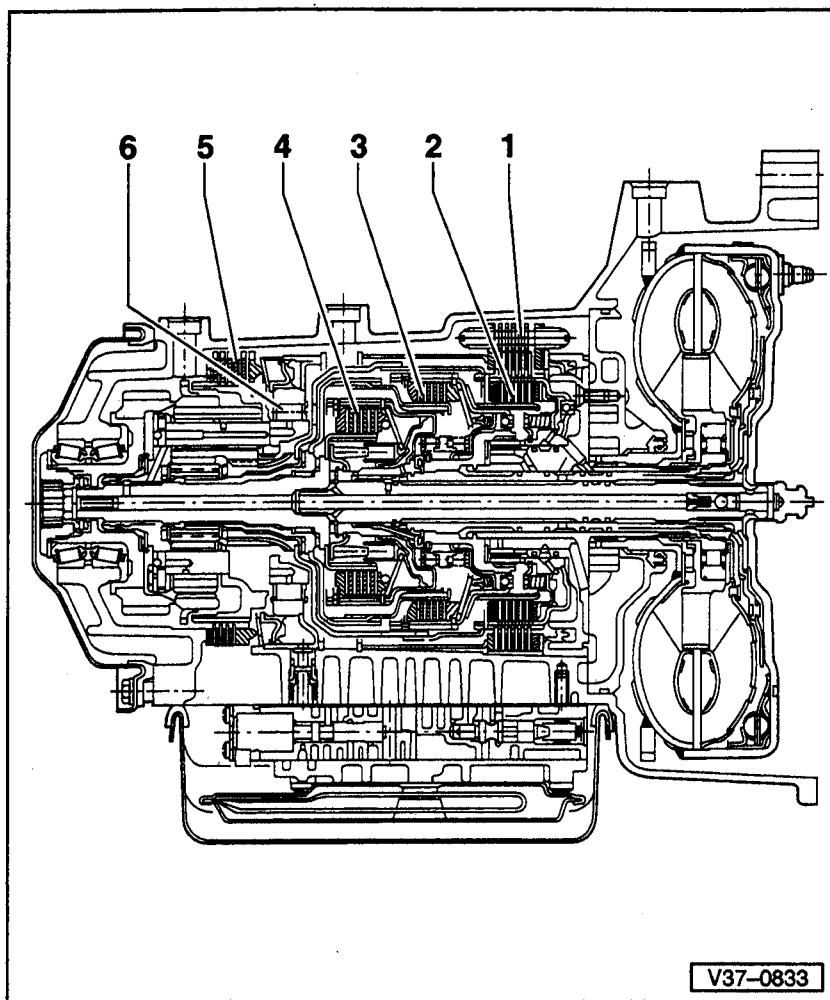
In the event of complaints about poor acceleration and speed values or in the case of drive problems in general, the following table provides information as to which selector elements are actuated in the individual gear positions, thus giving an indication of which selector elements are not functioning properly.

Perform self-diagnosis before carrying out gearbox repairs

⇒ Automatic Gearbox 097 Self-diagnosis; Repair Group 01

V37 - 1144

37-36



Position of selector elements on gearboxes up to 11.92

Gear	B1	B2	K1	K2	K3	F
R	x			x		
1H			x			x
2H		x	x			
3H			x	x		
3LT1			x		x	
3M			x	x	x	
3LT2				x	x	
4M		x			x	

X = Engaged clutches, brakes or free wheel

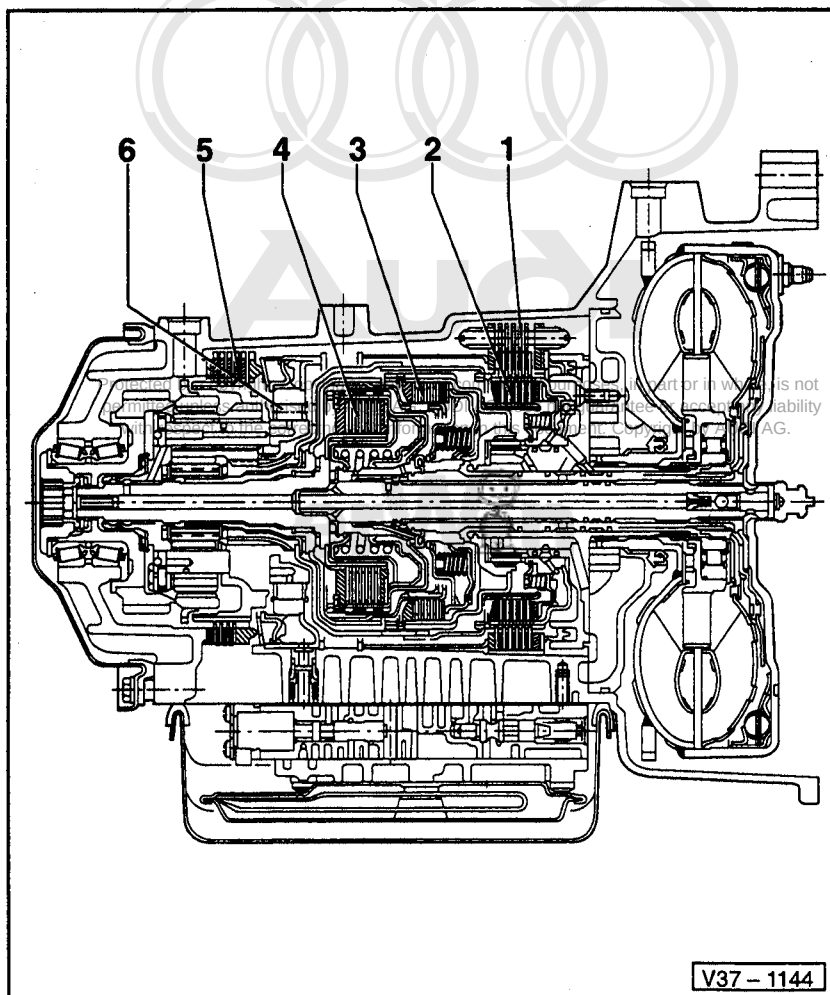
H = Hydraulic

M = Mechanical

LT1 = Load splitting

LT2 = Load splitting

37-37



Gearbox with selector elements as of 11.92

Layout of selector elements

1 = 2nd and 4th gear brake -B2-

2 = Reverse gear clutch -K2-

3 = 1st - 3rd gear clutch -K1-

4 = 4th gear clutch -K3-

5 = Reverse gear brake -B1-

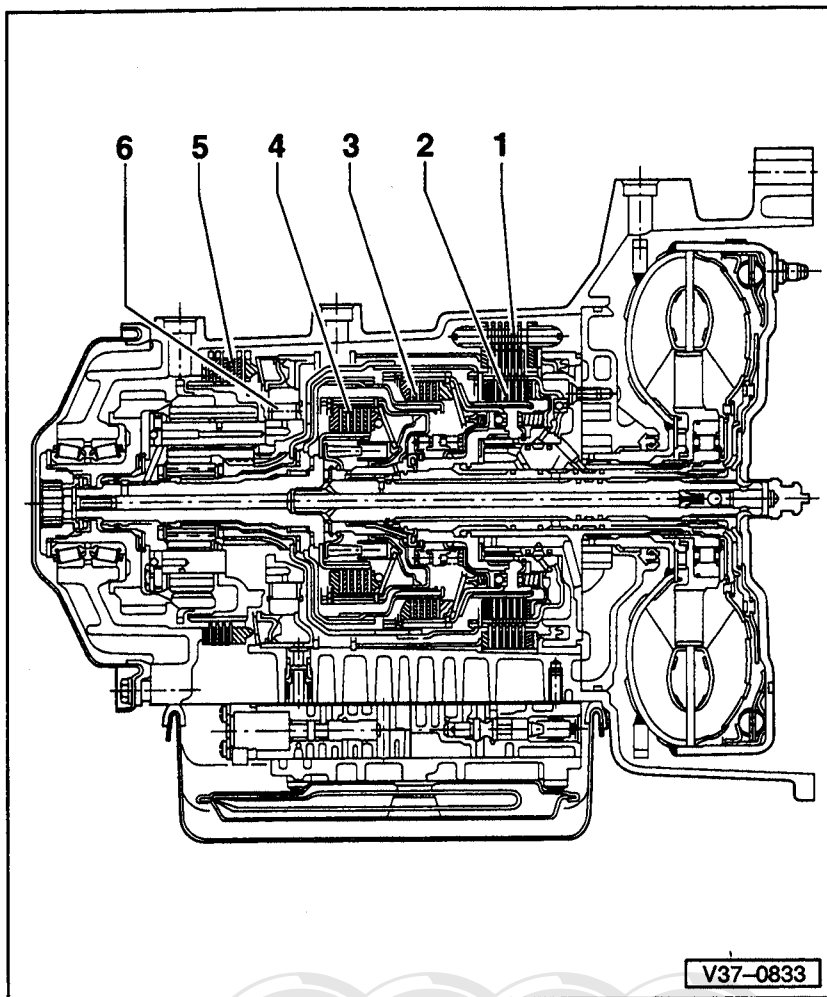
6 = Free wheel

In the event of complaints about poor acceleration and speed values or in the case of drive problems in general, the following table provides information as to which selector elements are actuated in the individual gear positions, thus giving an indication of which selector elements are not functioning properly.

Perform self-diagnosis before carrying out gearbox repairs

⇒ Automatic Gearbox 097 Self-diagnosis; Repair Group 01

37-38



Position of selector elements on gearboxes as of 11.92

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

X = Engaged clutches, brakes or free wheel

H = Hydraulic

M = Mechanical

Note:

Figs. V37-0833 and V37-1144 show the automatic gearbox 096. The layout of the selector elements for the automatic gearbox 097 is identical.

37-39

Dismantling and assembling gearbox

– Pay attention to general repair instructions ⇒ Page 00-15.

Removing and installing ATF pipes ⇒ Page 37-42.

Cleaning ATF pipes and ATF cooler ⇒ Page 37-46.

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Dismantling and assembling planetary gearbox: Exploded view ⇒ Page 37-48.

Exploded view of adjustment work for planetary gearbox ⇒ Page 37-94.

Removing and installing valve body ⇒ Page 38-44.

37-40

Rules for cleanliness when working on automatic gearbox

- ◆ Thoroughly clean joints and surrounding areas before unfastening.
- ◆ Set down parts removed on a clean surface and cover them over. Use sheeting and paper. Never employ fluffy cloths!
- ◆ Carefully cover over/seal open components if repairs are not to be performed immediately.
- ◆ Only install clean parts; leave replacement parts in their packaging until immediately prior to installation.
- ◆ Always replace O-rings, sealing rings and gaskets.
- ◆ Apply ATF to O-rings on installation to prevent rings being squashed.
- ◆ Never use any other lubricants in ATF area, as this could cause malfunctioning of hydraulic control system.
- ◆ After installation, check and if necessary top up gear oil and ATF.

37-41

Removing and installing ATF pipes

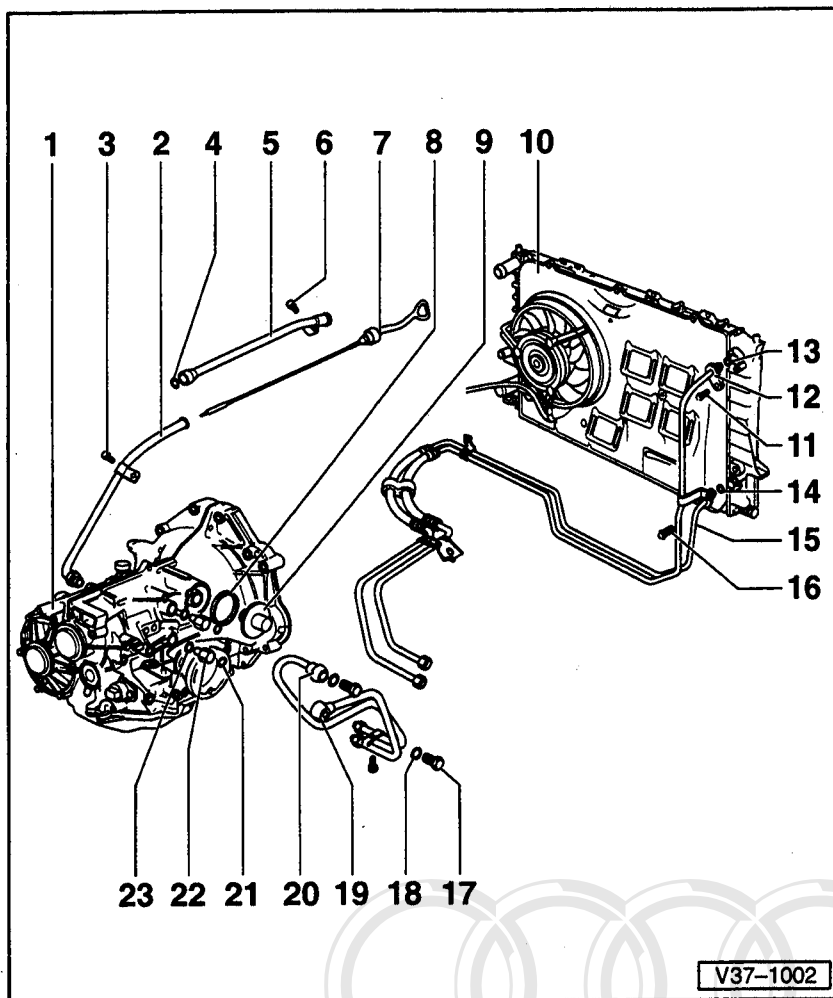
Notes:

- ◆ Pay attention to rules for cleanliness when working on automatic gearbox ⇒ Page 37-41..
- ◆ Thoroughly clean joints and surrounding areas before unfastening.
- ◆ Insert ATF pipes by hand into gearbox/radiator as far as they will go and then screw on.
- ◆ After replacing ATF pipes ⇒ Check and top up ATF, Page 37-32.

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37-42



1 - Gear case

2 - ATF filler pipe

- ♦ Tighten to 80 Nm on sump
- ♦ Assignment as per engine version

⇒ Parts list

3 - Bolt, 10 Nm

4 - O-ring

- ♦ Always replace
- ♦ Only fitted on gearboxes with 2-piece filler pipe

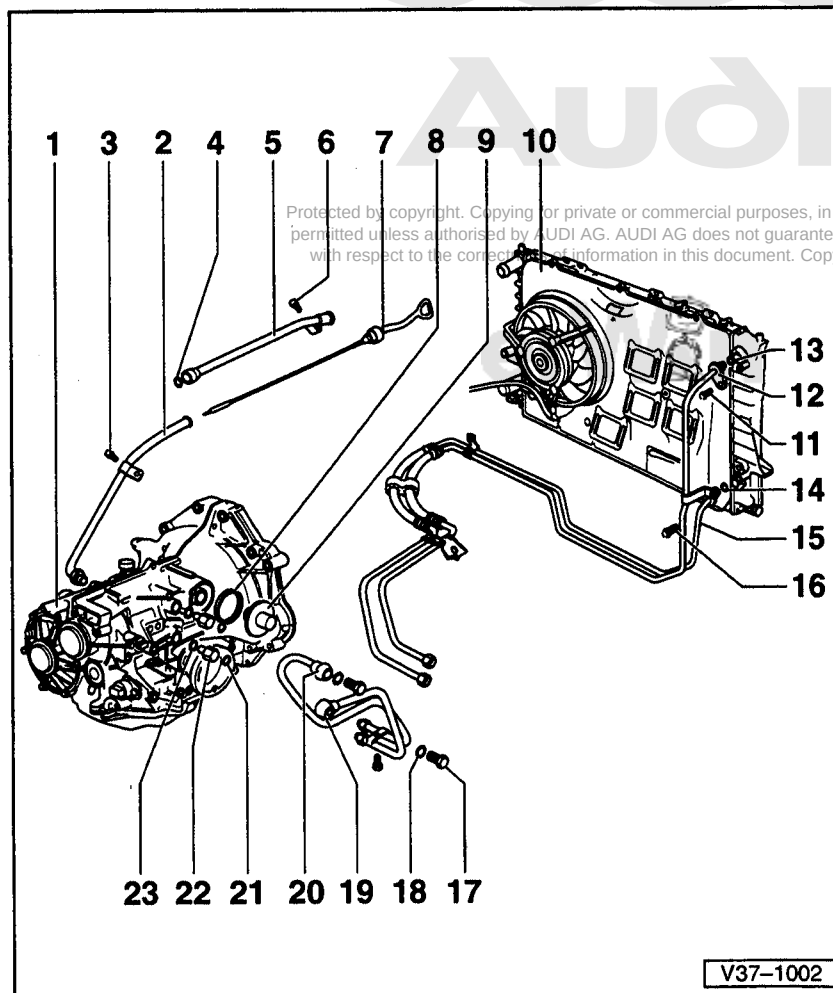
5 - ATF filler pipe

- ♦ 2-piece design, combined with -item 2-
- ♦ Assignment as per engine version

⇒ Parts list

6 - Bolt, 10 Nm

37-43



7 - ATF dipstick

- ♦ Checking ATF level ⇒ Page 37-32

8 - Flat seal

- ♦ Always replace
- ♦ Moisten with ATF for insertion in oil cooler cap

9 - Oil cooler cap, 25 Nm

10 - Radiator

- ♦ With integrated ATF cooler

11 - Bolt, 10 Nm

12 - Return line

- ♦ With hoses and securing clips

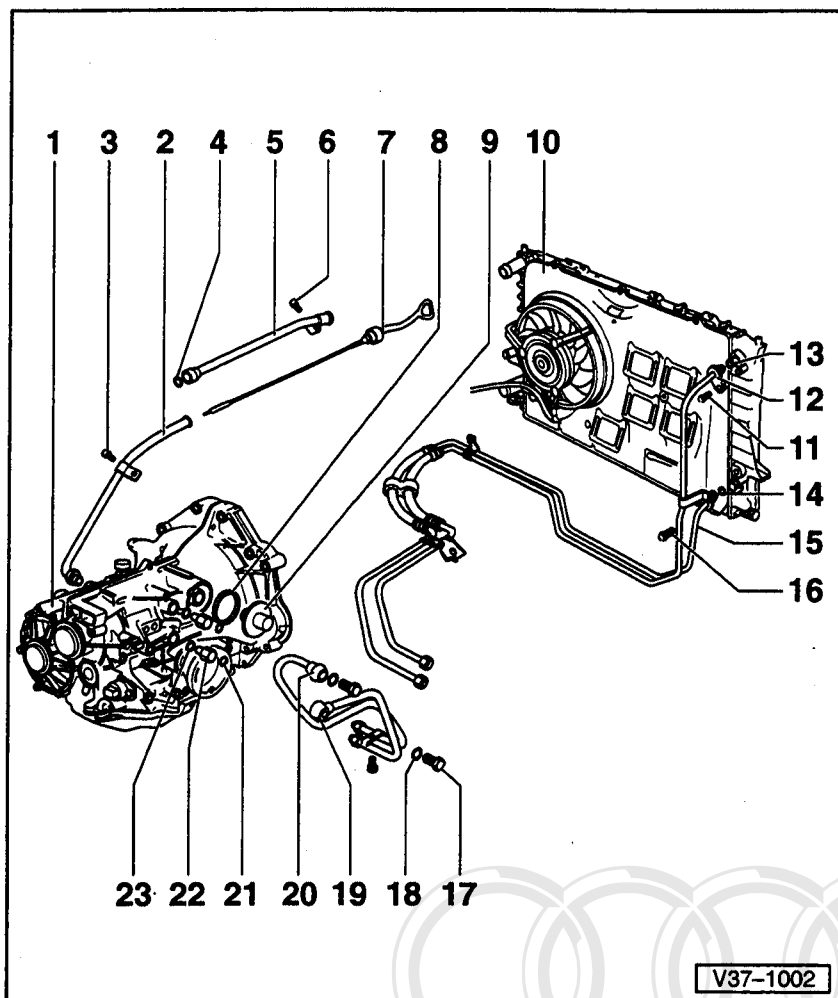
13 - O-ring

- ♦ Always replace

14 - O-ring

- ♦ Always replace

37-44



- 15 - Feed line
♦ With hoses and securing clips
- 16 - Bolt, 10 Nm
- 17 - Banjo bolt, 30 Nm
- 18 - Sealing ring
♦ Always replace
- 19 - Feed pipe
♦ Screw (40 Nm) to feed line
- 20 - Return pipe
♦ Screw (40 Nm) to return line
- 21 - Sealing ring
♦ Always replace
- 22 - Threaded connection, 60 Nm
- 23 - O-ring
♦ Always replace

V37-1002

37-45

Cleaning ATF pipes and ATF cooler

Special tools and workshop equipment required

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♦ V.A.G 1306: Collector

♦ Commercially available compressed-air gun

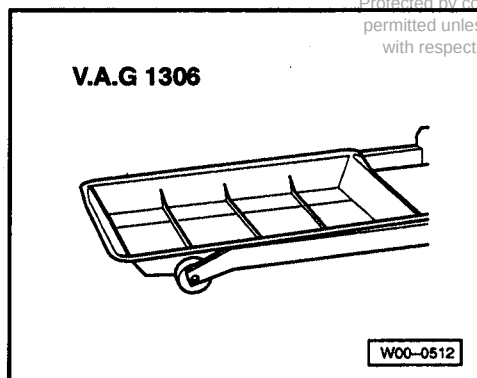
Notes:

- ♦ Pay attention to information on "Removing and installing ATF pipes" ⇒ Page 37-42..
- ♦ Before installing exchange gearbox, always blow out ATF cooler and ATF pipes with compressed air (max. 10 bar).
- ♦ On installation, insert ATF pipes by hand into gearbox/radiator as far as they will go and then screw on.

Attention:

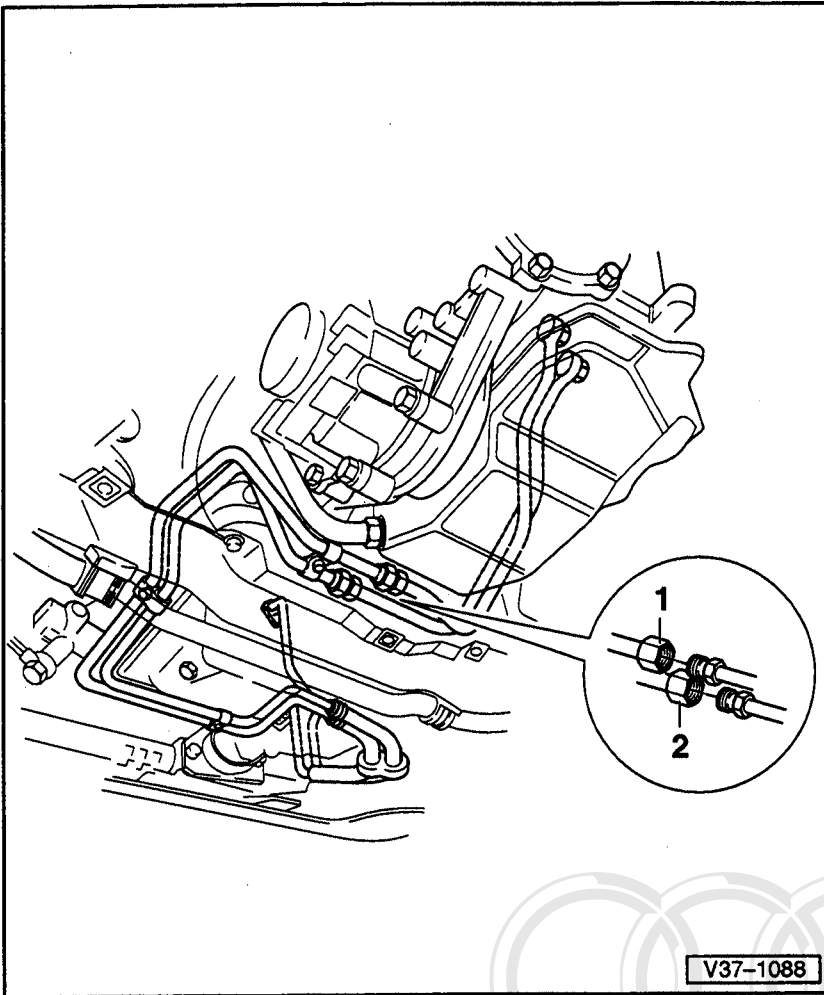
Wear protective goggles.

- Place collector V.A.G 1306 under gearbox.



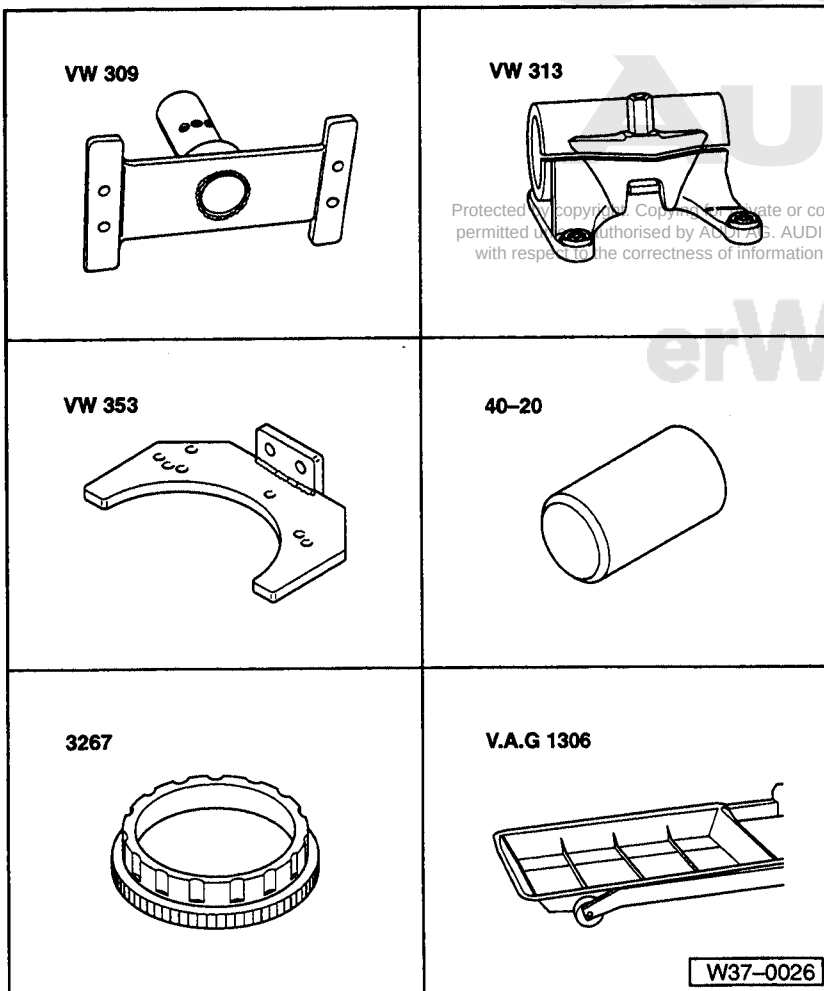
W00-0512

37-46



- Unfasten cap nuts of ATF pipes -1- and -2-.
- Unfasten holders for rigid ATF pipes.
- Attach hose (dia. 18 mm) to ATF pipe -1- and secure with hose clip.
- Place other end of hose over a suitable vessel.
- Blow several times into ATF pipe -2- with compressed-air gun.
- Move hose from ATF pipe -1- to ATF pipe -2- and repeat procedure.
- Tighten cap nuts -1- and -2- to tightening torque and re-attach holders of ATF pipes.
- Subsequent checking and topping-up of ATF ⇒ Page 37-32.

37-47

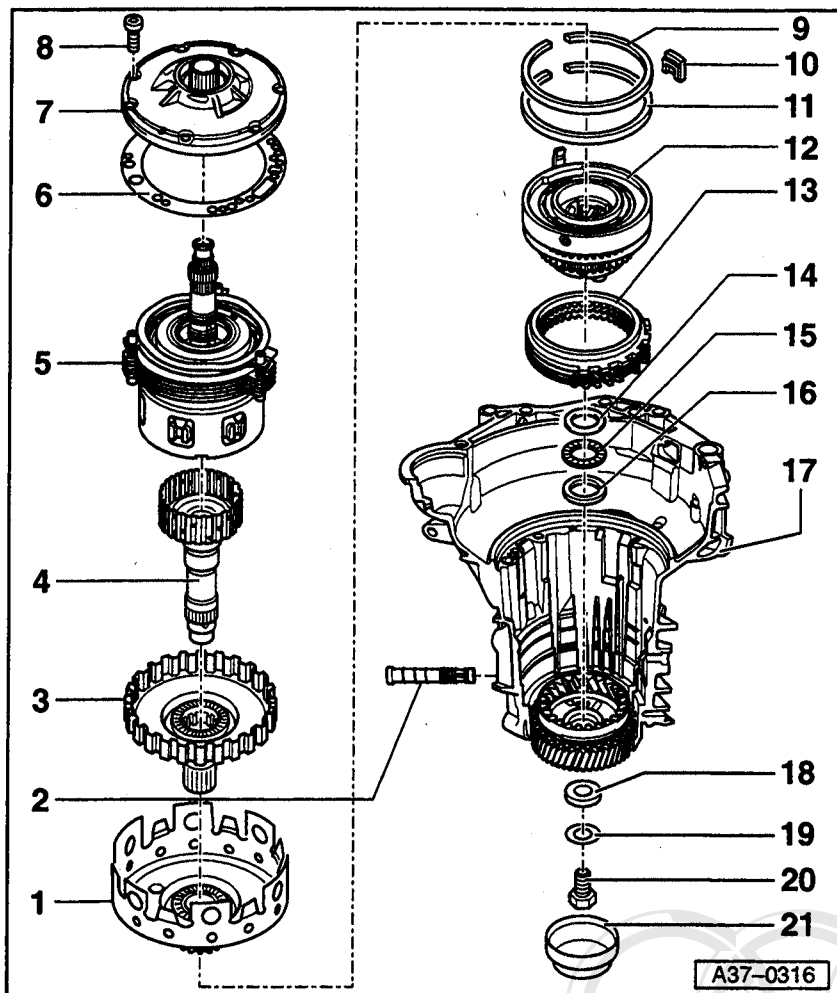


Dismantling and assembling planetary gearbox

Special tools and workshop equipment required

- ♦ VW 309: Holding plate
- ♦ VW 313: Clamp
- ♦ VW 353: Gearbox rest
- ♦ 40-20: Thrust sleeve
- ♦ 3267: Assembly ring
- ♦ V.A.G 1306: Collector

37-48



Dismantling planetary gearbox: Exploded view

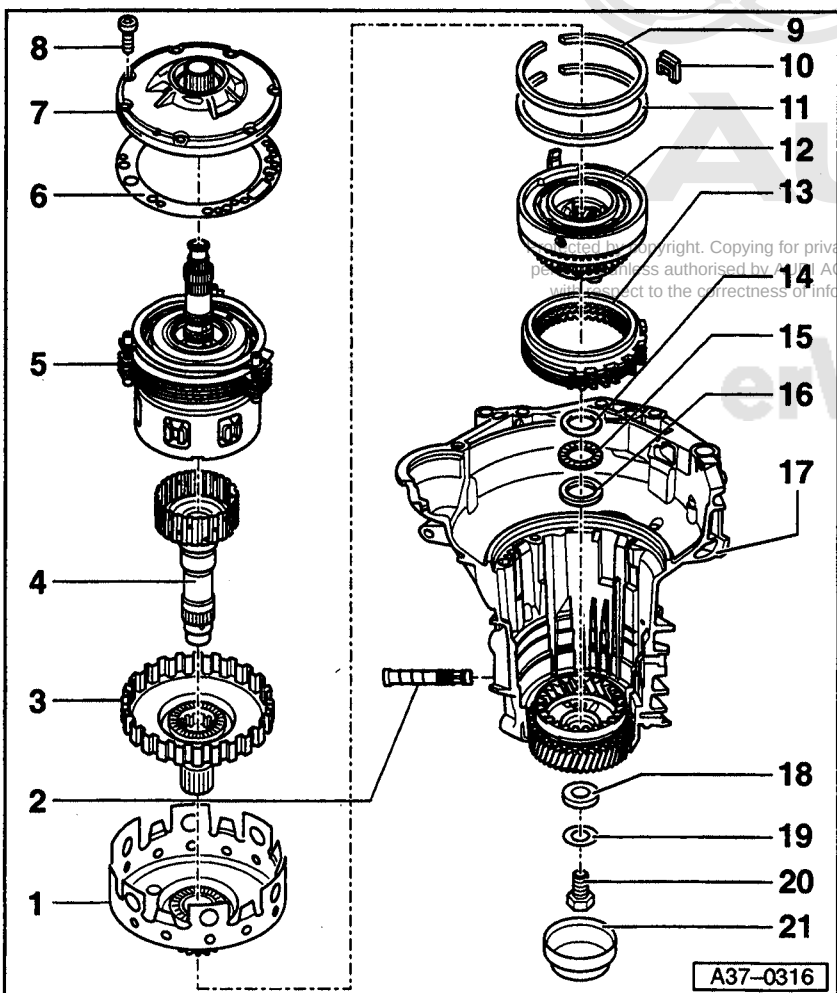
Notes:

- ♦ An exchange component containing all selector elements and the valve body is available for repair work on the automatic gearbox 097.
- ♦ The exchange component is assigned to the gearbox code letters ⇒ Page 00-3 onwards.
- ♦ Description of installation:
⇒ Special Information; Power Train; No. 10
- ♦ Removal sequence: Items 2, 21, 8, 7, 6, 5, 20, 19, 18, 4, 3, 1, 9, 10, 11, 12, 13, 14, 15, 16

1 - Large sun gear

- ♦ Pull out upwards

37-49



2 - Plug

- ♦ Remove before taking out free wheel ⇒ Removing valve body, Page 38-44

3 - Large drive shaft

- ♦ Pull out upwards

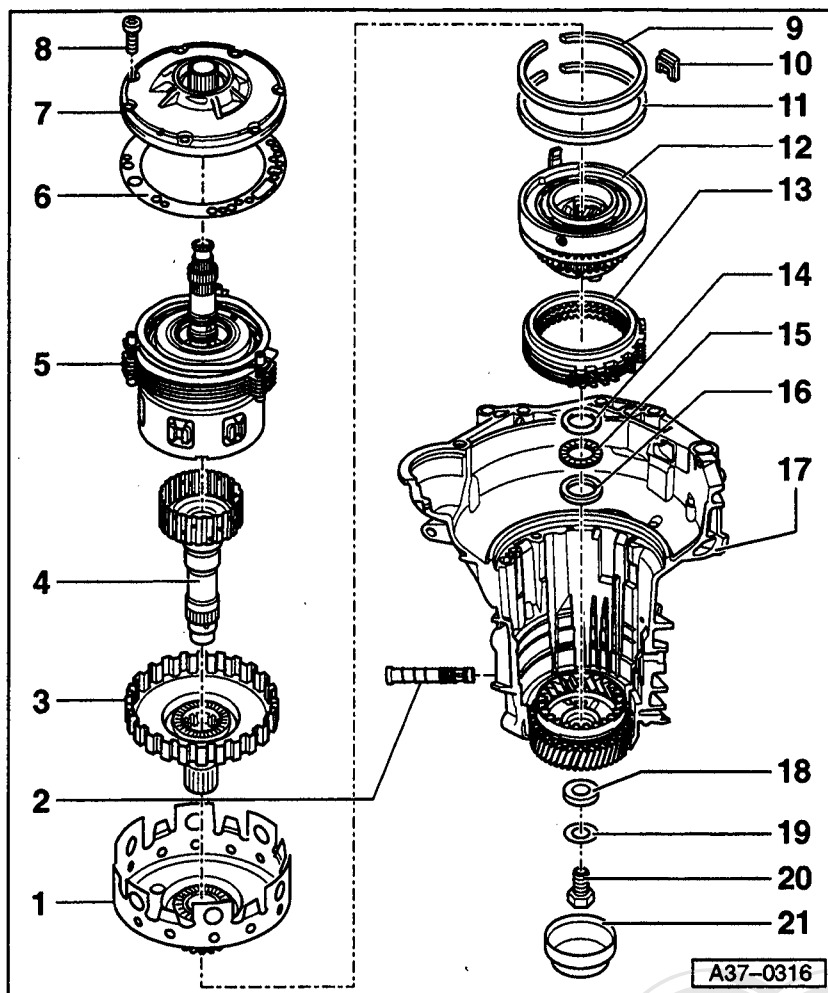
4 - Small drive shaft

- ♦ To remove, screw out bolt -item 20-
- ♦ Pull out upwards

5 - Component assembly

- ♦ With 3rd and 4th gear clutch -K3- with pump shaft
- ♦ With 1st - 3rd gear clutch -K1- with turbine shaft
- ♦ With reverse gear clutch -K2-
- ♦ With 2nd and 4th gear brake -B2-
- ♦ With supporting tube for -B2-
- ♦ Pull out upwards as a unit at pump shaft

37-50



6 - Gasket
♦ Detach

7 - ATF pump
♦ To remove, screw out all bolts
-item 8-
♦ To press off pump, evenly
screw 2 M8 bolts into the 2
tapped holes

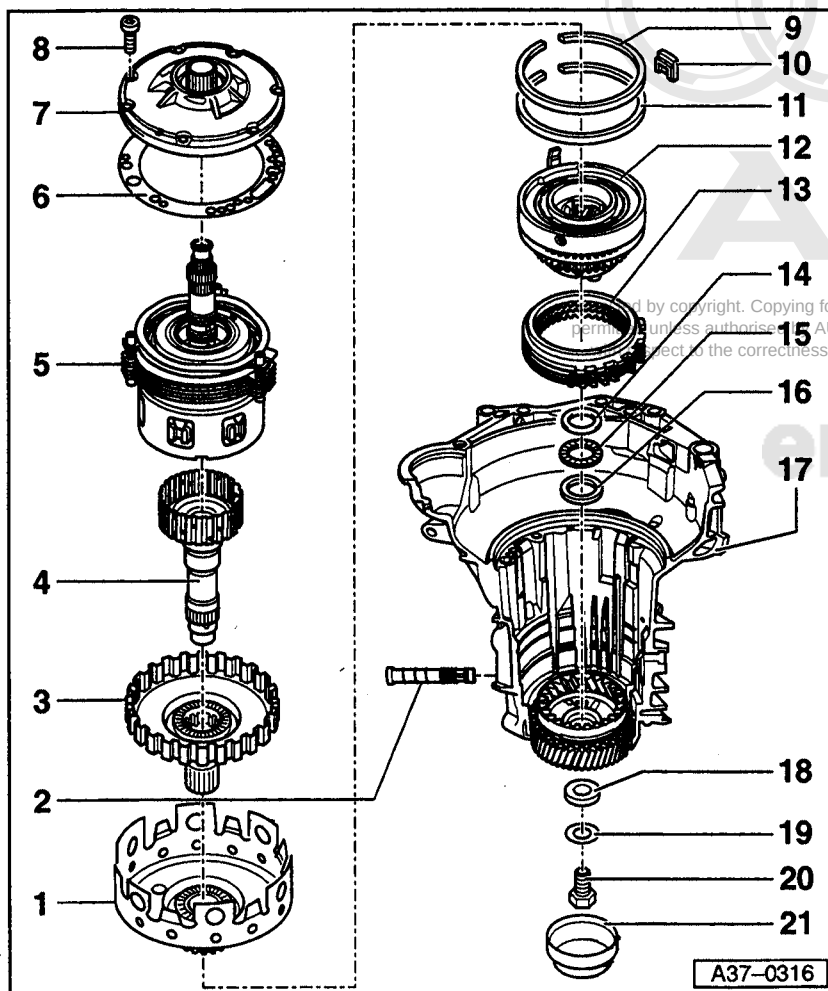
8 - Bolt
♦ For ATF pump

9 - Circlip
♦ For supporting tube for -B2-
♦ Lift out

10 - Baffle plate
♦ Pull off after lifting out circlip
-item 9-

11 - Circlip
♦ For free wheel
♦ Lift out

37-51



12 - Free wheel
♦ With planet carrier
♦ Before removing free wheel,
remove valve body and plug
-item 2- → Page 37-54

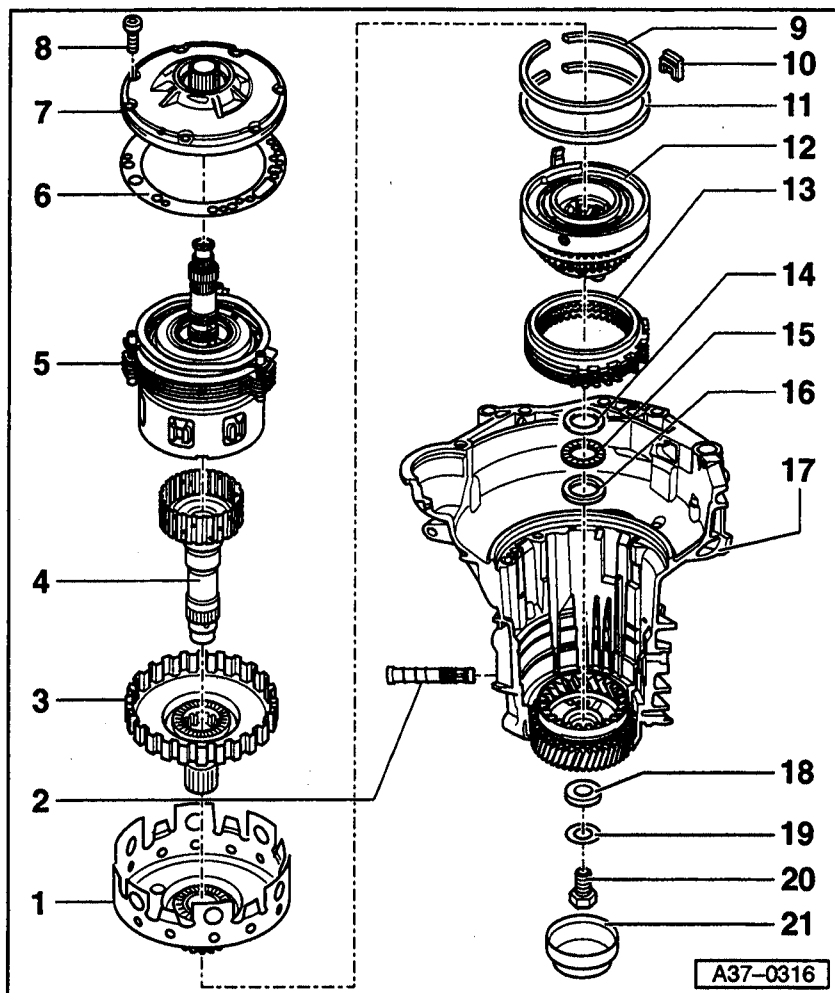
13 - Reverse gear brake -B1-
♦ Lift out pressure plate with
plates and shim(s)

14 - Washer for axial needle bearing
♦ Detach

15 - Axial needle bearing
♦ Detach

16 - Washer for axial needle bearing
♦ Detach

37-52



- 17 - Gear case with input gear**
 - ◆ Dismantling planetary gearbox does not involve removing input gear
 - ◆ Removing and installing input gear ⇒ Page 39-11
- 18 - Shim for planet carrier**
 - ◆ Detach after slackening off bolt -item 20-
- 19 - Washer**
 - ◆ Detach after slackening off bolt -item 20-
- 20 - Bolt**
 - ◆ For small drive shaft
 - ◆ Screw out
- 21 - Cap**
 - ◆ Drive out with chisel
 - ◆ Cannot be removed without destroying it

37-53

Dismantling planetary gearbox

- Allow ATF to drain off.

ATF can be drawn off using probe V.A.G 1358 A/1 and V.A.G 1358 A.

- Take out torque converter.

- ◀ - Attach gearbox to repair stand.

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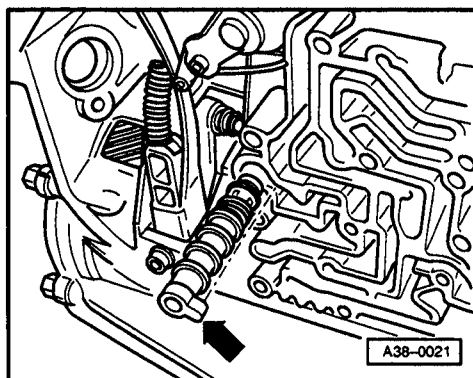
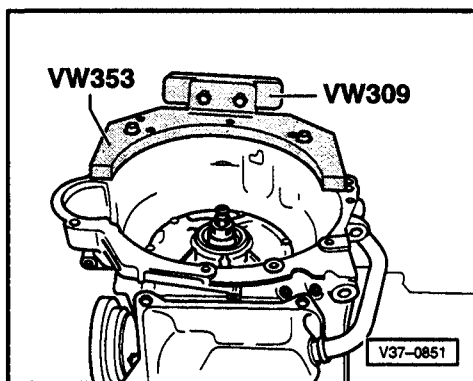
- Place collector V.A.G 1306 beneath gearbox.

- Removing valve body ⇒ Page 38-44

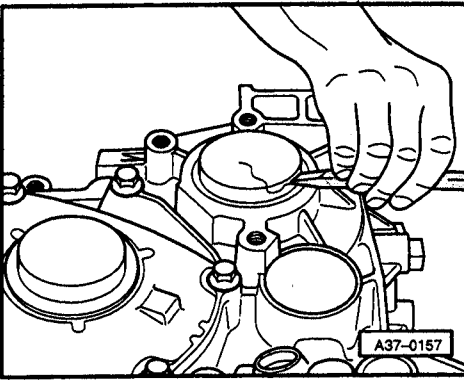
- ◀ - Pull off plug -arrow-.

Note:

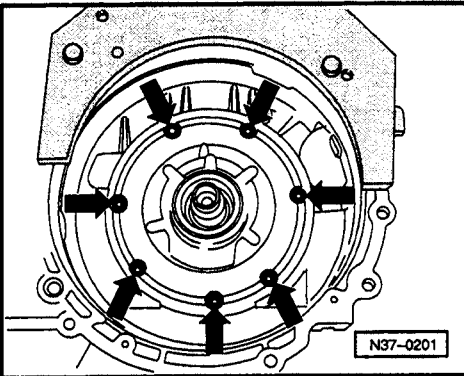
Plug must be removed to avoid damaging it.



37-54

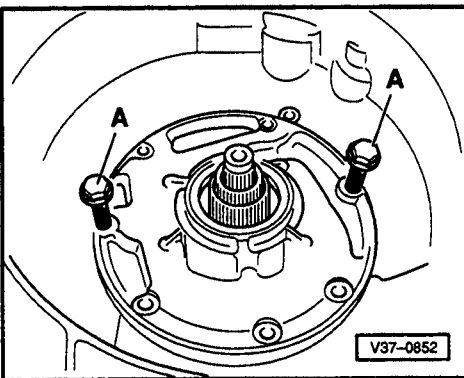


- ◀ – Remove cap.

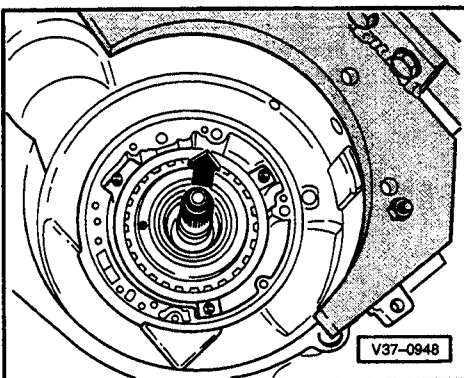


- ◀ – Remove bolts (arrows) for ATF pump.

37-55



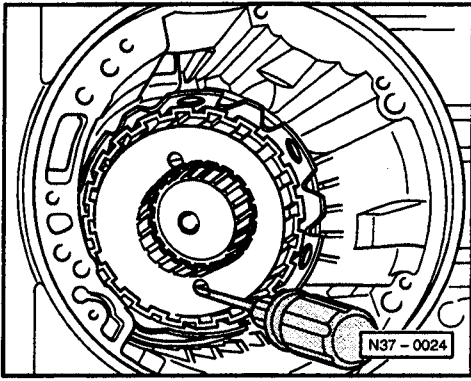
- ◀ – To remove ATF pump, screw 2 M8 bolts -A- into the 2 tapped holes of the ATF pump.
- Press ATF pump off gearbox by evenly screwing in bolts -A- and take out pump.



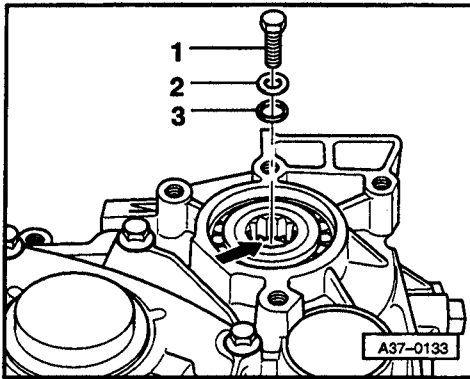
- ◀ – Grasp hold of pump shaft and jointly pull out -arrow- all clutches with supporting tube for -B2- plates for -B2-, springs and spring caps.

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37-56

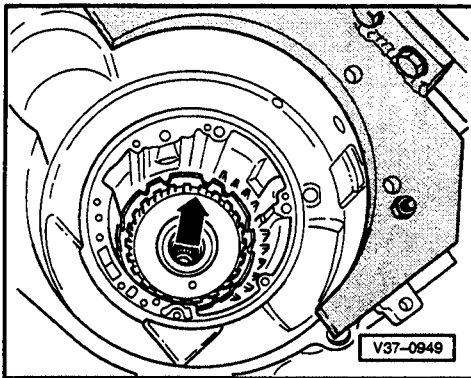


- Engage parking lock.
- ◀ - Insert screwdriver through holes in "large drive shaft" and "large sun gear" so as to enable "bolt for small drive shaft" to be unfastened and tightened.



- ◀ - Slacken off bolt -1- for "small drive shaft".
 - Remove bolt with washer -2- and shim -3- for "small drive shaft".
- Axial needle bearing for planet carrier remains in gearbox/input gear.
- Pull out small drive shaft.

———— 37-57 ————



- ◀ - Pull out large drive shaft (arrow).

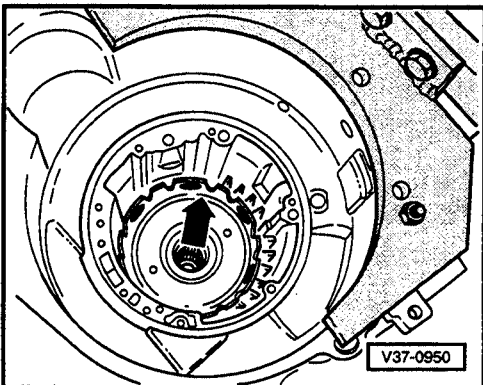


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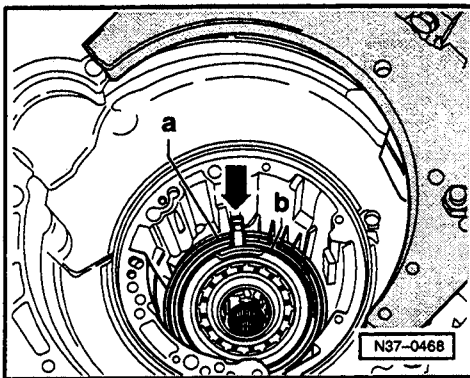
- ◀ - Pull out large sun gear (arrow).

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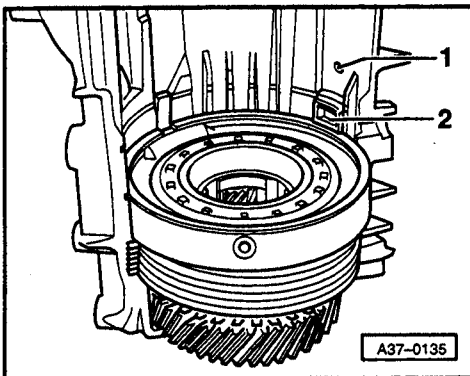
———— 37-58 ————



Note:

Plug must be removed before taking out free wheel.

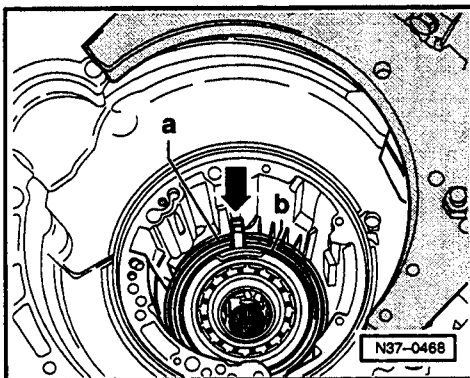
- ◀ – Remove circlip -a- for supporting tube for -B2-.



- ◀ – Pull off baffle plate -2-.

ATF bleeder hole

37-59



- ◀ – Remove circlip for free wheel -b-.
- Grasp hold of inside of planet carrier and pull out together with free wheel and dished washer.
- Remove pressure plate, plates and shim(s) of reverse gear brake -B1-.
- Detach axial bearing and washers.

Note:

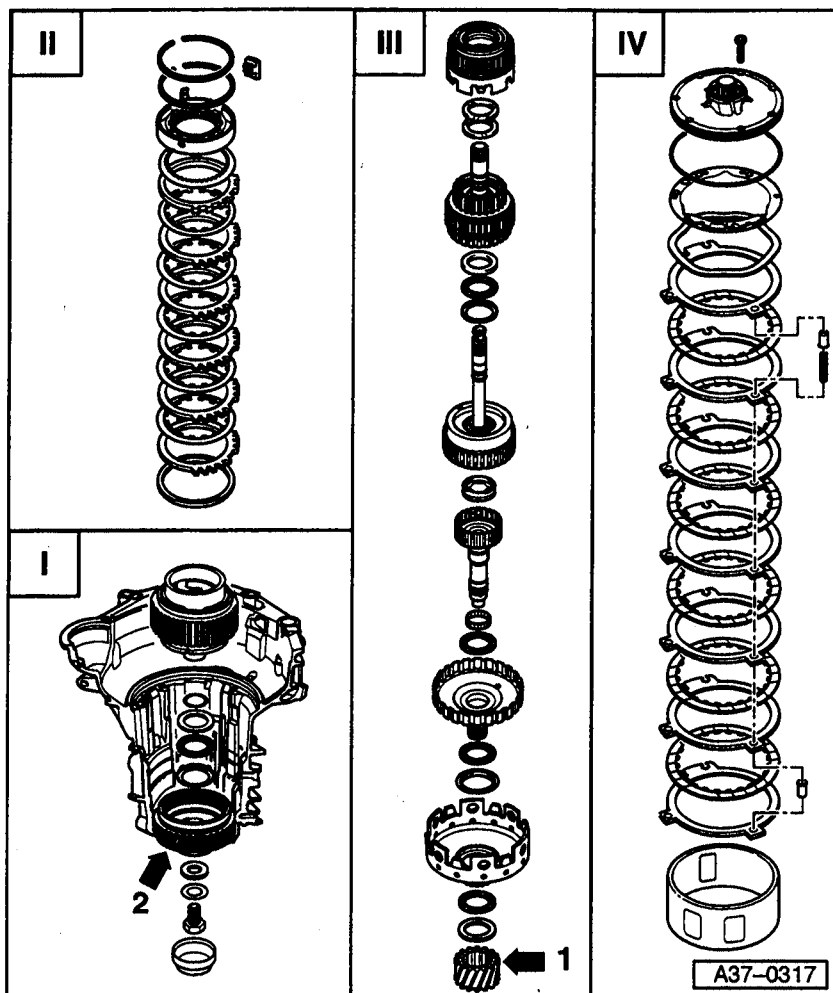
Assembling planetary gearbox ⇒ Page 37-61.

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37-60



Assembling planetary gearbox: Exploded view

Notes:

- ♦ An exchange component containing all selector elements and the valve body is available for repair work on the automatic gearbox 097.
- ♦ The exchange component is assigned to the gearbox code letters ⇒ Page 00-3 onwards.
- ♦ Description of installation:
⇒ Special Information; Power Train; No. 10

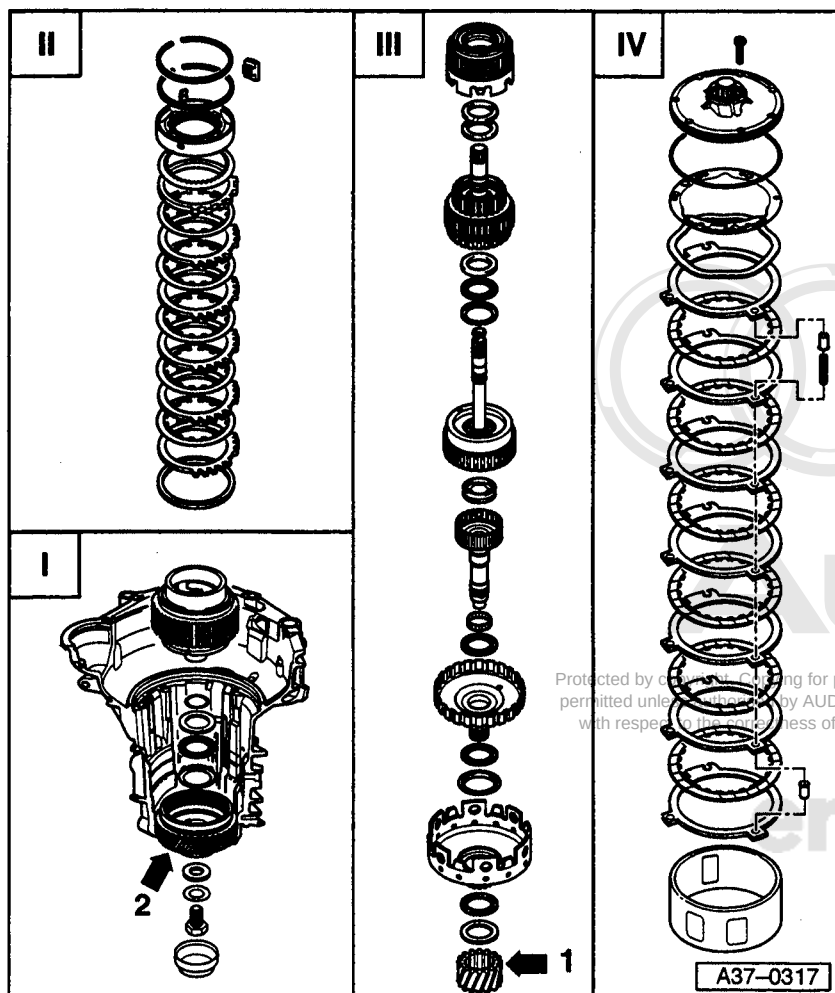
I - Installing planet carrier ⇒ Page 37-63

Note:

Input gear -arrow 2- does not have to be removed.

Removing and installing input gear ⇒ Page 39-11.

37-61



II - Installing reverse gear brake -B1- as far as circlip for supporting tube for -B2- ⇒ Page 37-66

Note:

Valve body with plug must be removed
⇒ Page 38-44 to remove and install free wheel.

III - Installing small sun gear as far as reverse gear clutch -K2- ⇒ Page 37-70

Note:

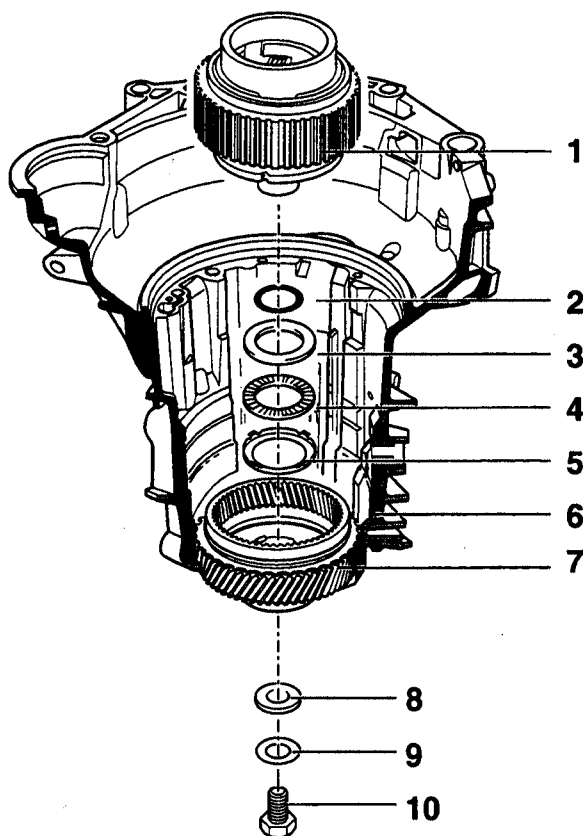
Small sun gear -arrow 1- cannot be removed from planet carrier on gearboxes as of 11.92 ⇒ Page 00-3 onwards.

IV - Installing supporting tube for -B2- as far as ATF pump ⇒ Page 37-75

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37-62



A37-0309

I - Installing planet carrier

⇒ Exploded view, Page 37-61

Notes:

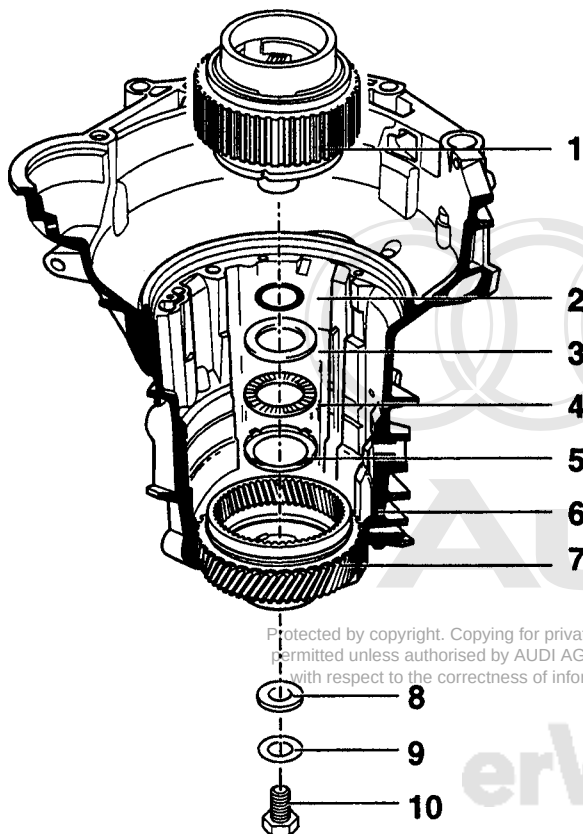
♦ *Dismantling planetary gearbox*
⇒ Page 37-54

♦ *Assembling planetary gearbox*
⇒ Page 37-79

1 - Planet carrier

- ♦ Modified ratios for gearboxes as of 11.92 ⇒ Page 00-3 onwards
- ♦ Small sun gear cannot be removed on gearboxes as of 11.92
- ♦ Adjusting ⇒ Page 37-95

37-63



A37-0309

2 - O-ring

- ♦ Always replace
- ♦ Insert in planet carrier

3 - Washer for axial needle bearing

4 - Axial needle bearing

5 - Washer for axial needle bearing

- ♦ Insert smooth side in input gear

6 - Gear case with installed input gear

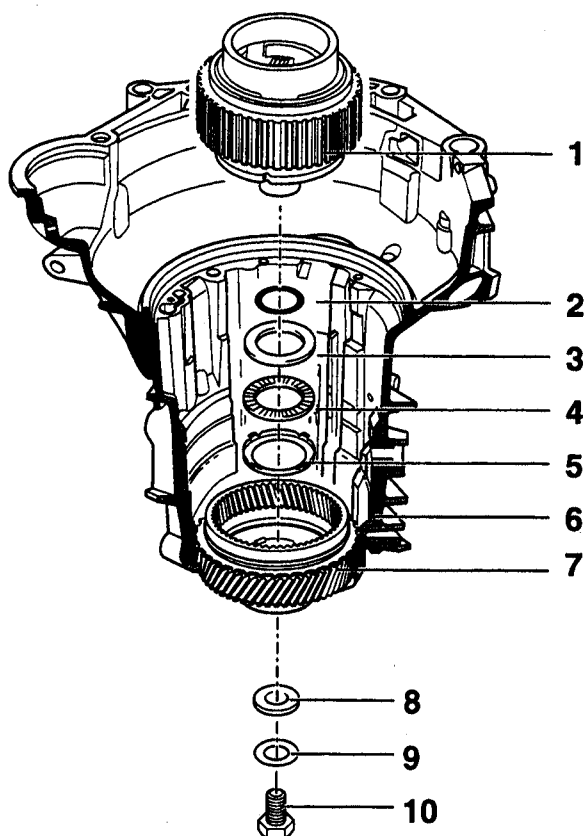
7 - Input gear

- ♦ Do not remove to dismantle planetary gearbox
- ♦ Removing and installing input gear or axial needle bearing for planet carrier ⇒ Page 39-11

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37-64

I



A37-0309

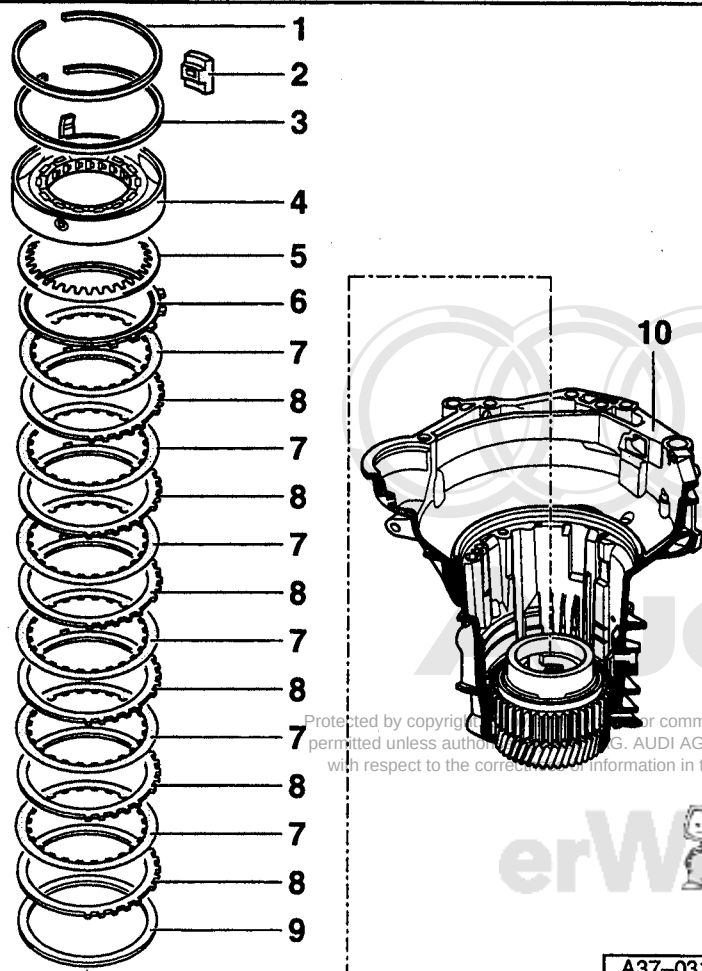
8 - Shim for planet carrier
 ♦ Determining thickness ⇒
 Adjusting planet carrier, Page
 37-95

9 - Washer

10 - Bolt, 30 Nm
 ♦ For small drive shaft

37-65

II



A37-0310

**II - Installing reverse gear
 brake -B1- as far as circlip
 for supporting tube for -B2-**

⇒ Exploded view, Page 37-61

Notes:

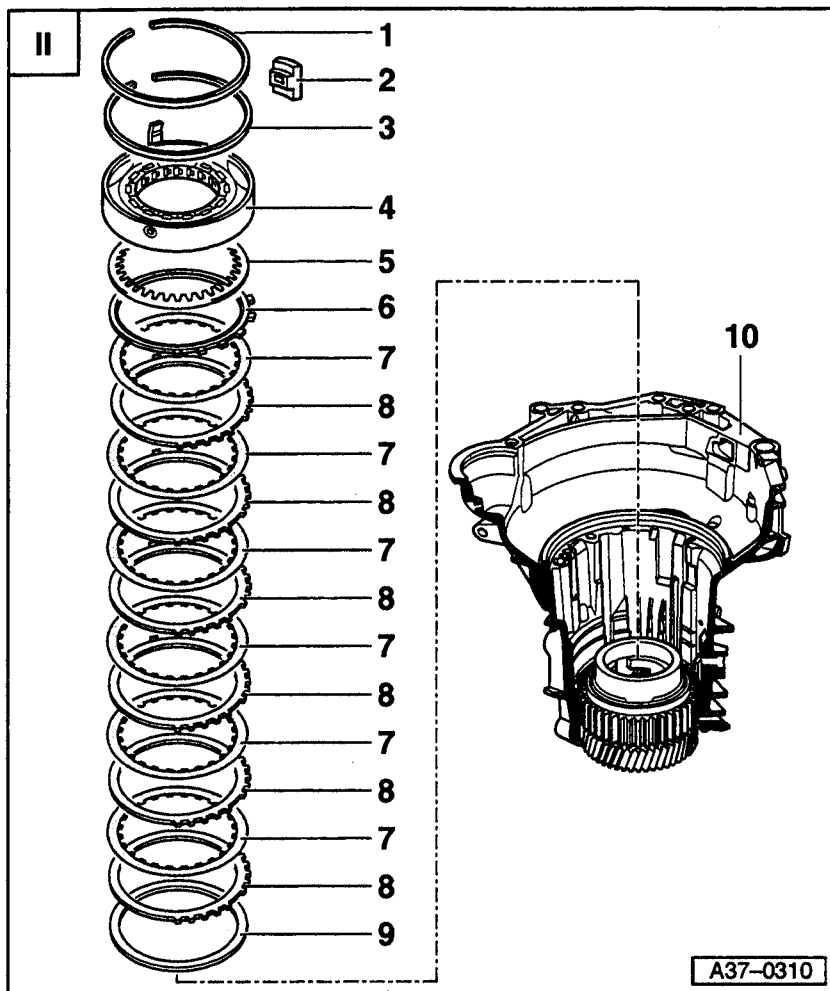
♦ *Dismantling planetary gearbox*
 ⇒ Page 37-54
 ♦ *Assembling planetary gearbox*
 ⇒ Page 37-79

1 - Circlip

♦ For supporting tube -B2-
 ♦ Insert baffle plate before fitting
 circlip
 ♦ Installation position: Open ends
 of circlip face retaining key of
 free wheel

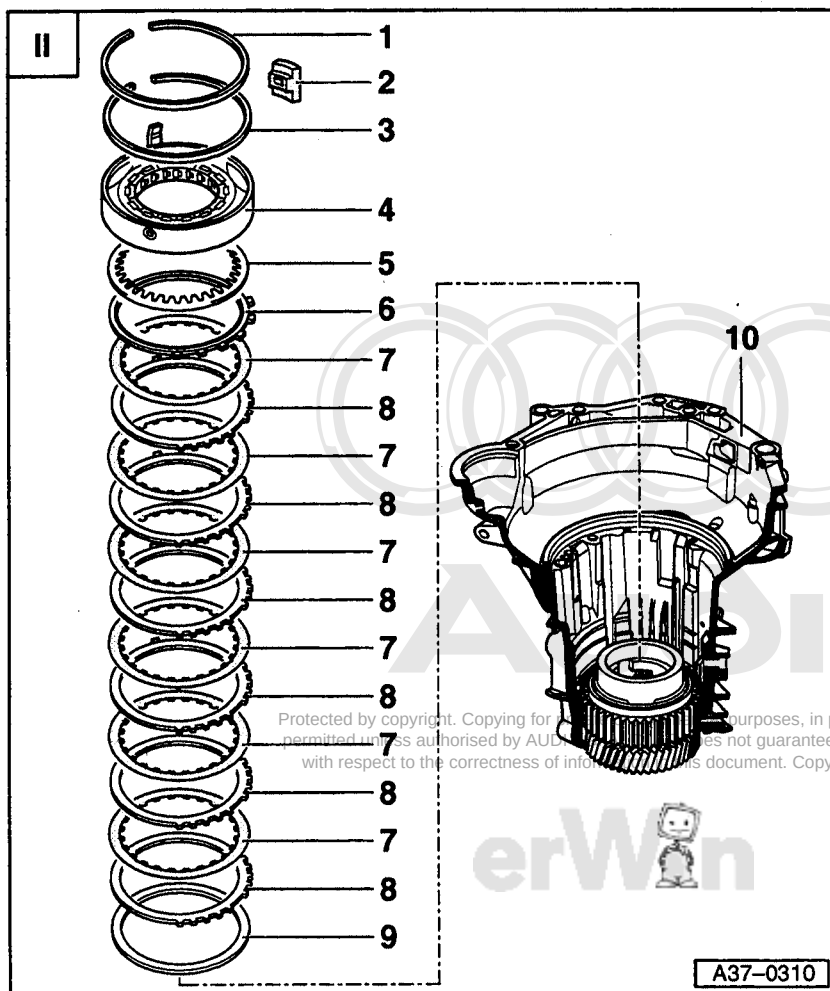
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37-66



- 2 - Baffle plate**
 ♦ Insert before fitting circlip (item 1)
- 3 - Circlip**
 ♦ For free wheel
 ♦ Installation position: Open ends of circlip face retaining key of free wheel
- 4 - Free wheel with -B1- piston**
 ♦ Removing valve body and plug before taking out free wheel ⇒ Page 38-44
 ♦ Dismantling and assembling ⇒ Page 38-5
 ♦ Install with assembly ring 3267
- 5 - Dished washer**
 ♦ Curved side faces free wheel

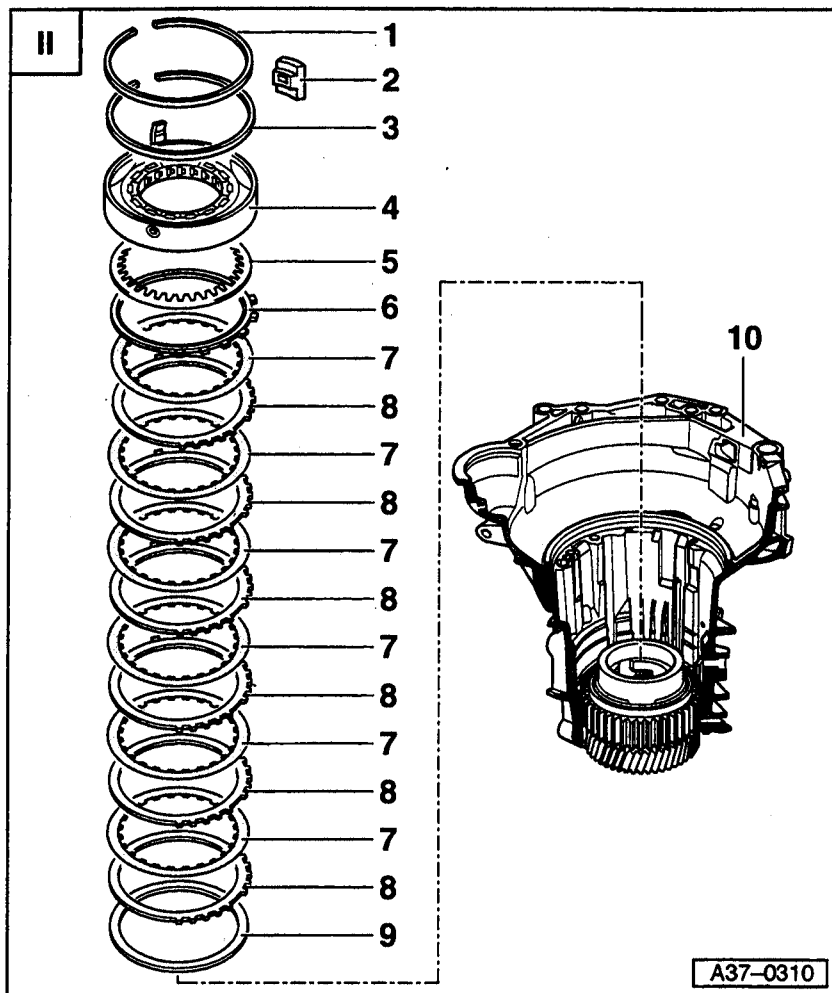
37-67



- 6 - Pressure plate -B1-**
 ♦ Install with flat side facing plates
 ♦ Differing thickness depending on number of inner plates fitted:
- Gearboxes as of 11.92 ⇒ Page 00-3**
 Gearboxes with 5 inner plates
 ♦ 13.5 mm
 Gearboxes with 6 inner plates
 ♦ 10.5 mm
 ♦ Replacement part is assigned to gearbox code letters
- 7 - Inner plate -B1-**
 ♦ Number of inner plates -B1- ⇒ Page 00-3 onwards
 ♦ Immerse in ATF for 15 minutes before installing
- 8 - Outer plate -B1-**
 ♦ Number of outer plates -B1- ⇒ Page 00-3 onwards

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37-68

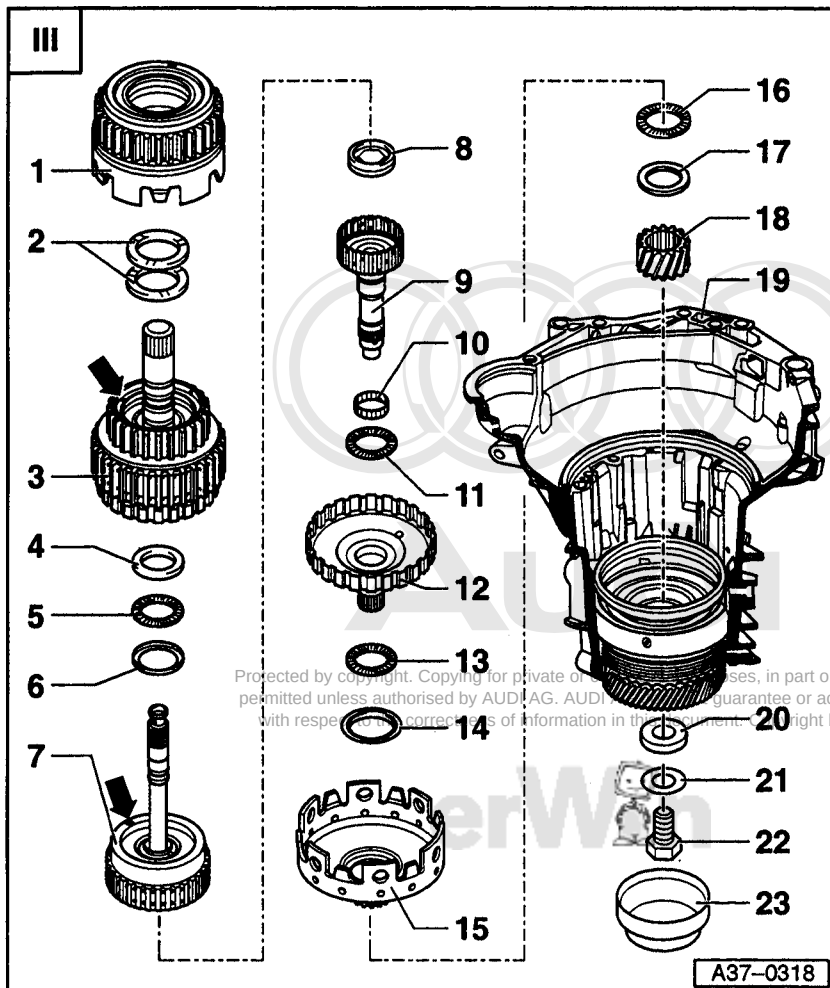


9 - Shim

- ◆ Determining thickness ⇒ Adjusting reverse gear brake -B1-, Page 37-104
- ◆ There may be 1 or 2 shims fitted
- ◆ Gearboxes AEH, ARC and CBT are fitted with additional 3.7 mm thick shim

10 - Gear case with installed planet carrier

37-69



III - Installing small sun gear as far as reverse gear clutch -K2-

⇒ Exploded view, Page 37-61

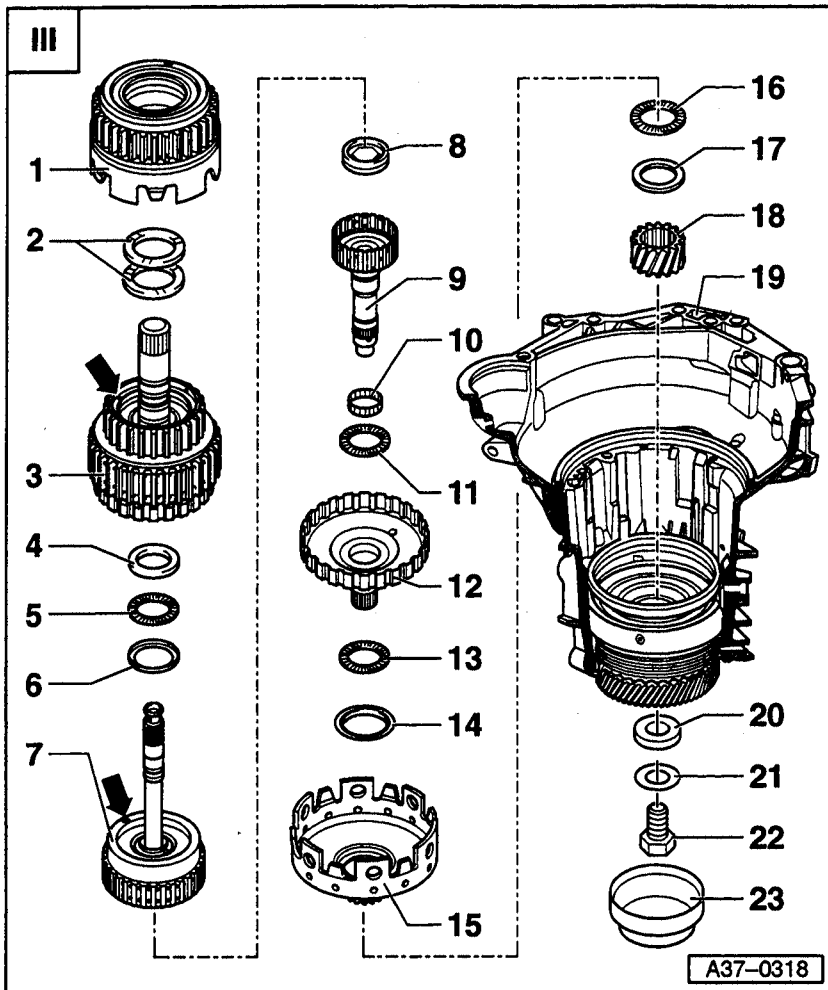
Notes:

- ◆ Dismantling planetary gearbox ⇒ Page 37-54
- ◆ Assembling planetary gearbox ⇒ Page 37-79

1 - Reverse gear clutch -K2-

- ◆ When installing, turn until all inner plates mesh
- ◆ Dismantling and assembling ⇒ Page 38-27

37-70



2 - Shim

- ♦ Determining thickness ⇒ Adjusting clutch play between -K1- and -K2-, Page 37-112
- ♦ There may be 1 or 2 shims fitted

3 - 1st - 3rd gear clutch -K1- with turbine shaft

- ♦ With ball valve (arrow)
Dismantling and assembling ⇒ Page 38-8
- ♦ With no ball valve (gearboxes as of 11.92 ⇒ Page 00-3 onwards)
Dismantling and assembling ⇒ Page 38-19

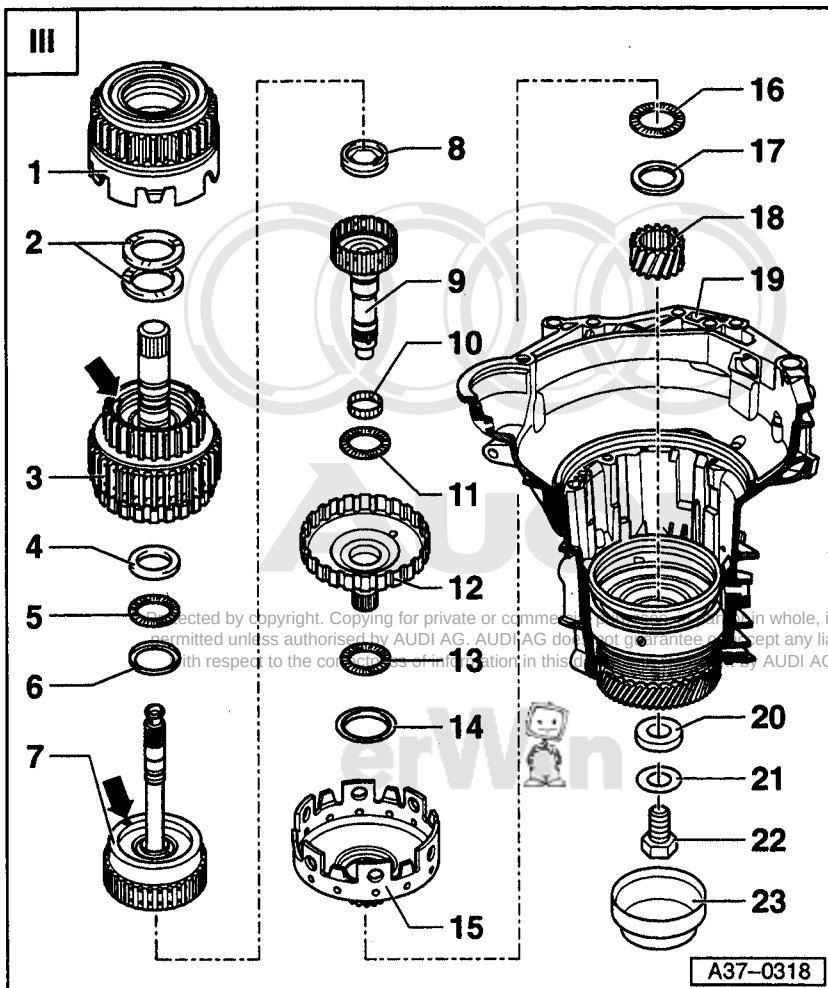
4 - Washer for axial needle bearing

5 - Axial needle bearing

6 - Washer for axial needle bearing

- ♦ Lugs face axial needle bearing

37-71



7 - 3rd and 4th gear clutch -K3- with pump shaft

- ♦ With ball valve (arrow)
Dismantling and assembling ⇒ Page 38-31
- ♦ 4th gear clutch -K3- with no ball valve (gearboxes as of 11.92 ⇒ Page 00-3 onwards)
Dismantling and assembling ⇒ Page 38-38

8 - Axial needle bearing with washer

- ♦ Axial needle bearing faces small drive shaft

9 - Small drive shaft

- ♦ Adapted to modified clutch -K3- as of 11.92

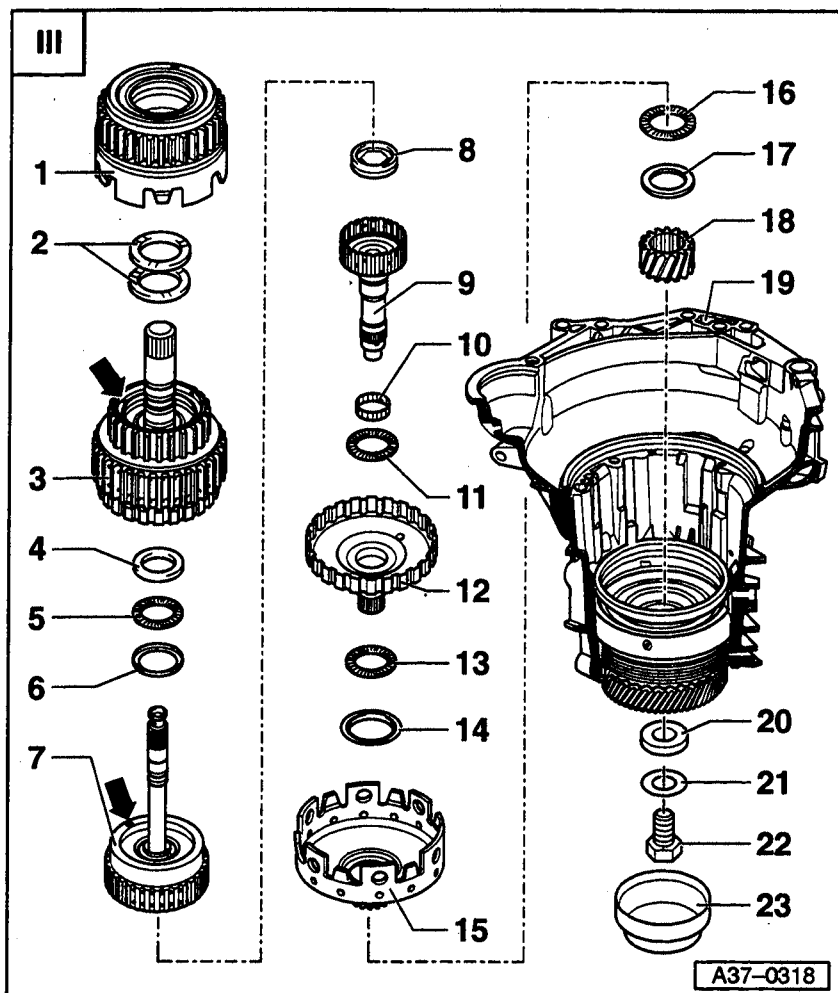
10 - Needle bearing

11 - Axial needle bearing

12 - Large drive shaft

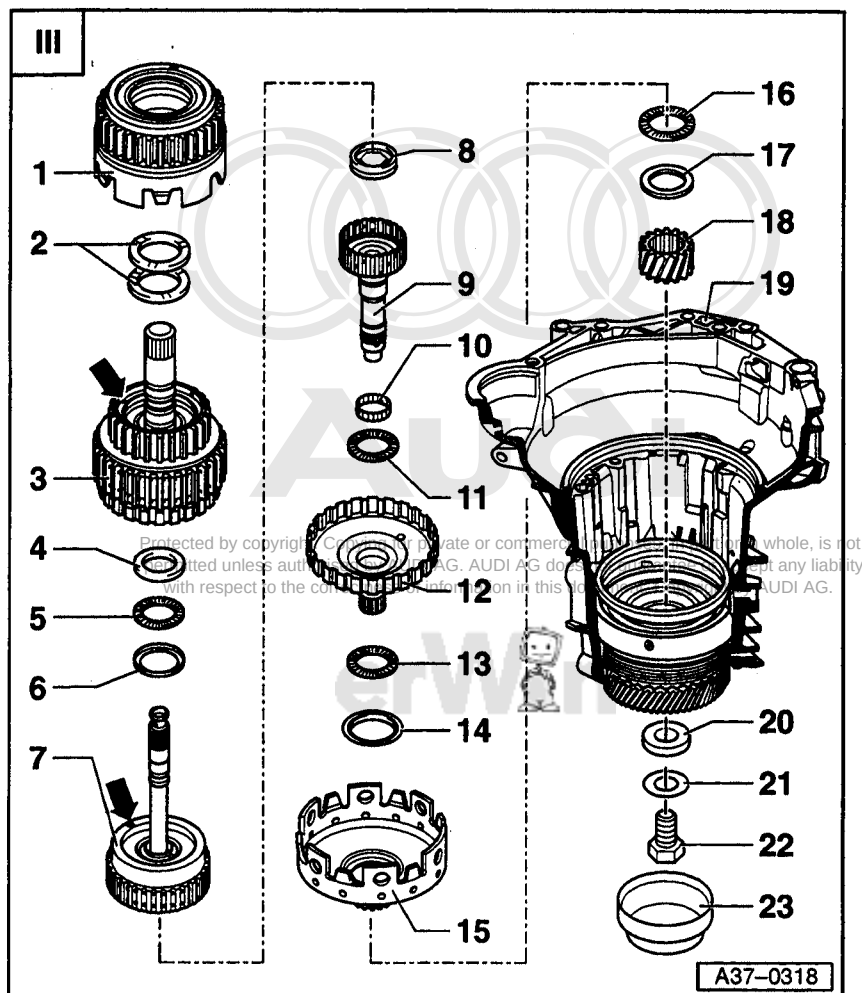
- ♦ Adapted to modified clutch -K3- as of 11.92

37-72



- 13 - Axial needle bearing
- 14 - Washer for axial needle bearing
 - ♦ With collar
- 15 - Large sun gear
 - ♦ Modified ratio (number of teeth) as of 11.92
- 16 - Axial needle bearing
 - ♦ Modified OD as of 11.92
- 17 - Washer for axial needle bearing
 - ♦ Modified size as of 11.92
- 18 - Small sun gear
 - ♦ Cannot be removed from planet carrier on gearboxes as of 11.92 ⇒ Page 00-3 onwards
- 19 - Gear case with installed free wheel and circlips

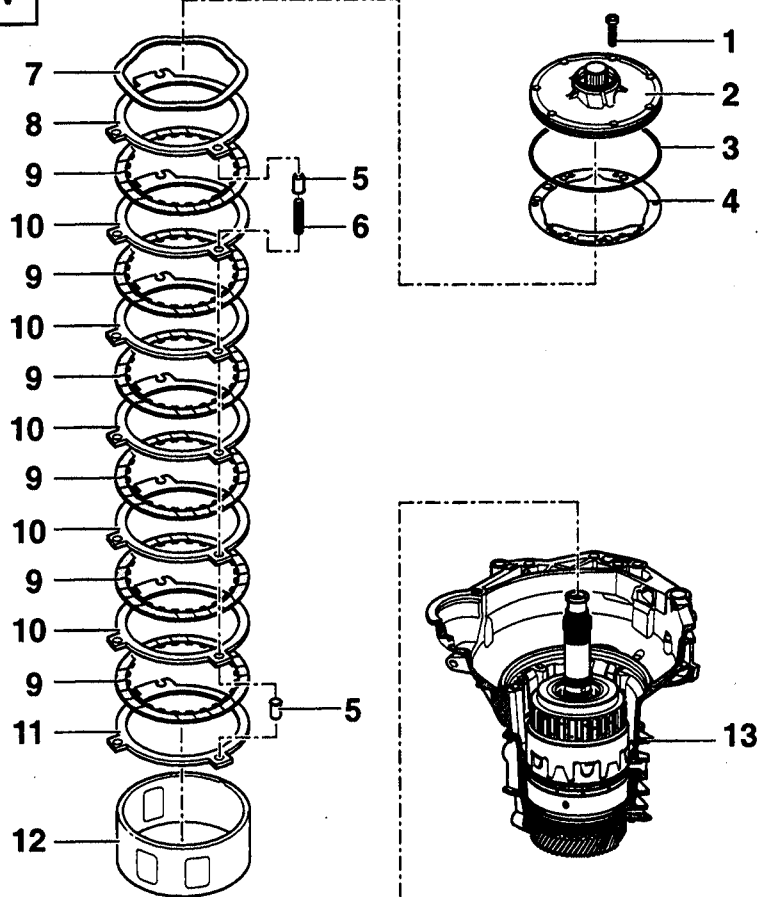
37-73



- 20 - Shim for planet carrier
 - ♦ Determining thickness ⇒ Adjusting planet carrier, Page 37-95
- 21 - Washer
- 22 - Bolt, 30 Nm
 - ♦ For small drive shaft
- 23 - Cap
 - ♦ Drive in with thrust sleeve 40-20

37-74

IV



A37-0320

IV - Installing supporting tube for -B2- as far as ATF pump

⇒ Exploded view, Page 37-61

Notes:

- ♦ Dismantling planetary gearbox
⇒ Page 37-54
- ♦ Assembling planetary gearbox
⇒ Page 37-79

1 - Bolt

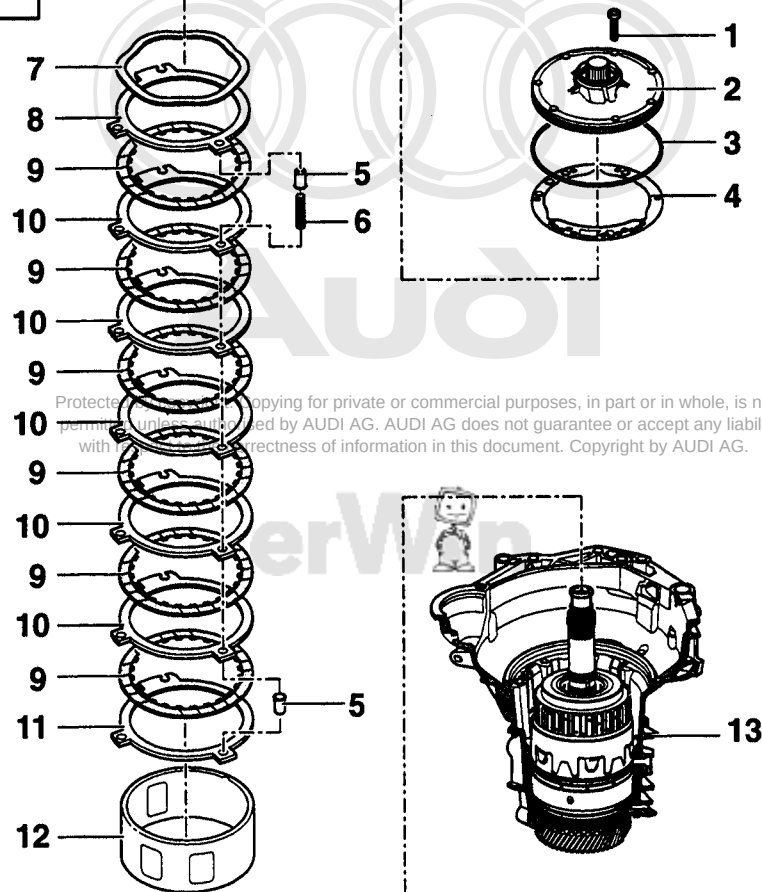
- ♦ 7x
- ♦ Tighten to 8 Nm and then give a further 90° turn
- ♦ Further turning by 90° can be carried out in several stages

2 - ATF pump with piston -B2-

- ♦ Dismantling and assembling
⇒ Page 38-1

37-75

IV



A37-0320

3 - O-ring

- ♦ Always replace
- ♦ Attach to ATF pump

4 - Gasket

- ♦ Always replace

5 - Spring cap, 6x

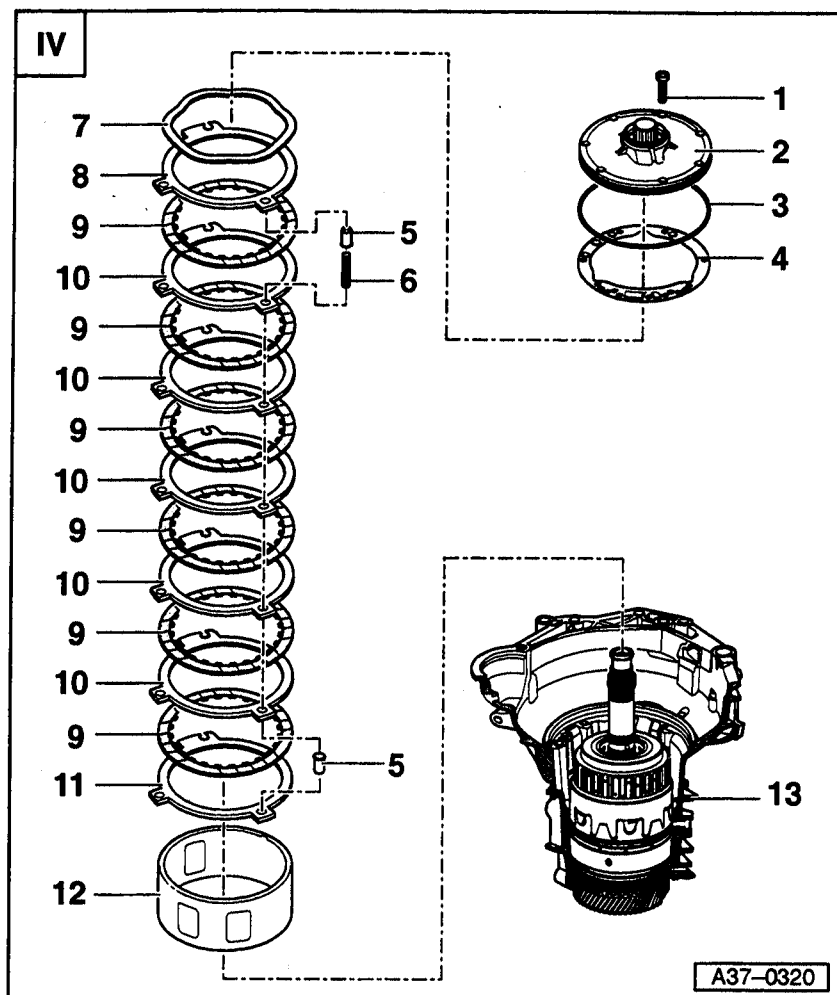
- ♦ Insert 3 spring caps after fitting first outer plate
- ♦ Fit 3 spring caps before inserting last outer plate

6 - Spring

- ♦ 3x

7 - Corrugated washer

37-76



8 - Outer plate -B2-

- ◆ Number of outer plates ⇒ Page 00-3 onwards
- ◆ Determining thickness of outer plate ⇒ Adjusting 2nd and 4th gear brake -B2-, Page 37-121
- ◆ There may be 1 or 2 outer plates fitted

9 - Inner plate -B2-

- ◆ Number of inner plates ⇒ Page 00-3 onwards
- ◆ Immerse new inner plate in ATF for 15 min. before installing

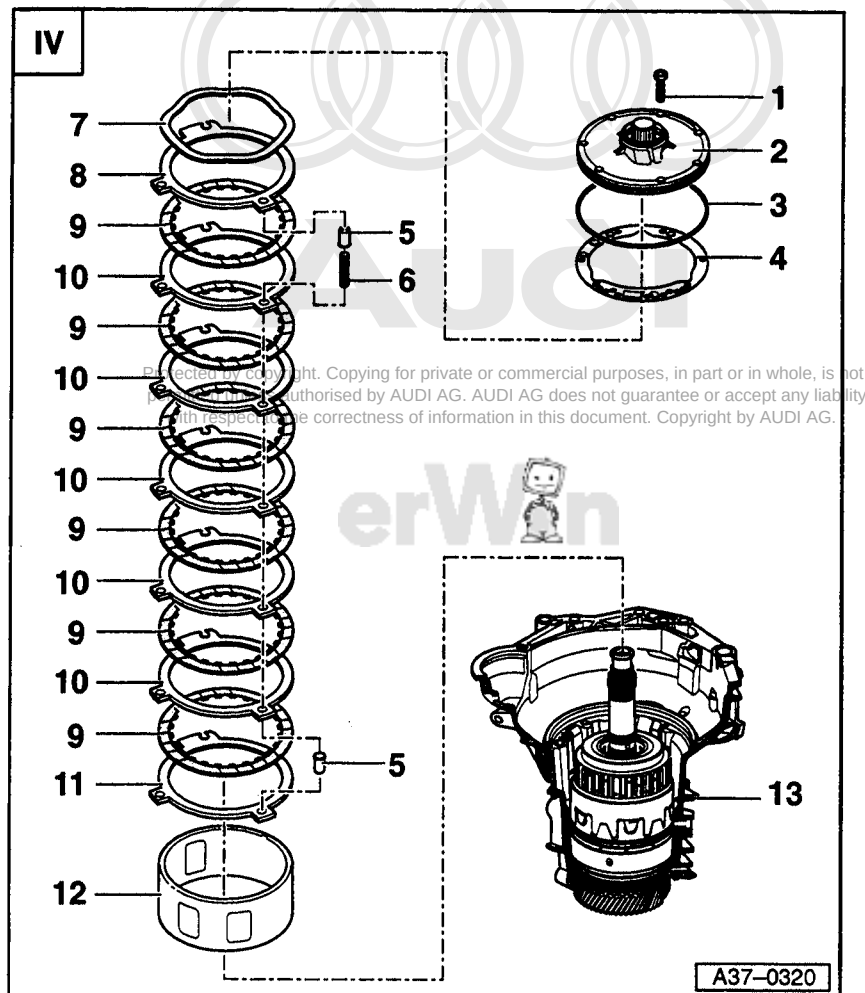
10 - Outer plate -B2-

- ◆ Always fit 2 mm thick outer plates
- ◆ Number of outer plates ⇒ Page 00-3 onwards

11 - Outer plate -B2-

- ◆ Attach 3 mm thick outer plate to supporting tube

37-77



12 - Supporting tube -B2-

- ◆ For plates of -B2-
- ◆ Insert such that groove engages in key of free wheel
- ◆ Replacement part is assigned to gearbox code letters

13 - Gear case with installed clutches

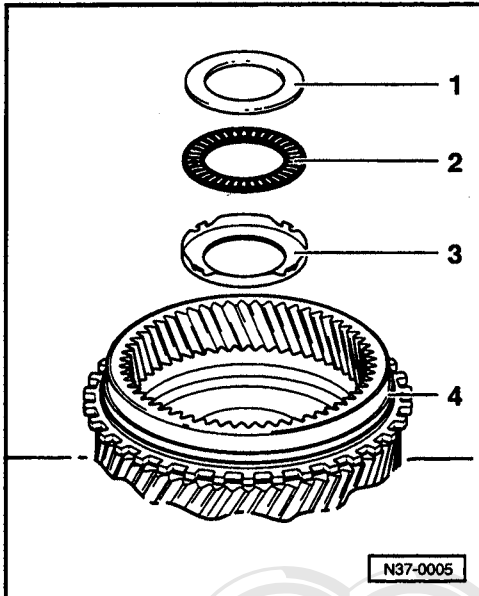
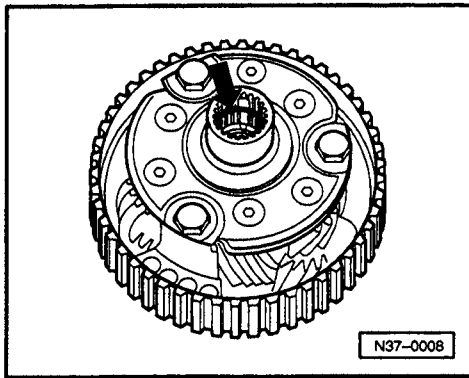
37-78

Assembling planetary gearbox

- – Insert O-ring -arrow- in planet carrier.

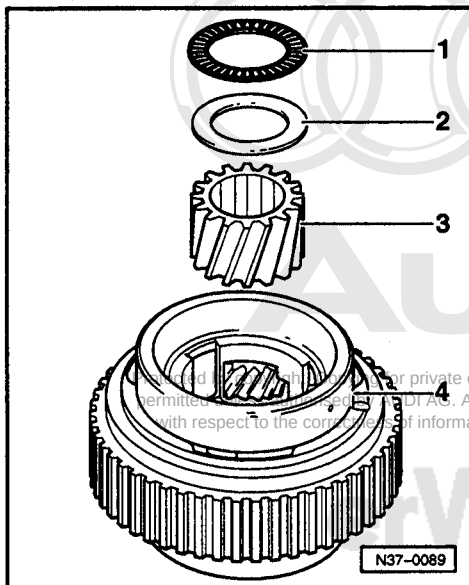
Note:

If planet carrier, large sun gear, large drive shaft or small drive shaft is replaced, planet carrier must be adjusted ⇒ Page 37-95.



- – Insert axial needle bearing with washers in input gear.
- 1 - Washer for axial needle bearing
- 2 - Axial needle bearing
- 3 - Insert smooth side of washer for axial needle bearing in input gear
- 4 - Input gear installed in gear case ⇒ Page 37-61

37-79



- – Insert small sun gear with washer and axial needle bearing in planet carrier.

1 - Axial needle bearing

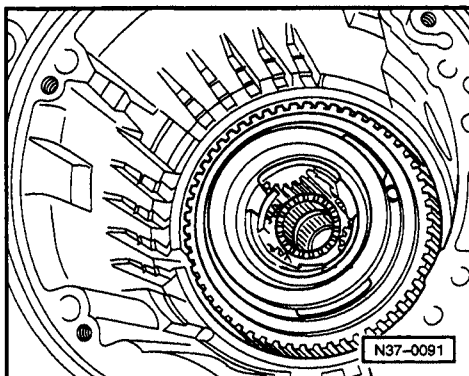
Note:

Modified OD on gearboxes as of 11.92.

2 - Washer for axial needle bearing

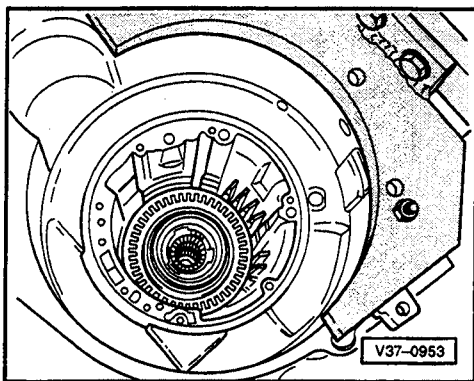
3 - Small sun gear cannot be removed from planet carrier on gearboxes as of 11.92 ⇒ Page 00-3 onwards

4 - Planet carrier



- – Insert planet carrier in input gear.
- Centrally align washer and axial needle bearing on "small sun gear".

37-80



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

Thickness of pressure plate differs depending on number of plates ⇒ Page 37-68.

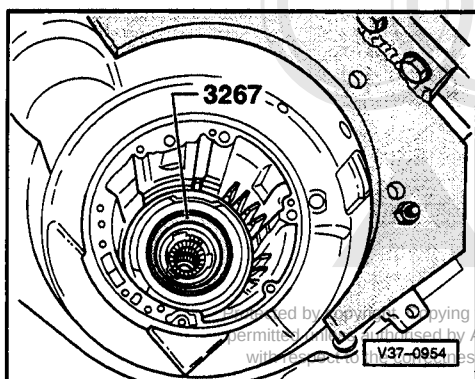
- ◀ - Insert dished washer with curved side facing free wheel.

Replacement of

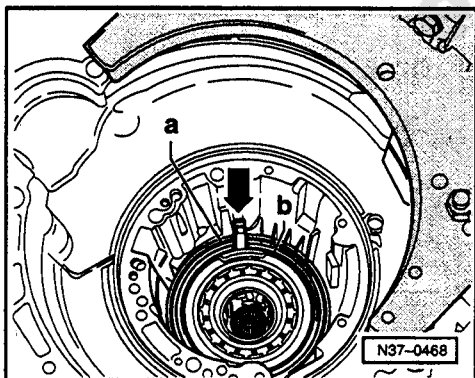
- ♦ Gear case
- ♦ Free wheel
- ♦ Piston for reverse gear brake -B1- or
- ♦ Plates

necessitates adjustment of -B1- ⇒ Page 37-104.

37-81

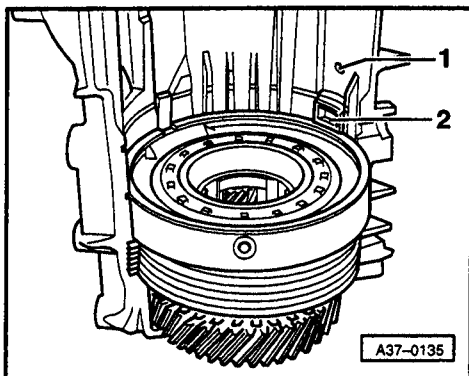


- ◀ - Pretension rollers of free wheel with assembly ring 3267 and insert free wheel.

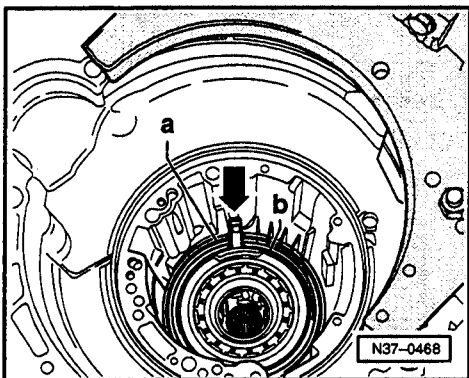


- ◀ - Installation position of free wheel: Retaining key (arrow) must be inserted in milled groove at gear case.
- Fit circlip for free wheel -b-.
- Position openings in circlips on retaining key (arrow) of free wheel.

37-82



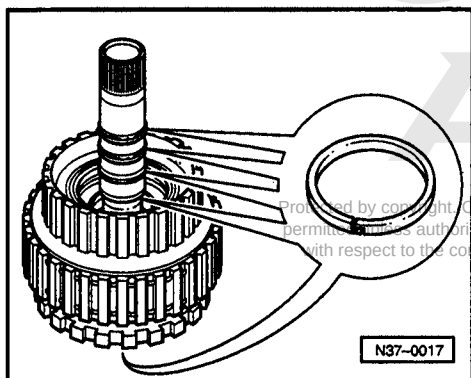
- ◀ – Insert baffle plate -2- in groove of gear case in which ATF bleeder hole -1- is located.



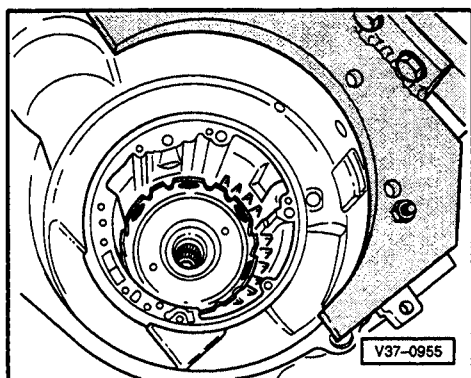
- ◀ – Fit circlip -a- for supporting tube for -B2- with open ends of circlip facing retaining key -arrow- of free wheel.
- Performing -B1- check measurement ⇒ Page 37-111.



———— 37-83 ————

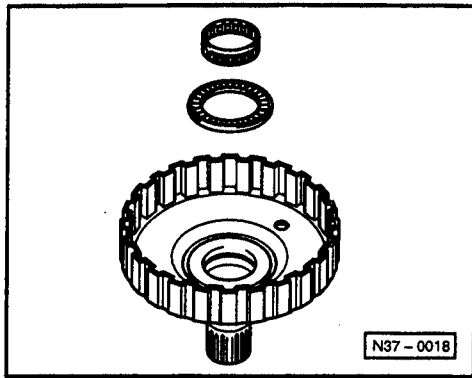


- ◀ – Insert washer with axial needle bearing in large sun gear.
- 1 - Axial needle bearing
- 2 - Washer with collar (smooth side faces axial needle bearing)
- 3 - Large sun gear

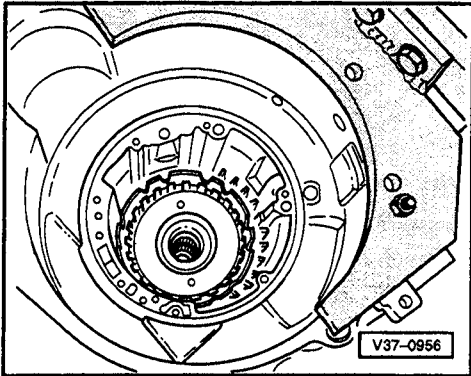


- ◀ – Insert large sun gear with bearing.
- Centre washer with axial needle bearing between the two sun gears.

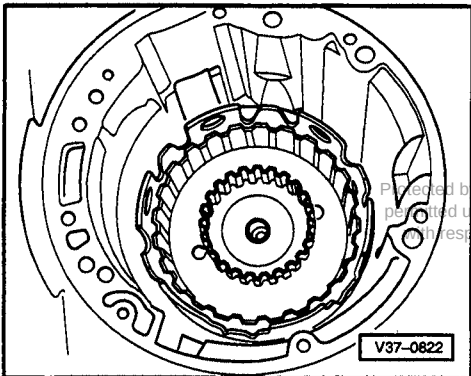
———— 37-84 ————



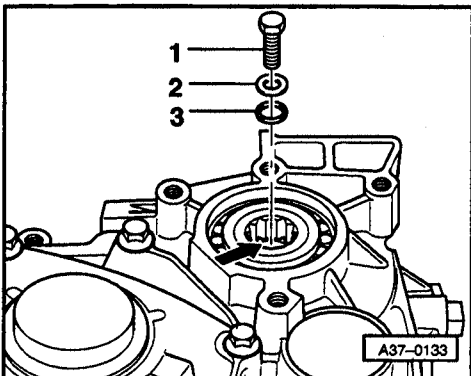
- ◀ – Insert axial needle bearing and needle bearing in large drive shaft.



- ◀ – Insert large drive shaft with bearing.



- ◀ – Insert small drive shaft.



- ◀ – Fit (tightening torque 30 Nm) bolt for small drive shaft -1- with washer -2- and shim -3-.

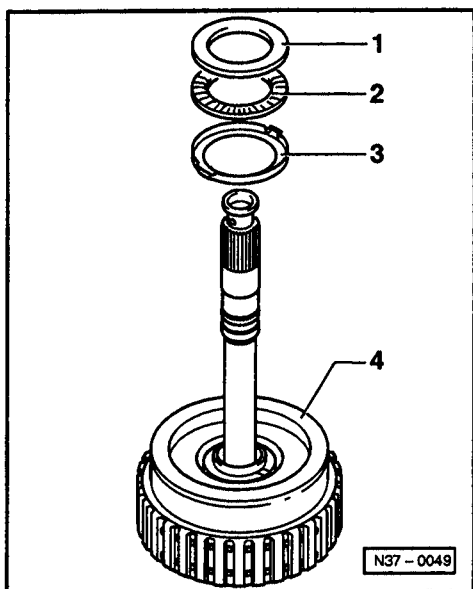
Notes:

- ♦ Position shim -3- on collar of small drive shaft (arrow).
- ♦ Determining thickness of shim ⇒ Adjusting planet carrier, Page 37-95.
- Performing planet carrier check measurement ⇒ Page 37-103.



Audi

erWin



- ◀ – Insert axial needle bearing with washers in -K3-.

1 - Washer for axial needle bearing

2 - Axial needle bearing

3 - Washer for axial needle bearing (smooth side faces -K3-)

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

On gearboxes as of 11.92 ⇒ Page 00-3 onwards, clutch -K3- is only used to select 4th gear.

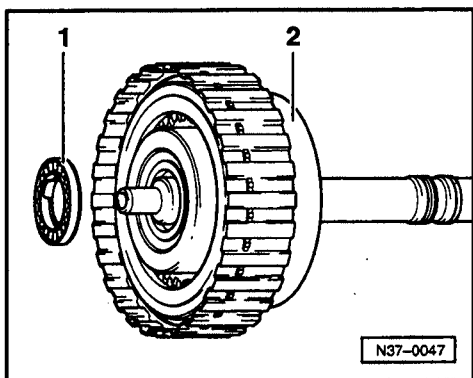
Note:

Make sure piston rings are correctly positioned.

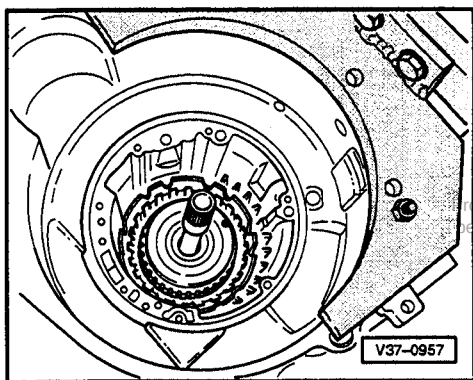
- Moisten washer of axial needle bearing with ATF so that bearing sticks to 3rd and 4th gear clutch -K3- on installation.

- ◀ – Attach axial needle bearing with washer -1- to 3rd and 4th gear clutch -K3- (-item 2-).

♦ Installation position: Washer of bearing faces -K3-.



37-87

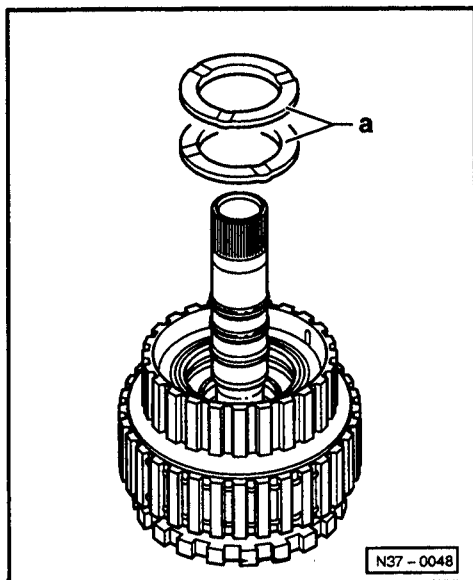


- ◀ – Insert 3rd and 4th gear clutch -K3-.

Note:

On insertion, turn 3rd and 4th gear clutch -K3- until all plates mesh.

erWin



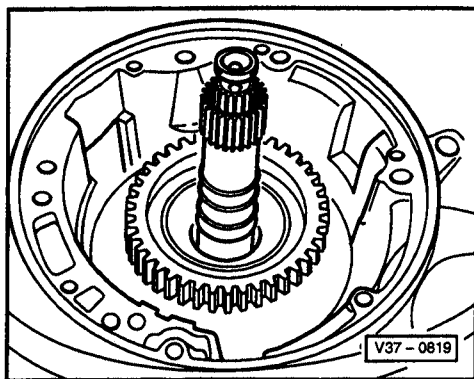
- ◀ – Insert shim(s) -a- in -K1-.

Notes:

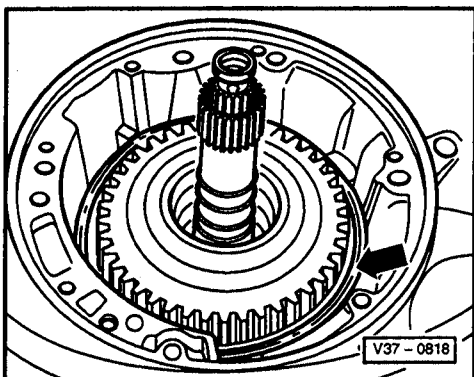
♦ If -K1-, -K2-, small drive shaft or ATF pump is replaced, shim must be re-measured ⇒ Adjusting clutch play between -K1- and -K2-, Page 37-112.

♦ There may be 1 or 2 shims fitted.

37-88



- ◀ – Insert 1st - 3rd gear clutch -K1-.

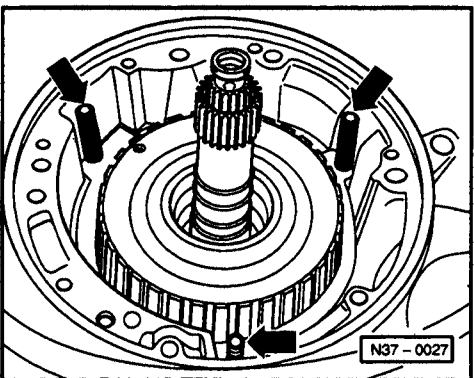


- ◀ – Insert reverse gear clutch -K2-.

Note:

On insertion, turn reverse gear clutch -K2- until all plates mesh.

- Insert supporting tube -arrow- for plates of 2nd and 4th gear brake -B2- such that recess at bottom of supporting tube engages in retaining key of free wheel.



- ◀ – Install plates of 2nd and 4th gear brake -B2- in following sequence:

- Start by inserting one 3 mm thick outer plate.

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- Insert three spring caps in outer plate.

- Insert compression springs (arrows).

- Insert all plates except last outer plate.

- Determining last outer plate ⇒ IV - Adjusting 2nd and 4th gear brake -B2-, Page 37-121

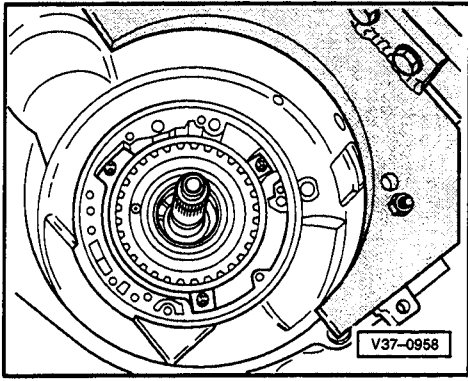
Note:

Replacement of the following components

- ♦ Gear case
- ♦ Supporting tube
- ♦ ATF pump
- ♦ Plates

necessitates adjustment of 2nd and 4th gear brake -B2- ⇒ Page 37-121.





- ◀ – Attach three spring caps to the compression springs before inserting last measured outer plate.
- Insert last outer plate.

Note:

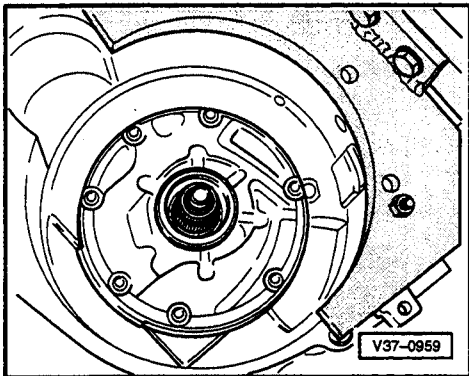
If the measurement reveals that two outer plates have to be inserted, these are to be attached jointly to the spring caps.

- Insert corrugated washer.
- Insert gasket for ATF pump, paying attention to position of holes.
- Attach O-ring to ATF pump.

Note:

Pay attention to correct positioning of piston rings.

———— 37-91 ————



- ◀ – Insert ATF pump. Installation position is specified by holes for bolts.
- Tighten bolts evenly and alternately to 8 Nm.

Note:

Take care not to damage O-ring.

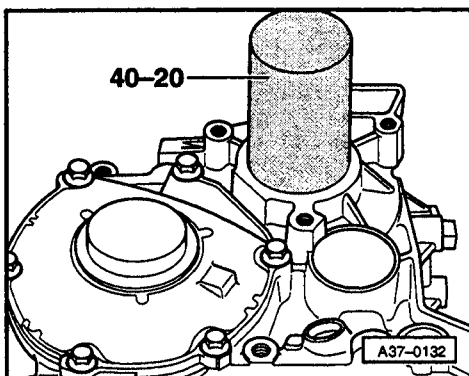
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- Then give bolts a further 90° turn.

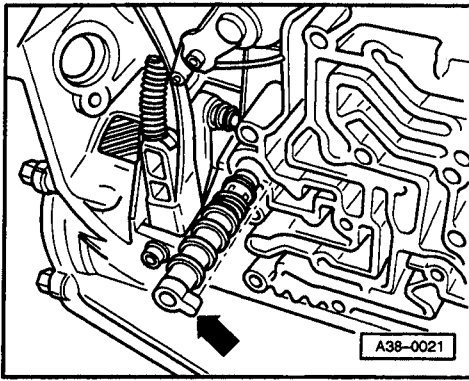
Further turning can be carried out in several stages.

- Performing check measurement on clutch play ⇒ Page 37-120.

- ◀ – Drive in cap with thrust sleeve 40-20.

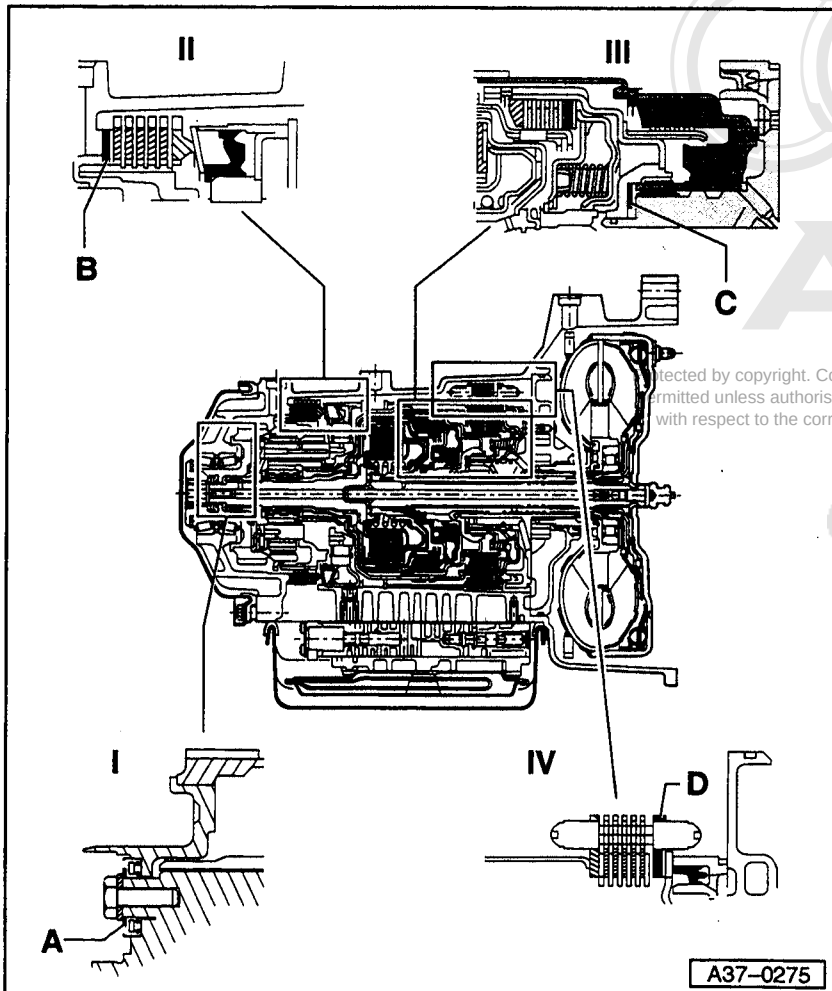


———— 37-92 ————



- – Insert plug with O-rings.
 - ◆ Installation position: Lug -arrow- engages in oil duct.
- Installing valve body ⇒ Page 38-44 onwards.
- Installing sump ⇒ Page 38-44 onwards.
- Install torque converter.
- Installing gearbox ⇒ Page 37-22 onwards.
- Topping up ATF and checking ATF level ⇒ Page 37-32.

37-93



Adjustment work on planetary gearbox: Exploded view

I - Planet carrier

- ◆ A - Shim
- ◆ Determining thickness ⇒ Adjusting planet carrier, Page 37-95

II - Reverse gear brake -B1-

- ◆ B - Shim
- ◆ Determining thickness ⇒ Adjusting reverse gear brake -B1-, Page 37-104

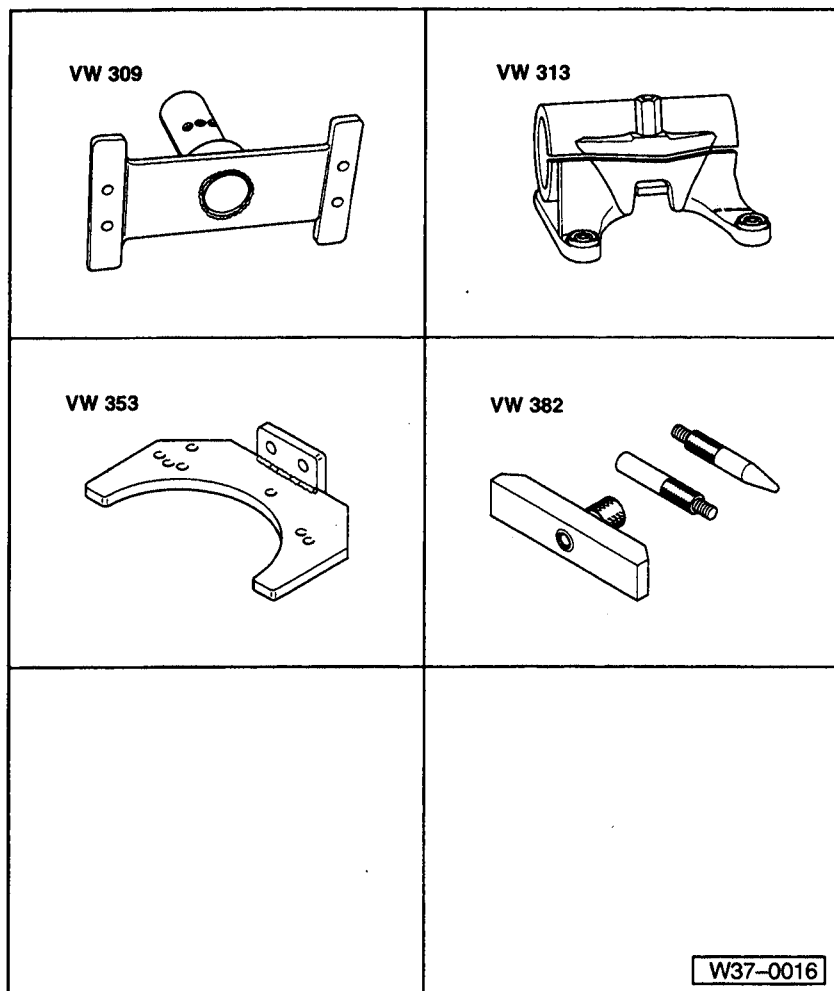
III - Clutch play

- ◆ C - Shim
- ◆ Determining thickness ⇒ Adjusting clutch play between -K1- and -K2-, Page 37-112

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

- ◆ D - Outer plate/shim
- ◆ Determining thickness ⇒ Adjusting 2nd and 4th gear brake -B2-, Page 37-121

37-94

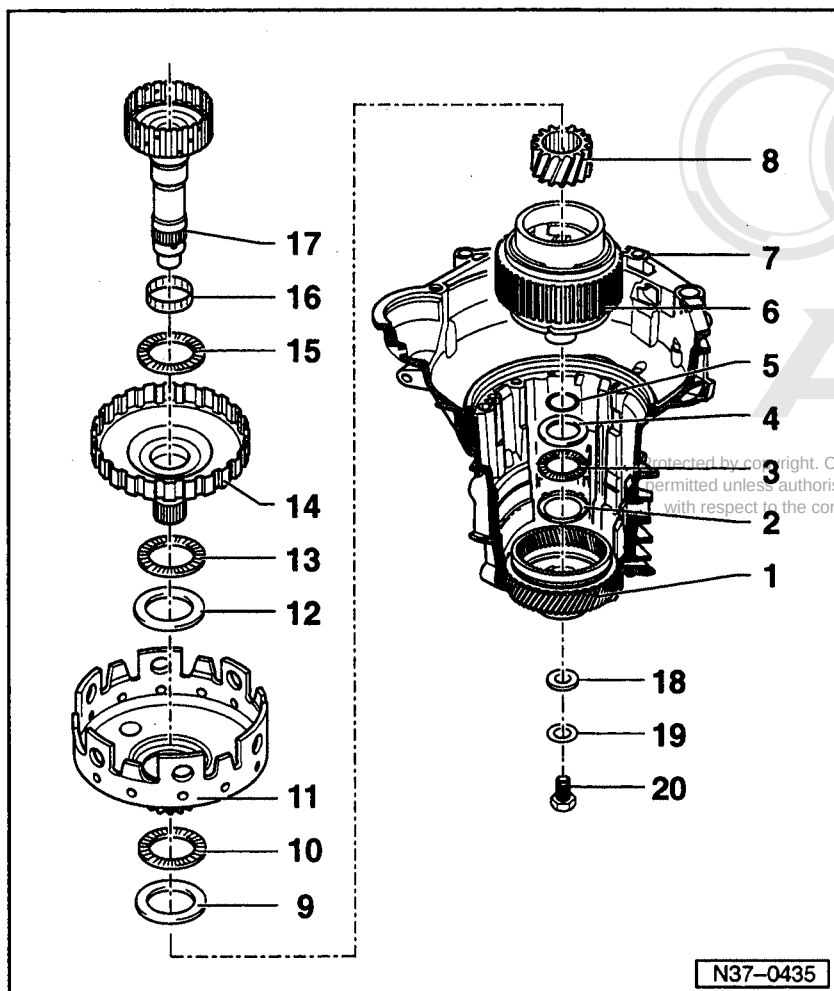


I - Adjusting planet carrier

Special tools and workshop equipment required

- ◆ VW 309: Holding plate
- ◆ VW 313: Clamp
- ◆ VW 353: Gearbox rest
- ◆ VW 382: Measurement tool

37-95



Exploded view of components

– To adjust planet carrier, install components without shim (item 18) in gear case.

1 - Input gear

- ◆ Do not remove to adjust planet carrier
- ◆ Removing and installing input gear or axial needle bearing for planet carrier ⇒ Page 39-11

2 - Washer for axial needle bearing

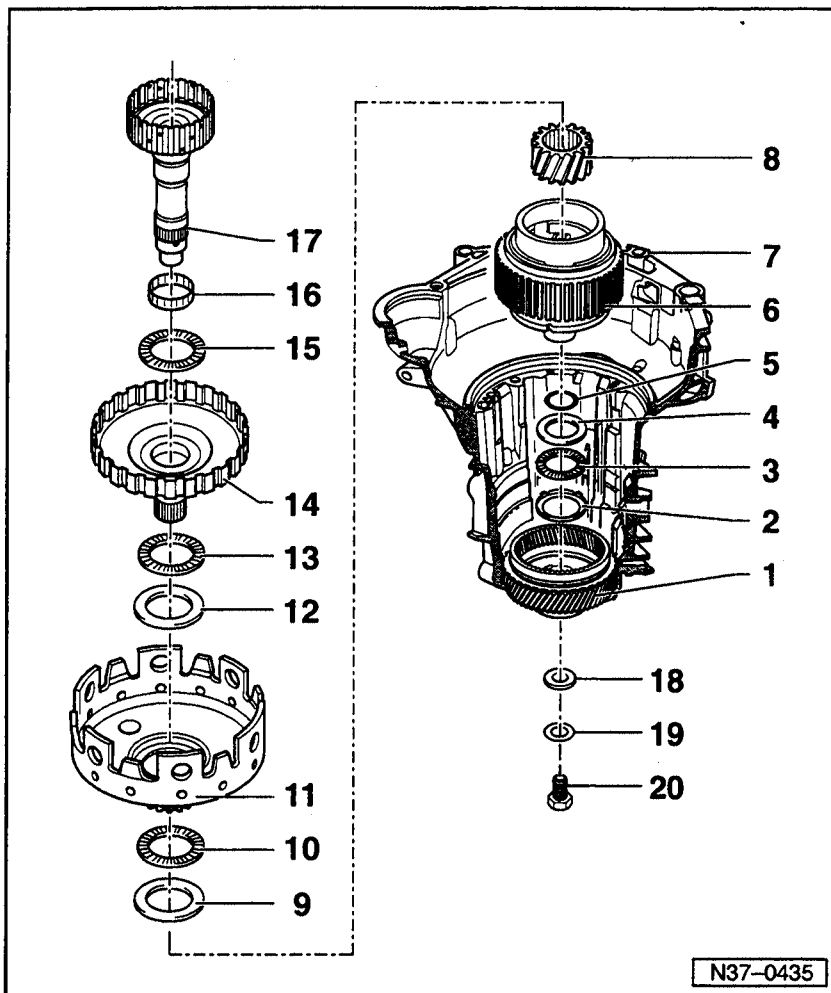
- ◆ Insert smooth side in input gear

3 - Axial needle bearing

4 - Washer for axial needle bearing

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37-96



5 - O-ring

- ♦ Always replace
- ♦ Inserting in planet carrier ⇒ Assembling planetary gearbox, Page 37-79

6 - Planet carrier

7 - Gear case

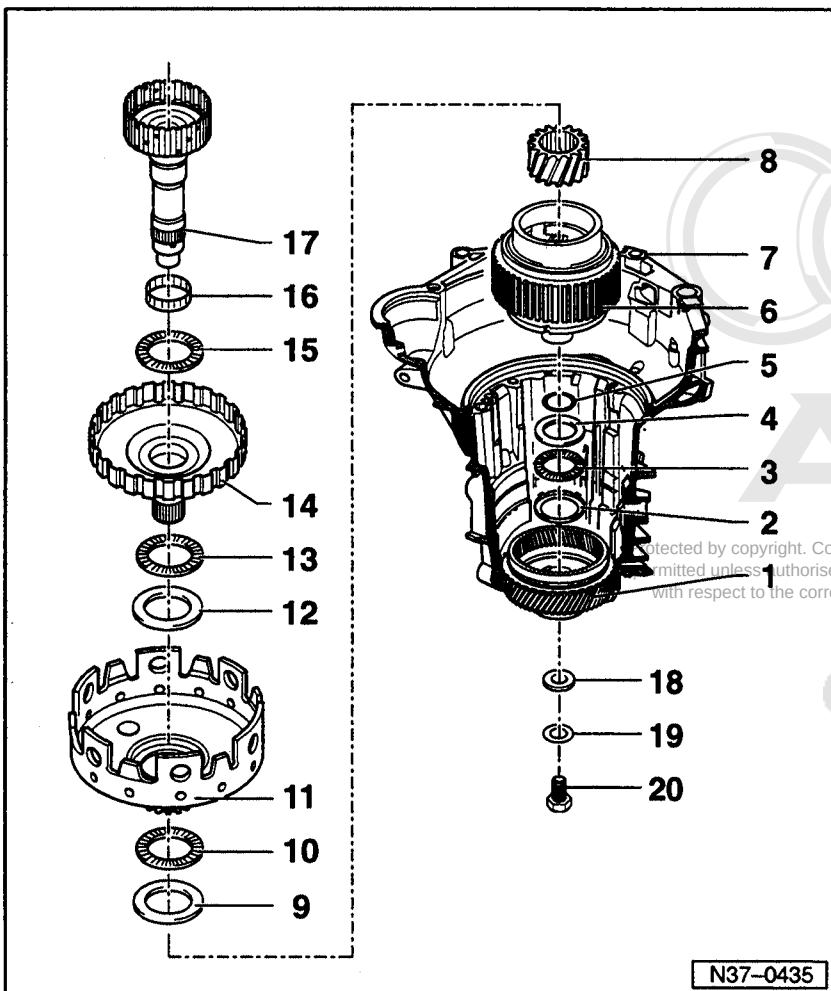
- ♦ With input gear and axial needle bearing
- ♦ Axial needle bearing remains in input gear
- ♦ Removing and installing input gear if axial needle bearing damaged ⇒ Page 39-11

8 - Small sun gear

- ♦ Cannot be removed from planet carrier on gearboxes as of 11.92 ⇒ Page 00-3 onwards

9 - Washer

10 - Axial needle bearing



11 - Large sun gear

12 - Washer

- ♦ Inserting in large sun gear ⇒ Assembling planetary gearbox, Page 37-79

13 - Axial needle bearing

14 - Large drive shaft

15 - Axial needle bearing

16 - Needle bearing

17 - Small drive shaft

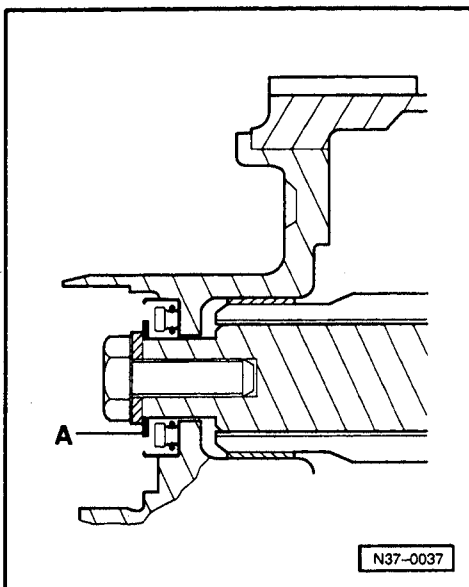
18 - Shim

- ♦ Do not install to adjust planet carrier

19 - Washer

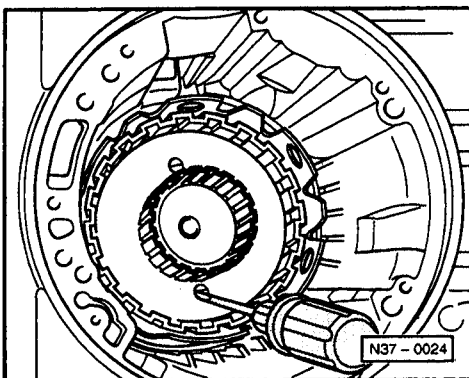
20 - Bolt for small drive shaft, 30 Nm

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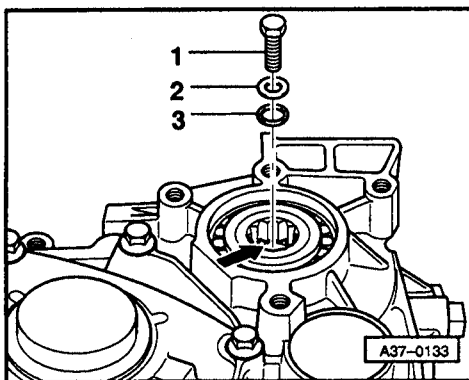
◀ Measuring out shim -A-

- Install all components (items 3...17 and 19...20) ⇒ Page 37-96 in gear case for adjustment of planet carrier.

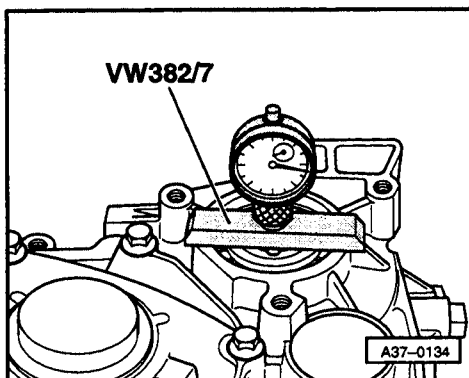
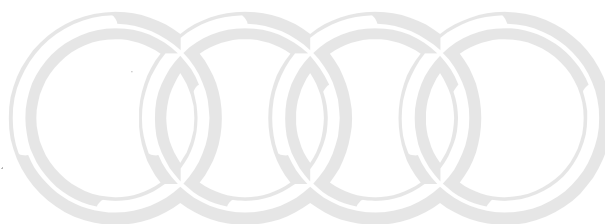


- Engage parking lock.
- ◀ - Insert screwdriver through holes in "large drive shaft" and "large sun gear" so as to enable "bolt for small drive shaft" to be unfastened and tightened.

_____ 37-99 _____



- ◀ - Fit (tightening torque 30 Nm) bolt for small drive shaft -1- with washer -2- but without shim -3-.



- ◀ - Set up measurement tool and position dial gauge tip in centre of bolt head with 1 mm preload.

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Set dial gauge to "0"

- Press up small drive shaft and read off measured value.

Example: Measured value 2 mm

- Establish thickness of shim as per table ⇒ Page 37-101 and determine part number in line with parts list.

_____ 37-100 _____

"Shim" table:

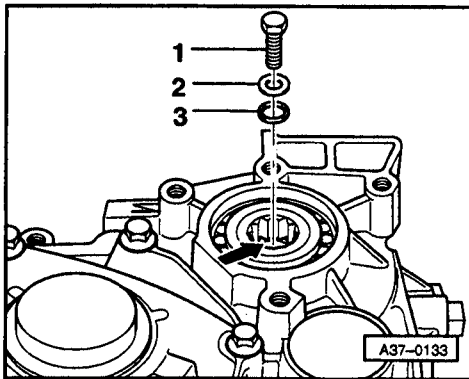
Measured value (mm)	Shims (mm)
1.26 ... 1.35	1.0
1.36 ... 1.45	1.1
1.46 ... 1.55	1.2
1.56 ... 1.65	1.3
1.66 ... 1.75	1.4
1.76 ... 1.85	1.5
1.86 ... 1.95	1.6
1.96 ... 2.05	1.7
2.06 ... 2.15	1.8
2.16 ... 2.25	1.9
2.26 ... 2.35	2.0
2.36 ... 2.45	2.1
2.46 ... 2.55	2.2
2.56 ... 2.65	2.3
2.66 ... 2.75	2.4
2.76 ... 2.85	2.5
2.86 ... 2.95	2.6
2.96 ... 3.05	2.7
3.06 ... 3.15	2.8
3.16 ... 3.25	2.9

37-101

Example:

If measured value is 2.00 mm, insert 1.7 mm thick shim.

- Remove bolt for small drive shaft.
- ◀ - Attach shim -3- determined to small drive shaft (arrow).
- Tighten (torque 30 Nm) bolt for small drive shaft -1- with washer -2-.
- Performing planet carrier check measurement ⇒ Page 37-103.

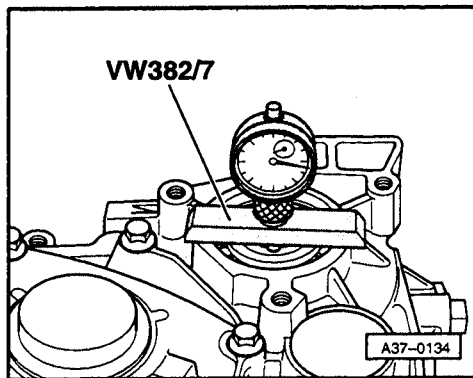


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erWin

37-102



Planet carrier check measurement

- ◀ – Insert dial gauge in VW 382/7 and position tip on bolt of small drive shaft.
- Move small drive shaft up and down and read play off dial gauge.

Play:

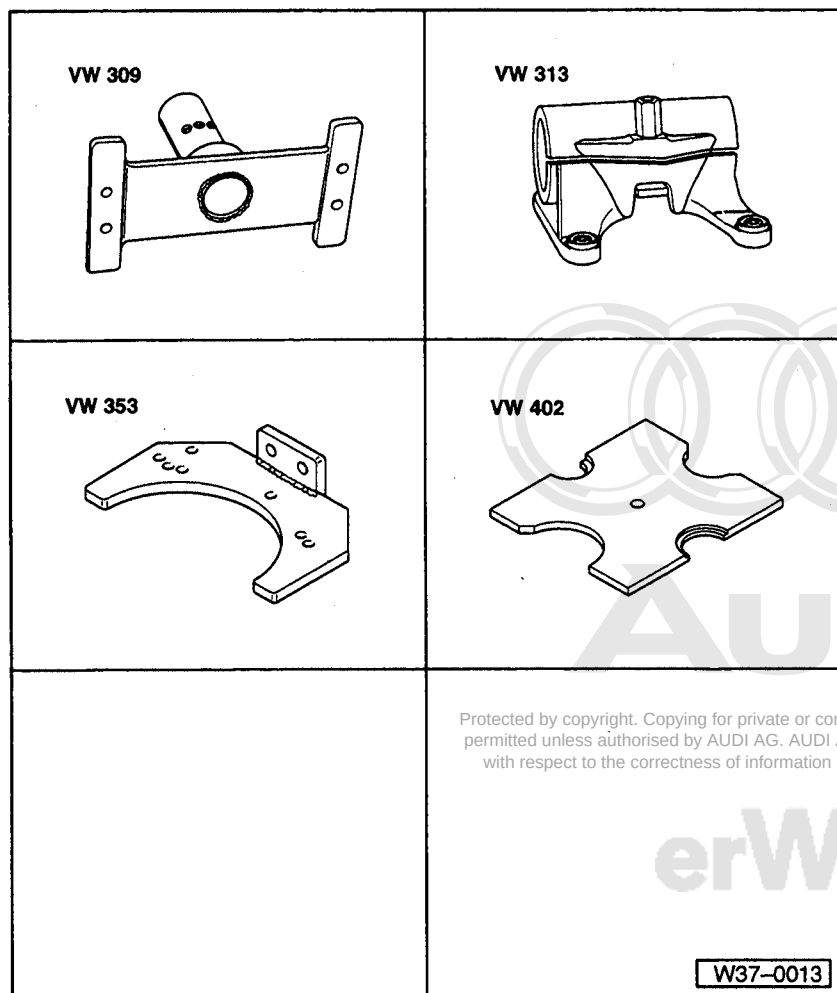
Min. = 0.23 mm

Max. = 0.37 mm

Note:

If planet carrier was adjusted with reverse gear brake -B1- and free wheel removed, reverse gear brake -B1- must be installed before fitting planet carrier ⇒ Assembling planetary gearbox, Page 37-79.

37-103

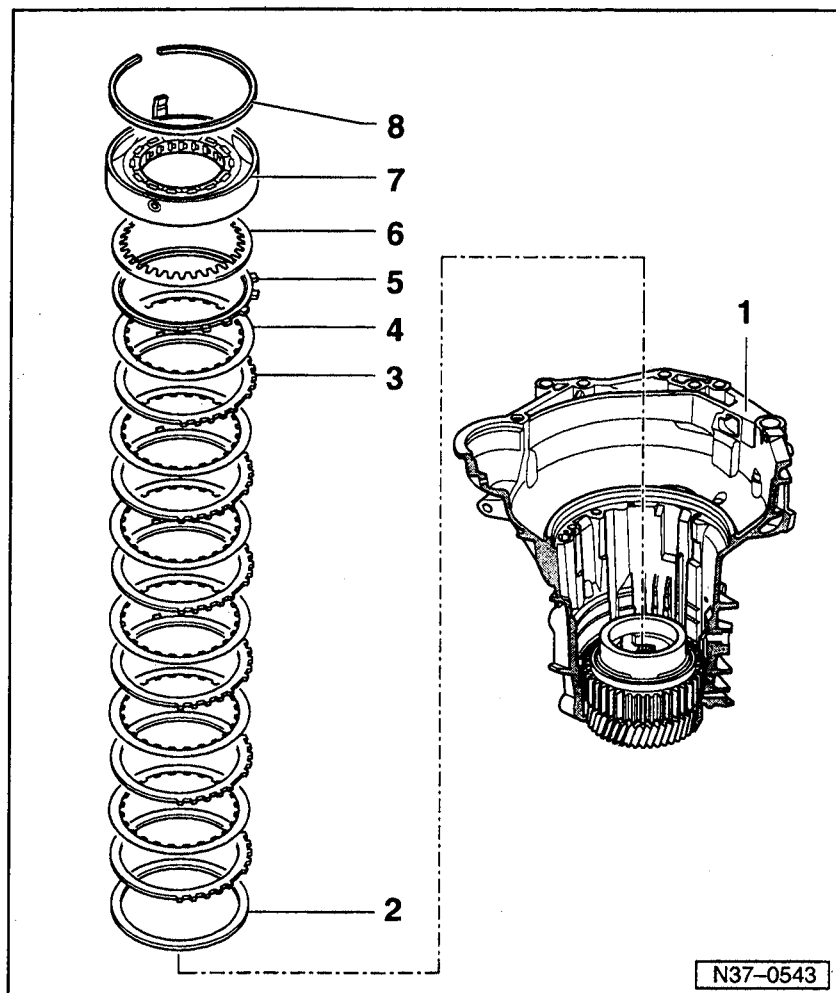


II - Adjusting reverse gear brake -B1-: Exploded view

Special tools and workshop equipment required

- ♦ VW 309: Holding plate
- ♦ VW 313: Clamp
- ♦ VW 353: Gearbox rest
- ♦ VW 402: Pressing plate

37-104



Exploded view of components

- To adjust reverse gear brake -B1-, install components without shims (item 2) in gear case ⇒ Assembling planetary gearbox, Page 37-79.

1 - Gear case

- ♦ With installed input gear and planet carrier

2 - Shim

- ♦ There may be 1 or 2 shims fitted
- ♦ Gearboxes AEH, ARC and CBT are fitted with additional 3.7 mm thick shim

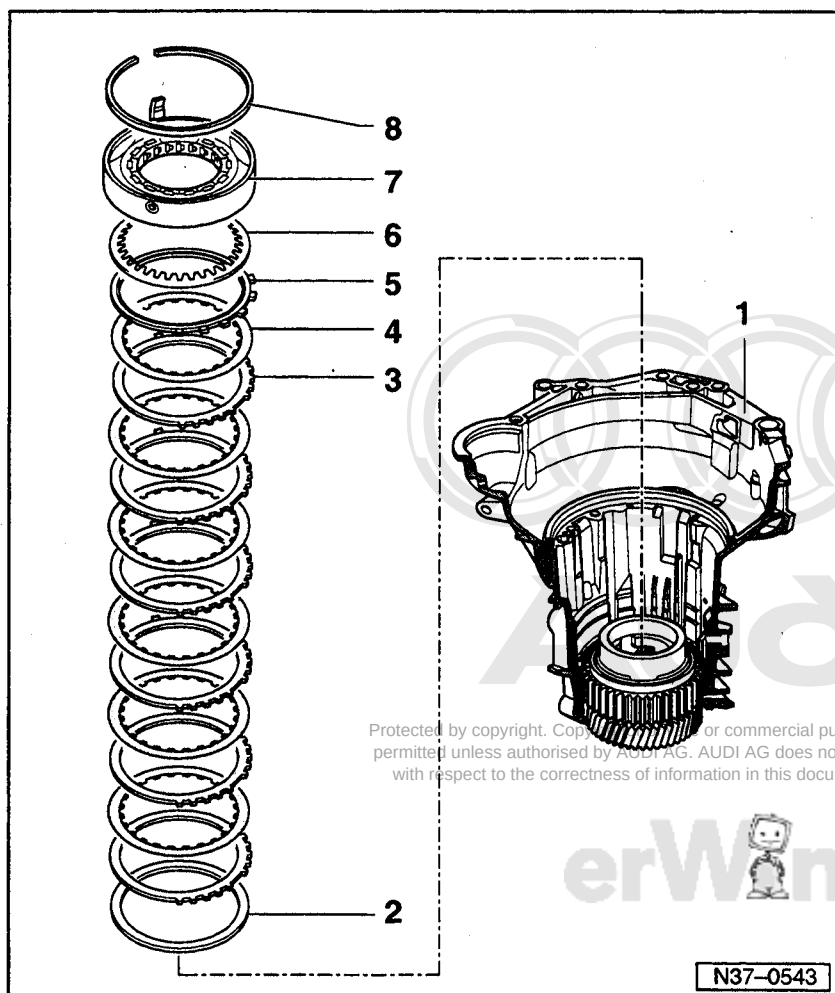
3 - Outer plate -B1-

- ♦ Number of outer plates ⇒ Page 00-3 onwards

4 - Inner plate -B1-

- ♦ Number of inner plates ⇒ Page 00-3 onwards

37-105



5 - Pressure plate

- ♦ Installation position: Flat side faces plates
- ♦ Replacement part is assigned to gearbox code letters

6 - Dished washer

- ♦ Installation position: Curved side faces free wheel

7 - Free wheel with -B1- piston

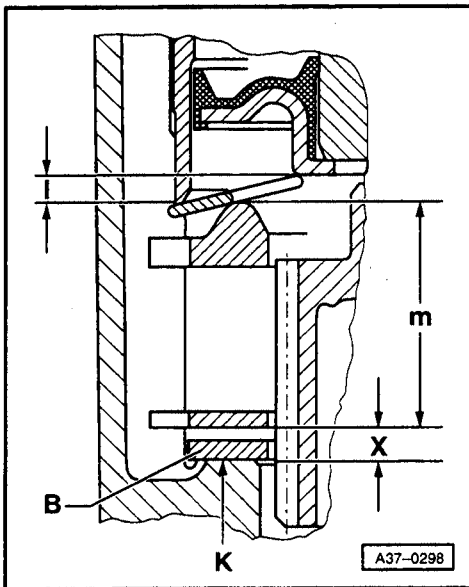
Before removing or installing free wheel, remove valve body and take out plug ⇒ Page 38-44.

8 - Circlip

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N37-0543

37-106



◀ Determining thickness of shim(s) -B-

Thickness of shim(s) is governed by gap dimension "x", which is determined in line with the following:

$$x = k + \frac{l}{2} - m$$

♦ B = Shim

♦ x = Gap dimension

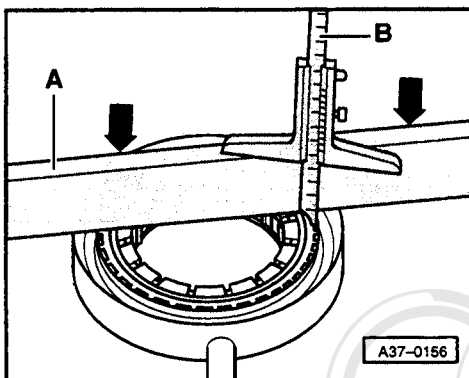
♦ l = Position of piston in free wheel; determining
⇒ Page 37-108

♦ m = Height of plates with pressure plate; determining
⇒ Page 37-109

♦ k = Constant value = 30.5 mm

"k" is determined by overall height in gear case and cannot be adjusted.

37-107



Determining value "l"

- ◀ – Press piston as far as it will go in direction of arrow.
- Position straightedge "A" on outer ring of free wheel.
- Take measurement on inside edge of piston with depth gauge "B".

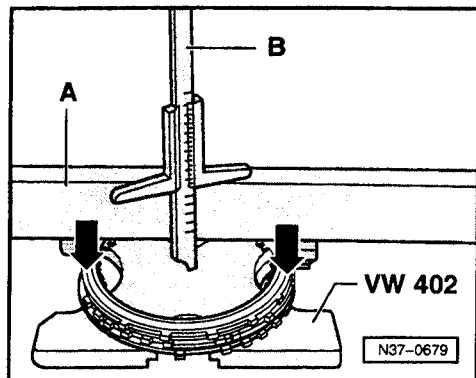
Example:

Measured value	=	51.8 mm
– Straightedge	=	– 48.2 mm
Calculated value l	=	3.6 mm

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37-108



Determining value "m"

- – Position straightedge "A" on pressure plate.
- Squeeze plates and pressure plate together in direction of arrow and use depth gauge "B" to measure thickness of plates.

Example:

Measured value	=	77.2 mm
– Straightedge	=	– 48.2 mm
Calculated value m	=	29.0 mm

$$\text{Gap dimension } x = k + \frac{1}{2} - m$$

$$= 30.5 + \frac{3.6}{2} - 29.0 = 3.3 \text{ mm}$$

- Establish shims as per table:

37-109

"Shim" table:

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

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- Establish thickness of shim as per table and determine part number in line with parts list.

37-110

- Perform check measurement after establishing shim for -B1-.

Check measurement for reverse gear brake -B1-

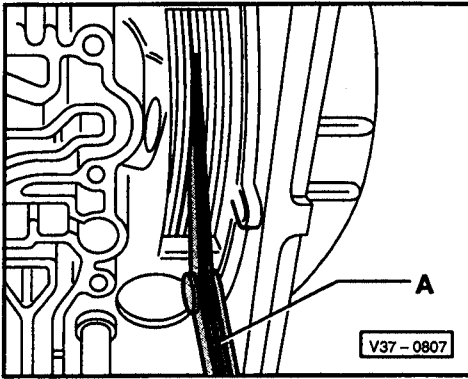
- Install components as far as free wheel and secure with circlip ⇒ Assembling planetary gearbox, Page 37-79.

- ◀ – Use valve gauge "A" to measure play between plates.

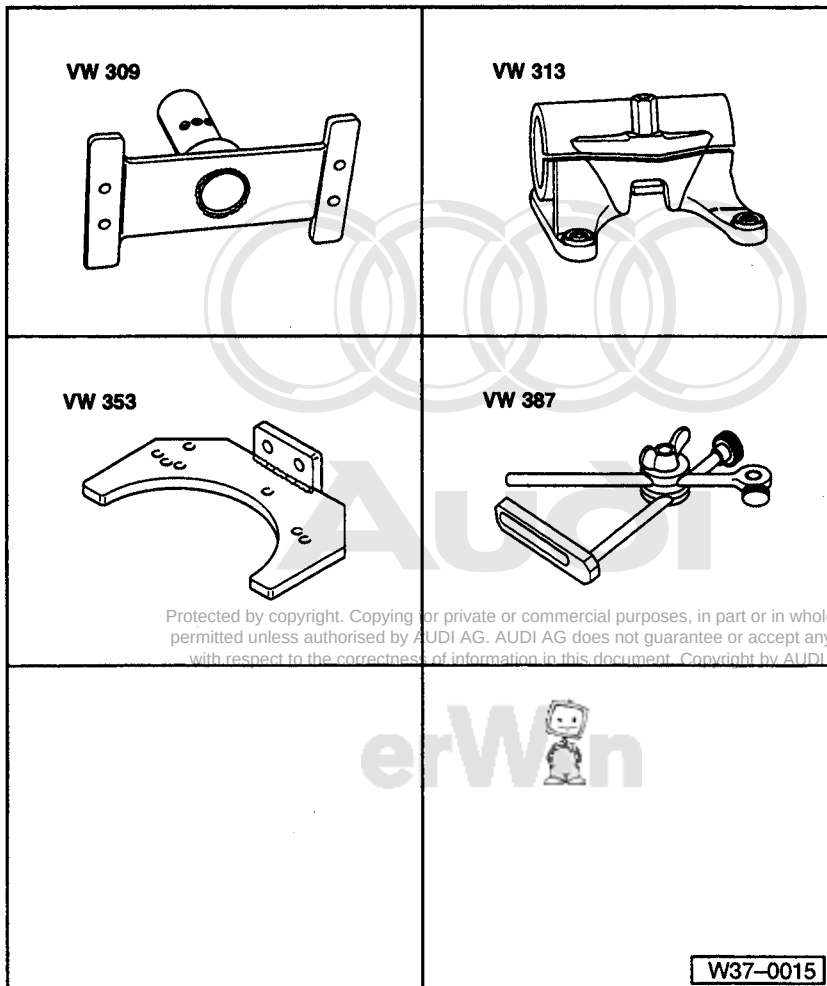
Play:

Min. = 1.2 mm

Max. = 1.8 mm



37-111

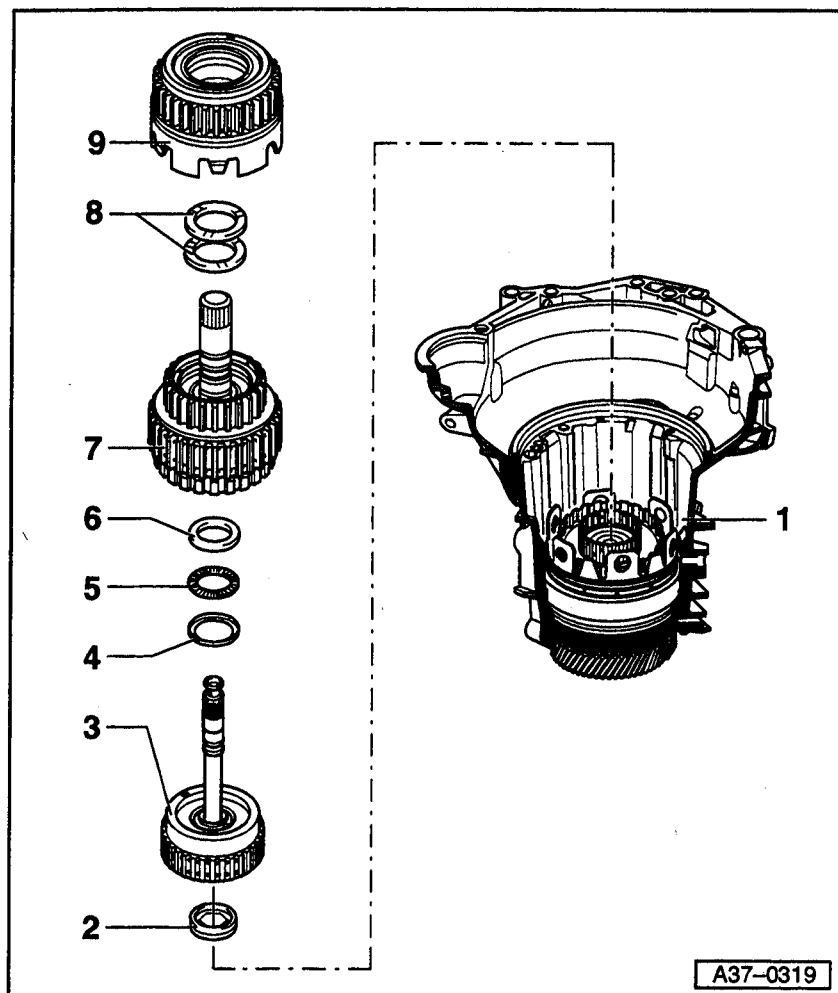


III - Adjusting clutch play between -K1- and -K2-

Special tools and workshop equipment required

- ♦ VW 309: Holding plate
- ♦ VW 313: Clamp
- ♦ VW 353: Gearbox rest
- ♦ VW 387: Universal dial gauge holder

37-112



Exploded view of components

Note:

- To adjust clutch play, install components without shim(s) -item 8-
⇒ Assembling planetary gearbox, Page 37-79

1 - Gear case

- ♦ Planetary gearbox installed as far as small drive shaft ⇒ Assembling planetary gearbox, Page 37-79

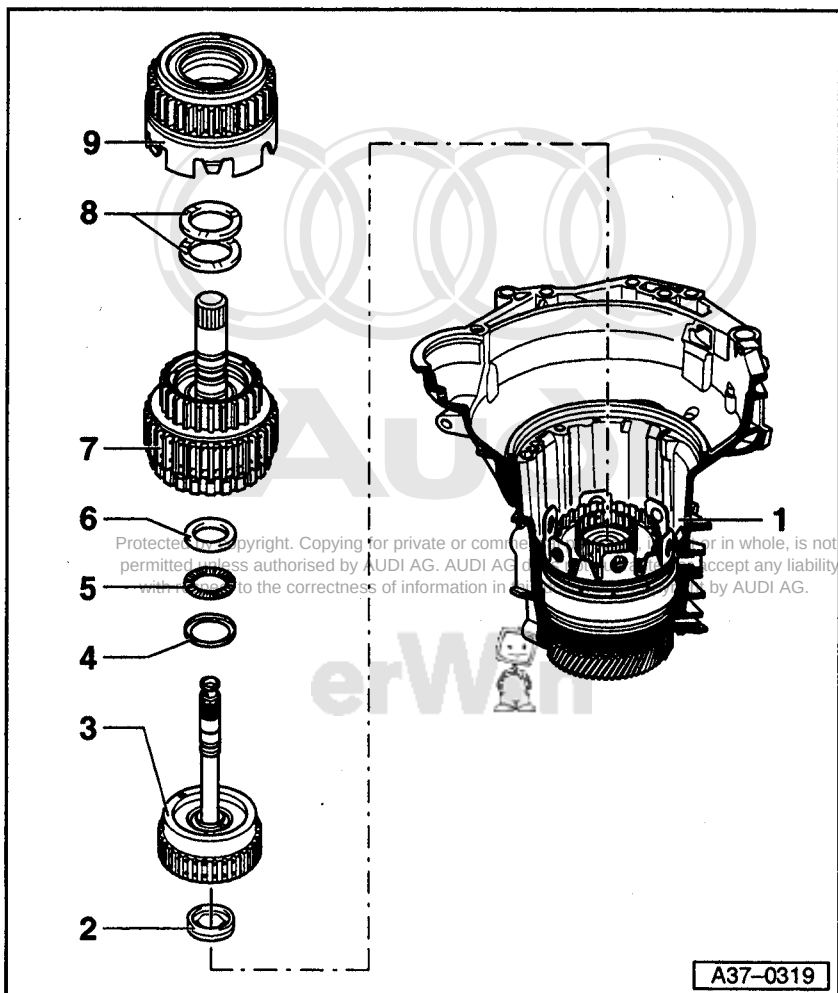
2 - Axial needle bearing with washer

- ♦ Axial needle bearing faces small drive shaft
- ♦ Washer faces -K3-

3 - 3rd and 4th gear clutch -K3- with pump shaft

- ♦ On gearboxes as of 11.92 ⇒ Page 00-3 onwards, clutch -K3- is only used to select 4th gear

37-113



4 - Washer for axial needle bearing

- ♦ Lugs face axial needle bearing

5 - Axial needle bearing

6 - Washer for axial needle bearing

7 - 1st - 3rd gear clutch -K1- with turbine shaft

8 - Shims

- ♦ Do not install to adjust clutch play
- ♦ There may be up to 3 shims fitted

9 - Reverse gear clutch -K2-

37-114

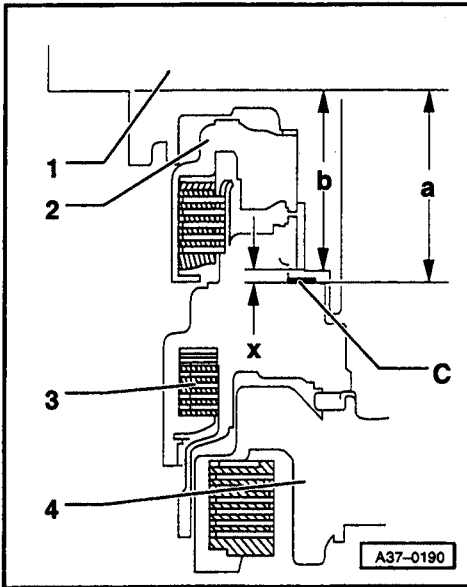
Determining thickness of shim(s) -C-

Prerequisites:

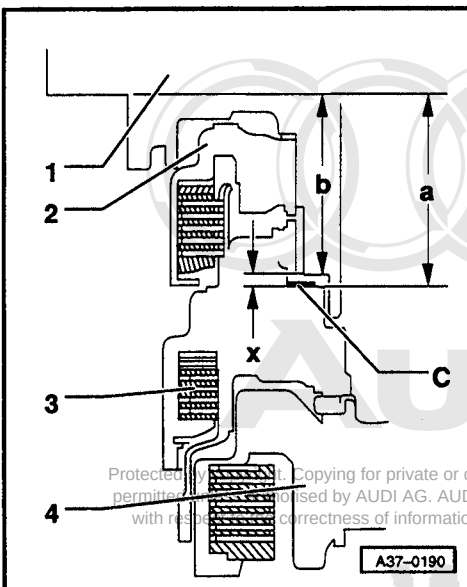
- Planet carrier installed and adjusted $\Rightarrow$ Assembling planetary gearbox, Page 37-79
- For measurement purposes, gear case must be turned in repair stand such that input gear is facing downwards as shown on Page 37-113

Thickness of shim(s) is governed by gap dimension "x", which is determined as follows:

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



37-115



1 - ATF pump

2 - Reverse gear clutch -K2-

3 - 1st - 3rd gear clutch -K1-

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

C = Shim(s)

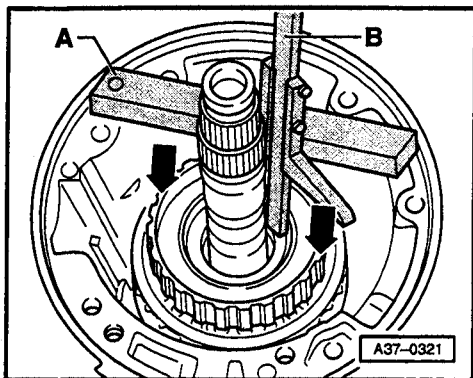
x = Gap dimension

a = Installation depth of clutch -K1-; determining $\Rightarrow$ Page 37-117

b = Housing dimension of ATF pump; determining $\Rightarrow$ Page 37-118

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37-116



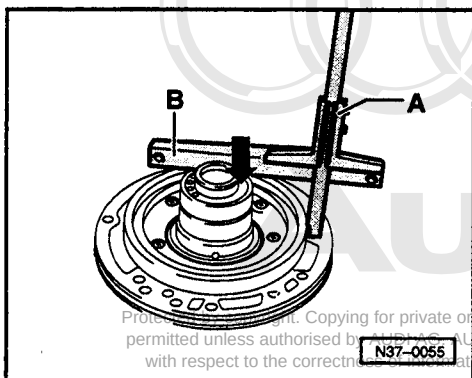
Determining value "a"

- ◀ - Place short straightedge "A" on pump flange at gear case.
- Press -K1- downwards in direction of arrow and measure into -K1- with depth gauge "B".

Example:

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

37-117



Determining value "b"

- Place paper gasket on ATF pump.
- ◀ - Position straightedge -B- on top of impeller support (arrow) and measure as far as pump flange gasket with depth gauge -A-.

Calculation example for value "b":

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

Gap dimension $x = a - b$

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

- Establish shims as per table:

Two shims (1.2 mm each) would be required in this example.

37-118

"Shim" table:

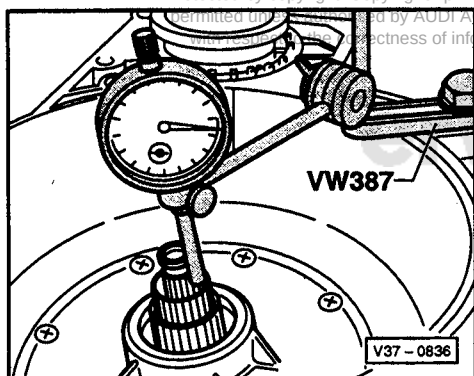
Gap dimension "x" (mm)	Shims (mm)
... 2.54	1.4
2.55 ... 3.09	1 + 1
3.10 ... 3.49	1.2 + 1.2
3.50...3.89	1.4 + 1.4
3.90...4.29	1.6+ 1.6
4.30...4.69	1.8 + 1.8
4.70...5.04	1.2 + 1.2 + 1.6
5.05...5.25	1.2 + 1.2 + 1.8

- Establish thickness of shim as per table and determine part number in line with parts list.
- Perform clutch play check measurement after installing ATF pump.

37-119

Check measurement (clutch play)

- Clutch play cannot be measured until ATF pump has been installed
- Reverse gear clutch -K1- must have been installed
- Attach dial gauge holder to gear case and position dial gauge on turbine shaft with 1 mm preload.



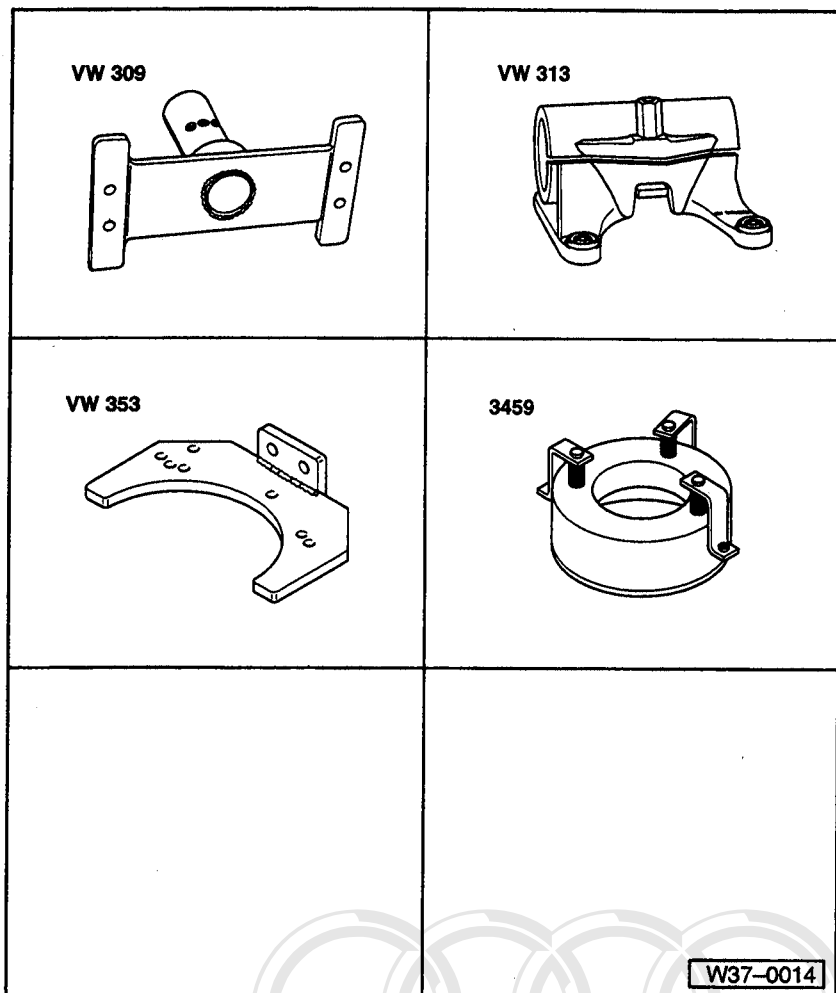
- ← Move turbine shaft up and down and take play reading on dial gauge.

Play:

Min. = 0.5 mm

Max. = 1.2 mm

37-120

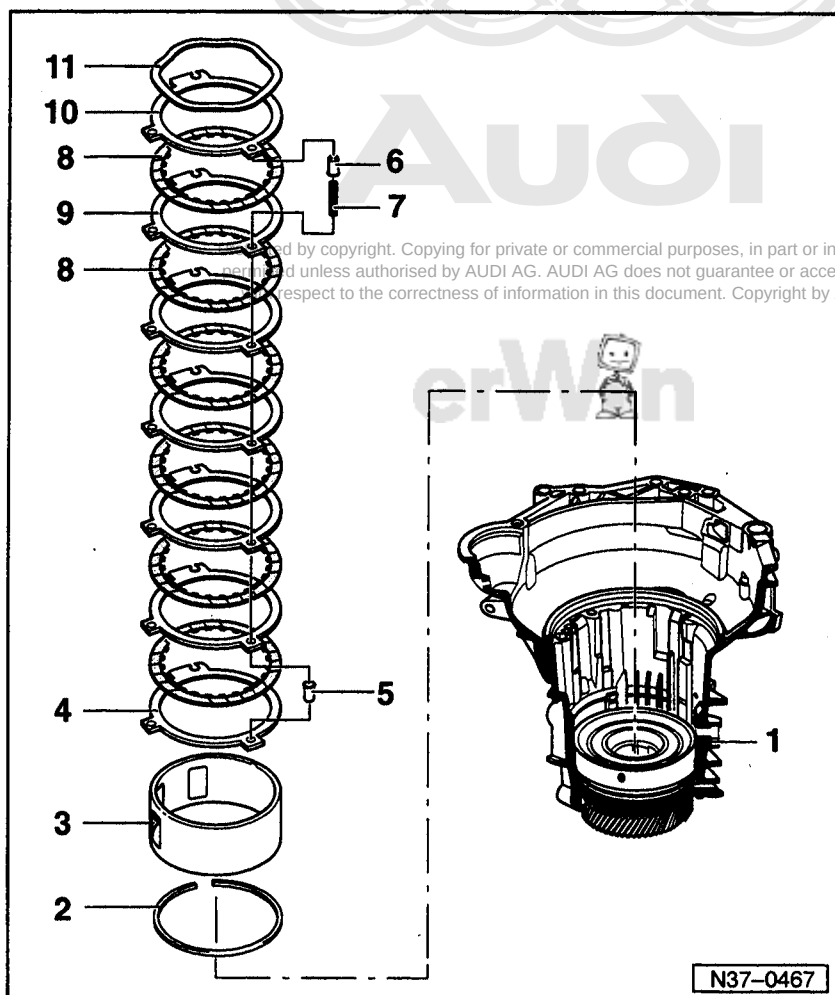


IV - Adjusting 2nd and 4th gear brake -B2-

Special tools and workshop equipment required

- ◆ VW 309: Holding plate
- ◆ VW 313: Clamp
- ◆ VW 353: Gearbox rest
- ◆ 3459: Adjustment tool

37-121



Exploded view of components

The play of the brake -B2- is determined by the thickness of the the last outer plate(s) (item -10-).

For adjustment, install components without corrugated washer (item 11), last outer plate(s) (item 10) and spring cap (item 6).

1 - Gear case

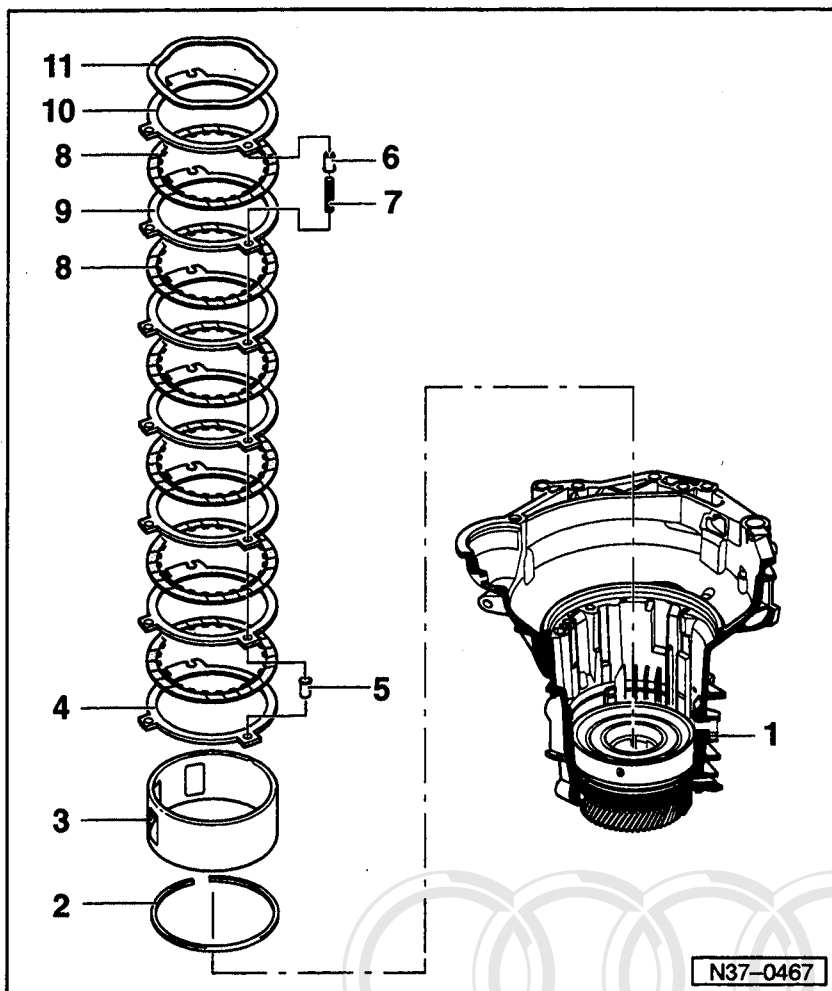
2 - Circlip

- ◆ For supporting tube -B2-
- ◆ Installation position: Open ends face retaining key of free wheel

3 - Supporting tube -B2-

- ◆ Insert such that groove engages in key of free wheel

37-122



4 - Outer plate -B2-

- ♦ 3 mm thick

5 - Spring cap

- ♦ Install after first outer plate (item 4)

6 - Spring cap

- ♦ Do not install to adjust -B2-
- ♦ Install before fitting last outer plate(s)

7 - Spring

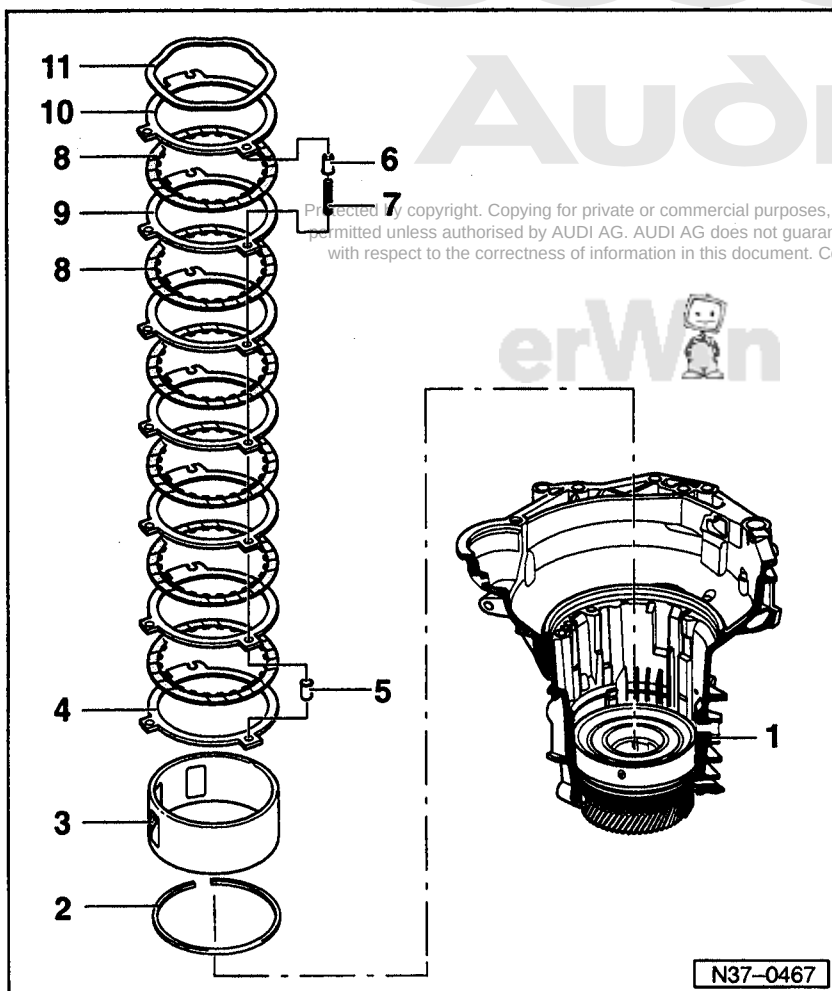
8 - Inner plate -B2-

- ♦ Number of inner plates ⇒ Page 00-3 onwards

9 - Outer plate -B2-

- ♦ Always install 2 mm thick outer plates
- ♦ Number of outer plates ⇒ Page 00-3 onwards

37-123



10 - Outer plate -B2-

- ♦ Always install 2 mm thick outer plates
- ♦ Do not install to adjust -B2-
- ♦ There may be 2 outer plates fitted for adjustment

11 - Corrugated washer

- ♦ Do not install to adjust -B2-

37-124

Determining thickness of last outer plate -D-

Thickness of last outer plate(s) is determined by gap dimension x as follows:

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

The adjacent illustration indicates the assembled brake -B2- in the gearbox. The illustration does not show the special tool 3459 which applies a force on the plates.

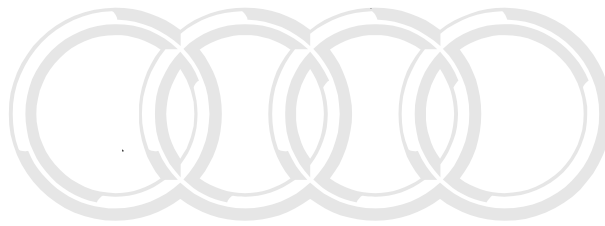
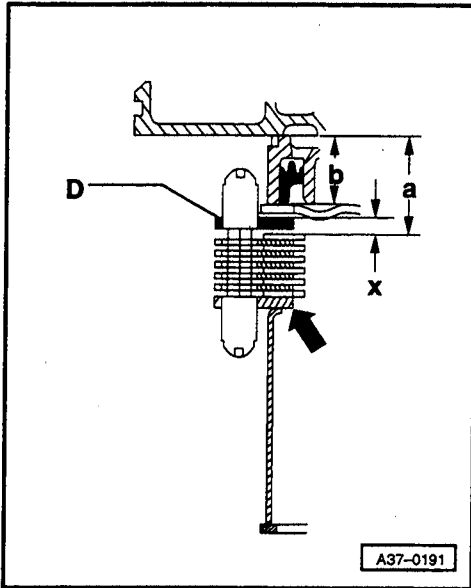
3.6 mm - this allows for the settling caused by the force of the special tool 3459

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

Determining dimension a:

Assemble planetary gearbox as far as last inner plate of -B2- ⇒ Page 37-79. Do not fit last outer plate, last 3 spring caps and corrugated washer.

- Position 3459 on last inner plate and turn until the three clips are aligned with the three holes for the ATF pump.
- Screw (5 Nm) 3459 to flange for ATF pump.



37-125

This compresses the plates of -B2- for measurement purposes.

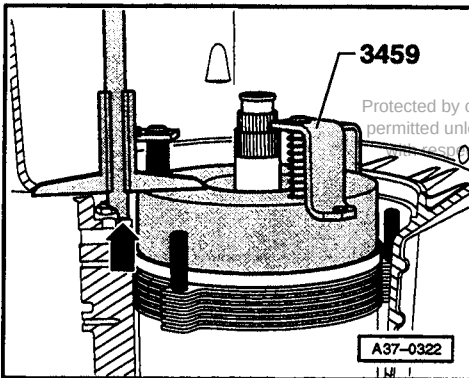
- ◀ - Take measurement between pump flange/gear case -arrow- and 3459 with depth gauge.

Dimension a = Height of 3459 in mm - measured value.

Example:

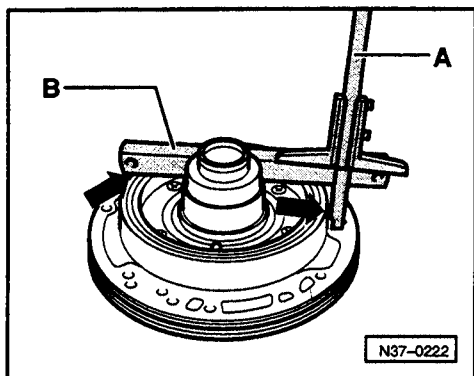
Height of 3459	=	60.0 mm
- Measured value	=	- 29.8 mm
Calculated value a	=	30.2 mm

- Note down value determined for a.
- Detach special tool 3459.



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37-126



Determining dimension b:

- Press home piston in ATF pump.
- Position paper gasket on ATF pump.
- Place straightedge "B" on bottom of impeller support (arrows) and measure as far as pump flange gasket with depth gauge "A".

Example:

Measured value	=	40.1 mm
– Straightedge	=	– 19.5 mm
Calculated value b	=	20.6 mm

- Note down value determined for b.

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

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

- Determine thickness of outer plate(s) as per table:

37-127

"Outer plate" table:

Gap dimension "x" (mm)	Plate (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

- Establish thickness of outer plate(s) required as per table and determine part number in line with parts list.

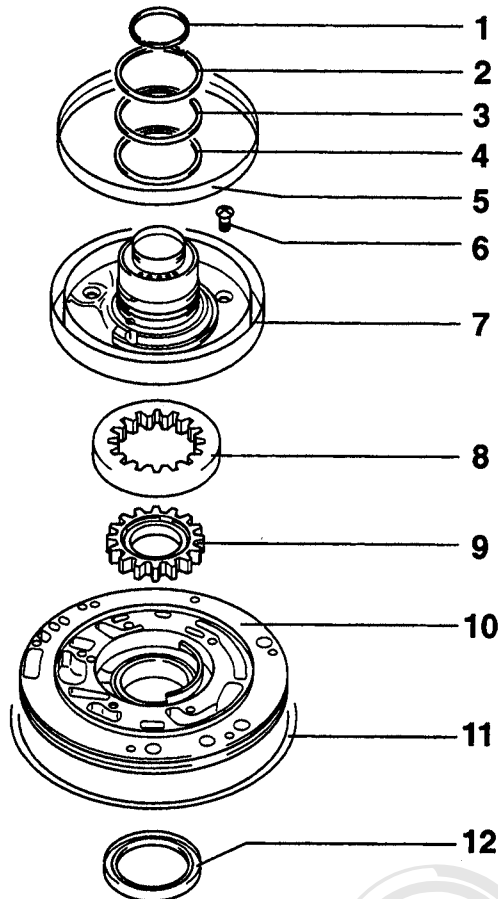
Two outer plates (each 2.25 mm thick) would have to be fitted in this example.

- Position three spring caps on compression springs.
- Fit last outer plate(s) determined.
- Insert corrugated washer.
- Further assembly is described on Page 37-91 onwards.

37-128

Dismantling and assembling ATF pump

Replacement ATF pump components and pump itself are assigned to gearbox code letters.



V38 - 0690

38-1

1 - Piston ring

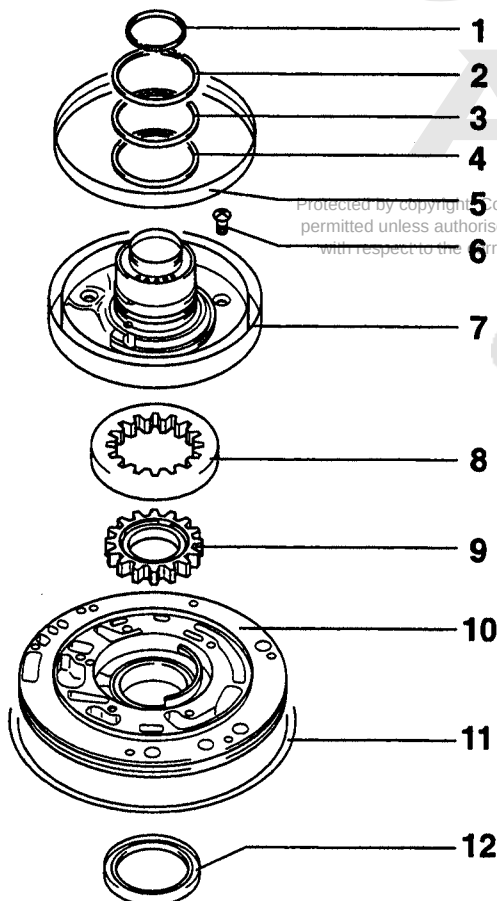
- ◆ Checking correct positioning
⇒ Fig. 1, Page 38-4
- ◆ Removing and installing
⇒ Fig. 2, Page 38-4

2 - Piston ring

- ◆ Checking correct positioning
⇒ Fig. 1, Page 38-4
- ◆ Removing and installing
⇒ Fig. 2, Page 38-4

3 - Piston ring

- ◆ Checking correct positioning
⇒ Fig. 1, Page 38-4
- ◆ Removing and installing
⇒ Fig. 2, Page 38-4



V38 - 0690

4 - Thrust washer

5 - Piston

- ◆ Sealing lips are vulcanised onto piston
- ◆ Moisten sealing lips with ATF prior to insertion
- ◆ Turn piston slightly on installation

6 - Bolt, 10 Nm

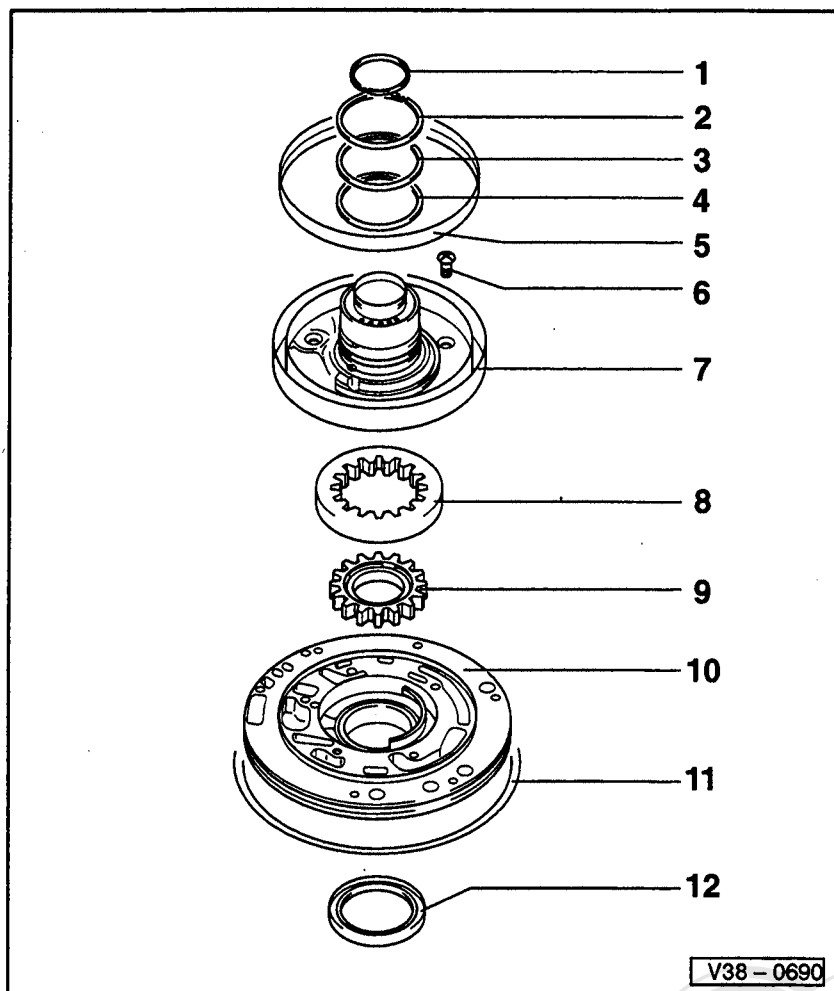
- ◆ + further 45° turn

7 - Impeller support

8 - Outer gear

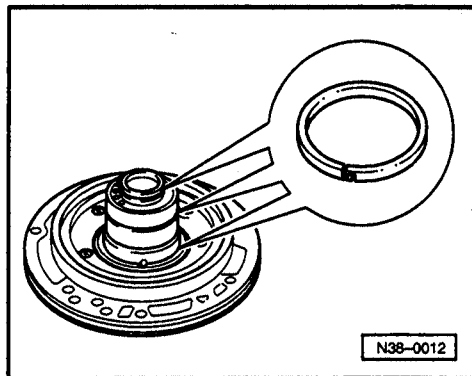
- ◆ Manufacturer's mark faces impeller support
- ◆ ATF pump may be stiff when fitted if outer gear is installed incorrectly

38-2



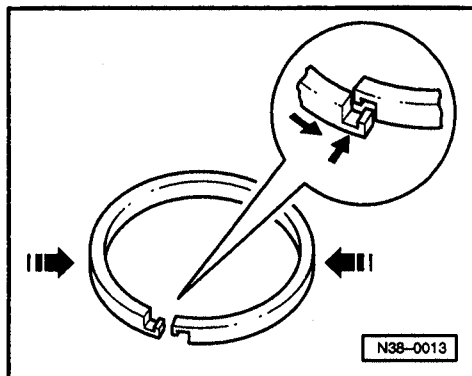
- 9 - Inner gear
 - ♦ Larger recess faces impeller support
- 10 - Housing for ATF pump
- 11 - O-ring
 - ♦ Always replace
- 12 - Sealing ring for torque converter
 - ♦ Removing and installing
 - ⇒ Page 32-3

38-3



◀ Fig. 1 Checking positioning of piston rings

- Make sure joints of piston rings are interlocked.



◀ Fig. 2 Removing and installing piston ring

Removing

- Squeeze piston ring together and release by hand.
- Spread piston ring on either side and detach; avoid one-sided twisting out of groove.

Installing

- Insert piston ring in groove.
- To interlock, squeeze piston ring together and align the joints.

38-4

Dismantling and assembling free wheel with -B1- piston

1 - Rollers

♦ Installing ⇒ Fig. 1, Page 38-6

2 - Springs

♦ Installing ⇒ Fig. 1, Page 38-6

3 - Cage

♦ Inserting ⇒ Fig. 2, Page 38-6

♦ Securing ⇒ Fig. 3, Page 38-7

4 - Outer race

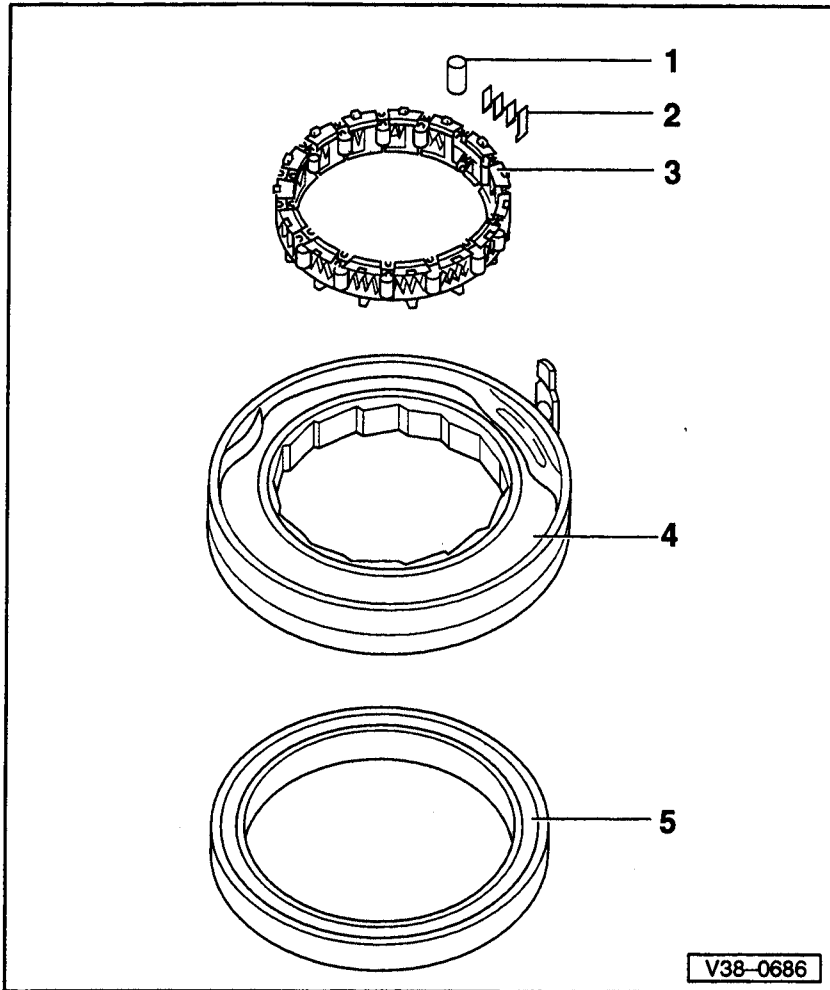
5 - Piston

♦ Sealing lips are vulcanised onto piston

♦ Moisten sealing lips with ATF before inserting

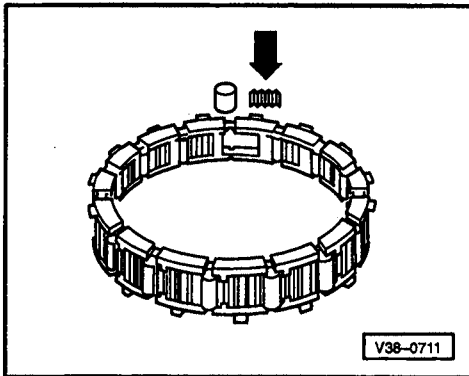
♦ Turn piston slightly on installation

♦ Installation position ⇒ Fig. 4, Page 38-7



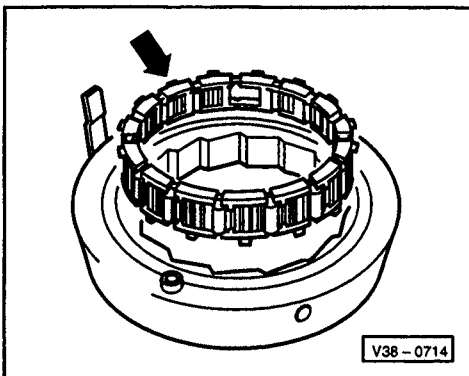
V38-0686

38-5



◀ Fig. 1 Installing rollers and springs

- Insert springs such that spring (arrow) clips into cage.
- Then fit rollers between cage and spring.

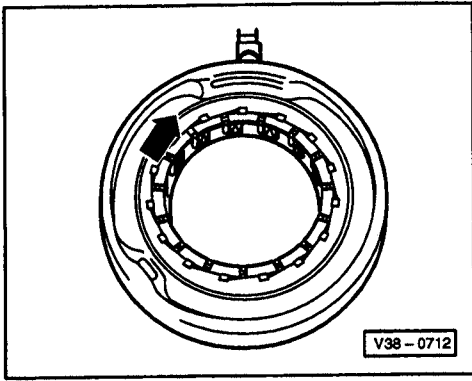


◀ Fig. 2 Inserting cage with springs and rollers

- Insert with large lugs (arrow) facing upwards.

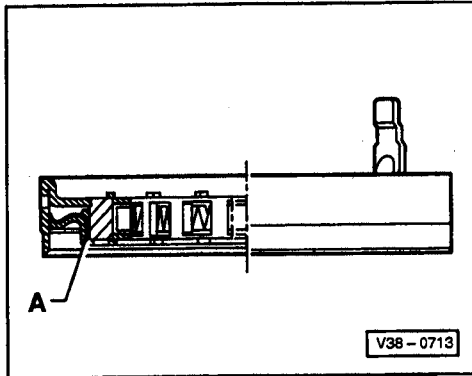
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38-6



◀ Fig. 3 Securing cage

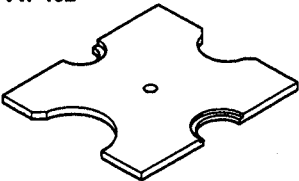
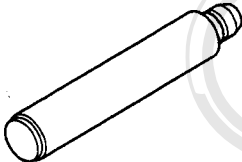
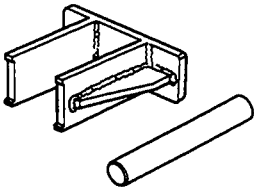
- Turn cage as far as it will go in direction of arrow to secure it.



◀ Fig. 4 Installation position of piston

- Insert piston -A- as shown.

_____ 38-7 _____

VW 402 	VW 407 
VW 460 	
	W38-0005

Dismantling and assembling 1st - 3rd gear clutch -K1- with turbine shaft for gearboxes up to 11.92

Special tools and workshop equipment required

◆ VW 401: Pressing plate

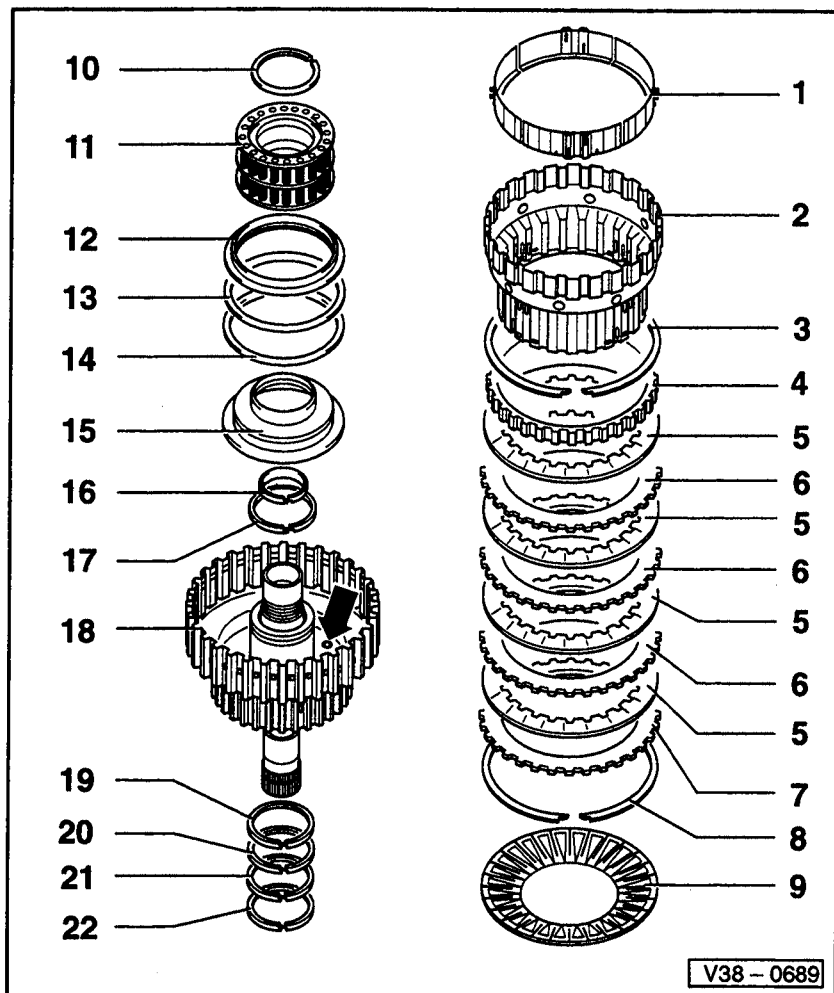
◆ VW 407: Punch

◆ VW 460: Pressing-out tool

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_____ 38-8 _____



Notes:

Clutch is only to be dismantled for cleaning and visual inspection.

Take care not to damage ball valve (arrow).

1 - Thrust bearing

- ◆ Unclip in 4 pieces from inner plate carrier
- ◆ Inserting ⇒ Fig. 4, Page 38-16

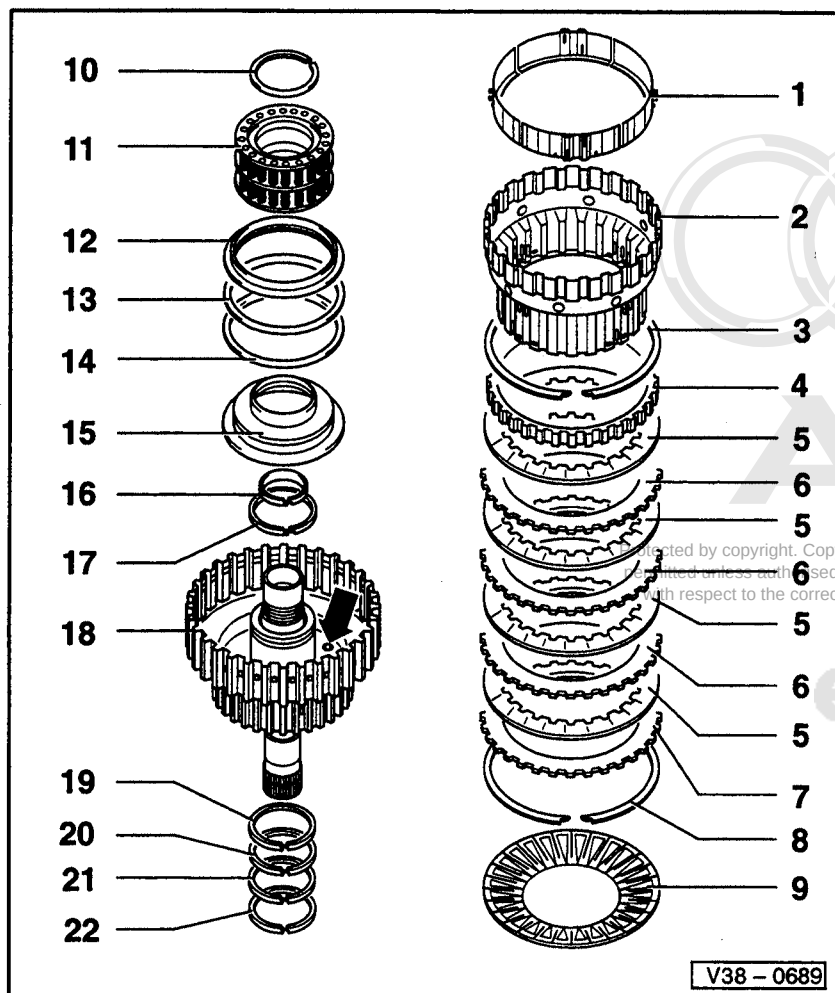
2 - Inner plate carrier

- ◆ Inserting ⇒ Fig. 6, Page 38-17
- ◆ Assembling ⇒ Fig. 4, Page 38-16

3 - Circlip

- ◆ Differing thickness
- ◆ Mark following removal and re-insert at same location

38-9



4 - Pressure plate

- ◆ Smooth side faces inner plate
- ◆ Inserting together with inner plate carrier ⇒ Fig. 4, Page 38-16

5 - Inner plate

- ◆ Number of inner plates ⇒ Page 00-3
- ◆ Installing ⇒ Fig. 4, Page 38-16
- ◆ Immerse new inner plates in ATF for 15 min. before fitting

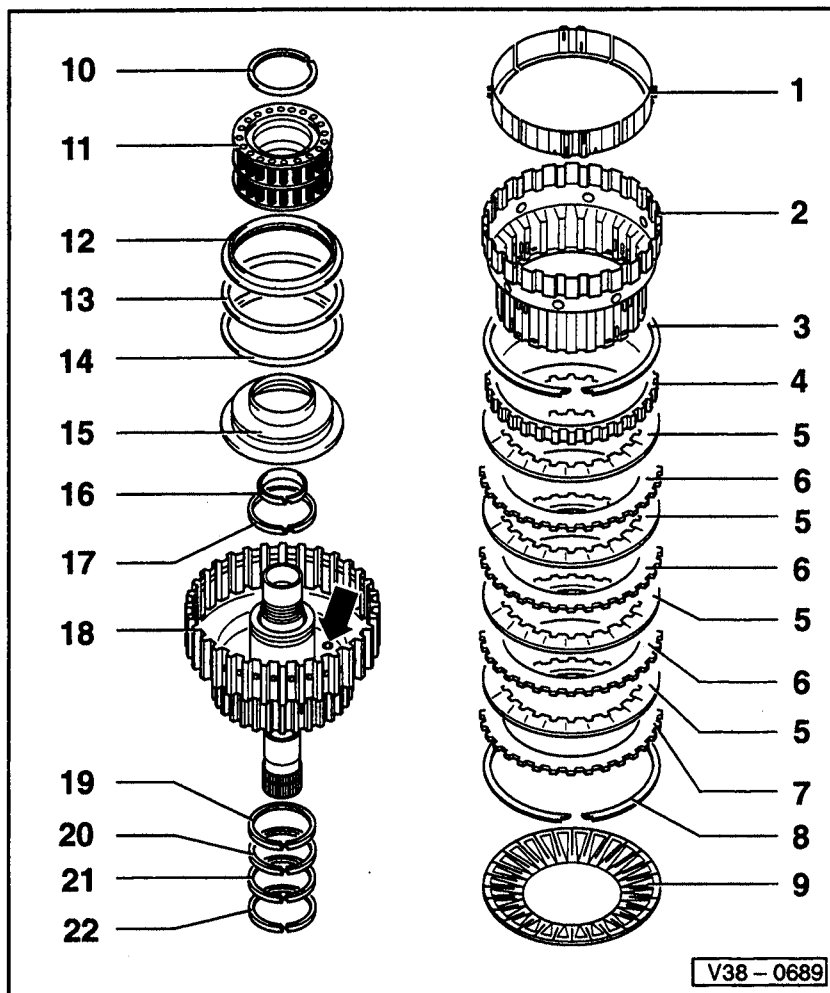
6 - Outer plate

- ◆ Number of outer plates ⇒ Page 00-3
- ◆ Installing ⇒ Fig. 4, Page 38-16

7 - Pressure plate

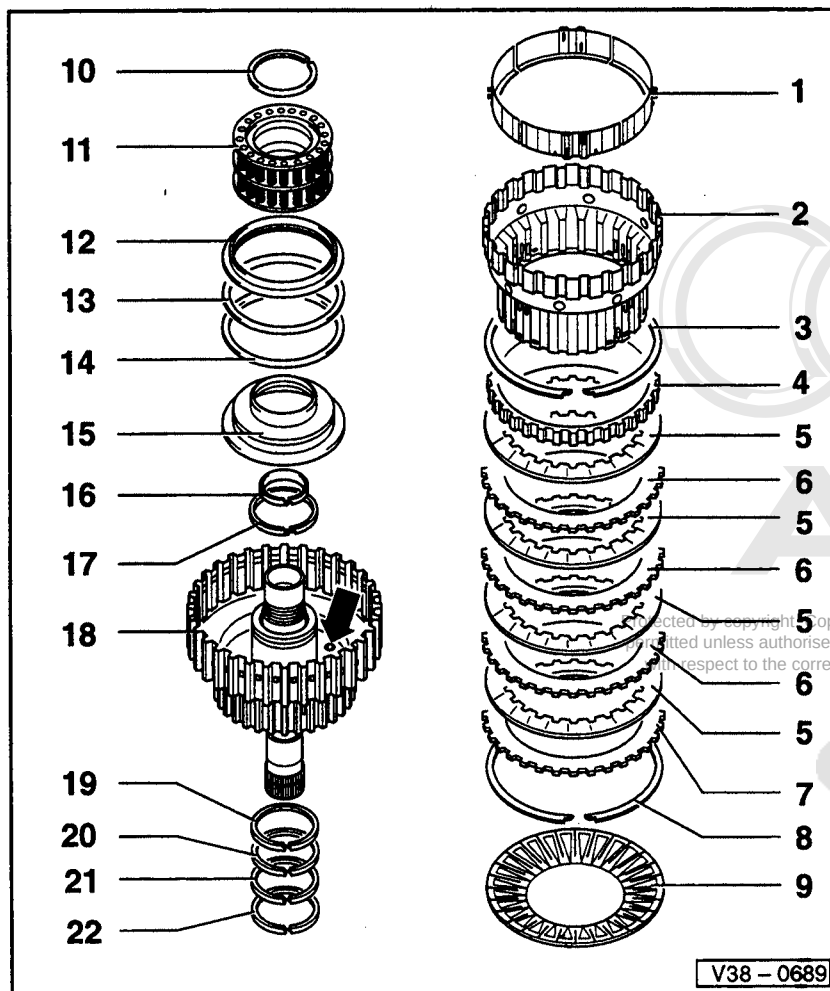
- ◆ Insert with curved side facing ring tensioning spring
- ◆ Installing ⇒ Fig. 5, Page 38-17

38-10



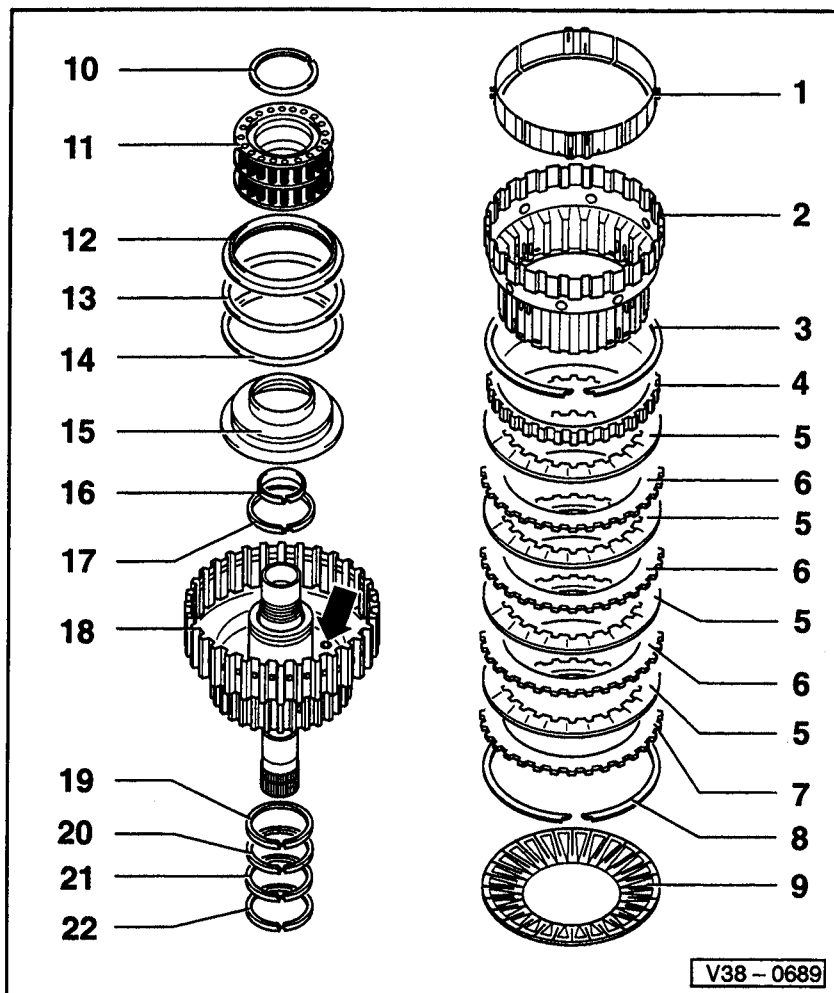
- 8 - Circlip**
 ♦ Inserting ⇒ Fig. 3, Page 38-16
- 9 - Ring tensioning spring**
 ♦ Insert with curved side facing piston
- 10 - Circlip**
 ♦ Removing and installing
 ⇒ Fig. 2, Page 38-15
- 11 - Spring spacer**
 ♦ With spring support and compression springs
- 12 - Actuator ring**
 ♦ Insert with curvature facing spring spacer
- 13 - Dished washer**
 ♦ Curved side faces actuator ring
 ♦ Installation position ⇒ Fig. 1, Page 38-15

38-11



- 14 - Dished washer**
 ♦ Curved side faces piston
 ♦ Installation position ⇒ Fig. 1, Page 38-15
- 15 - Piston**
 ♦ Sealing lips are vulcanised onto piston
 ♦ Moisten sealing lips with ATF before inserting
 ♦ Turn piston slightly on installation
- 16 - Piston ring (small dia.)**
 ♦ Checking correct positioning
 ⇒ Fig. 7, Page 38-18
 ♦ Removing and installing
 ⇒ Fig. 8, Page 38-18

38-12



17 - Piston ring

- ♦ Checking correct positioning
⇒ Fig. 7, Page 38-18
- ♦ Removing and installing
⇒ Fig. 8, Page 38-18

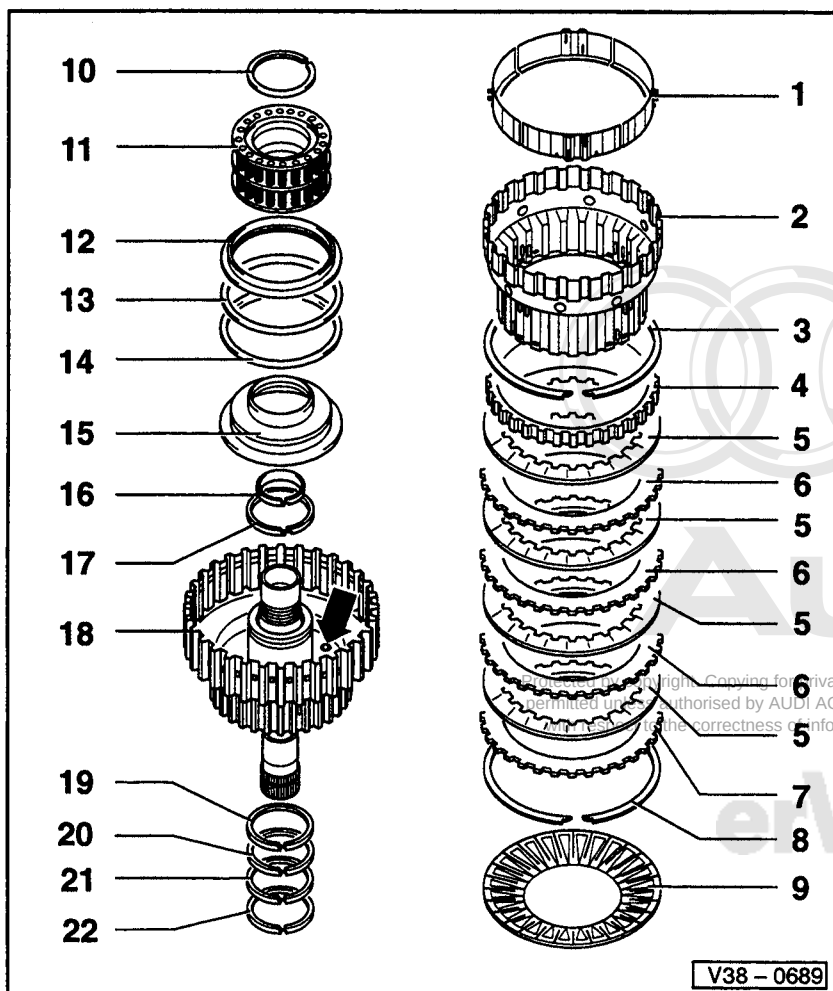
18 - Clutch housing with turbine shaft

- ♦ Check mounting bushes; replace clutch housing if bushes damaged
- ♦ Before fitting inner plate carrier, insert ring tensioning spring (item 9), circlip (item 3), one inner plate and one outer plate in clutch housing ⇒ Fig. 5, Page 38-17

19 - Piston ring

- ♦ Checking correct positioning
⇒ Fig. 7, Page 38-18
- ♦ Removing and installing
⇒ Fig. 8, Page 38-18

38-13



20 - Piston ring

- ♦ Checking correct positioning
⇒ Fig. 7, Page 38-18
- ♦ Removing and installing
⇒ Fig. 8, Page 38-18

21 - Piston ring

- ♦ Checking correct positioning
⇒ Fig. 7, Page 38-18
- ♦ Removing and installing
⇒ Fig. 8, Page 38-18

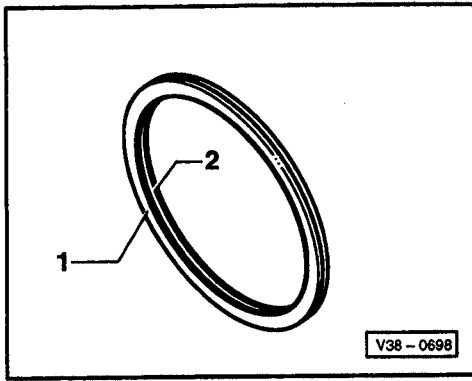
22 - Piston ring

- ♦ Checking correct positioning
⇒ Fig. 7, Page 38-18
- ♦ Removing and installing
⇒ Fig. 8, Page 38-18

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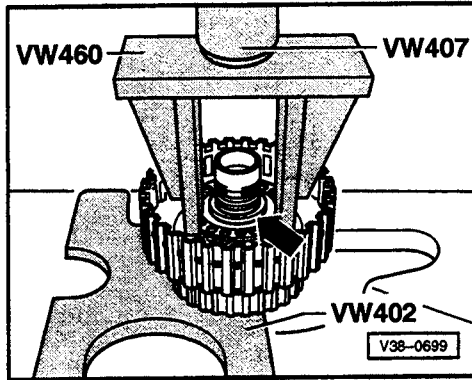


38-14



◀ Fig. 1 Installation position of dished washers

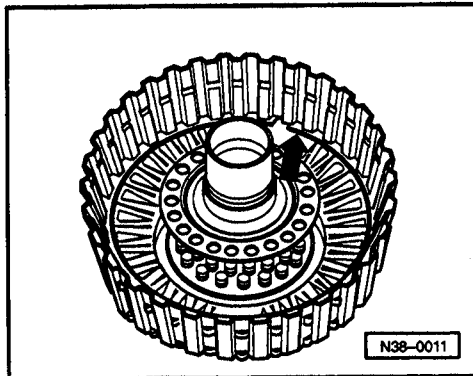
- Fit dished washers 1 and 2 such that outer edges make contact when fitted together; air gap remains in inside diameter.



◀ Fig. 2 Removing and installing circlip (arrow)

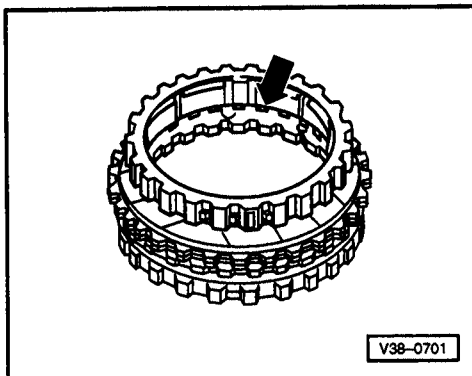
- Press down spring spacer such that circlip (arrow) can be inserted in groove.

38-15



◀ Fig. 3 Inserting circlip

- Insert circlip (arrow) in groove; ring tensioning spring is slightly pretensioned.



◀ Fig. 4 Positioning inner and outer plates on inner plate carrier and clipping in thrust bearing

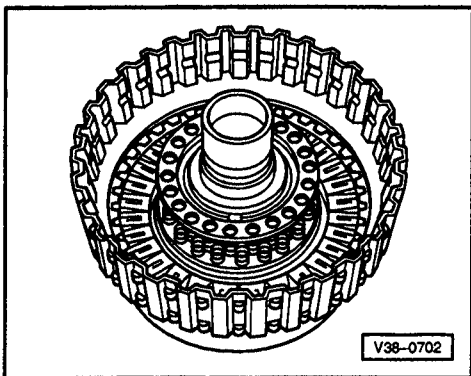
- Clip in thrust bearing (arrow) after inserting pressure plate as well as inner and outer plates.

Note:

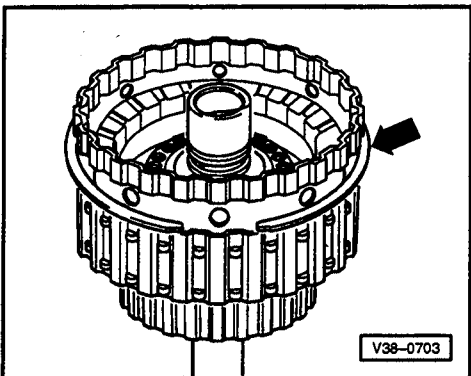
One inner and one outer plate must be inserted in clutch housing before fitting inner plate carrier.



38-16



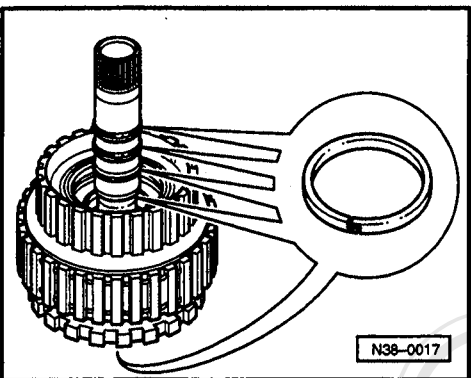
◀ Fig. 5 Inserting pressure plate, first inner plate and first outer plate in clutch housing



◀ Fig. 6 Inserting inner plate carrier and fitting circlip (arrow)

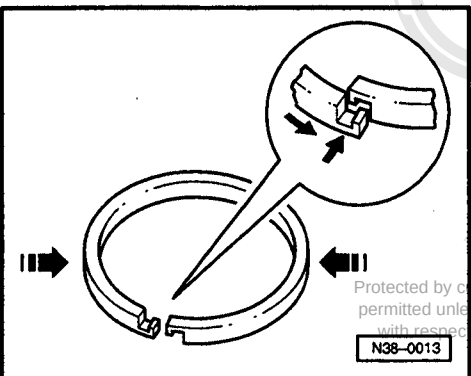
- Lift inner plate carrier slightly to fit circlip.

38-17



◀ Fig. 7 Checking positioning of piston rings

- Make sure joints of piston rings are interlocked.



◀ Fig. 8 Removing and installing piston ring

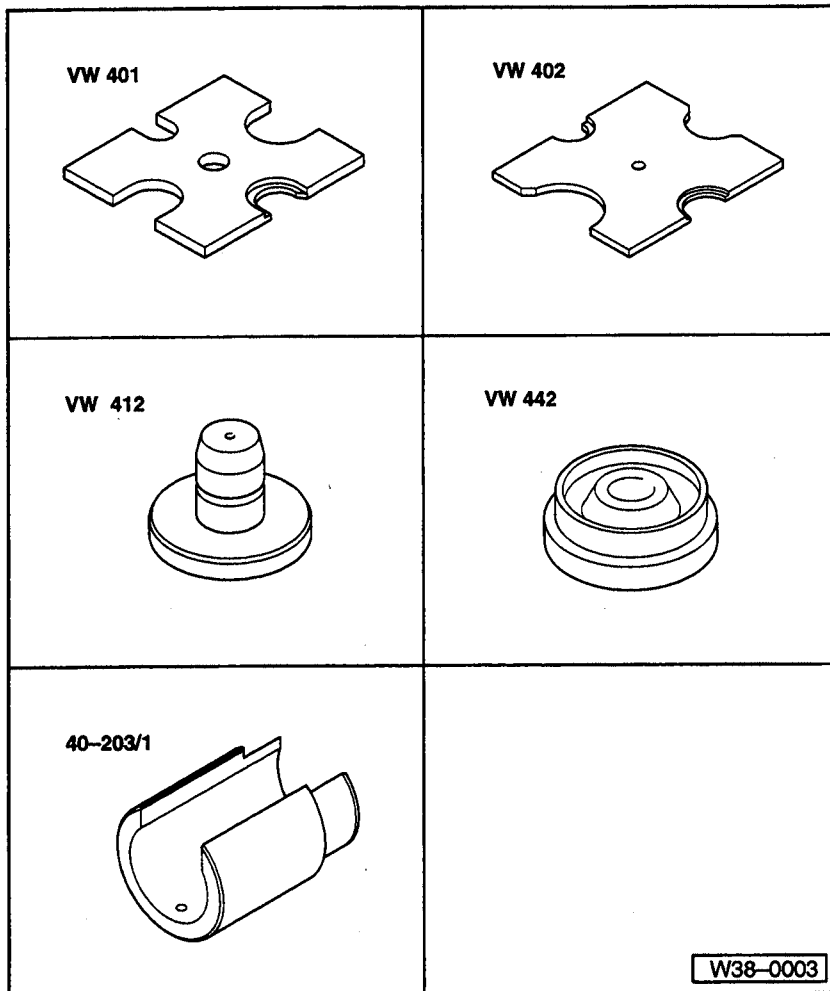
Removing

- Squeeze piston ring together and release by hand.
- Spread piston ring on either side and detach; avoid one-sided twisting out of groove.

Installing

- Fit piston ring in groove.
- To engage, press piston ring together and make sure joints are aligned.

38-18

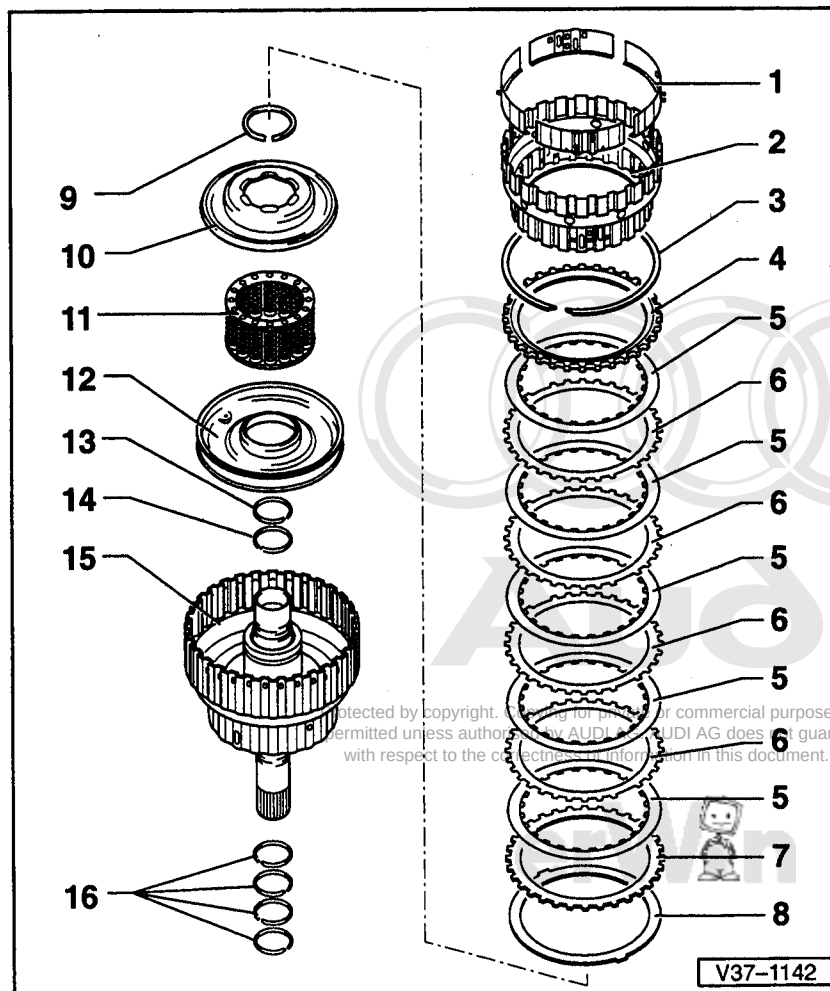


Dismantling and assembling 1st - 3rd gear clutch -K1- with turbine shaft for gearboxes as of 11.92

Special tools and workshop equipment required

- ◆ VW 401: Pressing plate
- ◆ VW 402: Pressing plate
- ◆ VW 412: Punch
- ◆ VW 442: Thrust piece
- ◆ 40-203/1: Tube

38-19



Note:

Clutch is only to be dismantled for cleaning and visual inspection.

1 - Thrust bearing

- ◆ Unclip in 4 pieces from inner plate carrier
- ◆ Inserting
- ⇒ Fig. 2, Page 38-24

2 - Inner plate carrier

- ◆ Inserting
- ⇒ Fig. 4, Page 38-25
- ◆ Assembling
- ⇒ Fig. 2, Page 38-24

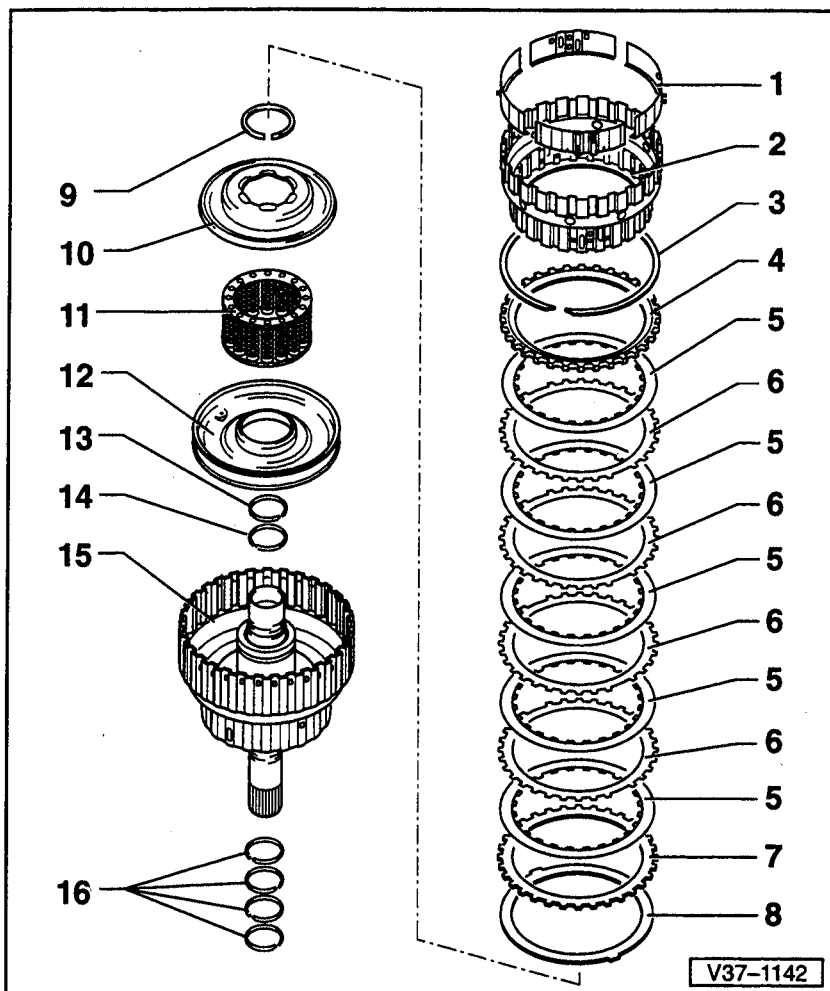
3 - Circlip

- ◆ Differing thickness
- ◆ Mark following removal and re-insert at same location

4 - Pressure plate

- ◆ Smooth side faces inner plate
- ◆ Inserting together with inner plate carrier
- ⇒ Fig. 2, Page 38-24

38-20



5 - Inner plate

- ◆ Number of inner plates
⇒ Page 00-3
- ◆ Installing ⇒ Fig. 2, Page 38-24
- ◆ Immerse new inner plates in ATF for 15 min. before fitting

6 - Outer plate

- ◆ Number of outer plates
⇒ Page 00-3
- ◆ Installing ⇒ Fig. 2, Page 38-24
- ◆ Always 1.5 mm thick

7 - Outer plate

- ◆ Always 2.0 mm thick
- ◆ Installing ⇒ Fig. 2, Page 38-24

8 - Corrugated washer

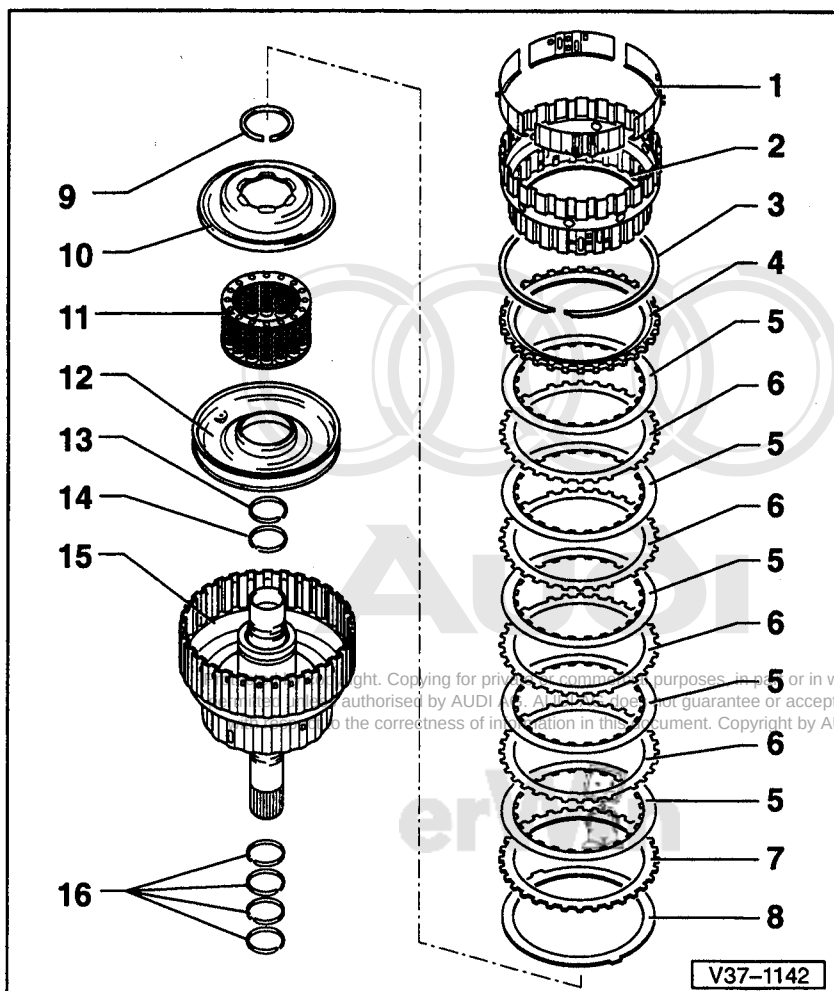
9 - Circlip

- ◆ Removing and installing
⇒ Fig. 1, Page 38-24

10 - Piston cover

- ◆ Sealing lips are vulcanised onto cover
- ◆ Moisten sealing lips with ATF before fitting
- ◆ Turn cover slightly on installation

38-21



11 - Spring spacer

- ◆ With spring support and compression springs

12 - Piston

- ◆ Sealing lips are vulcanised onto piston
- ◆ Moisten sealing lips with ATF before inserting
- ◆ Turn piston slightly on installation

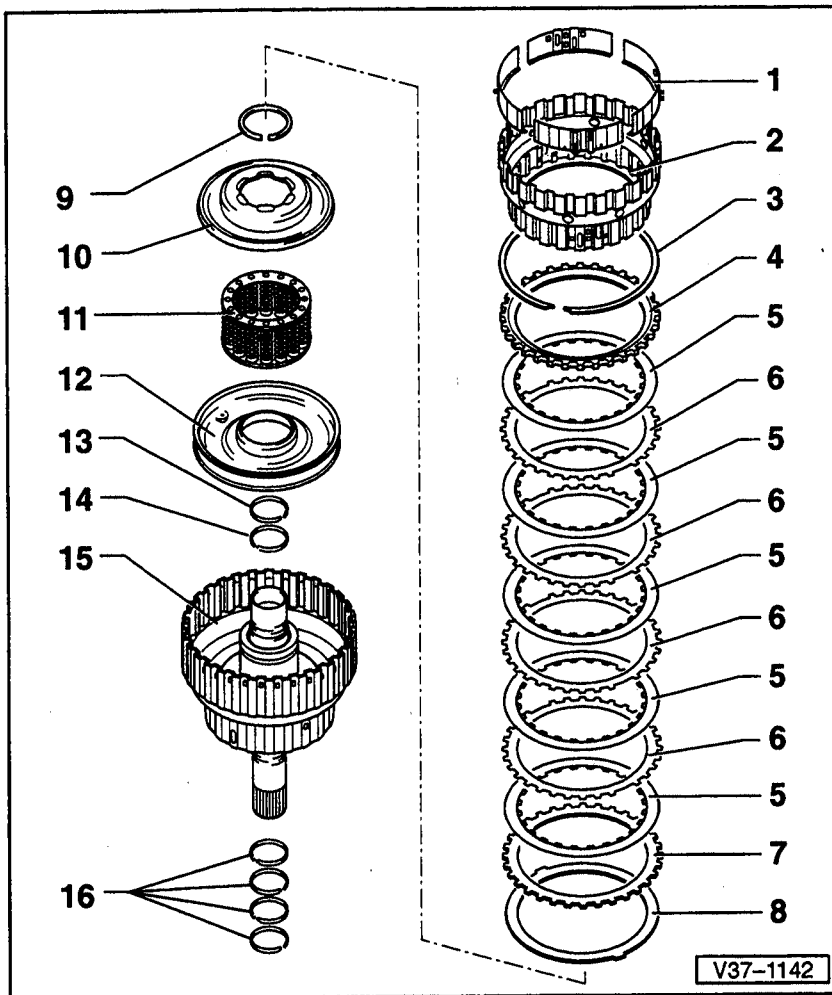
13 - Piston ring (small dia.)

- ◆ Checking correct positioning
⇒ Fig. 5, Page 38-26
- ◆ Removing and installing
⇒ Fig. 6, Page 38-26

14 - Piston ring

- ◆ Checking correct positioning
⇒ Fig. 5, Page 38-26
- ◆ Removing and installing
⇒ Fig. 6, Page 38-26

38-22



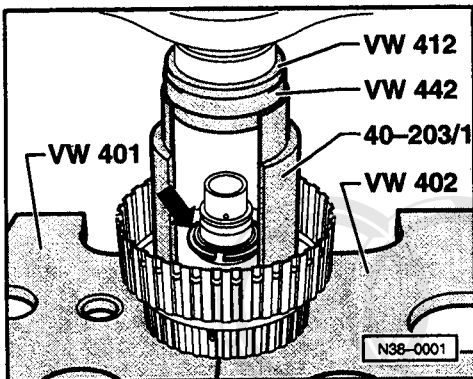
15 - Clutch housing with turbine shaft

- ♦ Check mounting bushes; replace clutch housing if bushes damaged
- ♦ Before fitting inner plate carrier, insert corrugated washer (item 8), inner plates and outer plates in clutch housing ⇒ Fig. 3, Page 38-25

16 - Piston ring

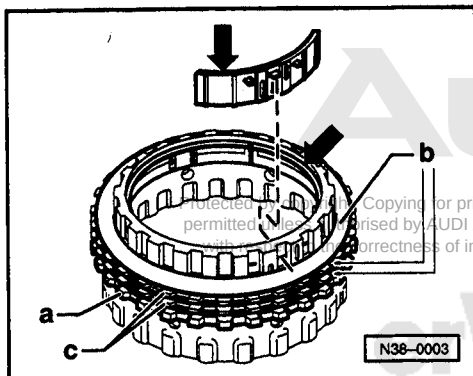
- ♦ Checking correct positioning ⇒ Fig. 5, Page 38-26
- ♦ Removing and installing ⇒ Fig. 6, Page 38-26

38-23



◀ Fig. 1 Removing and installing circlip

- Press down piston cover with spring spacer such that circlip (arrow) can be inserted in groove.



◀ Fig. 2 Positioning pressure plate and plates on inner plate carrier

- Mount pressure plate -a- with smooth side facing inner plate and recessed side facing inner plate carrier.
- Fit 3 inner plates -b- and 2 outer plates -c-.

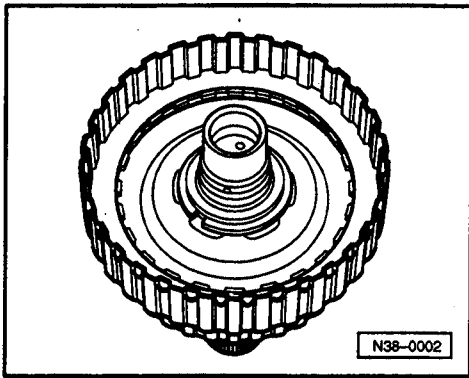


Note:

Properly engage retainers.

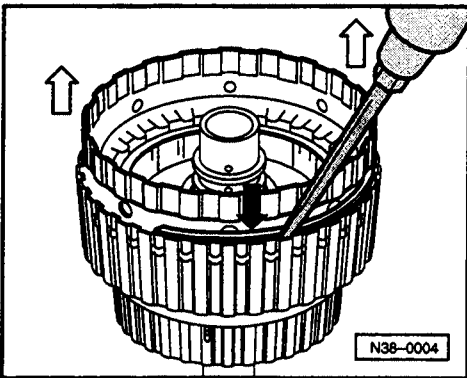
- Inserting corrugated washer and other plates in clutch housing ⇒ Fig. 3, Page 38-25

38-24



◀ **Fig. 3 Inserting corrugated washer and outer/inner plates in clutch housing**

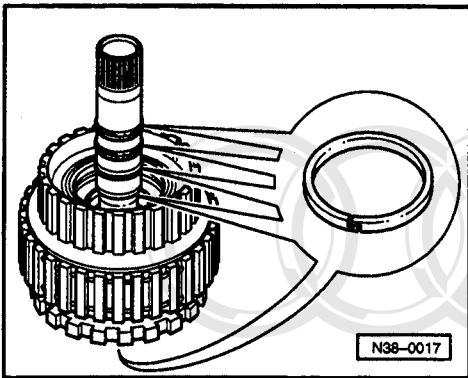
- Start by inserting corrugated washer.
- Insert 2 mm thick outer plate.
- Insert remaining inner and outer plates.



◀ **Fig. 4 Inserting inner plate carrier and fitting circlip (arrow)**

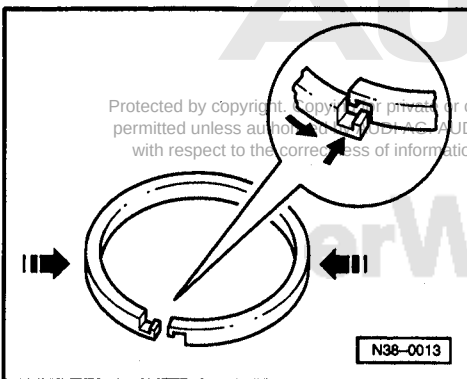
- Lift inner plate carrier -white arrows- slightly to fit circlip -black arrow-.

38-25



◀ **Fig. 5 Checking positioning of piston rings**

- Make sure joints of piston rings are interlocked.



◀ **Fig. 6 Removing and installing piston ring**

Removing

- Squeeze piston ring together and release by hand.

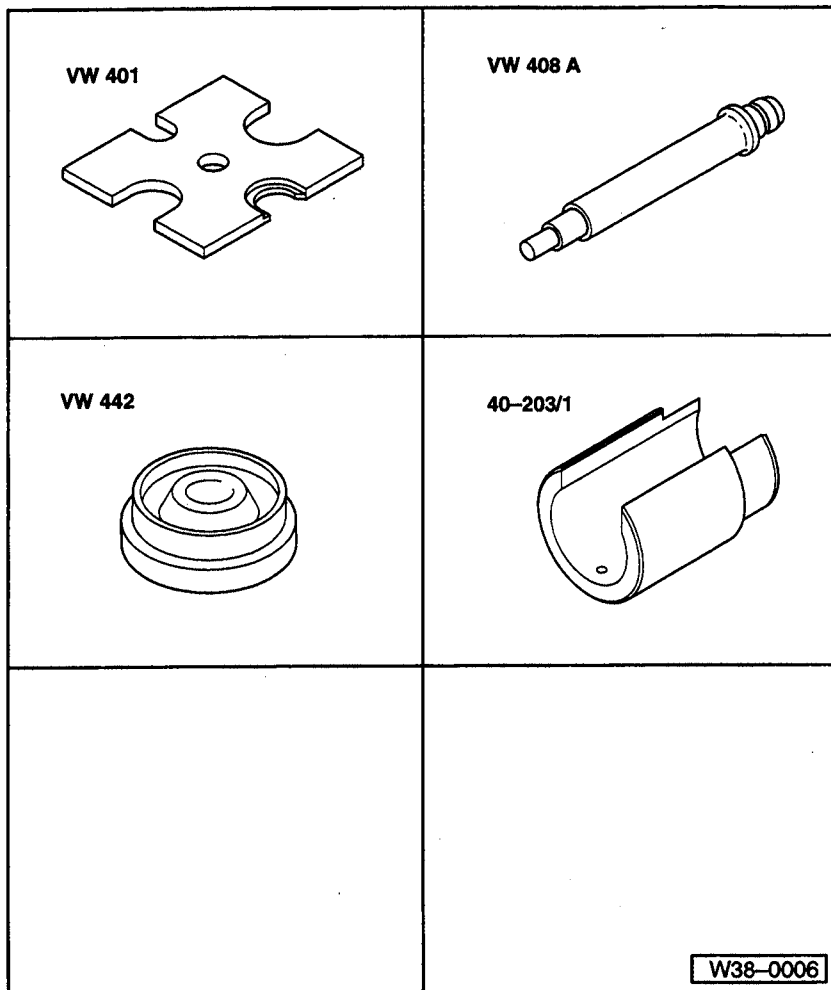
- Spread piston ring on either side and detach; avoid one-sided twisting out of groove.

Installing

- Fit piston ring in groove.

- To engage, press piston ring together and make sure joints are aligned.

38-26

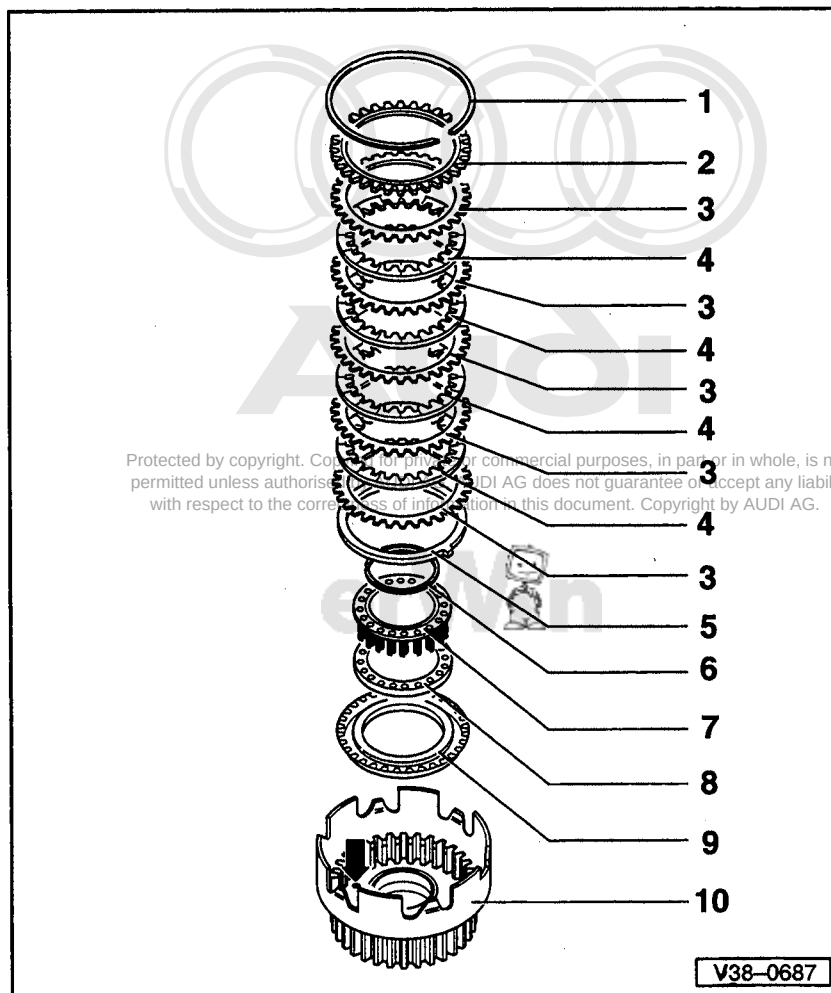


Dismantling and assembling reverse gear clutch -K2-

Special tools and workshop equipment required

- ♦ VW 401: Pressing plate
- ♦ VW 408A: Punch
- ♦ VW 442: Thrust piece
- ♦ 40-203/1: Tube

38-27



Notes:

Clutch is only to be dismantled for cleaning and visual inspection.

Take care not to damage ball valve (arrow).

1 - Circlip

- ♦ Mark following removal and re-insert at same location

2 - Pressure plate

- ♦ Smooth ground surface faces inner plates

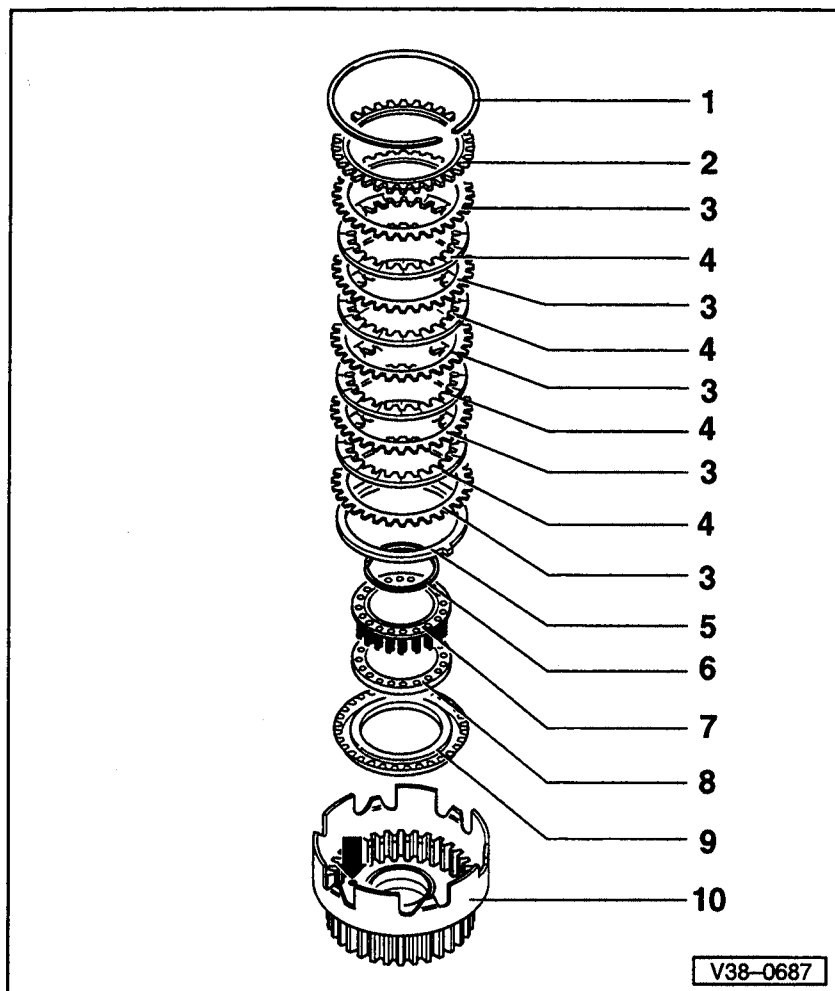
3 - Outer plate

- ♦ Number of outer plates ⇒ Page 00-3 onwards

4 - Inner plate

- ♦ Number of inner plates ⇒ Page 00-3 onwards
- ♦ Immerse new inner plates in ATF for 15 min. before fitting

38-28



5 - Corrugated washer

6 - Circlip

- ◆ Removing and installing
⇒ Fig. 1, Page 38-30
- ◆ Installation position
⇒ Fig. 2, Page 38-30

7 - Spring support plate

- ◆ With springs
- ◆ Installation position
⇒ Fig. 2, Page 38-30

8 - Spring support ring

9 - Piston

- ◆ Sealing lips are vulcanised onto piston
- ◆ Moisten sealing lips with ATF before fitting
- ◆ Turn piston slightly on installation and take care not to tilt

10 - Clutch housing with tube

38-29

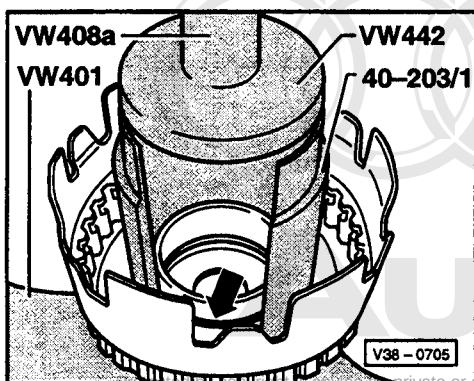


Fig. 1 Removing and installing circlip (arrow)

Removing

- Carefully press down spring support plate (taking care not to bend it) and spread circlip.

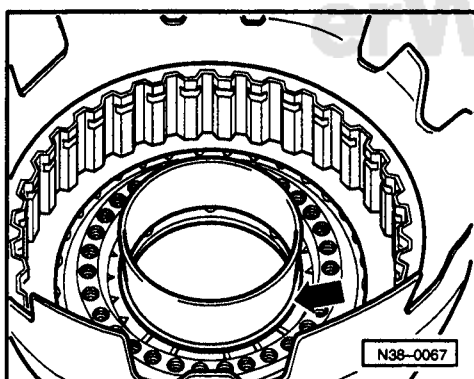
Installing

- Attach new circlip and press down carefully with spring support plate. Support plate must be centred with hub, as otherwise it will become bent.

Note:

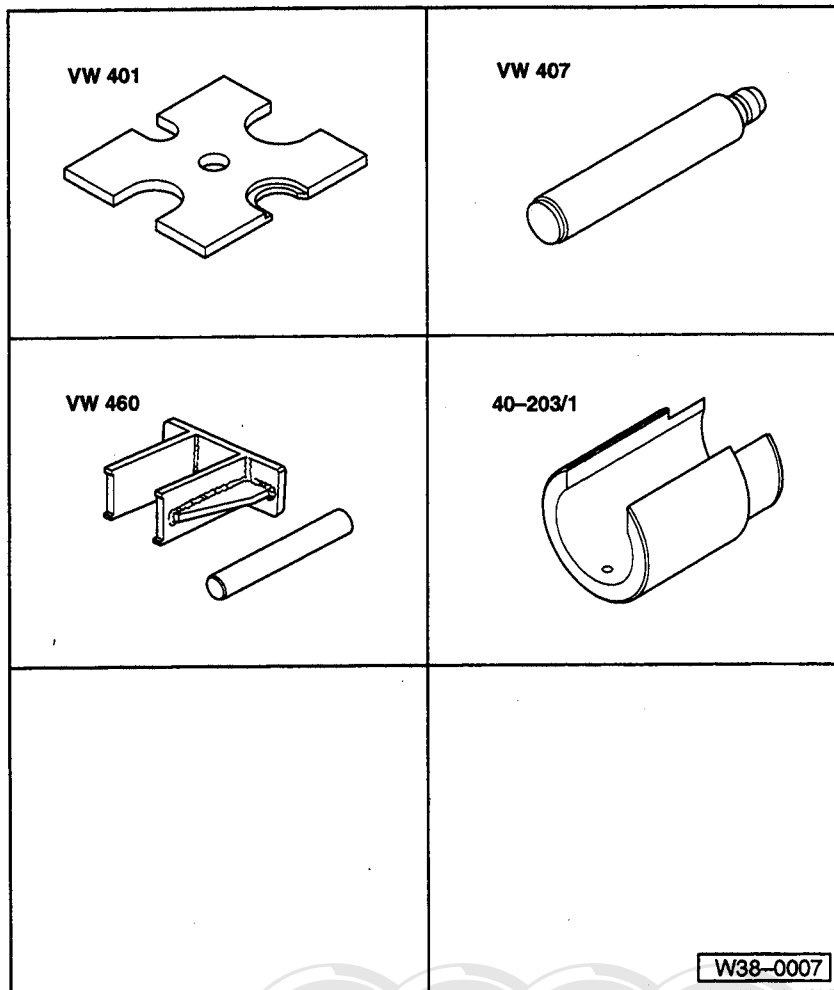
Take care not to damage ball valve of clutch housing.

Fig. 2 Checking installation position of spring support plate and circlip



Circlip (arrow) must be located in groove of clutch housing. Spring support plate must be centred with respect to hub.

38-30

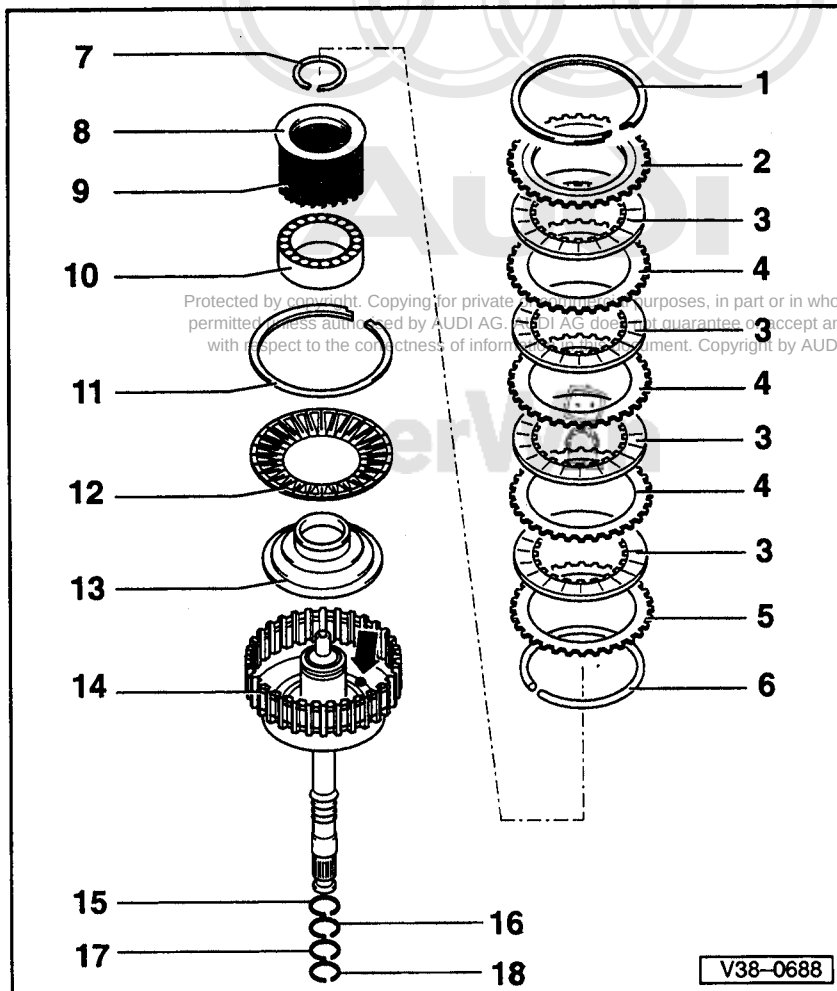


Dismantling and assembling 3rd and 4th gear clutch -K3- with pump shaft for gearboxes up to 11.92

Special tools and workshop equipment required

- ♦ VW 401: Pressing plate
- ♦ VW 407: Punch
- ♦ VW 460: Pressing-out tool
- ♦ 40-203/1: Tube

38-31



Notes:

Clutch is only to be dismantled for cleaning and visual inspection.

Take care not to damage ball valve (arrow).

1 - Circlip

- ♦ Differing thickness
- ♦ Mark following removal and re-insert at same location

2 - Pressure plate

- ♦ Install with recessed side facing circlip

3 - Inner plate

- ♦ Number of inner plates ⇒ Page 00-3 onwards
- ♦ Immerse new inner plates in ATF for 15 min. before fitting

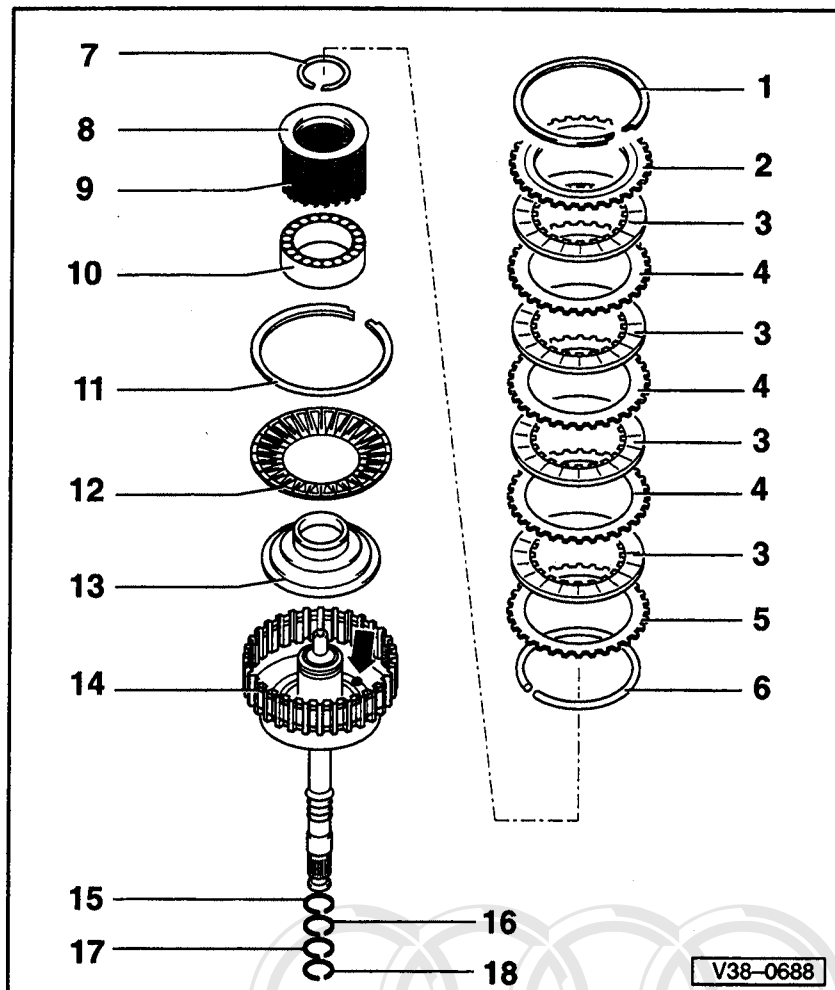
4 - Outer plate

- ♦ Number of outer plates ⇒ Page 00-3 onwards

5 - Pressure plate

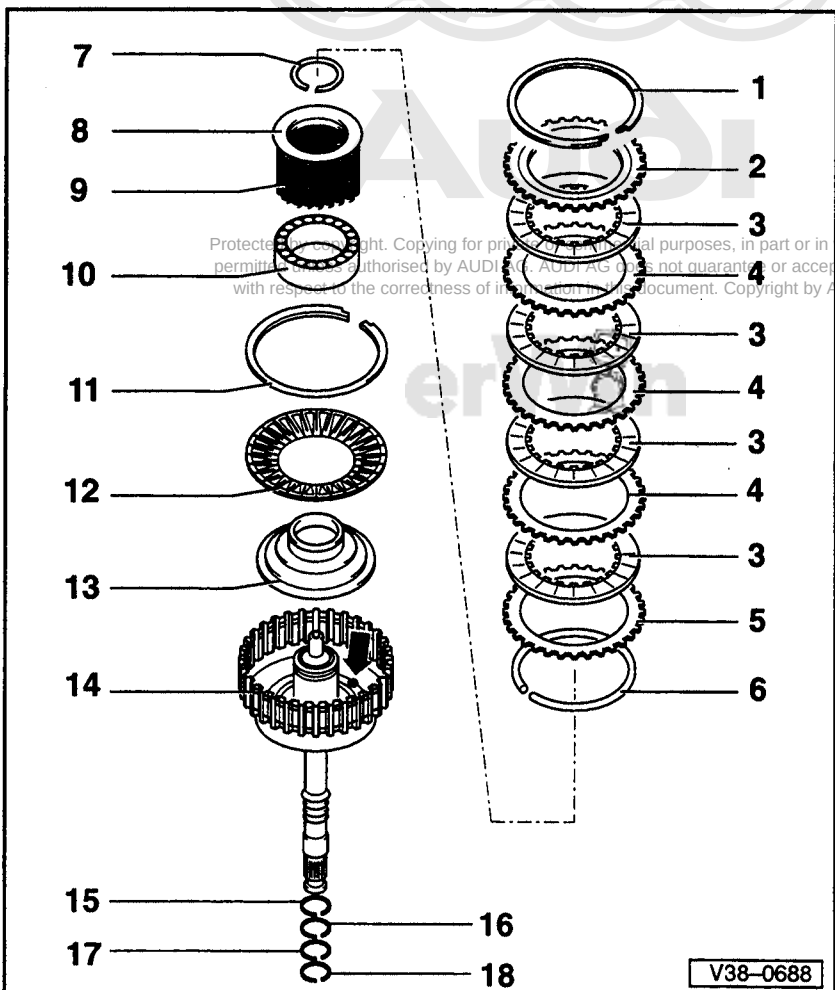
- ♦ Insert with curved side facing corrugated washer

38-32



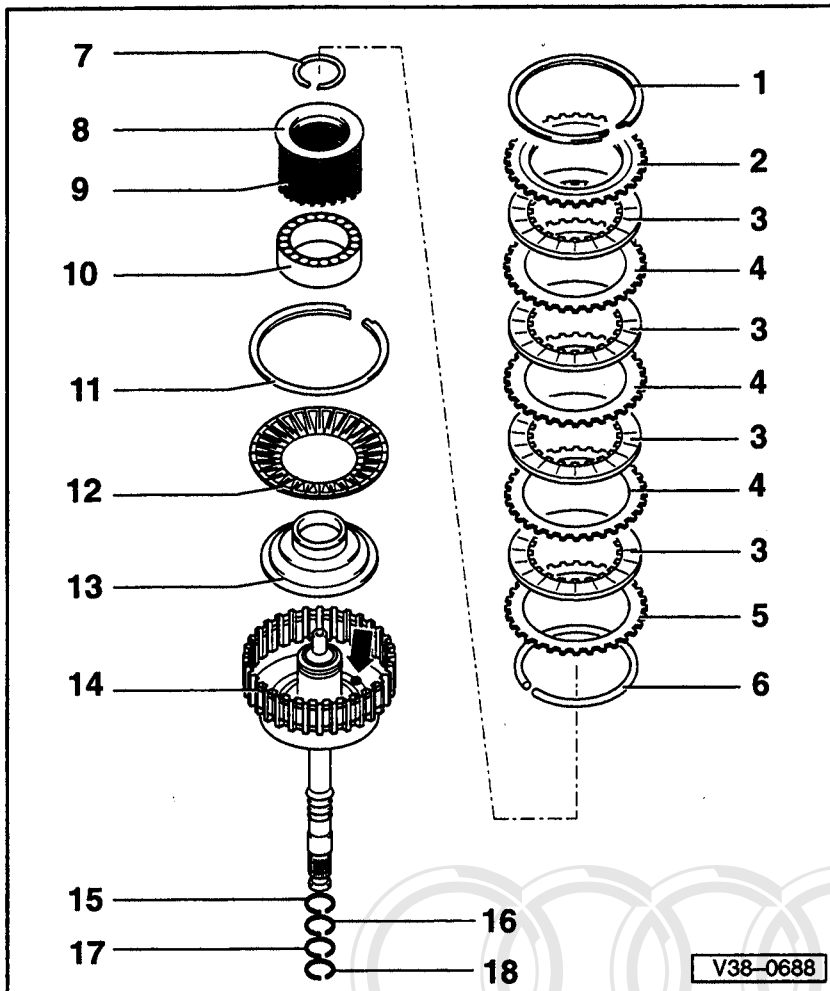
- 6 - Corrugated washer**
 - ♦ Insert into rounded side of pressure plate
- 7 - Circlip**
 - ♦ Removing and installing
⇒ Fig. 1, Page 38-36
- 8 - Spring support ring**
- 9 - Spring**
 - ♦ Position on spring support ring
- 10 - Spring support**
- 11 - Circlip**
 - ♦ Must be fitted in groove of clutch housing
- 12 - Ring tensioning spring**
 - ♦ Insert with curved side facing piston

38-33



- 13 - Piston**
 - ♦ Sealing lips are vulcanised onto piston
 - ♦ Moisten sealing lips with ATF before fitting
 - ♦ Turn piston slightly on installation
- 14 - Clutch housing with pump shaft**
- 15 - Piston ring**
 - ♦ Only replace defective piston rings
 - ♦ Destroyed on being dismantled
 - ♦ Checking correct positioning ⇒ Fig. 2, Page 38-36
 - ♦ Fitting ⇒ Fig. 3, Page 38-37
- 16 - Piston ring**
 - ♦ Only replace defective piston rings
 - ♦ Destroyed on being dismantled
 - ♦ Checking correct positioning ⇒ Fig. 2, Page 38-36
 - ♦ Fitting ⇒ Fig. 3, Page 38-37

38-34



17 - Piston ring

- ◆ Checking correct positioning
⇒ Fig. 2, Page 38-36
- ◆ Fitting ⇒ Fig. 3, Page 38-37

18 - Piston ring

- ◆ Checking correct positioning
⇒ Fig. 2, Page 38-36
- ◆ Fitting ⇒ Fig. 3, Page 38-37

38-35

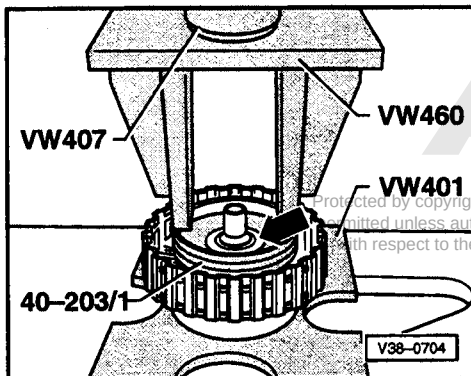


Fig. 1 Removing and installing circlip (arrow)

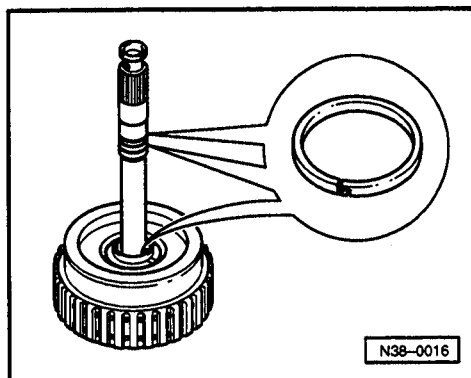
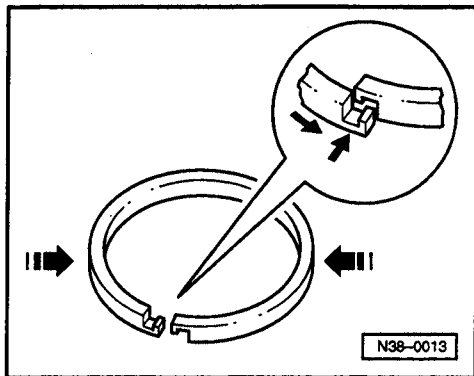


Fig. 2 Checking positioning of piston rings

- Make sure joints of piston rings are interlocked.

38-36



◀ **Fig. 3 Removing and installing piston ring**

Removing

- Squeeze piston ring together and release by hand.
- Spread piston ring on either side and detach; avoid one-sided twisting out of groove.

Installing

- Fit piston ring in groove.
- To engage, press piston ring together and make sure joints are aligned.



38-37

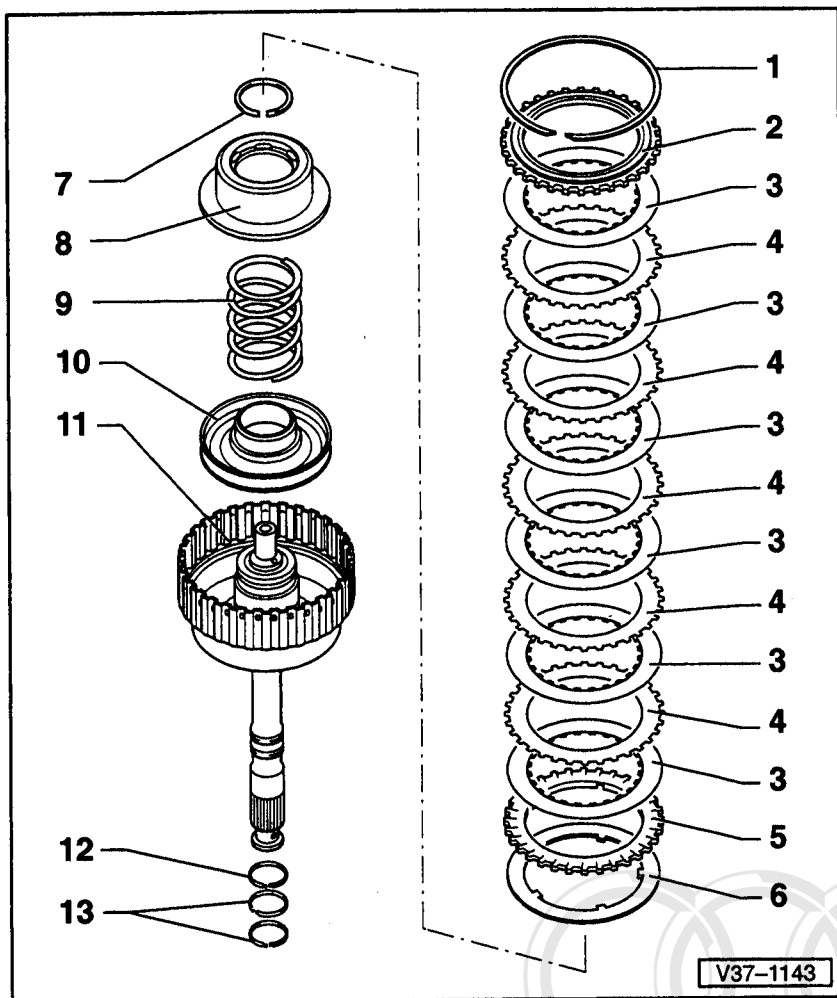
VW 401	VW 402
VW 407	3292
	W38-0001

Dismantling and assembling 4th gear clutch -K3- with pump shaft for gearboxes as of 11.92

Special tools and workshop equipment required

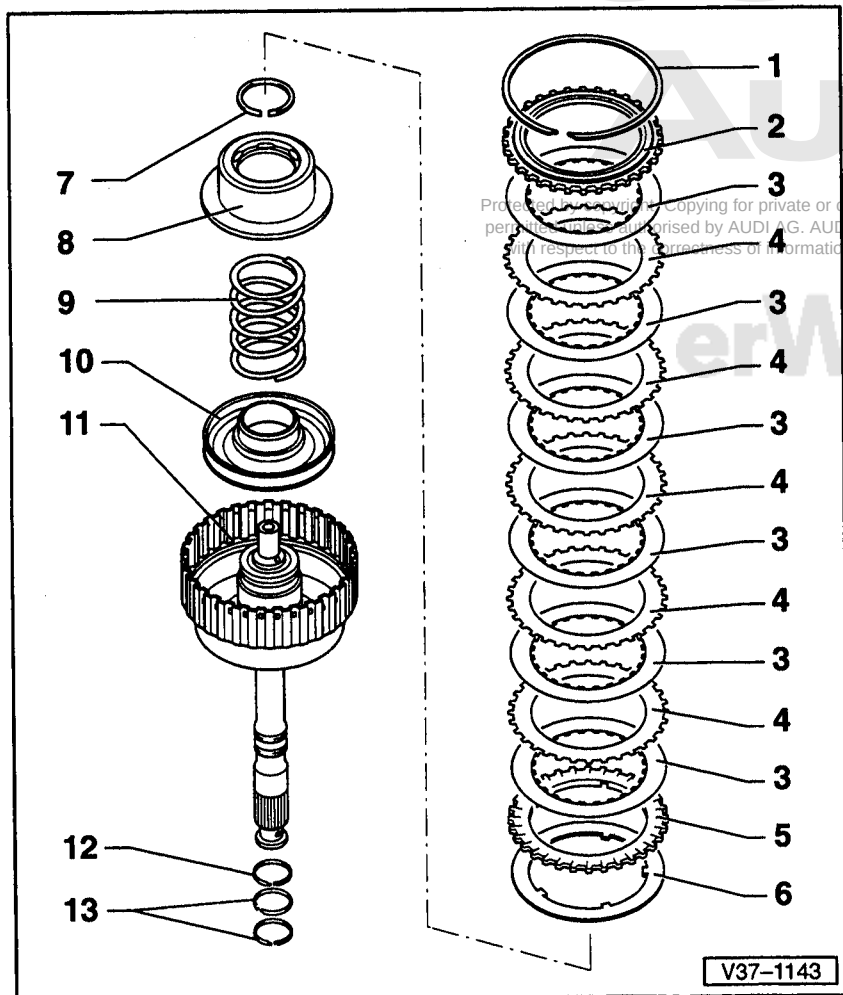
- ♦ VW 401: Pressing plate
- ♦ VW 402: Pressing plate
- ♦ VW 407: Punch
- ♦ 3292/1 from assembly tool 3292

38-38



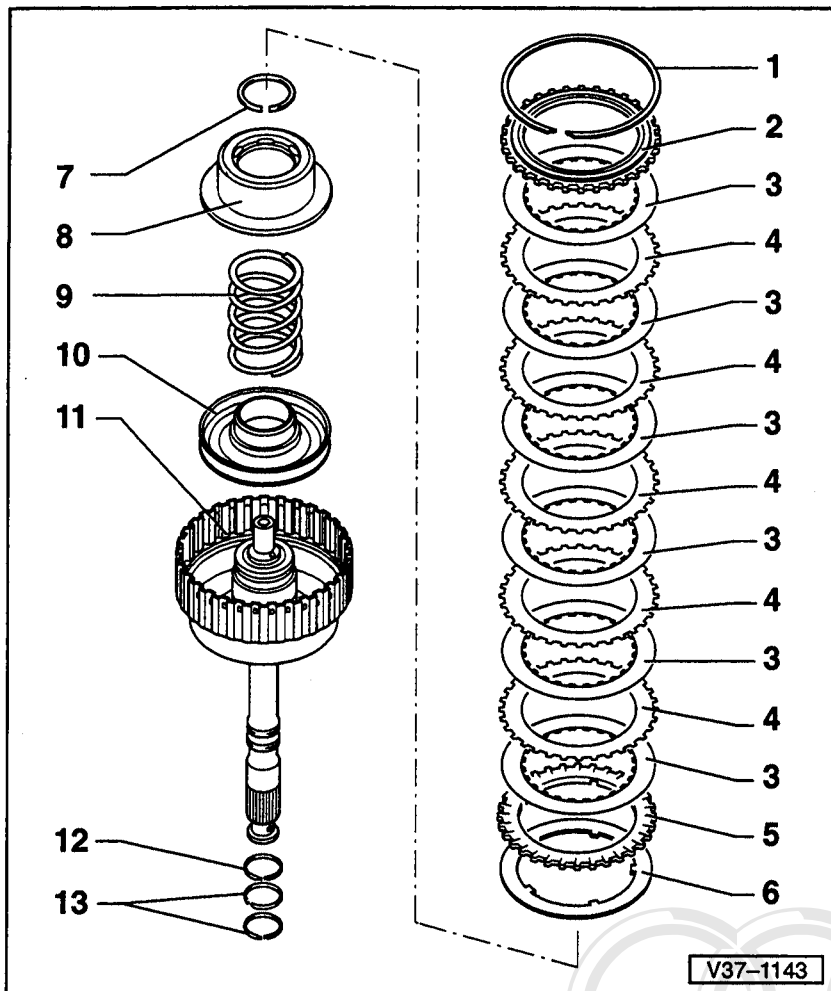
- 1 - Circlip**
 - ◆ Differing thickness
 - ◆ Mark following removal and re-insert at same location
- 2 - Pressure plate**
 - ◆ Install with recessed side facing circlip
- 3 - Inner plate**
 - ◆ Number of inner plates ⇒ Page 00-3 onwards
 - ◆ Immerse new inner plates in ATF for 15 min. before fitting
- 4 - Outer plate**
 - ◆ Number of outer plates ⇒ Page 00-3 onwards
- 5 - Pressure plate**
 - ◆ Insert with caulked corrugated washer facing piston
- 6 - Corrugated washer**
 - ◆ Caulked to pressure plate -item 5-

38-39



- 7 - Circlip**
 - ◆ Removing and installing
⇒ Fig. 1, Page 38-42
- 8 - Piston cover**
 - ◆ Sealing lips are vulcanised onto piston cover
 - ◆ Moisten sealing lips with ATF before fitting
 - ◆ Turn piston cover slightly when installing
 - ◆ To remove and install, press down and fit circlip (item 7)
- 9 - Spring**
 - ◆ Position between piston and piston cover
- 10 - Piston**
 - ◆ Sealing lips are vulcanised onto piston
 - ◆ Moisten sealing lips with ATF before fitting
 - ◆ Turn piston slightly on installation

38-40



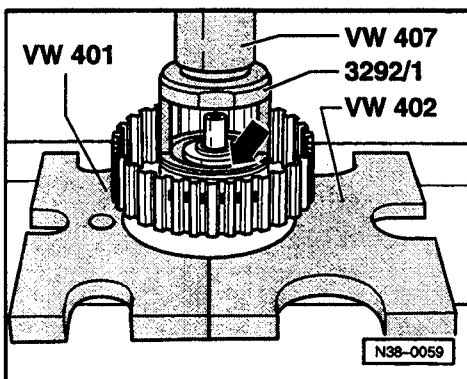
11 - Clutch housing with pump shaft
 ♦ Height differs depending on number of outer and inner plates

12 - Piston ring
 ♦ Only replace defective piston rings
 ♦ Destroyed on being dismantled
 ♦ Checking correct positioning
 ⇒ Fig. 2, Page 38-42
 ♦ Fitting ⇒ Fig. 3, Page 38-43

13 - Piston ring
 ♦ Checking correct positioning
 ⇒ Fig. 2, Page 38-42
 ♦ Removing and installing
 ⇒ Fig. 3, Page 38-43

V37-1143

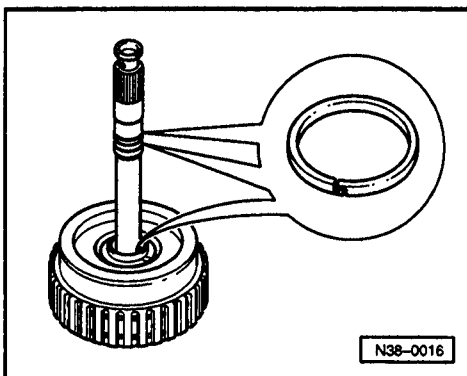
38-41



◀ Fig. 1 Removing and installing circlip (arrow)

– Carefully press down piston cover until circlip can be removed/installed.

– Mark circlip following removal and re-insert at same location on installation.
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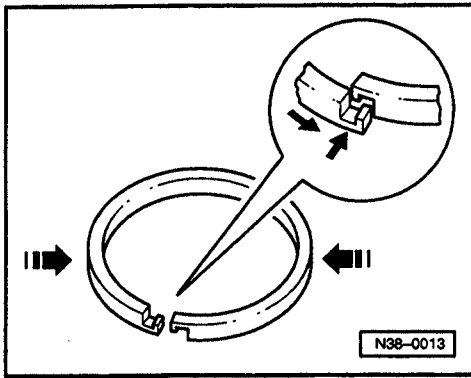


◀ Fig. 2 Checking positioning of piston rings

A piston ring is fitted on the pump shaft inside the clutch housing.

– Make sure joints of piston rings are interlocked.

38-42



◀ Fig. 3 Removing and installing piston ring

Removing

- Squeeze piston ring together and release by hand.
- Spread piston ring on either side and detach; avoid one-sided twisting out of groove.

Installing

- Fit piston ring in groove.
- To engage, press piston ring together and make sure joints are aligned.

38-43

Removing and installing valve body

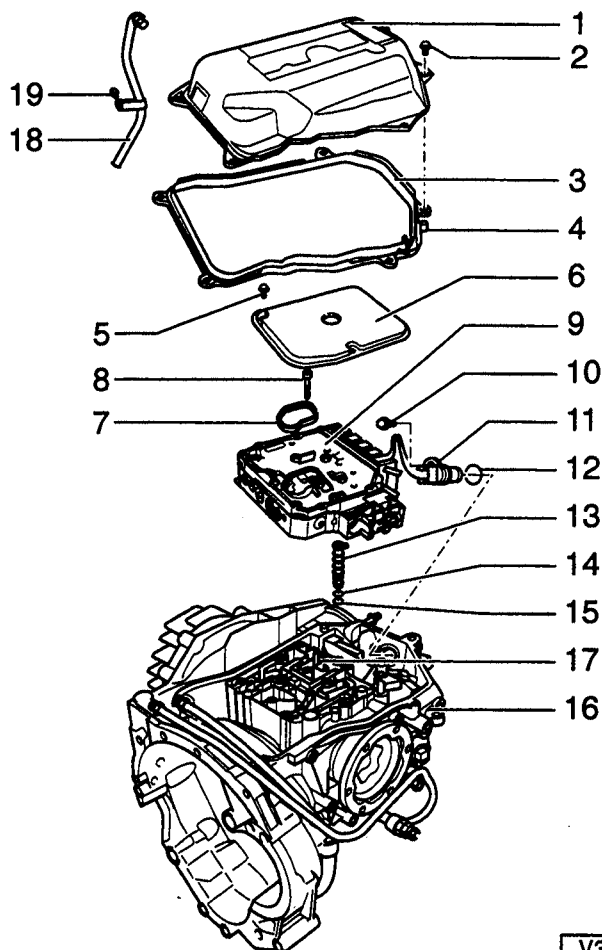
Attention:

Never run engine or tow vehicle with sump removed or without ATF fill.

Notes:

- ♦ An exchange component containing all selector elements and the valve body is available for repair work on the automatic gearbox 097.
- ♦ The exchange component is assigned to the gearbox code letters ⇒ Page 00-3 onwards.
- ♦ Description of installation:
⇒ Special Information; Power Train; No. 10
- ♦ The parts indicated in the illustration below can be removed without taking out the gearbox.
- ♦ Always replace dirty or defective valve body.
- ♦ General repair information ⇒ Page 00-15.
- ♦ Coat O-rings with ATF; other lubricants would cause malfunctioning of the hydraulic control system.
- ♦ Starter is to be removed on vehicles with 6-cyl. engine.

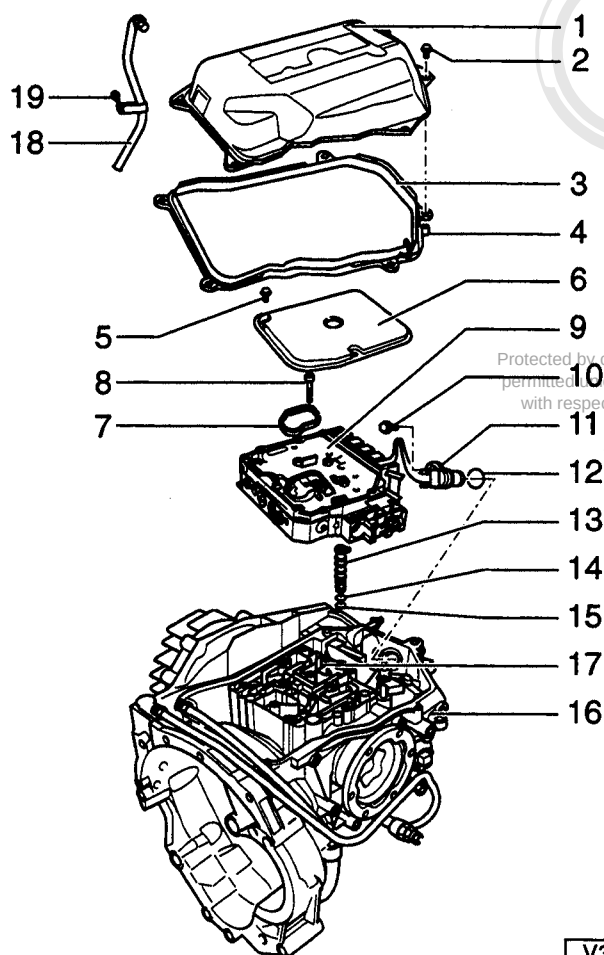
38-44



V38-0767

- 1 - Sump**
 - ◆ Unscrew ATF filler pipe before removing
- 2 - Bolt, 12 Nm**
- 3 - Gasket**
 - ◆ Always replace
 - ◆ Fasten spacers into gasket
- 4 - Spacer**
 - ◆ Fasten into gasket
- 5 - Bolt, 8 Nm**
- 6 - ATF screen**
 - ◆ Fasten in gasket
 - ◆ Installing ⇒ Fig. 4, Page 38-49
- 7 - Gasket**
 - ◆ Always replace
 - ◆ Fasten into ATF screen

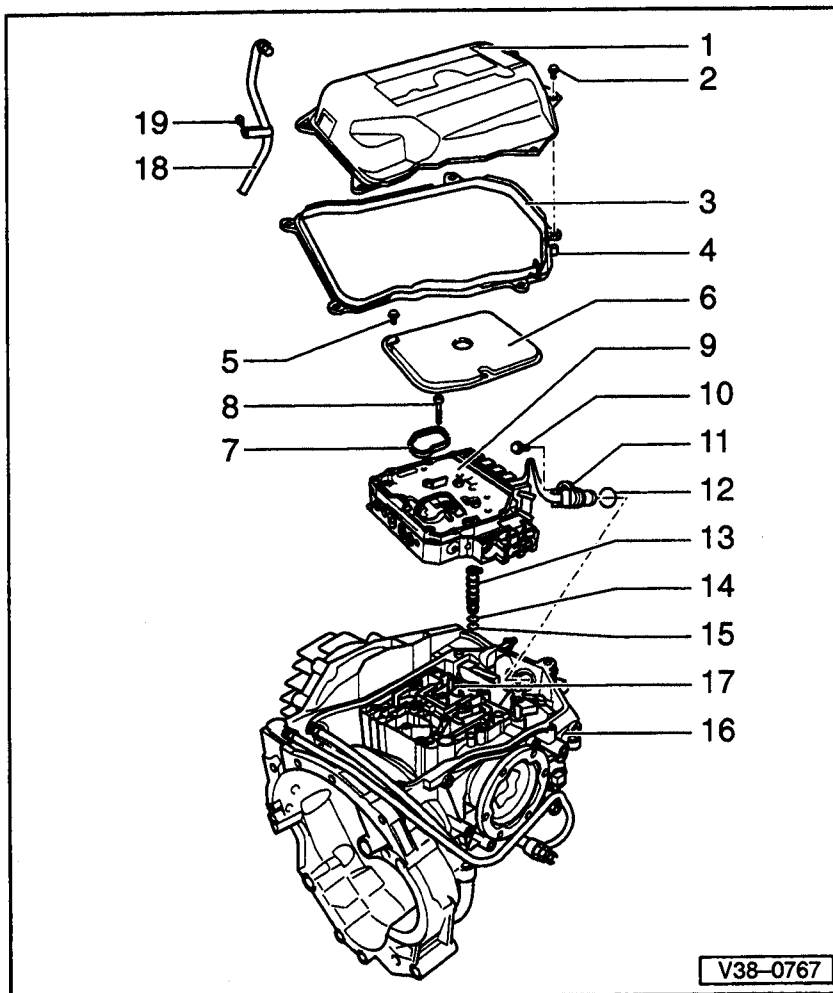
38-45



V38-0767

- 8 - Bolt, 5 Nm**
- 9 - Valve body**
 - ◆ Identification ⇒ Fig. 5, Page 38-50
 - ◆ Inserting with wiring loom ⇒ Fig. 2, Page 38-48
- 10 - Bolt, 10 Nm**
- 11 - Cable inlet connector**
 - ◆ Attach to gear case
- 12 - O-ring**
 - ◆ For cable bushing
 - ◆ Always replace
- 13 - Plug**
 - ◆ Take out before installing and removing free wheel
 - ◆ Insert such that lug is located in groove at case ⇒ Fig. 1, Page 38-48
 - ◆ Attach O-rings to plug

38-46



- 14 - O-ring
♦ Always replace
- 15 - O-ring
♦ Always replace
- 16 - Gear case
- 17 - Operating rod for manually operated selector valve
♦ Adjusting ⇒ Fig. 3, Page 38-49
♦ Fit with recessed side facing selector valve
- 18 - ATF filler pipe
♦ Screw (80 Nm) to sump
- 19 - Bolt, 10 Nm

V38-0767

38-47

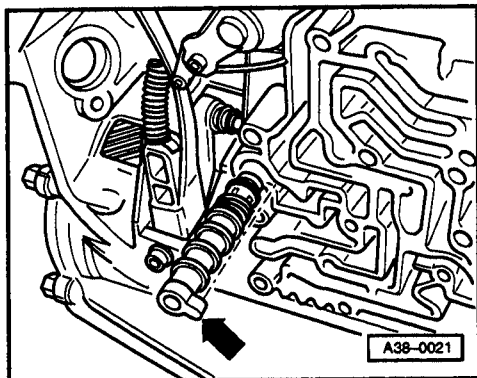


Fig. 1 Inserting plug

Pull plug out of gear case before removing or installing free wheel, as otherwise plug and O-ring would be destroyed.

- Attach O-rings to plug.
- Insert plug in hole of gear case. Lug -arrow- is inserted in oil duct.

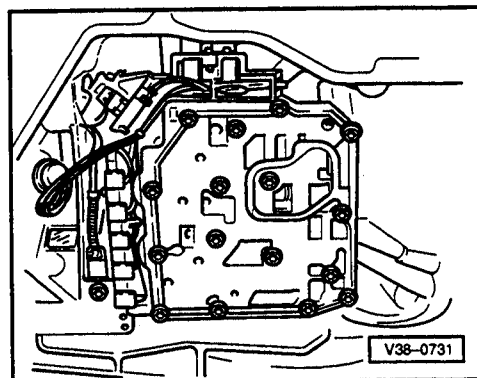
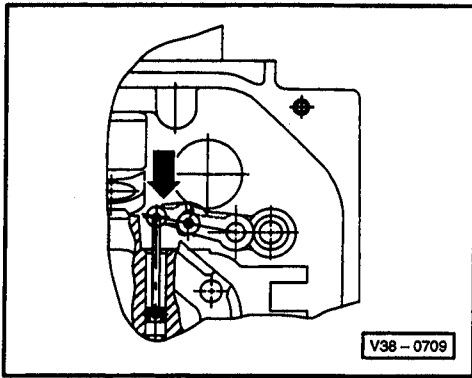


Fig. 2 Inserting valve body with wiring loom

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38-48

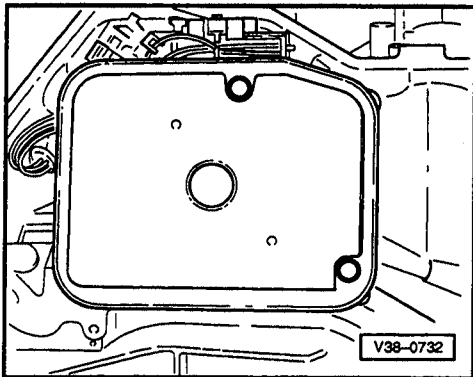


◀ Fig. 3 Adjusting operating rod for selector valve

- Shift selector shaft to selector lever position "P".
- Press home (arrow direction) operating rod with selector valve in valve body and tighten bolt to 4 Nm.

Notes:

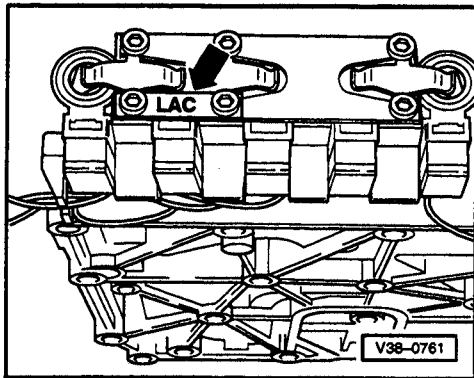
- ♦ Manually operated selector valve must always make contact with stop; provide support in direction of arrow when tightening bolt.
- ♦ Always replace bolt of manually operated selector valve.



◀ Fig. 4 Installing ATF screen

- Fasten gasket into ATF screen before fitting screen.

38-49



◀ Fig. 5 Valve body identification

Code letters are stamped on marker tag, which must remain assigned to valve body.

Valve body/gearbox assignment ⇒ Page 00-3 onwards

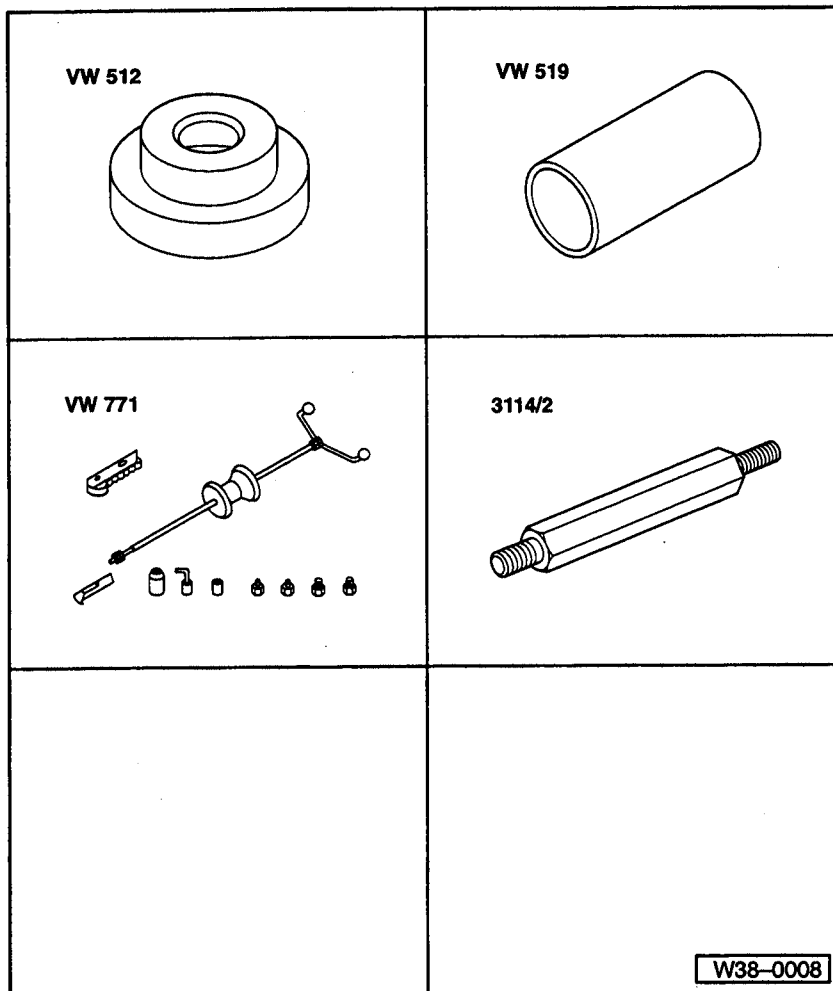
Note:

If valve body does not have a marker tag, it must remain assigned to the assembly. Re-determine assignment on replacing valve body ⇒ Page 00-3 onwards.

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38-50



Dismantling and assembling parking lock

Special tools and workshop equipment required

- ◆ VW 512: Pressing disc
- ◆ VW 519: Tube
- ◆ VW 771: Multi-purpose tool
- ◆ 3114/2: Straightening tool

38-51

Attention:

Do not run engine or tow vehicle with sump removed or without ATF fill.

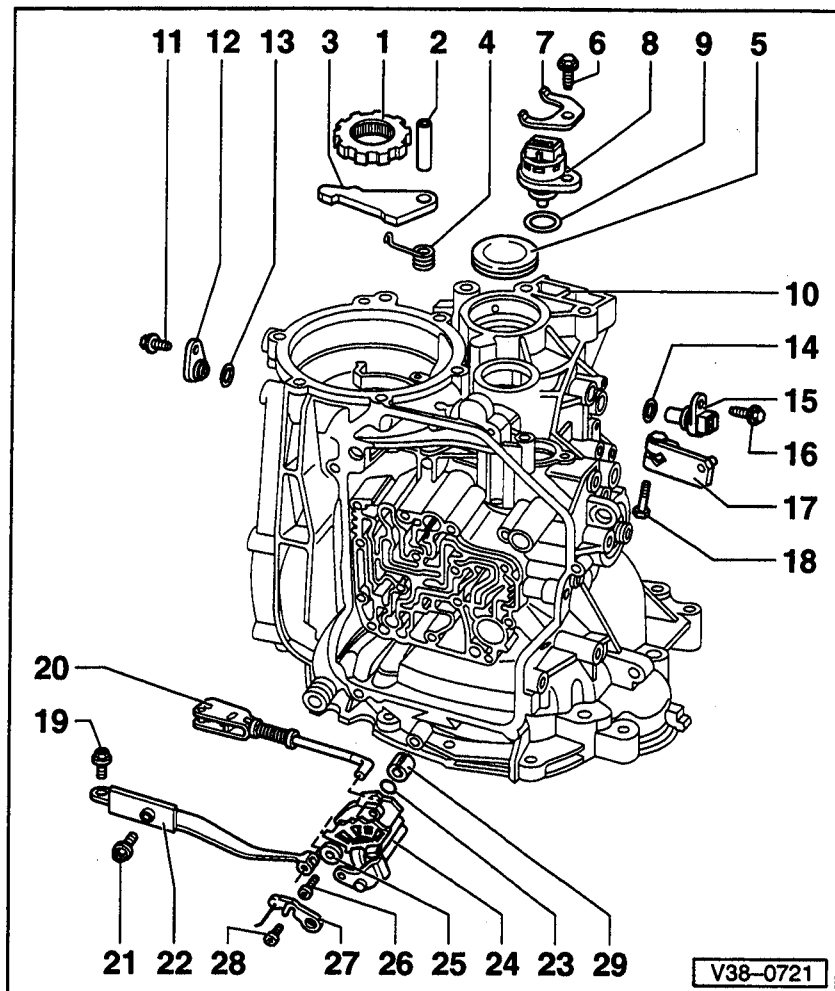
Notes:

- ◆ General repair instructions ⇒ Page 00-15.
- ◆ Coat O-rings with ATF; other lubricants would cause malfunctioning of hydraulic control system.
- ◆ Multi-function switch -F125 and road speed sender -G68 can be checked in vehicle by way of self-diagnosis.
⇒ Automatic Gearbox 097 Self-diagnosis; Repair Group 01; Performing self-diagnosis; Reading measured value block
- ◆ Dismantling and assembly of parking lock involve removing output gear ⇒ Removing and installing differential pinion, Page 39-21.
- ◆ Following replacement of parking lock gear, shim "S4" of differential pinion has to be re-determined ⇒ Page 39-70.

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38-52



1 - Parking lock gear

- ◆ Removing cover for differential pinion and output gear to take out parking lock gear ⇒ Page 39-21 onwards
- ◆ Installation position: Rounded side of parking lock gear faces cover for differential pinion
- ◆ Re-measuring shim "S4" of differential pinion after replacing parking lock gear ⇒ Page 39-70

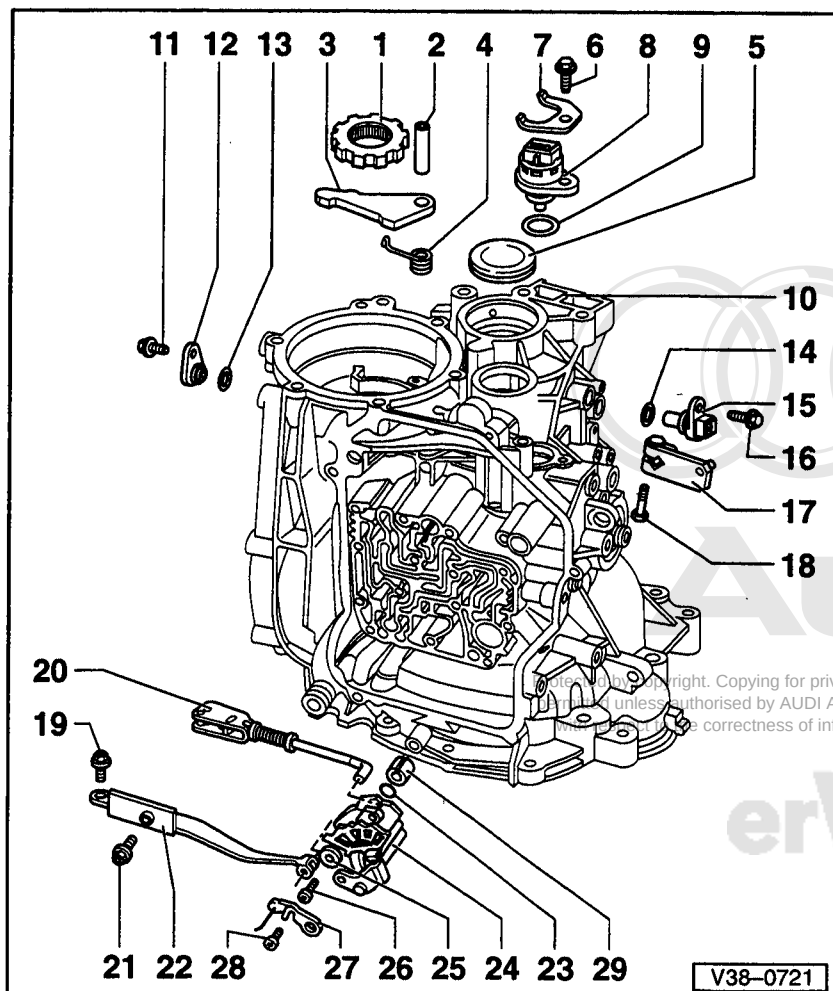
2 - Shaft for engaging lever

- ◆ Pulling out ⇒ Fig. 1, Page 38-59
- ◆ Drive home with mandrel
- ◆ Caulking ⇒ Fig. 2, Page 38-59

3 - Engaging lever

- ◆ Removing cover for differential pinion and output gear to take out lever ⇒ Page 39-21 onwards
- ◆ To remove, pull out shaft for engaging lever -item 2-
- ◆ Insert with return spring
- ◆ Installation position: Must be centred with parking lock gear

38-53



4 - Return spring

- ◆ Rests on gear case and is hooked in at engaging lever

5 - Cap

- ◆ Use screwdriver to knock out
- ◆ Driving home ⇒ Fig. 5, Page 38-61

6 - Bolt, 10 Nm

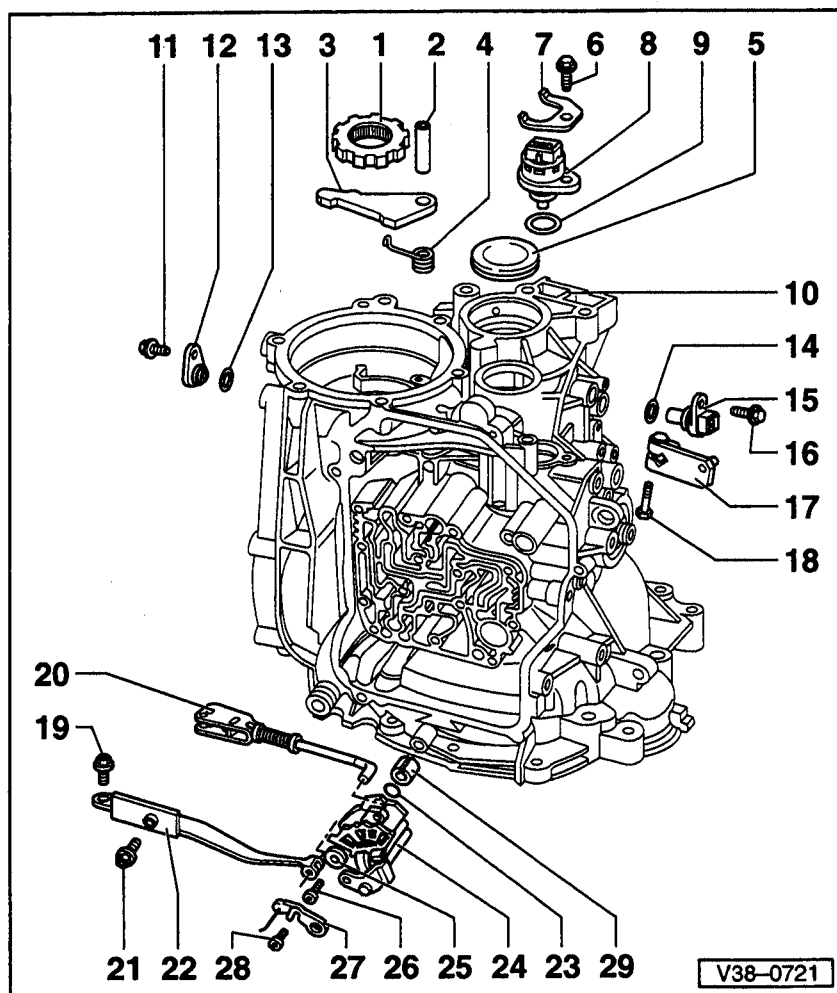
7 - Bracket

- ◆ For multi-function switch

8 - Multi-function switch -F125-

- ◆ Remove before dismantling selector shaft -item 24-
 - ◆ Checked in vehicle by means of self-diagnosis
- ⇒ Automatic Gearbox 097; Repair Group 01: Performing Self-diagnosis; Reading measured value block

38-54



9 - O-ring
♦ Always replace

10 - Gear case

11 - Bolt, 10 Nm

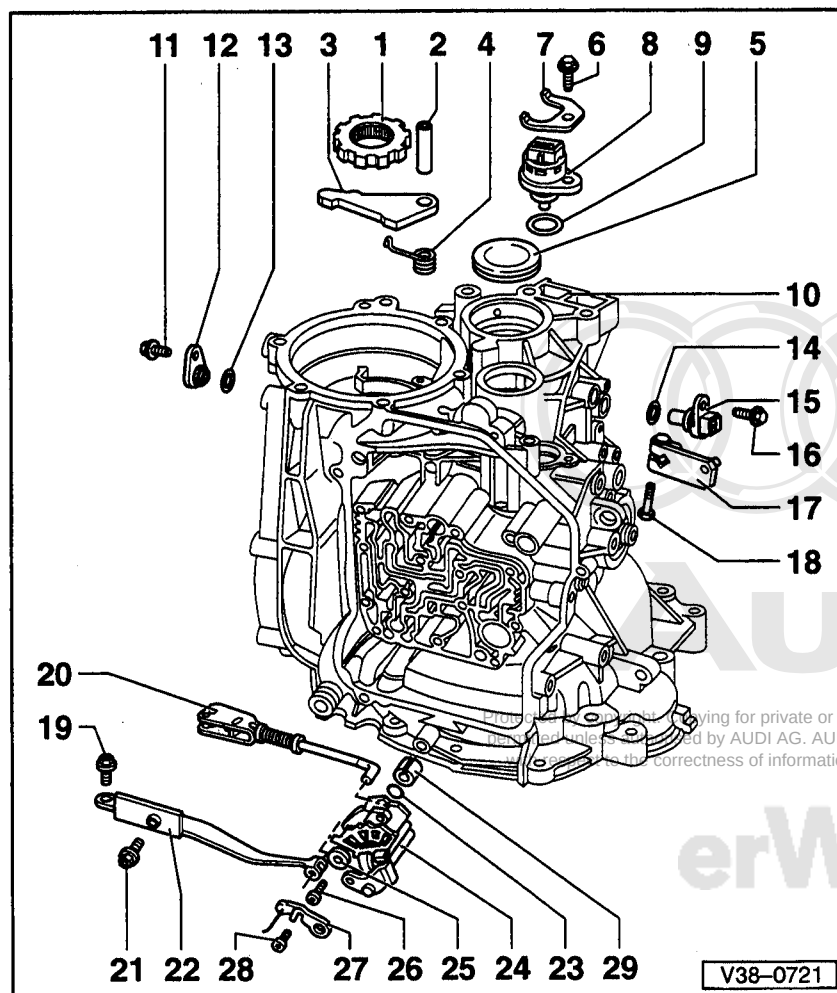
12 - Plug

13 - O-ring
♦ Always replace

14 - O-ring
♦ Always replace

15 - Road-speed sender -G68
♦ Checked in vehicle by means of self-diagnosis
⇒ Automatic Gearbox 097; Repair Group 01; Performing Self-diagnosis; Reading measured value block
♦ Clinging dirt will impair function; clean if necessary

38-55



16 - Bolt, 10 Nm

17 - Lever
♦ For selector shaft

18 - Bolt, 10 Nm

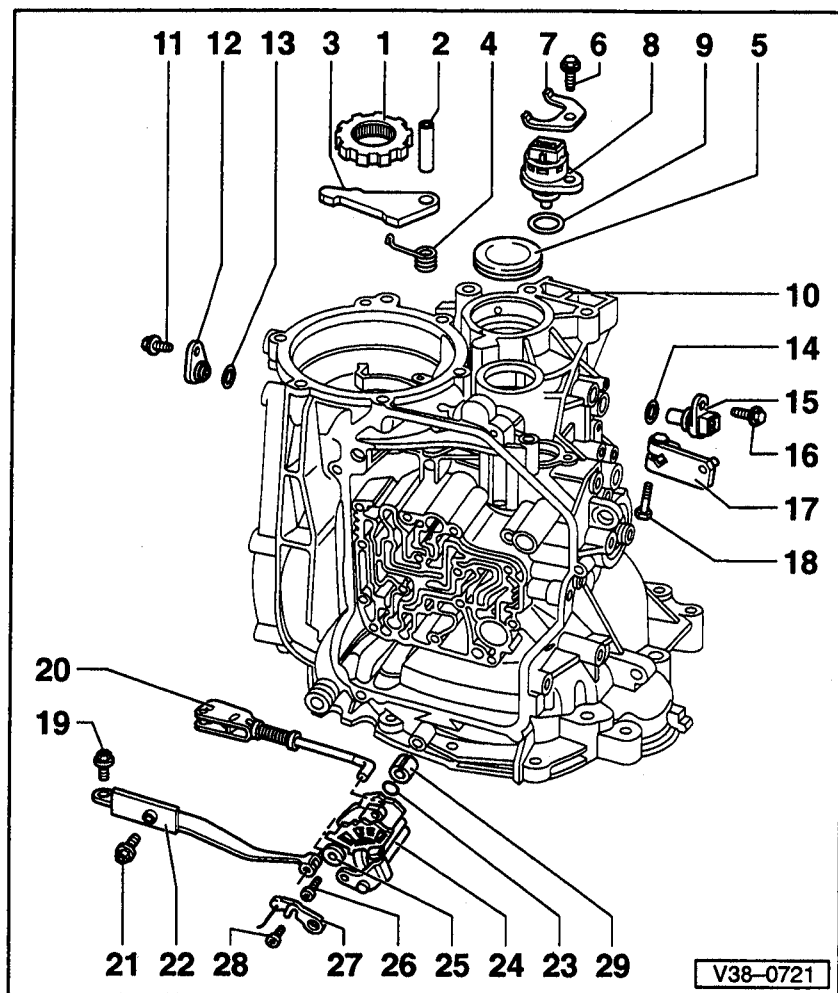
19 - Bolt, 10 Nm
♦ Installing ⇒ Fig. 4, Page 38-60

20 - Meshing lever

21 - Bolt, 10 Nm
♦ Installing ⇒ Fig. 4, Page 38-60

22 - Engaging spring
♦ Removing cover for differential pinion and output gear to take out spring ⇒ Page 39-21 onwards
♦ To remove, slacken off bolts -items 18 and 6- and lift parking lock engaging lever -item 3- by hand
♦ Pay attention to bolt fitting sequence on installation ⇒ Fig. 4, Page 38-60

38-56



23 - O-ring

- ◆ Always replace
- ◆ Insert in groove of selector shaft
- ◆ Installation position ⇒ Fig. 3, Page 38-60

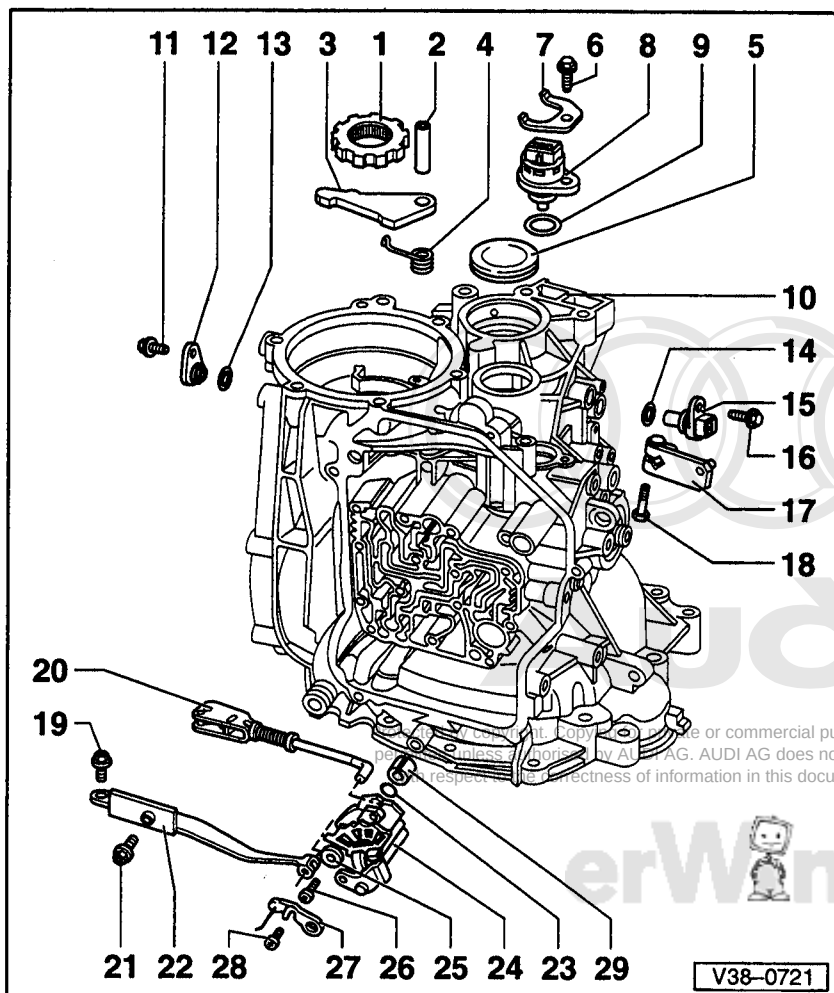
24 - Selector shaft

- ◆ Before removing selector shaft, take out multi-function switch -F125 (-item 8-) and engaging spring -item 22-
- ◆ On installation, insert together with meshing lever -item 20-
- ◆ Securing with washer -item 25- ⇒ Fig. 3, Page 38-60
- ◆ Pay attention to arrangement of components ⇒ Fig. 3, Page 38-60

25 - Lock washer

- ◆ Fitting
- ⇒ Fig. 3, Page 38-60

38-57



26 - Bolt, 10 Nm

- ◆ For fixing selector shaft in position
- ◆ Installing ⇒ Fig. 3, Page 38-60

27 - Operating rod for selector valve

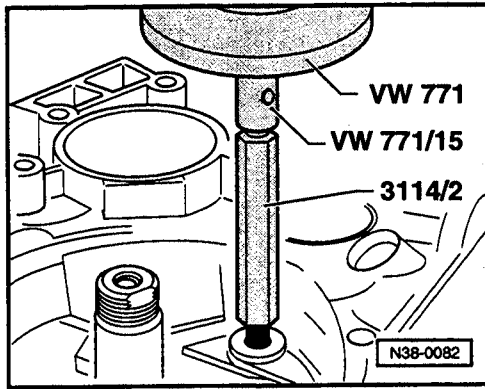
- ◆ Adjusting ⇒ Fig. 3, Page 38-49

28 - Bolt, 4 Nm

29 - Mounting bush

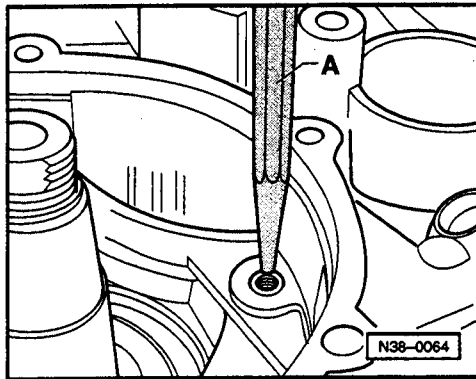
- ◆ Use mandrel to knock out and drive home
- ◆ Fit before installing selector shaft in gear case

38-58



◀ **Fig. 1 Pulling out shaft for engaging lever**

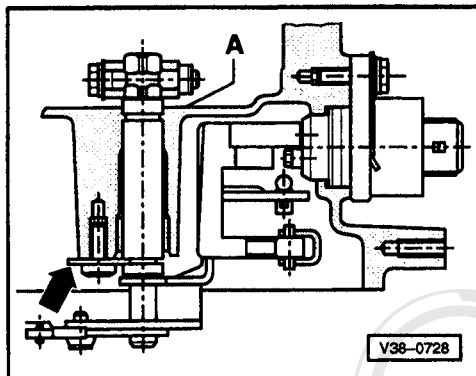
- Use multi-purpose tool VW 771 to pull out shaft.



◀ **Fig. 2 Caulking shaft for engaging lever**

- Drive home shaft with tapped hole facing upwards.
- Apply centre punch -A- at gear case and caulk shaft to secure.

38-59



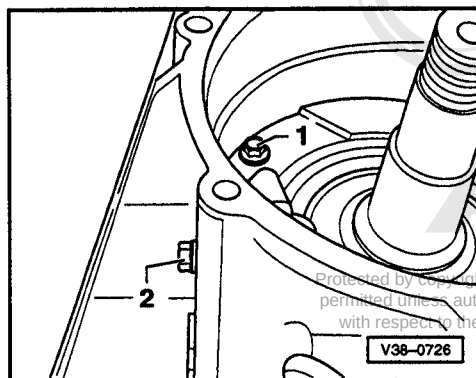
◀ **Fig. 3 Selector shaft with lock washer**

Selector shaft is secured in position by lock washer (arrow) to stop it moving.

A - O-ring

Note:

Fig. shows sectional view of selector shaft.



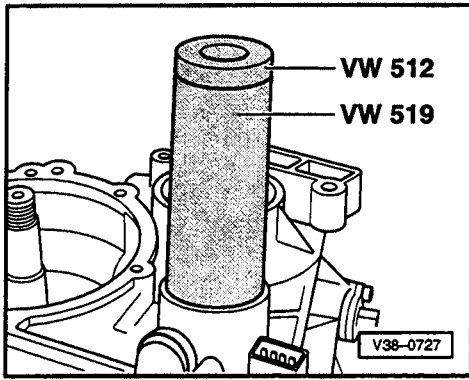
◀ **Fig. 4 Fitting bolts for engaging spring**

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

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38-60



◀ Fig. 5 Driving home plug



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Checking axle oil in final drive

Test conditions:

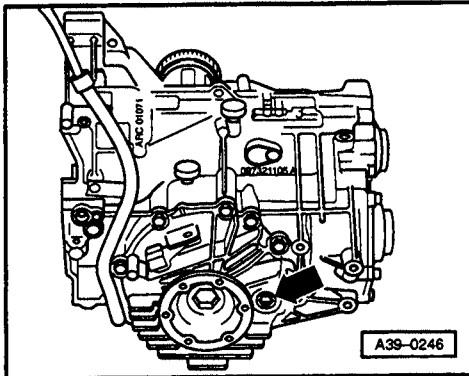
- Gearbox cold to hand-hot
- Axle oil level is checked with gearbox in position
- Vehicle must be on a flat surface

Checking:

- ◀ – Screw out plug for checking axle oil -arrow-.

Level must be up to bottom edge of filler opening.

- Top up axle oil if necessary. Specification ⇒ Page 00-14.
- Tighten screw plug to 25 Nm.



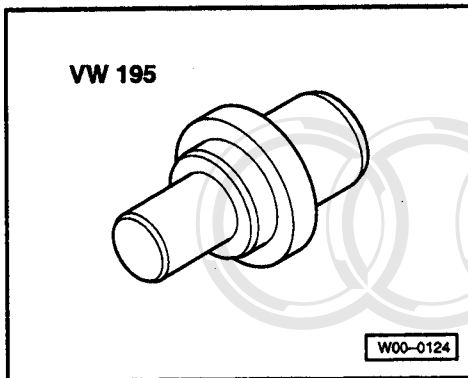
39-1

Replacing sealing rings for left flange shaft or right drive flange (gearbox installed)

Replacing sealing ring for left flange shaft

Special tools and workshop equipment required

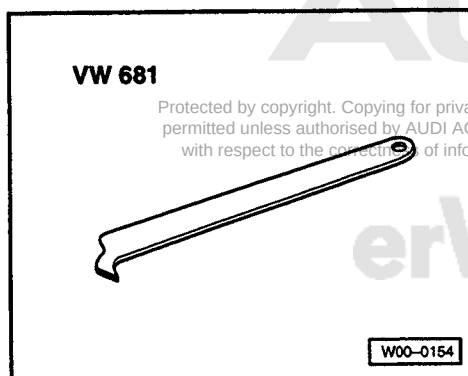
- ♦ VW 195: Fitting mandrel



- ♦ VW 681: Pressing-out lever

Additional information material required

- ♦ Workshop Manual "Audi 80 1992 ► FWD Running Gear"



39-2

Removing

- Gearbox installed.
- Slacken off bolt for drive shaft/wheel hub and wheel bolts with vehicle standing on ground.
- Remove front left wheel.
- Removing drive shaft
⇒ FWD Running Gear; Repair Group 40; Removing and installing suspension strut and drive shaft
- Place collector V.A.G 1306 beneath gearbox.
- Screw out central bolt of left flange shaft whilst securing flange shaft with mandrel to prevent turning.
- Pull out flange shaft.
- Use pressing-out lever VW 681 to extract sealing ring for flange shaft.

39-3

Installing

Install in reverse order, paying attention to the following:

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

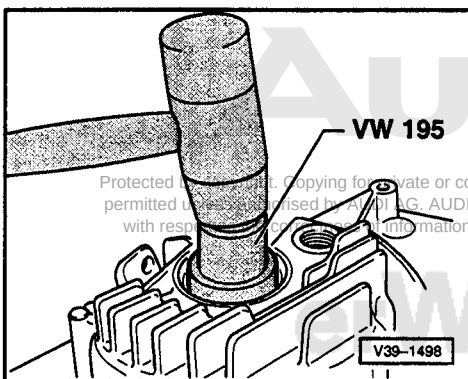
Note:

Sealing ring must be fitted at an even depth all round in case.

- Drive home new sealing ring, taking care not to tilt it.
- Install flange shaft.

Installing drive shaft

⇒ FWD Running Gear; Repair Group 40; Removing and installing suspension strut and drive shaft



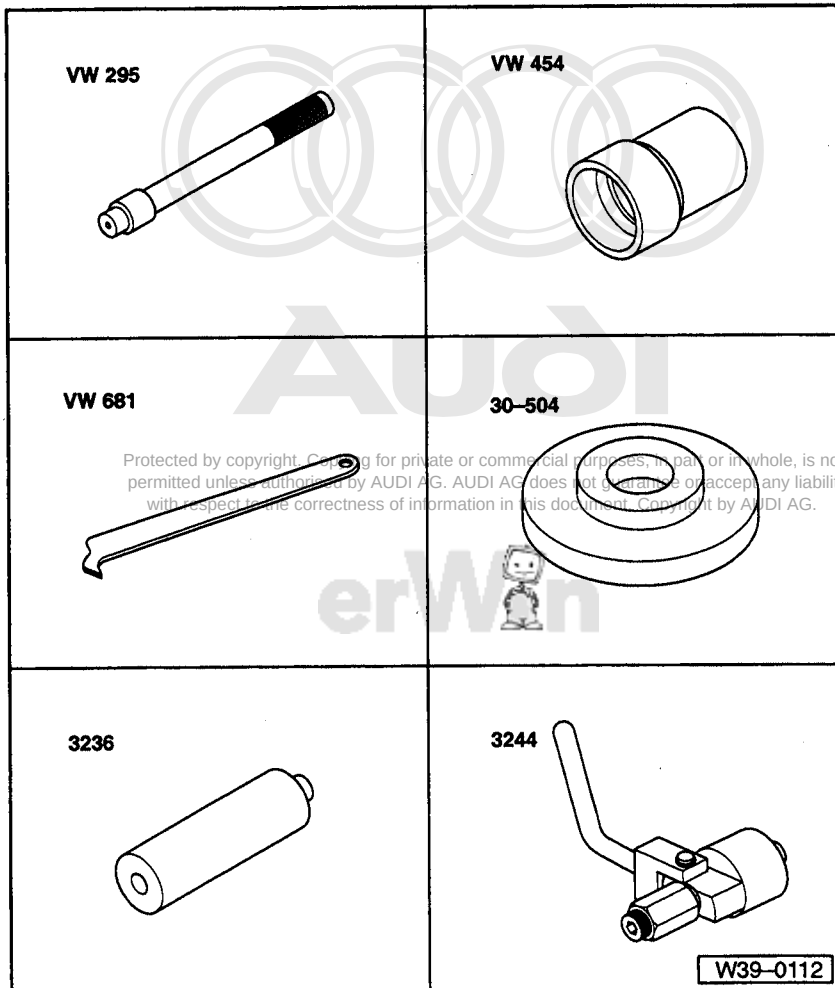
39-4

– Fit wheel.

– Checking oil in final drive with gearbox in position ⇒ Page 39-1.

Tightening torques

Flange shaft to gearbox	25 Nm
Drive shaft to gearbox M10	80 Nm
Drive shaft to wheel hub:	
Bolt M14 x 1.5	120 Nm
– Always replace bolt	+ 90°
Bolt M16 x 1.5	200 Nm
– Always replace bolt	+ 90°
Wheel bolts to wheel hub	110 Nm



Replacing sealing ring for right drive flange

Special tools and workshop equipment required

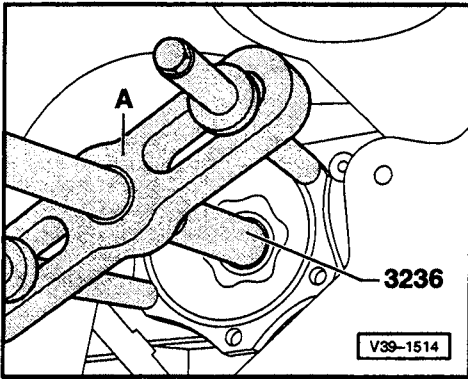
- ♦ VW 295: Mandrel
- ♦ VW 454: Thrust piece
- ♦ VW 681: Pressing-out lever
- ♦ 30-504: Pressing-in tool
- ♦ 3236: Thrust piece
- ♦ 3244: Pressing-on tool

Additional information material required

- ◆ Workshop Manual "Audi 80 1992 ► FWD Running Gear"

Removing

- Slacken off bolt for drive shaft/wheel hub and wheel bolts with vehicle standing on ground.
- Remove front right wheel.
- Removing drive shaft
⇒ FWD Running Gear; Repair Group 40; Removing and installing suspension strut and drive shaft
- Remove circlip for drive flange.
- Place collector V.A.G 1306 beneath gearbox.
- ◀ – Use thrust piece 3236 and two-arm puller Kukko 18/1 -A- to pull off drive flange.
- Use pressing-out lever VW 681 to extract sealing ring for drive flange.



39-7

Installing

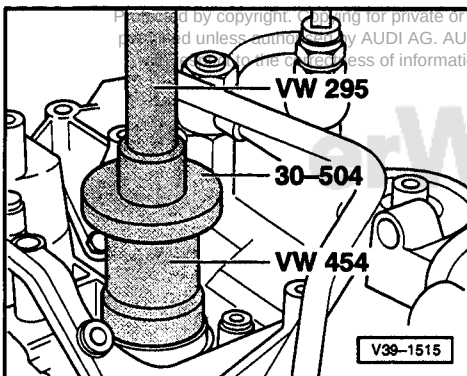
Install in reverse order, paying attention to the following:

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

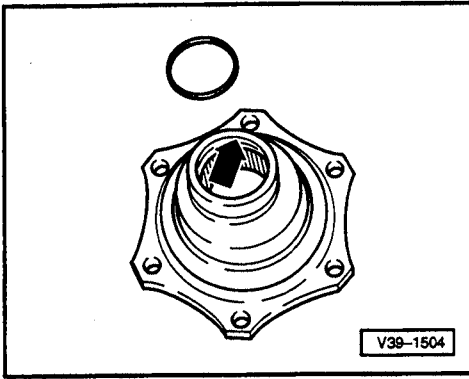
Note:

Sealing ring must be fitted at an even depth all round in case.

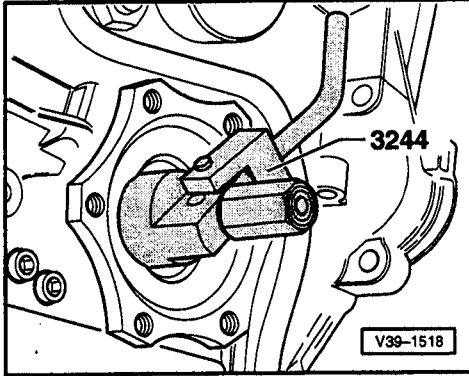
- ◀ – Drive home new sealing ring, taking care not to tilt it.



39-8



- ◀ – Insert new O-ring in drive flange -arrow-.



- ◀ – Fit drive flange.
- Fit circlip for drive flange.
 - Installing drive shaft
⇒ FWD Running Gear; Repair Group 40; Removing and installing suspension strut and drive shaft
 - Fit wheel.
 - Checking oil in final drive with gearbox in position ⇒ Page 39-1.

39-9



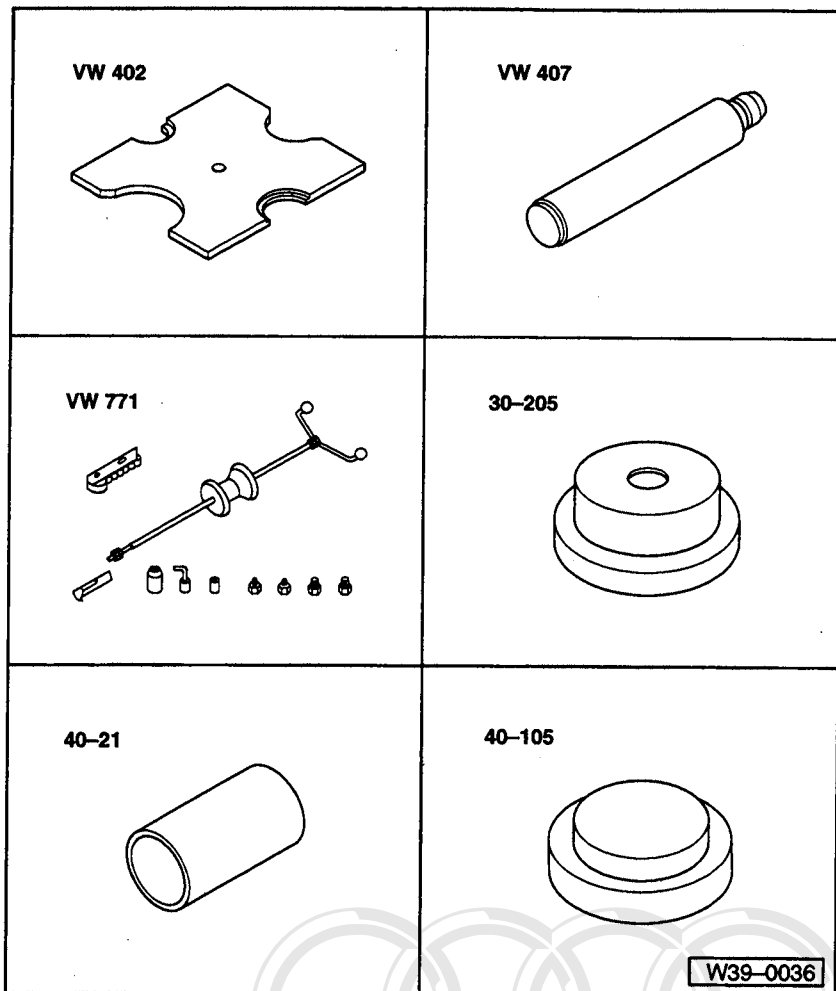
Tightening torques

Drive shaft to gearbox M10	80 Nm
Drive shaft to wheel hub:	
Bolt M14 x 1.5	120 Nm
– Always replace bolt	+ 90°
Bolt M16 x 1.5	200 Nm
– Always replace bolt	+ 90°
Wheel bolts to wheel hub	110Nm

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39-10



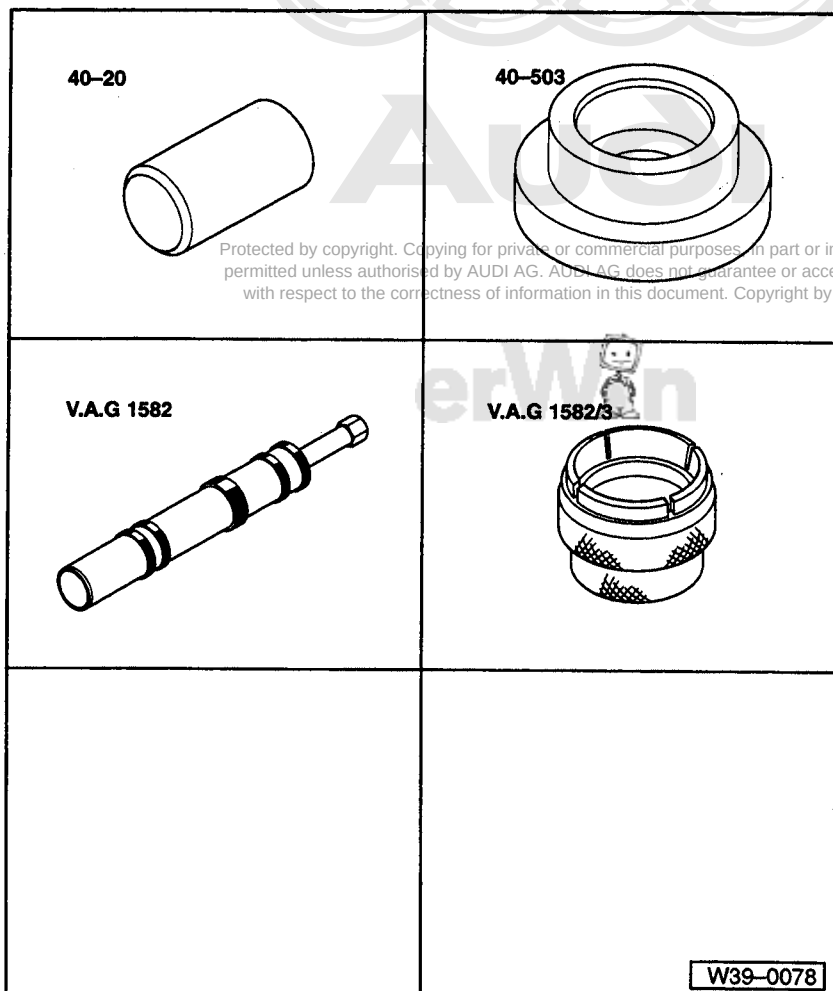
Dismantling and assembling final drive

Removing and installing input gear

Special tools and workshop equipment required

- ◆ VW 402: Pressing plate
- ◆ VW 407: Punch
- ◆ VW 771: Multi-purpose tool
- ◆ 30-205: Pressing block
- ◆ 40-21: Thrust sleeve
- ◆ 40-105: Pressing block

39-11



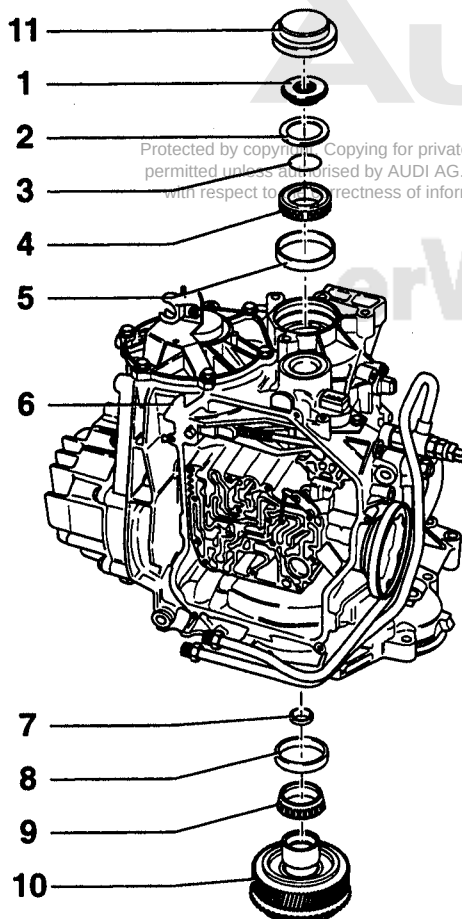
Special tools and workshop equipment required

- ◆ 40-20: Thrust sleeve
- ◆ 40-503: Pressing-in tool
- ◆ V.A.G 1582: Taper roller bearing puller
- ◆ V.A.G 1582/3: Gripper

39-12

Notes:

- ◆ Input gear can only be removed following removal of planetary gearbox ⇒ Page 37-49.
- ◆ Friction torque at nut of differential pinion must be measured ⇒ Page 39-64 before and after dismantling input gear. Note down measured value.
- ◆ If taper roller bearings are not replaced, previously measured value must be re-established.
- ◆ Removal of input gear does not involve taking out differential pinion and differential.
- ◆ Input and output gear are only to be jointly replaced.
- ◆ After replacing taper roller bearings, adjust input gear, planet carrier and clutch play between K1 and K2 ⇒ Pages 39-59, 37-95 and 37-112.
- ◆ After replacing input gear (with output gear), adjust input gear, shim "S4", differential pinion, planet carrier and clutch play between K1 and K2 ⇒ Pages 39-59, 39-70, 37-95 and 37-112.
- ◆ Always replace all taper roller bearings on a shaft and use same make for all.
- ◆ Take care not to interchange outer and inner races of bearings of equal size.



1 - Tensioning bolt, 250 Nm

- ◆ Engage parking lock to install or remove
- ◆ Removing and installing ⇒ Fig. 2, Page 39-17
- ◆ Fit axial needle bearing (item 7) before installing tensioning bolt

2 - Dished washer

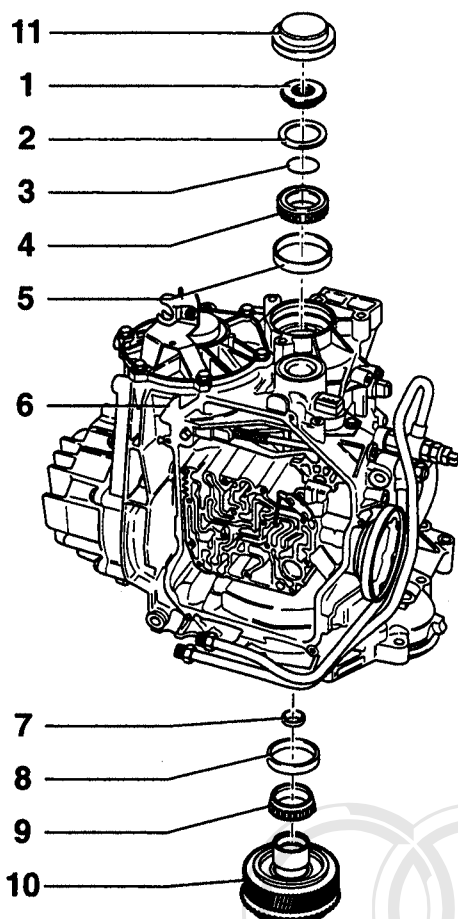
- ◆ Insert with curved side facing tensioning bolt

3 - Shim

- ◆ Determining thickness
⇒ Adjusting input gear,
Page 39-59

4 - Inner race/taper roller bearing

- ◆ Insert such that lugs engage in groove of inner race/taper roller bearing (item 9) ⇒ Fig. 5, Page 39-19
- ◆ Apply locking compound AMV 185 101 A1 and position on input gear after measuring out shim



V39-1437

- 5 - Outer race/taper roller bearing**
- ◆ Knock out with mandrel
 - ◆ Drive home with 30-205
 - ◆ Apply locking compound AMV 185 101 A1 when fitting

6 - Gear case

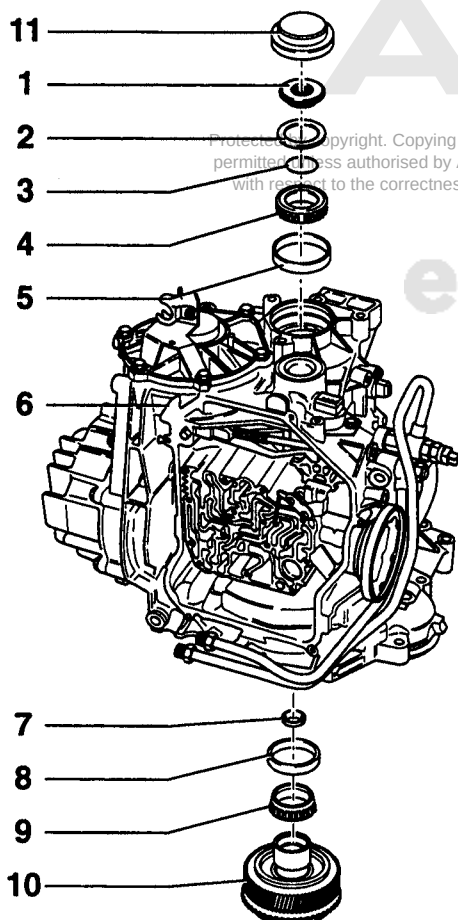
7 - Axial needle bearing

- ◆ Fit with flat side facing input gear
- ◆ Insert in input gear before installing tensioning bolt (item 1)

8 - Outer race/taper roller bearing

- ◆ Knock out with mandrel
- ◆ Drive home with 30-205 and mandrel of appropriate length
- ◆ Apply locking compound AMV 185 101 A1 when fitting

39-15



V39-1437

9 - Inner race/taper roller bearing

- ◆ Pulling off ⇒ Fig. 3, Page 39-18
- ◆ Pressing on ⇒ Fig. 4, Page 39-18
- ◆ Apply locking compound AMV 185 101 A1 when fitting

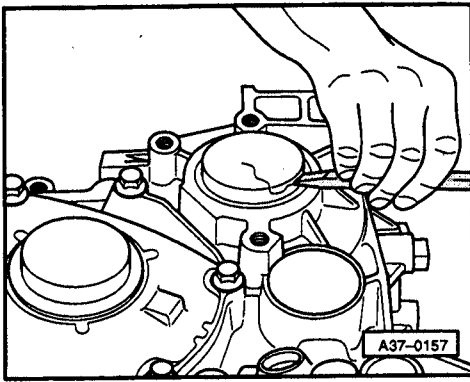
10 - Input gear

- ◆ With pulse wheel for road speed sender -G68
- ◆ Number of teeth ⇒ Page 00-3 onwards
- ◆ Adjusting ⇒ Page 39-59
- ◆ In the event of damage, always replace both input and output gear
- ◆ Adjusting planet carrier on replacing input gear ⇒ Page 37-95
- ◆ Removing ⇒ Fig. 6, Page 39-19

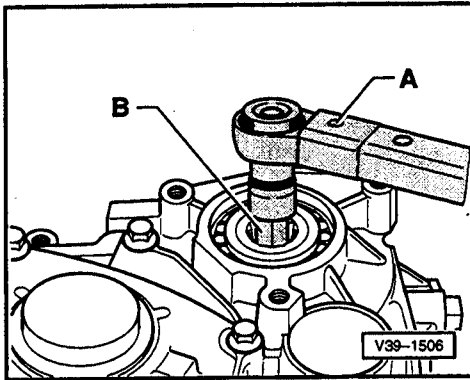
11 - Cap

- ◆ Knocking out ⇒ Fig. 1, Page 39-17
- ◆ Driving in ⇒ Fig. 7, Page 39-20

39-16



◀ Fig. 1 Knocking out cap



◀ Fig. 2 Removing and installing tensioning bolt

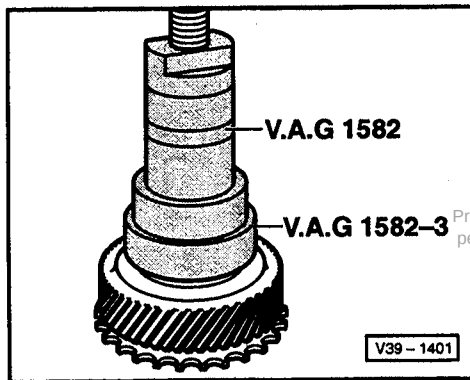
A - Torque wrench

B - 22 mm wrench socket

– Engage parking lock when slackening off and tightening.



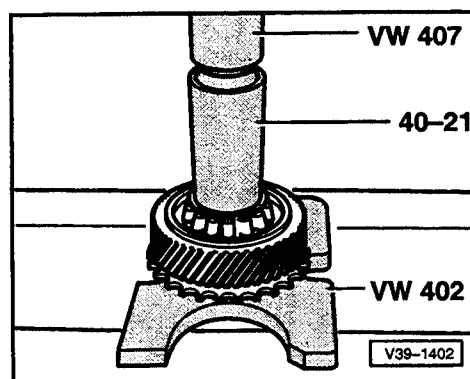
39-17



◀ Fig. 3 Pulling off inner race/taper roller bearing

– Position thrust piece 40-105 on input gear.

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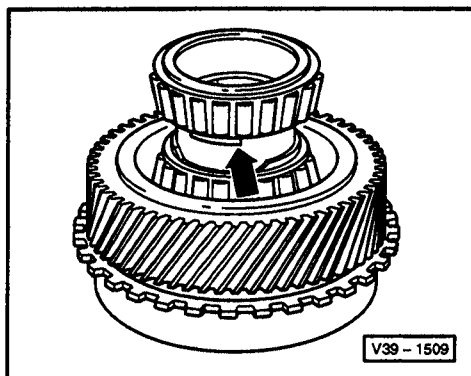


◀ Fig. 4 Pressing on inner race/taper roller bearing

Note:

Thrust piece must be positioned under hub of input gear to prevent input gear damage.

39-18

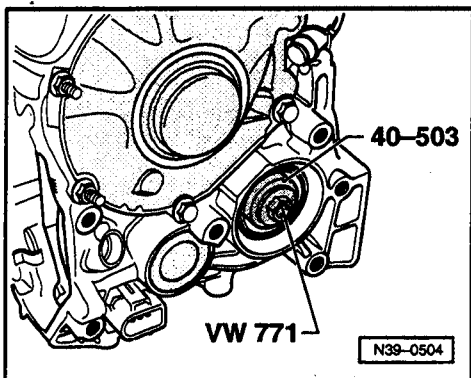


◀ **Fig. 5 Inserting inner race/taper roller bearing**

- Insert inner race/taper roller bearing such that lugs of inner race fit (arrow) in grooves of opposite inner race.

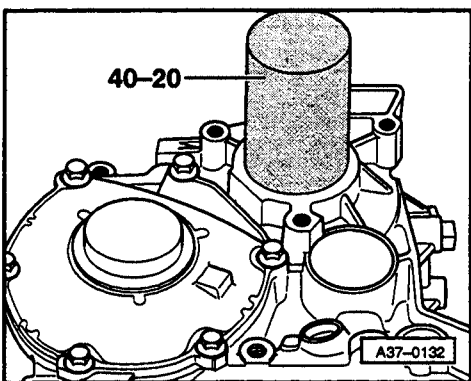
Note:

Taper roller bearings with no lugs may also be fitted.

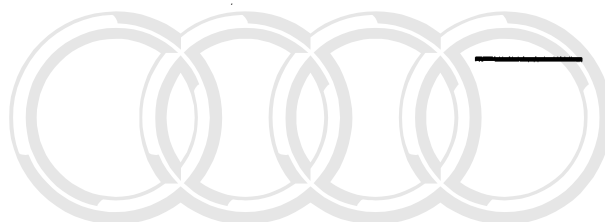


◀ **Fig. 6 Removing input gear**

- Insert collar of pressing-in tool 40-503 in tapped hole of input gear.
- Connect pressing-in tool to VW 771 through hole of input gear.
- Carefully knock out input gear.



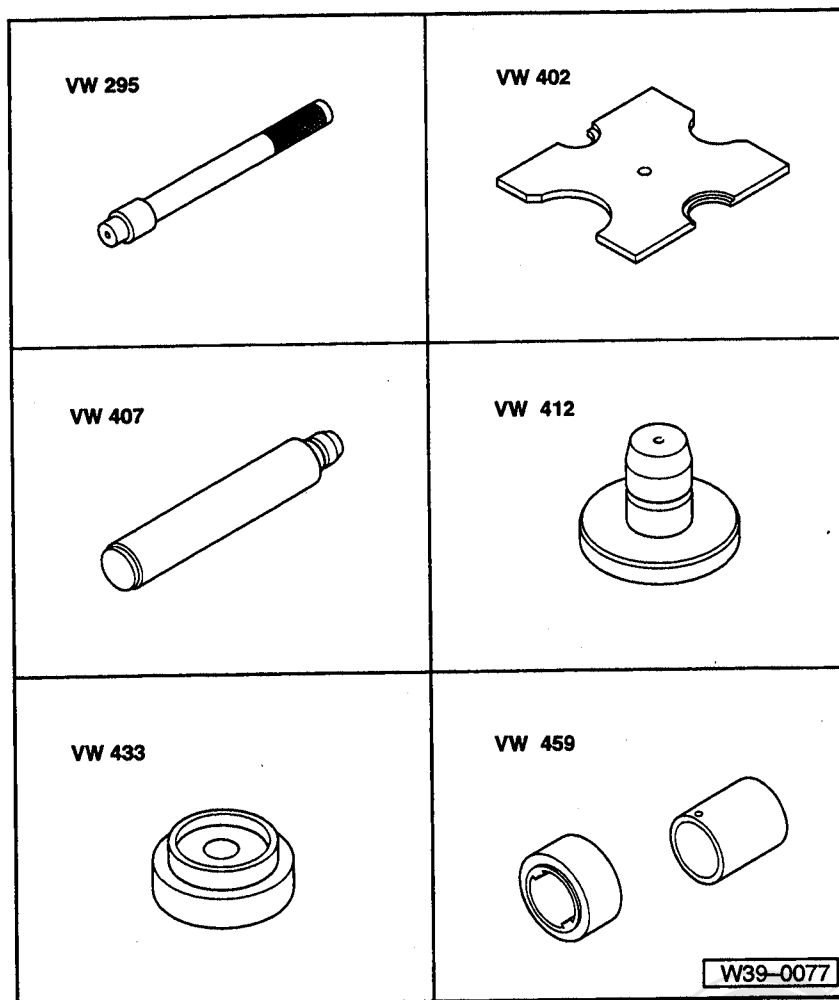
◀ **Fig. 7 Driving in cap**



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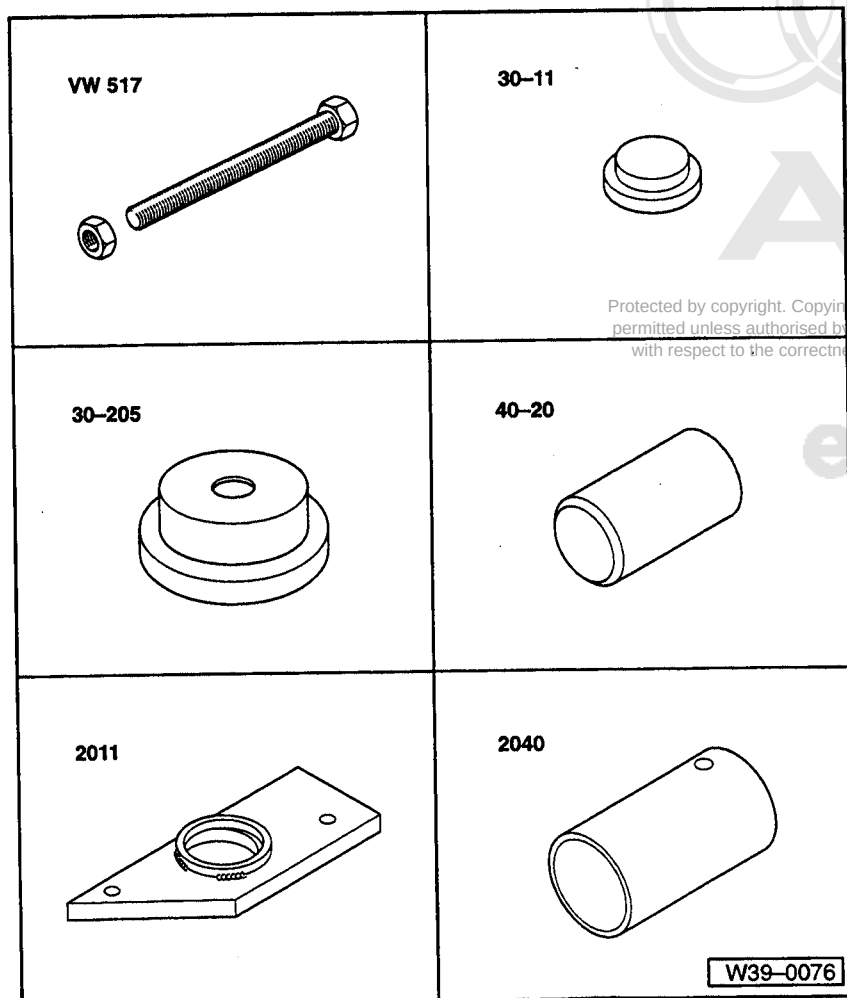


Removing and installing differential pinion

Special tools and workshop equipment required

- ◆ VW 295: Mandrel
- ◆ VW 402: Pressing plate
- ◆ VW 407: Punch
- ◆ VW 412: Punch
- ◆ VW 433: Thrust piece
- ◆ VW 459/2: Pressing-in and pressing-out tool

39-21

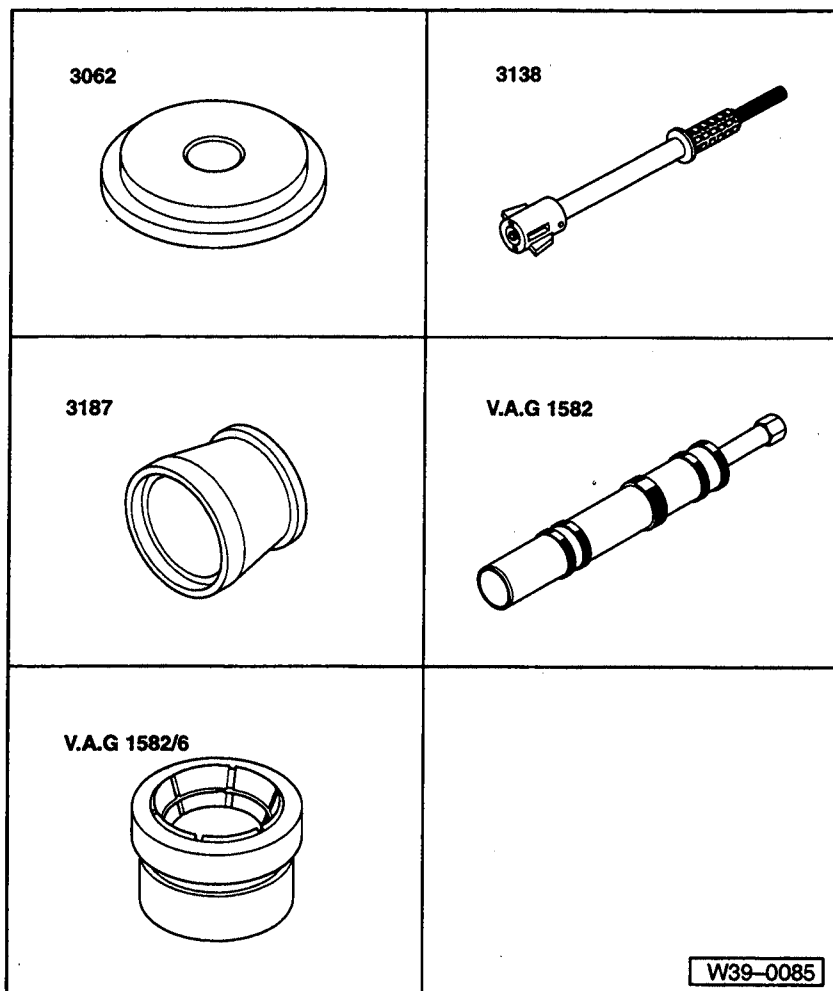


Special tools and workshop equipment required

- ◆ VW 517: Threaded stem
- ◆ 30-11: Pressing block
- ◆ 30-205: Pressing block
- ◆ 40-20: Thrust sleeve
- ◆ 2011: Support bridge
- ◆ 2040: Tube

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39-22



Special tools and workshop equipment required

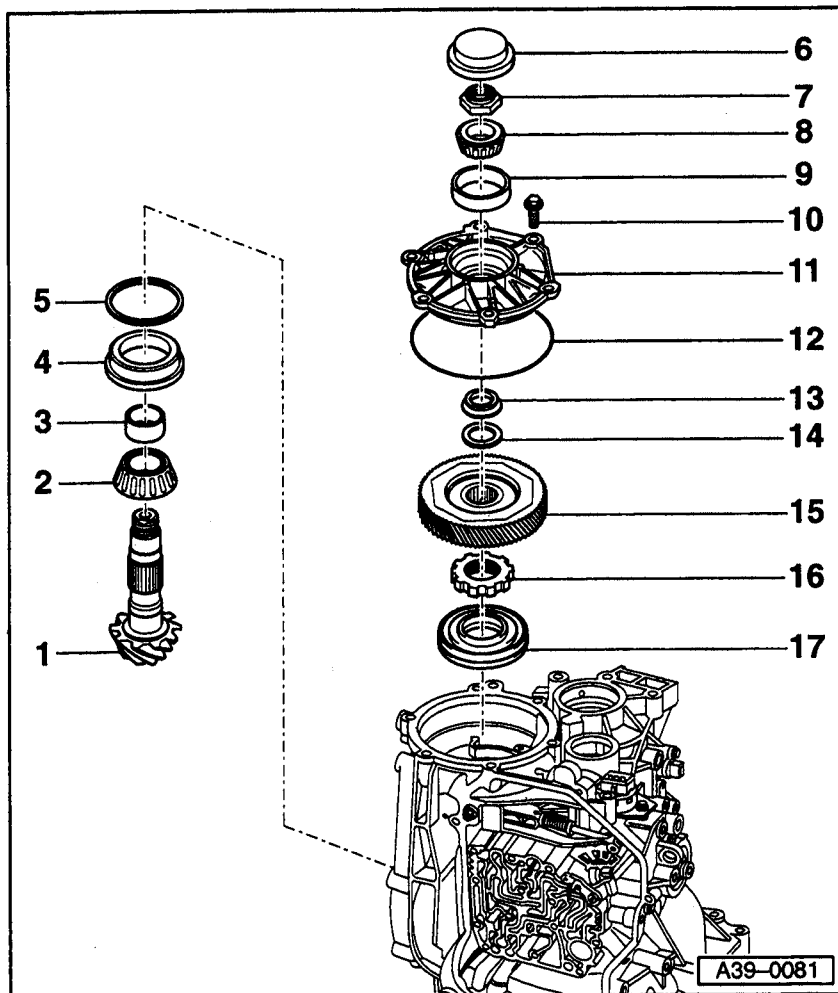
- ◆ 3062: Pressing disc
- ◆ 3138: Drift
- ◆ 3187: Assembly sleeve
- ◆ V.A.G 1582: Taper roller bearing puller
- ◆ V.A.G 1582/6: Gripper

39-23

Notes:

- ◆ Differential pinion and final drive gear are only to be jointly replaced.
- ◆ If final drive unit and taper roller bearing are to be re-used when performing repair work, friction torque is to be determined with planetary gearbox removed before commencing repairs ⇒ Page 39-79 and noted down for friction torque check on completion of repair work.
- ◆ If cover for differential pinion, spacer, input gear or parking lock gear is replaced, shim "S4" of differential pinion must be re-measured ⇒ Page 39-70.
- ◆ If taper roller bearings of differential pinion or bushing for differential pinion are replaced, shims "S3" and "S4" of differential pinion must be re-measured ⇒ Page 39-70.
- ◆ Following replacement of differential pinion (in conjunction with final drive gear), shims "S3" and "S4" as well as shims "S1" and "S2" (for final drive) must be re-measured ⇒ Page 39-70/39-86.
- ◆ Insert sealing ring for differential pinion (-item 17- on Page 39-29) in dry condition. Do not grease sealing lips.

39-24



1) Adjustment work must be performed
⇒ Page 39-58 if these components
are replaced

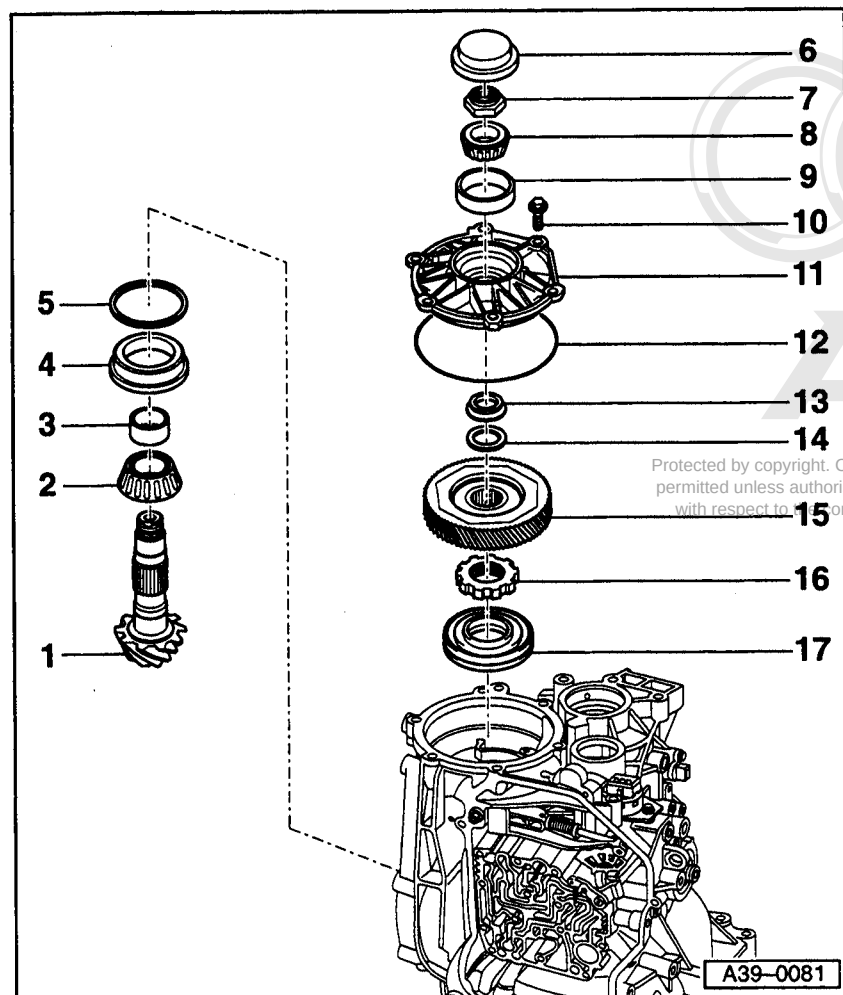
1 - Differential pinion ¹⁾

- ◆ Removing differential to take out pinion ⇒ Page 39-35
- ◆ Paired with final drive gear; replace entire final drive unit in the event of damage
- ◆ Number of teeth ⇒ Page 00-3 onwards
- ◆ Adjusting differential pinion and final drive gear ⇒ Page 39-68
- ◆ Inserting ⇒ Fig. 1, Page 39-30

2 - Inner race/taper roller bearing ¹⁾

- ◆ Pulling off
⇒ Fig. 2, Page 39-30
- ◆ Pressing on
⇒ Fig. 3, Page 39-31

39-25



3 - Bushing for differential pinion ¹⁾

- ◆ Pulling off with inner race for taper roller bearing
⇒ Fig. 2, Page 39-30
- ◆ Pressing on
⇒ Fig. 3, Page 39-31

4 - Outer race/taper roller bearing ¹⁾

- ◆ Knock out with 3138
- ◆ Fitting
⇒ Fig. 4, Page 39-31

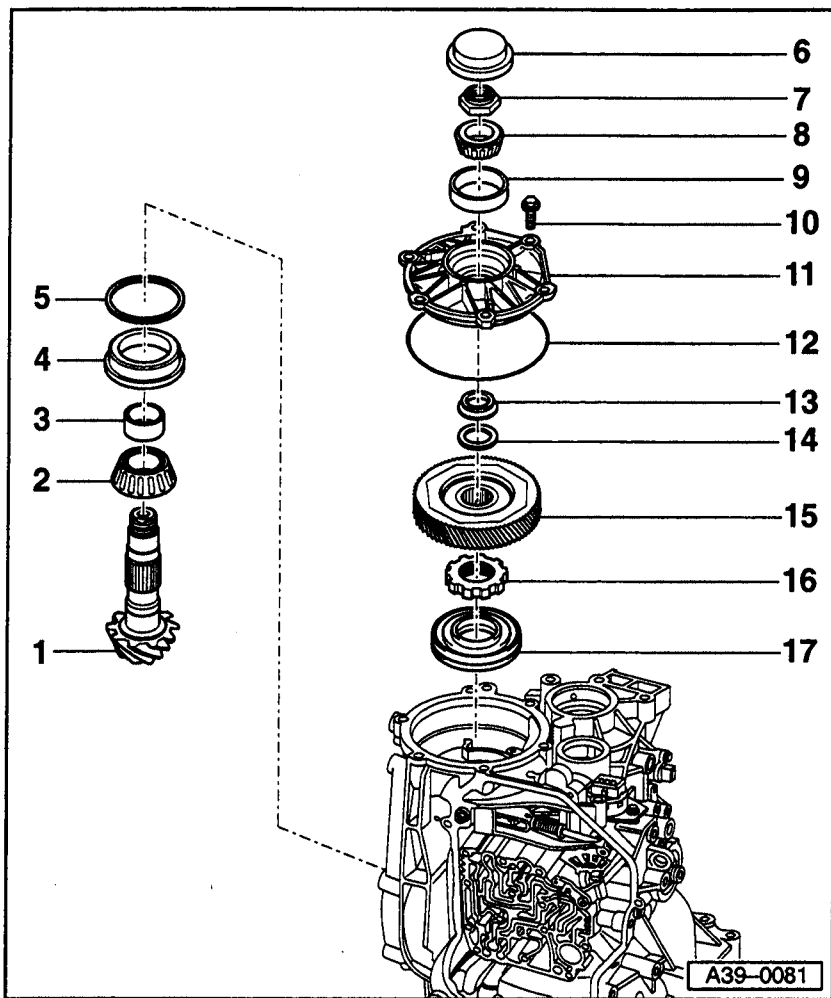
5 - Shim S3

- ◆ Determining thickness
⇒ Page 39-70, adjusting differential pinion

6 - Cap

- ◆ Knocking out
⇒ Fig. 9, Page 39-34
- ◆ Driving in
⇒ Fig. 10, Page 39-34

39-26



7 - Hexagon nut

- ♦ Always replace
- ♦ Engage parking lock when slackening off/tightening
- ♦ Tightening torque ⇒ Page 39-70, adjusting differential pinion
- ♦ Caulking after checking friction torque ⇒ Fig. 8, Page 39-33

8 - Inner race/taper roller bearing ¹⁾

9 - Outer race/taper roller bearing ¹⁾

- ♦ Knock out with mandrel
- ♦ Pressing in ⇒ Fig. 7, Page 39-33

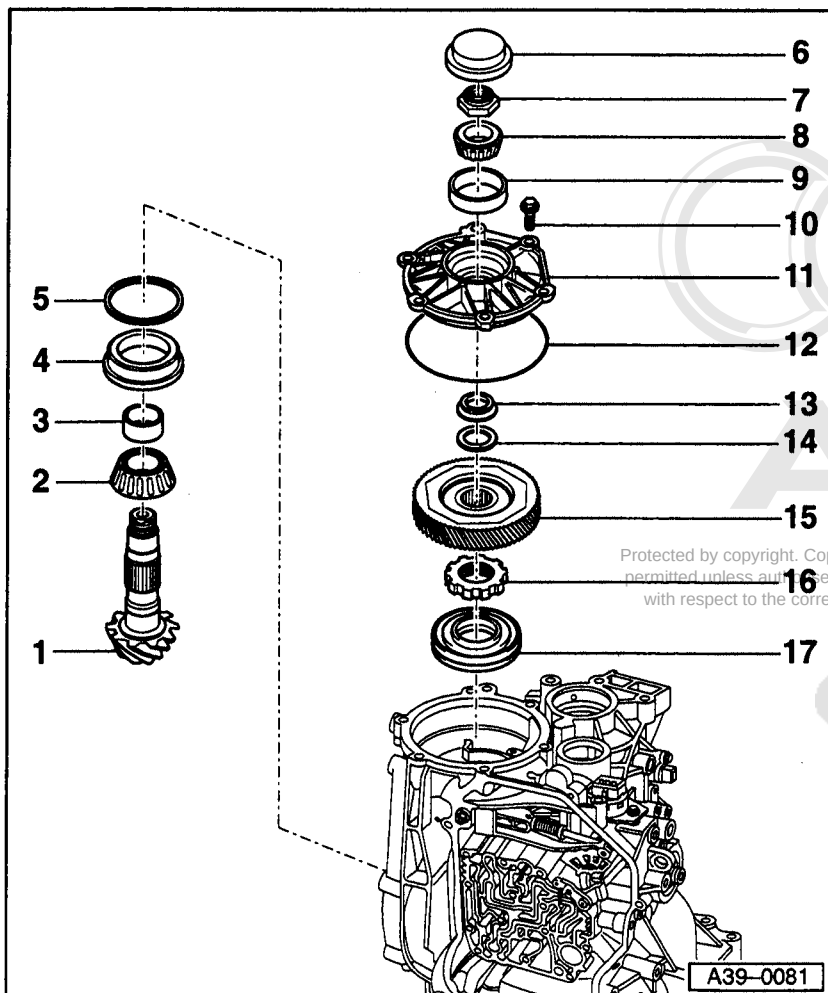
10 - Bolt, 25 Nm

- ♦ Tighten alternately and in stages

11 - Cover for differential pinion ¹⁾

- ♦ After removing hexagon nut -item 7-, cover can be pressed off gear case via tapped holes

39-27



12 - O-ring

- ♦ Always replace

13 - Spacer ¹⁾

- ♦ Installation position: Broader contact surface faces output gear

14 - Shim S₄

- ♦ Determining thickness ⇒ Page 39-70, adjusting differential pinion

15 - Output gear ¹⁾

- ♦ Number of teeth ⇒ Page 00-3 onwards

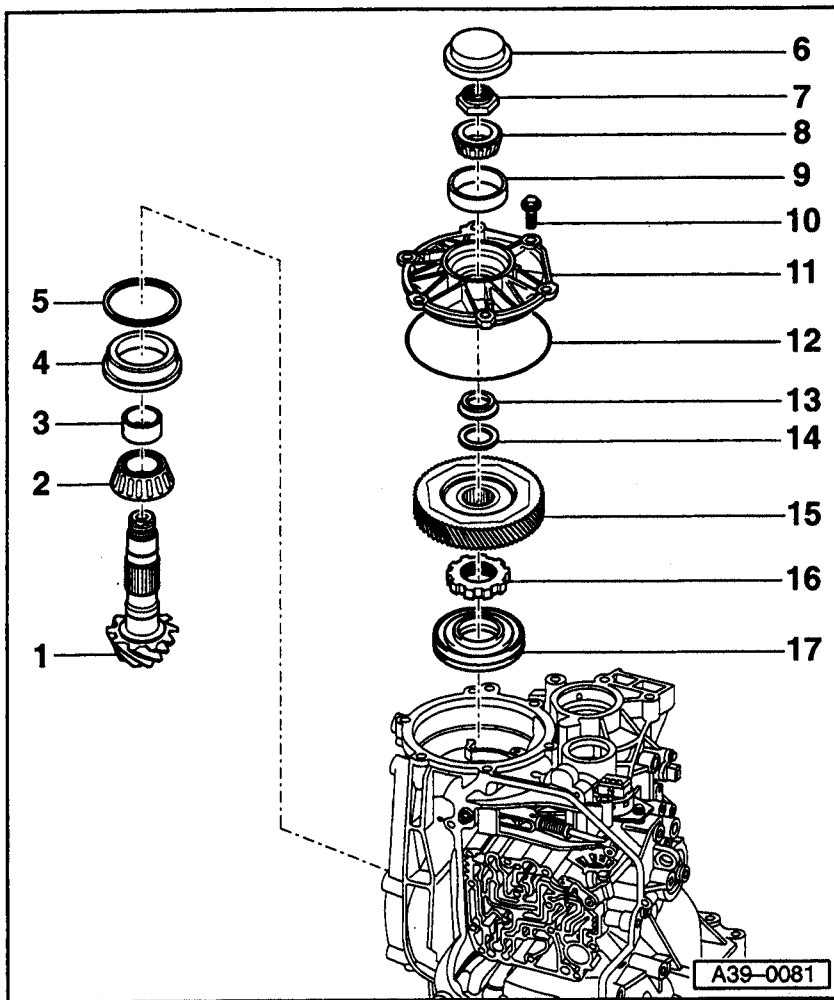
- ♦ Pulling off ⇒ Fig. 6, Page 39-32

- ♦ Heat before fitting

- ♦ Always replace output and input gear jointly in the event of damage

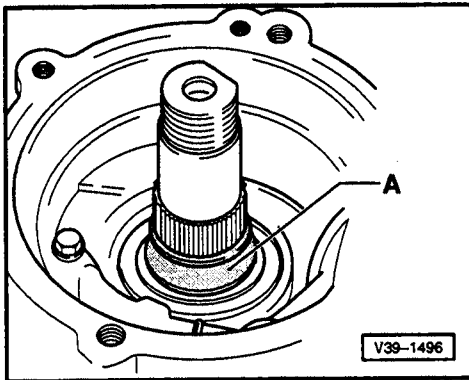
- ♦ Installation position: Raised collar faces parking lock gear

39-28



- 16 - Parking lock gear ¹⁾**
 ♦ Rounded side faces output gear
- 17 - Sealing ring for differential pinion**
 ♦ Knock out with mandrel
 ♦ Always replace
 ♦ Never grease or oil sealing lips
 ♦ Driving home
 ⇒ Fig. 5, Page 39-32

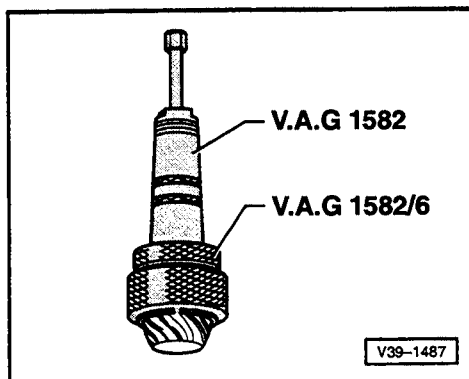
39-29



◀ Fig. 1 Inserting differential pinion

A - Assembly sleeve 3187

Use assembly sleeve 3187 to insert differential pinion so as not to damage sealing lips.

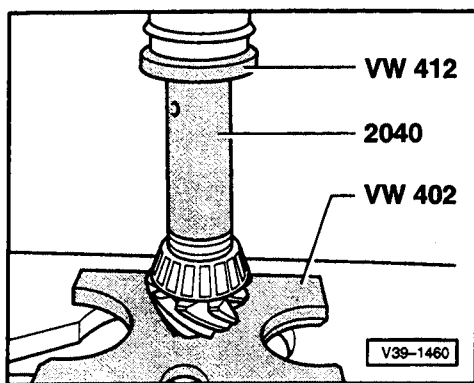


◀ Fig. 2 Pulling off inner race/taper roller bearing with bushing for differential pinion

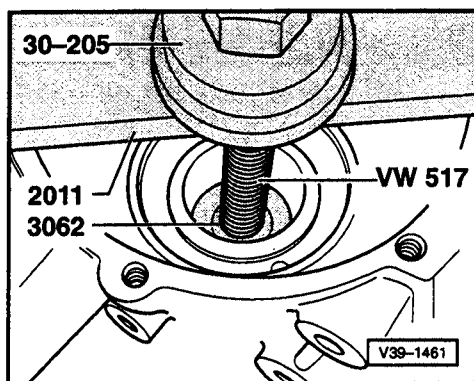
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39-30

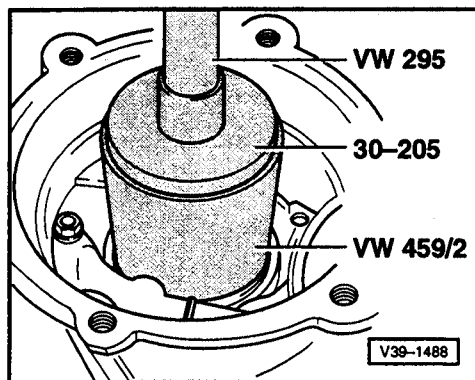


◀ Fig. 3 Pressing on inner race/taper roller bearing with bushing for differential pinion



◀ Fig. 4 Fitting outer race/taper roller bearing in gear case

———— 39-31 ————



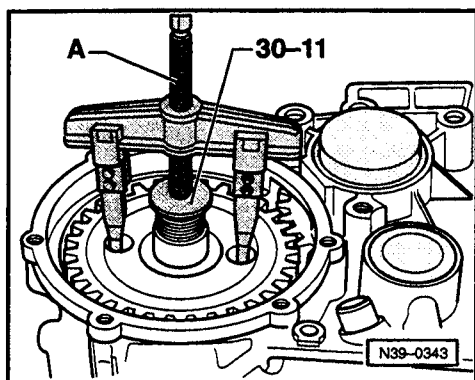
◀ Fig. 5 Driving home sealing ring for differential pinion

Insert sealing ring in dry condition; do not grease or oil sealing lips.

Installation position of sealing ring:

Raised collar (inner) faces parking lock gear.

– Drive home sealing ring.



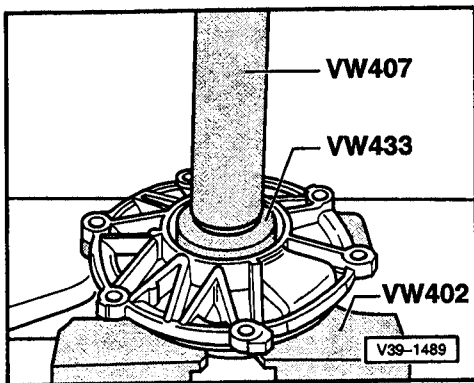
◀ Fig. 6 Pulling output gear off differential pinion

A - Kukko 20-10 and Matra V 172 puller

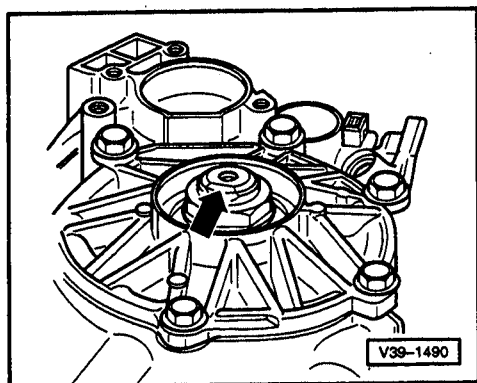
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———— 39-32 ————



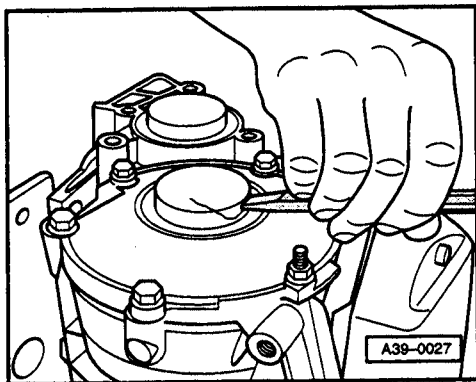
◀ Fig. 7 Pressing in outer race/taper roller bearing



◀ Fig. 8 Securing hexagon nut

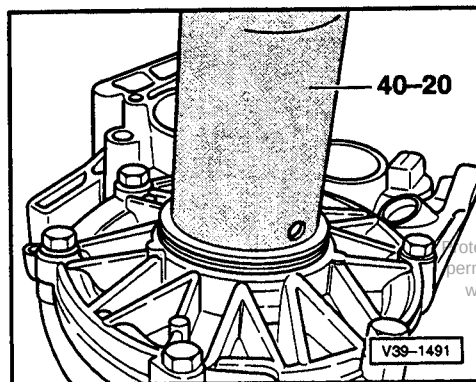
- Secure -arrow- collar of hexagon nut with mandrel at flattened side of differential pinion.

39-33



◀ Fig. 9 Knocking out cap

Cap cannot be removed without destroying it.



◀ Fig. 10 Driving in cap

- Use 40-20 to drive in new cap.

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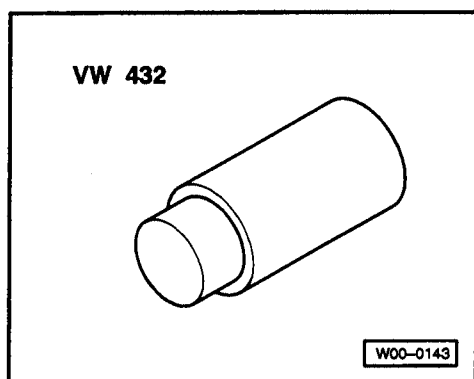
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39-34

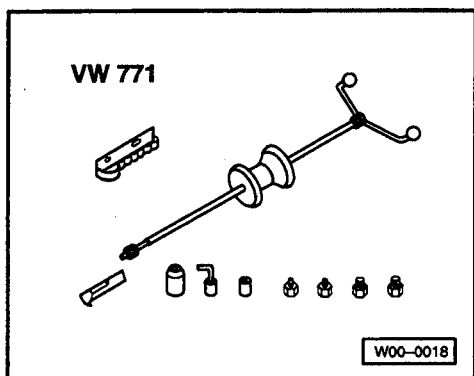
Removing and installing differential

Special tools and workshop equipment required

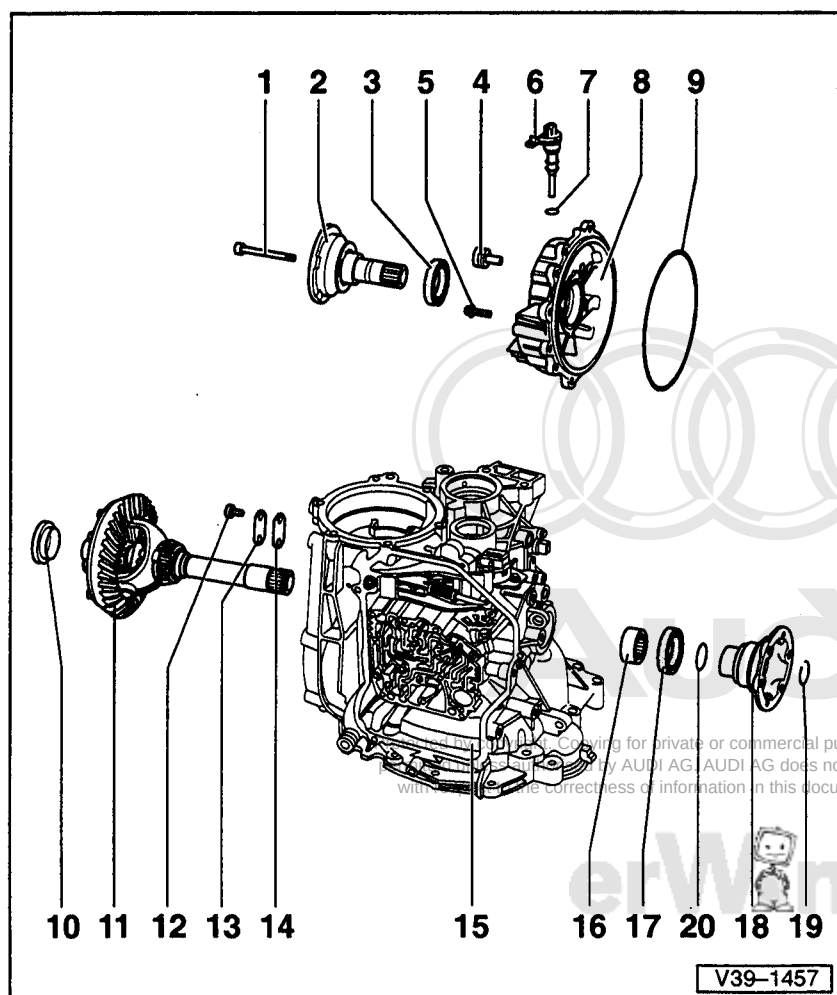
- ♦ VW 432: Thrust piece



- ♦ VW 771: Multi-purpose tool



39-35



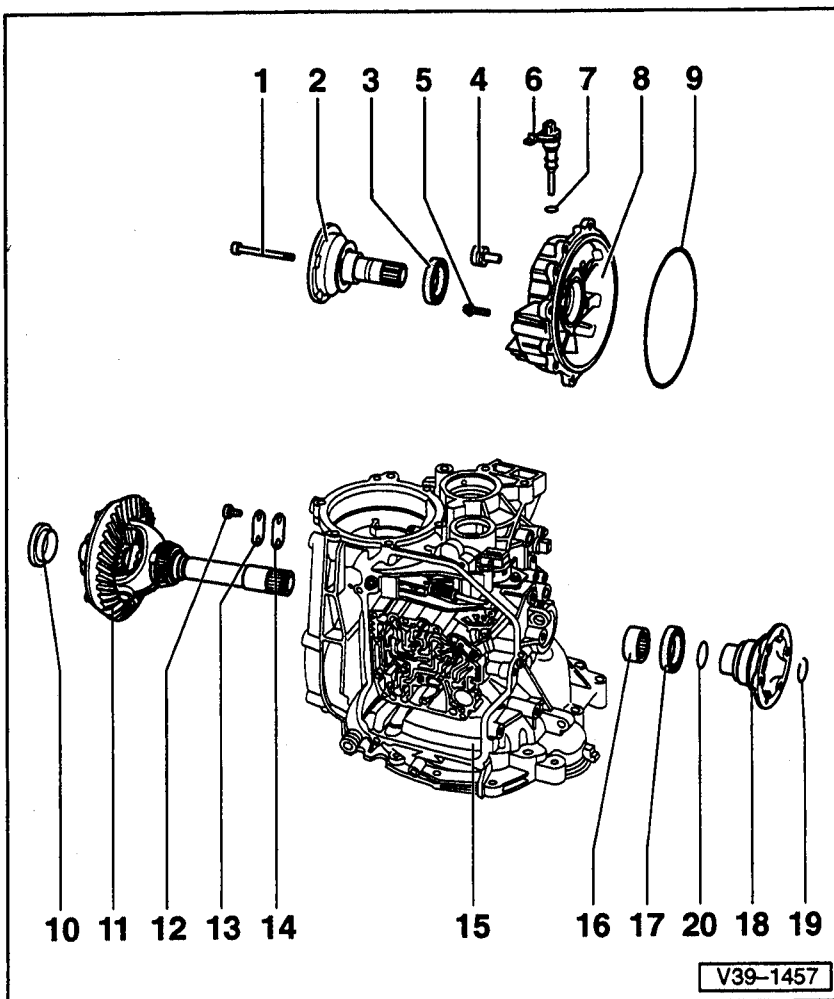
Notes:

- ♦ Removal and installation of differential do not necessitate taking out differential pinion.
- ♦ With the exception of the differential and the cover for the bleeder, all parts shown can be removed without taking out gearbox.
- ♦ If final drive unit and taper roller bearing are to be re-used following repair work, determine backlash ⇒ Page 39-94 and friction torque of differential ⇒ Page 39-93 before dismantling final drive and note down for friction torque check on completion of repairs.
- ♦ Sectional view ⇒ Page 39-55

1 - Bolt, 25 Nm

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39-36



2 - Flange shaft

- ♦ Removing and installing
⇒ Page 39-2 onwards

3 - Sealing ring for flange shaft

- ♦ Fill space between sealing lips with multi-purpose grease before fitting
- ♦ Can be replaced without taking out gearbox ⇒ Page 39-2
- ♦ Use VW 681 to remove
- ♦ Driving home ⇒ Page 39-4

4 - Oil filler plug, 25 Nm

- ♦ Checking axle oil with gearbox fitted ⇒ Page 39-1

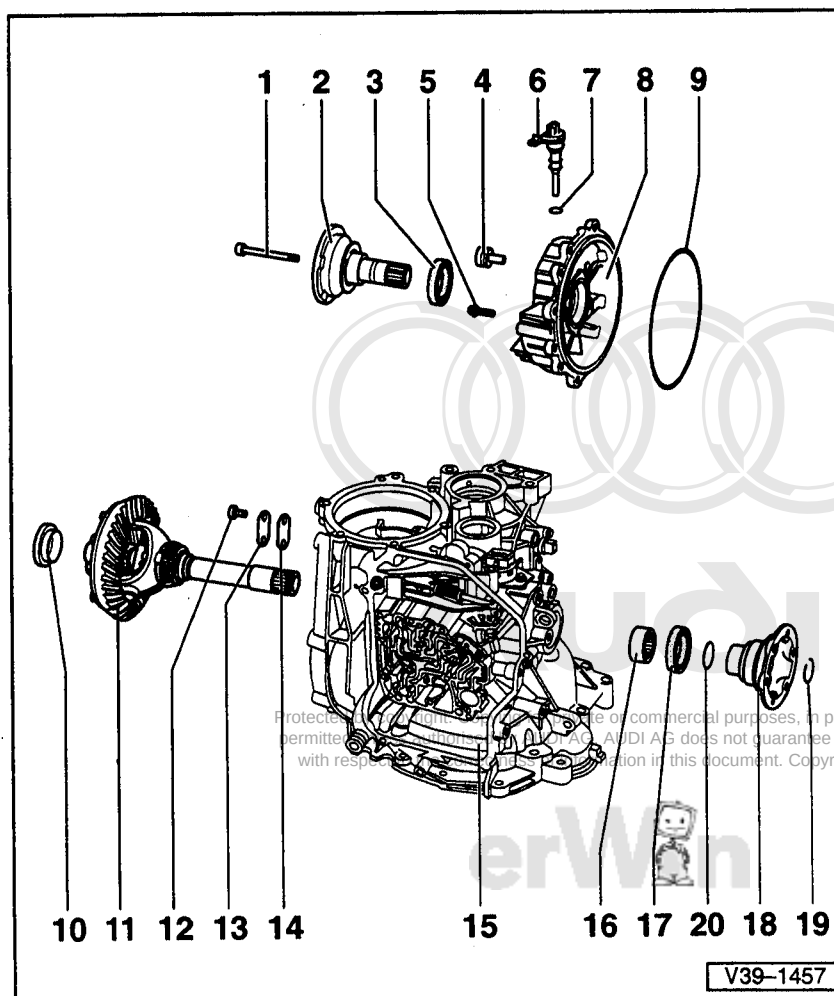
5 - Hexagon bolt, 25 Nm

- ♦ Tighten alternately and in stages

6 - Speedometer sender -G22

39-37

V39-1457



7 - O-ring

- ♦ Always replace

8 - Cover for differential

- ♦ Adjusting final drive gear on replacement ⇒ Page 39-86 onwards

9 - O-ring

- ♦ Always replace

10 - Drive gear for speedometer

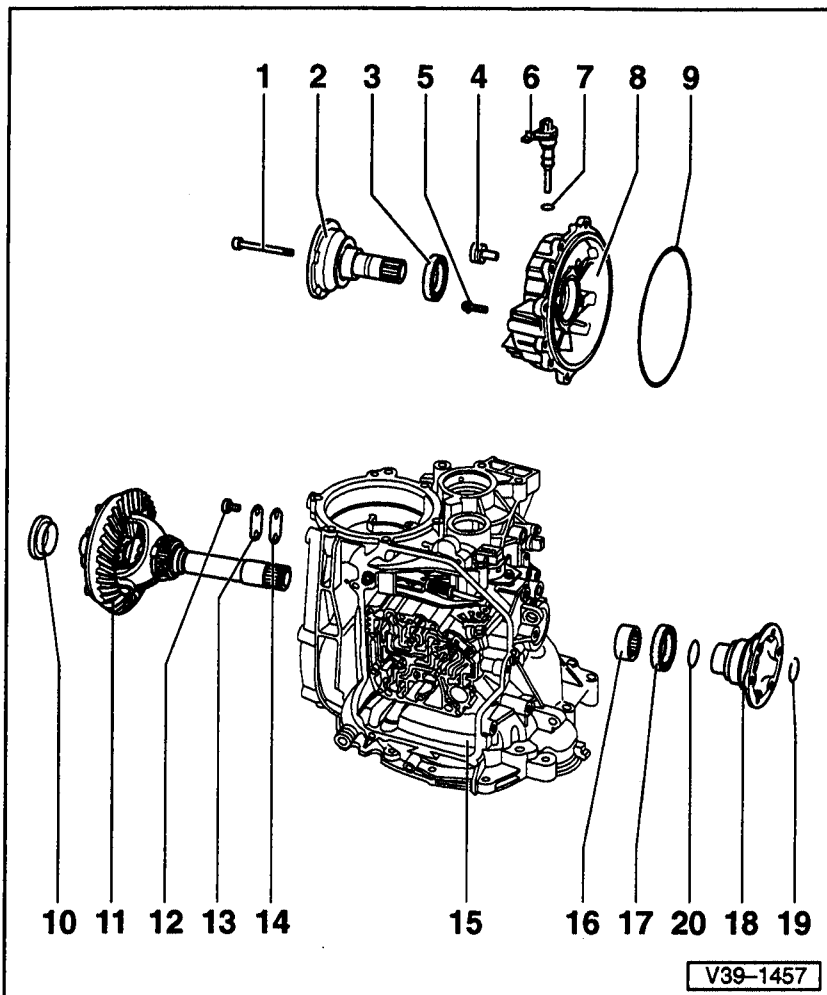
- ♦ Installation position: Lugs at inner periphery face flange shaft; taper faces differential

11 - Differential

- ♦ Dismantling and assembling
⇒ Page 39-42
- ♦ Always replace
- ♦ Adjusting final drive gear on replacement ⇒ Page 39-86 onwards

39-38

V39-1457



12 - Bolt, 10 Nm

13 - Cover
♦ For bleeder

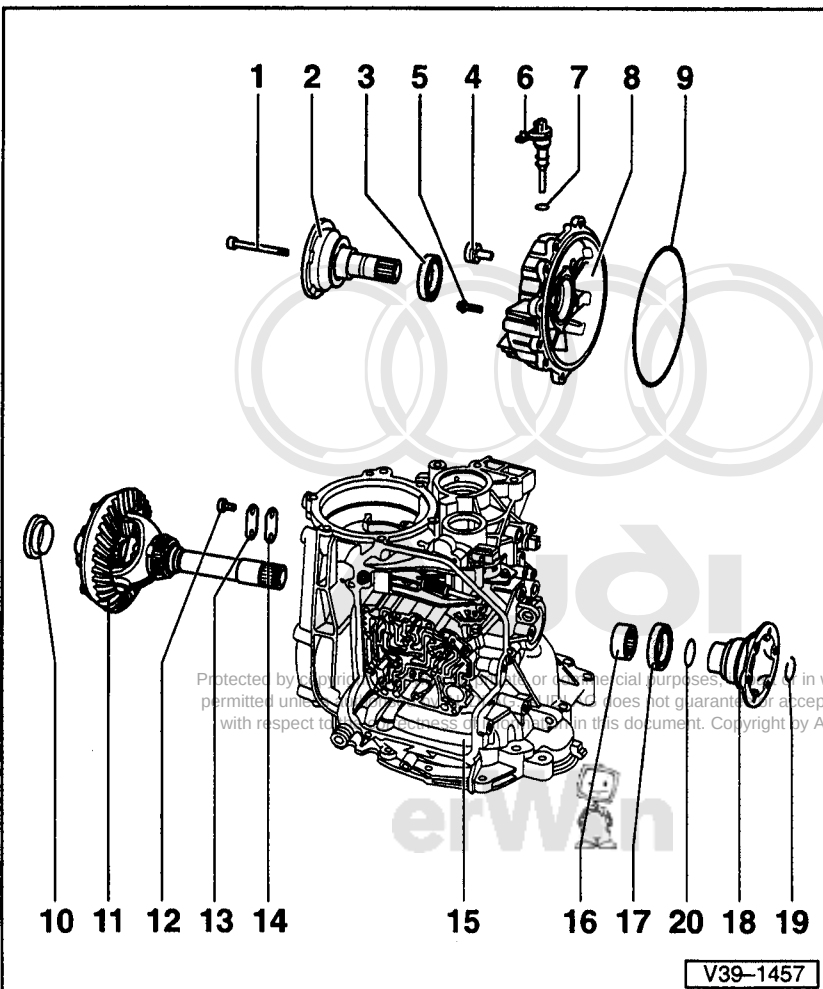
14 - Gasket
♦ Always replace

15 - Gear case

16 - Needle bearing
♦ Extracting
⇒ Fig. 1, Page 39-41
♦ Driving home
⇒ Fig. 2, Page 39-41

17 - Sealing ring for drive flange
♦ Fill space between sealing lips with multi-purpose grease before fitting
♦ Can be replaced without removing gearbox ⇒ Page 39-2
♦ Use VW 681 to remove
♦ Driving home ⇒ Page 39-8

39-39

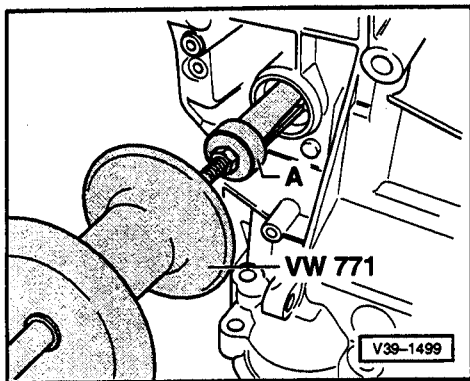


18 - Drive flange
♦ Removing and installing
⇒ Page 39-6 onwards

19 - Circlip

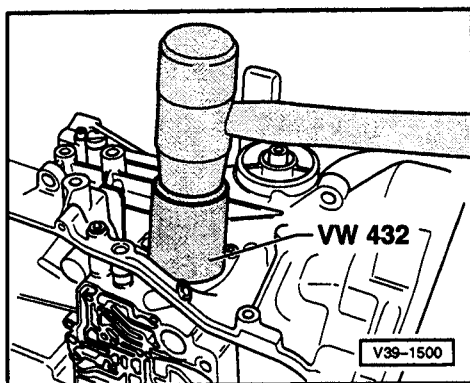
20 - O-ring
♦ Always replace
♦ Insert in drive flange

39-40



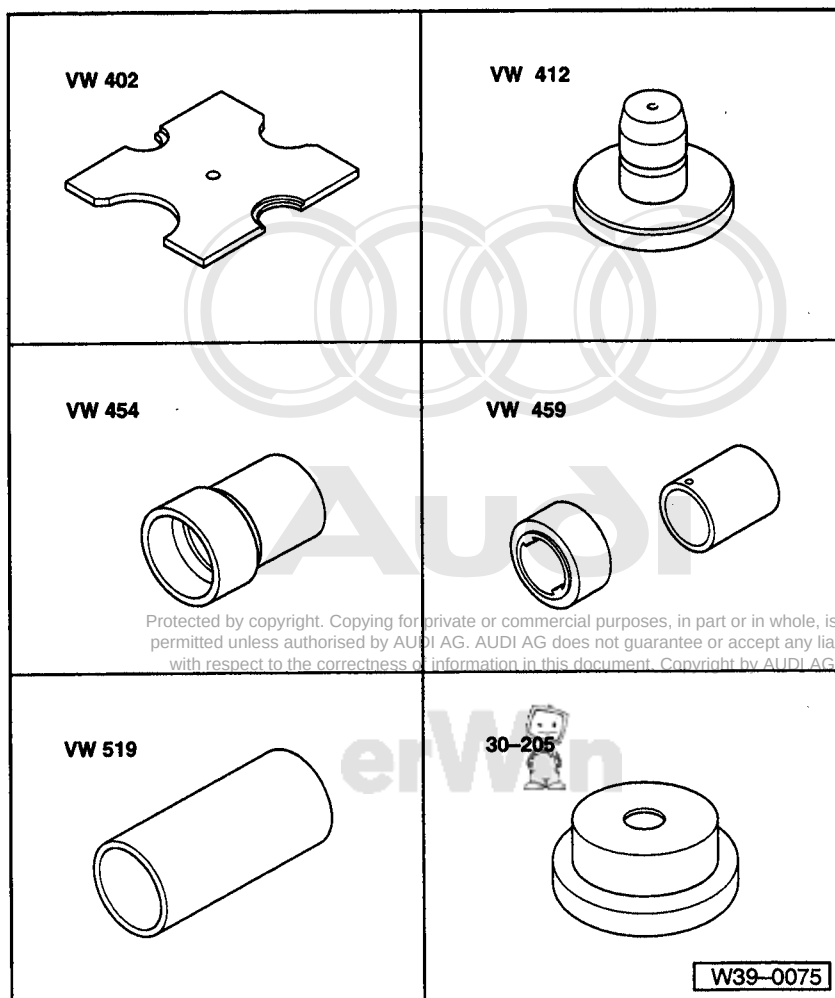
◀ Fig. 1 Extracting needle bearing

A - Extractor 18...23 mm, e.g. Kukko 21/3



◀ Fig. 2 Driving home needle bearing

39-41

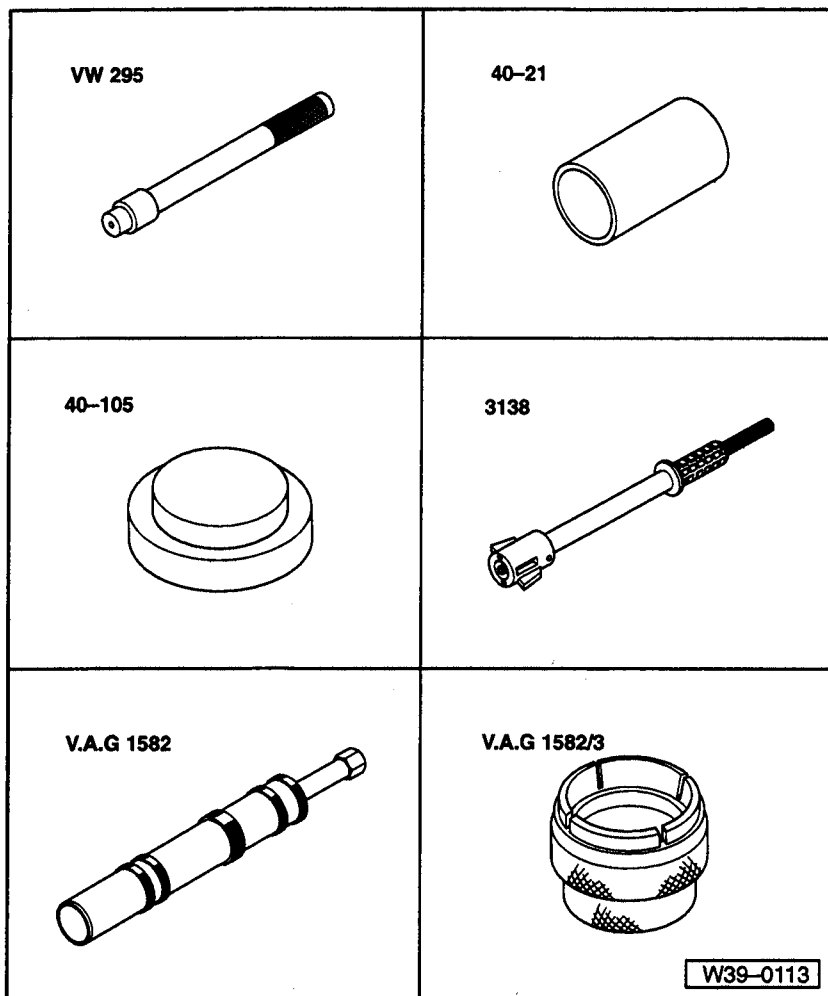


Dismantling and assembling differential

Special tools and workshop equipment required

- ♦ VW 402: Pressing plate
- ♦ VW 412: Punch
- ♦ VW 454: Thrust piece
- ♦ VW 459/2: Pressing-in and pressing-out tool
- ♦ VW 519: Tube
- ♦ 30-205: Pressing block

39-42



Special tools and workshop equipment required

- ◆ VW 295: Mandrel
- ◆ 40-105: Pressing block
- ◆ 3046: Fitting tool
- ◆ 3138: Drift
- ◆ V.A.G 1582: Taper roller bearing puller
- ◆ V.A.G 1582/3: Gripper

39-43

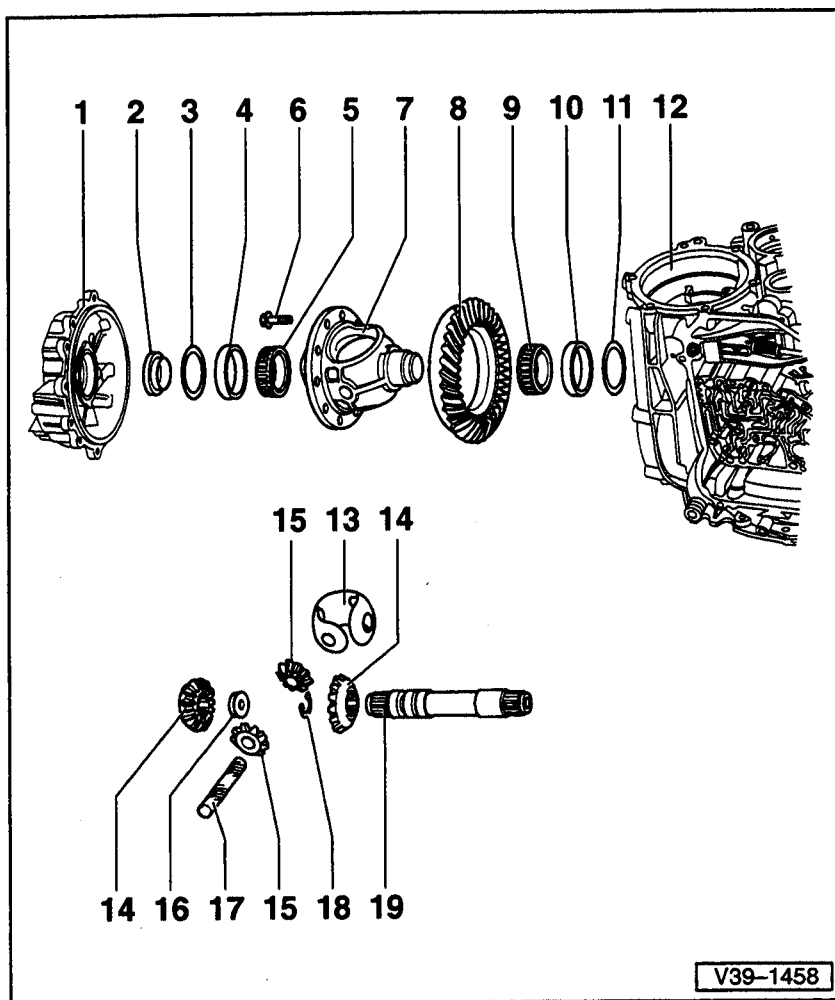
Notes:

- ◆ Differential pinion and final drive gear are only to be jointly replaced.
- ◆ If taper roller bearings of differential, differential housing or cover for final drive are replaced, shims "S1" and "S2" of differential must be re-measured ⇒ Page 39-86.
- ◆ Following replacement of final drive gear (in conjunction with differential pinion), shims "S1" and "S2" as well as shims "S3" and "S4" (for differential pinion) must be re-measured ⇒ Page 39-86/39-70.
- ◆ Always replace all taper roller bearings on a shaft and use same make for all.
- ◆ Take care not to interchange outer and inner races of bearings of equal size.

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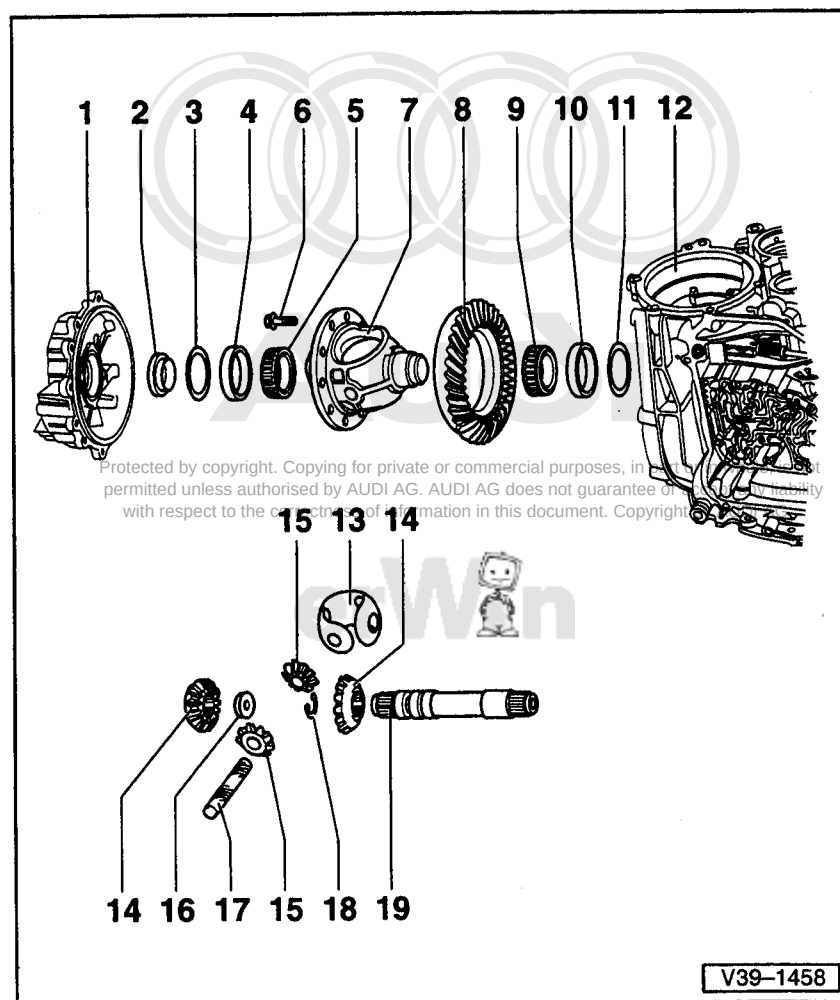


39-44



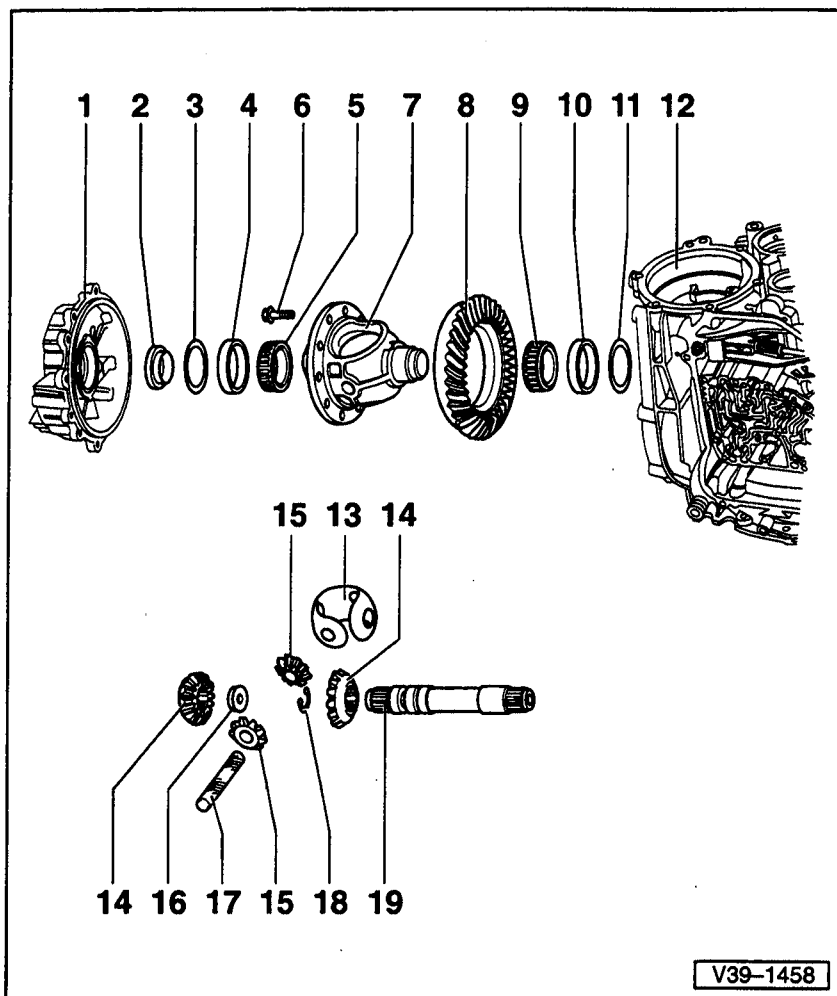
- 1 - Cover for differential**
 - ♦ Removing and installing ⇒ Page 39-35 onwards, removing and installing differential
- 2 - Speedometer drive gear**
 - ♦ Removing and installing ⇒ Page 39-35 onwards, removing and installing differential
- 3 - Shim S1**
 - ♦ Determining thickness ⇒ Adjusting final drive gear, Page 39-86
- 4 - Outer race/taper roller bearing**
 - ♦ Use drift 3138 to remove
 - ♦ Pressing in ⇒ Fig. 1, Page 39-49
- 5 - Inner race/taper roller bearing**
 - ♦ Pulling off ⇒ Fig. 2, Page 39-49
 - ♦ Pressing on ⇒ Fig. 3, Page 39-50

39-45



- 6 - Bolt, 90 Nm**
- 7 - Differential housing**
 - ♦ Re-measuring shims "S1" and "S2" for differential on replacement ⇒ Page 39-86 onwards
- 8 - Final drive gear**
 - ♦ Number of teeth ⇒ Page 00-3 onwards
 - ♦ Heat before fitting ⇒ Fig. 4, Page 39-51
 - ♦ Paired with differential pinion; replace jointly
 - ♦ Adjusting differential pinion and final drive gear on replacement ⇒ Page 39-68
 - ♦ Use mandrel to knock off from differential housing
 - ♦ Fitting ⇒ Fig. 4, Page 39-51
- 9 - Inner race/taper roller bearing**
 - ♦ Pulling off ⇒ Fig. 2, Page 39-49
 - ♦ Pressing on ⇒ Fig. 3, Page 39-50

39-46



10 - Outer race/taper roller bearing

- ♦ Knock out with mandrel
- ♦ Fitting ⇒ Fig. 5, Page 39-51

11 - Shim "S2"

- ♦ Determining thickness ⇒ Adjusting final drive gear, Page 39-86

12 - Gear case

13 - Thrust washer assembly

- ♦ Apply gear oil when fitting

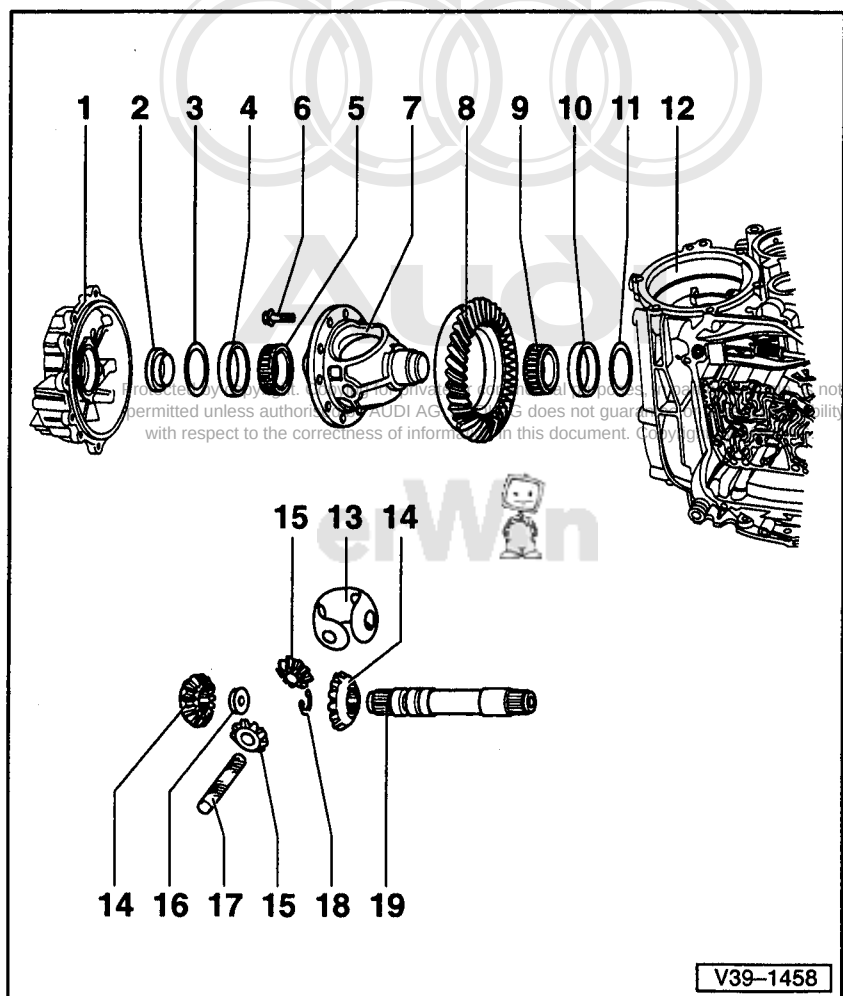
14 - Large bevel gear

- ♦ Removing and installing ⇒ Page 39-52 onwards

15 - Small bevel gear

- ♦ Removing and installing ⇒ Page 39-52 onwards

39-47



16 - Threaded element

- ♦ On assembly, insert lugs in large bevel gear
- ♦ Insert before fitting shaft for bevel gears

17 - Shaft for bevel gears

- ♦ Removing and installing ⇒ Page 39-52
- ♦ Check for wear and replace if necessary
- ♦ Take care not to damage thrust washer assembly when driving home

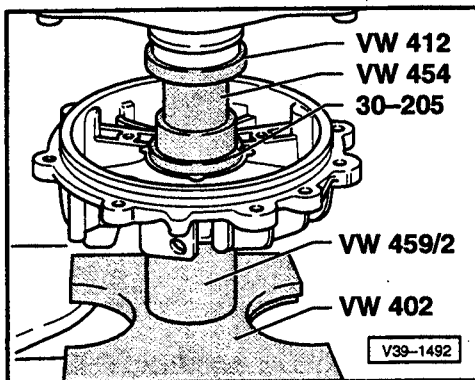
18 - Circlip

- ♦ For output shaft

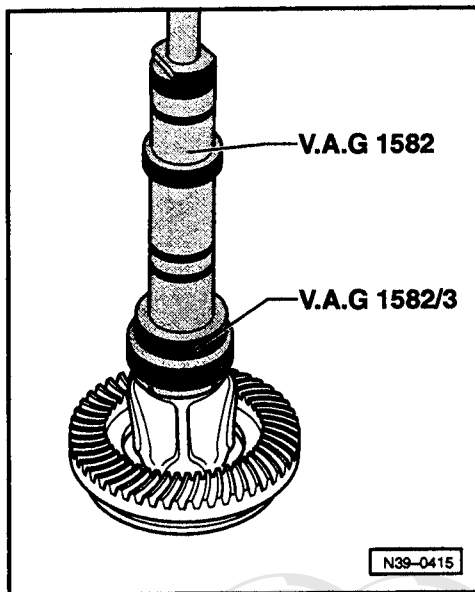
19 - Output shaft for drive flange

- ♦ Removing and installing ⇒ Page 39-52 onwards

39-48



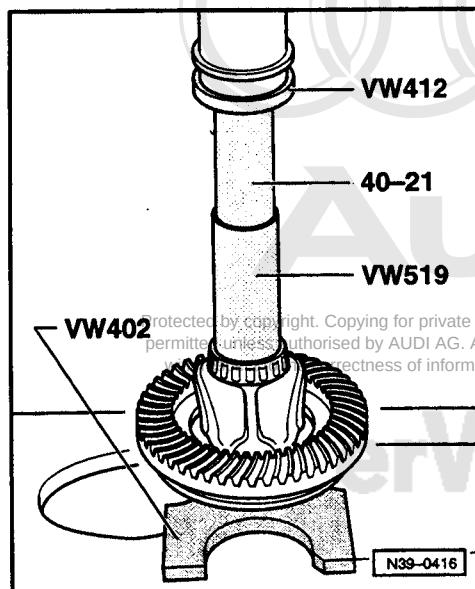
◀ Fig. 1 Pressing in outer race/taper roller bearing



◀ Fig. 2 Pulling off inner race/taper roller bearing

- Position thrust piece 40-105 on differential housing.

———— 39-49 ————



◀ Fig. 3 Pressing on inner race/taper roller bearing

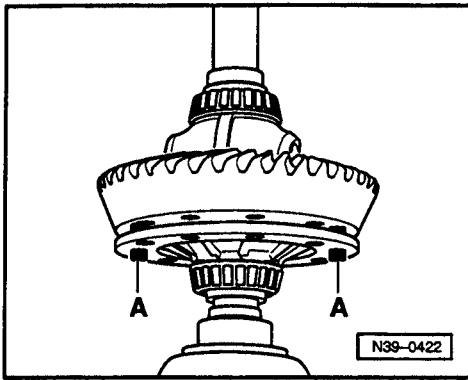
Attention:
Wear protective gloves.

- Heat inner race to approx. 100°C.

♦ Temperature can be checked with temperature measuring device V.A.G 1558.

- Press home inner race/taper roller bearing on differential housing.

———— 39-50 ————

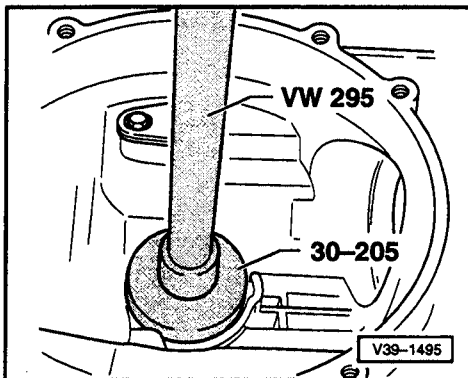


◀ Fig. 4 Fitting heated final drive gear

Attention:

Wear protective gloves.

- Heat final drive gear to approx. 100°C.
- ♦ Temperature can be checked with temperature measuring device V.A.G 1558.
- Position final drive gear over centring pins -A- (improvised) on differential housing.



◀ Fig. 5 Fitting outer race/taper roller bearing in housing

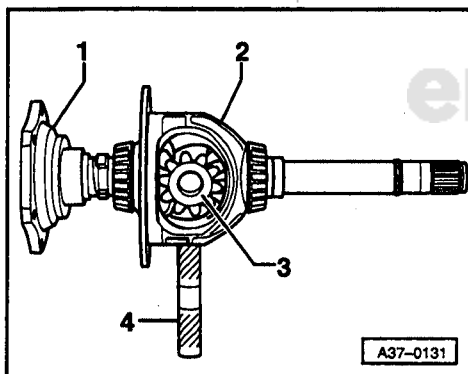
39-51

Removing and installing bevel gears

- Differential removed

Dismantling

Slacken off bolts at final drive gear and use mandrel to knock final drive gear off differential housing.

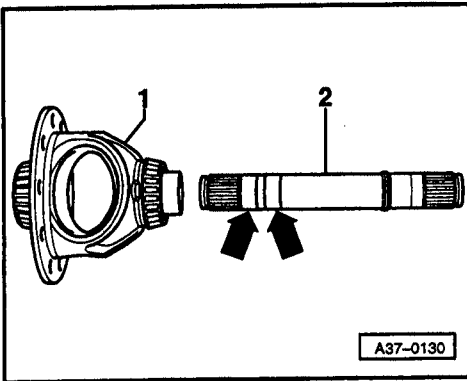


- ◀ Drive out shaft -4- for small bevel gears.
- ◀ Detach threaded element.

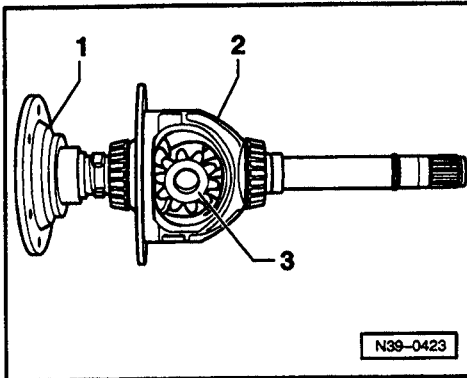
- Remove 3 bevel gears from differential housing.
- Take out circlip of output shaft for drive flange.
- Remove fourth bevel gear.
- Pull off output shaft for drive flange on right.
- Take thrust washer assembly out of differential housing.

39-52

Assembling

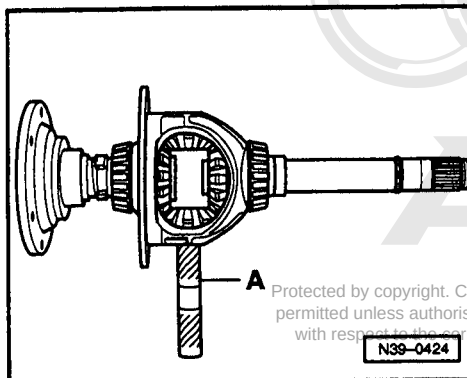


- Apply gear oil to thrust washer assembly and insert it in differential housing -1-.
- ◀ - Insert output shaft -2- in differential housing -1-.
- Pay attention to installation position: Side with two bearing seats -arrows- faces differential.
- Attach large bevel gear to output shaft -2- and secure in position on shaft with circlip.



- ◀ - Insert flange shaft -1- in differential housing -2- as assembly aid.
- Attach large bevel gear to left flange shaft with bolt and threaded element.
- Insert small bevel gears -3- offset by 180° and swivel in by turning at flange shaft.

———— 39-53 ————



- ◀ - Carefully drive home shaft -A- for small bevel gears. Make sure thrust washer assembly is correctly positioned.
- Fitting heated final drive gear ⇒ Page 39-51, Fig. 4.

Detach flange shaft from differential housing.

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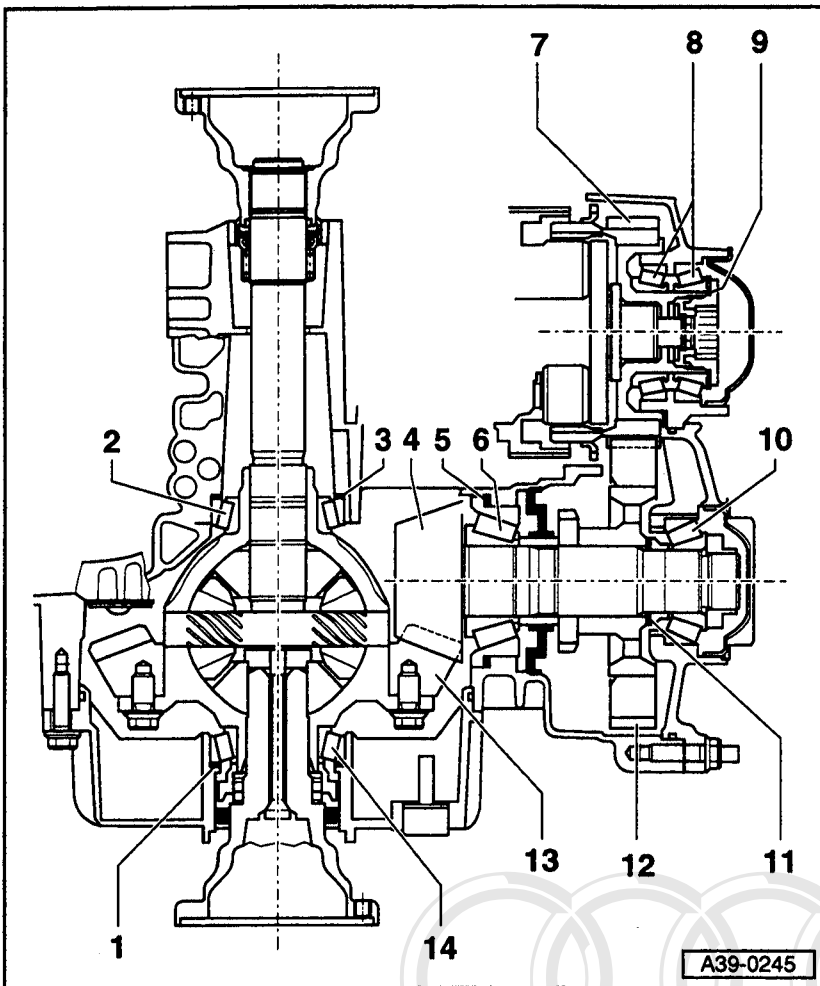
———— 39-54 ————

Adjusting final drive

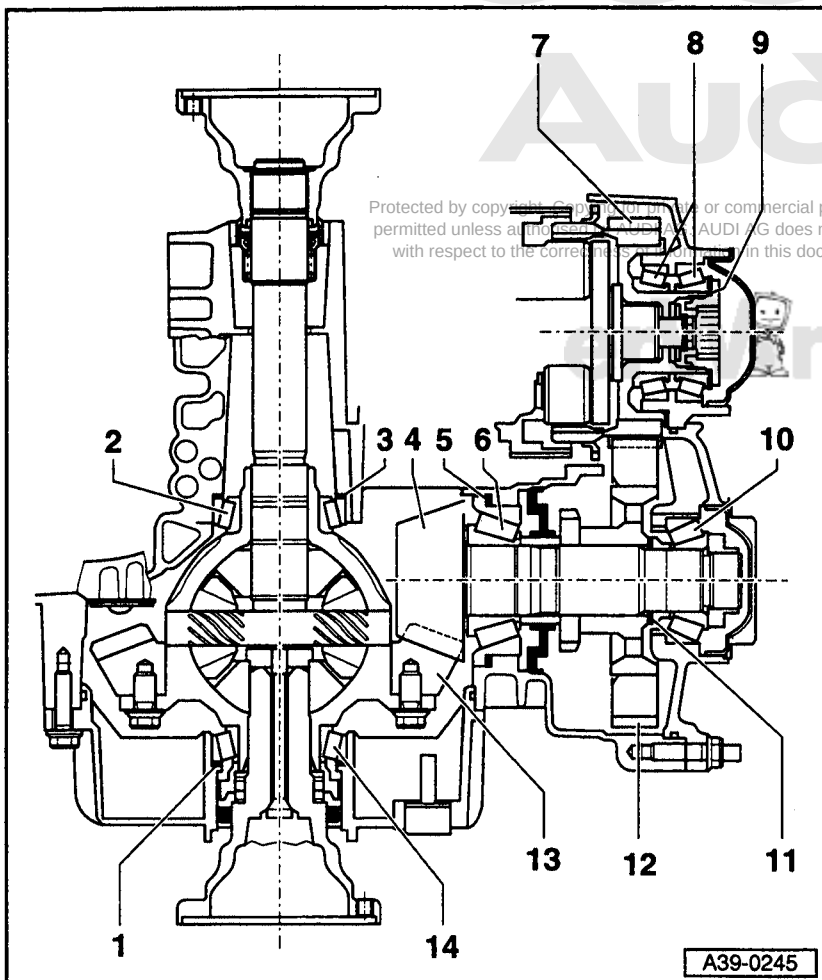
Exploded view

Notes:

- ◆ Adjustment list for replacement of individual gearbox components ⇒ Page 39-58.
- ◆ When fitting, coat all bearings with gear oil or ATF depending on which lubricant is used for the bearing concerned. Take particular care with lubrication for friction torque measurement.
- ◆ Take care not to interchange outer and inner races of bearings of equal size.
- ◆ Check shims for burr/damage. Only fit shims which are in perfect condition.
- ◆ Re-measure shims at several locations with a micrometer.

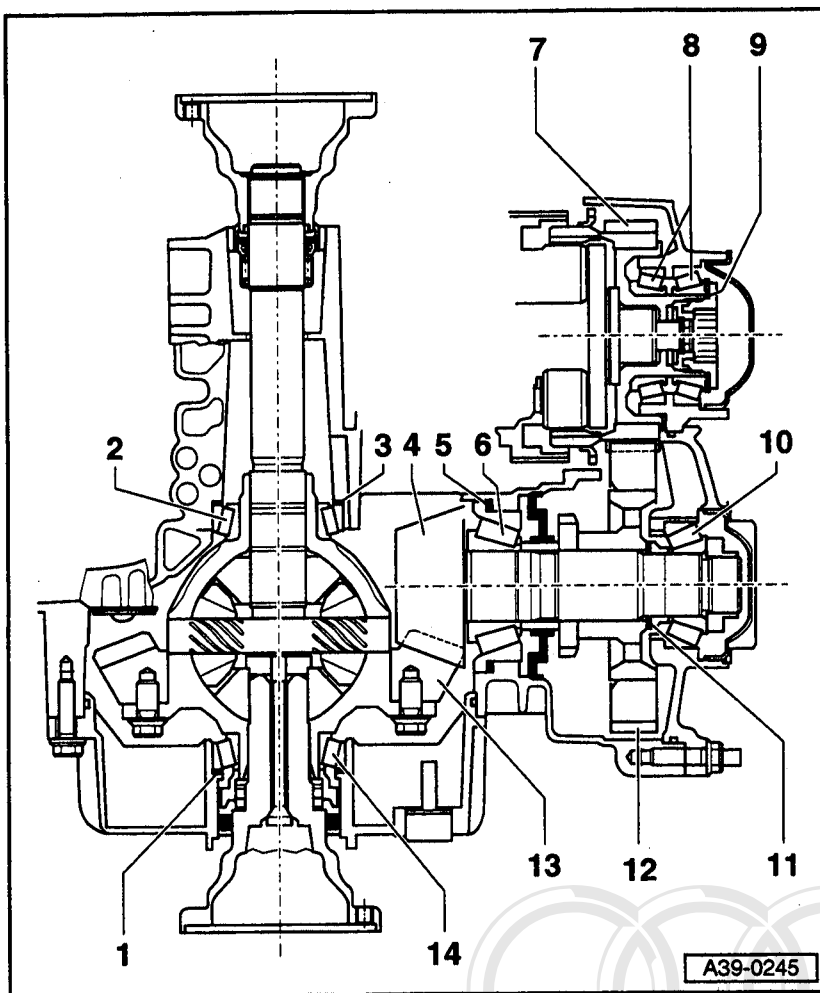


_____ 39-55 _____



- 1 - Shim "S1" for final drive gear
- 2 - Taper roller bearing for differential
- 3 - Shim "S2" for final drive gear
- 4 - Differential pinion
 - ◆ Only replace together with final drive gear
 - ◆ Adjusting differential pinion and final drive gear ⇒ Page 39-68
- 5 - Shim "S3" for differential pinion
- 6 - Large taper roller bearing for differential pinion
- 7 - Input gear
 - ◆ Only replace together with output gear
 - ◆ Adjusting ⇒ Page 39-59

_____ 39-56 _____



- 8 - Taper roller bearing for input gear
- 9 - Shim for input gear
- 10 - Small taper roller bearing for differential pinion
- 11 - Shim "S4" for differential pinion
- 12 - Output gear
 - ♦ Only replace together with input gear
- 13 - Final drive gear
 - ♦ Only replace together with differential pinion
 - ♦ Adjusting differential pinion and final drive gear ⇒ Page 39-68
- 14 - Taper roller bearing for differential

A39-0245

39-57

Adjustment work when replacing individual components

When performing assembly work on gearbox, re-adjustment of input gear, differential pinion with output gear or final drive gear with differential housing is only necessary if components are replaced which directly influence the setting of the final drive. Pay attention to the following table so as to avoid unnecessary adjustment work:

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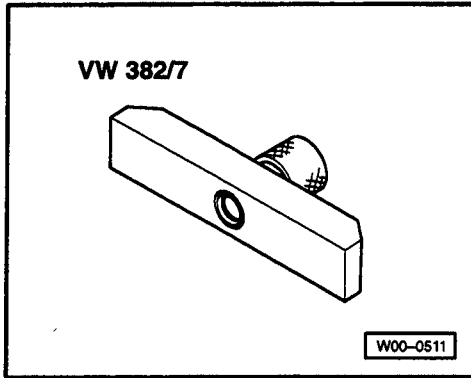
Component to be replaced:	Adjust:				
	Final drive gear "S1" + "S2" ⇒ Page 39-68 onwards	Final drive gear "S1" ⇒ Page 39-68 onwards	Differential pinion "S3" + "S4" ⇒ Page 39-68 onwards	Differential pinion "S4" ⇒ Page 39-68 onwards	Input gear adjustment ¹⁾ ⇒ Page 39-59
Gear case	X		X		X
Taper roller bearing for input gear					X
Input gear, output gear (joint replacement only)				X	X
Differential pinion, final drive gear (joint replacement only)	X		X		
Differential housing without final drive gear	X				
Taper roller bearing for differential pinion			X		
Taper roller bearing for differential	X				
Cover for final drive		X			
Cover for differential pinion, bushing for differential pinion, parking lock gear, spacer				X	

¹⁾ If input gear is re-adjusted, re-adjust planet carrier and clutch play between K1 and K2.

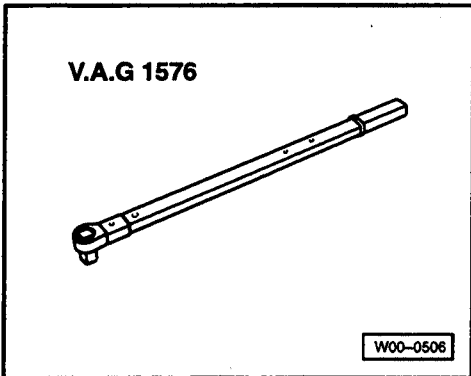
Adjusting input gear

Special tools and workshop equipment required

- ♦ VW 382/7: Bridge from measurement tool



- ♦ V.A.G 1576: Torque wrench



39-59

- Planetary gearbox removed

Note:

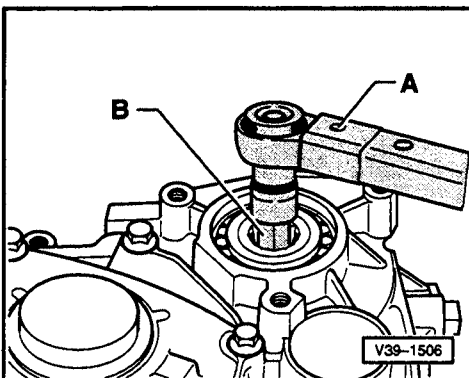
Before and after dismantling input gear, measure friction torque at nut of differential pinion ⇒ Note down values, as they are required for checking friction torque on assembly.

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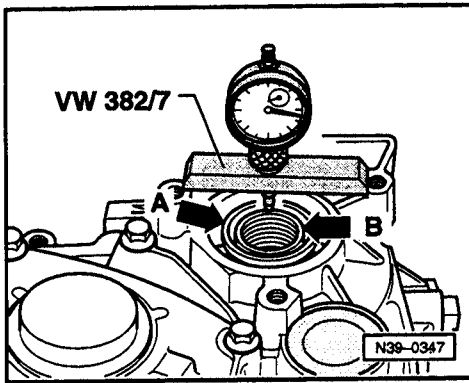
- Start by inserting inner race without locking compound.
- Fitting outer races for both taper roller bearings with locking compound AMV 185 101 A1 ⇒ Page 39-15, item 5 and item 8.
- Fit input gear with inner race of inner taper roller bearing.
- Engage parking lock.
- Tighten tensioning bolt without dished washer and shim to 100 Nm.

A - Torque wrench
B - 22 mm socket

- Remove tensioning bolt.



39-60



- Fit dial gauge and set to "0" with 3 mm preload.
- ◀ - Read off gap between input gear -B- and inner race -A- of taper roller bearing from dial gauge and note down measured value.
- Measured value in example below: 1.00 mm

Determining shim

- Add thickness of dished washer to gap measured and subtract bearing preload. This gives the specified bearing preload.

Example:

Measured value	1.00 mm
+ Dished washer	1.50 mm
- Bearing preload	0.18 mm
= Thickness of shim	2.32 mm

39-61

- Determine shim as per table and attach to drive shaft. Shim table ⇒ Page 39-63.
- Fit axial needle bearing for drive shaft.
- Installation position of bearing ⇒ Removing and installing input gear, Page 39-11.
- Insert dished washer. Installation position: Curved side faces tensioning bolt.
- Tighten tensioning bolt to 250 Nm.

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39-62

"Shim" table for input gear

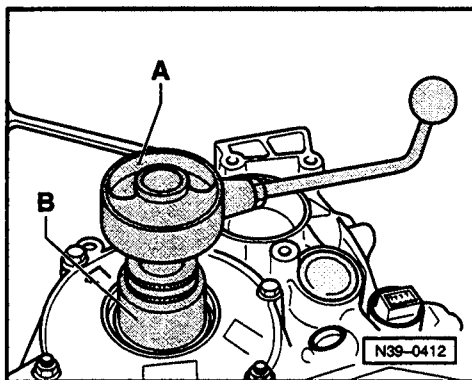
Measured thickness (mm)	Shim to be fitted (mm)	Measured thickness (mm)	Shim to be fitted (mm)	Measured thickness (mm)	Shim to be fitted (mm)
1.575 ... 1.599	1.600	1.900 ... 1.924	1.925	2.225 ... 2.249	2.250
1.600 ... 1.624	1.625	1.925 ... 1.949	1.950	2.250 ... 2.274	2.275
1.625 ... 1.649	1.650	1.950 ... 1.974	1.975	2.275 ... 2.299	2.300
1.650 ... 1.674	1.675	1.975 ... 1.999	2.000	2.300 ... 2.324	2.325
1.675 ... 1.699	1.700	2.000 ... 2.024	2.025	2.325 ... 2.349	2.350
1.700 ... 1.724	1.725	2.025 ... 2.049	2.050	2.350 ... 2.374	2.375
1.725 ... 1.749	1.750	2.050 ... 2.074	2.075	2.375 ... 2.399	2.400
1.750 ... 1.774	1.775	2.075 ... 2.099	2.100	2.400 ... 2.424	2.425
1.775 ... 1.779	1.800	2.100 ... 2.124	2.125	2.425 ... 2.449	2.450
1.800 ... 1.824	1.825	2.125 ... 2.149	2.150	2.450 ... 2.474	2.475
1.825 ... 1.849	1.850	2.150 ... 2.174	2.175	2.475 ... 2.499	2.500
1.850 ... 1.874	1.875	2.175 ... 2.199	2.200	2.500 ... 2.524	2.525
1.875 ... 1.899	1.900	2.200 ... 2.224	2.225	2.525 ... 2.549	2.550

Different tolerances permit precise measurement of the required shim thickness.

Part number:

⇒ Parts list

39-63



◀ Checking friction torque

- Planetary gearbox removed; differential installed

A – Commercially available torque gauge 0...600 Ncm

B – Wrench socket (41 mm)

- Take friction torque reading. With input gear fitted, reading must be 145...245 Ncm higher than without input gear.

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Friction torque for differential,
differential pinion and input gear 415 Ncm

– Friction torque for differential and
differential pinion (input gear
removed) 210 Ncm

= Friction torque for input gear 205 Ncm

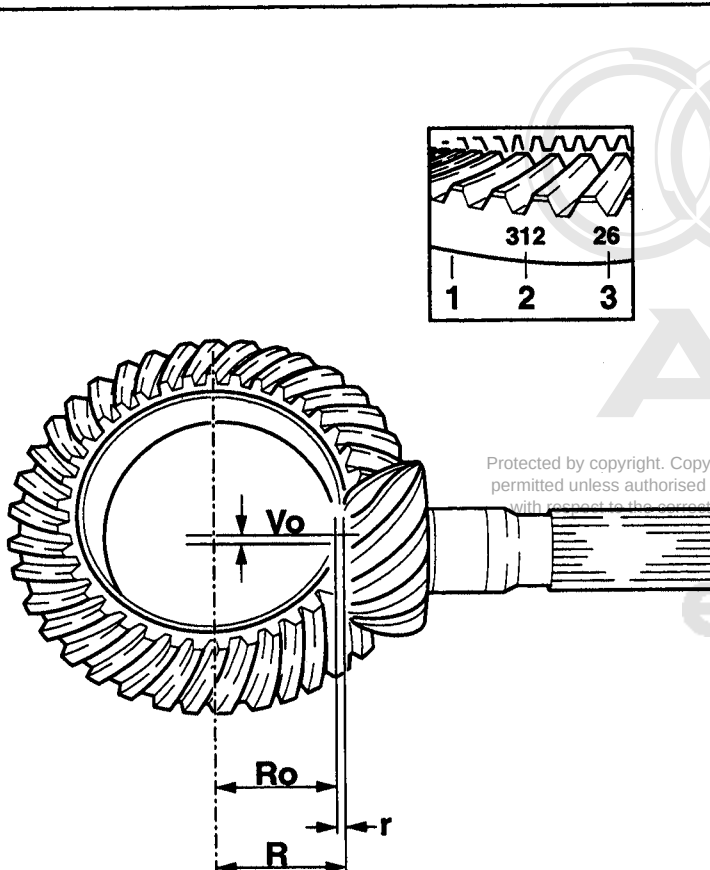
Note:

Friction torque measured prior to dismantling must be re-established for used bearings. An up to 80 Ncm higher friction torque is however permitted.

39-64

- Remove tensioning bolt.
- Remove input gear again $\Rightarrow$ Page 39-11.
- Insert inner race of outer taper roller bearing with locking compound AMV 185 101 A1.
- Attach shim to input gear.
- Fit axial needle bearing for drive shaft. Installation position: Flat side faces input gear.
- Insert dished washer. Installation position: Curved side faces tensioning bolt.
- Tighten tensioning bolt to 250 Nm.

39-65



Adjusting and labelling final drive units

1 - Marking "1143" indicates Oerlikon final drive unit with a ratio of 43:11

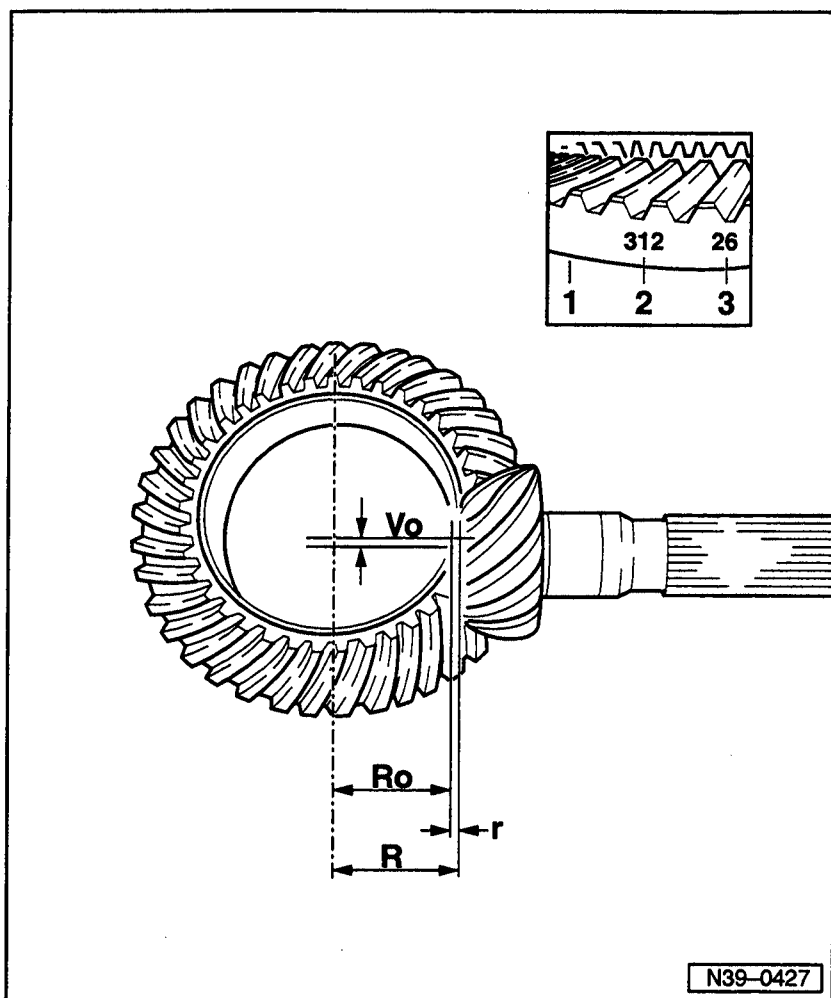
2 - Pairing number (312) of final drive unit

3 - Deviation "r" from master gauge of special test machine used in production; "r" is always given in 1/100 mm (example: "26" signifies $r = 0.26$ mm)

Ro - Length of master gauge used in special testing machine "Ro" = 59.20 mm

N39-0427

39-66



R - Actual dimension between final drive gear shaft and end face of differential pinion at quietest running point for final drive unit concerned

Vo - Hypoid offset

N39-0427

39-67

Adjusting differential pinion and final drive gear

General

- ♦ If only final drive is dismantled and re-assembled using the same components, it is merely necessary to check friction torque and backlash.
- ♦ Service life and smooth operation of the final drive are essentially governed by careful adjustment of differential pinion and final drive gear. These two components are checked at the manufacturing stage for proper contact pattern and low noise in both directions of rotation. The position providing the smoothest running is established by axially shifting the differential pinion with the final drive gear being constantly kept out of no-play meshing to the extent required to ensure that the backlash is within the specified tolerance.
- ♦ The aim of the adjustment process is to re-attain the position providing the smoothest running as determined on the test machine in the production phase. Absolute care and cleanliness must be maintained during all assembly operations and measurement procedures if correct results are to be obtained.
- ♦ The deviation "r" referenced to the master gauge "Ro" is measured for the replacement final drive units and marked on the outer periphery of the final drive gear. Final drive units (= differential pinion and final drive gear) are only to be replaced as a complete assembly.

39-68

Final drive unit adjustment sequence

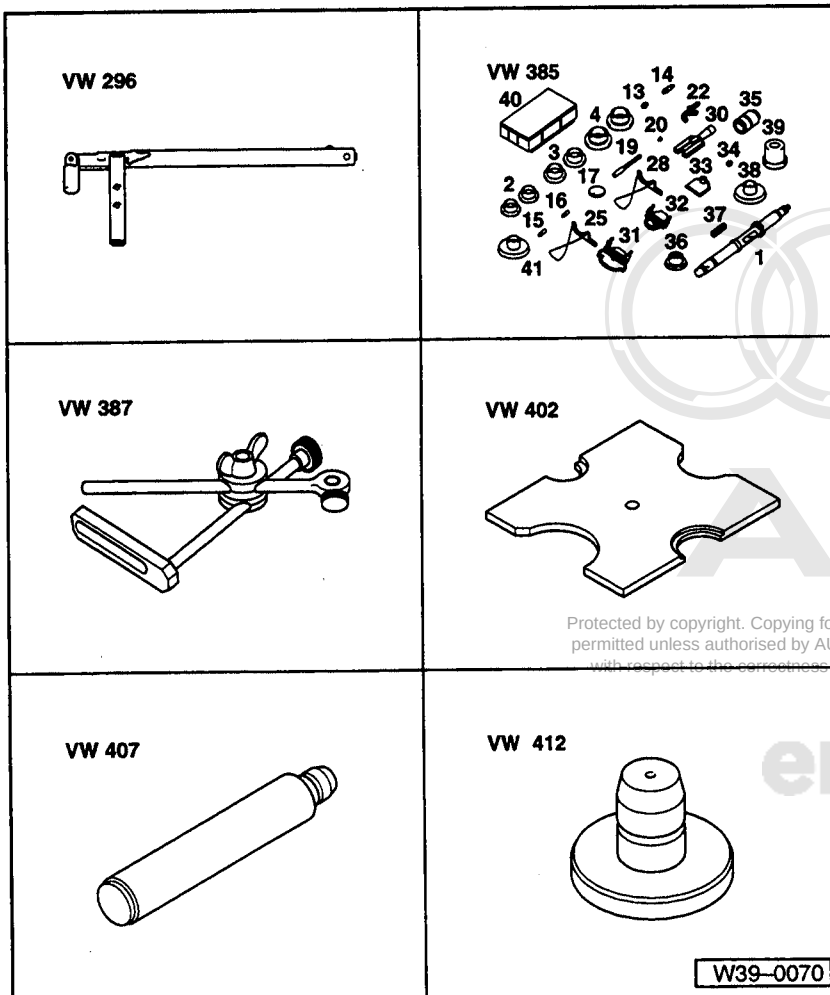
If differential pinion and final drive gear have to be adjusted, it is appropriate to adhere to the following sequence in the interests of rational working:

- 1.) Establish total shim thickness " S_{tot} " for "S1" + "S2" (adjust preload of taper roller bearings for differential) $\Rightarrow$ Page 39-89 onwards.
- 2.) Establish total shim thickness " S_{tot} " for "S3" + "S4" (preload of taper roller bearings for differential pinion) $\Rightarrow$ Page 39-73 onwards.
- 3.) Divide up total shim thickness " S_{tot} " for "S3" + "S4" such that dimension between centre of final drive gear and end face of differential pinion corresponds to installation dimension "R" determined during production $\Rightarrow$ Page 39-82 onwards.
- 4.) Divide up total shim thickness " S_{tot} " for "S1" + "S2" so as to produce the specified backlash between final drive gear and differential pinion $\Rightarrow$ Page 39-97 onwards.

Note:

List of components and shims $\Rightarrow$ Page 39-55.

39-69

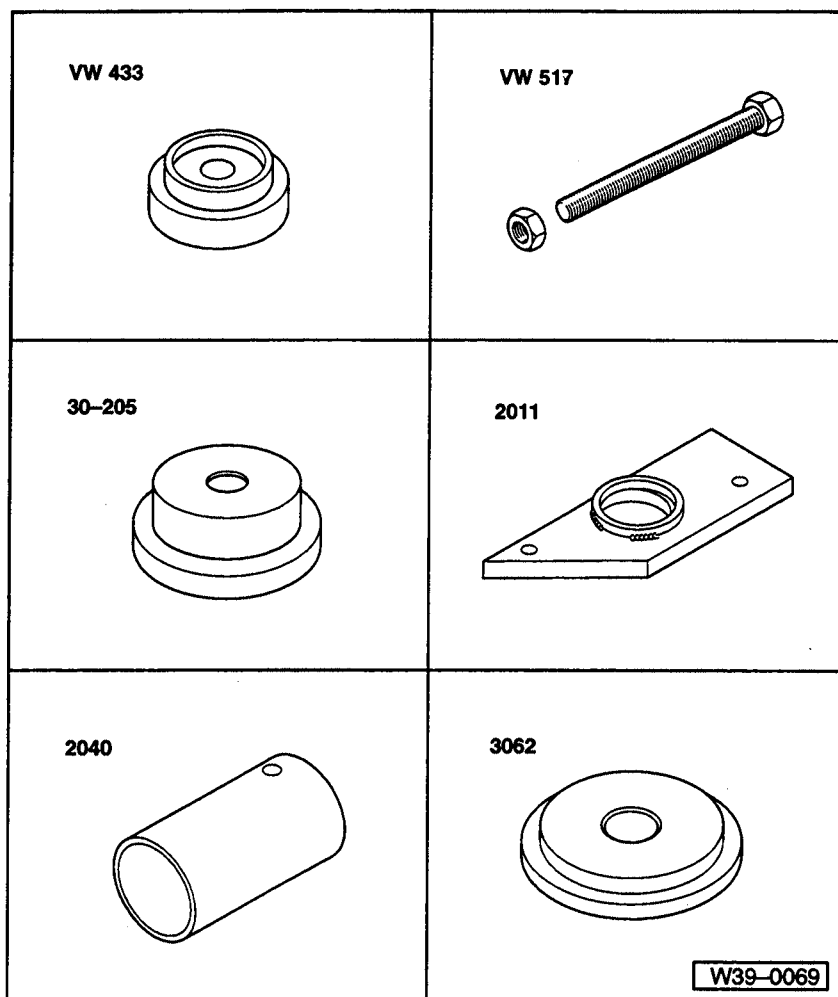


Adjusting differential pinion

Special tools and workshop equipment required

- ◆ VW 296: Pressing-out lever for gear set
- ◆ VW 385: Universal measuring tool
- ◆ VW 387: Universal dial gauge holder
- ◆ VW 402: Pressing plate
- ◆ VW 407: Punch
- ◆ VW 412: Punch

39-70



Special tools and workshop equipment required

- ◆ VW 433: Thrust piece
- ◆ VW 517: Threaded stem
- ◆ 30-205: Pressing block
- ◆ 2011: Support bridge
- ◆ 3110: Tube
- ◆ 3062: Pressing disc

————— 39-71 —————

The differential pinion has to be re-adjusted on replacement of

- ◆ Gear case
- ◆ Taper roller bearing for differential pinion

Or

- ◆ Final drive unit

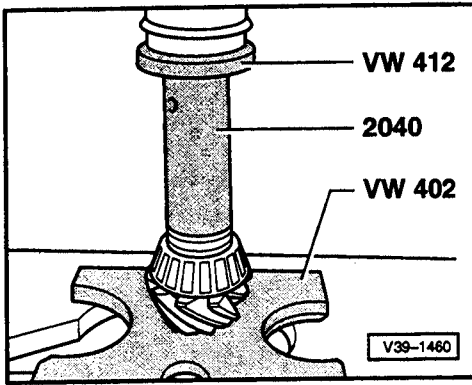
If bushing for differential pinion, parking lock gear, output gear, spacer or cover for differential pinion is replaced, it is only necessary to re-determine shim "S4".

Adjustment list ⇒ Page 39-58.

Notes:

- ◆ If old bearings are to be re-used after dismantling differential pinion, friction torque of old bearings is to be established before dismantling ⇒ Page 39-79.
- ◆ Original friction torque must be re-established for old bearings following assembly. Up to 80 Ncm higher friction torque is however permitted.
- ◆ Friction torque need not be determined if use is made of new bearings. A new friction torque then applies ⇒ Page 39-79.

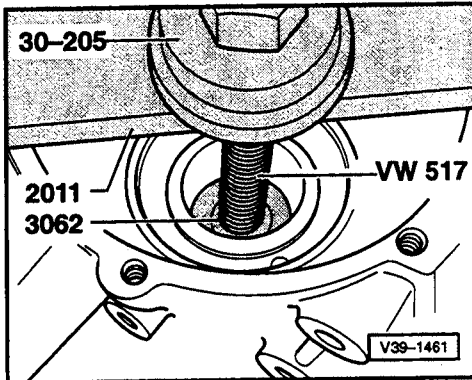
————— 39-72 —————



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

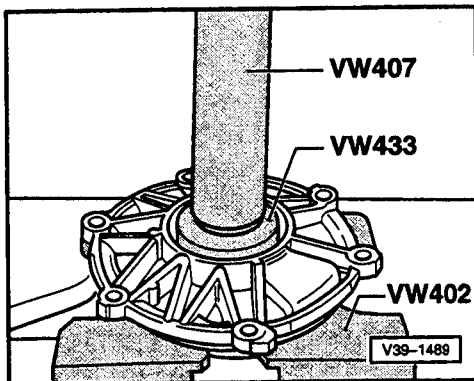
(Adjusting preload of taper roller bearings for differential pinion)

- ◀ - Press on inner race for taper roller bearing with bushing for differential pinion.

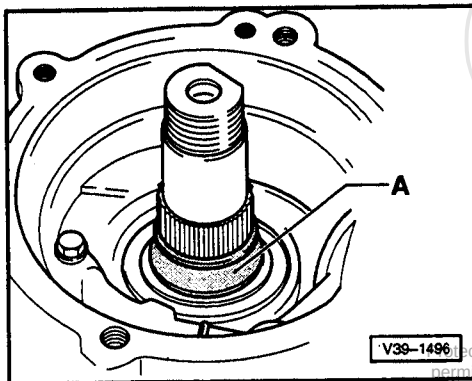


- ◀ - Fit outer race for taper roller bearing with shim "S3" (1.50 mm thick) in gear case.

39-73



- ◀ - Press outer race for taper roller bearing into cover for differential pinion.



- ◀ - Insert differential pinion in gear case.

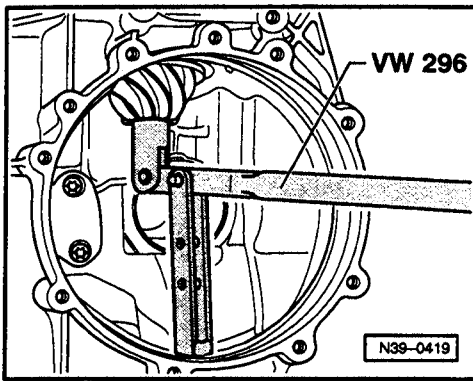
A - Assembly sleeve 3187

Use is to be made of assembly sleeve 3187 when inserting differential pinion so as not to damage sealing lips.

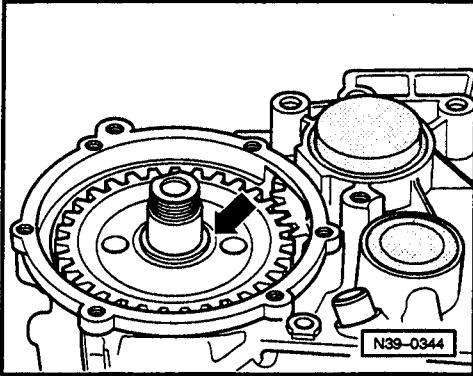
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39-74



- – Press differential pinion with pressing-out lever VW 296 against outer race/taper roller bearing in gear case and hold in this position.

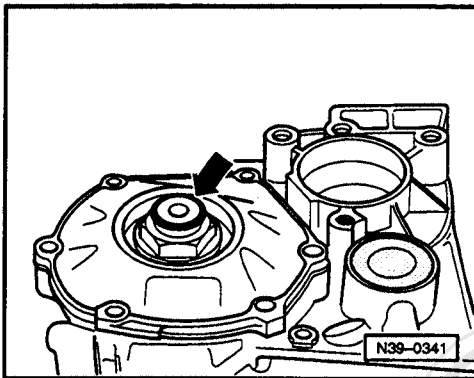


- – Fit parking lock gear, output gear and 2.40 mm thick shim "S4" -arrow- (use 2 x 1.20 mm shims).
- Fit spacer.

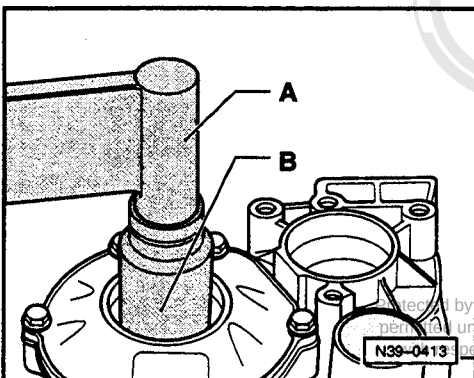
Note:

Installation position of parking lock gear, output gear and spacer ⇒ Page 39-28 onwards.

———— 39-75 ————



- Fit cover for differential pinion.
- – Insert inner race for taper roller bearing and screw hexagon nut -arrow- onto differential pinion.
- Tighten 4 bolts of cover for differential pinion to 25 Nm.
- Engage parking lock.



- – Pretighten hexagon nut to 340 Nm.

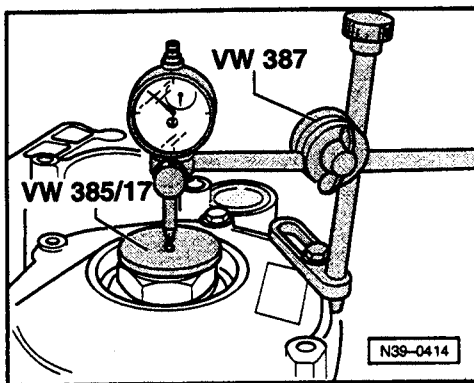
A - Torque wrench

B - Wrench socket (41 mm)

- Slacken off hexagon nut and tighten to 240 Nm.



———— 39-76 ————



- ◀ – Attach dial gauge holder VW 387 to cover for differential pinion; position gauge plate VW 385/17 on differential pinion.
- Fit dial gauge and set to "0" with 1 mm preload.
- Move differential pinion up and down several times without turning it.

Note:

Do not turn differential pinion, as otherwise measurement result would be biased.

- Read axial play off dial gauge and note down value.
- Measured value in example below: 0.95 mm

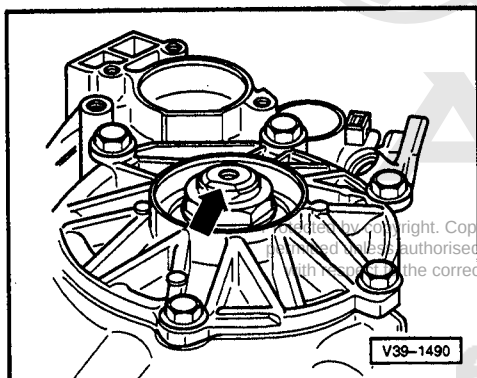
39-77

- Subtract measured value, bearing preload and settling level from shim "S4" fitted.

Example:

Shim "S4" fitted	2.40 mm
– Measured value	0.95 mm
– Bearing preload and settling level	0.25 mm
= Thickness of shim "S4" to be fitted	1.20 mm

- Remove cover for differential pinion, spacer and 2.40 mm shim.
- Fit shim of calculated thickness (1.20 mm in example). Shim table for "S4" ⇒ Page 39-84.



- ◀ – Fit cover for differential pinion. Pretighten hexagon nut to 340 Nm, slacken off, tighten to 240 Nm and secure -arrow- with mandrel.

39-78

Measuring friction torque (check)

Notes:

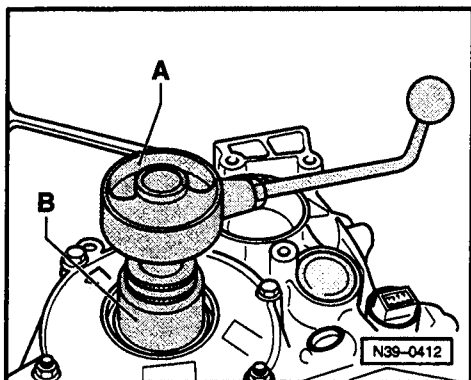
- ♦ If friction torque of differential pinion is to be measured with planetary gearbox and input gear fitted, then output gear must be removed.
- ♦ Fit pressed-out bushing of defective output gear in place of output gear. Measure thickness of bushing and offset any difference with respect to output gear removed by means of shims "S4" ⇒ Table, Page 39-84.

- Input gear and differential removed

- ◀ - Apply 41 mm wrench socket -A- and torque gauge 0...600 Ncm -B- to nut of differential pinion.
- Take friction torque reading. For new taper roller bearings, specified value is 80...220 Ncm.

Note:

Total friction torque measured before dismantling must be re-established for used bearings. An up to 80 Ncm higher friction torque is however permitted.



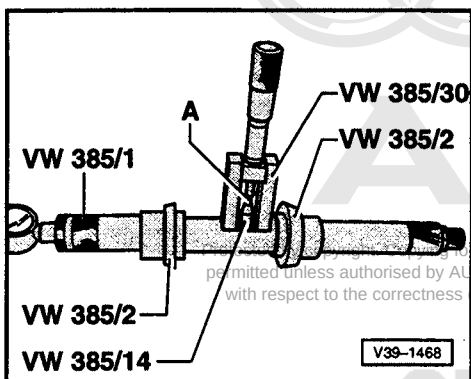
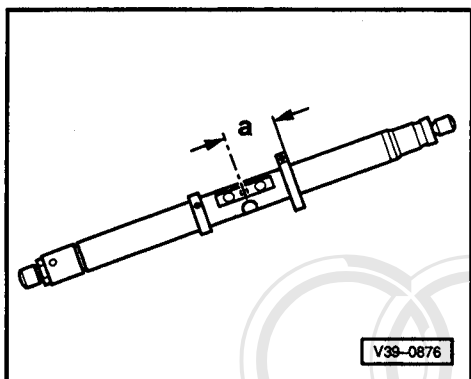
39-79

Determining dimension "e"

Note:

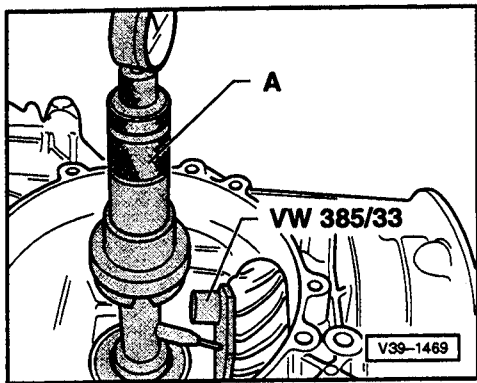
Dimension "e" is required for determining ultimate shim thickness of "S3" and "S4".

- ◀ - Set adjuster of universal test bar VW 385/1 to dimension a = 70 mm.



- ◀ - Set up universal test bar as shown.
A - Dial gauge extension VW 385/16 = 12.3 mm long
- Set universal master gauge VW 385/30 to $R_0 = 59.2$ mm.
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.

39-80

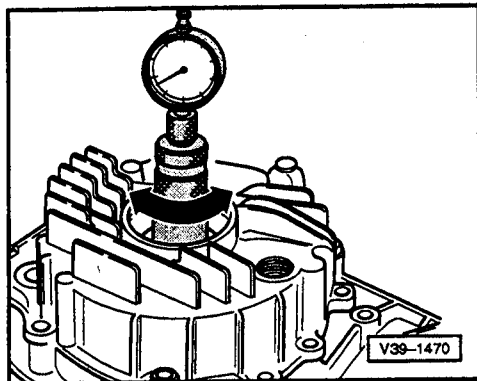


- ◀ – Place gauge plate on end of differential pinion.

Note:

Ensure plate makes accurate oil-free contact.

- Insert universal test bar -A-.
- Fit differential cover and alternately tighten the four bolts.
- Pull 2nd centring collar outwards via movable adjuster such that test bar can still just be turned by hand.



- ◀ – Turn test bar until dial gauge tip makes contact with gauge plate at end of differential pinion and indicates max. deflection (reversal point).

- Measured value in example below: "e" = 0.32 mm (red number band)

Note:

Then - after removing universal test bar - check again to see whether dial gauge is set to "0" with 2 mm preload and master gauge VW 385/30 in position. If not, correct adjustment.

39-81

Determining thickness of shim "S3"

Example:

- Add measured value "e" to thickness of shim "S3" already fitted and subtract deviation "r" (indicated on final drive gear).

Notes:

- ♦ The deviation "r" referenced to the master gauge "Ro" is measured for the replacement final drive units and marked on the outer periphery of the final drive gear.
- ♦ If measurement is in red number band, measured value "e" must be added.
- ♦ If measurement is in black number band, measured value "e" must be subtracted.

Shim "S3" fitted	1.50 mm
+ Value "e" determined	0.32 mm
Deviation "r"	0.26 mm
= Thickness of shim "S3"	1.56 mm

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- Determine shim(s) as accurately as possible in line with table.
- Part numbers
- ⇒ Parts list

39-82

Determining thickness of shim "S4"

- Add measured value "e" to thickness of shim "S4" fitted and subtract deviation "r".

Example:

Shim "S4" fitted	1.20 mm
+ Value "e" determined	0.32 mm
– Deviation "r"	0.26 mm
= Thickness of shim "S4"	1.26 mm

- Determine shim(s) as accurately as possible in line with table.

Part numbers
⇒ Parts list

Notes:

- ♦ If a thicker shim "S3" is required, then a thicker shim "S4" (same difference) must also be fitted.
- ♦ If a thinner shim "S3" is required, then a thinner shim "S4" (same difference) must also be fitted.

39-83

Shim "S3" table

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	

Shim "S4" table

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	

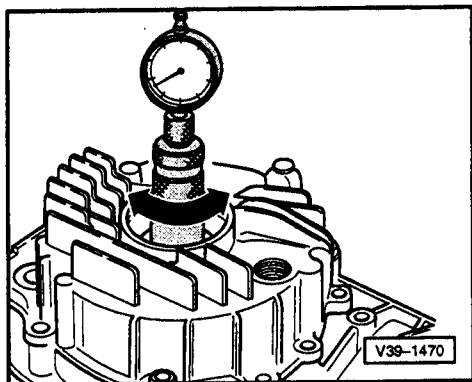
¹⁾ The tolerances of the shims permit determination of any thickness for "S4"; if necessary, fit 2 shims.

39-84

Performing check measurement

Checking dimension "r"

- Fit differential pinion with measured shims "S3" and "S4" and turn several times in both directions.

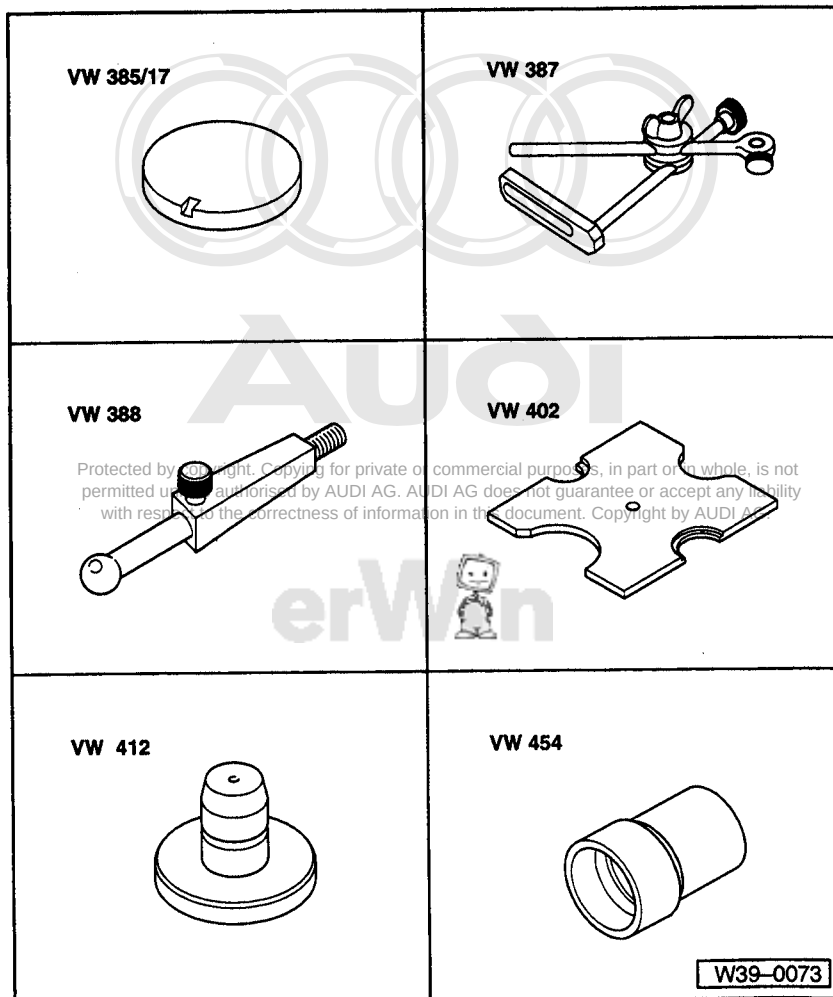


- ◀ - Fit universal test bar ⇒ "Determining dimension 'e'", Page 39-80 and perform check measurement.
- Take dial gauge reading in anti-clockwise direction (red number band).
- ♦ If shims have been selected correctly, deviation "r" (marked on outer periphery of final drive gear) must be indicated with a tolerance of ± 0.04 mm.

Note:

After removing universal test bar, check again that dial gauge reading is "0" with 2 mm preload and master gauge VW 385/30 in position. If not, correct adjustment.

39-85



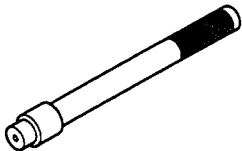
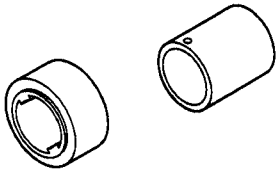
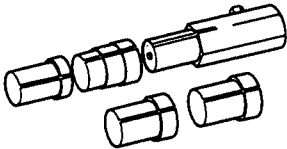
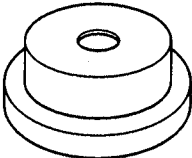
Adjusting final drive gear

(Adjusting differential)

Special tools and workshop equipment required

- ♦ VW 385/17: Gauge plate
- ♦ VW 387: Universal dial gauge holder
- ♦ VW 388: Test lever
- ♦ VW 402: Pressing plate
- ♦ VW 412: Punch
- ♦ VW 454: Thrust piece

39-86

VW 295 	VW 459 
VW 521 	30-205 
	W39-0114

Special tools and workshop equipment required

- ♦ VW 295: Mandrel
- ♦ VW 459/2: Pressing-out and pressing-in tool
- ♦ VW 521: Adjustment tool for final drive gear
- ♦ 30-205: Pressing block

39-87

Final drive gear has to be re-adjusted on replacement of:

- ♦ Gear case
- ♦ Differential cover
- ♦ Taper roller bearings for differential
- ♦ Differential housing

Or

- ♦ Final drive unit

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Adjustment table ⇒ Page 39-58

Notes:

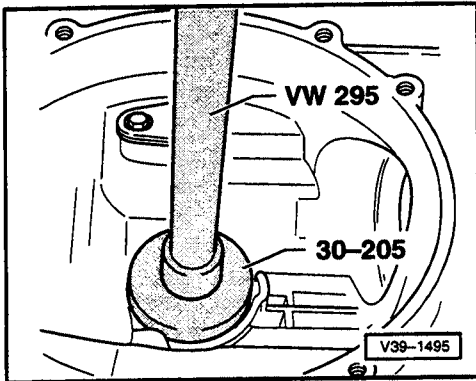
- ♦ If old bearings are to be re-used after dismantling differential, friction torque of old bearings is to be established before dismantling ⇒ Page 39-93.
- ♦ Original friction torque must be re-established for old bearings following assembly. Up to 80 Ncm higher friction torque is however permitted.
- ♦ Friction torque need not be determined if use is made of new bearings. A new friction torque then applies ⇒ Page 39-93.

39-88

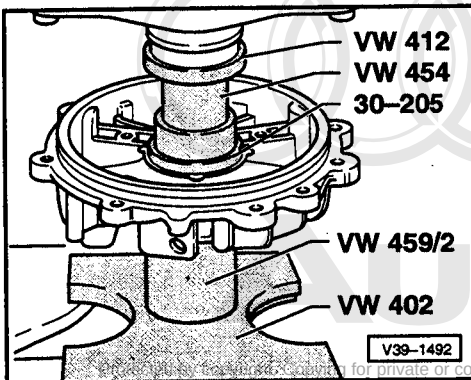
Determining total thickness of shims " S_{tot} " for shims "S1" and "S2"

(Adjusting preload of taper roller bearings for differential)

- Differential pinion removed
- Remove sealing ring, drive gear for speedometer sender -G22 and outer races of both taper roller bearings for differential.
- Removing shims $\Rightarrow$ Page 39-42.
- ◀ – Drive home outer race for taper roller bearing with shim "S2" in gear case. Use is made for measurement of a shim "S2" with a thickness of 1.50 mm (2 x 0.75 mm shims).

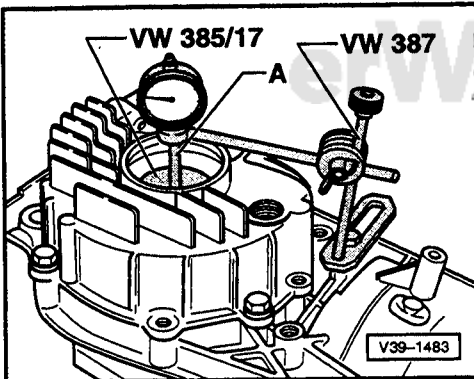


39-89



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- ◀ – Press outer race for taper roller bearing without shim "S1" into differential cover.
- Insert differential in gear case.
- Fit cover and tighten bolts to 25 Nm.



- ◀ – Attach dial gauge holder VW 387 to case, position gauge plate VW 385/17 on differential.
- Set dial gauge to "0" with 1 mm preload.
- Move differential up and down several times without turning it.

Note:

Turning differential would bias measurement result.

- Read axial play off dial gauge and note down.
- Measured value in following example: 0.60 mm

39-90

Formula:

$$S_{tot} = S2 + \text{measured value} + \text{bearing preload}$$

Example:

Shim(s) "S2" fitted	1.50 mm
+ Measured value	0.60 mm
+ Bearing preload (constant value)	0.40 mm
= Total shim thickness "S _{tot} " for shims "S1" + "S2"	2.50 mm

Determining thickness of shim "S1"

Notes:

- ◆ Provisional shim "S1" is replaced by ultimate shim "S1" after determining backlash.
- ◆ The total shim thickness "S_{tot}" remains unchanged.



39-91

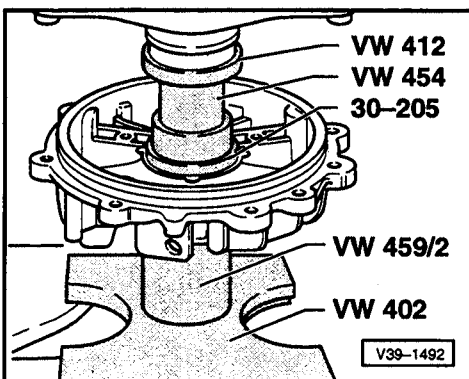
Formula:

$$S1 = S_{tot} - S2$$

Example:

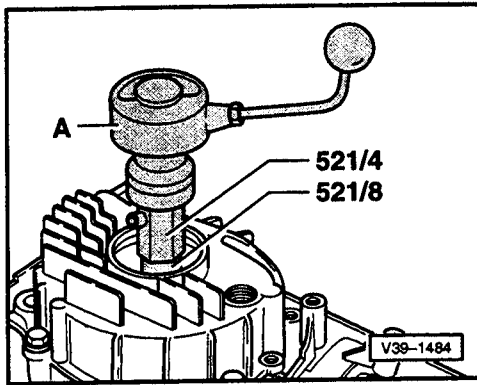
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Total shim thickness "S _{tot} " for shims "S1" + "S2"	2.50 mm
- Shim(s) "S2" fitted	1.50 mm
= Thickness of shim "S1"	1.00 mm



- ▲ - Press shim "S1" determined (1.00 mm in example) with outer race for taper roller bearing into differential cover.
- Fit cover and tighten bolts to 25 Nm.

39-92

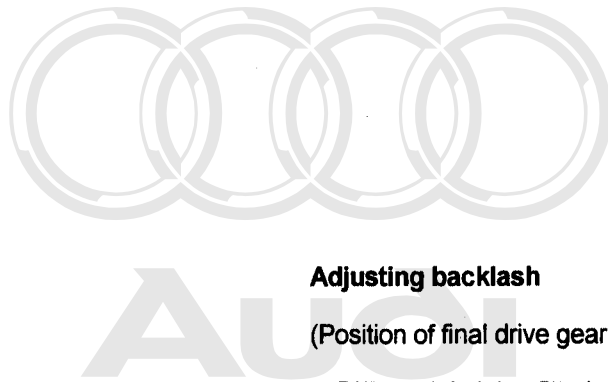


Measuring friction torque (check)

- Differential pinion removed
 - Differential fitted with shims "S1*" and "S2**"
- ◀ – Apply torque gauge 0 ... 600 Ncm -A- to differential.
- Take friction torque reading. Specified value for new taper roller bearings is 70...150 Ncm.

Notes:

- ♦ The total friction torque measured prior to disassembly must be re-established for used bearings. An up to 80 Ncm higher friction torque is however permitted.
- ♦ On re-adjusting final drive unit, differential pinion is to be adjusted and checked ⇒ Page 39-70.



39-93

Adjusting backlash

(Position of final drive gear in gear case)

- Differential pinion fitted with shims "S3" and "S4"

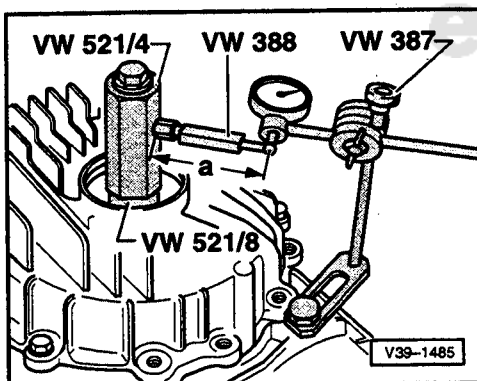
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Fit differential.

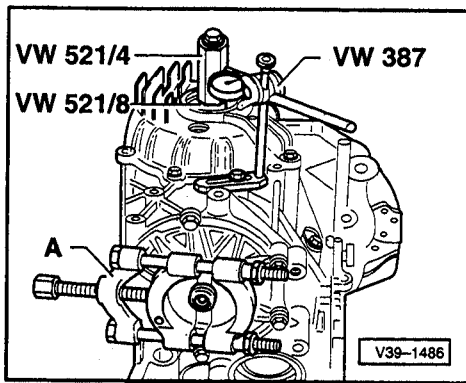
- Fit differential cover and tighten bolts to 25 Nm.
 - Turn differential several times in both directions so that taper roller bearings settle.
- ◀ – Attach dial gauge holder VW 387.
- Insert adjustment tool for final drive gear VW 521/4 and VW 521/8.
 - Set test lever VW 388 to dimension "a" = 70 mm.

Determine backlash between tooth flanks as follows:

- Turn final drive gear until it makes contact with tooth flank (backlash end).
- Set dial gauge to "0" with 1 mm preload.



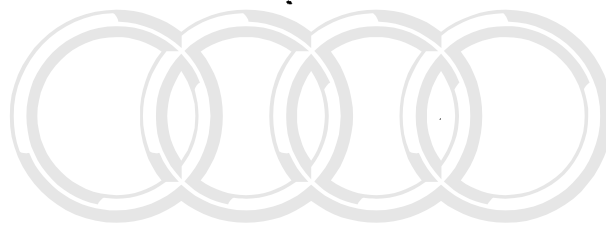
39-94



- Turn back final drive gear until it makes contact with opposite tooth flank.
- Take backlash reading and note down value.
- ◀ - If differential pinion turns during measurement, fit clamping tool, e.g. Kukko 17/2 -A-, and thus fix differential pinion in position.
- Turn final drive gear through a further 90° in each case and repeat measurement three times.

Note:

Clamping tool -A- is to be unfastened for further turning of final drive gear.



39-95

Calculating average backlash

- Add the 4 measured values together and divide the total by 4.

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Example:

1st measurement	0.49 mm
+ 2nd measurement	0.48 mm
+ 3rd measurement	0.50 mm
+ 4th measurement	0.49 mm
= Total	1.96 mm

- Result: Average backlash = $1.96 \text{ mm} \div 4 = 0.49 \text{ mm}$

Note:

If the individual values determined in this measurement differ by more than 0.06 mm, there is a problem either with the installation of the final drive gear or the final drive unit itself. Check assembly operations and replace final drive unit if necessary.

39-96

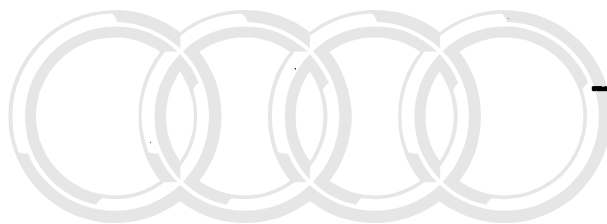
Determining thickness of shim "S2"

- Subtract backlash multiplied by 1.17 (fixed value) from thickness of shim "S2" already fitted (1.50 mm in example) and add lift of 0.20 (constant value).

Example:

Shim "S2*" fitted	1.50 mm
– Average backlash (0.49 mm x 1.17)	0.57 mm
+ Lift (constant value)	0.20 mm
= Thickness of "S2"	1.13 mm

- Determine shims as precisely as possible in line with table ⇒
Page 39-98.
Part numbers
⇒ Parts list



39-97

Determining thickness of shim "S1"

Formula:

$$\text{"S1"} = \text{"S}_{\text{tot}} - \text{"S2"}$$

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Example:

Total thickness "S _{tot} " for "S1" and "S2"	2.50 mm
– Thickness of shim "S2"	1.13 mm
= Thickness of shim "S1"	1.37 mm

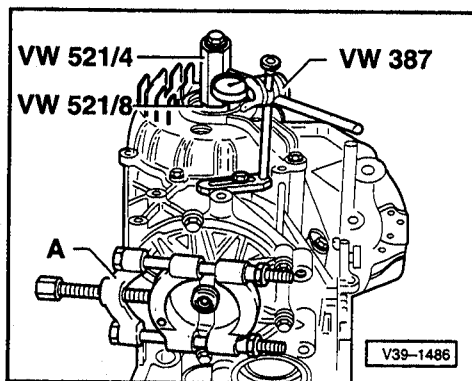
- Determine shim(s) as accurately as possible in line with table.
Part numbers
⇒ Parts list

Shim "S1" or "S2" table

Thickness of shims ¹⁾ in mm		
0.55	0.75	0.95
0.60	0.80	1.00
0.65	0.85	1.05
0.70	0.90	

¹⁾ The tolerances of the shims permit determination of any thickness for "S1" or "S2"; fit 2 shims if necessary.

39-98



◀ Check measurement

- After fitting shims "S1" and "S2", give differential 5 turns in both directions so that taper roller bearings settle.
- Measure backlash 4 times on periphery.
 - ♦ Specified value: 0.15...0.25 mm.

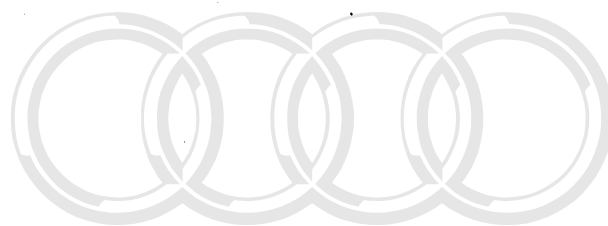


39-99

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